3 <u>Undertaking</u>

OPG TO PROVIDE AN ILLUSTRATIVE EXAMPLE OF HOW THE EARNINGS SHARING MECHANISM CALCULATION WOULD WORK, USING APPROPRIATE PROXY NUMBERS

6 7 8

1

2

4 5

9 **Response**

10

11 Provided below is an illustrative example for recording entries into the Earnings Sharing 12 Deferral Account pursuant to the earnings sharing mechanism ("ESM") included within the 13 Settlement Proposal (Ex. O1-1-1, p. 18). The example has been constructed such that there 14 is an eligible amount to be recorded in the deferral account.

15

16 As noted in the Settlement Proposal, the parties agreed to an ESM based on the performance 17 of the combined nuclear and regulated hydroelectric business on an asymmetrical basis, with 18 a 100-basis point deadband above the OEB-approved Return on Equity ("ROE") rate and 50/50 19 sharing beyond the deadband, which will be assessed over the cumulative 5-year period from 20 2022-2026. The 50% sharing amount would be recorded as a credit to the Earnings Sharing 21 Deferral Account, to be dispositioned following the 5-year period. The parties further agreed 22 that, for this purpose, the OEB-approved ROE rate for the regulated hydroelectric facilities will 23 be the rate base-weighted average of the OEB-approved ROE rate of 9.33% established in 24 EB-2013-0321.¹ For the nuclear facilities, the calculation will be based on the prevailing ROE 25 rate specified by the OEB as of the effective date of the final payment amounts order in this 26 proceeding.

27

In Table 1 below, the example illustrates the calculation of the OEB-approved ROE rate as set out above. Table 2 below shows the determination of the annual regulated earnings dollar amount, if any, above the deadband and the application of the cumulative 5-year assessment to determine amounts recorded in the deferral account. Other than the EB-2013-0321 ROE rate, all figures in the Tables are hypothetical.

34

Table 1: Calculation of OEB Approved ROE Rate for ESM Purposes

| Line | Description | 2022 | 2023 | 2024 | 2025 | 2026 |
|------|-------------------------------|---------|---------|----------|----------|----------|
| А | EB-2020-0290 OEB Approved ROE | 8.34% | 8.34% | 8.34% | 8.34% | 8.34% |
| | Rate (%) | | | | | |
| В | EB-2013-0321 OEB Approved ROE | 9.33% | 9.33% | 9.33% | 9.33% | 9.33% |
| | Rate (%) | | | | | |
| С | Nuclear Rate Base (\$M) | \$8,700 | \$8,700 | \$11,100 | \$12,300 | \$13,100 |
| D | Hydroelectric Rate Base (\$M) | \$7,800 | \$8,000 | \$8,200 | \$8,500 | \$8,900 |
| E | OEB Approved ROE Rate | 8.81% | 8.81% | 8.76% | 8.74% | 8.74% |

³⁵

¹ Average of the 2014 ROE rate of 9.30% and the 2015 ROE rate of 9.36%, as approved in EB-2013-0321.

| Line | Description | Ref | 2022 | 2023 | 2024 | 2025 | 2026 | Cumulative |
|------|---|---------------|----------|----------|----------|----------|----------|------------|
| F | Actual Nuclear Regulated Earnings (\$M) | | \$300 | \$370 | \$500 | \$550 | \$500 | |
| G | Actual Hydroelectric Regulated Earnings (\$M) | | \$400 | \$400 | \$400 | \$400 | \$400 | |
| Н | Total Actual Regulated Earnings (\$M) | (F + G) | \$700 | \$775 | \$900 | \$950 | \$900 | |
| I | Actual Nuclear Rate Base (\$M) | | \$8,700 | \$8,700 | \$11,100 | \$12,300 | \$13,100 | |
| J | Actual Hydroelectric Rate Base (\$M) | | \$7,800 | \$8,000 | \$8,200 | \$8,500 | \$8,900 | |
| K | Actual Total Rate Base (\$M) | (I + J) | \$16,500 | \$16,700 | \$19,300 | \$20,800 | \$22,000 | |
| L | OEB Approved Equity % | | 45% | 45% | 45% | 45% | 45% | |
| М | OEB Approved ROE Rate (%) | Line E | 8.81% | 8.81% | 8.76% | 8.74% | 8.74% | |
| N | Deadband ROE Rate (%) | M + 100bps | 9.81% | 9.81% | 9.76% | 9.74% | 9.74% | |
| 0 | Deadband Regulated Earnings (\$M) | KxLxN | \$728 | \$737 | \$848 | \$912 | \$964 | |
| Р | Regulated Earnings Variance to Deadband (\$M) | Н - О | \$(28) | \$38 | \$52 | \$38 | \$(64) | \$36 |
| Q | Deferral Account Entry (\$M) | P x 50% | | | | | | \$18.0 |

1 Table 2: Calculation of Earnings Above Deadband and Deferral Account Entry

2

3 <u>Undertaking</u>

OPG TO DESCRIBE THE CIRCUMSTANCES AND MEANS BY WHICH IT WOULD RECORD FIRM FINANCIAL COMMITMENTS IN THE NDVA

7 8

6

1

2

4 5

<u>Response</u>

9 10

11 This undertaking arose from a discussion regarding financial and regulatory accounting 12 details related to the Nuclear Development Variance Account ("NDVA").¹ Pursuant to 13 O. Reg. 53/05, section 5.4(1), the account records "differences between actual non-14 capital costs incurred and firm financial commitments made and the amount included 15 in payments made under [section 78.1 of the *Ontario Energy Board Act, 1998*] for 16 planning and preparation for the development of proposed new nuclear generating 17 facilities".

18

19 Before turning to the specific undertaking request, OPG wishes to clarify that while the 20 NDVA is referred to as a variance account, as opposed to a deferral account, nothing 21 in its definition under O. Reg. 53/05 or the implementing payment amounts order 22 issued by the OEB precludes the "amount included in the payments" from being nil. In 23 such a case, actual costs incurred would be compared against the nil amount included 24 in the payment amounts, resulting in the full amount of actual costs being recorded in the account. This was the case in the EB-2010-0008 and EB-2013-0321 proceedings, 25 26 where the approved revenue requirement contained \$0 of costs for planning and preparation for the development of new nuclear facilities and where such actual costs 27 28 were measured against the \$0 amount for purposes of entries into the NDVA.²

29

30 With respect to the NDVA recording amounts related to "firm financial commitments", 31 at Tr. Vol. 1, p. 86, lines 7-15, Ms. Ladak clarified OPG's position that the impact of 32 any such commitments is captured in the account only in the circumstances and at 33 point in time that they give rise to a non-capital cost recognized in OPG's financial 34 statements under generally accepted accounting principles. Thus, OPG does not 35 record amounts in the NDVA that it has not otherwise recognized for financial 36 accounting purposes, a determination that it makes like any other regulated or 37 unregulated entity following US GAAP.

¹ Tr. Vol. 1, pp. 52-68.

² For example, the EB-2013-0321 Payment Amounts Order, App. G, p. 9 stated with respect to the NDVA: "The monthly reference amount shall be 1/24 of the total forecast amount of \$0 underpinning the two-year revenue requirement approved by the Board for 2014 and 2015."

- 1 As a further point of clarification, OPG notes that any non-capital costs incurred for
- 2 planning and preparation for development activities for new nuclear facilities would not
- 3 be subsequently capitalized under US GAAP if the project meets capitalization criteria
- 4 at a later date. OPG would seek clearance of any such eligible costs recorded in the
- 5 NDVA in a subsequent proceeding.

1 2

4

3 **Undertaking**

5 TO EXPLAIN HOW OPG RECORDS COSTS IN THE VARIANCE ACCOUNT 6 RELATED TO LABOUR; TO ADVISE IF THE COSTS OF INITIATIVES INCLUDE ANY 7 FINANCING COSTS, TO EXPLAIN WHAT COSTS OPG IS BOOKING TO THIS 8 ACCOUNT, AND HOW AND WHETHER THE FULLY ALLOCATED COSTS AND 9 FINANCING COSTS ARE THERE OR WHAT EXACTLY IS BEING BOOKED

10

11 Response

12

13 The amounts recorded by OPG in the Nuclear Development Variance Account 14 ("NDVA") represent non-capital costs incurred "for planning and preparation for the 15 development of proposed new nuclear generation facilities", as per O. Reg. 53/05, section 5.4(1). Amounts being recorded are expenditures to preserve the option to 16 17 build new nuclear generation, including maintaining the environmental assessment for 18 site licence renewal and advancing a number of environmental assessment 19 commitments necessary to be ready for eventual site preparation, as well as 20 preliminary planning and preparation costs for developing a small modular reactor at 21 the Darlington site, including technology developer selection, licencing, and project 22 development and oversight costs.

23

These costs include internal labour costs and expenditures on purchased services, and are tracked separately in OPG's financial reporting systems. Internal labour costs are for fully dedicated individuals or hours charged through OPG's time keeping system, and are based on standard labour rates that include base salary, benefits and various payroll taxes. Purchased service costs are for external vendors and short-term contracted staff working on planning and preparation for new nuclear development.

30

31 Only direct costs are tracked and recorded in the NDVA; there are no allocations of 32 common 'overhead' costs captured in the account.

33

Financing costs are not recorded in the NDVA. As authorized by the OEB, OPG records interest on unamortized balances in the account at an OEB prescribed interest rate.

37

All costs recorded in the NDVA are those incurred for planning and preparation for new
 nuclear development at the Darlington site, including the potential grid-scale SMR
 generating station. No costs are recorded in the account in relation to off-grid SMR
 activities or initiatives.

3 **Undertaking**

TO CLARIFY THE NUCLEAR NEW BUILD LICENCE APPLICABILITY, WHAT IS THE LICENSE FOR, AND TO FILE THE LICENCE

6 7 8

1

2

4 5

9 <u>Response</u>

10

11 The Nuclear Power Reactor Site Preparation Licence ("PRSL") for OPG New Nuclear 12 at Darlington Generating Station is not specific to a nuclear reactor technology, and as 13 such, the licensing costs associated with maintaining and renewing this licence are 14 applicable irrespective of the nuclear technology that OPG is evaluating. The licence 15 authorizes the licensee to prepare the Darlington Nuclear site for the future 16 construction and operation of a new nuclear generating facillity. A copy of this licence 17 is provided in Attachment 1.

18

More specifically, the activity licensed by the PRSL is "site preparation" of the OPG New Nuclear at Darlington site.¹ Site preparation involves activities necessary to facilitate the subsequent construction and operation of the new nuclear facility. The PRSL does not permit physical works directly related to construction of nuclear facility structures, systems, and components.

¹ For up to four Class 1A nuclear power reactors with a maximum combined net electrical output of 4800 megawatt electric ("MWe") to supply the Ontario grid, and where a *Class IA nuclear facility* means: (a) a nuclear fission or fusion reactor or subcritical nuclear assembly; and b) a vehicle that is equipped with a nuclear reactor.

PRSL-18.00/2022 Project ID: 16-27600



Canadian Nuclear Safety Commission Commission canadienne de sûreté nucléaire

PDF Ref.: E-DOCS #3990795 Word Ref.: E-DOCS #3853682 File / Dossier: 2.01

NUCLEAR POWER REACTOR SITE PREPARATION LICENCE

OPG NEW NUCLEAR AT DARLINGTON GENERATING STATION

| I) | LICENCE NUMBER: | PRSL 18.00/2022 | (Effective Date: August 17, 2012) |
|------|-----------------|--|--|
| II) | LICENSEE: | Pursuant to section 24 licence is issued to: | of the Nuclear Safety and Control Act this |
| | | Ontario Power Gener 700 University Avenu | ration Inc. |
| | | Toronto, Ontario | |
| | | M5G 1X6 | |
| III) | LICENCE PERIOD | This licence is valid fr | am August 17, 2012 to August 17, 2022 |

III) LICENCE PERIOD: This licence is valid from August 17, 2012 to August 17, 2022, unless suspended, amended, revoked or replaced.

IV) LICENSED ACTIVITIES:

This licence authorizes the licensee to:

- (i) Prepare the Darlington Nuclear site, further described in OPG New Nuclear at Darlington Survey Drawing, NK054-DRAW-01210-00007, for the future construction and operation of a new nuclear generating station (hereinafter "the nuclear facility") located in the Township of Darlington, in the Municipality of Clarington, in the Regional Municipality of Durham, in the Province of Ontario. Site preparation activities include:
 - a) construction of site access control measures;
 - b) clearing and grubbing of vegetation;
 - c) excavation and grading of the site to a finished elevation of approximately +78 masl (metres above sea level);
 - d) installation of services and utilities (domestic water, fire water, sewage, electrical, communications, natural gas) to service the future nuclear facility;
 - e) construction of administrative and support buildings inside the future protected area;
 - f) construction of environmental monitoring and mitigation systems; and
 - g) construction of flood protection and erosion control measures.
- (ii) Possess and use prescribed information that is required for, associated with, or arise from the activities described in (i).

V) EXPLANATORY NOTES:

- (i) Nothing in this licence shall be construed to authorize non-compliance with any other applicable legal obligation or restriction.
- (ii) Unless otherwise provided for in this licence, words and expressions used in this licence have the same meaning as in the *Nuclear Safety and Control Act* and associated Regulations.
- (iii) The "OPG NEW NUCLEAR AT DARLINGTON GENERATING STATION SITE PREPARATION <u>LICENCE CONDITIONS HANDBOOK (LCH)</u>" provides compliance verification criteria in order to meet the conditions listed in this licence. The LCH also provides information regarding delegation of authority and applicable versions of documents.

VI) CONDITIONS:

1. <u>General</u>

- 1.1 The licensee shall have the documents required for site preparation accepted by the Commission, or person authorized by the Commission, prior to the commencement of the licensed activities described in Part IV (i) of this licence.
- 1.2 The licensee shall conduct the activities described in Part IV of this licence in accordance with the licensing basis.
- 1.3 The licensee shall give written notification to the Commission, or person authorized by the Commission, of any changes made to the documents needed to support the licence application.
- 1.4 The licensee shall report any apparent material non-compliance to applicable law at the federal, provincial or municipal level that pertains to the activities described in Part IV of this licence to the Commission, or person authorized by the Commission.
- 1.5 The licensee shall provide, at no expense to the Commission, office space for employees of the Commission who customarily carry out their functions on the site premises (on-site Commission staff). The licensee shall keep the office space of on-site Commission staff separate from the remainder of the building in which it is located by walls, partitions or other suitable structures.
- 1.6 The licensee shall, in the event of any conflict or inconsistency between licence conditions, codes, standards or regulatory documents referenced in this licence, direct the conflict or inconsistency to the Commission, or a person authorized by the Commission, for resolution.

2. <u>Management System</u>

2.1 The licensee shall implement and maintain a management system in accordance with the requirements of Canadian Standards Association (CSA) standard N286: MANAGEMENT SYSTEM REQUIREMENTS FOR NUCLEAR POWER PLANTS.

3. <u>Human Performance</u>

3.1 The licensee shall implement and maintain safety and control measures to ensure that personnel are qualified and competent to perform assigned work.

4. **Operating Performance (Conduct of the Licensed Activity)**

- 4.1 The licensee shall implement and maintain safety and control measures for the conduct of site preparation activities.
- 4.2 The licensee shall implement safety and control measures for reporting to the Commission, or person authorized by the Commission, that includes reporting of all events required by the *Nuclear Safety and Control Act* and associated Regulations.
- 4.3 The licensee shall submit to the Commission, or person authorized by the Commission, an annual report on the licensed activities.

5. <u>Conventional Health and Safety</u>

5.1 The licensee shall implement and maintain safety and control measures for occupational health and safety.

6. <u>Environmental Protection</u>

6.1 The licensee shall implement and maintain safety and control measures for environmental protection in accordance with the requirements of CNSC regulatory standard S-296: ENVIRONMENTAL PROTECTION, POLICIES, PROGRAMS AND PROCEDURES AT CLASS I NUCLEAR FACILITIES AND URANIUM MINES AND MILLS.

7. Emergency Management and Fire Protection

7.1 The licensee shall implement and maintain safety and control measures for emergency preparedness and fire protection.

8. <u>Waste Management</u>

- 8.1 The licensee shall implement and maintain safety and control measures for waste management.
- 8.2 The licensee shall maintain a preliminary decommissioning plan for site preparation in accordance with the requirements of Canadian Standards Association (CSA) standard N294: DECOMMISSIONING OF FACILITIES CONTAINING NUCLEAR SUBSTANCES. The preliminary decommissioning plan shall be revised every five years or when required by the Commission, or person authorized by the Commission.

9. <u>Security</u>

9.1 The licensee shall implement and maintain safety and control measures for site security.

10. <u>Site Specific</u>

- 10.1 The licensee shall implement the mitigation measures proposed and commitments made during the Darlington Joint Review Panel process.
- 10.2 The licensee shall implement the applicable recommendations of the Darlington Joint Review Panel Report in accordance with the Government of Canada response.
- 10.3 The licensee shall implement and maintain an environmental assessment follow-up program.

- 10.4 The licensee shall maintain a financial guarantee that is acceptable to the Commission which shall remain valid and in effect to adequately fund the preliminary decommissioning plan referenced in condition 8.2 of this licence.
- 10.5 The licensee shall implement and maintain a public information program in accordance with the requirements of CNSC regulatory document RD/GD-99.3: PUBLIC INFORMATION AND DISCLOSURE.
- 10.6 The licensee shall submit to the Commission, or person authorized by the Commission, the proposed quality assurance program for the design of the nuclear facility upon the selection of a reactor technology.

SIGNED at OTTAWA on August 17, 2012

Alan R. Graham Chair, Joint Review Panel Canadian Nuclear Safety Commission

Filed: 2021-08-13 EB-2020-0290 J1.5 Page 1 of 1

1 UNDERTAKING J1.5 2 Jundertaking 3 Undertaking 4 TO PROVIDE THE CITED LESSONS LEARNED DOCUMENT 6 Response 9 See Attachment 1 for a copy of the lessons learned document.

| | М.С. | 2013-03-07, | 10 # 214 558 | Filed 2021 EB-202 Attach | -08-13 0-0290 J1.5 ment 1 |
|------------------------|---------------------------|-----------------|---------------------|--------------------------------|------------------------------------|
| ONTARIO POWER | Prio, | Inter | nal Use Only | Page | 1 of 18 |
| GENERATION | Lessons Learned Report | Project Number: | Project Execution F | Plan Number: | |
| | | 16-31555 | 38000-04 | AN- 34605 | |
| | | Revision: | | | |
| D20 STORAGE AND DRUM H | ANDLING PROJECT: MO | DDIFICATION P | LANNING LES | SONS | |

D20 STORAGE AND DRUM HANDLING PROJECT: MODIFICATION PLANNING LESSONS LEARNED REPORT

D-LLD-38000-10001-R00

Project Number: 16-31555 PEP Number: NK38-PLAN-38000-0434605

2013-02-27

Purchase Order Number: 00217807 Other Reference Number: MEC #88528, 118880, 118632, 119824

Internal Use Only

Prepared by:

eb 27, 2013 Reviewed by: Date

Peter Moore Project Leader Projects & Mods

Approved by:

Date

Julian Read **OPG** Project Representative Projects & Mods

MG/112013

Date

R. Solanki Manager Projects & Mods

© Ontario Power Generation Inc., 2013. This document has been produced and distributed for Ontario Power Generation Inc. purposes only. No part of this document may be reproduced, published, converted, or stored in any data retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording, or otherwise) without the prior written permission of Ontario Power Generation Inc.

N-TMP-10204-R001 (Microsoft@ 2007)

| | | Filed 2021-08-1 EB-2020-029 J1. |
|------------------------|-----------------------------|---|
| | Inter | nal Use Only Attachment Page 2 of 1 |
| Lessons Learned Report | D-LLD-38000 | -10001 |
| | Project Number: 16-31555 | Project Execution Plan Number: NK38-PLAN- 38000-0434605 |
| | Revision: R00 | Page 2 of 18 |

D2O STORAGE AND DRUM HANDLING PROJECT: MODIFICATION PLANNING LESSONS LEARNED REPORT

Table of Contents

Page

| Revision | Summary | 3 |
|----------|--|---|
| 1.0 | BACKGROUND | 4 |
| 1.1 | Project Background | 4 |
| 1.2 | Scope of Review | 4 |
| 1.3 | Participants | 4 |
| 2.0 | PROJECT ORGANIZATION AND RESPONSIBILITIES | 6 |
| 3.0 | LESSONS LEARNED | 7 |
| 3.1 | Cost | 7 |
| 3.2 | Schedule | 8 |
| 3.3 | Quality1 | 0 |
| 3.4 | Process | 3 |
| 3.5 | Other 1 | 5 |
| 4.0 | COMMUNICATIONS PLAN FOR THE LESSONS LEARNED REPORT 1 | 7 |
| 5.0 | CONCLUSIONS1 | 7 |
| Appendi | x A: Acronyms1 | 8 |

| | Inter | mal Use Only Attachm |
|------------------------|---------------------------------|---|
| Lessons Learned Report | Document Number: D-LLD-38000 | -10001 |
| | Project Number: 16-31555 | Project Execution Plan Number: NK38-PLAN- 38000-0434605 |
| | Revision: R00 | Page 3 of 18 |

Revision Summary

| Revision Number | Date | Comments | |
|--------------------|------------|---------------|--|
| R00 | 2013-02-27 | Initial issue | |

| | Interna | All Use Only Attachment 1 Page 4 of 18 | | |
|------------------------|---------------------------------------|---|--|--|
| Lessons Learned Report | Document Number: D-LLD-38000-10001 | | | |
| | Project Number: 16-31555 | Project Execution Plan Number: NK38-PLAN- 38000-0434605 | | |
| | Revision: | Page 4 of 18 | | |
| Title: | PRO ISOT MODIFICATION DU | | | |

D2O STORAGE AND DRUM HANDLING PROJECT: MODIFICATION PLANNING LESSONS LEARNED REPORT

1.0 BACKGROUND

1.1 Project Background

The project scope is to build a facility for the storage of 2,100 m³ of D₂O in tanks, including a drum cleaning, testing and handling area and consolidated office space for the Tritium Removal Facility (TRF) staff. The planned in service date is April 15, 2015. Of the 2,100 m³ of D₂O storage to be provided, 1,700 m³ is mandatory support of core scope for Darlington Refurbishment (a value enhancing project). The remaining project scope provides needed D₂O management operational improvements.

This project is currently executing a Full Definition release to complete scope definition, modification planning, and detailed engineering. This work is considered Phase I of a three phase engineer, procure and construct (EPC) contract.

The project is also executing a Partial Full release in parallel to complete ordering of long lead materials, such as Nuclear Class III tanks and pumps, and the start of site preparation activities upon approval of the Darlington Refurbishment Environmental Assessment.

The Modification Planning phase was substantially completed at the end of December, 2012.

1.2 Scope of Review

The scope of this lessons learned review is Contract Award and Modification Planning activities from July-December 2012.

Subsequent Lessons Learned Report(s) will be issued for this project as the work progresses.

1.3 Participants

A lessons learned workshop was held on February 5, 2013 with the following participants. The project sponsor or delegate was also invited however declined due to a conflict.

Refurbishment Engineering:

Chris De Vaal, Section Manager Refurbishment Design Engineering

Stuart Harris, Refurbishment Design Engineering Manager

Brian Krystolovich, Design Team Leader

Neil Mitchell, Vice President Nuclear Refurbishment

Marcel Poirier, Nuclear Refurbishment Design Engineering

| | | Filed 2021-08-1 EB-2020-029 J1. | | |
|--|---|---------------------------------------|--|--|
| Inter | nal Use Only | Attachment | | |
| Document Number: Page D-LLD-38000-10001 | | | | |
| Project Number: 16-31555 | Project Execution PI NK38-PL 38000-04 | an Number: AN- 34605 | | |
| Revision: | Page 5 of 18 | | | |

D2O STORAGE AND DRUM HANDLING PROJECT: MODIFICATION PLANNING LESSONS LEARNED REPORT

Mike Ismail, Engineering Lead

Projects & Modifications:

Peter Moore, Project Leader Julian Read, OPG Modification Team Leader

EPC Vendor:

Lessons Learned Report

Jason Burnett, Project Manager RCM Technologies Bruce Smith, Project Manager Black & McDonald Ltd. Stephen Tutsch, Modification Team Leader RCMT

Tritium Removal Facility:

Glen Barton, TRF Operations Nicole Go, TRF Lifecycle Projects

| Lessons Learned Report | Inter | nal Use Only | Attachmer Page 6 of |
|------------------------|-----------------------------|--|------------------------|
| | D-LLD-38000- | -10001 | |
| | Project Number: 16-31555 | Project Execution Plan NK38-PLA 38000-0434 | Number: N- 4605 |
| | Revision: | Page 6 of 18 | |

D2O STORAGE AND DRUM HANDLING PROJECT: MODIFICATION PLANNING LESSONS LEARNED REPORT

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The overall project organization is shown below. For specific roles, see the Project Management Plan NK38-PLAN-38000-0434605.



Filed 2021-08-13



| Interr | nal Use Only |
|-----------------------------|--|
| NK38-LLD-38 | 000-10001 |
| Project Number: 16-31555 | Project Execution Plan Number NK38-PLAN- 38000-0434605 |
| Revision: | |
| R00 | |

D20 STORAGE AND DRUM HANDLING PROJECT: MODIFICATION PLANNING LESSONS LEARNED REPORT

Lessons Learned Report

3.0 LESSONS LEARNED

3.1 Cost

Lessons learned are listed in order of highest to lowest impact.

| # | Issue Summary | Background | Recommendation | SCR (if applicable) |
|----|--|---|--|---------------------|
| C1 | Positive involvement of expert stakeholders | The TRF technology, design and operational details are unique in the OPG fleet and perhaps the world. As a result this project is utilizing a strategy of expert stakeholder complete integration into the project team. TRF staff has dedicated 2.5 FTE's to the project and do not simply review submittals, but are proactively engaged, attend most project meetings, and meet with the EPC vendor frequently. As a result there has been excellent involvement from the key stakeholder and many examples of good input and "catches" which prevent errors or omissions from propagating very long into the design cycle, preventing future rework and costs. | Other projects, especially those involving unique technologies, consider following this approach. | n/a |
| C2 | Expectations of expert stakeholder involvement | As per C1 above, TRF stakeholders are intimately involved in the project. However, there was inadequate definition by the project team of the level of the support expected. At the start of the project the stakeholder reviewed all submittals and details. It was realized that certain submittals were being commented on, for example the Design Plans, which was not required, resulting in inefficient use of the resource and generating additional work for the EPC Contractor. | The corollary of C1 above is stakeholder involvement must be fine tuned to ensure the most efficient use of the resource. | n/a |

Filed 2021-08-13 EB-2020-0290 J1.5 Attachment 1 Page 8 of 18

| Inter | nal Use Only |
|---------------------------------|--|
| Document Number: D-LLD-38000 | -10001 |
| Project Number: 16-31555 | Project Execution Plan Number NK38-PLAN- 38000-0434605 |
| Revision: R00 | Page 8 of 18 |

Lessons Learned Report

D20 STORAGE AND DRUM HANDLING PROJECT: MODIFICATION PLANNING LESSONS LEARNED REPORT

3.2 Schedule

Lessons learned are listed in order of highest to lowest impact.

| # | Issue Summary | Background | Recommendation | SCR (if applicable) |
|----|---|---|--|---------------------|
| S1 | Quality and timeliness of schedule from EPC Contractor was not to expectations. | Lack of a quality, accepted schedule until late in Modification Planning. Schedule lacked integration between EPC vendor groups (construction, engineering). Apparent causes: There was flux in the B&Mc project manager position for 2 months until the permanent project manager joined the project. The Scope of Work required a Class 3 schedule for Phase I (Engineering) and Class 2 for the Overall Project at time of contract award. Typically a Class 3 schedule is developed by the contractor as part of its bidding process for the project, or by the project team during the initial phases of planning. In hindsight there was not enough information known to require a Class 3 at the time of bidding. Class 3 should have been requested for Modification Planning, Class 2 for Detailed Engineering, updated to Class 3 upon completion of Mod Planning. Level 3 for all of detailed design was not realistic for a project of this complexity. Lack of resources initially – permanent project manager and dedicated B&Mc schedule analyst. Integration between RCMT/ED/B&Mc scheduling | Projects should consider, and challenge, Contractor's "readiness to execute" and resources at the RFP stage. Consider requested granularity of schedule at contract award, based on project complexity. Acknowledge any unrealistic expectations. Scope of payment milestones need to balance SMART (Specific, Measurable, Achievable, Realistic, Timely) expectations with the state of scope definition. | D-2012-08890 |

Filed 2021-08-13 EB-2020-0290 J1.5 Attachment 1 Page 9 of 18

| Intern | nal Use Only |
|--|-----------------|
| Document Number: D-LLD-38000- | 10001 |
| Project Number: Project Execution Plan Number: 16-31555 NK38-PLAN- 38000-0434605 | |
| Revision: R00 | Page 9 of 18 |

Lessons Learned Report

D20 STORAGE AND DRUM HANDLING PROJECT: MODIFICATION PLANNING LESSONS LEARNED REPORT

| | | processes/software was not ready at contract award. 6. Prescription of milestone deliverables i.e. which exact EC's were to be included in each milestone, was too specific can caused churn as some EC's were added and others deleted during Modification Planning. | | |
|----|---|--|---|--|
| S2 | Modification Planning Milestone missed | BCS committed date of October 29, 2012 for the Modification Planning Complete (DES) milestone was missed. A recovery TCD of November 21, 2012 was targeted as part of the recovery plan. This recovery date and subsequent recovery was missed. The milestone was completed on Dec 20, 2012. Apparent causes: The original contract start date was early June, 2012 and contract was not signed until July 5, 2012 which used up some float. Quality issues (see Lesson Learned Q1) impacted schedule. Milestones were fixed and were not allowed to float "from APO" (award of purchase order). | Approximately 2 months was allotted for Modification Planning, which eventually took 6 months. Even with the avoidable quality issues the schedule was not realistic. Essential to have credible schedule and to escalate when required. Oversight required to prevent quality issues which had a large impact. | D-2012-10298 |
| S3 | Positive effect of implementing project staffing plan | Following a benchmarking trip in 2011 to Bruce Power to study their Heavy Water Storage Project implementation, a staffing plan was developed which included 2.5 dedicated FTE's from TRF and up to 6 FTE's for design oversight. As a result of funding and implementation of the plan, the significant workload of submittal reviews has been managed successfully. All but 2 cases were completed within the prescribed turnaround time. | Use of OPEX, consultation with stakeholders, "acknowledging reality" that the work could not be managed with existing resources, and execution of the plan "making it happen" in this case was successful. | Self Assessment NO11-000423 SCR: N-2011- 04605 |
| S4 | Lack of workstations for EPC contractor | Once a permanent project manager was assigned and work control SPOC joined the project, there were requests for a | On large projects EPC contractors need a site presence, which requires | n/a |

| Interr | nal Use Only |
|----------------------------------|---|
| Document Number: D-LLD-38000- | 10001 |
| Project Number: 16-31555 | Project Execution Plan Number: NK38-PLAN- 38000-0434605 |
| Revision: R00 | Page 10 of 18 |

Lessons Learned Report

D20 STORAGE AND DRUM HANDLING PROJECT: MODIFICATION PLANNING LESSONS LEARNED REPORT

| | presence at Darlington site | workstation at Darlington site which went unfulfilled due to difficulty in finding available real estate. | assignment of workstation(s) at site. | |
|----|---|--|--|-----|
| S5 | Positive effect of Scope of Work terms concerning submittals | The Scope of Work specified that no more than 4 design ECs per discipline were to be submitted at one time. This contributed to most of the 10-day turnaround periods being met by OPG and also 3-day turnaround adherence on dispositions by RCMT. | Contract terms should not just specify turnaround times for submittals, but how many submittals may be processed at one time. | n/a |

3.3 Quality

Lessons learned are listed in order of highest to lowest impact.

| # | Issue Summary | Background | Recommendation | SCR (if applicable) |
|----|---------------------------------|--|---|---|
| Q1 | Initial design quality concerns | Two key documents were rejected by OPG due to quality concerns: 1. The first Modification Design Requirement (MDR) submitted on 7/18/12 rejected due to noncompliance with new N-INS-00700-10007 and with historical expectations of MDRs. 2. Modification Outline for EC 118632 was rejected due to insufficient detail in solution and justifications, and incorrect conclusion of an RRAM was possible. Apparent causes: 1. This was one of the first EPC projects requiring engineering vendor to produce MDR and there was little transition period for this change in strategy. 2. Time pressures were involved i.e. 2 months to complete | As per engineering directive, vendors will not produce MDRs in the future. Projects should be cognizant of time pressures. Managerial "courage" to recognize when schedule is unrealistic for the required deliverable and to escalate. | N-2012-03854, N-2012-03914, D-2013-01651, D-2013-01653 |

Filed 2021-08-13 EB-2020-0290 J1.5 Attachment 1 Page 11 of 18

| Inter | nal Use Only |
|----------------------------------|---|
| Document Number: D-LLD-38000- | 10001 |
| Project Number: 16-31555 | Project Execution Plan Number: NK38-PLAN- 38000-0434605 |
| Revision: R00 | Page 11 of 18 |

D20 STORAGE AND DRUM HANDLING PROJECT: MODIFICATION PLANNING LESSONS

Lessons Learned Report

| Q3 | Consolidation of OPG comments on submittals | OPG comments on submittals were initially not consolidated resulting in additional time/effort on part of the EPC vendor to resolve duplicate or conflicting comments. Cost change order resulted. | Comments must be consolidated among all OPG stakeholders reviewing documents before leaving OPG. This is the role of the new Engineering Lead | N-2013-00848 |
|----|--|--|---|--------------|
| Q2 | Modification Outlines did not initially take advantage of ECC process and "EPC" nature of the contract strategy. | example MDR based on new N-INS. 5. Lack of acknowledgement by team that schedule for MDR was unrealistic. Note, following the Mod Planning activities in 2012, Construction Services Mod Outline first submittal in 2013 was considered very high quality. Two MOs were planned and were eventually split into 5 in order to classify appropriately in terms of risk. Apparent Causes: From initial proposal, MO's and MDR were planned from an Engineering perspective not a holistic (engineering, construction) perspective. "E" part of planning was activated before "PC". OPG Project Team could have escalate risk of the plan more effectively and that the contractor required help. Time pressure to complete Mod Planning within 2 months did not allow much time for planning the work. | The goal to allow EPC contractors to decide "how" to do the work. This strategy should include "show me" how the plan will work, not rely completely on the Contractor to develop/execute the plan. Critical need for a strategic plan before starting work. Going forward OPG will produce MDRs/MOs to lay groundwork for plan prior to EPC start. Senior leadership present at the lessons learned workshop emphasized that project teams have the option to put work on hold until a strategic plan is in place, and this will be supported by the management team. | N-2013-00847 |
| | | Vendor had limited experience producing OPG MDRs. Expectations re: N-INS not clear in contract documentation, no | | |

| Interr | nal Use Only |
|----------------------------------|---|
| Document Number: D-LLD-38000- | 10001 |
| Project Number: 16-31555 | Project Execution Plan Number: NK38-PLAN- 38000-0434605 |
| Revision: R00 | Page 12 of 18 |

Lessons Learned Report

D20 STORAGE AND DRUM HANDLING PROJECT: MODIFICATION PLANNING LESSONS LEARNED REPORT

| | | | on the D2O Storage Project. | |
|----|---|---|---|---|
| Q4 | Overall quality of OPG comments on submittals | Some OPG comments on deliverables were out of discipline, in the form of information requests, or preferential in nature. | Discipline in commenting and enforcement by Project Manager is required. Reviewers only comment for their discipline. Reviewers should be aware of the EPC model which holds vendor responsible for how to execute the work. Stop submittal review and escalate if required. | N-2013-00848 |
| Q5 | Integration of EPC Contractor's Proposal | The original Proposal provided by the successful EPC Contractor was not well integrated; for example sections submitted by the prime and subcontractors conflicted. This was a precursor to integration problems seen later, as in Lesson Learned S1 & Q2. | Pay attention to quality of proposal as it can be a precursor for later issues. | n/a |
| Q6 | EPC vendor "Learning organization" area for improvement on submittals | Frequently, the same errors appeared on submittals which were generic issues already subject to comment on previous submittals. This was caused by multiple preparers, schedule pressure, and parallel work. | EPC vendor has accepted coaching. This is an area to be considered for increased oversight. | n/a |
| Q7 | Enhanced COMS deficiency | COMS deficiency: critical design attributes and characteristics of the design for enhanced COMS are required. This was deficient in a COMS package submitted to OPG. | Critical attributes and characteristics should be provided in advance of COMS meetings as applicable. MP-0090 has been revised regarding critical design attributes to allow to not do enhanced COMS/AFS for items clearly not commissionable. | Project Oversight Report #31555- 007 |
| Q8 | Positive effect of proactive coordination with OPG stakeholders | There were many good examples of EPC contractor personnel being proactive regarding coordination and walkdowns with OPG stakeholders. | This positive result requires timely training/access for vendor personnel. | n/a |

| Intern | nal Use Only |
|----------------------------------|---|
| Document Number: D-LLD-38000- | 10001 |
| Project Number: 16-31555 | Project Execution Plan Number: NK38-PLAN- 38000-0434605 |
| Revision: R00 | Page 13 of 18 |

D20 STORAGE AND DRUM HANDLING PROJECT: MODIFICATION PLANNING LESSONS LEARNED REPORT

| Q9 | Project Oversight Plan execution area for improvement | Due to the schedule and volume of submittals the documenting of oversight executed under the Project Oversight Plan sometimes taken a lower priority and can be improved. | More attention to detail needed in documenting the oversight that is being performed. | N-2012-05614, N-2012-05956, N-2012-06082 |
|----|---|---|---|--|
|----|---|---|---|--|

3.4 Process

Lessons Learned Report

Title

Lessons learned are listed in order of highest to lowest impact.

| # | Issue Summary | Background | Recommendation | SCR (if applicable) |
|----|--|---|---|---------------------|
| P1 | Code Classification risk for Long Lead Materials (LLM) | In order to maintain the schedule, LLM (tanks) had to be ordered prior completion of flow diagrams and therefore prior to obtaining code classification from the CNSC. Tank order had to be placed at some risk. | Schedule / plan early. Identify and track risks. | n/a |
| P2 | Expectations around quality i.e. "what good looks like" and OPG governance | OPG governance sometimes vague and open to interpretation. Expectations on quality or rigour differ from manager to manager. For example, acceptance of the Modification Outlines. Apparent causes: OPG Refurbishment Engineering staff turnover at start of project (DTL, section manager) contributed. OPG is utilizing a new COIR and EPC strategy/ expectations. | Utilize DTL, Engineering Lead, and Refurbishment senior advisor to resolve interpretation. Rollouts have been completed with EPC vendors and additional rollout is warranted. Consider providing "client rep" at vendor site to do in-line reviews, identify issues early, and improve communication. | n/a |

| Inter | nal Use Only |
|----------------------------------|---|
| Document Number: D-LLD-38000- | 10001 |
| Project Number: 16-31555 | Project Execution Plan Number: NK38-PLAN- 38000-0434605 |
| Revision: R00 | Page 14 of 18 |

D20 STORAGE AND DRUM HANDLING PROJECT: MODIFICATION PLANNING LESSONS LEARNED REPORT

Lessons Learned Report

| P3 | Management of challenge meeting process vs. verification process | Final verification of an MDR is a design activity only, however all stakeholders were initially allowed to review during this cycle. Stakeholder input should have been via the challenge meeting. Also, the challenge process was not fully complete (comments resolved) prior to final verification – normal process not followed. | For MDR development, a challenge meeting should be held to incorporate all stakeholder input, and this process should be completed (comments resolved) prior to final verification by Engineering only. | N-2013-00850 |
|----|---|--|--|--------------|
| P3 | Deviation from normal Comment & Disposition process. | Due to the challenging schedule and volume of comments on deliverables like Modification Outlines and MDRs, the project deviated from normal Comment & Disposition process. This involved generating/resolving comments in a face to face session outside normal documented Comment & Disposition Sheet process after submission. This deviance evolved due to sometimes unclear comments by OPG, and unclear dispositions by RCMT, which meant OPG could not rely on simply signing the Comment & Disposition Sheet to trust that a comment would be incorporated to the reviewer's satisfaction. | The model used by this project going forward will be face to face discussion of comments generated as part of oversight, in a proactive way before final submittal of a document. After submittal, specific, high quality comments, and specific dispositions are required for process to run efficiently. | n/a |
| P4 | COMS process issue | One scoping COMS for entire project caused problems. For example, OPG DCC group involvement was missed and had to be captured later. Apparent cause was that related to Lesson Learned Q2, initially there was one Mod Outline which was later split into 5, after Scoping COMS was completed. | Going forward, the MP-0090 process allows challenge meeting to serve as scoping COMS. Implement COMS in manageable chunks. | N-2013-00851 |
| P5 | OPG templates area for improvement | Ability to track changes on ECC forms such as Mod Outline, and OPG Comment & Disposition Sheet (CDS) would save a lot of time. CDS template was converted to an Excel sheet that was much more user friendly. | Projects would benefit from revised templates to allow tracked changes, spell check, etc. | N-2013-00853 |

Filed 2021-08-13 EB-2020-0290 J1.5 Attachment 1 Page 15 of 18

| Interi | nal Use Only |
|----------------------------------|--|
| Document Number: D-LLD-38000- | 10001 |
| Project Number: 16-31555 | Project Execution Plan Number NK38-PLAN- 38000-0434605 |
| Revision: R00 | Page 15 of 18 |

Lessons Learned Report

D20 STORAGE AND DRUM HANDLING PROJECT: MODIFICATION PLANNING LESSONS LEARNED REPORT

3.5 Other

Lessons learned are listed in order of highest to lowest impact.

| # | Issue Summary | Background | Recommendation | SCR (if applicable) |
|----|--|---|---|-------------------------------|
| 01 | Rollout of EPC strategy area for improvement | Expectations surrounding interface with EPC Contractors and EPC strategy could have been rolled out better within OPG, eg. Stakeholder groups not willing to work directly with EPC Contractor (instead, only through OPG Project Representative), and adherence to contractual 10 day turnaround times. | New strategy/ process did not have transition time. Need more project level communication with station, for example at station POND or PHC meetings. | n/a |
| 02 | COMS quorum issue #1 | OPG failed to achieve quorum for one COMS meeting and several nearly had to be cancelled due to quorum issues except for last minute "heroics" of the team. Apparent causes: 1. Station Operations in particular did not have the resources to provide support for the volume of COMS meetings. Since then 2 staff have been provided to support projects. 2. COMS process originally had a very short notification of 2-3 days, which has since been improved to 10-15 days. | Ensure COMS meetings notifications are sent and all material provided at least 10 days in advance. An overview sheet with all COMS, and where a particular COMS fits in to the project, was beneficial. 3-way Communication with invitees to ensure attendance. | D-2013-00065, D-2013-00825 |
| 03 | Issue Tracking File (ITF) area for improvement | Issue Tracking File (ITF) not kept up to date with statuses and all issues (for example COMS issues). | Critical to keep ITF up to date to ensure issues are identified and closed. For complex projects with large ITF, method to actively track is required i.e. workdown curve or other | D-2013-01004 |

Filed 2021-08-13 EB-2020-0290 J1.5 Attachment 1 Page 16 of 18

| Intern | nal Use Only |
|----------------------------------|---|
| Document Number: D-LLD-38000- | 10001 |
| Project Number: 16-31555 | Project Execution Plan Number: NK38-PLAN- 38000-0434605 |
| Revision: R00 | Page 16 of 18 |

Lessons Learned Report

Title:

D20 STORAGE AND DRUM HANDLING PROJECT: MODIFICATION PLANNING LESSONS LEARNED REPORT

| | | | metrics. | |
|----|-------------------------|--|---|-------------------------------|
| 04 | COMS quorum issue #2 | Quorum was failed to be achieved for one COMS meeting due to lack of attention to detail in scheduling the meeting. There are usually "fringe" stakeholders who only interact with the project for one COMS and require attention to detail in identifying and ensuring attendance. Or, SSC's for which responsibility is not well defined within OPG; for example yard drainage. | Attention to detail is required for some stakeholders who only interact with the project for one COMS, or for SSC's for which responsibility is not well defined. More attention to detail with nuances such as which COMS Station One should attend vs. TRE One | D-2012-10297, D-2013-00825 |

| | | | Filed 20 EB-2 | 21-08-13)20-0290 J1.5 |
|---|--|-----------------------------|---|------------------------------|
| ONTARIOPOWER GENERATION Lessons Learned Report | nal Use Only Atta Page 000-10001 | chment 1 17 of 18 | | |
| | Lessons Learned Report | Project Number: 16-31555 | Project Execution Plan Number: NK38-PLAN- 38000-0434605 | |
| | | Revision: | | 7 |
| D20 STORAGE AND DRUM H | ANDLING PROJECT: N | IODIFICATION P | LANNING LESSONS | |

COMMUNICATIONS PLAN FOR THE LESSONS LEARNED REPORT 4.0

This Lessons Learned Report shall be communicated in accordance with N-MAN-00120-10001-RISK-06 Darlington Refurbishment Lessons Learned and OPEX Management.

CONCLUSIONS 5.0

In conclusion, the most impactful lessons learned are summarized here. Additional lesson learned report(s) will be required throughout the project lifecycle.

- 1. #C1 & S3 Staffing plan and positive involvement of expert stakeholders. Due to the relative uniqueness of the TRF, and lessons learned from other Utilities around EPC Contractor oversight, the project benefitted from dedicated design oversight and expert stakeholder resources to review submittals and provide oversight. However, the expert stakeholder oversight must be carefully controlled and targeted for maximum efficiency.
- 2. #S1 Quality and timeliness of schedule from EPC Contractor was not to expectations. Challenge Contractor's readiness and resources at RFP stage. Carefully consider requested schedule granularity at contract award. The granularity of deliverables specified within payment milestones needs to be balanced with the state of scope definition at time of award.
- 3. #S2 Modification Planning Milestone missed. After Modification Planning was complete, the team recognized that even with the avoidable quality issues, the schedule for Modification Planning had not been realistic. Essential to have credible schedule and to escalate when required. Properly delivered oversight required to prevent quality issues which had a large impact on missing milestone.
- 4. #Q1 Initial design guality concerns. Be cognizant of time pressures and exercise managerial "courage" to recognize when schedule is unrealistic for the required deliverable and to escalate. As per engineering directive, vendors will not produce MDRs in the future.
- 5. #Q2 Modification Outlines did not initially take advantage of ECC process and "EPC" nature of the contract strategy. There is a critical need to have a strategic plan before starting the work. Project teams have the option to put work on hold until a strategic plan is in place, and this will be supported by the management team.
- 6. #Q3 & Q4 Quality of OPG comments on submittals. Comments from OPG must be consolidated among all stakeholders reviewing a submittal and vetted properly for quality - in discipline, specific, non preferential in nature.

| | | Filed 2021-08-13 EB-2020-0290 J1.5 |
|---|---|--|
| | Internal Use C | Attachment 1 Page 18 of 18 |
| | D-LLD-38000-10001 | |
| Lessons Learned Report | Project Number: Project B 16-31555 NK3 3800 | Attachment 1 Use Only Page 18 of 18 001 Project Execution Plan Number: NK38-PLAN- 38000-0434605 Page 18 of 18 |
| | Revision: Page R00 18 0 | of 18 |
| TITLE: D2O STORAGE AND DRUM HANDLING F | PROJECT: MODIFICATION PLANNING | LESSONS |

D2O STORAGE AND DRUM HANDLING PROJECT: MODIFICATION PLANNING LESSONS LEARNED REPORT

Appendix A: Acronyms

- COIR: Contract Owner Interface Requirements
- COMS: Constructability, Operability, Maintenance, Safety
- EC: Engineering Change (package)
- ED: Ellis Don
- EPC: Engineer, Procure, Construct
- FTE: Full Time Equivalent
- MDR: Modification Design Requirement
- MO: Modification Outline
- OSS Operational Support Services
- PHC: Plant Health Committee
- POND: Plan of the Next Day
- RCMT: RCM Technologies Canada
- RRAM: Reduced Risk Modification
- SSC: System, Structure, or Component
- TRF: Tritium Removal Facility

Filed: 2021-08-13 EB-2020-0290 J1.6 Page 1 of 1

UNDERTAKING J1.6 1 2 3 **Undertaking** 4 5 TO IDENTIFY THE STUDY MENTIONED, TO DETERMINE WHETHER IT NEEDS 6 TO BE PRODUCED AS PART OF AN UNDERTAKING, AND TO CONFIRM WHETHER THE REFERRED TO STUDY IS THE ONE CITED 7 8 9 10 11 **Response** 12

13 See Attachment 1 for a copy of the referenced study prepared by OPG.





Report

| Inte | ernal Use Only |
|------------------|--|
| Document Number: | ······································ |
| NK38-REP | -09701-0265054 |
| Revision: | Aetention: |
| R000 | T 20 |

DARLINGTON REFURBISHMENT D2O STORAGE FACILITY EVALUATION

© Ontario Power Generation Inc., 2009. This document has been produced and distributed for Ontario Power Generation Inc. purposes only. No part of this document may be reproduced, published, converted, or stored in any data retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording, or otherwise) without the prior written permission of Ontario Power Generation Inc.

Darlington Refurbishment D2O Storage Facility Evaluation

NK38-REP-09701-0265054--R000 T 20

2009-05-28

Order Number: N/A Project ID: 10-27959

Internal Use Only

28.05.09 Prepared by: May 2009 Prepared by: Date Date Stefan Varga Margini Patel Senior Technical Engineer Senior Technical Engineer Engineering Support **Engineering Support** Nuclear Refurbishment Nuclear Refurbishment May 2009 Reviewed by: 28 Raju Chander Date Section Manager Engineering Support Nuclear Refurbishment Concurred by Approved by: Denny Williams Date **Glenn Pringle** Date Section Manager Department Manager **TRF/HW Operations &** Engineering Support

Maintenance

Nuclear Refurbishment

 Filed 2021-08-13 EB-2020-0290 J1.6 Attachment 1

 Internal Use OnlyPage 2 of 45

 Document Number: NK38-REP-09701-0265054

 Revision: Revision: Revision:

 Retention: Page: 2 of 45

 Trite:

DARLINGTON REFURBISHMENT D20 STORAGE FACILITY EVALUATION

Table of Contents

| | | Page |
|------------|---|------------------|
| List of Ta | bles and Figures | 3 |
| Executive | Summary | 4 |
| 1.0 | INTRODUCTION | 5 |
| | | |
| 2.0 | NEED FOR ADDITIONAL D20 STORAGE CAPACITY | 6 |
| 2.1 | Existing D ₂ O Storage & Inventory | 6 |
| 2.2 | Additional D ₂ O Storage Capacity Needs | 6 |
| 2.2.1 | Refurbishment | 6 |
| 2.2.1.1 | Refurbishment HTS and Moderator draining capacity needs | 6 |
| 2.2.1.2 | Decontamination capacity needs during Refurbishment | 7 |
| 2.2.2 | Operational Improvements additional storage capacity needs | 8 |
| 2.3 | Summary of Total Storage capacity needs | 9 |
| 3.0 | REVIEWED OPTIONS | 10 |
| 3 1 | New buildings | 10 |
| 311 | Build separate facility south of the existing storage | 10 |
| 3.1.2 | Build separate facility south of the SG storage tank and west of the SG. | 10 |
| 3.1.3 | Extension to existing S&I | 10 |
| 3.2 | Using existing facilities with addition of new tanks | 10 |
| 4.0 | PREFFERED OPTION – NEW BUILDING - DESIGN REQUIREMENTS | 11 |
| | Panafita of the proposed leastion | 1.4 |
| 4.1 | Disadvantages of the proposed location | 14 1 <i>1</i> |
| 4.3 | Cost Estimate | 14 |
| 4.3.1 | Cost Estimate for the Operational Improvements 400 Mg D ₂ O Storage project. | 16 |
| 4.3.2 | Conceptual Cost Estimate for the Refurbishment D ₂ O Storage of 845 Mg | 17 |
| 4.3.3 | Conceptual Cost Estimate for the Combined D ₂ O Storage of 1245 Mg | 18 |
| 4.4 | Schedule | 20 |
| 5.0 | REFURBISHMENT UPGRADING AND TRITIUM REMOVAL COST ESTIMAT | E20 |
| 6.0 | PROJECT RISKS | 21 |
| Appendix | A DNGS Refurbishment Outage and D ₂ O Managing Schedule | າ |
| Appendix | B: DNGS Refurbishment D_2O Process Flow | |

GE Email DNGS Refurbishment Decontamination D₂O Storage24

Appendix C:

| | | | Filed 2021-08-13 |
|-----------|------------------|--------------|------------------|
| | | | EB-2020-0290 |
| | | | J1.6 |
| | | | Attachment 1 |
| | | Internal Use | OnlyPage 3 of 45 |
| | Document Number: | | |
| Report NK | | P-09701-026 | 65054 |
| | Revision: | Retention: | Page: |
| | R000 | T 20 | 3 of 45 |
| Title: | <u> </u> | | • |

DARLINGTON REFURBISHMENT D20 STORAGE FACILITY EVALUATION

| Appendix D: | Meeting Minutes DNGS Refurbishment Decontamination D ₂ O Storage | .27 |
|-----------------|---|-----|
| Appendix E: | DNGS Project # 16-31555 Scope of Work | .28 |
| Appendix F: | DNGS Project # 16-31555 Exclusion from Additional Scope of Work | .31 |
| Appendix G: | DNGS Refurbishment D ₂ O Storage Conceptual Schematic | .33 |
| Appendix H: | DNGS Refurbishment D ₂ O Storage Conceptual Tanks Arrangement Layouts. | .34 |
| Appendix I: | Cost Estimate Details for 400 Mg Storage & Drum Handling Project 31555 | .36 |
| Appendix J: | Refurbishment Upgrading and Tritium Removal Cost Estimate | .43 |
| Reference List. | | .44 |
| Glossary of Acr | onyms | .45 |

List of Tables and Figures

| Figure 1: | DNGS Refurbishment D ₂ O Process Flow | .23 |
|-----------|--|-----|
| Figure 2: | DNGS Refurbishment D ₂ O Storage Conceptual Schematic | .33 |
| Figure 3: | Proposed Conceptual Tanks Arrangement - Layout A | .34 |
| Figure 4: | Proposed Conceptual Tanks Arrangement – Layout B | .35 |

| Table 1: | DNGS Refurbishment D ₂ O Storage Need to drain 1 Unit | 7 |
|-----------|--|----|
| Table 2: | DNGS Refurbishment D ₂ O Decontamination Storage Need (for 1 Unit) | 7 |
| Table 3: | DNGS Operational Improvements D ₂ O Storage Need | 9 |
| Table 4: | DNGS Total D ₂ O Storage Need (for 1 Unit Refurb. & Op. Improvements) | 9 |
| Table 5: | Cost Estimate Summary for 400 Mg & 845 Mg Storage | 15 |
| Table 6: | Cost Estimate for Operational Improvements 400 Mg D ₂ O Project | 16 |
| Table 7: | Building Material Cost, Operational Improvements 400 Mg D ₂ O Project | 17 |
| Table 8: | Building Installation Cost, Operational Improvements 400 Mg D ₂ O Project | 17 |
| Table 9: | Conceptual Cost Estimate for the Refurbishment D ₂ O Storage of 845 Mg | 18 |
| Table 10: | Conceptual Cost Estimate for the Combined D ₂ O Storage of 1245 Mg | 19 |
| Table 11: | Refurbishment Upgrading & Tritium Removal Cost Estimate | 21 |
| Table 12: | DNGS Refurbishment Outage and D ₂ O Managing Schedule | 22 |

| | | | Filed 2021-08-13 |
|--------------------|-------------------------------|-------------|------------------|
| | | | EB-2020-0290 |
| | | | J1.6 |
| | | | Attachment 1 |
| | Internal Use Only age 4 of 45 | | Only age 4 of 45 |
| | Document Number | : | |
| Report NK38-REP-09 | | P-09701-026 | 5054 |
| | Revision: | Retention: | Page: |
| | R000 | T 20 | 4 of 45 |
| Title: | | | |

DARLINGTON REFURBISHMENT D20 STORAGE FACILITY EVALUATION

Executive Summary

Purpose and Scope

The overall objective of this project is to provide sufficient heavy water storage capacity at the Darlington site during the refurbishment period. The operational improvement needs have also been incorporated separately in this report.

According to the draft Darlington station refurbishment outage scheduling [Appendix A:] there is a minimum gap of ten weeks between the refilling of one unit and the dewatering of the next unit. As a result, the refurbishment storage capacity needs to meet the requirements of one Unit.

The main emphasis of this report is to identify the most appropriate solution for heavy water storage that will provide the best flexibility and least disturbance to the plant operations and to develop a cost estimate for the storage facility.

The various options investigated are presented as part of this report with benefits/shortfall rationalizations.

The estimated storage facility cost presented in this report will be part of the overall business case summary of the Nuclear Refurbishment Project - Darlington.

Conclusion

Build a new Heavy Water Storage Facility at Darlington NGS with 1245 Mg of Heavy Water storage capability located inside the Inner Security fence immediately west of the existing storage building. The 1245 Mg of D_2O storage capacity is for:

- 845 Mg in support of the refurbishment of the 4 DNGS units
- 400 Mg in support of the normal operation of the in-service DNGS units and the TRF

Estimated cost of the combined project is \$ 138.5 Million when implemented over a period of 4 years.

When taking normal cost scaling factors into account, this estimate is nominally comparable with previous estimates produced for storage at Darlington.

| | | | Filed 2021-08-13 EB-2020-0290 J1.6 Attachment 1 |
|-------------------------|------------------|--------------|--|
| | | Internal Use | OnlyPage 5 of 45 |
| | Document Number: | | |
| Report NK38-REP-09701-0 | | P-09701-026 | 65054 |
| • | Revision: | Retention: | Page: |
| | R000 | T 20 | 5 of 45 |
| Title: | | | |

DARLINGTON REFURBISHMENT D2O STORAGE FACILITY EVALUATION

1.0 INTRODUCTION

The overall objective for this project is to provide sufficient heavy water storage facilities at Darlington sites during the refurbishment period.

There are three drivers for the additional storage capacity planning, two required by Refurbishment (draining and decontamination) and one required by Operational Improvements (for continuous station operation at the Darlington site).

The requirements for Operational Improvements are reflected in a previous project (# 16-31555) for the addition of a 400 Mg HW storage and drum handling facility. This project was later deferred, in order to be implemented together with the Darlington refurbishment project, as being more cost effective to be carried-out together (Ref [16] and Ref [17]).

Based on the DNGS refurbishment screening level Draft Rev. 0, dated 27-Apr-2009 (DNGS 2/3-4 months - Engineering Mods – Level 1& 2 Activities) there is a 10 weeks gap between the end of refilling of one unit and start of dewatering of the next unit. This means that storage volume for one unit HW (Moderator and HTS) will be sufficient for refurbishment purposes.

The total refurbishment storage capacity needs to meet the requirements of one unit refurbishment is 845 Mg as follows:

- 350 Mg for D₂O from one unit Moderator Systems
- 345 Mg for D₂O from one unit Primary Heat transport (PHT) Systems
- 150 Mg designated for decontamination prior to refurbishment (medium risk see section 2.2 for details)

The operational improvement needs for continuous station operation are:

• 400 Mg HW storage space for continuous operation improvements as per Ref [16] and Ref [17] (for details see Section 2.2.2). This quantity requirement could change in the future as new circumstances arise until the start of refurbishment.

The cost estimate for both projects will be presented separately in this report. The Refurbishment project cost estimate will be detailed, and the cost of the previous 400 Mg project will be presented as received from the project team.

The Heavy water management cycle at Darlington is different from that at Pickering due to the presence of a single, mixed recovery Upgrader. Upgrader product is utilized as addition/swap to the Moderator system keeping the isotopic at a very high level (approx. 99.98% D₂O). This results in significant fuel savings for the station. The TRF is integrated into the heavy water management cycle and is used to produce low-Curie make up to compensate for HTS losses, thus removing the requirement to segregate recoveries during normal operation of TRF. When the TRF is on outage for prolonged periods, recoveries must be segregated imposing additional storage (and manpower) requirements.

| | | | Filed 2021-08-13 EB-2020-0290 |
|--------|-----------------------------|--------------------|-----------------------------------|
| | | Internal Use | Attachment 1 Only Page 6 of 45 |
| Report | Document Number: NK38-RE | P-09701-020 | 65054 |
| | Revision: R000 | Retention: T 20 | Page: 6 of 45 |
| | | | |

DARLINGTON REFURBISHMENT D20 STORAGE FACILITY EVALUATION

2.0 NEED FOR ADDITIONAL D₂O STORAGE CAPACITY

2.1 Existing D₂O Storage & Inventory

The existing Storage and Inventory has four objectives:

- normal operation of the units
- segregation of the high isotopic (> 99.98% D2O) and high curie (> 1.2 Ci/kg) reactor grade D2O (upgrader product) for the moderator systems
- segregation of the lower isotopic (< 99.96% D2O) and lower curie (< 0.7 Ci/kg) reactor grade D2O for the PHT systems, and
- support outages

The station existing Storage and Inventory System includes eight storage tanks with a total volume of 747 m3 and two weigh tanks:

- (a) Four PHT tanks with a capacity of 100 m^3 each (i.e. 38110-TK7/8/9/10)
- (b) One PHT weigh tank with a capacity of 30 m^3 (i.e. 38110-TK1)
- (c) 3 Moderator tanks with a capacity of 3x100 m³ each & 1moderator tank of 47 m³ (i.e. 38110-TK3/4/6 & 38110-TK5 respectively)
- (d) One Moderator weigh tank with a capacity of 10 m3 i.e. 38110-TK2

Details of the system can be found in references [18] and [19] and the details of the seismic qualification in references [5] and [19]

2.2 Additional D₂O Storage Capacity Needs

There are three drivers for the additional storage capacity planning, two required by refurbishment (draining and decontamination) and one required by operational improvement. The project for the latter was deferred, in order to be implemented together with the refurbishment project, since this approach would be more cost effective (Ref [16] and Ref [17]). This additional storage can also be used during TRF Refurbishment (see Ref [25] for details).

2.2.1 Refurbishment

There are two refurbishment drivers for the storage capacity planning:

- o HTS and Moderator D₂O draining capacity during refurbishment
- o D₂O capacity for decontamination during refurbishment

2.2.1.1 Refurbishment HTS and Moderator draining capacity needs

The refurbishment HW storage capacity needs are set by the volume of HTS and Moderator drained from one unit.
| | Filed 2021-08-1 | 3 |
|--------|--|----|
| | EB-2020-029 |)0 |
| | J1 | .6 |
| | | -1 |
| | Internal Use Only _{Page 7 of 4} | 5 |
| | Document Number: | |
| Report | NK38-REP-09701-0265054 | |
| - | Revision: Retention: Page: | |
| | R000 T 20 7 of 45 | |
| Title | | |

- 345 Mg for D₂O from one unit HTS (Ref [23]).
- 350 Mg for D₂O from one unit Moderator Systems (Ref [23], Ref [9], page 3 & Ref [10], page 2, Ref [1] Table 5.7)

| | Total Requ | ired [Mg] | Tanks Need |
|-----------|------------|-----------|---------------|
| HTS | 1x343 | 345* | 3x115 |
| Moderator | 1x343 | 350 | 3.5x100 |
| | Total | 695 | 3x115+3.5x100 |

Table 1: DNGS Refurbishment D₂O Storage Need to drain 1 Unit

• Note: Although Ref [8] (Table 1, page 528), and Ref [1] (Table 5.1) calls for a total inventory of 273 Mg storage space for the HTS, we selected the most conservative solution from Ref [23].

2.2.1.2 Decontamination capacity needs during Refurbishment

The Retube & Feeder Replacement Study is not yet completed at the time of issuing this report.

The Decontamination D_2O Storage needs are based on the preliminary judgment articulated through the email in Appendix C: and the minutes of meeting in Appendix D: and they are:

| Decontamination Total Required [Mg] | | | |
|-------------------------------------|-------------------------|-----|--|
| High Risk | sk Medium Risk Low Risk | | |
| 0 | 150 | 350 | |

Table 2: DNGS Refurbishment D₂O Decontamination Storage Need (for 1 Unit)

The basis of the judgment is that the Darlington contamination levels are less than the Pickering B (Ref [2]), the HTS Tritium limit is 1.2 Ci/ kg D₂O and the Moderator Tritium Limit is 15.0 Ci/kg versus 2.5 Ci/ kg D₂O and 25.0 Ci/kg respectively (Ref [3]). In addition the operating levels are much lower than the OP&P levels.

We made the assumption that the existing SUP can handle (if needed) the quantity and in time processing of the downgraded D_2O from the decontamination of the unit under refurbishment.

High Risk:

The decontamination process is very unlikely since the contamination levels in DNGS is very low; as a result, no HW storage space is needed (see Appendix C: and Appendix D: option A).

| | | | EB-2020-0290 |
|--------|------------------|-------------|-----------------|
| | | | J1.6 |
| | I | nternal Use | Onlyttachment 1 |
| | Document Number: | | Page 8 of 45 |
| Report | NK38-RE | P-09701-026 | 5054 |
| | Revision: | Retention: | Page: |
| | R000 | T 20 | 8 of 45 |
| | | | |

Medium Risk

The next likely scenario (per Appendix D: option E) is a decontamination of the HTS, with no fuel in core, and up to the header level. Per the appendix the volume of low Curie HW needed is 120 m^3 (132 Mg).

The above quantity of 132 Mg low Ci HW is in addition to the quantity taken from the HTS system as explained in the following (based on Ref. [13]):

The decontamination of the HTS main circuit header-to-header is done in principle by draining the main circuit above header to LLDS (130 Mg), keeping the rest of the inventory (140 Mg) in the main circuit header-to-header. After the fuel is removed the decontamination skid is installed between the inlet and outlet headers and circulating chemical reagents through the loop. The decontamination skid is equipped with pumps, filters, ion exchange columns and other equipment (Ref. [13]).

The deuteration and de-deuteration of ion exchange resins will generate about 400 m³ of downgraded HW having an isotopic content of about 60%. The HW in the 60%-isotopic would correspond to 231 m³ of reactor grade HW (254 Mg). (These volumes were calculated scaling the volumes/quantities from Pickering B decontamination study, Ref. [13]). To provide this 254 Mg low Ci HW, 130 Mg can be used from the drained main circuit above header to LLDS and the rest needed is 124 Mg and has to be provided from additional station reserve. This conclusion is close to the quantity proposed per Appendix D: option E (132 Mg).

The 132 Mg station reserve low Ci HW has to be stored in additional tanks to the already planned storage tanks, because after decontamination the remainder of the of the HTS inventory (140 Mg) in the main circuit header-to-header needs to be drained to the refurbishment storage.

Low Risk

The safest scenario (per Appendix D: option D) is a decontamination of the entire HTS, with no fuel in core. The volume of low Curie HW needed is 305 m3 (335 Mg).

The major difference from the above scenario is that the draining of the main circuit above header to LLDS (130 Mg) will not be performed; as a result the quantity of 130 Mg HW from HTS is not available for deuteration and de-deuteration of ion exchange resins. This amount of low Ci HW needs to be provided in addition to the medium risk case. Even though the sum of the two is about 254 Mg, we need to consider the deuteration and de-deuteration of a larger quantity of ion exchange resins; as a result we increased the storage volume from 254 Mg to 350 Mg. It needs to be repeated that 350 Mg of additional low Ci HW needs to be provided by the station during decontamination.

2.2.2 Operational Improvements additional storage capacity needs

The needs for sufficient heavy water storage and segregation had been recognized for years in OPG and initiatives were taken since 2004 to improve the heavy water management process. As a result studies were initiated leading to, in November 2005, the project charter (Ref [16]) and the Kinectrics report (Ref [18]). The report,

| | | | Filed 2021-08-13 |
|--------|-------------------------------|--------------|------------------|
| | | | EB-2020-0290 |
| | | | J1.6 |
| | | | Attachment 1 |
| | Internal Use OnlyPage 9 of 45 | | OnlyPage 9 of 45 |
| | Document Number | | |
| Report | NK38-RE | EP-09701-026 | 65054 |
| | Revision: | Retention: | Page: |
| | R000 | T 20 | 9 of 45 |
| Title: | | | |

examined in detail the heavy water and drum management issues for both Pickering and Darlington.

As an outcome of the report it was concluded that there is inadequate S&I capacity to allow large volume bulk swap to be performed. A new storage facility building similar to the existing Heavy Water Storage Facility was recommended with a capacity of 400 m³ as follows:

- 100 Mg (2x50 Mg) for Downgraded Dirty D₂O Tank/Drum Emptying Tank for SUP
- 100 Mg (2x50 Mg) for Downgraded Clean D2O Tanks for SUP
- 200 Mg for TRF operations support (2x50 Mg TRF Feed Tank/Moderator Drain Tank and 2x50 Mg TRF Product Tank/Upgrader Product Tank)
- Drum handling (storing, emptying, washing and testing) station for 300 drums

| Operational Improvements | | |
|-------------------------------------|--|--|
| Total Required [Mg] Number of Tanks | | |
| 400 4x100 | | |

Table 3: DNGS Operational Improvements D₂O Storage Need

A draft copy of the scope of work for the 400 Mg project is attached in Appendix E:. This was not approved since the project was deferred. The Kinetrics report was used and accepted by OPG as Scope of Work (ref. [18]).

Note: As per Appendix F: the addition of the New IXCU system was subsequently excluded from the Scope of Work.

2.3 Summary of Total Storage capacity needs

The total storage capacity needs at Darlington during refurbishment are calculated by adding the requirements from Table 1, Table 2, and Table 3. The results are summarized in the following table:

| | Total Required [Mg] | | |
|-----------|---------------------|----------|----------------|
| High Risk | Medium Risk | Low Risk | Medium Risk |
| 1095 | 1245 | 1445 | 3x115+9x100 Mg |

Table 4: DNGS Total D₂O Storage Need (for 1 Unit Refurb. & Op. Improvements)

Following are the details explaining the final numbers:

- High Risk: 695 Mg (Refurb. Mod & HTS) + 400 Mg (Op. Impr.) + 0 Mg (Refurb. Decont.)
- Medium Risk: 695 Mg (Refurb. Mod & HTS) + 400 Mg (Op. Impr.) + 150 Mg (Refurb. Decont.)
- Low Risk: 695 Mg (Refurb. Mod & HTS) + 400 Mg (Op. Impr.) + 350 Mg (Refurb. Decont.)

| | | | EB-2020-0290 |
|--------|-----------------|--------------|---------------------|
| | | | J1.6 |
| | | | Attachment 1_ |
| | | Internal Use | • Only age 10 of 45 |
| | Document Number | : | |
| Report | NK38-RE | P-09701-026 | 65054 |
| - | Revision: | Retention: | Page: |
| | R000 | Т 20 | 10 of 45 |
| Title: | | | |

3.0 **REVIEWED OPTIONS**

3.1 New buildings

3.1.1 Build separate facility south of the existing storage

This option is unattractive, as the space should be reserved for a possible/likely new TRF. There is as well a Hydrogen supply station on this location. The underground soil as deep as 15 m is unexplored geologically.

3.1.2 Build separate facility south of the SG storage tank and west of the SG

This option is unattractive, as the space should be reserved for a possible/likely new TRF. In addition to this, we have to consider the environmental issue due to closeness to the lake. Also the soil conditions are unknown which is a risk for construction of a seismically qualified building such as the D_2O Storage facility. By comparison the projected new TRF building has no seismic requirements and its basement is expected to be only about 5 m below ground level, which may be acceptable.

3.1.3 Extension to existing S&I

This option seems the most practical. The main benefit is the closeness to existing storage and the lower cost for tying in to this system (even though the new storage facility will be provided with independent functionality).

3.2 Using existing facilities with addition of new tanks

The Kinetrics study (Ref [18]) examined several options where additional heavy water could be stored within the existing station structures to avoid the need for building extension or new building. The two explored options of the study were:

- Provision of Additional Storage at each Unit, one 50 m³ tank located at each Reactor Unit (4x50 m³ tanks in total).
- Locate Additional Tanks in the OGMS Room (could only accommodate a 100 m³ tank or about 8 x 20 m³ tanks)

The space available within the pre-existing structures was deemed inadequate for meeting the needs of additional heavy water storage defined in the report. It was concluded that for a building extension or new building, the incremental costs associated with the heavy water tanks are minor and the various options of providing additional storage for only one or two systems were deemed unnecessary.

Since the refurbishment requirements are much greater, we concluded that revisiting those options were not worth consideration.

The preferred option is to locate the storage facility in a new building.

Filed 2021-08-13

| | | | EB-2020-0290 |
|--------|------------------|-------------------------------|--------------|
| | | | LD-2020-0290 |
| | | | |
| | | Internal Use Onlyage 11 of 45 | |
| | Document Number: | | |
| Report | NK38-RE | P-09701-026 | 65054 |
| | Revision: | Retention: | Page: |
| | R000 | T 20 | 11 of 45 |
| | | | |

4.0 PREFFERED OPTION – NEW BUILDING - DESIGN REQUIREMENTS

A total of 1245 Mg of storage tank capacity (made up of $3 \times 115 + 9 \times 100$ Mg tanks) shall be provided for segregation of different streams of D₂O. This storage is for one unit Moderator drain (350 Mg), PHT drain (345 Mg), Decontamination (150 Mg) and the additional Operational Improvements requirement (400 Mg) as explained in details in section 2.2 and 2.3. All tanks with associated pump, piping, valves etc. will be located inside the new building.

Consideration shall be given to ensure maximum flexibility in storing and transferring different grades of D₂O to and from reactor units, TRF, Upgrader, etc

The storage facility should have provision for the treatment of the moderator drain (Gd removal prior to detritiation in the TRF and chemistry control prior to refill).

There shall be no negative impact to the performance of existing systems as the result of this project and the current mode of operation shall not be degraded.

System

All pressure boundary systems and components shall meet the requirement of CSA-N285.0-08.

CNSC approval of the proposed system code classification of "Class 3" and "Class 6" is required.

Most of the D_2O lines and storage tanks are expected to contain more than 74 GBq/kg (2 Ci/kg) tritium, hence all nuclear systems are classified as Class 3. Only the conventional part of the system is classified as Class 6.

Building

The building needs to meet the requirement of a Zone 3 area and shall meet the requirements of National Building Code of Canada 2005, the National Fire Code of Canada 2005, CSA-N293-07 (Fire Protection for CANDU Nuclear Power Plants), as well as all federal, provincial and local municipal regulations. (For costing purposes 2005 codes and standards are acceptable. However, the design should be based on the codes and standards in effect at the time of the design and construction.)

- The building to have heating system to maintain minimum OSHA ambient conditions during winter months with building sealing/insulating to minimize heat losses (see Ref [6] for details).
- The building to have ventilation system and kept under marginal negative pressure to maximize the recovery of D2O and isotope products in order to minimize release to the environment including radiation monitoring with alarm and exhaust through HEPA filters (see Ref [6] for details).
- Tritium monitoring, tritium emission reduction and D2O recovery from vent lines must be considered.
- It is not a safety related system

The D₂O storage tanks, transfer pumps and associated equipment shall be located in a pit at elevation depth of 87.000 m. The road elevation is at 100.000 m.

| | | | Filed 2021-08-13 |
|--------|-----------------|--------------|-------------------|
| | | | EB-2020-0290 |
| | | | J1.6 |
| | | | |
| | | Internal Use | Only age 12 of 45 |
| | Document Number | * | |
| Report | NK38-RE | P-09701-026 | 5054 |
| | Revision: | Retention: | Page: |
| | R000 | T 20 | 12 of 45 |
| Title: | | | |

A platform shall be provided in the pit at El. 96.700 m to provide access to the top of the D_2O storage tanks for maintenance and inspection work.

The seismic qualification requirement for the proposed additional storage is similar to that of the existing storage facility (reference [4] & [5]). The substructure of the West Annex Building, enclosing the D₂O tanks, is to be seismically qualified to DBE category D (including the dyke around the tanks that would contain the D₂O inventory if the tanks were to fail during a seismic event and that would contain the spill of D₂O to the environment).

The concrete substructure of the dyke is sited on rock at elevation 87.000 m.

The superstructure of the building to be braced steel frame resting on a concrete structure. It does not need to be seismically qualified. However, it shall be analyzed for earthquake loads as per NBC 2005.

The suggested location for the building is inside the Inner Security Fence at immediate proximity of the existing HWMB to the West as indicated in Appendix H: (two variations of layouts). The approximate size of the building is 400 m2 (width between 13.3 m to 18 m and length between 22 m to 33 m, depending on the option) with a height of maximum 13 m below ground level of 100.000 m required by the refurbishment storage and a maximum height of 20 m above ground level of 100.000 m required by the 400 Mg Operational Improvement project.

Drainage shall be provided in the new building so that spills can be drained to the sumps in the D₂O Management Building.

Appendix G: shows the Conceptual D₂O Refurbishment Storage Schematic.

Material

The materials required to complete the project shall be procured as per OPG specifications/standards.

All equipment and piping shall be enclosed in a building to prevent freezing of system contents

Material of tanks and piping is Stainless Steel AISI 304L.

The new tanks shall be designed to Class 3. The orientation is vertical. The Design Pressure is 240 kPag (35 psig). The Design Temperature is 66 °C (150 °F) (ref [19]).

Each tank shall have a partition in the centre to divide it into two storage compartments. The capacity shall be at least 110% of the total storage capacity.

The tanks shall be inter-connected with piping (Size 2 inches) with provision for isolation, transfer and purification of the content. Piping shall include tank inlet and outlet headers, tank vent and drain lines and provision for tank recirculation, complete with sample points and quick disconnect fittings (or equivalent) for connection to a local IXCU.

All pipe fittings and valves are stainless steel. EPDM rubber is used for items such as gaskets, valve diaphragms and flexible hoses, which are in contact with D_2O .

Two 100% Nuclear Class 3 canned centrifugal type pumps with stainless steel internals. Capacity is 8 L/s at a total head of about 147 m. Design pressure is 2000

| | | | Filed 2021-08-13 |
|--------|-----------------|--------------|------------------|
| | | | EB-2020-0290 |
| | | | J1.6 |
| | | | Attachment 1 |
| | | Internal Use | Onlyage 13 of 45 |
| | Document Number | ər: | |
| Report | NK38-RI | EP-09701-026 | 65054 |
| - | Revision: | Retention: | Page: |
| | R000 | Т 20 | 13 of 45 |
| Title | | | |

kPa(g) and Design Temperature is 68 $^{\circ}$ C (Ref [24] & Ref [19]). The pumps shall be connected to a common suction and discharge header. Manually operated isolation valves shall be designed to ensure a flow path can be established from any of the tanks to any of the pumps.

Instrumentation

The new storage tanks shall be designed to tie in to existing control/transfer systems, and still to have independent functionality.

Level and pressure indications shall be provided for the new D_2O storage tanks, both locally and in the Control Room. Alarms (locally and Control Room) shall be provided to alert operator of abnormality in the storage tanks. The existing control computers in the D_2O Management and TRF Building shall be utilized for any new equipment indicating alarms and control functions.

Fixed Area Alarming Tritium monitors shall be installed to detect the presence of tritiated water and/or vapour leakages.

Beetle alarms shall be provided to alert operator of leaks or spills. The new alarm system shall mirror the existing design for consistency

Cover gas shall be provided for the storage tanks from the existing system. The tanks shall be designed for a pressure equivalent to the cover gas pressure plus the static elevation of a water column in the tank.

Isolations and draining shall be provided to isolate/drain any individual tank for maintenance. Double block and bleed arrangements shall be used for isolation between tanks designated for PHT D2O and Moderator D2O, interconnecting lines between reactor grade and downgraded D2O.

Means of sampling and analyzing of the contents in the tanks shall be provided. In order to obtain a representative sample, the water present in the tanks must be recirculated for several minutes using the appropriate recirculation line.

Tanks to be protected against overpressure by a pressure relief valve in the vent line.

Relocation of services: (List of pipes/sewer/cable ducts affected)

The following yard services are located within the construction area of the proposed location of the new storage building and have to be relocated (see ref [11] and [12]):

- A ½" diameter buried Helium Supply Piping 7554-L601-H1/2ANF (SCI 75540 Helium) (SCI 75000 Compressed Air, Gas & Vacuum Services) (SCI 75500 Miscellaneous Gas Services)
- A 10" diameter buried Fire Protection water Piping (7811-L18-W10APAA) (SCI 78110 Fire Protection Water Supply/Distribution)
- A Fire Protection water Piping of unknown size (SCI 78110)
- A 600 mm diameter buried yard drainage Piping (SCI 15200) (Sewer CSP -Corrugated Steel Pipe)
- A catch basin CB 483 (SCI 15200)
- A 6" diameter buried drain line from HWMB roof drain to catch basin (SCI 79110) (7911-W6APAB)

| | | | Filed 2021 08 13 |
|--------|--------------|---------------|---------------------------------------|
| | | | Fileu 202 1-00-13 |
| | | | EB-2020-0290 |
| | | | J1.6 |
| | | | - Attachment 1 |
| | | Internal Use | Onlyage 14 of 45 |
| | Document Num | ber: | · · · · · · · · · · · · · · · · · · · |
| Report | NK38-F | REP-09701-020 | 65054 |
| | Revision: | Retention: | Page: |
| | R000 | T 20 | 14 of 45 |
| Title | | | |

- A 300 mm diameter buried drain line from catch basin to yard drainage piping (SCI 15200)
- 7210-L921-W30A Low Pressure Service Water Open System Pipe (SCI 72100 Liquid recovery)
- Cable Duct from Standby Gen OIL Tanks #1&2 to the Generators. (low probability to interfere)

All the yard services, except for the fire protection water piping of unknown size, will be relocated toward the west under the road. The fire protection water piping of unknown size will require further review relative to relocation.

There are four buried construction pipes (12" Steam, 3" C.R., 6" Air, 8" Water) running along the middle of the road west of the HWMB (see ref [11] and [12]). These pipes might not be in use and might not need to be relocated, only capped. The cost of these four pipes relocation should be included in contingency.

4.1 Benefits of the proposed location

- System tie-ins to the existing systems are less expensive than other farther location options
- Use of an extension to the HWMB reduces costs as it is already a Zone 3 building with a suitable ventilation and stack monitoring
- There are existing D2O transfer lines which simplifies piping installation needs
- Tanks can be monitored by existing HWMB operations staff
- Extra flexibility for segregation and management of D2O during the extended life of the plant reducing the outage duration and cost

4.2 Disadvantages of the proposed location

- The existing truck ramp and the loading dock will be affected and a temporary area needs to be provided on the north side of the existing HWMB to facilitate the loading and unloading operations of D2O drums during the construction of the HWMB West Annex.
- The proposed location is affecting the existing road that needs to be relocated toward west by about 2 meters.
- The closeness to the existing building imposes additional excavation and construction difficulties
- Since the HWMB West Annex systems are, in most cases, extensions of the existing systems in the HWMB, temporary design modifications to the following systems may be required to minimize the interruptions of their operation during system tie-ins: D₂O Supply System (SCI 38110); D₂O Cleanup System (SCI 38410); Downgraded D₂O Transfer System (SCI 38500); D₂O Sampling System (SCI 63800)
- The existing service pipes (firewater, helium, and storm water) and the 600 V electrical cables located on the west side of the existing HWMB need to be relocated or re-routed.

| | | Filed 2021-08-13 |
|--------------|------------------------------|------------------|
| | | EB-2020-0290 |
| | | J1.6 |
| | | Attachment 1 |
| | Only ^{age 15 of 45} | |
| Document Num | ber: | |
| NK38-F | REP-09701-02 | 65054 |
| Revision: | Retention: | Page: |
| R000 | T 20 | 15 of 45 |
| | | |

4.3 Cost Estimate

In the following sub-sections are presented the cost estimates for the Operational Improvement 400 Mg D_2O Storage and Drum Handling project, the cost estimate for the Refurbishment 845 Mg Storage, and the combined cost estimate for 1245 Mg Storage.

The Operational Improvement 400 Mg D_2O Storage project cost estimate was prepared by Project Management Office (PMO) on May 22, 2008 (section 4.3.1), and forms the basis for the Refurbishment 845 Mg Storage cost estimate (section 4.3.2).

The total cost of the combined storage of 1245 Mg is \$ 138.5M (section 4.3.3). There is a cost reduction of 10% to 15% if both projects are completed together. This saving comes from space saving, PM, labour etc.

| | Operational Improvements 400 Mg Storage | Refurbishment 845 Mg Storage | Combined 1245 Mg Storage |
|-------------------------|---|---------------------------------|-----------------------------|
| Cost w/o Contingency | \$ 55.9M | \$ 61.7M | \$ 103.4M |
| Contingency | \$ 19.0M | \$ 21.0M | \$ 35.1M |
| Total Cost | \$ 74.8M | \$ 82.7M | \$ 138.5M |

Table 5: Cost Estimate Summary for 400 Mg & 845 Mg Storage

Notes:

- o All the estimates are in \$ 2008
- o Interest is not included
- o Installation work is done by an external contractor
- o All work is within the secured "protected area" with the incumbent restrictions
- Commissioning and Work Plans are prepared and managed by OPG Procedures
- o External agency to provide design and construction documents for the facility
- Operating and Maintenance costs (excluding personnel) during the Refurbishment (approximately 7 years) is not included
- Costs related for approval procedures (CNSC, local municipality to obtain building permit) is included
- We made the assumption that the existing TRF and SUP can handle (if needed) the quantity and in time processing of the drained D2O from the unit under refurbishment
- Cost of detritiation and upgrading is separately indicated in section 5.0
- Cost of TRF refurbishment / new TRF is not included in this report (for this cost see Ref [25])
- o Cost of D₂O Storage for TRF refurbishment is not included in this report

| | | | Filed 2021-08-13 EB-2020-0290 |
|--------|-----------------|--------------|----------------------------------|
| | | | J1.6 |
| | | Internal Use | Only age 16 of 45 |
| Report | Document Number | P-09701-026 | 5054 |
| | Revision: | Retention: | Page: |
| | R000 | T 20 | 16 of 45 |
| Title- | | | |

4.3.1 Cost Estimate for the Operational Improvements 400 Mg D₂O Storage project

The cost of the Operational Improvement 400 Mg D_2O Storage project is \$74.8M, and it was prepared under Project 31555 by PMO (Ref [20]).

| Ref. Appendix I Tables | Description | Cost | % of total cost |
|------------------------------|---|--------------|-----------------|
| | Process Systems incl. Tanks | | |
| Table 1A | Material | \$5,000,000 | 8.95% |
| Table 1B | Installation | \$9,000,000 | 16.12% |
| | Sub total | \$14,000,000 | 25.07% |
| | Building | | |
| Table 2A | Material - 13 meter height (160 m ²) | \$2,400,000 | 4.30% |
| Table 2A | Material - 6 meter height (820 m ²) | \$5,600,000 | 10.03% |
| Table 2B | Construction - 13 meter height (160 m ²) | \$4,335,000 | 7.76% |
| Table 2B | Construction - 6 meter height (820 m ²) | \$10,115,000 | 18.11% |
| Table 2B | Relocation services | \$1,000,000 | 1.79% |
| | Sub total | \$23,450,000 | 41.99% |
| | Sub total Material & Installation | \$37,450,000 | 67.06% |
| Table 3 | Design Engineering | \$8,500,000 | 15.22% |
| Table 4 | Project Management | \$5,862,364 | 10.50% |
| Table 5 | Installation OPG (support during installation, commissioning & close out) | \$4,035,669 | 7.23% |
| | Sub total | \$18,398,033 | 32.94% |
| | Total before contingency | \$55,848,033 | 100% |
| | Contingency @ 34% | \$18,988,331 | |
| | Total including contingency | \$74,836,364 | |

The scope of the project is given in section 2.2.2.

Table 6: Cost Estimate for Operational Improvements 400 Mg D₂O Project

Since the cost breakdown of this project is not available in the PMO documents, the cost breakdown was derived as follows, to facilitate cost estimation of refurbishment storage costs:

The Table 1A, Appendix I: Material cost (tanks & process system) gives the cost of long lead items i.e. tanks & associated process system material cost as \$ 5M.

One 100 Mg tank cost is \$ 500k which is based on the Pickering B Refurbishment D_2O Storage estimate (ref [21]). Four tanks cost is \$ 2M, therefore the process

| | | | Filed 2021-08-13 |
|--------|------------------|------------|--------------------------------|
| | | | EB-2020-0290 |
| | | | J1.6 |
| | | | Attachment 1 |
| | Inte | ernal Use | e Only ^{age 17 of 45} |
| | Document Number: | | |
| Report | NK38-REP-0 |)9701-02(| 65054 |
| | Revision: | Retention: | Page: |
| | R000 | Т 20 | 17 of 45 |
| Title; | | | - |

systems cost is \$ 3M. As a result, the process system cost is 1.5 times the cost of the tanks.

The Table 1B, Appendix I: gives the installation (tanks & process system) cost as \$ 9M, which is 1.8 times the material cost.

In Table 2A, Appendix I: Material cost (building), the total cost of material for building is \$ 8M. The cost is proportionately calculated for two different heights. The higher unit cost for the 13 m area takes in to consideration that the building is completely underground; it needs special foundation and isolation, and is seismically qualified. This method of proportionate allocation is used for both the building material and construction costs.

| | Area | Unit Cost | Total Cost |
|---------------------|--------------------|--------------------------|-------------|
| Total Material Cost | | | \$8,000,000 |
| 13 meter high area | 160 m ² | \$15,000 /m ² | \$2,400,000 |
| 5/6 meter high area | 820 m ² | \$6,829 /m ² | \$5,600,000 |

Table 7: Building Material Cost, Operational Improvements 400 Mg D₂O Project

In Table 2B, Appendix I: the total cost for construction of the building is \$ 15.45M and includes the relocation of services.

The cost is proportionately calculated as mentioned above.

| | Area | Unit Cost | Total Cost |
|-------------------------|--------------------|--------------------------|--------------|
| Total Construction Cost | | | \$15,450,000 |
| 13 meter high area | 160 m ² | \$27.094 /m ² | \$4,335,000 |
| 5/6 meter high area | 820 m ² | \$12.335 /m ² | \$10,115,000 |
| Relocation of Services | | | \$1,000,000 |

Table 8: Building Installation Cost, Operational Improvements 400 Mg D₂O Project

In Table 3, Appendix I: the Design Engineering cost is \$8.5M, and it represents 23% of the total material and installation cost.

In Table 4, Appendix I: the Project Management cost is \$ 5.86M, and it represents 16% of the total material and installation cost.

In Table 5, Appendix I: the OPG Installation cost is \$ 4M. The cost includes OPG support during Design, Installation, Commissioning and Closeout; and it represents 11% of the total material and installation cost.

4.3.2 Conceptual Cost Estimate for the Refurbishment D₂O Storage of 845 Mg

The cost for the Refurbishment D₂O Storage of 845 Mg, alone, is \$ 82.7M.

| NK38-RE | EP-09701-026 | 5054 |
|-----------|--|---|
| Revision: | Retention: | Page: |
| DOOD | T 20 | 18 of 45 |
| | Document Numbe NK38-RE Revision: | Internal Use Document Number: NK38-REP-09701-026 Revision: Retention: |

The conceptual cost estimate for the Darlington Refurbishment D_2O Storage project of 845 Mg is based on the cost estimates and notes provided in section 4.3.1, for the Operational Improvements 400 Mg D_2O Storage project.

The scope of the Refurbishment D_2O Storage of 845 Mg is presented in section 2.2.1.

| Description | Cost (x1000) | % of total cost | Comment |
|---|--------------|-----------------|---|
| Process Systems incl. Tanks | | | |
| Material | \$10,000 | 16.20% | 8 tanks at 500k\$ (same for 115Mg & 100Mg tanks) 2.5 times to include pumps piping, valves |
| Installation | \$17,778 | 28.80% | Back worked to get 64% installation of total |
| Sub total | \$27,778 | 45.00% | |
| Building | | | |
| Material (300 m²) | \$4,500 | 7.29% | \$15,000 / m ² |
| Construction (300 m ²) | \$8,128 | 13.17% | \$27,094 / m ² |
| Relocation services | \$750 | 1.21% | |
| Sub total | \$13,378 | 21.67% | |
| Sub total Material & Installation | \$41,156 | 66.67% | |
| Design Engineering | \$9,466 | 15.33% | 23% of material & install. |
| Project Management | \$6,585 | 10.67% | 16% of material & install. |
| Installation OPG (support during installation, commissioning & close out) | \$4,527 | 7.33% | 11% of material & install. |
| Sub total | \$20,578 | 33.33% | Planning & Eng. cost is 30% of total cost |
| Total before contingency | \$61,734 | 100% | |
| Contingency @ 34 % | \$20,990 | | |
| Total incl. contingency | \$82,724 | | |

Table 9: Conceptual Cost Estimate for the Refurbishment D₂O Storage of 845 Mg

4.3.3 Conceptual Cost Estimate for the Combined D₂O Storage of 1245 Mg

The cost for the Combined D₂O Storage of 1245 Mg is \$ 138.5M.

The conceptual cost estimate for both projects (the Darlington refurbishment D_2O storage project for 845 Mg & the Operational Improvement Project of 400 Mg) are presented in parallel in Table 10.

| | | | Filed 2021-08-13 |
|--------|------------------|-------------|------------------|
| | | | EB-2020-0290 |
| | | | J1.6 |
| | | | Attachment 1 |
| | l I | nternal Use | Onlyage 19 of 45 |
| | Document Number: | | |
| Report | NK38-REF | -09701-026 | 5054 |
| | Revision: | Retention: | Page: |
| | R000 | T 20 | 19 of 45 |
| Title: | | | |

There is a cost reduction between 10 to 15% if the two projects are implemented together mainly because there will be an area savings for the entire building from a more favourable tanks arrangement and other organizational costs savings.

| Description | 400 Mg Cost (x1000) | 845 Mg Cost (x1000) | Total Cost (x1000) | Cost if implemented together (x1000) | |
|---|------------------------|------------------------|-----------------------|---|----------|
| Process Systems incl. Tank | s | | | | |
| Material | \$5,000 | \$10,000 | \$15,000 | | |
| Installation | \$9,000 | \$17,778 | \$26,778 | | |
| Sub total | \$14,000 | \$27,778 | \$41,778 | \$37,600 | 10% less |
| Building | | | | | |
| Material (13 m high) | \$2,400 | \$4,500 | \$6,900 | | |
| Construction (13 m high) | \$4,335 | \$8,128 | \$12,463 | | |
| Material (6 m high) | \$5,600 | | | | |
| Construction (6 m high) | \$10,115 | | | | |
| Relocation services (see note below) | \$1,000 | \$750 | \$1,750 | | |
| Sub total | \$23,450 | \$13,378 | \$36,828 | \$31,304 | 15% less |
| Total Material & Installation cost | \$37,450 | \$41,156 | \$78,606 | \$68,904 | |
| Design Engineering | \$8,500 | \$9,466 | \$17,966 | \$15,848 | |
| Project Management | \$5,862 | \$6,585 | \$12,447 | \$11,025 | |
| Installation OPG (support during install., commissioning & close out) | \$4,036 | \$4,527 | \$8,563 | \$7,579 | |
| Sub total | \$18,398 | \$20,578 | \$38,976 | \$34,452 | 12% less |
| Total (before contingency) | \$55,848 | \$61,734 | \$117,582 | \$103,356 | |
| Contingency @ 34 % | \$18,988 | \$20,990 | \$39,978 | \$35,141 | |
| Total (including contingency) | \$74,836 | \$82,724 | \$157,560 | \$138,497 | 12% less |

Table 10: Conceptual Cost Estimate for the Combined D₂O Storage of 1245 Mg

Note:

Relocation of services cost for 845 Mg project is in addition to the relocation services cost for 400 Mg project.

.

| | | | Filed 2021-08-13 |
|--------|------------------|--------------|-------------------|
| | | | EB-2020-0290 |
| | | | J1.6 |
| | | | Attachment 1 |
| | | Internal Use | Only age 20 of 45 |
| | Document Number: | | |
| Report | NK38-RE | P-09701-026 | 65054 |
| | Revision: | Retention: | Page: |
| | R000 | T 20 | 20 of 45 |
| Title: | | | |

4.4 Schedule

Total project duration for 1245 Mg D_2O storage project is 4 years. The details for each activity can be found from the following schedule (based on Ref [26]):

| | Year 1 | Year 2 | Year 3 | Year 4 |
|---------------------------------------|----------------------------|---------------------------|------------------------------|----------------------------|
| Task / Duration in years | 1 2 3 4 5 6 7 8 9 10 11 12 | 1 2 3 4 5 6 7 8 9 10 11 1 | 2 1 2 3 4 5 6 7 8 9 10 11 12 | 1 2 3 4 5 6 7 8 9 10 11 12 |
| Project Management | | | | |
| Preliminary and detailed design | | | | |
| Construction of facility (Civil) | | | Contraction and the | |
| Procurement of material (Long lead) | | | | |
| Installation of tanks and piping | | | | |
| Installation of electrical & I/C work | | | | in and |
| Commissioning | | | | |
| Close Out | | | | |

The overall schedule for execution of the project includes time for approvals from municipality and CNSC.

5.0 REFURBISHMENT UPGRADING AND TRITIUM REMOVAL COST ESTIMATE

PHT Tritium limit is 1.2 Ci/ kg D₂O and Moderator Tritium limit is 15.0 Ci/kg as per the Darlington Operating Policies & Principles (Ref [2]).

The cost was calculated on the following judgments:

- o Decontamination HW does not need de-tritiation
- PHT Ci level is 1 before refurbishment
- o Moderator Ci level is 10 before refurbishment
- o De-tritiation cost is \$25/kg (Ref [22])
- Upgrading cost is \$1,050 (\$2,000 for decontamination HW at 60% isotopic). (Cost of upgrading is taken from the 1991 estimates provided by common services, Pickering B and adjusted to 2007) (Ref [22])
- Detritiated D₂O (Ci = 0.7) will be mixed to adjust the curie level by the following formula:

$$Qp = Qt * (Ca-Ct) / (Ca-Cp)$$

Where:

Qt = total quantity (273 Mg for PHT or 340 Mg for Moderator)

Ca= actual concentration (of PHT or Moderator D_2O)

Ct= target concentration

Cp=0.7 Ci/kg detritiated water from TRF

| | | | Filed 2021-08-13 | | |
|--------|-----------------|-------------------------------|------------------|--|--|
| | | | EB-2020-0290 | | |
| | | | J1.6 | | |
| | | | Attachment 1 | | |
| | | Internal Use OnlyPage 21 of 4 | | | |
| | Document Number | | | | |
| Report | NK38-RE | EP-09701-026 | 5054 | | |
| | Revision: | Retention: | Page: | | |
| | R000 | T 20 | 21 of 45 | | |
| Title: | | | | | |

Following is the cost summary for Tritium Removal & Upgrading of the D₂O drained from units throughout Refurbishment:

| | High Risk Cost | Med Risk Cost | Low Risk Cost |
|-----------------------------------|-------------------|------------------|------------------|
| Tritium Removal Total 4 Units | \$0 | \$ 29.25M | \$ 32.90M |
| Upgrading Total 4 Units | \$0 | \$ 1.78M | \$ 3.95M |
| Tritium Removal & Upgrading Total | \$0 | \$ 31.03M | \$ 36.85M |

Table 11: Refurbishment Upgrading & Tritium Removal Cost Estimate

Calculation details are presented in Appendix J:

6.0 **PROJECT RISKS**

The following list is created for both the refurbishment project and the operational improvement project.

- The current estimate is a conceptual level and unforeseen technical issues may arise that were not accommodated for in the proposed scope and not covered by the 34% contingency
- Correspondence with Regulators will require approvals from both the CNSC and TSSA. Obtaining approvals from outside parties can be time-consuming and may cause significant delays. In addition, it is possible that various levels of government may get involved, which have not been anticipated, such as the Ministry of the Environment.
- Scope Changes depending on the progress of the project and the information communicated over the course of the project. Scope changes may affect the schedule and/or price.
- The unavailability of design basis documentation that reflects the "as built" condition of the systems and/or equipment may cause additional processing and engineering effort in order to complete the engineering change packages.
- Effectiveness of OPG/Contractor team Interface, as the project process will require multiple interfaces between the design engineers and the approvers (OPG) for each design change (i.e. COMS review, issues resolution, document approvals, etc.).
- It is assumed that the refurbishment project D₂O upgrading and tritium removal can be accommodated during the refurbishment of one unit (this assumption is in conjunction with the requirements of the 400 Mg Operational Improvement project which must be satisfied). Some of the operational needs may require to be rescheduled accordingly. Any non-conformance to this rule may affect the refurbishment schedule.
- The outage schedule as per 27 Apr 09 (10 weeks gap between the end of refilling of one unit and start of dewatering of the next unit) could change and there could be an overlap.

| | | Internal Use Only | | | | |
|--------|-----------------|-------------------|----------|--|--|--|
| | Document Number | <i>r</i> : | | | | |
| Report | NK38-RE | EP-09701-026 | 65054 | | | |
| | Revision: | Retention: | Page: | | | |
| | R000 | T 20 | 22 of 45 | | | |
| Title: | | | | | | |

Appendix A: DNGS Refurbishment Outage and D₂O Managing Schedule

| IDT | ask Name | Start | Finish | Durati | Q4 16 Q1 17 Q2 17 | Q3 17 Q4 17 | Q1 18 Q2 18 | Q3 18 | Q4 18 Q1 | 19 Q2 19 | Q3 19 | Q4 19 Q1 | 20 Q2 20 | Q3 20 | Q4 20 | Q1 21 Q2 | 21 Q321 | Q4 21 | Q1 22 | Q2 22 Q3 | 22 Q4 2 | 2 Q1 23 | Q2 23 | Q3 23 | Q4 23 |
|------|----------|------------|------------|--------|-------------------------------|---------------------------|-----------------|-----------------|---------------|-----------------|-----------------|----------------|------------------------------------|----------------|--------------|-----------|-----------------|----------------|------------------------|--------------------------------------|------------|-----------|---------------|-------------|--------------|
| | | | | on | OctNovDedJan Mai ApriMayJun J | JI Aug Sep Oct Nov Ded Ja | n Mai AprMay Ju | n Jul AugSep Oi | ctNovDedJan F | Mar Apr May Jur | n Jul Aug Sep C | OctNovDedJanFe | Mai AprMayJu | n Jul AugSep (| OctNovDedJar | Mar April | layJun Jul AugS | ep Oct Nov Dec | Jan Mai Aj | orMay Jun Jul Au | gSepOctNov | Ded Jan N | lai AprMayJun | Jul Aug Sep | OciNovDeqJan |
| 11 | Jnit 1 | 10/1/2016 | 11/1/2018 | 762d | | 762d | | ACCELLAND | | 1.5.5.7.1. | | | 5 | 1000 | | | | | | | | | | | |
| 2 L | Jnit 2 | 7/1/2018 | 8/2/2020 | 764d | | | | N CH Z LA | A Starting | IUDEEN D.A | 764d | | and a second a special cost of the | | | | | | | | | | | | |
| 3 L | Unit 3 | 4/1/2020 | 5/1/2022 | 761d | | | | | | | | | A A A A | 1442 | 15 34 1 | 761d | L Setting | State - | ALL 37 52 | | | | | | |
| 4 1 | Unit 4 | 1/2/2022 | 2/1/2024 | 761d | | | | | | | | | | | | | 1.2.2.2 | | 45000 - 14 comosono os | 10-101/0 (Notion - No. 45-110 (MALE) | | 761d | 1 - NE 1 | | |
| 5 5 | Store U1 | 2/6/2017 | 8/17/2018 | 558d | | 558d | | | 10000 | 100 | Read A | | | | | | | | | | | | 8 | - | |
| 6 5 | Store U2 | 10/29/2018 | 5/16/2020 | 566d | | | 1 Standard | | | | 566d | | | | | 1.33 | 1 | | | | | | | | |
| 7 5 | Store U3 | 7/30/2020 | 2/15/2022 | 566d | | | | | 12.12.23 | | | California - | | | | 56 | id . | | | S | | 45.2 | | | |
| 8 5 | Store U4 | 5/2/2022 | 11/10/2023 | 558d | | | | | | | | | | | | | | | | | | 558d | | | |
| 9 (| OLap 1-2 | 7/1/2018 | 11/1/2018 | 124d | | AL MELL S | OLap 1-2 | 124d | | | | | Constant of | | Stort a | | | | | | | | | | |
| 10 0 | OLap 2-3 | 4/1/2020 | 8/2/2020 | 124d | | | | | | | | OLap 2 | ·3 124d | | | | | | | | | | 5.5.12 | | |
| 11 (| OLap 3-4 | 1/2/2022 | 5/1/2022 | 120d | | | | | | | | | | 5-7-3-1 | 1000 | - | (| OLap 3-4 | 120d | | | | 1.22.14 | | |
| 12 (| GAP 1-2 | 8/17/2018 | 10/29/2018 | 74d | | | GAP | 1-2 74d | | | | | | 3.83 E | | | | | | | | 1000 | | | |
| 13 (| GAP 2-3 | 5/16/2020 | 7/30/2020 | 76d | | | | | 5.000 | | | G | AP 2-3 7 | 5d | 91 1.23 | | | | | | | | | | |
| 14 (| GAP 3-4 | 2/15/2022 | 5/2/2022 | 77d | | 2 | | | | | Sec. S. | 1 | | | | | | GAP 3 | 3-4 77d | | | | | | |

 Table 12:
 DNGS Refurbishment Outage and D₂O Managing Schedule

Filed 2021-08-13 EB-2020-0290 J1.6 Attachment 1 Page 22 of 45

| | | | Filed 2021-08-13 | |
|--------|---------------------------------|-------------------------------------|------------------|--|
| | | | EB-2020-0290 | |
| | | | J1.6 | |
| | | | Attachment 1 | |
| | Internal Use Only ^{Pa} | | | |
| | Document Number: | | | |
| Report | NK38-REP | -0 9 701-02 6 | 5054 | |
| | Revision: | Retention: | Page: | |
| | R000 | T 20 | 23 of 45 | |
| Title: | | | | |

Appendix B: DNGS Refurbishment D₂O Process Flow





Filed 2021-08-13 EB-2020-0290 J1.6 Attachment 1 Internal Use OnlyPage 24 of 45 Document Number: NK38-REP-09701-0265054 Revialon: Retention: Page: R000 T 20 24 of 45

DARLINGTON REFURBISHMENT D20 STORAGE FACILITY EVALUATION

Appendix C: GE Email DNGS Refurbishment Decontamination D₂O Storage

HITACHI

GE Hitachi Nuclear Energy Canada Inc.

Graham MacDonald Manager, Field Services

1160 Monaghan Raad Peterborough, Ontario K9J 785 Canada

7 705 748 7061 F 705 748 8187 M 705 872 2344 E graham macdanald@ge.com

T4756

N/A

inh #

Ref #:

Feb 27th, 2009

Report

David Kurpjeweit, Ontario Power Generation Nuclear Refurbishment Projects 889 Brock Rd., Pickering ON L1W 3J2

Subject: Darlington Retube and Feeder Replacement D2O Considerations - Preliminary

Attachments: 1. GEH-C Sketch, DNGS R&FR PHTS Chemical Decontamination Application Scenario Map.

References:

A. Meeting Notes, OPG Darlington R&FR Study, Status Update Meeting #4, 19-Feb-2009

- B. OPG Doc. W-REP-03460-00015 R00 "Reference Plan for Management of Low- and Intermediate-Level Waste From Darlington Refurbishment"
- C. OPG Doc. N-SPEC-09701-10001 R000 * Scope of Work Darlington Retube and Feeder Replacement Study"

D. OPG Doc. NK38-SR-03500-10001 R002 "Darlington Safety Report - Part 2 Design Description"

Dear Mr. Kurpjeweit:

As discussed during our recent Status Update Meeting (Ref. A), we have prepared the following rough estimate of the D2O supply requirements for the various identified scenarios for Darlington Retube and Feeder Replacement (R&FR).

Regarding D2O requirements for chemical decontamination, please see the attached scenario map (Att. 1) that plots the various decon permutations. The table below provides preliminary, qualitative recommendations for each scenario, and a rough estimate of the D2O requirements:

| ID | Scenario | Likelihood | Notes |
|----|---|-------------|--|
| A | No Decon | Recommended | No additional D2O req'd |
| В | Decon, Fuel in Core, D2O medium Full PHTS (+SGs) | Not Recomm. | ~ 240 m ³ for IX deuteration ~ 40-50 m ³ for decon system volume ~ 7 m ³ make up for removed fuel volume de-deuteration water must be upgraded |
| С | Decon, Fuel in Core, D2O medium Up to Header Level | Not Recomm | ~ 120 m³ for IX deuteration ~ 40–50 m³ for decon system volume de-deuteration water must be upgraded |

GE-Hitachi Nuclear Energy Canada Inc.

ALL RIGHTS RESERVED THIS MATERIAL MAY NOT BE USED OR REPRODUCED WITHOUT PRIOR WRITTEN CONSENT OF GE HITACHI NUCLEAR ENERGY CANADA INC

Filed 2021-08-13 EB-2020-0290 J1.6 Attachment 1

| Re | no | rt |
|-----|----|----|
| 110 | μυ | |

Title:

Document Number NK38-REP-09701-0265054 Retention:

T 20

Revision:

R000

Internal Use Only age 25 of 45

25 of 45

Pege:

DARLINGTON REFURBISHMENT D2O STORAGE FACILITY EVALUATION

| 10 | Scenario | Likelihood | Notes |
|----|------------------------------------|----------------|---|
| D | Decon, No Fuel in Core, D2O medium | Not Recomm, | Bounding scenario for D2O. |
| | Full PHTS (+SGs) | | ~ 240 m ³ for IX deuteration |
| | | | ~ 40-50 m ³ for decon system volume |
|] | | | ~ 15 m ³ make up for removed fuel volume |
| | | | de-deuteration water must be upgraded |
| E | Decon, No Fuel in Core, D2O medium | Recommended | ~ 120 m ³ for IX deuteration |
| | Up to Heoder Level | Decon scenario | ~ 40-50 m ³ for decon system volume |
| | | | de-deuteration water must be upgraded |
| F | Decon, No Fuel in Core, H2O medium | Not Recomm. | No additional D2O req'd |
| | Full PHTS (+SGs), D2O removed | | Tritiated H2O on issue |
| G | Decon, No Fuel in Core, H2O medium | Not Recamm. | No additional D2O req'd |
| · | Full PHTS (+SGs), D2O present | | Upgrading with high % H2O required |
| н | Decon, No Fuel in Core, H2O medium | Not Recomm. | No additional D2O req'd |
| | Up to Header Level, D20 removed | | Tritiated H2O an issue |
| 1 | Decon, No Fuel in Core, H2O medium | Not Recomm. | No additional D2O req'd |
| L | Up to Header Level, D2O present | | Upgrading with high % H2O required |

An additional consideration is that of flushing either the Primary Heat Transport System (PHTS) or Moderator System with low-Currie D2O prior to undertaking R&FR activities.

- Flushing the PHTS with low Currie D2O is not recommended for any scenario due to impact on schedule, assuming bulk drying of the PHTS is applied.
- Flushing the Moderator with low Currie D2O is not recommended, but should have no impact upon schedule and could be a useful tool for "soaking" out tritium from Moderator metallic components.

Note that condensed D2O product that is removed from both the PHTS and Moderator, during bulk drying, as per recommendations to come in the R&FR study, would need to be processed for upgrading and de-tritiation.

I trust this provides the preliminary assessment that your group requires.

Sincerely,

Graham MacDonald Manager, Field Services

| сс | R. Asodi | OPG |
|----|-------------|-------|
| | M. Crawford | GEH-C |
| | M. Toland | GEH-C |

| | | | Filed 2021-08-13 | | |
|--------|--|------------|------------------|--|--|
| | | | EB-2020-0290 | | |
| | | | J1.6 | | |
| | | | Attachment 1 | | |
| | Internal Use Only ^{age 26 of 4} | | | | |
| | Document Number: | | | | |
| Report | NK38-REP | -09701-026 | 5054 | | |
| | Revision: | Retention: | Page: | | |
| | R000 | T 20 | 26 of 45 | | |
| Title: | | | | | |



| | | | Filed 2021-08-13 | | |
|--------|--------------|--|------------------|--|--|
| | | | EB-2020-0290 | | |
| | | | J1.6 | | |
| | | | Attachment 1 | | |
| | | Internal Use Only ^{age 27 of 4} | | | |
| | Document Num | ber: | | | |
| Report | NK38-F | EP-09701-026 | 65054 | | |
| | Revision: | Retention: | Page: | | |
| | R000 | T 20 | 27 of 45 | | |
| Title: | | | | | |

Appendix D: Meeting Minutes DNGS Refurbishment Decontamination D₂O Storage

Minutes of the meeting:

Subject: D2O Storage requirement for Decontamination during DNGS Refurbishment

Date: March 13, 2009

Participants:

David Kurpjuweit Rafi Asadi Stefan Varga Raju Chander

Context:

D2O Storage for Refurbishment of DNGS needs to be finalized to develop the corporate HWM strategy. Volume of D2O for decontamination is one of the inputs required for determining the quantity of D2O storage during refurbishment. The strategy of decontamination of DNGS has not been finalized yet. Conclusion of this meeting is based on the information obtained from GE and the AECL assessment on Pickering B decontamination.

Conclusions:

1. Moderator system decontamination is not necessary. Hence there is no D2O storage required. There are no alternative options for moderator system decontamination.

2. PHT system decontamination: GE has recommended two options, out of this the preferred option is (A) i.e. – No Decontamination – No D2O storage required. The next preferred option is (E) i.e. – no fuel in core, D2O up to header level - D2O storage required is 120 Cu. M. Third preferred option is (D) i.e. – no fuel in core, PHTS full – D2O storage required is 305 Cu. M.

Minutes prepared by: Raju Chander

| | Filed 2021-08 EB-2020-0 | -13 290 |
|--------|---------------------------------------|-------------|
| | · · · · · · | 1.6 |
| | Attachme | <u>nt 1</u> |
| | Internal Use Only ^{age 28} o | f 45 |
| | Document Number: | |
| Report | NK38-REP-09701-0265054 | |
| | Revision: Retention: Page: | |
| | R000 T 20 28 of 45 | 5 |
| Title: | | |

Appendix E: DNGS Project # 16-31555 Scope of Work

<u>Important Note:</u> This scope of work is a draft copy only and was not used for Technical Evaluation Packages or bids by the selected vendors.

The original scope of work (incorporated in RFP #2007804) was based on Kinetrics report (ref [18]). Their conceptual study was accepted by OPG as the basis for the design of the new D₂O Storage Facility. The document provides the information required to carry-out the additional storage and drum handling upgrades of the existing D₂O management system.

That original scope of work was supplemented subsequently by the "Clarification #7 – Scope Addition" (incorporated in RFP #2007204)

Original Scope of Work:

- A total of 400 Mg of storage tank capacity made up of 8 x 50Mg tanks shall be provided for segregation of different streams of D₂O. Consideration shall be given to the new "design/build" to ensure maximum flexibility in storing and transferring different grades of D₂O to and forth from reactor units, TRF, Upgrader, etc.
- The new storage tanks shall be designed to tie in to existing control/transfer systems. The current mode of operation shall not be degraded as the result of the new "design/build".
- Level and pressure indications shall be provided for the new D₂O storage tanks, both locally and in the Control Room. Alarms (locally and Control Room) shall be provided to alert operator of abnormality in the storage tanks. The existing control computers in the D₂O Management Building and TRF shall be utilized for any new equipment indicating alarms and control functions.
- Cover gas shall be provided for the storage tanks.
- Isolations and draining shall be provided to isolate/drain any individual tank for maintenance. Double block and bleed arrangements shall be used for isolation between tanks designated for PHT D₂O and Moderator D₂O, interconnecting lines between reactor grade and downgraded D₂O.
- Means of sampling and analyzing of the contents in the tanks shall be provided.
- Venting shall be provided where necessary. The design of the venting system shall maximize the recovery of D₂O and isotope products in order to minimize release to the environment.
- Vacuum Relief devices shall be installed on the tanks to minimize the risk of implosion during emptying
- Based on the Kinectrics report, the new tanks shall be designed to Class 3.
- All tanks shall be assumed to be filled to a maximum of 90% capacity.
- The pit in which the new D₂O storage tanks located shall be seismically qualified with dykes around that would contain the D₂O inventory if the tanks were to fail during a seismic event. This would limit the spill of D₂O to the environment. Beetle alarms shall be provided to alert operator of leaks or spills. The new alarm system shall mirror the existing design for consistency.

| | | Filed 2021-08-13 | | | | |
|--------|----------------------|-------------------------------|--|--|--|--|
| | | EB-2020-0290 | | | | |
| | | J1.6 | | | | |
| | | Attachment 1 | | | | |
| | Internal Use | Internal Use Onlyage 29 of 45 | | | | |
| | Document Number: | | | | | |
| Report | NK38-REP-09701-02 | 65054 | | | | |
| | Revision: Retention: | Page: | | | | |
| | R000 T 20 | 29 of 45 | | | | |
| Title: | | | | | | |

- Sufficient storage space for 300 drums, with drum pressure test capabilities shall be provided. A drum requires pressure testing prior to re-use. Consideration shall be given to the new "design/build" to maximize the space available for drum storage and handling. Empty drums may be stacked to maximize the use of space.
- The new "design/build" shall take into consideration the movement of drums between storage and the loading bay to ensure easy access and drum handling. Human factors shall be considered in the new "design/build" to minimize operator efforts in operating and maintaining the facilities. Provision for hoist to lift drum shall be considered.
- Pressure test facility shall be provided to pneumatically test the drum to 90 kPag (13 psig) to ensure the integrity of the drum before re-use. The drum testing shall be located in the vented area to prevent release into the room.
- For high dose areas, proper shielding shall be required.
- Drainage shall be provided in the new building so that spills can be drained to the sumps in the D₂O Management Building.
- There shall be no negative impact to the performance of existing systems as the result of this project.
- The new "design/build" shall take into consideration means to minimize any interruptions to the existing infrastructures and Station operations during construction, installation, commissioning, etc.
- The technical package shall include sufficient descriptions / directions to enable a firm fixed price bid for the EPC contract. The technical package will be reviewed by OPG which may ask for additional supporting drawings and documents.

Additional Scope of Work:

(1) Drum Emptying Station.

- Design of a new Drum Emptying Station in the same area as the new Drum Washing/Rinsing Station.

- Basis of design:
 - 1. Emptying D₂O from the drums to the Dirty Downgraded D₂O Tanks via the existing filtering system.
 - 2. Incorporate a small pump to pump out the drums during the emptying process instead of using air pressure (existing process).
 - 3. The estimated capacity shall be 25 drums per shift.

(2) New IXCU System.

- Design a new IXCU System with the dual task of supporting the new Drum system and to act as an emergency back up for the existing system
- Basis of design:
 - 1. Estimated capacity to be 50% of the existing IXCU System.
 - Shall include its own in-line filter (for quick replacement), charcoal filter and 2 (two) IX with connections to the existing activated charcoal and spent resin tanks, and all the necessary services for the clean-up operation
 - 3. Shall operate as much independently as possible with the new system, but shall have the flexibility to take over the functions (not operation) of the existing IXCU

| | Filed 2021-08-13 EB-2020-0290 | | | | | |
|--------|--|--|--|--|--|--|
| | J1.6 | | | | | |
| | Attachment 1 | | | | | |
| | Internal Use Only ^{age 30 of 4} | | | | | |
| | Document Number: | | | | | |
| Report | NK38-REP-09701-0265054 | | | | | |
| | Revision: Retention: Page: | | | | | |
| | R000 T 20 30 of 45 | | | | | |
| Title | | | | | | |

system in case of any shut down (emergency or maintenance) of the existing IXCU system.

- It is expected that this new IXCU System together with the associated piping, shielding and maintenance access will reduce some of the drum storage area capacity. The design shall be such as the impact is minimal.

<u>Note:</u> As per Appendix F: the addition of the New IXCU system was excluded from the Scope of Work

(3) Two of the tanks from the current design submitted shall be split into halves.

The design work shall be supplemented to include:

- Split 1 Dirty Downgraded D₂O Tank into half.
- Split 1 Clean Downgraded D₂O Tank into half.
- All in and out piping, part of the 2 tanks original design, shall now have a simple split with all required valves.

| | | | | | | | | | Filed EB | 2021-08-13 -2020-0290 J1.6 ttachment 1 |
|--|---|---|---|--|---|--|-----------------------------|------------------------------|---------------------------|---|
| | | | | | | - De constant block | Inter | nal Use | • Only ^a | ige 31 of 45 |
| F | Report | | | | | NK38-R | EP-09 | 701-026 | 65054 | |
| | | <u> </u> | | | | Revision: | R | 20 | 31 | of 45 |
| Tit C | DARLING | | URBISHMENT | D2O STOR | AGE FA | | VALU | ATION | | |
| Aŗ | opendix F | : DNGS | SProject # 16-3 | 1555 Exclus | sion fror | n Additio | onal So | cope of | Work | |
| J | Time: DARLINGTON REFURBISHMENT D20 STORAGE F uppendix F: DNGS Project # 16-31555 Exclusion fr JOK Eric -NUCLEAR From: SULLIVAN Aileen -DARLINGTON Sent: Monday, March 10, 2008 2:12 PM To: JOK Eric -NUCLEAR; THAM Stephanie -NUC From: SULLIVAN Aileen -DARLINGTON; CORNACC Monday, March 10, 2008 2:12 PM To: To: JOK Eric -NUCLEAR; THAM Stephanie -NUCC Kubject: RE: D20 Storage - Scope Addition meeting w As actioned below, please move forward with the project including the folio 1) drum emptying station 2) splitting 2 tanks into havies. As As discussed with and confirmed with TRF Ops, please do NOT include th Thank You Aileen Sullivan TRF Manager, Darlington ESSB 324, x 1361 CORNCCLEAR Sent: Monday, March 03, 2008 3:09 PM To: THAM Stephanie -NUCLEAR; SULLYAN Aileen -DARLINGTON; MARTIN I C: GAINE Dianee, NUCLEAR; SULLYAN Aileen -DARLINGTON; MARTIN I C: GAINE Dianee, NUCLEAR; SULLYAN Aileen -DARLINGTON; MARTIN I C: CAINE Dianee, NUCLEAR; SULLYAN Aileen -DARLINGTON; MARTIN I C: CAINE Dianee, NUCLEAR; SULLYAN Aileen -DARLINGTON | 20 | ope H | faar, | llon. |) | | | | |
| F S T C S | irom: ient: io: ic: iubject: | | SULLIVAN Aileen -D Monday, March 10, 2 JOK Eric -NUCLEAF WILLIAMS Denny -D NUCLEAR; FUNG 1a GAINE Dianne -NUC RE: D2O Storage - S | DARLINGTON 2008 2:12 PM 3; THAM Stephan DARLINGTON; Cr an -NUCLEAR; VI CLEAR Scope Addition mo | ie -NUCLE ORNACCH ELAYUTHA eeting with | AR; MARTIN IA Mario -NU N Mano -NU Stakeholders | Brent -E CLEAR; CLEAR | OARLINGTO | DN; Charles - | |
| A 1 2 | s actioned be) drum empty) splitting 2 ta | low, please ying station anks into hav | move forward with the | project including | the followir | ng scope add | ition(s) | | | |
| A | s discussed v | vith and conf | firmed with TRF Ops, | please do NOT in | clude the s | cope addition | n for the | New IXCU : | system. | |
| Т | hank You | | | | | | | | | |
| A T C a | ileen Sullivan RF Manager, SSB 324, x 1 ell/pager - 416 ileen.sullivan(| Darlington 361 3-526-4381 @opg.com | | | | | | | | |
| | Original From: Sent: To: | Message JOK Eric -NUC Monday, Marc THAM Stepha CORNAC | CLEAR ch 03, 2008 3:09 PM inie -NUCLEAR; SULLIVAN A ICHIA Mario -NUCLEAR; FO: - MUCI EAP | Aileen -DARLINGTON; STER Charles -NUCLE | MARTIN Bren AR; FUNG Ian | t -DARLINGTON -NUCLEAR; VEL | I; WILLIAM AYUTHAN | IS Denny -DAR Mano -NUCLE | RLINGTON; EAR | |
|) | Subject: | D2O Storage | - Scope Addition meeting w | ith Stakeholders. | | | | | | |
| | The Confe However, A | rence Call m Aileen Sulliva | eeting was called off a an called Stephanie Th | at 11:40am due to nam at 11:45am to | o missing ke o re-start th | ey participants e meeting: | s. | | | |
| | <u>Present:</u> Aileen Sulli | ivan, Brent N | <i>l</i> iartin, Stephanie Thar | n, Eric Jok. | | | | | | |
| | Objective This meetin discussions decision ca | of meeting: ng was NOT s about the C in be made t | intended to SELECT Quotes for the Scope A o move forward with 1 | vendor A or B for Additions and any , 2 or all 3 Scope | the Scope Schedule I Addition Ite | Addition. It wa mpact from the ams. | as intend hem - so | ded for ques that a mar | stions and agement | ł |
| | Scope Add Scope Scope Scope | ition Quote L Addition # 1 Addition # 2 Addition # 3 | Jpdate quotes receiv : Drum Emptying Stati : New IXCU System : Divide 2 of the tanks | ved on Feb.11, 20 on into halves. | 008 from bo | th vendors (N | NSS and | Wardrop) r | egarding: | : |
| Number Number Name Name DARLINGTON REFURBISHMENT D20 STORAGE FACILITY EVALUATION Additional Scope of Work Appendix F: DNGS Project # 16-31555 Exclusion from Additional Scope of Work JOK Eric -NUCLEAR Carbot Add. Muthematical Scope of Work JOK Eric -NUCLEAR Carbot Add. Muthematical Scope of Work Carbot Add. Muthematical Scope of Work JOK Eric -NUCLEAR Monday, March 10, 2008 212 PM Muthematical Scope of Work Serie: Monday, March 10, 2008 212 PM Muthematical Scope Addition Page 10, 2008 212 PM From: SULLIVAN Alleen-OARLINGTON; Monday, March 10, 2008 214 PM Muthematical Scope Addition Page 10, 2008 214 PM Serie: GUN Exit Doublack Muthematical Scope Addition Reserve NUCLEAR FUNCEAR Subject: RE: D20 Storage - Scope Addition meeting with Stakeholders. Addition(s) 1) drum emptying station A discussed with and confirmed with TRF Ops, please do NOT include the scope addition for the New IXCU system. Thank You March Sullivan Borger Prover: Carbot Addition Additional Scope Addition Reserve Frem: XX Er K-KULEAR Sullivang Borger Sullivang Borger Frem: XX Er K-KULEAR Sullivang Borger Sulit Addit | | | | g d | | | | | | |
| | Based on the indicated it conducted | he Total Proj changes fro later. | iect Quote received in m +4.4M to the -ve zo | late January/2008 ne without the Sco | 8 from the v ope Addition | endors, the p n Costs. An e | orelimina exact NP | ry NPV re-v V re-caicula | visit has ation will t | be |
| | Due to the | tight timeline | of the project, the Sco | ope Addition choi | ces will hav | e to be made | e by Mar. | 17, 2008. | | |

Note: The choice for the Scope Addition Item(s) should not be based on the less price of the 2 vendors, because the 1___

| | | | Filed 2021-08-13 | | | |
|--------|------------------|-------------------------------|------------------|--|--|--|
| | | | EB-2020-0290 | | | |
| | | | J1.6 | | | |
| | | | Attachment 1 | | | |
| | | Internal Use Onlyage 32 of 45 | | | | |
| | Document Number: | | | | | |
| Report | NK38-REF | P-09701-026 | 65054 | | | |
| | Revision: | Retention: | Page: | | | |
| | R000 | T 20 | 32 of 45 | | | |
| Title: | | | | | | |

final vendor selected may mean the higher cost for that Item.

Action: Aileen S. will forward an e-mail to Stephanie T. by Mar.17/2008, indicating which Scope Addition(s) will be chosen to move forward.

Regards, Eric Jok P.Eng PMP Design Projects, Proj & Mods 905-839-1151 x8550 Pager 416-442-6612

.

| | Internal Use Only | | | | | |
|--------|-------------------|--------------|----------|--|--|--|
| | Document Number: | | | | | |
| Report | NK38-RI | EP-09701-026 | 65054 | | | |
| | Revision: | Retention: | Page: | | | |
| | R000 | T 20 | 33 of 45 | | | |
| Title: | | •••••• | | | | |

Appendix G: DNGS Refurbishment D₂O Storage Conceptual Schematic



- •
- PRV on the cover gas air line
- Sampling lines Recirculation lines

Figure 2: DNGS Refurbishment D₂O Storage Conceptual Schematic

Filed 2021-08-13 EB-2020-0290 J1.6 Attachment 1 Page 33 of 45

| | Internal Use Only | | | | | | |
|--------|-------------------|--|----------|--|--|--|--|
| | Document Numbe | Document Number: NK38-REP-09701-0265054 | | | | | |
| Report | NK38-RE | | | | | | |
| | Revision: | Retention: | Page: | | | | |
| | R000 | T 20 | 34 of 45 | | | | |
| Title: | | | | | | | |

Appendix H: DNGS Refurbishment D₂O Storage Conceptual Tanks Arrangement Layouts



Figure 3: Proposed Conceptual Tanks Arrangement - Layout A

Filed 2021-08-13 EB-2020-0290 J1.6 Attachment 1 Page 34 of 45



Figure 4: Proposed Conceptual Tanks Arrangement – Layout B

Filed 2021-08-13 EB-2020-0290 J1.6 Attachment 1 Page 35 of 45

| | [| Interr | al Use Only | |
|---|--|--|---|--|
| | Do N | IK38-REP-097 | /01-0265054 | |
| | F | Note that the second se | 20 Page: | of 45 |
| ON REFURBISHMENT D2O STORAG | | | TION | |
| Cost Estimate Details for 400 Mg S | torage | & Drum Hand | ling Project 3 | 1555 |
| | | **** | | |
| Activity Description | LWBS | Planned Start | Planned Finish | Resource |
| Long Lead Items 2009 | 99810 | 7/30/2009 | 12/24/2009 | ZMATPER |
| Long Lead Items 2010 | 99810 | 1/2/2010 | 5/13/2010 | ZMATPER |
| Total | | | | 1 |
| | | • | | |
| Activity Description | LWBS | Planned Start | Planned Finish | Resource |
| Contractor - Installation (tanks) | 39930 | 1/2/2010 | | ZEXT_G2 External Contractor - Generic 2 |
| Total | | | | 1 |
| | | | | |
| | | | | |
| Activity Description | LWBS | Planned Start | Planned Finish | Resource |
| Material - HWMB Addition | 99810 | 7/20/2010 | 12/24/2010 | ZMATPER |
| Material - HWMB Addition | 99810 | 7/20/2011 | 12/24/2011 | ZMATPER |
| Material-Issue PO & Delivery- Relocate Servic | 99710 | 4/29/2009 | 12/24/2009 | ZMATPER |
| Total | | | | |
| | | | | |
| Activity Description | IWBS | Planned Start | Planned Finish | Resource |
| | | | | |
| Installation - HWMB Addition | 49811 | 1/1/2011 | 10/5/2011 | ZEXT_G3 External Contractor - Generic 3 |
| Installation - HWMB Addition | 49811 | 1/1/2012 | 10/5/2012 | ZEXT_G3 External Contractor - Generic 3 |
| Installation - Relocate Services 2010 | 49711 | 9/1/2010 | 12/24/2010 | 2EXT_G3 External Contractor - Generic 3 |
| | 29011 | 11/1/2008 | 12/15/2006 | |
| Total | | | - | |
| | | | | |
| | | | | |
| | ON REFURBISHMENT D2O STORAG Cost Estimate Details for 400 Mg S Activity Description Long Lead Items 2009 Long Lead Items 2010 Total Total Activity Description Contractor - Installation (tanks) Total Activity Description Material - HWMB Addition Material - HWMB Addition Material - ISSUE PO & Delivery- Relocate Service Total Activity Description Installation - HWMB Addition Installation - Relocate Services 2010 Contract - core samples Total | ON REFURBISHMENT D2O STORAGE FACII Cost Estimate Details for 400 Mg Storage at the cost of the co | Interr Decomment Humber: NK388-REP-097 NK388-REP-097 NK388-REP-097 NK388-REP-097 Notestain: Free Roool Ref CON REFURBISHMENT D2O STORAGE FACILITY EVALUA Cost Estimate Details for 400 Mg Storage & Drum Hand Activity Description LWBS Planned Start Long Lead Items 2009 99810 7/30/2009 Long Lead Items 2010 99810 7/30/2010 Total | Internal Use Only Decement Number: NK38-REP-09701-0265054 Memotion: Activity Description LWBS Activity Description LWBS Planned Start Planned Finish Contractor - Installation (tanks) 39930 1/2/2010 Total Activity Description LWBS Planned Start Planned Finish Material - HWMB Addition 99810 7/20/2010 1/2/24/2010 Activity Description LWBS Planned Start Planned Finish Material - HWMB Addition <th< td=""></th<> |

| P131555230 | Contract - Detailed Engineering | 39930 | 10/1/2008 | 12/31/2008 ZEXT_G5 External Contractor - Generic 5 | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip |
|------------|-----------------------------------|-------|-----------|--|--|
| P131555303 | Contractor - Detailed Engineering | 39930 | 1/2/2009 | 7/31/2009 ZEXT_G2 External Contractor - Generic 2 | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip |
| | Total | | | | |

Filed 2021-08-13 EB-2020-0290 J1.6 Attachment 1 Page 36 of 45

| | | Veer | Hours/ Year /ETE | total | Data | SubTotal |
|-----------|------------|-------|---|-------|---------|---------------|
| NO. F 11 | | rear | | nours | nale | SubTotal |
| | 1 | 2009 | | | **** | 3000000 |
| | 1 | 2010 | | | | 2000000 |
| | | | | | | |
| | | | | | | 5000000 |
| | | | | | | |
| | 2000/10000 | | Hours/ | | | |
| | | | Year | total | | |
| No. FTI | E | Year | /FTE | hours | Rate | SubTotal |
| | | | | | | |
| | 1 | 2010 | | | | 900000 |
| | | r | | г | | 000000 |
| | _ | | | L | | 900000 |
| | | | | | | |
| | | | Hours/ | | | |
| | _ | | Year | total | | . |
| NO. FII | E | Year | /ГІС | nours | Rate | Sudiotai |
| | 1 | 2010 | | | | 400000 |
| | 1 | 2010 | | | ******* | 400000 |
| | <u>.</u> | 2009 | | | | 0 |
| | | | | | | |
| | | | | | | 8000000 |
| | | | | | | |
| | | | Hours/ | | | |
| | | | Year | total | | |
| No. FTI | Е | Year | /FTE | hours | Rate | SubTotal |
| | | | | | | |
| | 1 | 2011 | | | | 9900000 |
| | 1 | 2012 | | | | 450000 |
| | 1 | 2010 | | | | 100000 |
| | 1 | 2008 | | | | 50000 |
| | Т | | | | | 15450000 |
| k | | I | | 1 1 | | A STATE STATE |
| | | | | | | |
| | | | Year | total | | |
| | = | Voar | /FTE | hours | Pata | SubTotal |
| 11V. F II | | i cai | | | nale | JUDIVIAI |
| | 1 | 2008 | | | | 500000 |
| ****** | 1 | 2009 | *************************************** | | ******* | 800000 |
| | | | | | | |
| | | | | | | 8500000 |
| | | | | | | |

RC

RC

RC

RC

RC

EM_2896Eng & Mods-Mods-Dsgn Proj Crit EquipEM_2896Eng & Mods-Mods-Dsgn Proj Crit Equip

EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip

EM_2896Eng & Mods-Mods-Dsgn Proj Crit EquipEM_2896Eng & Mods-Mods-Dsgn Proj Crit EquipEM_2896Eng & Mods-Mods-Dsgn Proj Crit Equip

EM_2896Eng & Mods-Mods-Dsgn Proj Crit EquipEM_2896Eng & Mods-Mods-Dsgn Proj Crit EquipEM_2896Eng & Mods-Mods-Dsgn Proj Crit EquipEM_2896Eng & Mods-Mods-Dsgn Proj Crit Equip

N-TMP-10010-R008 (Microsoft® XP)

Title:

| Internal Use Only | | | | | | | | |
|-------------------|--------------|----------|--|--|--|--|--|--|
| Document Number | : | | | | | | | |
| NK38-RE | EP-09701-026 | 65054 | | | | | | |
| Revision: | Retention: | Page: | | | | | | |
| R000 | T 20 | 37 of 45 | | | | | | |
| | | | | | | | | |

DARLINGTON REFURBISHMENT D20 STORAGE FACILITY EVALUATION

Table 4 (continuation on next sheet)

| | | ***** | **** | *** | | | ang nganasana ang katalan katalan katalan katalan sa katalan katalan katalan katalan katalan katalan katalan ka | **** | Hours/ | ******* | *********** | |
|--|---|-------|---------------|----------------|--|---|---|------|--|---------|-------------|----------|
| | | | | | | | | | Year | total | | |
| ID | Activity Description | LWBS | Planned Start | Planned Finish | Resource | RC | No. FTE | Year | /FTE | nours | Rate | SubTotal |
| LTD06-07 | Life to Date 2007 Actuals | 19999 | 12/1/2006 | 12/31/2007 | | | **** | | | | | 1564000 |
| P131555012 | Project Management 2008 - Str 4 | 19010 | 1/3/2008 | 12/31/2008 | BANDG X Band G | EM 2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 0.1 | 2008 | 1600 | 160 | 123.7 | 19792 |
| P131555027 | Project Management 2009 - Str 4 | 19010 | 1/2/2009 | 12/31/2009 | BANDG X Band G | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 0.1 | 2009 | 1600 | 160 | 128.18 | 20508.8 |
| P131555037 | Project Management 2010 - Str 4 | 19010 | 1/2/2010 | 12/24/2010 | BANDG X Band G | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 0.1 | 2010 | 1600 | 160 | 132.66 | 21225.6 |
| P131555049 | Project Management 2011 - Str 4 | 19010 | 1/4/2011 | 12/23/2011 | BANDG_X Band G | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 0.1 | 2011 | 1600 | 160 | 137.14 | 21942.4 |
| P131555056 | Project Management 2012 - Str 4 | 19010 | 1/3/2012 | 12/22/2012 | BANDG_X Band G | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 0.1 | 2012 | 1600 | 160 | 141.62 | 22659.2 |
| P131555014 | Work Control 2008 - PMO | 19020 | 1/3/2008 | 12/31/2008 | BANDH_E Band H - Engineering | EM_2894 Eng & Mods-Mods-Proj Mgmt Office | 0.2 | 2008 | 1600 | 320 | 95.3 | 30496 |
| P131555029 | Work Control 2009 - PMO | 19020 | 1/2/2009 | 12/31/2009 | BANDH_E Band H - Engineering | EM_2894 Eng & Mods-Mods-Proj Mgmt Office | 0.2 | 2009 | 1600 | 320 | 98.76 | 31603.2 |
| P131555039 | Work Control 2010 - PMO | 19020 | 1/2/2010 | 12/24/2010 | BANDH_E Band H - Engineering | EM_2894 Eng & Mods-Mods-Proj Mgmt Office | 0.2 | 2010 | 1600 | 320 | 102.22 | 32710.4 |
| P131555051 | Work Control 2011 - PMO | 19020 | 1/4/2011 | 12/23/2011 | BANDH_E Band H - Engineering | EM_2894 Eng & Mods-Mods-Proj Mgmt Office | 0.2 | 2011 | 1600 | 320 | 105.68 | 33817.6 |
| P131555057 | Work Control 2012 - PMO | 19020 | 1/3/2012 | 12/22/2012 | BANDH_E Band H - Engineering | EM_2894 Eng & Mods-Mods-Proj Mgmt Office | 0.2 | 2012 | 1600 | 320 | 109.14 | 34924.8 |
| P131555012 | Project Management 2008 - PM | 19010 | 1/3/2008 | 12/31/2008 | BANDH_E Band H - Engineering | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 0.5 | 2008 | 1600 | 800 | 95.3 | 76240 |
| P131555027 | Project Management 2009 - PM | 19010 | 1/2/2009 | 12/31/2009 | BANDH_E Band H - Engineering | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 0.5 | 2009 | 1600 | 800 | 98.76 | 79008 |
| P131555037 | Project Management 2010 - PM | 19010 | 1/2/2010 | 12/24/2010 | BANDH_E Band H - Engineering | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 0.5 | 2010 | 1600 | 800 | 102.22 | 81776 |
| P131555049 | Project Management 2011 - PM | 19010 | 1/4/2011 | 12/23/2011 | BANDH_E Band H - Engineering | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 0.5 | 2011 | 1600 | 800 | 105.68 | 84544 |
| P131555056 | Project Management 2012 - PM | 19010 | 1/3/2012 | 12/22/2012 | BANDH_E Band H - Engineering | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 0.5 | 2012 | 1600 | 800 | 109.14 | 87312 |
| P131555035 | 3rd Party Review Budget Cost Estimate | 19011 | 4/1/2008 | 5/31/2008 | ZEXT_HLY External Contractor - Helyar Es | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2008 | ************************************** | | | 50000 |
| P131555035 | 3rd Party Review Budget Cost Estimate | 19011 | 11/1/2009 | 12/31/2009 | ZEXT_HLY External Contractor - Helyar Es | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2009 | | | | 55000 |
| P131555035 | 3rd Party Fire Protection System Review | 19011 | 3/1/2009 | 4/30/2009 | ZEXT_HLY External Contractor - Helyar Es | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2009 | | | | 30000 |
| P131555032 | Non Project Specific 2009 | 19050 | 1/2/2009 | 12/31/2009 | ZEXPENSE | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2009 | **** | | | 50000 |
| P131555042 | Non Project Specific 2010 | 19050 | 1/2/2010 | 12/24/2010 | ZEXPENSE | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2010 | | | | 195000 |
| P131555016 | Training 2008 | 19070 | 1/3/2008 | 12/31/2008 | ZEXPENSE | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2008 | ······································ | | | 10000 |
| P131555031 | Training 2009 | 19070 | 1/2/2009 | 12/31/2009 | ZEXPENSE | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2009 | | | | 20000 |
| P131555041 | Training 2010 | 19070 | 1/2/2010 | 12/24/2010 | ZEXPENSE | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2010 | | ***** | ***** | 62000 |
| P131555053 | Training 2011 | 19070 | 1/4/2011 | 12/23/2011 | ZEXPENSE | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2011 | | | | 33000 |
| P131555054 | Non Project Specific 2011 | 19050 | 1/4/2011 | 12/23/2011 | ZEXPENSE | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2011 | | ***** | | 118000 |
| 10000000000000000000000000000000000000 | Training 2012 | ***** | - | | ZEXPENSE | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2012 | Cold (Cold (| | | 10000 |
| | Non Project Specific 2012 | **** | | | ZEXPENSE | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2012 | **** | | | 25000 |
| P131555017 | Non Project Specific 2008 - Travel | 19050 | 1/3/2008 | 12/31/2008 | ZEXPENSE | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2008 | | | =0.00 | 5000 |
| P131555012 | Project Management 2008 - PL | 19010 | 1/3/2008 | 12/31/2008 | ENGOP_E Nuclear Operations | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 0.5 | 2008 | 1600 | 800 | 73.93 | 101027 |
| P131555027 | Project Management 2009 - PL | 19010 | 1/2/2009 | 12/31/2009 | ENGOP_E Nuclear Operations | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2009 | 1700 | 1700 | //.61 | 131937 |
| P131555037 | Project Management 2010 - PL | 19010 | 1/2/2010 | 12/24/2010 | ENGOP_E Nuclear Operations | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2010 | 1800 | 1800 | 81.29 | 140322 |
| P131555049 | Project Management 2011 - PL | 19010 | 1/4/2011 | 12/23/2011 | ENGOP_E Nuclear Operations | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2011 | 1800 | 1800 | 84.97 | 152940 |
| P131555056 | Project Management 2012 - PL | 19010 | 1/3/2012 | 12/22/2012 | ENGOP_E Nuclear Operations | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2012 | 1800 | 1800 | 88.05 | 109070 |
| P131555014 | Work Control 2008 - CSA | 19020 | 1/3/2008 | 12/31/2008 | PPCSA_B Analyst - Cost/Schedule | EM_2894 Eng & Mods-Mods-Proj Mgmt Office | 0.33 | 2008 | 1600 | 528 | 70.2 | 40233.0 |
| P131555029 | Work Control 2009 - CSA | 19020 | 1/2/2009 | 12/31/2009 | PPCSA_B Analyst - Cost/Schedule | EM_2894 Eng & Mods-Mods-Proj Mgmt Office | 0.33 | 2009 | 1600 | 528 | /9.9/ | 42224.10 |
| P131555039 | Work Control 2010 - CSA | 19020 | 1/2/2010 | 12/24/2010 | PPCSA_B Analyst - Cost/Schedule | EM_2894 Eng & Mods-Mods-Proj Mgmt Office | 0.33 | 2010 | 1600 | 520 | 03.74 | 44214.72 |
| P131555051 | Work Control 2011 - CSA | 19020 | 1/4/2011 | 12/23/2011 | PPCSA_B Analyst - Cost/Schedule | EM_2894 Eng & Mods-Mods-Proj Mgmt Office | 0.33 | 2011 | 1600 | 520 | 01.01 | 40205.20 |
| P131555057 | Work Control 2012 - CSA | 19020 | 1/3/2012 | 12/22/2012 | PPCSA_B Analyst - Cost/Schedule | EM_2894 Eng & Mods-Mods-Proj Mgmt Office | 0.33 | 2012 | 1600 | 160 | 91.20 | 0797.2 |
| P131555014 | Work Control 2008 - other support | 19020 | 1/3/2008 | 12/31/2008 | PPCSI_I Tech Cost/Schedule | EM_2894 Eng & Mods-Mods-Proj Might Office | 0.1 | 2000 | 1600 | 160 | 64.01 | 10241.6 |
| P131555029 | Work Control 2009 - other support | 19020 | 1/2/2009 | 12/31/2009 | PPCSI_I Tech Cost/Schedule | EM_2894 Eng & Mods-Mods-Proj Mgmt Office | 0.1 | 2009 | 1600 | 160 | 66.85 | 10696 |
| P131555039 | Work Control 2010 - other support | 19020 | 1/2/2010 | 12/24/2010 | PPUSI_I Tech Cost/Schedule | EM_2894 Eng & Mode Mode Proj Mgmt Office | 0.1 | 2010 | 1600 | 160 | 60.60 | 11150 4 |
| P131555051 | Work Control 2011 - other support | 19020 | 1/4/2011 | 12/23/2011 | PPOST_I Tech Cost/Schedule | EW_2094 Eng & Mode Mode Proj Mgmt Office | 0.1 | 2011 | 1600 | 160 | 72 52 | 11604 8 |
| P131555057 | Work Control 2012 - Other support | 19020 | 1/3/2012 | 12/22/2012 | | EW_2094 Eng & Mode Mode Deers Drei Orit Fauin | <u> </u> | 2012 | 150 | 150 | 84 07 | 12745 5 |
| P131555503 | Commissioning Support Common | 59000 | 10/1/2011 | 12/31/2011 | | EM_2090 Eng & Mode Mode Dears Drai Orit Equip | | 2011 | 250 | 350 | 99.65 | 31027 5 |
| P131555503 | Commissioning Support Common | 59000 | 6/1/2012 | 11/24/2012 | | EW_2090 Eng & Mode Mode Dears Droi Orit Equip | | 2012 | 100 | 100 | 99.65 | 8865 |
| P131555603 | Design ECs Close Out- Relocate Services | 89710 | 2/23/2012 | 8/30/2012 | ENGPE_E Project Engineer | EM_2896 Eng & Moas-Moas-Dsgn Proj Crit Equip | 1 | 2012 | 100 | 100 | 00.00 | 0005 |

Filed 2021-08-13 EB-2020-0290 J1.6 Attachment 1 Page 37 of 45

| | Internal Use Only | | | | | | | |
|--------|-------------------|--------------|----------|--|--|--|--|--|
| | Document Number: | | | | | | | |
| Report | NK38-RI | EP-09701-020 | 65054 | | | | | |
| | Revision: | Retention: | Page: | | | | | |
| | R000 | T 20 | 38 of 45 | | | | | |
| Title | | | h | | | | | |

Table 4 (continuation from previous sheet)

| P131555309 | Engineering Support Common 2009 | 39930 | 1/3/2009 | 12/24/2009 ENGPE_E Project Engineer | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2009 | 500 | 500 | 77.61 | 38805 |
|------------|--|-------|-----------|-------------------------------------|---|-----|------|------|------|-------|-----------|
| P131555400 | Work Planning RS | 49710 | | ENGPE_E Project Engineer | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2010 | 800 | 800 | 81.29 | 65032 |
| P131555418 | Work Planning HWMB Addition | 49810 | | ENGPE_E Project Engineer | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2010 | 800 | 800 | 81.29 | 65032 |
| P131555309 | Engineering Support Common 2010 | 39930 | 1/3/2010 | 6/30/2010 ENGPE_E Project Engineer | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2010 | 400 | 400 | 81.29 | 32516 |
| P131555412 | Installation Support Common RS 2011 | 49000 | 1/2/2011 | 12/24/2011 ENGPE_E Project Engineer | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2011 | 1100 | 1100 | 84.97 | 93467 |
| P131555469 | Installation Support Common 2011 | 49000 | 1/4/2011 | 12/23/2011 ENGPE_E Project Engineer | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2011 | 2200 | 2200 | 84.97 | 186934 |
| P131555469 | Installation Support Common 2012 | 49000 | 1/4/2012 | 12/23/2012 ENGPE_E Project Engineer | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2012 | 550 | 550 | 88.65 | 48757.5 |
| P131555615 | Design ECs Close Out- HWMB Addition 2012 | 89810 | 1/3/2012 | 5/26/2012 ENGPE_E Project Engineer | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2012 | 400 | 400 | 88.65 | 35460 |
| P131555013 | Project Engineering 2008 - MTL | 19010 | 1/3/2008 | 12/31/2008 ENGPE_E Project Engineer | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2008 | 1600 | 1600 | 73.93 | 118288 |
| P131555013 | Project Engineering 2008 - Proj Eng | 19030 | 1/3/2008 | 12/31/2008 ENGPE_E Project Engineer | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 0.5 | 2008 | 1600 | 800 | 73.93 | 59144 |
| P131555027 | Project Management 2009 - MTL | 19010 | 1/2/2009 | 12/31/2009 ENGPE_E Project Engineer | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2009 | 1700 | 1700 | 77.61 | 131937 |
| P131555028 | Project Engineering 2009 - Proj Eng | 19030 | 1/2/2009 | 12/31/2009 ENGPE_E Project Engineer | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2009 | 1700 | 1700 | 77.61 | 131937 |
| P131555037 | Project Management 2010 - MTL | 19010 | 1/2/2010 | 12/24/2010 ENGPE_E Project Engineer | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2010 | 1800 | 1800 | 81.29 | 146322 |
| P131555038 | Project Engineering 2010 - Proj Eng | 19030 | 1/2/2010 | 12/24/2010 ENGPE_E Project Engineer | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2010 | 1800 | 1800 | 81.29 | 146322 |
| P131555049 | Project Management 2011 - MTL | 19010 | 1/4/2011 | 12/23/2011 ENGPE_E Project Engineer | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2011 | 1800 | 1800 | 84.97 | 152946 |
| P131555050 | Project Engineering 2011 - Proj Eng | 19030 | 1/4/2011 | 12/23/2011 ENGPE_E Project Engineer | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2011 | 1800 | 1800 | 84.97 | 152946 |
| P131555056 | Project Management 2012 - MTL | 19010 | 1/3/2012 | 12/22/2012 ENGPE_E Project Engineer | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2012 | 1800 | 1800 | 88.65 | 159570 |
| P131555056 | Project Engineering 2012 - Proj Eng | 19030 | 1/3/2012 | 12/22/2012 ENGPE_E Project Engineer | EM_2896 Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2012 | 1800 | 1800 | 88.65 | 159570 |
| P131555206 | Engineering Support - DTL | 29000 | 1/3/2008 | 12/31/2008 ENGPE_E Project Engineer | EV_1860 Eng & Mods-Eng Srvs-Mechanical Design | 0.4 | 2008 | 1600 | 640 | 73.93 | 47315.2 |
| P131555206 | Engineering Support - Civil | 29000 | 11/1/2008 | 12/15/2008 ENGPE_E Project Engineer | EV_1860 Eng & Mods-Eng Srvs-Mechanical Design | 1 | 2008 | 100 | 100 | 73.93 | 7393 |
| | | | | | | | | | | | |
| | Total | | | | | | | | | | 5862364.3 |

Table 5 (continuation on next 4 sheets)

| Table 5 (COTI | lingation on next 4 sheets | | | | | | | | | | | |
|---------------|--|-------|---------------|---|------------------------------|---|---------|------|--------|-------|--------|----------|
| | | | | | | | | | Hours/ | | | |
| | | | | | | | | | Year | total | | |
| ID | Activity Description | LWBS | Planned Start | Planned Finish | Resource | RC | No. FTE | Year | /FTE | hours | Rate | SubTotal |
| | | | | 1000000000000.000.000.000.000.000000000 | | | | | | | | |
| P131555503 | Commissioning Support Common | 59000 | 10/1/2011 | 12/31/2011 E | BANDH_E Band H - Engineering | EV_1860 Eng & Mods-Eng Srvs-Mechanical Design | 1 | 2011 | 20 | 20 | 105.68 | 2113.6 |
| P131555503 | Commissioning Support Common | 59000 | 6/1/2012 | 11/24/2012 E | BANDH_E Band H - Engineering | EV_1860 Eng & Mods-Eng Srvs-Mechanical Design | 1 | 2012 | 40 | 40 | 109.14 | 4365.6 |
| P131555603 | Design ECs Close Out- Relocate Services | 89710 | 2/23/2012 | 8/30/2012 E | ANDH_E Band H - Engineering | EV_1860 Eng & Mods-Eng Srvs-Mechanical Design | 1 | 2012 | 40 | 40 | 109.14 | 4365.6 |
| P131555309 | Engineering Support Common 2009 | 39930 | 1/3/2009 | 12/24/2009 E | SANDH_E Band H - Engineering | EV_1860 Eng & Mods-Eng Srvs-Mechanical Design | 1 | 2009 | 40 | 40 | 98.76 | 3950.4 |
| P131555309 | Engineering Support Common 2010 | 39930 | 1/3/2010 | 6/30/2010 E | SANDH_E Band H - Engineering | EV_1860 Eng & Mods-Eng Srvs-Mechanical Design | 1 | 2010 | 50 | 50 | 102.22 | 5111 |
| P131555412 | Installation Support Common RS 2011 | 49000 | 1/2/2011 | 12/24/2011 B | ANDH_E Band H - Engineering | EV_1860 Eng & Mods-Eng Srvs-Mechanical Design | 1 | 2011 | 25 | 25 | 105.68 | 2642 |
| P131555469 | Installation Support Common 2011 | 49000 | 1/4/2011 | 12/23/2011 E | BANDH_E Band H - Engineering | EV_1860 Eng & Mods-Eng Srvs-Mechanical Design | 1 | 2011 | 50 | 50 | 105.68 | 5284 |
| P131555469 | Installation Support Common 2012 | 49000 | 1/4/2012 | 12/23/2012 E | BANDH_E Band H - Engineering | EV_1860 Eng & Mods-Eng Srvs-Mechanical Design | 1 | 2012 | 20 | 20 | 109.14 | 2182.8 |
| P131555615 | Design ECs Close Out- HWMB Addition 2012 | 89810 | 1/3/2012 | 5/26/2012 E | ANDH_E Band H - Engineering | EV_1860 Eng & Mods-Eng Srvs-Mechanical Design | 1 | 2012 | 50 | 50 | 109.14 | 5457 |
| P131555206 | Engineering Support - Design SM | 29000 | 1/3/2008 | 12/31/2008 E | BANDH_E Band H - Engineering | EV_1860 Eng & Mods-Eng Srvs-Mechanical Design | 0.2 | 2008 | 1600 | 320 | 95.3 | 30496 |
| P131555503 | Commissioning Support Common | 59000 | 10/1/2011 | 12/31/2011 E | ANDH_E Band H - Engineering | EV_1870 Eng & Mods-Eng Srvs-Elect & Inst Design | 1 | 2011 | 20 | 20 | 105.68 | 2113.6 |
| P131555503 | Commissioning Support Common | 59000 | 6/1/2012 | 11/24/2012 E | ANDH_E Band H - Engineering | EV_1870 Eng & Mods-Eng Srvs-Elect & Inst Design | 1 | 2012 | 40 | 40 | 109.14 | 4365.6 |
| P131555603 | Design ECs Close Out- Relocate Services | 89710 | 2/23/2012 | 8/30/2012 E | ANDH_E Band H - Engineering | EV_1870 Eng & Mods-Eng Srvs-Elect & Inst Design | 1 | 2012 | 40 | 40 | 109.14 | 4365.6 |
| P131555309 | Engineering Support Common 2009 | 39930 | 1/3/2009 | 12/24/2009 E | ANDH_E Band H - Engineering | EV_1870 Eng & Mods-Eng Srvs-Elect & Inst Design | 1 | 2009 | 40 | 40 | 98.76 | 3950.4 |
| P131555309 | Engineering Support Common 2010 | 39930 | 1/3/2010 | 6/30/2010 E | ANDH_E Band H - Engineering | EV_1870 Eng & Mods-Eng Srvs-Elect & Inst Design | 1 | 2010 | 50 | 50 | 102.22 | 5111 |
| P131555412 | Installation Support Common RS 2011 | 49000 | 1/2/2011 | 12/24/2011 E | ANDH_E Band H - Engineering | EV_1870 Eng & Mods-Eng Srvs-Elect & Inst Design | 1 | 2011 | 25 | 25 | 105.68 | 2642 |
| P131555469 | Installation Support Common 2011 | 49000 | 1/4/2011 | 12/23/2011 E | ANDH_E Band H - Engineering | EV_1870 Eng & Mods-Eng Srvs-Elect & Inst Design | 1 | 2011 | 50 | 50 | 105.68 | 5284 |
| P131555469 | Installation Support Common 2012 | 49000 | 1/4/2012 | 12/23/2012 E | ANDH E Band H - Engineering | EV 1870 Eng & Mods-Eng Srvs-Elect & Inst Design | 1 | 2012 | 20 | 20 | 109.14 | 2182.8 |
| P131555615 | Design ECs Close Out- HWMB Addition 2012 | 89810 | 1/3/2012 | 5/26/2012 E | ANDH_E Band H - Engineering | EV_1870 Eng & Mods-Eng Srvs-Elect & Inst Design | 1 | 2012 | 50 | 50 | 109.14 | 5457 |
| P131555206 | Engineering Support - Elec | 29000 | 11/1/2008 | 12/15/2008 B | ANDH_E Band H - Engineering | EV_1870 Eng & Mods-Eng Srvs-Elect & Inst Design | 1 | 2008 | 100 | 100 | 95.3 | 9530 |
| P131555503 | Commissioning Support Common | 59000 | 10/1/2011 | 12/31/2011 B | ANDH_E Band H - Engineering | EV_1880 Eng & Mods-Eng Srvs-Eng'g Mechanics | 1 | 2011 | 20 | 20 | 105.68 | 2113.6 |
| | | | | | - U U | _ 0 0 00 | | | | | | |

Filed 2021-08-13 EB-2020-0290 J1.6 Attachment 1 Page 38 of 45

| | Internal Use | Only |
|-----------------|--------------|----------|
| Document Number | ; | |
| NK38-RE | P-09701-026 | 65054 |
| Revision: | Retention: | Page: |
| R000 | T 20 | 39 of 45 |

Table 5 (continuation 1 from previous sheet)

| P131555503 | Commissioning Support Common | 59000 | 6/1/2012 | 11/24/2012 BANDH E Band H - Engineering | EV 1880 Eng & Mods-Eng Srvs-Eng'g Mechanics | 1 2012 | 40 | 40 | 109.14 | 4365.6 |
|------------|--|-------|---|---|---|--------|------|------|--------|----------|
| P131555603 | Design ECs Close Out- Relocate Services | 89710 | 2/23/2012 | 8/30/2012 BANDH E Band H - Engineering | EV 1880 Eng & Mods-Eng Srvs-Eng'g Mechanics | 1 2012 | 40 | 40 | 109.14 | 4365.6 |
| P131555309 | Engineering Support Common 2009 | 39930 | 1/3/2009 | 12/24/2009 BANDH_E Band H - Engineering | EV 1880 Eng & Mods-Eng Srvs-Eng'g Mechanics | 1 2009 | 40 | 40 | 98.76 | 3950.4 |
| P131555309 | Engineering Support Common 2010 | 39930 | 1/3/2010 | 6/30/2010 BANDH_E Band H - Engineering | EV_1880 Eng & Mods-Eng Srvs-Eng'g Mechanics | 1 2010 | 50 | 50 | 102.22 | 5111 |
| P131555412 | Installation Support Common RS 2011 | 49000 | 1/2/2011 | 12/24/2011 BANDH_E Band H - Engineering | EV 1880 Eng & Mods-Eng Srvs-Eng'g Mechanics | 1 2011 | 25 | 25 | 105.68 | 2642 |
| P131555469 | Installation Support Common 2011 | 49000 | 1/4/2011 | 12/23/2011 BANDH_E Band H - Engineering | EV_1880 Eng & Mods-Eng Srvs-Eng'g Mechanics | 1 2011 | 50 | 50 | 105.68 | 5284 |
| P131555469 | Installation Support Common 2012 | 49000 | 1/4/2012 | 12/23/2012 BANDH_E Band H - Engineering | EV_1880 Eng & Mods-Eng Srvs-Eng'g Mechanics | 1 2012 | 20 | 20 | 109.14 | 2182.8 |
| P131555615 | Design ECs Close Out- HWMB Addition 2012 | 89810 | 1/3/2012 | 5/26/2012 BANDH_E Band H - Engineering | EV_1880 Eng & Mods-Eng Srvs-Eng'g Mechanics | 1 2012 | 50 | 50 | 109.14 | 5457 |
| P131555503 | Commissioning Support Common | 59000 | 10/1/2011 | 12/31/2011 CTCCM_T Contract Monitor | EM_2898 Eng & Mods-Mods-Trades Darlington | 1 2011 | 150 | 150 | 55.79 | 8368.5 |
| P131555503 | Commissioning Support Common | 59000 | 6/1/2012 | 11/24/2012 CTCCM_T Contract Monitor | EM_2898 Eng & Mods-Mods-Trades Darlington | 1 2012 | 350 | 350 | 58.06 | 20321 |
| P131555309 | Engineering Support Common 2009 | 39930 | 1/3/2009 | 12/24/2009 CTCCM_T Contract Monitor | EM_2898 Eng & Mods-Mods-Trades Darlington | 1 2009 | 80 | 80 | 51.25 | 4100 |
| P131555412 | Installation Support Common RS 2011 | 49000 | 1/2/2011 | 12/24/2011 CTCCM_T Contract Monitor | EM_2898 Eng & Mods-Mods-Trades Darlington | 1 2011 | 600 | 600 | 55.79 | 33474 |
| P131555469 | Installation Support Common 2011 | 49000 | 1/4/2011 | 12/23/2011 CTCCM_T Contract Monitor | EM 2898 Eng & Mods-Mods-Trades Darlington | 1 2011 | 2300 | 2300 | 55.79 | 128317 |
| P131555469 | Installation Support Common 2012 | 49000 | 1/4/2012 | 12/23/2012 CTCCM_T Contract Monitor | EM_2898 Eng & Mods-Mods-Trades Darlington | 1 2012 | 600 | 600 | 58.06 | 34836 |
| P131555206 | Engineering Support - PE | 29000 | 11/1/2008 | 12/15/2008 CTCCM T Contract Monitor | EM 2898 Eng & Mods-Mods-Trades Darlington | 1 2008 | 80 | 80 | 48.98 | 3918.4 |
| P131555503 | Commissioning Support Common | 59000 | 10/1/2011 | 12/31/2011 CTCVL T Construction Tech Civil | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2011 | 50 | 50 | 73.56 | 3678 |
| P131555503 | Commissioning Support Common | 59000 | 6/1/2012 | 11/24/2012 CTCVL T Construction Tech Civil | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2012 | 100 | 100 | 76.55 | 7655 |
| P131555309 | Engineering Support Common 2009 | 39930 | 1/3/2009 | 12/24/2009 CTCVL T Construction Tech Civil | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2009 | 50 | 50 | 67.58 | 3379 |
| P131555400 | Work Planning RS | 49710 | | CTCVL T Construction Tech Civil | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2010 | 120 | 120 | 70.57 | 8468.4 |
| P131555418 | Work Planning HWMB Addition | 49810 | ****** | CTCVL T Construction Tech Civil | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2010 | 120 | 120 | 70.57 | 8468.4 |
| P131555309 | Engineering Support Common 2010 | 39930 | 1/3/2010 | 6/30/2010 CTCVL T Construction Tech Civil | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2010 | 350 | 350 | 70.57 | 24699.5 |
| P131555412 | Installation Support Common RS 2011 | 49000 | 1/2/2011 | 12/24/2011 CTCVL T Construction Tech Civil | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2011 | 500 | 500 | 73.56 | 36780 |
| P131555469 | Installation Support Common 2011 | 49000 | 1/4/2011 | 12/23/2011 CTCVL T Construction Tech Civil | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2011 | 1000 | 1000 | 73.56 | 73560 |
| P131555469 | Installation Support Common 2012 | 49000 | 1/4/2012 | 12/23/2012 CTCVL T Construction Tech Civil | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2012 | 300 | 300 | 76.55 | 22965 |
| P131555206 | Engineering Support - FE | 29000 | 11/1/2008 | 12/15/2008 CTCVL T Construction Tech Civil | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2008 | 160 | 160 | 64.59 | 10334.4 |
| P131555503 | Commissioning Support Common | 59000 | 10/1/2011 | 12/31/2011 CTELC T Construction Tech EC | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2011 | 50 | 50 | 73.56 | 3678 |
| P131555503 | Commissioning Support Common | 59000 | 6/1/2012 | 11/24/2012 CTELC T Construction Tech EC | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2012 | 100 | 100 | 76.55 | 7655 |
| P131555309 | Engineering Support Common 2009 | 39930 | 1/3/2009 | 12/24/2009 CTELC T Construction Tech EC | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2009 | 50 | 50 | 67.58 | 3379 |
| P131555400 | Work Planning RS | 49710 | | CTELC T Construction Tech EC | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2010 | 120 | 120 | 70.57 | 8468.4 |
| P131555418 | Work Planning HWMB Addition | 49810 | *************************************** | CTELC T Construction Tech EC | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2010 | 120 | 120 | 70.57 | 8468.4 |
| P131555309 | Engineering Support Common 2010 | 39930 | 1/3/2010 | 6/30/2010 CTELC T Construction Tech EC | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2010 | 175 | 175 | 70.57 | 12349.75 |
| P131555412 | Installation Support Common RS 2011 | 49000 | 1/2/2011 | 12/24/2011 CTELC T Construction Tech EC | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2011 | 500 | 500 | 73.56 | 36780 |
| P131555469 | Installation Support Common 2011 | 49000 | 1/4/2011 | 12/23/2011 CTELC T Construction Tech EC | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2011 | 1000 | 1000 | 73.56 | 73560 |
| P131555469 | Installation Support Common 2012 | 49000 | 1/4/2012 | 12/23/2012 CTELC T Construction Tech EC | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2012 | 300 | 300 | 76.55 | 22965 |
| P131555206 | Engineering Support - FE | 29000 | 11/1/2008 | 12/15/2008 CTELC T Construction Tech EC | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2008 | 160 | 160 | 64.59 | 10334.4 |
| P131555503 | Commissioning Support Common | 59000 | 10/1/2011 | 12/31/2011 CTMEC T Construction Tech Mechan | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2011 | 100 | 100 | 73.56 | 7356 |
| P131555503 | Commissioning Support Common | 59000 | 6/1/2012 | 11/24/2012 CTMEC T Construction Tech Mechan | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2012 | 150 | 150 | 76 55 | 11482.5 |
| P131555309 | Engineering Support Common 2009 | 39930 | 1/3/2009 | 12/24/2009 CTMEC T Construction Tech Mechan | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2009 | 50 | 50 | 67.58 | 3379 |
| P131555400 | Work Planning RS | 49710 | | CTMEC T Construction Tech Mechan | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2010 | 120 | 120 | 70.57 | 8468.4 |
| P131555418 | Work Planning HWMB Addition | 49810 | ****** | CTMEC T Construction Tech Mechan | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2010 | 120 | 120 | 70.57 | 8468.4 |
| P131555309 | Engineering Support Common 2010 | 39930 | 1/3/2010 | 6/30/2010 CTMEC T Construction Tech Mechan | EM 2891 Eng & Mode-Mode-Field Engineering | 1 2010 | 175 | 175 | 70.57 | 12349.75 |
| P131555412 | Installation Support Common RS 2011 | 49000 | 1/2/2011 | 12/24/2011 CTMEC T Construction Tech Mechan | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2011 | 500 | 500 | 73.56 | 36780 |
| P131555469 | Installation Support Common 2011 | 49000 | 1/4/2011 | 12/23/2011 CTMEC T Construction Tech Mechan | EM 2891 Eng & Mode-Mode-Field Engineering | 1 2011 | 1000 | 1000 | 73.56 | 73560 |
| P131555469 | Installation Support Common 2012 | 49000 | 1/4/2012 | 12/23/2012 CTMEC T Construction Tech Mechan | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2012 | 300 | 300 | 76.55 | 22965 |
| P131555206 | Engineering Support - FE | 29000 | 11/1/2008 | 12/15/2008 CTMEC T Construction Tech Mechan | EM 2891 Eng & Mods-Mods-Field Engineering | 1 2008 | 160 | 160 | 64.59 | 10334.4 |
| P131555603 | Design ECs Close Out- Relocate Services | 89710 | 2/23/2012 | 8/30/2012 DTCVL T Drafting Civil | DA 2644 DA-Drawing office | 1 2012 | 800 | 800 | 70.87 | 56696 |
| P131555309 | Engineering Support Common 2009 | 39930 | 1/3/2009 | 12/24/2009 DTCVL T Drafting Civil | DA 2644 DA-Drawing office | 1 2009 | 60 | | 62.56 | 3753.6 |
| P131555309 | Engineering Support Common 2010 | 39930 | 1/3/2010 | 6/30/2010 DTCVL T Drafting Civil | DA 2644 DA-Drawing office | 1 2010 | 288 | 288 | 65.33 | 18815.04 |
| P131555412 | Installation Support Common RS 2011 | 49000 | 1/2/2011 | 12/24/2011 DTCVL T Drafting Civil | DA 2644 DA-Drawing office | 1 2011 | 100 | 100 | 68 1 | 6810 |
| | | | | | | | | | | |

Filed 2021-08-13 EB-2020-0290 J1.6 Attachment 1 Page 39 of 45

| Report |
|--------|
|--------|

| | Internal Use | Only |
|----------------|--------------|----------|
| Document Numbe | r: | |
| NK38-RE | EP-09701-026 | 65054 |
| Revision: | Retention: | Page: |
| R000 | T 20 | 40 of 45 |

Table 5 (continuation 2 from previous sheet)

| P131555469 | Installation Support Common 2011 | 49000 | 1/4/2011 | 12/23/2011 DTCVL_T Drafting Civil | DA_2644 DA-Drawing office 1 | 2011 | 200 | 200 | 68.1 | 13620 |
|------------|---|-------|-----------|--|---|------|-----|-----|----------------|----------|
| P131555469 | Installation Support Common 2012 | 49000 | 1/4/2012 | 12/23/2012 DTCVL_T Drafting Civil | DA_2644 DA-Drawing office 1 | 2012 | 0 | 0 | 70.87 | 0 |
| P131555615 | Design ECs Close Out- HWMB Addition 2012 | 89810 | 1/3/2012 | 5/26/2012 DTCVL T Drafting Civil | DA 2644 DA-Drawing office | 2012 | 700 | 700 | 70.87 | 49609 |
| P131555206 | Engineering Support | 29000 | 11/1/2008 | 12/15/2008 DTCVL T Drafting Civil | DA 2644 DA-Drawing office | 2008 | 20 | 20 | 59.79 | 1195.8 |
| P131555603 | Design ECs Close Out- Relocate Services | 89710 | 2/23/2012 | 8/30/2012 DTELC T Drafting Electrical | DA 2644 DA-Drawing office | 2012 | 800 | 800 | 70.87 | 56696 |
| P131555309 | Engineering Support Common 2009 | 39930 | 1/3/2009 | 12/24/2009 DTELC T Drafting Electrical | DA 2644 DA-Drawing office | 2009 | 60 | 60 | 62.56 | 3753.6 |
| P131555309 | Engineering Support Common 2010 | 39930 | 1/3/2010 | 6/30/2010 DTELC T Drafting Electrical | DA 2644 DA-Drawing office | 2010 | 288 | 288 | 65.33 | 18815.04 |
| P131555412 | Installation Support Common RS 2011 | 49000 | 1/2/2011 | 12/24/2011 DTELC T Drafting Electrical | DA 2644 DA-Drawing office | 2011 | 100 | 100 | 68.1 | 6810 |
| P131555469 | Installation Support Common 2011 | 49000 | 1/4/2011 | 12/23/2011 DTELC T Drafting Electrical | DA 2644 DA-Drawing office | 2011 | 200 | 200 | 68.1 | 13620 |
| P131555469 | Installation Support Common 2012 | 49000 | 1/4/2012 | 12/23/2012 DTELC T Drafting Electrical | DA 2644 DA-Drawing office | 2012 | 0 | 0 | 70.87 | 10020 |
| P131555615 | Design ECs Close Out- HWMB Addition 2012 | 89810 | 1/3/2012 | 5/26/2012 DTELC T Drafting Electrical | DA 2644 DA Drawing office | 2012 | 700 | 700 | 70.07 | 0 |
| P131555206 | Engineering Support | 29000 | 11/1/2008 | 12/15/2008 DTELC T Drafting Electrical | DA 2644 DA Drawing office | 2012 | 20 | 20 | 50.70 | 1105.8 |
| P131555603 | Design ECs Close Out- Relocate Services | 89710 | 2/23/2012 | 8/30/2012 DTMEC T Drafting Mechanical | DA_2644 DA-Drawing office | 2008 | 20 | 20 | 70.97 | 56606 |
| P131555309 | Engineering Support Common 2009 | 39930 | 1/3/2009 | 12/24/2009 DTMEC_T_Drafting Mechanical | DA_2644 DA-Drawing office | 2012 | 000 | 60 | 70.07 60.56 | 0752 6 |
| P131555309 | Engineering Support Common 2010 | 30030 | 1/3/2010 | 6/30/2010 DTMEC_T_Drafting Mechanical | DA_2644 DA-Diawing office | 2009 | 00 | 0 | 02.30 | 3753.0 |
| P131555412 | Installation Support Common BS 2011 | 49000 | 1/2/2010 | 12/24/2011 DTMEC_T Drafting Mechanical | DA_2044 DA-Drawing office | 2010 | 288 | 288 | 05.33 | 18815.04 |
| P131555460 | Installation Support Common 2011 | 49000 | 1/2/2011 | 12/22/2011 DTMEC_T Drafting Mechanical | DA_2644 DA-Drawing office | 2011 | 100 | 100 | 68.1 | 6810 |
| P131555460 | Installation Support Common 2012 | 49000 | 1/4/2011 | 12/22/2011 DTMEC_T Dratting Mechanical | DA_2644 DA-Drawing office | 2011 | 200 | 200 | 68.1 | 13620 |
| P101555409 | Design ECo Close Out HIM/MR Addition 2012 | 49000 | 1/4/2012 | 12/23/2012 DTMEC_1 Dratting Mechanical | DA_2644 DA-Drawing office 1 | 2012 | 0 | 0 | 70.87 | 0 |
| P101550015 | Engineering Support | 00000 | 1/3/2012 | 5/26/2012 DTMEC_1 Drafting Mechanical | DA_2644 DA-Drawing office 1 | 2012 | 700 | 700 | 70.87 | 49609 |
| P131555200 | Commissioning Support | 29000 | 11/1/2008 | 12/15/2008 DTMEC_T Drafting Mechanical | DA_2644 DA-Drawing office 1 | 2008 | 20 | 20 | 59.79 | 1195.8 |
| P131555503 | | 59000 | 10/1/2011 | 12/31/2011 ENCVL_E Civil Engineer | EV_1880 Eng & Mods-Eng Srvs-Eng'g Mechanics 1 | 2011 | 20 | 20 | 84.97 | 1699.4 |
| P131555503 | Commissioning Support Common | 59000 | 6/1/2012 | 11/24/2012 ENCVL_E Civil Engineer | EV_1880 Eng & Mods-Eng Srvs-Eng'g Mechanics 1 | 2012 | 40 | 40 | 88.65 | 3546 |
| P131555603 | Design ECs Close Out- Relocate Services | 89710 | 2/23/2012 | 8/30/2012 ENCVL_E Civil Engineer | EV_1880 Eng & Mods-Eng Srvs-Eng'g Mechanics 1 | 2012 | 400 | 400 | 88.65 | 35460 |
| P131555309 | Engineering Support Common 2009 | 39930 | 1/3/2009 | 12/24/2009 ENCVL_E Civil Engineer | EV_1880 Eng & Mods-Eng Srvs-Eng'g Mechanics 1 | 2009 | 250 | 250 | 77.61 | 19402.5 |
| P131555400 | Work Planning RS | 49710 | | ENCVL_E Civil Engineer | EV_1880 Eng & Mods-Eng Srvs-Eng'g Mechanics 1 | 2010 | 120 | 120 | 81.29 | 9754.8 |
| P131555418 | Work Planning HWMB Addition | 49810 | ······ | ENCVL_E Civil Engineer | EV_1880 Eng & Mods-Eng Srvs-Eng'g Mechanics 1 | 2010 | 120 | 120 | 81.29 | 9754.8 |
| P131555309 | Engineering Support Common 2010 | 39930 | 1/3/2010 | 6/30/2010 ENCVL_E Civil Engineer | EV_1880 Eng & Mods-Eng Srvs-Eng'g Mechanics 1 | 2010 | 380 | 380 | 81.29 | 30890.2 |
| P131555412 | Installation Support Common RS 2011 | 49000 | 1/2/2011 | 12/24/2011 ENCVL_E Civil Engineer | EV_1880 Eng & Mods-Eng Srvs-Eng'g Mechanics 1 | 2011 | 175 | 175 | 84.97 | 14869.75 |
| P131555469 | Installation Support Common 2011 | 49000 | 1/4/2011 | 12/23/2011 ENCVL_E Civil Engineer | EV_1880 Eng & Mods-Eng Srvs-Eng'g Mechanics 1 | 2011 | 350 | 350 | 84.97 | 29739.5 |
| P131555469 | Installation Support Common 2012 | 49000 | 1/4/2012 | 12/23/2012 ENCVL_E Civil Engineer | EV_1880 Eng & Mods-Eng Srvs-Eng'g Mechanics 1 | 2012 | 100 | 100 | 88.65 | 8865 |
| P131555615 | Design ECs Close Out- HWMB Addition 2012 | 89810 | 1/3/2012 | 5/26/2012 ENCVL_E Civil Engineer | EV_1880 Eng & Mods-Eng Srvs-Eng'g Mechanics 1 | 2012 | 450 | 450 | 88.65 | 39892.5 |
| P131555503 | Commissioning Support Common | 59000 | 10/1/2011 | 12/31/2011 ENELC_E Electrical Engineer | EV_1870 Eng & Mods-Eng Srvs-Elect & Inst Design 1 | 2011 | 20 | 20 | 84.97 | 1699.4 |
| P131555503 | Commissioning Support Common | 59000 | 6/1/2012 | 11/24/2012 ENELC_E Electrical Engineer | EV_1870 Eng & Mods-Eng Srvs-Elect & Inst Design 1 | 2012 | 40 | 40 | 88.65 | 3546 |
| P131555603 | Design ECs Close Out- Relocate Services | 89710 | 2/23/2012 | 8/30/2012 ENELC_E Electrical Engineer | EV_1870 Eng & Mods-Eng Srvs-Elect & Inst Design 1 | 2012 | 400 | 400 | 88.65 | 35460 |
| P131555309 | Engineering Support Common 2009 | 39930 | 1/3/2009 | 12/24/2009 ENELC_E Electrical Engineer | EV_1870 Eng & Mods-Eng Srvs-Elect & Inst Design 1 | 2009 | 250 | 250 | 77.61 | 19402.5 |
| P131555400 | Work Planning RS | 49710 | | ENELC_E Electrical Engineer | EV_1870 Eng & Mods-Eng Srvs-Elect & Inst Design 1 | 2010 | 120 | 120 | 81.29 | 9754.8 |
| P131555418 | Work Planning HWMB Addition | 49810 | | ENELC_E Electrical Engineer | EV_1870 Eng & Mods-Eng Srvs-Elect & Inst Design 1 | 2010 | 120 | 120 | 81.29 | 9754.8 |
| P131555309 | Engineering Support Common 2010 | 39930 | 1/3/2010 | 6/30/2010 ENELC_E Electrical Engineer | EV_1870 Eng & Mods-Eng Srvs-Elect & Inst Design 1 | 2010 | 380 | 380 | 81.29 | 30890.2 |
| P131555412 | Installation Support Common RS 2011 | 49000 | 1/2/2011 | 12/24/2011 ENELC_E Electrical Engineer | EV 1870 Eng & Mods-Eng Srys-Elect & Inst Design 1 | 2011 | 175 | 175 | 84.97 | 14869.75 |
| P131555469 | Installation Support Common 2011 | 49000 | 1/4/2011 | 12/23/2011 ENELC_E Electrical Engineer | EV 1870 Eng & Mods-Eng Srys-Elect & Inst Design 1 | 2011 | 350 | 350 | 84.97 | 29739.5 |
| P131555469 | Installation Support Common 2012 | 49000 | 1/4/2012 | 12/23/2012 ENELC E Electrical Engineer | EV 1870 Eng & Mods-Eng Srys-Elect & Inst Design 1 | 2012 | 100 | 100 | 88.65 | 8865 |
| P131555615 | Design ECs Close Out- HWMB Addition 2012 | 89810 | 1/3/2012 | 5/26/2012 ENELC E Electrical Engineer | EV 1870 Eng & Mods-Eng Srys-Elect & Inst Design 1 | 2012 | 450 | 450 | 88 65 | 39892 5 |
| P131555309 | Engineering Support Common 2009 | 39930 | 1/3/2009 | 12/24/2009 ENINC E Instrumentation/Control Eng | EV 1860 Eng & Mods-Eng Srys-Mechanical Design 1 | 2009 | 250 | 250 | 77 61 | 19402.5 |
| P131555400 | Work Planning RS | 49710 | | ENINC E Instrumentation/Control Eng | EV 1860 Eng & Mods-Eng Srvs-Mechanical Design | 2010 | 120 | 120 | 81 29 | 9754.8 |
| P131555418 | Work Planning HWMB Addition | 49810 | | ENINC E Instrumentation/Control Eng | EV 1860 Eng & Mode Eng Srvs-Mechanical Design | 2010 | 120 | 120 | 81 29 | 0754.8 |
| P131555309 | Engineering Support Common 2010 | 39930 | 1/3/2010 | 6/30/2010 ENINC E Instrumentation/Control Eng | EV 1860 Eng & Mods-Eng Srys-Mechanical Design | 2010 | 380 | 380 | 81 20 | 30800.2 |
| P131555503 | Commissioning Support Common | 59000 | 10/1/2011 | 12/31/2011 ENINC E Instrumentation/Control Eng | EV 1870 Eng & Mode Eng Srvs-Flect & Inst Design | 2011 | 20 | 20 | 84 97 | 1600 / |
| P131555503 | Commissioning Support Common | 59000 | 6/1/2012 | 11/24/2012 ENINC E Instrumentation/Control Eng | EV 1870 Eng & Mods-Eng Srys-Elect & Inst Design | 2012 | 40 | 40 | 88.65 | 25/6 |
| | | | | | | 2012 | -+0 | -+0 | 00.00 | 3540 |

Filed 2021-08-13 EB-2020-0290 J1.6 Attachment 1 Page 40 of 45

| Report |
|--------|
|--------|

Title:

| | Internal Use | Only |
|--------------|--------------|----------|
| Document Num | per: | |
| NK38-R | EP-09701-026 | 65054 |
| Revision: | Retention: | Page: |
| B000 | T 20 | 41 of 45 |

DARLINGTON REFURBISHMENT D20 STORAGE FACILITY EVALUATION

Table 5 (continuation 3 from previous sheet)

| | | | ***** | | | | | | | | |
|------------|--|-------|-----------|--|---|--------|------|------|------|-------|----------|
| P131555603 | Design ECs Close Out- Relocate Services | 89710 | 2/23/2012 | 8/30/2012 ENINC_E Instrumentation/Control Eng | EV_1870 Eng & Mods-Eng Srvs-Elect & Inst Design | 1 | 2012 | 400 | 400 | 88.65 | 35460 |
| P131555412 | Installation Support Common RS 2011 | 49000 | 1/2/2011 | 12/24/2011 ENINC_E Instrumentation/Control Eng | EV_1870 Eng & Mods-Eng Srvs-Elect & Inst Design | 1 | 2011 | 175 | 175 | 84.97 | 14869.75 |
| P131555469 | Installation Support Common 2011 | 49000 | 1/4/2011 | 12/23/2011 ENINC_E Instrumentation/Control Eng | EV_1870 Eng & Mods-Eng Srvs-Elect & Inst Design | 1 | 2011 | 350 | 350 | 84.97 | 29739.5 |
| P131555469 | Installation Support Common 2012 | 49000 | 1/4/2012 | 12/23/2012 ENINC_E Instrumentation/Control Eng | EV_1870 Eng & Mods-Eng Srvs-Elect & Inst Design | 1 | 2012 | 100 | 100 | 88.65 | 8865 |
| P131555615 | Design ECs Close Out- HWMB Addition 2012 | 89810 | 1/3/2012 | 5/26/2012 ENINC_E Instrumentation/Control Eng | EV_1870 Eng & Mods-Eng Srvs-Elect & Inst Design | 1 | 2012 | 450 | 450 | 88.65 | 39892.5 |
| P131555503 | Commissioning Support Common | 59000 | 10/1/2011 | 12/31/2011 ENMEC_E Mechanical Engineer | EV_1860 Eng & Mods-Eng Srvs-Mechanical Design | 1 | 2011 | 150 | 150 | 84.97 | 12745.5 |
| P131555503 | Commissioning Support Common | 59000 | 6/1/2012 | 11/24/2012 ENMEC_E Mechanical Engineer | EV_1860 Eng & Mods-Eng Srvs-Mechanical Design | 1 | 2012 | 350 | 350 | 88.65 | 31027.5 |
| P131555603 | Design ECs Close Out- Relocate Services | 89710 | 2/23/2012 | 8/30/2012 ENMEC_E Mechanical Engineer | EV 1860 Eng & Mods-Eng Srvs-Mechanical Design | 1 | 2012 | 400 | 400 | 88.65 | 35460 |
| P131555309 | Engineering Support Common 2009 | 39930 | 1/3/2009 | 12/24/2009 ENMEC_E Mechanical Engineer | EV 1860 Eng & Mods-Eng Srys-Mechanical Design | 1 | 2009 | 1100 | 1100 | 77.61 | 85371 |
| P131555400 | Work Planning RS | 49710 | | ENMEC E Mechanical Engineer | EV 1860 Eng & Mods-Eng Srys-Mechanical Design | 1 | 2010 | 120 | 120 | 81.29 | 9754.8 |
| P131555418 | Work Planning HWMB Addition | 49810 | | ENMEC E Mechanical Engineer | EV 1860 Eng & Mods-Eng Srys-Mechanical Design | 1 | 2010 | 120 | 120 | 81.29 | 9754.8 |
| P131555309 | Engineering Support Common 2010 | 39930 | 1/3/2010 | 6/30/2010 ENMEC E Mechanical Engineer | EV 1860 Eng & Mods-Eng Srys-Mechanical Design | | 2010 | 770 | 770 | 81 29 | 62593.3 |
| P131555412 | Installation Support Common RS 2011 | 49000 | 1/2/2011 | 12/24/2011 ENMEC E Mechanical Engineer | EV 1860 Eng & Mods-Eng Srys-Mechanical Design | | 2011 | 600 | 600 | 84.97 | 50982 |
| P131555469 | Installation Support Common 2011 | 49000 | 1/4/2011 | 12/23/2011 ENMEC E Mechanical Engineer | EV 1860 Eng & Mods-Eng Srys-Mechanical Design | | 2011 | 1200 | 1200 | 84 97 | 101964 |
| P131555469 | Installation Support Common 2012 | 49000 | 1/4/2012 | 12/23/2012 ENMEC E Mechanical Engineer | EV 1860 Eng & Mods-Eng Srys-Mechanical Design | | 2012 | 300 | 300 | 88 65 | 26595 |
| P131555615 | Design ECs Close Out- HWMB Addition 2012 | 89810 | 1/3/2012 | 5/26/2012 ENMEC E Mechanical Engineer | EV 1860 Eng & Mods-Eng Srys-Mechanical Design | 1 | 2012 | 450 | 450 | 88.65 | 30802.5 |
| P131555503 | Commissioning Support Common | 59000 | 10/1/2011 | 12/31/2011 ENMUL E Multi-Discipline Eng | DA 2681 DA-Chem/TRF Technical | 4 | 2012 | 70 | 70 | 8/ 07 | 5947.9 |
| P131555503 | Commissioning Support Common | 59000 | 6/1/2012 | 11/24/2012 ENMUL E Multi-Discipline Eng | DA 2681 DA-Chem/TRE Technical | | 2011 | 150 | 150 | 88.65 | 13207.5 |
| P131555309 | Engineering Support Common 2009 | 39930 | 1/3/2009 | 12/24/2009 ENMLIL E Multi-Discipline Eng | DA 2681 DA Chem/TRE Technical | ן 1 | 2012 | 250 | 250 | 77 61 | 10/02 5 |
| P131555309 | Engineering Support Common 2010 | 39930 | 1/3/2010 | 6/30/2010 ENMLIL E Multi-Discipline Eng | DA 2681 DA Chem/TRE Technical | ر ۲ | 2009 | 200 | 200 | 01.01 | 20900.2 |
| P131555412 | Installation Support Common BS 2011 | 49000 | 1/2/2011 | 12/24/2011 ENMLIL E Multi-Discipline Eng | DA 2681 DA-Chem/TRE Technical | ا ۲ | 2010 | 200 | 300 | 01.29 | 16004 |
| P131555469 | Installation Support Common 2011 | 49000 | 1/4/2011 | 12/23/2011 ENMLIL E Multi-Discipline Eng | DA_2001 DA-Chem/TRE Technical | 1 | 2011 | 200 | 200 | 04.97 | 22000 |
| P131555469 | Installation Support Common 2012 | 49000 | 1/4/2012 | 12/23/2011 ENMLIL E Multi-Discipline Eng | | 1 | 2011 | 400 | 400 | 04.97 | 0000 |
| P131555206 | Engineering Support | 29000 | 11/1/2008 | 12/15/2008 ENMLIL E Multi-Discipline Eng | | | 2012 | 100 | 100 | 70.00 | |
| P131555206 | Engineering Support | 29000 | 11/1/2000 | | | | 2008 | 160 | 160 | 73.93 | 11828.8 |
| P131555503 | Commissioning Support Common | 59000 | 10/1/2008 | 12/21/2011 MCONE M ELMA Control | DA_2001 DA-Peri Engly Primary Sys | | 2008 | /0 | /0 | 73.93 | 51/5.1 |
| P131555503 | Commissioning Support Common | 59000 | 6/1/2011 | | DA_2082 DA-Chem/THF Operations |] | 2011 | 180 | 180 | /1.15 | 12807 |
| P131555503 | Commissioning Support Common | 59000 | 10/1/2012 | 10/21/2011 MCONT M Meinteiner Control | DA_2082 DA-Chem/TRF Operations | 1 | 2012 | 350 | 350 | /4.05 | 25917.5 |
| P121555503 | Commissioning Support Common | 59000 | 6/1/2011 | 12/31/2011 MCONT_M Maintainer Control | DA_2682 DA-Chem/TRF Operations | 1 | 2011 | 180 | 180 | 71.15 | 12807 |
| P12155503 | Commissioning Support Common | 59000 | 0/1/2012 | | DA_2682 DA-Chem/TRF Operations | 1 | 2012 | 350 | 350 | 74.05 | 25917.5 |
| P101555500 | Commissioning Support Common | 59000 | 0/1/2011 | 12/31/2011 MMECF_M FLMA Mechanical | DA_2682 DA-Chem/TRF Operations | 1 | 2011 | 375 | 375 | 71.67 | 26876.25 |
| P101555000 | Installation Support Common | 59000 | 6/1/2012 | 11/24/2012 MMECF_M FLMA Mechanical | DA_2682 DA-Chem/TRF Operations | 1 | 2012 | 725 | 725 | 74.59 | 54077.75 |
| P131555460 | Installation Support Common RS 2011 | 49000 | 1/2/2011 | 12/24/2011 MMECF_M FLMA Mechanical | DA_2682 DA-Chem/TRF Operations | 1 | 2011 | 200 | 200 | 71.67 | 14334 |
| P131555409 | Installation Support Common 2011 | 49000 | 1/4/2011 | 12/23/2011 MMECF_M FLMA Mechanical | DA_2682 DA-Chem/TRF Operations | 1 | 2011 | 400 | 400 | 71.67 | 28668 |
| P131555469 | Installation Support Common 2012 | 49000 | 1/4/2012 | 12/23/2012 MMECF_M FLMA Mechanical | DA_2682 DA-Chem/TRF Operations | 1 | 2012 | 100 | 100 | 74.59 | 7459 |
| P131555503 | | 59000 | 10/1/2011 | 12/31/2011 MSCVF_M FLMA Civil | DA_2682 DA-Chem/TRF Operations | 1 | 2011 | 180 | 180 | 57.8 | 10404 |
| P131555503 | | 59000 | 6/1/2012 | 11/24/2012 MSCVF_M FLMA Civil | DA_2682 DA-Chem/TRF Operations | 1 | 2012 | 350 | 350 | 60.15 | 21052.5 |
| P131555412 | Installation Support Common RS 2011 | 49000 | 1/2/2011 | 12/24/2011 MSCVF_M FLMA Civil | DA_2682 DA-Chem/TRF Operations | 1 | 2011 | 200 | 200 | 57.8 | 11560 |
| P131555469 | Installation Support Common 2011 | 49000 | 1/4/2011 | 12/23/2011 MSCVF_M FLMA Civil | DA_2682 DA-Chem/TRF Operations | 1 | 2011 | 400 | 400 | 57.8 | 23120 |
| P131555469 | Installation Support Common 2012 | 49000 | 1/4/2012 | 12/23/2012 MSCVF_M FLMA Civil | DA_2682 DA-Chem/TRF Operations | 1 | 2012 | 100 | 100 | 60.15 | 6015 |
| P131555503 | Commissioning Support Common | 59000 | 10/1/2011 | 12/31/2011 NMODF_N FLM Modifications | EM_2898 Eng & Mods-Mods-Trades Darlington | 1 | 2011 | 150 | 150 | 92.51 | 13876.5 |
| P131555503 | Commissioning Support Common | 59000 | 6/1/2012 | 11/24/2012 NMODF_N FLM Modifications | EM_2898 Eng & Mods-Mods-Trades Darlington | 1 | 2012 | 350 | 350 | 96.49 | 33771.5 |
| P131555309 | Engineering Support Common 2009 | 39930 | 1/3/2009 | 12/24/2009 NMODF_N FLM Modifications | EM_2898 Eng & Mods-Mods-Trades Darlington | 1 | 2009 | 125 | 125 | 84.55 | 10568.75 |
| P131555400 | Work Planning RS | 49710 | | NMODF_N FLM Modifications | EM_2898 Eng & Mods-Mods-Trades Darlington | 1 | 2010 | 120 | 120 | 88.53 | 10623.6 |
| P131555418 | Work Planning HWMB Addition | 49810 | | NMODF_N FLM Modifications | EM_2898 Eng & Mods-Mods-Trades Darlington | 1 | 2010 | 120 | 120 | 88.53 | 10623.6 |
| P131555309 | Engineering Support Common 2010 | 39930 | 1/3/2010 | 6/30/2010 NMODF_N FLM Modifications | EM_2898 Eng & Mods-Mods-Trades Darlington | 1 | 2010 | 175 | 175 | 88.53 | 15492.75 |
| P131555412 | Installation Support Common RS 2011 | 49000 | 1/2/2011 | 12/24/2011 NMODF_N FLM Modifications | EM_2898 Eng & Mods-Mods-Trades Darlington | 1 | 2011 | 600 | 600 | 92.51 | 55506 |
| P131555469 | Installation Support Common 2011 | 49000 | 1/4/2011 | 12/23/2011 NMODF_N FLM Modifications | EM_2898 Eng & Mods-Mods-Trades Darlington | 1 | 2011 | 1200 | 1200 | 92.51 | 111012 |
| P131555469 | Installation Support Common 2012 | 49000 | 1/4/2012 | 12/23/2012 NMODF_N FLM Modifications | EM_2898 Eng & Mods-Mods-Trades Darlington | 1 | 2012 | 300 | 300 | 96.49 | 28947 |
| | | | | | - | | | | | | |

Filed 2021-08-13 EB-2020-0290 J1.6 Attachment 1 Page 41 of 45

| | Internal Use Only | | | | | |
|--------|-------------------|------------|----------|--|--|--|
| | Document Number | <i>t</i> : | | | | |
| Report | NK38-RE | 65054 | | | | |
| | Revision: | Retention: | Page: | | | |
| | R000 | T 20 | 42 of 45 | | | |
| Title: | | | | | | |

Table 5 (continuation 4 from previous sheet)

| | | Ables to second a local second s | | | | | | | | | | | |
|------------|--|--|-----------|------------|-----------------------------------|-------------|--------------------------------------|---|------|------|------|-------|------------|
| P131555206 | Engineering Support - CMO | 29000 | 11/1/2008 | 12/15/2008 | 3 NMODF_N FLM Modifications | EM_2898 | Eng & Mods-Mods-Trades Darlington | 1 | 2008 | 80 | 80 | 80.57 | 6445.6 |
| P131555503 | Commissioning Support Common | 59000 | 10/1/2011 | 12/31/2011 | OPNUC_O Operator Nuclear | DA_2682 | DA-Chem/TRF Operations | 1 | 2011 | 120 | 120 | 70.65 | 8478 |
| P131555503 | Commissioning Support Common | 59000 | 6/1/2012 | 11/24/2012 | 2 OPNUC_O Operator Nuclear | DA_2682 | DA-Chem/TRF Operations | 1 | 2012 | 250 | 250 | 73.52 | 18380 |
| P131555309 | Engineering Support Common 2009 | 39930 | 1/3/2009 | 12/24/2009 | OPNUC_O Operator Nuclear | DA_2682 | DA-Chem/TRF Operations | 1 | 2009 | 40 | 40 | 64.91 | 2596.4 |
| P131555309 | Engineering Support Common 2010 | 39930 | 1/3/2010 | 6/30/2010 | OPNUC_O Operator Nuclear | DA_2682 | DA-Chem/TRF Operations | 1 | 2010 | 40 | 40 | 67.78 | 2711.2 |
| P131555412 | Installation Support Common RS 2011 | 49000 | 1/2/2011 | 12/24/2011 | I OPNUC_O Operator Nuclear | DA_2682 | DA-Chem/TRF Operations | 1 | 2011 | 200 | 200 | 70.65 | 14130 |
| P131555469 | Installation Support Common 2011 | 49000 | 1/4/2011 | 12/23/2011 | OPNUC_O Operator Nuclear | DA_2682 | DA-Chem/TRF Operations | 1 | 2011 | 400 | 400 | 70.65 | 28260 |
| P131555469 | Installation Support Common 2012 | 49000 | 1/4/2012 | 12/23/2012 | 2 OPNUC_O Operator Nuclear | DA_2682 | DA-Chem/TRF Operations | 1 | 2012 | 100 | 100 | 73.52 | 7352 |
| P131555206 | Engineering Support | 29000 | 11/1/2008 | 12/15/2008 | 3 OPNUC_O Operator Nuclear | DA_2682 | DA-Chem/TRF Operations | 1 | 2008 | 160 | 160 | 62.04 | 9926.4 |
| P131555503 | Commissioning Support Common | 59000 | 6/1/2012 | 11/24/2012 | 2 RADTN_T Tech Radiation | DA_3152 | DA-Rad Safety Materials | 1 | 2012 | 80 | 80 | 65.14 | 5211.2 |
| P131555309 | Engineering Support Common 2009 | 39930 | 1/3/2009 | 12/24/2009 | RADTN_T Tech Radiation | DA_3152 | DA-Rad Safety Materials | 1 | 2009 | 40 | 40 | 57.52 | 2300.8 |
| P131555309 | Engineering Support Common 2010 | 39930 | 1/3/2010 | 6/30/2010 | 0 RADTN_T Tech Radiation | DA_3152 | DA-Rad Safety Materials | 1 | 2010 | 40 | 40 | 60.06 | 2402.4 |
| P131555412 | Installation Support Common RS 2011 | 49000 | 1/2/2011 | 12/24/2011 | RADTN_T Tech Radiation | DA_3152 | DA-Rad Safety Materials | 1 | 2011 | 500 | 500 | 62.6 | 31300 |
| P131555469 | Installation Support Common 2011 | 49000 | 1/4/2011 | 12/23/2011 | RADTN_T Tech Radiation | DA_3152 | DA-Rad Safety Materials | 1 | 2011 | 1000 | 1000 | 62.6 | 62600 |
| P131555469 | Installation Support Common 2012 | 49000 | 1/4/2012 | 12/23/2012 | 2 RADTN_T Tech Radiation | DA_3152 | DA-Rad Safety Materials | 1 | 2012 | 300 | 300 | 65.14 | 19542 |
| P131555206 | Engineering Support | 29000 | 11/1/2008 | 12/15/2008 | B RADTN_T Tech Radiation | DA_3152 | DA-Rad Safety Materials | 1 | 2008 | 80 | 80 | 54.98 | 4398.4 |
| P131555512 | Commissioing - HWMB | 59810 | | | ZEXT_G4 External Contractor - Gen | eri EM_2896 | Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2012 | | | | 300000 |
| P131555500 | Commissioing - Relocate Services | 59710 | | | ZEXT_G4 External Contractor - Gen | eri EM_2896 | Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2011 | | | | 100000 |
| P131555610 | Contract Design EC Close-out HWMB 2012 | 89810 | | | ZEXT_G5 External Contractor - Gen | eri EM_2896 | Eng & Mods-Mods-Dsgn Proj Crit Equip | 1 | 2012 | | | | 200000 |
| | | | | | | | | | | | | | |
| | Total | | | | | | | | | | | | 4035668.67 |

Filed 2021-08-13 EB-2020-0290 J1.6 Attachment 1 Page 42 of 45
| | | Internal Use | Only |
|--------|-----------------|--------------|----------|
| Report | Document Number | : | |
| | NK38-RE | P-09701-026 | 5054 |
| | Revision: | Retention: | Page: |
| | R000 | T 20 | 43 of 45 |
| Title: | | | • |

DARLINGTON REFURBISHMENT D20 STORAGE FACILITY EVALUATION

Appendix J: Refurbishment Upgrading and Tritium Removal Cost Estimate

| | | | | Tritiu | ım Remo | val | | | | - |
|-----------------|---|-------|----------------|---------------|------------------------|-------------------------------|--------------|----------------------|-------------|-------------|
| | Target [| | Target [Ci/kg] | | | Volume [Mg] | | Total Cost [\$/unit] | | |
| | Actual [Ci/kg] | ALARA | Realistic | Cost \$/Mg | ALARA (Low Risk) | Realistic (Medium Risk) | High Risk | Low | Med | High |
| PHT* | 1 | 0.7 | 0.9 | \$25,000 | 273 | 91 | 0 | \$0 | \$0* | \$0* |
| Moderator | 10 | 1.0 | 2.0 | \$25,000 | 329 | 292 | 0 | \$0 | \$7,311,828 | \$8,225,806 |
| Decontamination | | | | \$25,000 | 0 | 0 | 0 | \$0 | \$0 | \$0 |
| | Tritium Removal Cost for one unit | | | | | \$0 | \$7,311,828 | \$8,225,806 | | |
| | Tritium Removal Total 4 Units \$0 \$29,247,312 \$32,903,224 | | | | | | | | | |

Upgrading Volume [Mg] Target Total Cost [\$/unit] Actual Isotopic Cost Isotopic High Medium Low [Mass %D₂O] \$/Mg High Low Med [Mass %D₂O] Risk Risk Risk PHT \$143,850 \$286,650 95 99.96 \$1,050 0 273 137 \$0 \$1,000 340 Moderator* 99.9 99.98 170 0 \$0 \$0* \$0* Decontamination 60 99.98 \$2,000 350 150 0 \$0 \$300,000 \$700,000 Upgrading Cost for one unit \$443,850 \$986,650 \$0 **Upgrading Total 4 Units** \$0 \$1,775,400 \$3,946,600

Tritium Removal & Upgrading Total

\$31,022,712 \$36,849,824

\$0

*Assumptions: 1. PHT D₂O does not require detritiation;

2. Moderator D₂O does not require upgrading

| | Filed 2021-08-1 EB-2020-029 J1. | 3 0 6 |
|--------|---------------------------------------|-------------|
| | Attachment | 1 |
| | Internal Use Only age 44 of 4 | 5 |
| | Document Number: | |
| Report | NK38-REP-09701-0265054 | |
| • | Revision: Retention: Page: | |
| | R000 T 20 44 of 45 | |
| Title: | | _ |

DARLINGTON REFURBISHMENT D20 STORAGE FACILITY EVALUATION

Reference List

| [1] | NK38-SR-03500-10001 Darlington Safety Report - Part 1: Plant/site Description And Part 2: Design Description |
|------|--|
| [2] | NK38-OPP-03600 Operating Policies And Principles |
| [3] | NK30-OPP-03600 Operating Policies And Principles (PB) |
| [4] | NK38-DG-03650.2BNuclear Safety Design Guide – Common Mode Incidents - Seismic Design |
| [5] | NK38-REP-D1274014Darlington GS A Heavy Water Management Building Seismic Analysis |
| [6] | NK38-DM-73690TRF and D ₂ O Management Building Ventilation |
| [7] | NA44-DRT-32310-00004-U2 Modification Design Report - DCP 70548 / DCN 70549 Assessment of Piping Modification |
| [8] | NK38-DM-33100 Main Heat Transport Circuit - Design Manual |
| [9] | NK38-OM-32100-04.09 Moderator Draining – Operating Manual |
| [10] | NK38-OM-32100-04.10 Moderator Filling - Drained To Overpoisoned GSS |
| [11] | NK38-D1H-10249-1343Yard Services Area No. 1343 (Drawing) |
| [12] | NK38-D1H-10249-1353Yard Services Area No. 1353 (Drawing) |
| [13] | NK30-REF-09701-0185104 AECL Retube & Feeder Replacement Study – Input to Environmental Assessment (AECL # 30RF-09700-ASD-001 Rev. 1) |
| [14] | NK30-REP-09701-0236734 Pickering B Assessment Document: Retube and Feeder Study–Technical Assessment (AECL # 30RF-09700-ASD-002) |
| [15] | NK38-39000-T5 TRF Plant Life Extension Assessment - R02, Sep 11, 2006 |
| [16] | N-PCH-03800-10000Adding Heavy Water Storage/Drum Handling Facilities |
| [17] | D-BCS-38000-10001-001 BCS DNGS D_2O Storage and Drum Handling Project |
| [18] | K-012667-001-RA-0001Kinetrics Report - OPG Heavy Water Storage Management and Drum Handling – Study of Preferred Solution |
| [19] | NK38-DM-38110 D ₂ O SUPPLY - Design Manual |
| [20] | NK38-CORR-09701-0264963 DNGS 400 Mg D2O Storage Project Cost Estimate Supporting Documents |
| [21] | NK30-REP-09701-0185093 D_2O PLEP Storage Facility Evaluation |
| [22] | N-REP-03800-10002 Heavy Water Management Strategy For Pickering B Plant Life Extension Project |
| [23] | NK38-CORR-38000-0150457 Memo Dnd Heavy Water D_2O Annual Physical Inventory Results For 2004 |
| [24] | NK38-TS-38112-10001 D ₂ O Supply Pumps |
| [25] | NK38-CORR-09701-0249012 Cost and Schedule for DTRF Plant Life Extension Options |
| [26] | NK30-CORR-09701-0185091Pickering B PLEP HW Storage Facility – Conceptual Quality Estimate by Altus Helyar |

| | _ |
|-----------------------------------|---|
| Filed 2021-08-1 | 3 |
| EB-2020-029 | 0 |
| J1. | 6 |
| Attachment | 1 |
| Internal Use Only age 45 of 4 | 5 |
| H | |
| EP-09701-0265054 | |
| Retention: Page: | _ |
| T 20 45 of 45 | |
| rnal 9701 Retention T 20 | Filed 2021-08-1 EB-2020-029 J1. <u>Attachment</u> Use Only age 45 of 4 -0265054 Page: 45 of 45 |

DARLINGTON REFURBISHMENT D2O STORAGE FACILITY EVALUATION

Report

Title:

Glossary of Acronyms

| ASME | American Society of Mechanical Engineers |
|------|--|
| CNSC | Canadian Nuclear safety Commission |
| DBE | Design Basis Earthquake |
| DNGS | Darlington Nuclear Generating Station |
| EA | Environmental Assessment |
| ECC | Engineering Change Control |
| EOL | End of Life |
| HTS | Heat Transport System |
| HW | Heavy Water |
| HWMB | Heavy Water Management Building |
| HWSF | Heavy Water Storage Facility |
| lgpm | Imperial gallon per minute |
| IXCU | Ion Exchange Column Unit |
| LLDS | Low Level Drained State |
| NBC | National Building Code |
| NGS | Nuclear Generating Station |
| OGMS | Off-Gas Management System |
| OPEX | Operating Experience |
| OPG | Ontario Power Generation |
| PB | Pickering B |
| PHT | Primary Heat Transport |
| PLEP | Plant Life Extension Project |
| S&I | Storage & Inventory |
| SUP | Station UPgrader |
| TRF | Tritium Removal Facility |

1 2

4

3 **Undertaking**

5 TO PROVIDE DETAILS OF DURATIONS FOR THE STAGES OF WATER 6 DRAINAGE FROM UNIT 2, INCLUDING THE TRANSITION POINT, AND THE 7 VOLUMES OF ASSOCIATED WATER; AND TO PROVIDE THE EQUIVALENT 8 NUMBERS FOR UNIT 3

9 10

11 Response

12

13 The actual volumes and durations for the Unit 2 and Unit 3 PHT and moderator drains 14 through to the D2O Storage Project facility are provided in Chart 1 and Chart 2, 15 respectively. Piping connections from each unit to the Heavy Water Management Building existed prior to the D2O Storage Project. The D2O Storage Project extended 16 17 the connections from the Heavy Water Management Building to the D2O Storage 18 Project facility.

19 20

Chart 1: Actual Volumes for PHT and Moderator Bulk Drain and Vacuum Dry

21 22

| | | Volumes | (Mg) | |
|------|-------|---------|-------|--------|
| Unit | Pł | ΗT | Mode | erator |
| | Bulk | Vacuum | Bulk | Vacuum |
| | Drain | Dry | Drain | Dry |
| 2 | 240.4 | 114.5 | 310 | 4.4 |
| 3 | 260 | 128.2 | 317 | 3.2 |

23 24 25 26 Note 1: Actual Unit 2 volumes in Chart 1 differ slightly from the approximated volumes provided in Ex. L-D2-02-AMPCO-126 (a) and Ex. D2-2-10, Attachment 5.

Note 2: Unit 2 and Unit 3 volumes in Chart 1 differ from the theoretical volumes provided in Ex. L-D2-02-AMPCO-088 (b). Differences between theoretical and actual volumes are expected based on temperature, pressure factors 27 and order of operations impacting volume.

28

29

30

Chart 2: Actual Durations for PHT and Moderator Bulk Drain and Vacuum Dry

31

| Duration (Days) | | | | | |
|-----------------|-------------|-----|-------|--------|--|
| Unit | Pł | ΗT | Mode | erator | |
| | Bulk Vacuum | | Bulk | Bulk | |
| | Drain | Dry | Drain | Drain | |
| 2 | 5 | 78 | 5 | 17 | |
| 3 | 7 | 62 | 7 | 22 | |

32

1

2 See Attachment 1 (this document is marked commercially sensitive, but OPG has 3 determined it is non-confidential in its entirety) for a copy of OPG's Darlington 4 Refurbishment: D2O Management Strategy dated September 2012. This report 5 describes OPG's approach to managing heavy water throughout the refurbishment 6 program and at p. 15, Table 3, provides forecasted drain/fill timelines as forecasted in 7 2012.

8

9 For clarity, in Attachment 2 OPG has restated the drain/fill schedule in Ex. K1.6 to
 10 reflect the refurbishment schedule as planned in 2012 at the time of OPG's initial D2O

11 Storage Project Full Release Definition BCS (Ex. D2-2-10, Attachment 2m).

| | | Internal Use | Only | Filed: 2021-08-17 EB-2020-0290 J1.7 Attachment 1 Dags 1 of 20 |
|----------------|--------|--|--------|---|
| ERATION Report | | Commercially Sensitive | | |
| | Report | Document Number: NK38-REP-09701-10080 | Usage | Classification: |
| | | Sheet Number: N/A | Revisi | on: 00 |

© Ontario Power Generation Inc., 2012. This document has been produced and distributed for Ontario Power Generation Inc. purposes only. No part of this document may be reproduced, published, converted, or stored in any data retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording, or otherwise) without the prior written permission of Ontario Power Generation Inc.

Darlington Refurbishment: D₂O Management Strategy

NK38-REP-09701-10080-2012-09-10

Order Number: N/A Other Reference Number:

Internal Use Only **Commercially Sensitive**

Prepared by:

UNTARIO

OUTION Date

Reviewed by:

2012-10-

Frank Cox Operations Nuclear Refurbishment

2012-10-12

Date

Date

Ron Chatterton Operations Project Manager Nuclear Refurbishment

Alan Cornthwaite Operations Nuclear, Refurbishment

Reviewed by:

·u

Date

Thomas Wong Section Manager TRF Life Cycle and Projects **Darlington Nuclear**

Approved by:

| | | | | File | ed: 2021-08-17 EB-2020-0290 |
|-------------------|---|-----------------------------|-----------------------------------|-----------------|--------------------------------|
| | | | Internal Use C Commercially Se |)nly nsitive | Attachment 1 Page 2 of 20 |
| Report | | Document Number: NK38-RE | P-09701-10080 | Usage Classifie | ation: |
| | | Sheet Number: N/A | Revision Number: R000 | Page: 2 of | 19 |
| | IGTON REFURBISHMENT: D ₂ O MAN | NAGEMEN | STRATEGY | | |
| | Table o | f Contents | | | |
| | | | | | Page |
| 1.0 | EXECUTIVE SUMMARY | | | | 5 |
| 2.0 | INTRODUCTION | | | | 6 |
| 3.0 | TRITIUM REMOVAL FACILITY AND | HEAVY W | ATER MANAGEME | | RVIEW 6 |
| 4.0 | MOD AND PHT SYSTEM TRITIUM | ACTIVITIES | | | 8 |
| 5.0 | PROPOSED TRITIUM REDUCTION | PRIOR TO | REFURBISHMENT | | 10 |
| 6.0 | HEAVY WATER MANAGEMENT ST | ORAGE F | CILITY - WEST AN | INEX | 10 |
| 6.1 6.2 6.3 | Storage Capability D ₂ O Transfers to the West Annex West Annex Build and Commissionin |)g | | | 10 10 11 |
| 7.0 | MODERATOR | | | | 11 |
| 7.1 7.2 7.3 | Over Poisoned Guarantee Shutdown Moderator Flushing Volume: Moderator Purification | State (OPC | GSS) | | 11 12 12 |
| 8.0 | PRIMARY HEAT TRANSPORT | | | | 12 |
| 9.0 | REACTOR PHT AND MOD D ₂ O VO | LUMES: | | | 13 |
| 9.1 9.2 9.3 | Moderator Heat Transport PHT Maintenance Cooling (proposed | ł) | | | 13 13 13 |
| 10.0 | D₂O TRANSFERS – PRE, POST RE | FURBISHN | IENT: | | 14 |
| 11.0 | TRF AND HEAVY WATER MANAG | EMENT WC | RK PROGRAM PL | ANNING | 16 |

| | | | | Filed: 2021-08-17 EB-2020-0290 J1.7 Attachment 1 |
|--------------|---|-------------------------------|--------------------------|---|
| | | | Internal Use | Only Page 3 of 20 |
| Repor | t | Document Number: NK38-REP- | 09701-10080 | Usage Classification: |
| | | Sheet Number: | Revision Number: R000 | Page: 3 of 19 |
| | NGTON REFURBISHMENT: D ₂ O | MANAGEMENT S | TRATEGY | |
| 12.0 | CHEMISTRY AND ENVIRONME | NT | | |
| 12.1 12.2 | Chemistry Layup Environmental Protection | | | 17 17 |
| 13.0 | REFURBISHMENT UNIT SHUTI | DOWN DATES: | | 18 |
| 14.0 | OPEX | | | 18 |
| 15.0 | REFERENCES | | | 19 |

| | | | Filed: 2021-08-17 EB-2020-0290 J1.7 |
|---------------------------|----------------------|--------------------------------|---|
| Report | | Internal Use Commercially S | Only Attachment 1 Page 4 of 20 |
| | NK38-REP- | Usage Classification: | |
| | Sheet Number: N/A | Revision Number: R000 | Page: 4 of 19 |
| DARLINGTON REFURBISHMENT: | D2O MANAGEMENT S | TRATEGY | |

Revision Summary

| Revision Number | Date | Comments | | | |
|--------------------|------------|----------------|--|--|--|
| R000 | 2012-09-10 | Initial issue. | | | |

| | Fil | | | | |
|--------|--|--------------------------|-----------------------|--|--|
| | | | J1.7 Attachment 1 | | |
| | Internal Use Only Page 5 of 20 Commercially Sensitive | | | | |
| Report | Document Number: NK38-REP- | 09701-10080 | Usage Classification: | | |
| | Sheet Number: | Revision Number: R000 | Page: 5 of 19 | | |
| Title: | | | | | |

1.0 EXECUTIVE SUMMARY

Darlington will begin refurbishing its reactor units beginning with U2 in fall of 2016. Over the course of eight years, all four units will be refurbished.

Part of the refurbishment requires removal, and replacement, of all pressure and calandria tubes in the reactor core under a program titled Retube and Feeder Replacement (R&FR). This program will necessitate the draining of the Moderator (Mod) and Primary Heat Transport (PHT) systems in order to replace the tubes.

Mod and PHT D₂O will be transferred to the Darlington Tritium Removal Facility (DTRF) for storage in the new Heavy Water Management Building West Annex storage facility¹ (West Annex for short). Improvements to facilitate long term storage of unit D₂O is provided under Project Charter N-PCH-09701-10001 - Refurbishment, Operational Improvement & Long Term D₂O Storage (Project No: 16-31555).

Recommendations have been established to proceed with a storage facility capable of storing 2100 m³ of D_2O to meet:

- (a) Refurbishment
- (b) TRF operational improvements
- (c) Long term decommissioning.

Over the 8 year refurbishment period, D_2O transfers will require coordination between respective refurbishing units, operating units and managed D_2O sales/detritiation/upgrading.

Prior to refurbishment a tritium reduction program will be implemented to reduce unit tritium values to minimize environmental releases and to facilitate dose management.

Heavy Water Management is governed by N-PROG-AS-0008.

Heavy Water Programming D₂O Supply/Demand Plan and the 5 year Integrated Business Plan for OPG Detritiation Management detailed in N-REP-03800-10000.

Heavy Water Management Upkeep and Inventory Reporting detailed in D-INS-38000-10002

Due to the changing nature of the Refurbishment program and the TRF Life Cycle, this report will need future revision.

¹ NK38-REP-38000-10002 – Conceptual Design Report for the Heavy Water Management Building West Annex.

| | Filed: 202 | | | | |
|--------|--|--------------------------|-----------------------|--|--|
| | | EB-2020- | | | |
| | | | J1.7 | | |
| | | Internal Use | Only Attachment 1 | | |
| | C | ommercially S | ensitive Page 6 of 20 | | |
| Report | Document Number: NK38-REP-09701-10080 | | Usage Classification: | | |
| | Sheet Number: N/A | Revision Number: R000 | Page: 6 of 19 | | |
| Title: | | | | | |

2.0 INTRODUCTION

The purpose of this report is to provide an overview of the D₂O Management Strategy pre, during, and post refurbishment (refurb). The TRF supports this program as indicated in correspondence; Tritium Removal Facility – Darlington D₂O Refurbishment Strategy²

Approximately one year prior to refurb, a tritium reduction program will begin. Two hundred Mg's of stored D₂O will be cycled through the TRF to reduce the tritium concentration to a low level, expected to be < 5 Ci/kg. This low curie D₂O will then be stored for a bulk swap at the beginning of refurb. This program will support As Low As Reasonably Achievable (ALARA) minimizing environmental releases and allowing better dose management during refurb.

During the defueling process, additional PHT water will be required to make up for the voids created during the spent fuel removal. With all fuel removed, the PHT system will be drained and vacuum dried prior to system maintenance.

The Mod system will be maintained in a hot state (61° C) during the PHT drain and dry program. Once completed, the Mod will be drained, partially refilled with demineralised water, flushed, re-drained, and then air dried prior to system maintenance.

Both Mod and PHT D₂O will be transferred to the West Annex for storage in a clean state.

On completion of the unit refurb, the Mod will be refilled with low curie (<2 Ci/kg) D_2O , circulated via purification, and analyzed to ensure no contaminants are present which could affect reactivity.

With cleanliness confirmed, Gadolinium Nitrate and / or Boron will be added to establish the Over Poisoned Guaranteed Shutdown State (OPGSS) in preparation for new fuel load.

Once new fuel load has been completed, the PHT will be refilled with D_2O in preparation for unit restart.

3.0 TRITIUM REMOVAL FACILITY AND HEAVY WATER MANAGEMENT OVERVIEW³

The DTRF is an integral part of the site design and has a critical role in Heavy Water Management (HWM) at Darlington Nuclear² (DN). The importance of the DTRF to the continued operation of the DN generating units is highlighted by the following three factors:

² Reference – NK38-CORR-38000-0417633 – Memorandum – TRF – Refurbishment Strategy

³ Reference - NK38-REP-39000-10112 - Darlington Nuclear Tritium Removal Facility 2011 Annual Report

| | | Filed: 2021-08-17 EB-2020-0290 |
|--|--|---|
| | | J1.7 Attachment 1 |
| Internal Use Only Page 7 of 20 Commercially Sensitive | | |
| Document Number: NK38-REP | -09701-10080 | Usage Classification: |
| Sheet Number: | Revision Number: R000 | Page: 7 of 19 |
| | Document Number: NK38-REP Sheet Number: N/A | Internal Use C Commercially Se NK38-REP-09701-10080 Sheet Number: N/A R000 |

DARLINGTON REFURBISHMENT: D2O MANAGEMENT STRATEGY

- (a) The operating (OP&P) limits on the Mod and PHT system tritium activity levels at Darlington can only be maintained with the continued operation of the DTRF (in the absence of new virgin D₂O production capability)
- (b) DTRF product is the only long-term source of PHT system recovery makeup at DN since the site has only one upgrader for mixed (i.e. PHT and Mod) heavy water recoveries.
- (c) The DTRF is essential for the OPGN strategic goals of reducing tritium emissions and consequently contributing to reduction in occupational and public dose.

The DTRF reduces the tritium activity in both the Mod and PHT Systems.

PHT system activity is reduced by processing high activity Mod D₂O via the DTRF and returning the detritiated product to the PHT System.

Mod system activity is reduced by mixing the high activity Mod system recoveries with the lower activity PHT system recoveries. This mixing produces heavy water with an intermediate level activity that is returned to the Mod system after upgrading. Any DTRF product that is not used as PHT makeup is returned to the Mod system in order to maintain the mass balance. This strategy further reduces the Mod system activity.

The heavy water flows described here are illustrated on the simplified heavy water management diagram shown in Figure 2.1.⁴





⁴ Reference - NK38-REP-39000-10112

| | | | Fi | led: 2021-08-17 | | |
|--------|------------------------|----------------------------|---------------|-----------------|--|--|
| | | EB-202 | | | | |
| | | | | J1.7 | | |
| | | Internal Use Only Attachme | | | | |
| | Co | mmercially S | ensitive | Page 8 of 20 | | |
| Report | Document Number: Usage | | Usage Classif | ication: | | |
| | Sheet Number: N/A | Revision Number: R000 | Page: 8 of | 19 | | |
| Title: | | | - D | | | |

DARLINGTON REFURBISHMENT: D2O MANAGEMENT STRATEGY

4.0 MOD AND PHT SYSTEM TRITIUM ACTIVITIES

The Mod tritium activity for each unit (based on 2011 data) is shown in Figure 2.2⁵. The average unit Mod tritium activity remained relatively constant during 2011 at an average of 7.83 Ci/kg. The DTRF is essential for keeping the Mod tritium activity level below the OP&P limit of 15 Ci/kg. DN Mod tritium activities are expected to remain stable with continued DTRF operation till 2015. Reduction activities for refurb will begin in 2015, post SCO/VBO outage, to minimize environmental releases and personnel dose.

The DN PHT tritium activity of each unit is shown in Figure 2.3⁶. The DTRF is also essential for keeping the PHT tritium activity level below the OP&P operating limit of 1.2 Ci/kg. Heavy Water Management strategies are used to limit the increase in PHT tritium activity level during DTRF Outages. The average unit PHT tritium activity remained relatively constant at about 0.62 Ci/kg during 2011. This was below the DTRF local action limit of 0.75 Ci/kg and below the OP&P limit of 1.2 Ci/kg.

The DTRF local tritium action limits for the Moderator and PHT systems are tighter than the official site action limits of 12 Ci/kg and 1.0 Ci/kg respectively (as provided in Chemical Control OM - NK38-OM-09160). This provides further assurance that tritium levels will remain within the OP&P limit.





⁵ Reference - NK38-REP-39000-10112

⁶ Reference - NK38-REP-39000-10112

| | Filed: 2021-08-1 EB-2020-029 | | | |
|--------|--|--------------------------|-----------------------|--|
| | | | J1.7 Attachment 1 | |
| | Internal Use Only Page 9 of 20 Commercially Sensitive | | | |
| Report | Document Number: NK38-REP- | 09701-10080 | Usage Classification: | |
| | Sheet Number: | Revision Number: R000 | Page: 9 of 19 | |



Fig 2.3 – Darlington Unit PHT Activity Levels

Current (Sept 2012) tritium activity in the Unit PHT and Mod systems are listed in Table 1.

Table 1 (Ci/Kg)

| Unit | PHT | Mod |
|------|------|-------|
| 1 | 0.62 | 10.96 |
| 2 | 0.62 | 11.39 |
| 3 | 0.61 | 8.83 |
| 4 | 0.63 | 10.13 |

| | | | Filed: 2021-08-17 | | | |
|--------|----------------------|--------------------------|-----------------------|--|--|--|
| | | EB· | | | | |
| | | | J1.7 | | | |
| | | Internal Use (| Attachment 1 | | | |
| | Cor | nmercially Se | Page 10 of 20 | | | |
| | | minerenany oc | Insitive . | | | |
| Report | NK38-REP-09 | 701-10080 | Usage Classification: | | | |
| | Sheet Number: N/A | Revision Number: R000 | Page: 10 of 19 | | | |
| Title: | | | | | | |

5.0 PROPOSED TRITIUM REDUCTION PRIOR TO REFURBISHMENT

In order to reduce dose to those working on the DN refurb project and minimize tritium releases to the environment, a tritium reduction program will commence prior to the start of this work. This program will include a bulk transfers of 200 Mg's of unit high curie moderator D_2O to the TRF, and return 200 Mg's of reduced curie D_2O back to the unit. It is anticipated that this program will occur during the HT Drain and Dry phase, after defueling and PHT drying has been completed.

Tritium reduction in the Moderator, based on calculations, will achieve < 5 Ci/kg.

During the bulk swap phase, operating unit on-line transfers will be suspended.

6.0 HEAVY WATER MANAGEMENT STORAGE FACILITY - WEST ANNEX

6.1 Storage Capability

The new West Annex will provide storage capability for two units moderator drained (700m³), two units PHT drained including auxiliaries (800m³), reactor grade D_2O for TRF efficiency improvements (400m³), and any additional downgraded D_2O generated during refurb (200m³).

Storage will be provided in stainless steel tanks matched to system specifications. West Annex tank layout is provided in the Conceptual Design Report for Heavy Water Management Building West Annex⁷

6.2 D₂O Transfers to the West Annex

During refurb, Mod D_2O and PHT D_2O will be drained⁸ from the shutdown unit and transferred to the West Annex for storage. Once refurb is complete, D_2O will be transferred back to the unit.

This transfer program is recognized in the TRF and Heavy Water Management Yearly⁹, Five Year and Twenty Five Year plans to be issued late 2013. Sufficient float shall be built into the one year and five year plans to ensure success of the transfer program.

Transfers will take into account the requirement to place other priority work on hold until refurb drain, or refill is complete.

Emergency unit actions will override transfers. Once the situation has been resolved, transfers may continue.

⁷ NK38-REP-38000-10002 – Conceptual Design Report for the Heavy Water Management Building West Annex ⁸ NK38-OM-32100-4.9 – Moderator Draining

⁹ NK38-REP-39000-10112 – Darlington Nuclear Tritium Removal Facility 2011 Annual Report.

| | | | Filed: 2021-08-17 |
|--------|--------------------------------|--------------------------|-----------------------|
| | | | EB-2020-0290 |
| | | | J1.7 |
| | | | Attachment 1 |
| | | Internal Use O | nly Page 11 of 20 |
| | C | ommercially Ser | nsitive |
| Report | Document Number: NK38-REP-0 | 9701-10080 | Usage Classification: |
| | Sheet Number: N/A | Revision Number: R000 | Page: 11 of 19 |
| Title: | | | |

6.3 West Annex Build and Commissioning

The new D_2O storage facility Conceptual Design Report ¹⁰ is complete with a draft design overview provided in the report. As of Sept 2012, the Purchase Order has been issued to begin work on the West Annex design.

The execution of this work will be divided into 3 Phases. In order to ensure the earliest possible start, and to mitigate completion schedule risk, the phases overlap.

The contractual commitment of OPG under this release is to Phase 1 work only. The overall project schedule will be developed immediately following Phase 1 contract award. The work will be phased as below:

Phase 1,

Detailed Design.

Phase 2,

Site preparation and procurement of Long Lead materials. Site preparation includes activities such as demolition of existing truck dock and TRF trailers. With Environmental Assessment approval and completion of civil design packages, installation of caisson walls, start of excavation and miscellaneous civil substructure and relocation of existing buried services will begin in 2013.

The Environmental Assessment is expected to be completed by December 2012.

Phase 3

Completion of caisson wall installation and excavation, facility construction, tie-in to existing station services, commissioning and final close-out of project.

With the completion of the PO, and approval to build, a successful bidder will be chosen to build the new storage facility. Expected start date for West Annex new build is fall 2013 with an in-service date of spring 2015.

7.0 MODERATOR

7.1 Over Poisoned Guarantee Shutdown State (OPGSS)

Once shutdown, the refurb unit Mod will be placed in the OPGSS by over poisoning with gadolinium nitrate. When de-fuelling is complete, the mod poison will be removed by recirculation through the Mod Purification circuit. When the D_2O quality reaches values specified in Refurbishment Chemical Control: Main Moderator (NK38-OM-

¹⁰ NK38-REP-38000-10002 – Conceptual Design Report for the Heavy Water Management Building West Annex N-TMP-10010-R010 (Microsoft® 2007)

| | | | Fi | led: 2021-08-17 | |
|--------|----------------------|--------------------------|---------------|-----------------|--|
| | | EB-202 | | | |
| | | | | J1.7 | |
| | | Internal Use | Only | Attachment 1 | |
| | c | ommercially S | ensitive | Page 12 of 20 | |
| Report | Document Number: | 9701-10080 | Usage Classif | ication: | |
| | Sheet Number: N/A | Revision Number: R000 | Page: 12 c | of 19 | |
| Title: | | | | | |

09701-3.0), the D_2O is deemed clean and may be transferred to the West Annex for storage.

Pending availability of the transfer header, D_2O in the calandria may remain on recirculation until it is ready to be transferred to the West Annex.

On completion of refurbishment, clean D_2O , as specific in NK38-OM-09701-3.0, will be transferred back to the unit. Gadolinium nitrate and / or boron will be added to establish the OPGSS condition prior to new fuel load.

7.2 Moderator Flushing Volume:

It is expected that the Mod will not be drained until the entire reactor core has been defueled and PHT vacuum dried.

In order to reduce tritium on moderator components during refurb, a light water flush will be completed after the moderator drain. Demineralised light water will be used creating approximately 50 Mg of low isotopic, tritiated water.

7.3 Moderator Purification

Once all the gadolinium poison has been removed from the moderator water through purification, the spent resin must be slurried to spent resin storage (resin sitting in IX columns for extended periods will become compacted and difficult to slurry).

 D_2O entrained in the resin will be removed by the dedeuteration process, collected as downgraded D_2O , and then transferred to the TRF for upgrading. Dedeuteration of Mod and PHT resin will produce approximately 9 Mg's of downgraded D_2O .

Once the resin has been removed, the IX columns will be isolated, but not drained due to the difficulty in removing this D2O. The IX's will be refilled with fresh resin after refurb has been completed.

8.0 PRIMARY HEAT TRANSPORT

 D_2O will remain in the PHT system circuit until defueling has been completed. Once all the fuel has been removed from the reactor core, D_2O will be transferred to the West Annex for storage.

The PHT will then be vacuum dried to remove all remaining trapped D_2O . The Mod system will remain at a high temperature, approximately 61° C, to aid in drying the PHT system

Transferring PHT D_2O must meet specifications as listed in Refurbishment Chemical Control – Main Heat Transport (NK38-OM-09701-5.0) to ensure that system parameters such as lithium, dissolved D_2 , etc are in specification.

| | | | Filed: 2021-08-17 | | | |
|--------|--------------------------------|--------------------------|-----------------------|--|--|--|
| | | E | | | | |
| | | | J1.7 | | | |
| | | | Attachment 1 | | | |
| | | Internal Use Or | nly Page 13 of 20 | | | |
| | C | ommercially Sen | sitive | | | |
| Report | Document Number: NK38-REP-0 | 09701-10080 | Usage Classification: | | | |
| | Sheet Number: N/A | Revision Number: R000 | Page: 13 of 19 | | | |
| Title: | | | | | | |

On completion of refurbishment, and after fuel load has been completed, clean D₂O, as specified in NK38-OM-09701-5.0, will be transferred back to the PHT system.

9.0 REACTOR PHT AND MOD D₂O VOLUMES:

Each running reactor unit contains a specific volume of D₂O to provide reactor fuel cooling and moderation of the nuclear fission process.

As part of shutdown/drain procedure, and to assist with PHT drying, the Mod will remain at an expected temperature of 61° C. Once the PHT is dried, the Mod will be drained, and then flushed with demineralised water to further reduce the tritium contamination of internal components.

Due to the extensive collection of pipework in both the Moderator and PHT systems, after draining is complete, drying will remove any remaining D_2O . The PHT will be vacuum dried while the Mod will be air purge dried. It is not feasible to vacuum dry the Mod.

9.1 Moderator

For the moderator drain, flush, refill and commissioning activities the following inventory requirements are expected for a single unit:

Drain and refill inventory (includes auxiliaries) 350 m3

9.2 Heat Transport

For the PHT drain, refill and commissioning activities the following inventory requirements are expected for a single unit:

- Drain and refill inventory (includes SDC, PI&C, etc) 310 m³
- Due to the defueling process, an additional D₂O make-up inventory will need to be added to the PHT system to compensate for fuel bundles that have been removed¹¹ 39 m³ (approx)

Note: On restart, the PHT system will not include a D_2O flush as this activity has been removed from the Refurb Scope.

9.3 Shutdown Cooling Modification

Presently in scope as of Sept 2012, the Shutdown Cooling system will be modified to improved redundancy by adding additional pumps. This is expected to add one to two m^3 of PHT water to each unit inventory.

¹¹ NK38-REP-09701-10028 – 4.1 System Layup Technical Requirements – PHT System

| | | Filed: 2021-08- | | | |
|--------|--------------------------------|----------------------------|---------------|---------------|--|
| | | EB-2020-02 | | | |
| | 2 | | | J1.7 | |
| | | Internal Lise Only Attachm | | Attachment 1 | |
| | Co | ommercially S | ensitive | Page 14 of 20 | |
| Report | Document Number: NK38-REP-0 | 9701-10080 | Usage Classif | îcation: | |
| | Sheet Number: N/A | Revision Number: R000 | Page: | of 19 | |
| Title: | | | | | |

10.0 D₂O TRANSFERS – PRE, POST REFURBISHMENT:

During refurbishment, unit D_2O will be transferred to the West Annex, stored for the duration of refurbishment and returned back to the unit once refurbishment is completed. Transfer dates are impacted by station outages. Outage dates are provided in Table 2 below.

The transfer program for this D₂O movement is identified in Table 3.

Assumptions:

- (1) HT Drain and Dry will begin 84 days after unit shutdown (end of defueling)
- (2) HT Drain and Dry is expected to take 74 days
- (3) Mod Bulk Swap/Drain/Flush will occur during the last 15 days of the PHT Drain/Dry program
 - (i) Mod Bulk Swap expected to be the first 5 days
 - Mod Drain will occur at the end of the Bulk Swap. Five day window but expected to be shorter
 - (iii) Mod Flush will occur after the Mod Drain, 5 day window but expected to be shorter
- (4) PHT Refill expected to occur 5 months before unit turnover.

| TABLE 2 | 2 |
|---------|---|
|---------|---|

| Future Outage Dates | | | | |
|------------------------|--------------------|--------|----------------------------|--|
| TRF 09-2016 to 01-2017 | | Unit 1 | 24 Mar 2017 to 30 May 2017 | |
| | 02-2018 to 07-2018 | | 03 Dec 2021 to 20 Dec 2021 | |
| | 09-2019 to 01-2020 | | 02 Dec 2022 to 23 Dec 2022 | |
| | 02-2021 to 07-2021 | Unit 2 | 03 Jul 2020 to 24 Jul 2020 | |
| | 09-2022 to 01-2023 | | 02 Jul 2021 to 19 Jul 2021 | |
| | 02-2024 to 07-2024 | Unit 3 | 23 Mar 2018 to 29 May 2018 | |
| | | Unit 4 | 22 Mar 2019 to 30 May 2019 | |

| | | | Filed: 2021-08-17 EB-2020-0290 J1.7 | | |
|--------|--------------------------------|---------------------------------|---|--|--|
| | | | Attachment 1 | | |
| Report | | Internal Use Only Page 15 of 20 | | | |
| | C | Commercially Sensitive | | | |
| | Document Number: NK38-REP-0 | 9701-10080 | Usage Classification: | | |
| | Sheet Number: N/A | Revision Number: R000 | Page: 15 of 19 | | |
| Title: | | | | | |

TABLE 3

| U | nit Refu | ırbishm | ent Drai | in/Dry/E | Bulk Swap | o/Refill | Timelin | e (Estin | nate) |
|--------|------------------|-------------------------------|------------------------|----------------------|------------------|-----------------------------|------------|------------|------------------|
| Unit | Shutdown Date | PHT Drain and Dry Start | Mod Bulk Swap Start | Mod Bulk Swap End | Mod Drain End | PHT Drain and Dry End | Mod Refill | PHT Refill | Unit Turnover |
| 2 | 15-Oct-16 | 7-Jan-17 | 7-Mar-17 | 12-Mar-17 | 18-Mar-17 | 22-Mar-17 | 24-Feb-19 | 24-Jul-19 | 24-Dec-19 |
| | | | | Mod Drain Start | Mod Flush In | Mod Flush Out | | | |
| | | | | 12-Mar-17 | 18-Mar-17 | 22-Mar-17 | | | |
| Unit | Shutdown Date | PHT Drain and Dry Start | Mod Bulk Swap Start | Mod Bulk Swap End | Mod Drain End | PHT Drain and Dry End | Mod Refill | PHT Refill | Unit Turnover |
| 121-14 | 25-May-18 | 17-Aug-18 | 15-Oct-18 | 20-Oct-18 | 25-Oct-18 | 30-Oct-18 | 1-Aug-20 | 1-Jan-21 | 1-Jun-21 |
| | | | | Mod Drain Start | Mod Flush In | Mod Flush Out | | | |
| | | | | 20-Oct-18 | 25-Oct-18 | 30-Oct-18 | | | |
| Unit | Shutdown Date | PHT Drain and Dry Start | Mod Bulk Swap Start | Mod Bulk Swap End | Mod Drain End | PHT Drain and Dry End | Mod Refill | PHT Refill | Unit Turnover |
| 3 | 28-Jan-20 | 21-Apr-20 | 19-Jun-20 | 24-Jun-20 | 29-Jun-20 | 4-Jul-20 | 30-Jan-22 | 30-Jun-22 | 30-Nov-22 |
| | | | | Mod Drain Start | Mod Flush In | Mod Flush Out | | | |
| | | | | 24-Jun-20 | 29-Jun-20 | 4-Jul-20 | | | |
| Unit | Shutdown Date | PHT Drain and Dry Start | Mod Bulk Swap Start | Mod Bulk Swap End | Mod Drain End | PHT Drain and Dry End | Mod Refill | PHT Refill | Unit Turnover |
| 4 | 6-Jul-21 | 28-Sep-21 | 26-Nov-21 | 1-Dec-21 | 6-Dec-21 | 11-Dec-21 | 15-Apr-23 | 15-Sept-23 | 15-Feb-24 |
| | | | | Mod Drain Start | Mod Flush In | Mod Flush Out |] | | |
| | | | | 1-Dec-21 | 6-Dec-21 | 11-Dec-21 | | | |

| | | | Fi | led: 2021-08-17 | |
|--------|---------------------------------|--|---------------|-----------------------|--|
| | | | | EB-2020-0290 | |
| | | | | J1.7 | |
| | | Internal Use | Only | Attachment 1 | |
| Report | Co | mmercially S | ensitive | Page 16 of 20 | |
| | Document Number: NK38-REP-09 | Document Number: NK38-REP-09701-10080 | | Usage Classification: | |
| | Sheet Number: N/A | Revision Number: R000 | Page: 16 (| of 19 | |
| Title: | | | | | |

11.0 TRF AND HEAVY WATER MANAGEMENT WORK PROGRAM PLANNING

The TRF and Heavy Water work programs are defined in their Yearly, Five Year¹² and Twenty Five year plans.

This planning process is critical to the success of refurbishment both for storage of unit D_2O and for the necessary reduction in unit tritium levels to minimize releases to the environment and to support dose reduction efforts. Long term plans are being developed to support these programs and will be reflected in future reports.

Issues of concern for work programs include:

- Transfers to, and from running units
- Transfers into the TRF from outside contracts
- Availability of TDO and transport packages
- TRF maintenance outages, planned maintenance on TRF loading bay equipment (cranes and radioactive material transfers) and unplanned events

Information on future TRF outages over the next five years is provided in Table 4. Information on TRF Feed assumptions for the next five years is provided in Table 5.

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|----------------------------------|------|-----------------------------|------------------------------|------|--------------------------|---------------------------|
| Outage Start Date: | N/A | January 20 th | August 22 nd | N/A | February 8 th | September 2 nd |
| Outage End Date: | N/A | June 20 th | December 24 th | N/A | July 3 rd | December 5 th |
| Outage Duration (Days): | N/A | 152 Gas Outage | 125 CRS Outage | N/A | 145 Gas Outage | 95 CRS Outage |
| Available for Service (Days): | 365 | 213 | 240 | 365 | 220 | 270 |

 Table 4

 TRF Outages Assumptions – Start/Finish Time Line

¹² HW Programming D₂O Supply/Demand Plan (N-REP-03800-10000)

| | | | Filed: 2021-08-17 EB-2020-0290 J1.7 <u>Attachment 1</u> | | | |
|--------|--------------------------------|---|--|--|--|--|
| Report | c | Internal Use Only Page 17 of 20 Commercially Sensitive | | | | |
| | Document Number: NK38-REP-0 | Document Number: Usage Cla | | | | |
| | Sheet Number: N/A | Revision Number: R000 | Page: 17 of 19 | | | |
| Title: | | | | | | |

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|----------------------------------|-------|-------|-------|-------|-------|-------|
| Operating Time (Months) | 12 | 7 | 8 | 12 | 7 | 9 |
| Operating Time (Days) | 365 | 213 | 240 | 365 | 220 | 270 |
| Feed Rate (Kgs/Hr) | 400 | 400 | 400 | 400 | 400 | 400 |
| Availability Factor (%): | 85% | 85% | 85% | 85% | 85% | 85% |
| TRF Production (Mgs) | 2,978 | 1,738 | 1,958 | 2,978 | 1,795 | 2,203 |
| TRF Production 5 Year Average | 2,264 | 2,132 | 2,098 | 2,244 | 2,207 | 2,135 |

Table 5 TRF Feed Assumptions

12.0 CHEMISTRY AND ENVIRONMENT

12.1 Chemistry Layup

During the refurb process, D_2O will be transferred in a clean state from the reactor to the West Annex, where it will be stored for a period of up to three years. During this time period, regular sampling will occur to ensure no change in water quality.

Sampling will occur monthly to confirm D₂O specifications remain within the limits provided in NK38-OM-09701, Refurbishment - Chemical Control.

If conditions of the D₂O change unexpectedly, actions will be taken to return the water quality back to its original stored condition.

12.2 Environmental Protection

In order to monitor and reduce tritium releases to the environment:

(a) A 200 Mg bulk swap will take place during the HT drain and dry program. This will be a proactive opportunity to reduce the bulk moderator tritium concentration in anticipation of potential tritium releases to the vault.

| | | | F | Filed: 2021-08-17 EB-2020-0290 | |
|--------|--------------------------------|--|------------|-----------------------------------|--|
| | | | | J1.7 | |
| Report | C | Internal Use Only Attachment Commercially Sensitive | | | |
| | Document Number: NK38-REP-0 | Document Number: NK38-REP-09701-10080 | | Usage Classification: | |
| | Sheet Number: N/A | Revision Number: R000 | Page 18 | of 19 | |
| Title: | | | | | |

(b) A tritium in ground water monitoring program has been established. Through the development of onsite wells, monitoring of station ground water will take place to trend tritium levels around the station during refurbishment.

13.0 REFURBISHMENT UNIT SHUTDOWN DATES:

Based on the present (June 2012) approved refurbishment timeline, the expected shutdown of Darlington units will occur in the rotation – Unit 2, Unit 1, Unit 3, and Unit 4.

- Unit 2 will begin refurb in October 2016, with return to service in December 2019
- Unit 1 will begin refurb in May 2018, with return to service in June 2021
- Unit 3 will begin refurb in January 2020, with return to service in November 2022
- Unit 4 will begin refurb in July 2021, with return to service in February 2024

14.0 OPEX

There are significant advantages to reducing the PHT and Moderator Tritium source terms from both environmental emissions to air and water, and from a worker safety perspective.

Point Lepreau showed significant increases in tritium emission to the atmosphere at the start of their refurbishment. Wolsong detritiated to 0.25 and 0.14 Ci/kg for Moderator and PHT respectively and actually reduced their emissions.

Based on original thought, Mod D_2O would be transferred to the West Annex in a poisoned state. OPEX from Bruce and Pt. Lepreau refurb has reshaped this idea and it is now understood that D_2O can be transferred out of the reactor core for storage in a clean state. In this condition, there should be no need to chemically adjust the water during the storage period.

Once refurbishment is completed, D₂O will be returned back to the calandria in the same condition as it was removed.

| | | | Filed: 2021-08-17 EB-2020-0290 J1.7 Attachment 1 | | | |
|--------|--------------------------------|---|---|--|--|--|
| Report | c | Internal Use Only Page 19 of 20 Commercially Sensitive | | | | |
| | Document Number: NK38-REP-0 | Document Number: Usar NK38-REP-09701-10080 | | | | |
| | Sheet Number: N/A | Revision Number: R000 | Page: 19 of 19 | | | |
| Title | | | | | | |

15.0 REFERENCES

- [R-1] D-INS-38000-10002-R000 Heavy Water Management Upkeep and Inventory Reporting
- [R-2] NK38-OM-09701 Refurbishment – Chemical Control
- [R-3] NK38-REP-09701-10029-R000 System Lay-Up Technical Requirement – Moderator
- [R-4] NK38-REP-09701-10028-R000 System Lay-Up Technical Requirement – Primary Heat Transport System
- [R-5] NK38-REP-03800-10000-R006 Ontario Power Generation Nuclear - Heavy Water Supply and Demand Year End 2009
- [R-6] NK38-REP-38000-10002-R000 Conceptual Design Report for the Heavy Water Management Building West Annex
- [R-7] NK38-REP-39000-10077-R000 Darlington Nuclear Tritium Removal Facility 2010 Annual Report
- [R-8] N-PCH-09071-10001-R00 Refurbishment, Operational Improvement & Long Term D₂O Storage.
- [R-9] N-PROG-AS-0008-R002 Heavy Water Management.

Filed: 2021-08-17 EB-2020-0290 J1.7 Attachment 1 Page 20 of 20

Filed 2021-08-16 EB-2020-0290 J1.7 Attachment 2 Page 1 of 1

3 <u>Undertaking</u>

4 5

1

2

TO PROVIDE DURATIONS THAT STORAGE IS BEING USED DURING EACH OF THE TRANSFERS FROM EACH OF THE UNITS 1, 2, 3, AND 4

6 7 8

9

<u>Response</u>

10 The 125 m³ of storage in the Downgraded D2O System and the 75 m³ of storage in 11 the D2O Cleanup System are necessary to complete the processes of upgrading (i.e., 12 removing light water from the heavy water) and clean-up (i.e., removal of impurities) of 13 downgraded water flushed from the moderator systems of Units 3, 1 and 4 while the 14 units are undergoing refurbishment. The primary purpose of these tanks is not long-15 term storage of downgraded/upgraded water during unit refurbishment outages, but instead the facilitation of the above processes which are necessary steps in OPG's 16 17 heavy water management plan.

18

19 OPG is not able to define set storage durations of downgraded water in the 20 Downgraded D2O tanks and the heavy water awaiting cleanup in the D2O Cleanup 21 tanks. This is because the TRF undertakes these activities (upgrading and cleanup) 22 depending on process availability and need in order to have reactor grade heavy water 23 available for purposes of satisfying the needs of the Ontario nuclear fleet. These 24 activities are influenced by several interdependent variables, which can change from 25 one refurbishment outage to the next. For example, the active TRF cycle (and the necessity and duration to store heavy water in the 200 m³ of Downgraded and Cleanup 26 27 tanks) is dependent on the timing of TRF outages, the amount of downgraded water 28 generated by operating units that requires upgrading, and the schedule and volume of 29 heavy water shipments from Bruce Power. The duration of storage in these tanks also depends on other heavy water management activities ongoing at Darlington, 30 31 equipment performance and the various types of impurities that are contained in the 32 heavy water drained during refurbishment.

33

34 Moderator drain during the Unit 2 refurbishment was also processed for upgrading and 35 clean-up. As explained in Ex. D2-2-10, Attachment 5, OPG temporarily reconfigured 36 the HWMB to create adequate storage space for this water. Piping connections between the HWMB storage tanks and the TRF allowed for the processing to occur 37 38 and where necessary, water was drummed to keep separate the various grades of 39 water until it was returned to reactor grade. With the D2O Storage Project facility available for Unit 3, OPG was able to flush the Unit 3 moderator with a large volume 40 41 (approximately 130 m3) of demineralized water following the moderator drain, which avoided the need to use low curie heavy water to detritiate the moderator system. This 42 approach was employed to lower the amount of radioactivity in the moderator thereby 43 44 reducing refurbishment staff dose levels and lowering emissions.

2 3 **Undertaking**

4

1

5 TO CONFIRM WHETHER THE PLAN THAT MANAGES MODERATOR CURIE LEVELS CALLS FOR DETRITIATION OF UNIT 3 MODERATOR DRAIN DURING 6

- 7 THE REFURBISHMENT WINDOW
- 8
- 9

Response 10

- 11
- Confirmed. The TRF has overall responsibility to ensure that the requisite quantity of 12
- detritiated moderator heavy water is available when the Unit 3 moderator is ready to 13 14 be refilled.

2 3 <u>Undertaking</u>

TO DETERMINE WHETHER THE 2004 STUDY REFERRED TO IN EXHIBIT L-D2-

- 6 02-AMPCO 87 EXISTS, AND IF IT EXISTS, TO PROVIDE IT
- 7 8

1

4 5

9 Response

10

11 While OPG cannot be certain, given the passage of time, OPG believes that the study

- being referred to is the one already filed at Ex. L-D2-02-AMPCO-131, Attachment 1. In
- 13 any event, Ex. L-D2-02-AMPCO-131, Attachments 1-4 are the four Kinectrics reports
- 14 addressing the TRF life cycle that were roughly contemporaneous with the December
- 15 2004 Kinectrics report found at Ex. L-D2-02-AMPCO-087, Attachment 1, p. 12.

1 2

3 **Undertaking**

4

5 TO DETERMINE IF WHAT WAS INCLUDED IN THE 5,000 METRES OF PIPE THAT 6 WAS SPECIFIED IN THAT EARLIER BUSINESS CASE AND WHETHER THAT WAS 7 THE ENTIRE AMOUNT OF PIPING IN THE FACILITY, OR A SUBSET OF PIPING; IF 8 IN THIS UNDERTAKING OPG DETERMINES THAT THE 5,000 WAS A SUBSET OF 9 PIPING, OPG WILL PROVIDE THAT SAME SUBSET IN THE FINAL BUILD

10 11

12 **Response**

The 2018 Superseding Release Execution BCS at Ex. D2-2-10, Attachment 2q, p. 3,
states: "The actual design requires over 5km of piping (including all relocates, process
and non-process piping)..." This is a reference to all piping in the facility, not a subset
of piping.

18

The statement in OPG's pre-filed evidence at Ex. D2-2-10, p. 85, line 11, regarding "…installation of almost 10,000 m of piping." is similarly a reference to all piping installed in the facility and accurately reflects the total amount of piping (9,616 m as stated in the Bill of Quantities at Ex. J3.6, Attachment 1, p. A-1).

23

The length of piping in the facility did not in fact increase by almost 5km between 2018 and 2020. For example, the 2015 Superseding Release Execution BCS also referred to "over 5km of piping" (Ex. D2-2-10, Attachment 2p, p. 3). In both BCSs, the sentence is included in the section setting out major contributors to cost variances and is used to exemplify the growth in material requirements as a result of design evolution.

2 3 <u>Undertaking</u>

> TO EXPLAIN THE DELTA BETWEEN THE 161 MILLION FORECAST BUDGET AND THE BUSINESS CASE ESTIMATE OF 110 MILLION, BOTH IN MAY 2013

6 7 8

1

4 5

9 **Response**

10

The delta is the result of a typographical error in the report to OPG's Board of Directors dated August 15, 2014 at Ex. L-D2-02-SEC-090, Attachment 1. The report erroneously says May 2013 instead of May 2014. As corrected, the sentence in question would read: "The current estimate at completion is approximately \$375 Million, an increase of \$214 Million from the amount forecast in May <u>2014</u>" (emphasis added).

16

17 For certainty, the D2O Storage Project estimate at completion in May 2013 was \$110M,

18 per Ex. D2-2-10, Attachment 20, p. 2.

3 <u>Undertaking</u>

TO PROVIDE THE COSTS TO OPG OF DEWATERING THE D2O FACILITY SITE; TO INCLUDE WHAT, IF ANYTHING, WAS INCLUDED IN THE INITIAL BLACK & MCDONALD BUSINESS CASE

7 8

6

1

2

4 5

9

10 <u>Response</u> 11

12 The total cost of dewatering on the D2O Storage Project was \$8.9M.

Black & McDonald's ("B&M") estimate submitted in response to the 2012 competitive
procurement for the D2O Storage Project, which is the basis for the initial 2012 Full
Release Definition BCS at Ex. D2-2-10, Attachment 2m, included construction costs
but did not break-out associated dewatering costs. In accordance with B&M's proposal,
they committed to designing and developing a dewatering strategy and plan during
construction and execution in accordance with OPG requirements.

As Mr. Reiner explained, early studies indicated that dewatering would be needed when excavating below approximately 2m, however, what was not and could not have been known was the volume of water that would actually enter the site during excavation and the associated dewatering challenges and cost increases (Tr. Vol. 2, pp. 137-138). Examples of this were provided in OPG's evidence (Ex. D2-2-10, pp. 54-56 and 72).

2 3 <u>Undertaking</u>

4

1

5 TO CONFIRM ANY ANALYSIS THAT WAS DONE WITH RESPECT TO THE 6 FEASIBILITY OF LARGER TANKS VERSUS SMALLER TANKS IN TERMS OF 7 MANUFACTURING AND SHIPPING AND INSTALLING THOSE TANKS AT THE D2O 8 FACILITY

8 9

10 **Response**

11

OPG did not evaluate tanks larger than 100m³ for the D2O Storage Project. The Project
Charter (Ex. D2-2-10, Attachment 2b, p. 10) states that the design of the D2O Storage
Project should be "similar to the existing D20 Supply and Inventory system in order to
take advantage of the previous design work." It goes on to specify:

16

For consistency most of the tanks should be the same size as the ones used in the existing D20 storage (Ref [7] and [8]). Some of them should be divided in two or four (or four smaller tanks should be used) in order to give further operational flexibility in the storage, handling and transferring of different grades of heavy water to and from reactor units, TRF, Upgrader, etc. (Ref [3]). (Ex. D2-2-10, Attachment 2b, p.10).

24

The largest sized heavy water storage tanks in use in the Heavy Water Management Building and throughout the Darlington site are 100m³ (Ex. L-D2-02-AMPCO-131, Attachment 6, pp. 55-56).

28

The use of larger tanks would reduce operational flexibility and introduce risk. For example, use of single large tank would eliminate redundancy and reduce OPG's ability to separately manage various grades of heavy water in response to changing conditions.

33

As detailed in OPG's evidence (Ex. D2-2-10, p. 21), 100 m³ tanks are very large, specialized equipment:

36

37 The D2O storage tanks were constructed in Cambridge, Ontario. 38 They were shipped to the project individually via specialized low level float trailers resting in wooden bunks. Once all the tanks were 39 received, they were lifted into the basement using cranes. Because 40 41 of their size (each of the nineteen 100 m³ tanks has a diameter of 42 about 3.8 m and a height of approximately 11 m, which is taller than 43 a typical three-story building), it was necessary to place the tanks in 44 the seismic dike prior to completing the ground level floor slab.

1

A picture of a fully assembled 100 m^3 tank being lowered into the seismic dike can be seen at Ex. D2-2-10, p. 84.

4

5 In addition, as Mr. Reiner explained, larger sized tanks could not have been shipped 6 fully assembled. They would have required assembly within the seismic dike, which 7 would have required on-site welding thereby significantly increasing construction 8 complexity and quality assurance when compared to using fully assembled 9 prefabricated tanks supplied by a tank manufacturer (Tr. Vol. 2, p. 73).

3 <u>Undertaking</u> 4

WITH REFERENCE TO D2-02-SEC-094, TO PROVIDE A SPREADSHEET CLARIFYING THE FIGURES IN THE BUSINESS CASE SUMMARIES

6 7 8

5

1

2

9 **Response**

10

See Chart 1 for information regarding the net present value ("NPV") figures in the D2O Storage Project business case summaries at Ex. D2-2-10, Attachments 2m – 2q. OPG was unable to locate the NPV calculations for the 2006 Developmental Release BCS for the operational improvement project (Ex. D2-2-10, Attachment 2k) or for the 2011 Draft Developmental BCS (Ex. D2-2-10, Attachment 2l) that was not approved.

16

17

18

Chart 1: D2O Storage Project BCS and NPV Data

| BCS | NPV | NPV and Assumptions | NPV Analysis | Notes |
|--|---------|--|---------------|-------|
| 2012 Full Release Definition BCS | N/A | N/A | N/A | 1 |
| 2012 Partial Release Execution BCS | ¢67.1M | Exhibit D2-2-10, Attachments | Attachment 1 | 2, 3 |
| 2013 Full Release Execution BCS | φ07.ΠVI | 18 | | |
| 2015 Superseding Release Execution BCS | \$73M | Exhibit D2-2-10, Attachment 2p, pp. 10, 21 | Attachment 2* | |
| 2018 Superseding Release Execution BCS | N/A | N/A | N/A | 4 |

* This Attachment is marked commercially sensitive but OPG has determined it is non-confidential in its
 entirety.

21 22

Notes:

- As stated in Ex. D2-2-10, Attachment 2m, p. 8, per OPG's Type 3 business case form,
 OPG did not calculate the NPV at the time of the 2012 Full Release Definition BCS
 because there was no feasible alternative that would meet the needs of refurbishment,
 TRF operational improvements, and TRF life extension, and therefore no financial
 evaluation of alternatives was completed.
- 28 29

30

31

32 33

34

35

- 2. The NPV stated in Ex. D2-2-10, Attachments 2n, p. 7 and 2o, p. 10 are for the Heavy Water Management Operational Improvements scope of work. The NPV for the refurbishment scope is included in the overall Darlington Refurbishment Program ("DRP") NPV because the D2O Storage Project is a DRP Facilities and Infrastructure Project that is mandatory to support core scope in order to execute and achieve the benefits of the DRP.
- The 2012 Partial Release Execution BCS and the 2013 Full Release Execution BCS
 show the same NPV of \$67.1M, the derivation of which is shown in Attachment 1. OPG
 did not re-calculate the NPV when completing the 2013 Full Release Execution

Release BCS because the project estimate was only approximately \$2M greater than
 the previous project estimate and there would not have been a material change in the
 NPV.

5

6

7

8

9

10

- 4. As stated in Ex. D2-2-10, Attachment 2q, p. 5, OPG did not calculate the NPV in the 2018 Superseding Release Execution BCS because the alternative options analysis and NPV calculations were completed in the previous 2015 Superseding Release Execution BCS where all options were based on the completion of the facility and would have similar impacts to NPV.
- 11 Attachments 1 and 2 are provided in Excel format on RESS titled as 'OPG_J2.07_Attachment 12 1' and 'OPG_J2.07_Attachment 2' respectively.
UNDERTAKING J2.8

1 2

3 <u>Undertaking</u>

4

5 TO PROVIDE THE 2020 TO 2026 PERIOD, WHICH IS REDACTED IN THE MAIN 6 EVIDENCE, LOOKING AT THE HEAVY WATER PROCESSING REVENUE 7 SPECIFICALLY SPLIT OUT INTO TOTAL VOLUMES PER YEAR AND THE VOLUMES SPLIT OUT BETWEEN WHAT WOULD BE REGULAR VOLUMES AND 8 9 INCREMENTAL VOLUMES ASSOCIATED WITH THE HEAVY WATER STORAGE FACILITY BEING IN OPERATION, AND THEN WITH RESPECT TO THE SEC IR. 10 THE INFORMATION AND CALCULATIONS UNDERPINNING THE ALLOCATION OF 11 12 COSTS TO THE PRICE THAT BRUCE PAYS AND THE PRICE THAT BRUCE PAYS 13 FOR ALL OF IT

- 14
- 15

16 **Response**

17

18 The Bruce Power ("Bruce") heavy water processing volumes and its usage ratio for the 2020 19 to 2026 period are set out in Chart 1 below. Because of the interdependent nature of the 20 systems, it is not possible to break out the portion of the heavy water revenue (and the 21 corresponding volume) that is attributable solely to the incremental processing volume 22 associated with the D2O Storage Project. As Mr. Reiner stated, the incremental TRF 23 processing volume associated with the D2O Storage Project is a result of the removal of the 24 bottleneck on TRF operations and this incremental processing volume enables OPG to more 25 efficiently use the TRF to meet its existing operational needs and obligations to process Bruce 26 heavy water (Tr. Vol. 2, p. 19). The heavy water processing revenue forecast considers the 27 overall impact of all of these competing factors (e.g., TRF operation and performance, 28 obligations to process Bruce heavy water and OPG operational needs).

- 29
- 30

Chart 1: Bruce Power Heavy Water Processing Volumes and Usage Ratio

| | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
|------------------|------|------|------|------|------|------|------|
| Bruce Heavy | | | | | | | |
| Water Processing | | | | | | | |
| Volume (Mgs) | | | | | | | |
| TRF Processing | | | | | | | |
| Ratio (% Usage) | | | | | | | |

31 * The value in 2020 reflects actual volume and usage and the remaining years are forecasted figures.

32

2

As noted in Ex. L-D2-02-SEC-091, OPG recovers a portion of capital costs for the D2O Storage

Project through a unit rate that Bruce pays for heavy water processing based on a forecast of the heavy water processing volumes and costs. The unit rate calculation includes a true-up mechanism that adjusts for any over or under recovery in the previous period based on actual usage and costs.

37 38

To determine the portion of the D2O Storage Project cost that Bruce pays, a percentage of the facility's cost is first assigned to heavy water management services based on a review of the facility's use. That percentage, **beau**, results in **beau** of the total D2O Storage Project capital cost being attributed to heavy water management services (i.e. **beau** of \$509.3M = **beau**). The **beau** is then straight line depreciated over the period to 2055 and a return on capital is applied on the undepreciated asset balance. Together, this results in an average capital recovery amount of approximately **beau** per year over the 2022-2026 period, which is then allocated to Bruce based on the relative usage of heavy water processing service using

7 the percentages in Chart 1 above.

UNDERTAKING J3.1

2 3 <u>Undertaking</u>

TO PROVIDE THE AVERAGE LABOUR RATE THAT WAS EXPERIENCED IN THE D20 PROJECT, INCLUDING CONTRACTORS

6 7 8

1

4 5

9 <u>Response</u>

10

Based on 2019 rates, the average labour rate on the D2O Storage Project was \$71. This figure is the simple average of the rates for the various trades that worked on the project, which include: Pipefitters, Boilermakers, Electricians (EPSCA and CUSW), Labourers and Carpenters. As the relative use of these trades varied over the year, this figure is an approximation for the actual labour rate experienced on the project in 2019.

UNDERTAKING J3.2

3 **Undertaking**

TO PROVIDE THE CALCULATION OF THE D2O PROJECT IMPACT ON REVENUE REQUIREMENTS FOR 2022 TO 2026 AS PROPOSED IN THE APPLICATION, INCLUDING WITH 50 PERCENT OVERRUN

- 8 9 **Response**
- 10 11

12

1

2

4 5

6

7

2022-2026 Revenue Requirement Impact Requested in this Proceeding

The impact of the D2O Storage Project on the 2022-2026 nuclear revenue
requirements as proposed totals \$197.3M, as follows: 2022 – \$41.2M, 2023 – \$40.0M,
2024 – \$39.5M, 2025 – \$38.7M, 2026 – \$37.9M, and is shown in attached Table 1.
The impact is calculated on the total project in-service additions of \$509.3M, including
the \$14.6M addition that was previously approved for inclusion in the rate base.¹

18

The cost of capital component of the above impacts (Table 1, line 3) reflects the capital structure per the OEB-approved settlement proposal and is subject to the prevailing return on equity rate specified by the OEB as of the effective date of the final payment amounts order in this proceeding.

23

24 The overall income tax component of the above impacts (Table 1, line 10) is nil due to 25 the forecasted cumulative regulatory tax loss position over the period (Ex. O, Draft 26 Payment Amounts Order, App. A, Tables 17-21, line 25 and Table 22). The regulatory taxable income associated with the project (Table 1, line 8) therefore forms part of the 27 28 tax loss carry forward amount for future rate terms (Ex. O, Draft Payment Amounts 29 Order, App. A, Tables 17a-21a, Note 7). There is no capital cost allowance ("CCA") under the accelerated investment property program ("enhanced CCA") related to the 30 31 project during the 2022-2026 period.

32

33 2022-2026 Revenue Requirement Impact Assuming a \$200M Project 34 Disallowance

35

OPG has undertaken the calculation of an illustrative \$200M disallowance for the sole purpose of responding to the undertaking request, using the figure provided in the transcript (Tr. Vol. 3, p. 23, line 20). OPG does not agree that this figure is either representative of a "50 percent overrun" or an appropriate disallowance.

40

Assuming a \$200M project disallowance that would reduce the in-service additions
 reflected in the nuclear revenue requirements to \$309.3M, OPG calculates the 2022-

¹ Ex. D2-2-10, p. 1, Note 1.

1 2026 revenue requirement impact to be \$118.1M, as follows: 2022 - \$24.7M, 2023 -2 \$24.0M, 2024 - \$23.6M, 2025 - \$23.2M, 2026 - \$22.6M, and is shown in attached 3 Table 2. This would represent a reduction of \$79.2M to the requested amounts above, 4 as follows: 2022 - \$16.5M, 2023 - \$16.0M, 2024 - \$15.9M, 2025 - \$15.5M, 2026 -5 \$15.3M. These impacts are calculated by adjusting the most recent in-service additions 6 by the assumed disallowance. 7

8 Due to the forecasted regulatory tax loss position, there would no impact on the income 9 tax expense included in the 2022-2026 revenue requirements, with the regulatory tax 10 losses carried forward at the end of the period increasing by \$15.8M (Table 1, line 9, 11 col. (f) less Table 2, line 9, col. (f)).

12

13

Revenue Requirement Impact Recorded in Capacity Refurbishment Variance 14 Account and Impact Thereon of a \$200M Project Disallowance

15

16 In EB-2016-0152, OPG removed forecasted in-service additions for the D2O Storage 17 Project totaling \$365.9M from the requested 2017-2021 nuclear revenue requirements. 18 as explained in Ex. J3.03. However, as noted in Ex. D2-2-10, p. 13, note 10, the income 19 tax impacts of the CCA deductions associated with the forecasted project expenditures 20 over the 2017-2021 period were not removed from the EB-2016-0152 application. 21 These expenditures continued to form part of the overall forecasted Darlington 22 Refurbishment Project ("DRP") amounts, for which CCA deductions are claimed under 23 the "long-term project" and "rolling start" rules that result in deductions being realized 24 beginning prior to the amounts being declared in service.²

25

26 The revenue requirement impact of the D2O Storage Project in-service additions 27 totaling \$494.7M (i.e., the difference between the total in-service additions of \$509.3M 28 and the previously approved \$14.6M) is being recorded in the Capacity Refurbishment 29 Variance Account ("CRVA"), as of the dates various portions of the project were placed into service. As OPG did not remove a forecast of the CCA impacts associated with 30 31 the project from the EB-2016-0152 revenue requirements, the CRVA also captures the 32 variance in the project CCA from those forecasts.

33

34 In this application, OPG has sought to clear the year-end 2019 CRVA balance related 35 to the D2O Storage Project ("D2O balance") of \$58.1M debit (Ex. H1-1-1, Table 1b, 36 line 24, col. (f)), with the underpinning account entries for each of the years 2016-2019 37 set out in Ex. H1-1-1, Table 16. As noted at Ex. H1-1-1, Table 16, Note 3, these amounts exclude any CCA variance for the project, which is instead included with all 38 39 other DRP CCA variances as part of the CRVA. The enhanced CCA portion of the 40 variance is captured with all other DRP enhanced CCA amounts at Ex. H1-1-1, Table 41 1b, line 23,³ which are being cleared in this proceeding. The non-enhanced CCA

² Ex. F4-2-1, p. 4, lines 25-30.

³ As further detailed at Ex. L-H1-01-Staff-330.

1 portion of the variance is included with all other DRP amounts ("DRP excluding D2O

2 balance") at Ex. H1-1-1, Table 1b, line 21, which are not being cleared in this

3 application.

4

5 A disallowance of \$200M as assumed above would reduce the year-end 2019 CRVA

D2O balance recoverable in this application by \$2.8M to \$55.3M, including associated
 interest on the account. The revised recoverable account additions are calculated in

8 attached Table 3, in the format of Ex. H1-1-1, Table 16. The disallowance would also

9 reduce the year-end 2019 CRVA DRP enhanced CCA balance refundable in this

10 application by \$1.0M to \$18.2M, including associated interest on the account.⁴

⁴ The ultimate impact of the disallowance on non-enhanced CCA for the 2017-2021 period would be captured as an adjustment to the CRVA DRP excluding D2O balance, to be cleared in a subsequent proceeding.

| Line | | | 2022 | 2023 | 2024 | 2025 | 2026 | |
|------|--|------|--------|--------|--------|--------|--------|---------|
| No. | Category | Note | Plan | Plan | Plan | Plan | Plan | Total |
| | | | (a) | (b) | (c) | (d) | (e) | (f) |
| | | | | | | | | |
| 1 | Rate Base (Ex. B3-1-1, Table 2, lines 3 and 11) | | 455.9 | 441.0 | 426.0 | 411.0 | 396.1 | |
| | | | | | | | | |
| 2 | Weighted Average Cost of Capital | 1 | 5.75% | 5.68% | 5.75% | 5.78% | 5.78% | |
| 3 | Cost of Capital (line 1 x line 2) | | 26.2 | 25.1 | 24.5 | 23.7 | 22.9 | 122.4 |
| | | | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | |
| 4 | Depreciation (Ex. F4-1-1, Table 2, line 3) | | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | /4.8 |
| | Regulatory Taxable Income | | | | | | | |
| 5 | ROE (line 1 x 45% x 8.34%) | | 17.1 | 16.5 | 16.0 | 15.4 | 14.9 | 79.9 |
| 6 | Depreciation (line 4) | | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 74.8 |
| 7 | CCA | | (24.7) | (22.7) | (20.9) | (19.3) | (17.7) | (105.3) |
| 8 | Net Increase (Decrease) in Regulatory Taxable Income Before Tax Loss Carry-Over | | 7.4 | 8.8 | 10.0 | 11.1 | 12.1 | 49.4 |
| 9 | Tax Loss Carry-Over/ (Applied) | | (7.4) | (8.8) | (10.0) | (11.1) | (12.1) | (49.4) |
| 10 | Regulatory Taxable Income After Tax Loss Carry-Over | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | | | | | | | | |
| 11 | Income Tax Rate | | 25.0% | 25.0% | 25.0% | 25.0% | 25.0% | 25.0% |
| 12 | Income Tax Impact (line 10 x line 11) | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | | | | | | | | |
| 13 | Total Revenue Requirement Impact (line 3 + line 4 + line 12) | | 41.2 | 40.0 | 39.5 | 38.7 | 37.9 | 197.3 |

 Table 1

 Revenue Requirements Impact for D2O Storage Project for 2022-2026 (\$M)

Notes:

1 Weighted Average Cost of Capital is calculated as ((55% debt x debt cost rate)+(45% equity x ROE rate)) based on the capital structure outlined in Ex. O, Draft Payment Amounts Order, App. A, Tables 11-15, line 4, cols. (b) and (c), line 5b, col (b) and line 5a, col (c). The final WACC will be subject to the prevailing return on equity rate specified by the OEB as of the effective date of the final payment amounts order.

| Line | | | 2022 | 2023 | 2024 | 2025 | 2026 | |
|------|--|------|--------|--------|--------|--------|--------|-------|
| No. | Category | Note | Plan | Plan | Plan | Plan | Plan | Total |
| | | | (a) | (b) | (c) | (d) | (e) | (f) |
| | | | 070.0 | 004.0 | 050.0 | 0.40.7 | 004.0 | |
| 1 | Rate Base | 1 | 270.9 | 261.8 | 252.8 | 243.7 | 234.6 | |
| 2 | Weighted Average Cost of Capital | 2 | 5.75% | 5.68% | 5.75% | 5.78% | 5.78% | |
| 3 | Cost of Capital (line 1 x line 2) | | 15.6 | 14.9 | 14.5 | 14.1 | 13.6 | 72.6 |
| 4 | Depreciation | 1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 45.5 |
| | Regulatory Taxable Income Impacts | | | | | | | |
| 5 | ROE (line 1 x 45% x 8.34%) | | 10.2 | 9.8 | 9.5 | 9.1 | 8.8 | 47.4 |
| 6 | Depreciation (line 4) | | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 45.5 |
| 7 | CCA | | (11.9) | (13.3) | (12.3) | (11.3) | (10.4) | (59.3 |
| 8 | Net Increase (Decrease) in Regulatory Taxable Income Before Tax Loss Carry-Over | | 7.3 | 5.6 | 6.2 | 6.9 | 7.5 | 33.6 |
| 9 | Tax Loss Carry-Over/ (Applied) | | (7.3) | (5.6) | (6.2) | (6.9) | (7.5) | (33.6 |
| 10 | Regulatory Taxable Income After Tax Loss Carry-Over | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 11 | Income Tax Rate | | 25.0% | 25.0% | 25.0% | 25.0% | 25.0% | 25.0% |
| 12 | Income Tax Impact (line 10 x line 11) | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 13 | Total Revenue Requirement Impact (line 3 + line 4 + line 12) | | 24.7 | 24.0 | 23.6 | 23.2 | 22.6 | 118.1 |

Table 2

Revenue Requirements Impact of D2O Storage Project for 2022-2026 Assuming \$200M Project Disallowance (\$M)

Notes:

1 The details of the rate base and depreciation figures are as follows:

| Line No. | Prescribed Facility Category | 2019 Actual | 2020 Plan | 2021 Plan | 2022 Plan | 2023 Plan | 2024 Plan | 2025 Plan | 2026 Plan |
|-------------|---|----------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 1a | Gross Plant Opening Balance (2019: Ex. B3-3-1, Table 1, line 27, col. (a)) | 174.6 | 309.3 | 309.3 | 309.3 | 309.3 | 309.3 | 309.3 | 309.3 |
| 2a | In-Service additions (Ex. B3-3-1, Table 1, col. (b), lines 27, 35, 43, and Table 2. col. (b), lines 3, 11, 19, 27, 35) | 320.9 | 13.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3a | Assumed disallowance of \$200M applied to most recent in-service additions | (186.2) | (13.8) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4a | Gross Plant Closing Balance (line 1a + 2a + 3a) | 309.3 | 309.3 | 309.3 | 309.3 | 309.3 | 309.3 | 309.3 | 309.3 |
| 5a | Gross Plant Rate Base Amount (line 1a + 4a)/2 # | 185.9 | 309.3 | 309.3 | 309.3 | 309.3 | 309.3 | 309.3 | 309.3 |
| | | | | | | | | | |
| 6a | Accumulated Depreciation and Amortization Opening Balance | 10.6 | 15.7 | 24.8 | 33.9 | 43.0 | 52.1 | 61.1 | 70.2 |
| 7a | Depreciation and Amortization (Ex. B3-4-1, Table 1, col. (b), line 27, Table 2, col. (b) and col. (c), lines 3, 11, 19, 27, 35, and Table 3, col. (b) and col. (c), lines 3 and 11) | 5.6 | 14.8 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 |
| 8a | Depreciation and Amortization Adjustment on \$200M Assumed Disallowance | (0.5) | (5.7) | (5.9) | (5.9) | (5.9) | (5.9) | (5.9) | (5.9) |
| 9a | Accumulated Depreciation and Amortization Closing Balance (line 6a + 7a + 8a) | 15.7 | 24.8 | 33.9 | 43.0 | 52.1 | 61.1 | 70.2 | 79.3 |
| 10a | Accumulated Depreciation and Amortization Rate Base Amount (line 6a + line 9a)/2 | 13.1 | 20.2 | 29.3 | 38.4 | 47.5 | 56.6 | 65.7 | 74.8 |
| | | | | | | | | | |
| 11a | Net Plant Rate Base Amount (line 5a - line 10a) | 172 7 | 289.1 | 280.0 | 270.9 | 261.8 | 252.8 | 243 7 | 234.6 |

*Per Ex. B3-3-1, Table 1a, Note 1, the 2019 in-service addition is weighted by one month as part of the 2019 gross plant rate base amount.

2 Weighted Average Cost of Capital (WACC) is calculated as ((55% debt x debt cost rate)+(45% equity x ROE rate)) based on the capital structure outlined in Ex. O, Draft Payment Amounts Order, Appendix A, Tables 11-15, line 4, cols. (b) and (c), line 5b, col. (b) and line 5a, col (c). The final WACC will be subject to the prevailing return on equity rate specified by the OEB as of the effective date of the final payment amounts order.

Table 3 Capacity Refurbishment Variance Account - Nuclear - D2O Storage and Drum Handling Facility Project Illustrative Summary of Account Transactions - 2016, 2017, 2018 and 2019 Assuming \$200M Project Disallowance (\$M)

| Line | | | Actual | Actual | Actual | (b) + (c) Actual | Actual | Actual | Total |
|------|---|------|--------|----------------|----------------|---------------------|--------|--------|-----------|
| No. | Particulars | Note | 2016 | Jan - May 2017 | Jun - Dec 2017 | 2017 | 2018 | 2019 | 2016-2019 |
| | | | (a) | (b) | (c) | (d) | (e) | (f) | (f) |
| | Capital Addition to Variance Account: | | | | | | | | |
| 1 | Forecast Cost of Capital Amount | 1 | 0.7 | 0.3 | 0.5 | | 0.9 | 0.8 | |
| | | | | | | | | | |
| 2 | Actual Net Plant Rate Base Amount | 2 | 13.9 | 171.3 | 171.3 | | 166.5 | 172.7 | |
| 3 | Weighted Average Cost of Capital | | 6.85% | 6.85% | 6.65% | | 6.50% | 6.46% | |
| 4 | Actual Cost of Capital Amount | | 1.0 | 4.9 | 6.6 | 11.5 | 10.8 | 11.2 | |
| 5 | Cost of Capital Variance (line 4 - line 1) | | 0.3 | 4.6 | 6.1 | 10.7 | 10.0 | 10.3 | |
| | | | | | | | | | |
| 6 | Forecast Depreciation | 1 | 0.6 | 0.2 | 0.2 | 0.4 | 0.4 | 0.4 | |
| 7 | Actual Depreciation | 2 | 0.4 | 2.0 | 2.8 | 4.8 | 4.8 | 5.2 | |
| 8 | Depreciation Variance (line 7 - line 6) | | (0.2) | 1.8 | 2.6 | 4.4 | 4.4 | 4.8 | |
| | | | | | | | | | |
| 9 | Net (Decrease) Increase in Regulatory Taxable Income | | (0.0) | 4.6 | 6.2 | 10.8 | 10.5 | 11.1 | |
| 10 | Income Tax Rate | | 25.00% | 25.00% | 25.00% | 25.00% | 25.00% | 25.00% | |
| 11 | Income Tax Impact (line 9 x line 10 / (1 - line 10)) | | (0.0) | 1.5 | 2.0 | 3.5 | 3.5 | 3.7 | |
| | | | | | | | | | |
| 12 | Total Capital Additon to Variance Account - Nuclear (line 5 + 8 + 11) | 3 | 0.1 | 7.9 | 10.7 | 18.6 | 17.9 | 18.8 | 55.3 |

Notes:

1 For cols. (a) to (f) the forecast amounts are determinded as follows:

Table to Note 1 - D2O Storage Project Forecast Capital Amounts - EB-2013-0321 and EB-2016-0152 (\$M)

| | | | | ((a)+(b)) / 2 | | | | | | |
|------|---|-------|-------------|---------------|-----------------------------|----------|----------|--------------|-------------|-------|
| Line | | 2014 | 2015 | Reference | 2016 (ogual to col. (c)) | (d)/12*5 | (g)/12*7 | EB-2016-0152 | 2019 | 2010 |
| NU. | | 2014 | 2013 (b) | Annount | (equal to col. (c)) | (a) | /f) | (g) | 2010 (b) | (i) |
| 4. | Exercise the transferred by the Base Assessed # | (a) | (0) | (0) | (u) | (e) | (1) | (9) | (1) | (1) |
| la | Forecast Net Plant Rate Base Amount " | 0.0 | 20.3 | | | | | 13.7 | 13.3 | 12.9 |
| 2a | Weighted Average Cost of Capital ** | 6.86% | 6.85% | | | | | 6.65% | 6.50% | 6.46% |
| 3a | Cost of Capital Forecast Amount (line 1a x line 2a) | 0.0 | 1.4 | 0.7 | 0.7 | 0.3 | 0.5 | 0.9 | 0.9 | 0.8 |
| | | | | | | | | | | |
| 4a | ROE Component of Cost of Capital Amount | 0.0 | 0.8 | 0.4 | 0.4 | 0.2 | 0.3 | 0.5 | 0.5 | 0.5 |
| | | | | | | | | | | |
| 5a | Depreciation | 0.0 | 1.1 | 0.6 | 0.6 | 0.2 | 0.2 | 0.4 | 0.4 | 0.4 |

* Col. (b) from EB-2013-0321, Ex. L-4.9-1 Staff-048, p. 2, Chart 1 (as referred to in EB-2016-0152, Ex. L-2.2 Staff-009) Cols. (g) to (i) as reflected in the EB-2016-0152 Payment Amounts Order.

** Cols. (a) and (b) from EB-2013-0321 Payment Amounts Order, App. A. Table 6b, col. (c), line 6. Cols. (g), (h) and (i) from EB-2016-0152 Payment Amounts Order, App. A, Tables 11-13, cols. (c), line 6.

2 Per EB-2016-0152, Ex. L-2.2 Staff-009, actual 2015 rate base of \$14.3M and depreciation of \$0.4M results in 2016 rate base of \$13.9M. Rate base amount for 2017-18 is the net of Ex. B3-3-1 table 1 col. (f) line 11 and 19, and Ex. B3-4-1 table 1 col. (e) line 11 and 19. For 2019, refer to attached Table 2, Note 1: line 11a for rate base and line 7a plus 8a for depreciation.

3 CCA is included with overall DRP and Capacity Refurbishment Variance - Nuclear - Accelerated Investment Incentive CCA-DRP balance.

UNDERTAKING J3.3

1 2

3 **Undertaking**

OPG TO IDENTIFY THE DOLLAR AMOUNTS ASSOCIATED WITH THE D2O
PROJECT THAT WAS REMOVED FROM OPG'S EB-2016-0152 APPLICATION
WHEN OPG FILED THE N2 IMPACT STATEMENT, SPECIFICALLY TO VALIDATE
THE \$365.9 MILLION IN 2017 INDICATED IN THE DECISION AND RECONCILE IT
WITH THE \$381 MILLION

- 10
- 11

12 <u>Response</u>13

OPG confirms that the \$365.9M in-service addition to the D2O Storage Project forecast
in 2017 (EB-2016-0152, Decision and Order, p. 32, Table 12, line 2) was removed from
the EB-2016-0152 application when the N2 Impact Statement was filed (EB-20160152, Ex. N2-1-1, p. 4, Chart 2, lines 1 and 2).

18

Forecast depreciation of \$6.9M in 2017 and \$10.7M in 2018-2021 (EB-2016-0152,
Decision and Order, p. 85, Table 26, line 3) related to the above in-service addition
and was also removed through the N2 Impact Statement (EB-2016-0152, Ex. N2-1-1,
p. 4, Chart 2, line 5).

23

The estimated total project cost at the time in 2017, based on the full release from the 25 2015 Superseding Release Execution BCS was \$381.1M (Ex. D2-2-10, Attachment 26 2p). The difference between the \$365.9M in-service addition removed from the EB-27 2016-0152 application and this \$381.1M amount comprises: 1) \$14.6M capital amount 28 that had already been approved for inclusion in rate base and formed part of the 29 nuclear rate base approved in EB-2016-0152, and 2) \$0.7M in OM&A removal costs 30 incurred in 2013 (Ex. D2-2-10, Footnote 1).

31

There were no changes to nuclear liabilities or associated asset retirement costs ("ARC") in the EB-2016-0152 application from removing the above in-service addition. The change in the ARC amortization shown in the EB-2016-0152 Decision and Order at p. 85, Table 26, line 2 stemmed from updates made to reflect projected changes in nuclear liabilities and associated ARC arising from the 2017-2021 ONFA Reference Plan (EB-2016-0152, Ex. N1-1-1) and did not pertain to the D2O Storage Project.

UNDERTAKING J3.4

3 <u>Undertaking</u>

TO UPDATE THE REPORT WITH CORRECTED NUMBERS

7 **Response**

9 The following response was prepared by Bates White:

10

1

2

4 5

6

8

The Bates White document at Attachment 1, "Construction Cost Estimate for the Darlington Nuclear Generating Station D2O Storage Project," dated August 16, 2021, represents an update to the original report of that title, dated December 16, 2020, to correct an error identified in oral testimony delivered by Bates White on August 6, 2021. The analysis was not changed and all references to tables and pages are identical between the original and updated documents.

17

The original Bates White report inadvertently contained 12 lines of preliminary cost 18 19 data calculations related to BOQ item 33-05, Yard Drainage Temporary Provision (civil) 20 on p. D-47. Those lines of data and the calculations should have been removed before 21 the report was submitted. While correcting p. D-47 to remove the provisional cost data, 22 the sub-title of the section was updated from "Dewatering (based on actuals)" to "Soil 23 Management and Dewatering (based on actuals)." to more accurately reflect the items listed. In addition, the "Design and Fabrication" line was modified to read "Design and 24 25 Fabrication (F1)" to define it more precisely. Neither of these labelling changes had 26 an impact on the costs.

27

28 The presence of preliminary cost data resulted in an additional \$5.6 million being included in the overnight cost estimate. Bates White corrected this error by reducing 29 the total overnight cost for BOQ Section B 33 from \$30.2 million, as reported in Exhibit 30 31 D2-2-11, Attachment 3 ("Bates White Report"), pages 67 and 113, which correspond 32 to pages D-1 and D-47 in the native-format report), to \$24.6 million. Consequently, the total overnight cost for BOQ Section B was reduced from \$94.2 million (Bates White 33 34 report, p. D-1) to \$88.6 million, a reduction of \$5.6 million. In turn, the original overall 35 estimate of overnight costs was reduced from \$377.2 million (see Bates White Report. 36 p. 19, Table 6) to \$371.6 million. This sum comprised both the EPC contractor's direct 37 costs and fees associated with performing all construction activities as if those activities 38 were accomplished in late 2019.

39

Bates White then re-ran its cost model with the revised overnight cost estimate as an
input. The model extracted the fee portion of the overnight cost estimate and recorded
those costs in a separate cost category of fee and contingency. (The contingency
amount was estimated separately and then added to the fee amount.) This is discussed
in Section VI.A.2 of the Bates White Report, at p. 20.

- 1 2 Bates White then de-escalated those 2019 cost estimates to reflect the nominal dollar 3 values in the year(s) those costs were expected to be expended. The resulting de-4 escalated direct costs without fee and contingency were reduced from \$307.7 million 5 (Bates White Report, Tables 1, 5, and 18) to \$303.3 million, a reduction of \$4.4 million. 6 Fees and contingency costs fell from \$47.2 million (Bates White Report, Tables 1, 5, 7 and 18) to \$46.6 million, a reduction of \$0.6 million, based on the slightly lower direct 8 cost values
- 9

10 The slightly lower direct cost affected two other cost categories: owner's cost less 11 financing, and financing costs. The owner's costs were reduced from \$35.4 million 12 (Bates White report, Tables 1, 5, and 18) to \$35.3 million, as the Bates White estimate 13 for a management reserve was lowered by \$0.1 million. The financing costs were 14 reduced from \$46.1 million (Bates White report, Tables 1, 5, and 18) to \$45.6 million, 15 a reduction of \$0.5 million, as fewer dollars had to be financed.

16

17 Overall, the Bates White total cost estimate was reduced from \$517.7 million (Bates White Report, Tables 1, 5, and 18) to \$512.1 million, a reduction of 5.6 million. 18

19

22

26

27

28

29

20 Bates White notes in passing that these changes were described correctly in oral 21 testimony. (Tr. Vol. 3, pp. 54-55)

23 Bates White has taken the opportunity to clean-up three minor errors in the updated 24 report. None of these affected the cost estimate or the accompanying analyses: 25

- 1. Table 19—In the process of updating the table to reflect the reduction in direct costs, it was determined that the table contained other minor transcription errors. The table has been updated to reflect the correct information. This affected neither the cost estimate nor the conclusions drawn from the table.
- 30 31

32

34

35

2. Appendix D, p. D-137, D 06 03 Pipe Supports—In the process of printing the backup sheets to BOQ Section D, the value \$132.88 was inadvertently omitted 33 from the right-hand column. This affected the total shown for this section in the Bates White Report, but not the total in the model itself and therefore did not have an impact on the cost estimate.

36 37 3. Appendix D, p. D-171, F 03 02 Temporary foam fire suppression connection-38 In the process of printing the backup sheets to BOQ Section F, the values in the 39 top row did not sum properly. The actual sum should have been \$2,963.48. Making this correction, the total is revised from \$39,771.70 to \$41,720.20, an 40 41 increase of \$1.948.50. As stated, this was done in the course of printing the 42 Excel file, rather than in the model itself, and therefore did not have an impact on the cost estimate. 43

Construction Cost Estimate for the Darlington Nuclear Generating Station D2O Storage Project

Bates White Economic Consulting

August 16, 2021 Revised



Table of Contents

| I. Executive Summary | 5 |
|---|----|
| II. Disclaimers and Limitations | 7 |
| III. Team | 7 |
| IV. Going-In Assumptions | 8 |
| IV.A. Project Scope of D2O Storage Project Construction Cost Estimate | 8 |
| IV.B. State of Knowledge | 8 |
| IV.C. Construction Timeline | 9 |
| IV.D. Commissioning and Close-Out | 9 |
| IV.E. Spend Profiles | 9 |
| IV.F. Financing | 10 |
| IV.G. Class-Level Designation of Estimate | 10 |
| IV.H. Summary | 11 |
| V. Methodology and approach | 12 |
| V.A. Overview of Estimating Approach | 12 |
| V.B. Step 1: EPC Direct Costs Excluding Contingency and Fee | 12 |
| V.C. Step 2: EPC Contingency and Fee | 13 |
| V.D. Step 3: EPC Indirect and Commissioning Support Costs | 13 |
| V.E. Step 4: Owner's Cost Excluding Financing | 13 |
| V.F. Step 5: Financing Costs | 14 |
| V.G. Price Deflators | 14 |
| VI. Construction Cost Estimate | 14 |
| VI.A. EPC Contractor's Direct Costs | 16 |
| VI.A.1. Step 1: Direct Costs of Construction without Contingency or Fee | 16 |
| VI.A.2. Step 2: Contingency and Fee | 20 |
| VI.A.3. Spend Plan for the EPC Direct Project Cost | 21 |
| VIB Step 3: EPC Indirect Costs, Commissioning Support and Close-Out Costs | 22 |
| VI B 1 Indirect Costs | |
| | |
| VI.B.2. EPC's Commissioning and Close-out Costs | |
| VLC. Step 4: Owner's Cost. Excluding Financing | 24 |
| VI.D. Step 5: Financing Cost | |
| VI.D.1. Probability Distribution of Financing Cost | |
| · · · · · · · · · · · · · · · · · · · | |
| VI.D.2. Spend Plan and Annual Financing Cost | |
| VI.E. Summary of Costs | 29 |
| VII. Corroborating Analyses | 29 |
| VII.A. Consistency with EMWG and EIA Data | 29 |
| VII.B. Lang Factor Analysis | 30 |
| VII.C. Comparables | 32 |

Tables

| Table 1: Estimated Construction Costs (Dollars in Millions) | 6 |
|---|----|
| Table 2: End-of-Year Financing Rates | 10 |
| Table 3: Cost Estimate Classification System for the Building and General Construction Industries | 11 |
| Table 4: Deflator Factors, 2013 to 2019 | 14 |
| Table 5: D2O Storage Project Construction Cost Estimate (Dollars in Millions) | 15 |
| Table 6: EPC Overnight Direct Costs (Dollars in Millions). | 19 |
| Table 7: EPC Direct Costs (Dollars in Millions) | 19 |
| Table 8: Construction Materials and Equipment (Dollars in Millions) | 21 |
| Table 9: Construction Labour Spend Profile (Dollars in Millions) | 22 |
| Table 10: Process Systems Materials Spend Profile (Dollars in Millions) | 22 |
| Table 11: Process Systems Labour Spend Profile (Dollars in Millions) | 22 |
| Table 12: Spend Plan for the EPC Indirect Cost (Dollars in Millions) | 24 |
| Table 13: EPC Contractor Commissioning Support Costs (Dollars in Millions) | 24 |
| Table 14: Owner's Costs excluding Financing (Dollars in Millions) | 25 |
| Table 15: Owner's Cost Spend Profile (Dollars in Millions) | 27 |
| Table 16: Annual Project Financing Interest Rates, 2012 through 2019 | 27 |
| Table 17: Estimated Spend Plan and Financing Cost (Dollars in Millions) | |
| Table 18: D2O Storage Project Construction Cost Estimate (Dollars in Millions), 2013-2019 | 29 |
| Table 19: Corroboration of Cost Breakdown (Percent of Direct Costs) | 30 |
| Table 20: D2O Storage Project Information | 32 |
| Table 21: Estimated Cost of D2O Storage Project Based on SWPF | 32 |
| Table 22: Estimated Cost of D2O Based on IWTU | 33 |

Figures

| Figure 1: Probability Distribution of Total Cost of Construction, including Financing Cost | 6 |
|--|----|
| Figure 2: Steps in Developing the Construction Cost Estimate. | 12 |
| Figure 3: Probability Distribution of Estimated Total Cost of the D2O Storage Project | 15 |
| Figure 4: Probability Distribution of EPC Direct Cost without Fee or Contingency | 20 |
| Figure 5: Probability Distribution of Estimated EPC Direct Cost with Contingency and Fee | |
| Figure 6: Probability Distribution of EPC Contractor's Indirect Cost | 23 |
| Figure 7: Probability Distribution of Owner's Cost Less Commissioning, Close-Out and Financing | |
| Figure 8: Probability Distribution of Owner's Cost of Commissioning and Close-Out | |
| Figure 9: Probability Distribution of Financing Cost | |
| Figure 10: Lang Factor: Total Installed Cost (TOT) to Equipment Cost, fluid process plants, n=58 | 31 |
| | |

Appendices

| Appendix A. Team Members | A-1 |
|--|-----|
| Appendix B. Information Considered and Relied Upon | B-1 |
| Appendix C. Adjustments to Direct Costs | C-1 |
| Appendix D. Backup Detail on Overnight Direct Costs | D-1 |
| Appendix E. Backup Detail on EPC Contractor's Indirect Costs | E-1 |
| Appendix F. Backup Detail on EPC and Owner's Commissioning and Close-Out Costs | F-1 |
| Appendix G. Backup Detail on Owner's Cost Excluding Commissioning and Close-Out Cost and Financing | G-1 |
| Appendix H. Backup Detail on Financing Cost | H-1 |
| Appendix I. Backup Detail on Comparables Analyses | I-1 |

Tables in Appendices

| Table C-1: Historical Foreign Exchange Rates, CAD/USD | C-1 |
|--|------------|
| Table C-2: Construction Cost Price Indexes for the Toronto Area | C-2 |
| Table C-3: Cost Escalation Factors | C-2 |
| Table C-4 Conversion of US Currency Values to Canadian Currency Values | C-3 |
| Table C-5: Cost Differentials betw. Nuclear and Nonnuclear Materials | C-4 |
| Table C-6: Differentials betw. Nuclear-Related Installation Hrs. and RSMeans-Presumed Installation H | rsC-5 |
| Table C-7: Differentials betw. Non-Nuclear-Related Installation Hrs. and RSMeans-Presumed Installat | ion HrsC-5 |
| Table C-8 Cost Data for Various Sizes and Types of Pipe Fixtures | C-8 |
| Table C-9: Nuclear Grade Stainless Steel, Weighted Average Adjustment Factors | C-9 |
| Table C-10: List of Directly Procured Items | C-10 |
| Table C-11: RSMeans Data Used in Predicting the Cost of 35 MPa Concrete | C-12 |
| Table C-12: Quantities in kg and meters, BOQ Section B, 5.01 | C-13 |
| Table D-1: BOQ Section B – Architectural/Structural (Civil) | D-1 |
| Table D-2: BOQ Section C – Process Systems Tie-in | D-48 |
| Table D-3: BOQ Section D – Process Systems | D-58 |
| Table D-4: BOQ Section E – Process Support Systems | D-148 |
| Table D-5: BOQ Section F – Building Support Systems Tie-in | D-165 |
| Table D-6: BOQ Section G – Building Support Systems | D-172 |
| Table D-7: BOQ Section H - Electrical | D-196 |
| Table E-1: EPC Civil Engineering Spend Profile Details | E-2 |
| Table E-2: EPC Electrical Engineering Spend Profile Details | E-5 |
| Table E-3: EPC Engineering Support Spend Profile Details | E-8 |
| Table E-4: EPC Mechanical Engineering Spend Profile Details | E-14 |
| Table E-5: EPC Nuclear Mechanical Engineering Spend Profile Details | E-18 |
| Table E-6: EPC Nuclear Structural Engineering Spend Profile Details | E-24 |
| Table E-7: EPC Procurement Spend Profile Details | E-27 |
| Table E-8: EPC Project Management Spend Profile Details | E-33 |
| Table F-1: EPC Contractor's Commissioning Support Cost | F-2 |
| Table F-2: EPC Commissioning Support Spend Profile Details | F-3 |
| Table F-3: Owner's Commissioning and Close-Out Costs | F-4 |
| Table F-4: Owner's Commissioning and Close-Out Cost Spend Profile Details | F-4 |
| Table G-1: Owner's Costs Spend Profile Details | G-2 |
| Table H-1: Development of Financing Costs (Dollars Million) | H-1 |
| Table I-1: SWPF Project Details | I-1 |
| Table I-2: IVV I U Project Details | I-2 |

Figures in Appendices

| Figure F-1: Probability Distribution of EPC Contractor's Commissioning Support Cost | F-2 |
|---|-----|
| Figure F-2: Probability Distribution of Owner's Commissioning and Close-Out Cost | F-4 |

I. EXECUTIVE SUMMARY

Bates White was retained to prepare an estimate of the cost to construct the Heavy Water Storage and Drum Handling Facility ("D2O Storage Project") at OPG's Darlington Nuclear Generating Station. The D2O Storage Project supplies heavy water storage, integrates with the Heavy Water Management Building and Tritium Removal Facility ("TRF"), enables the removal and storage of heavy water from the Darlington units during refurbishment, facilitates the long-term renewal of the TRF, and provides a long-term solution for management of heavy water during normal operations. The need for heavy water management improvements was recognized in 2007 and, upon approval of the Darlington Refurbishment Program ("DRP"), the requirements for operational and DRP storage were integrated into a single project to achieve economies of scale and reduce overall project costs.

This report presents our cost estimate for the engineering design, procurement, construction, and commissioning of the D2O Storage Project, as it would have been calculated before construction began. The cost estimate assumes what might be called "perfect knowledge" with respect to project scope, design requirements, and actual site conditions encountered. The estimate comprises the cost to pay a construction contractor to engineer, procure, and construct ("EPC") the D2O Storage Project, and OPG's in-house cost ("owner's cost") for contract administration, procurement support, and engineering oversight and approval through project turnover, commissioning, and contract close-out, but does not include any costs associated with post-commissioning operations and maintenance ("O&M").

The construction timeline is consistent with the assumed perfect knowledge.¹ The construction timeline includes an allowance for typical delays but no unusually long gaps. Thus, our estimate does not represent an ideal or least-cost perfect build; our probabilistic analysis explicitly reflects typical variability in labour productivity, weather, the need for modest rework, and other factors. The estimated construction cost captures the reality of a build that is located within the exclusion zone of an operating nuclear facility, on a constricted and previously contaminated building site, subject to water ingress and dewatering requirements resulting from the location on the north shore of Lake Ontario, and in a region subject to weather extremes, particularly in winter, and is appropriately regarded as a "first-of-a-kind" ("FOAK") project.

Our estimate is summarized in Table 1. The estimated total cost of the project, from project inception to project turnover, commissioning, and close-out is **\$512.1 million**. This total cost, which represents our mean or maximum-likelihood estimate, comprises the contractor's cost to engineer, procure, and construct the facility; owner's cost to manage the contract, oversee the engineering and construction effort, and commission the facility; and owner's cost for financing and closing out the construction project. We believe our estimate is accurate within 15% above and 10% below the mean (expected) cost.

The distribution of costs, configured as a probability density function reflecting the accuracy criterion, is represented in Figure 1.² In this figure, we also identify a one-sided, 90% confidence interval of potential costs within the estimated distribution. This **"P90" cost** (*i.e.*, the cost at which there is a 90% probability that it will not be exceeded) **is \$559.4 million**.

This report represents a revision to the original report, dated December 16, 2020, to address an error identified by Bates White in oral testimony before the Ontario Energy Board on August 6, 2021. It corrects an error in the calculation of the overnight direct costs related to dewatering and soil management on p. D-47 in Appendix D of our December 2020 report, and as explained in response to Undertaking J3.4. The correction is flowed through the results. No changes were made to the methodology or approach.

¹ The timeline begins with preliminary project work in 2012, continues through a six-year construction period that begins in January 2013 and is completed in December 2018, and is followed by a four-month commissioning process.

² The probability distribution functions shown throughout this report are log-normal in functional form, reflecting the *right-skewed* nature (+15% and - 10%) of our accuracy criterion. Use of log-normal probability distribution functions is standard practice in the field of construction cost estimation. *See, e.g.,* Kurt Heinze, *Cost Management of Capital Projects* (New York, Marcel Dekker, Inc., 1996); Kenneth K. Humphreys, *Jelen's Cost and Optimization Engineering,* 3rd ed. (New York, McGraw-Hill, Inc., 1991); and Kenneth K. Humphreys, ed. *Project and Cost Engineers' Handbook,* 4th ed. (New York, Marcel Dekker, 2005).

Table 1: Estimated Construction Costs (Dollars in Millions)³

| | Cost |
|--|---------|
| EPC contractor costs | |
| Direct costs w/o fee and contingency | \$303.3 |
| Fee and contingency | \$46.6 |
| Direct costs with fee and contingency | \$349.9 |
| Indirect costs | \$69.9 |
| EPC commissioning support | \$4.5 |
| EPC contractor total project cost | \$424.3 |
| Owner's costs | |
| Owner's cost less financing, commissioning and close-out | \$35.3 |
| Owner's commissioning and close-out costs | \$6.8 |
| Total project cost less financing | \$466.5 |
| Financing cost | \$45.6 |
| Total cost | \$512.1 |

Figure 1: Probability Distribution of Total Cost of Construction, including Financing Cost



Following Section II—Disclaimers and Limitations, and Section III—Team, our report is organized as follows:

- Section IV sets forth the underlying assumptions of our cost estimate.
- Section V describes the methodology and approach taken to develop our cost estimate.
- Section VI presents our estimate of the project cost. The total project cost estimate is broken out into the categories typically used in defining project cost:
 - EPC direct costs—Materials, labour, and equipment associated with construction and process systems
 - Fees and contingencies associated with the EPC direct costs
 - o Indirect costs—Including, for example, design engineering and construction management
 - Owner's cost (excluding financing)—Includes project oversight and contract administration costs, together with commissioning cost
 - Commissioning and close-out costs—Includes costs for both the EPC contractor and the owner, and
 - Financing costs.
- Section VII presents our corroborating analyses, which are provided to permit an assessment of the reasonableness of our cost estimate.

³ Throughout this report, all dollar amounts are in Canadian dollars unless otherwise specified. Note that figures in this table and elsewhere in this report may not add due to rounding.

The accompanying appendices are an integral part of the report. <u>Appendix A</u> provides *curricula vitae* for the senior team members. <u>Appendix B</u> lists all information considered and relied upon, including OPG documents. Appendices C through H provide detail on the logic, data, methodology, and mathematical calculations used in developing our estimate, as follows:

- Appendix C Adjustments to Direct Costs
- Appendix D Backup Detail on Overnight Direct Costs
- Appendix E Backup Detail on EPC Contractor's Indirect Costs
- Appendix F Backup Detail on EPC and Owner Commissioning and Close-out Costs
- Appendix G Backup Detail on Owner's Costs Excluding Financing
- Appendix H Backup Detail on Financing Cost
- Appendix I Backup Detail on Comparable Analyses

II. DISCLAIMERS AND LIMITATIONS

This report was prepared by an expert team led by Glenn R. George, MBA, PE, PhD, and including Steven L. Krahn, DPA, BCEE; David R. Gallay, DSc, PE; Karen E. Morgan, MA, CFA, CRRA; and Mr. Alexei Sothoron, MS. The initial cost estimation work was carried out by Drs. Gallay and Krahn, assisted by Mr. Sothoron. Ms. Morgan helped manage the project and prepare the initial draft report. For convenience, this team of individuals may be referred to in this report as "the Bates White team," "Bates White," "we," or similar locutions.

All work was performed under the direct supervision of Dr. George, who accepts full responsibility for the contents of this report. Most of the analysis was performed in winter and spring 2020.

The views expressed in this report are those of the Bates White team and do not necessarily represent the views of, and should not be attributed to, other Bates White employees or affiliates, or Ontario Power Generation ("OPG") or its staff.

III. TEAM

Immediately below are brief bios for each of the team members. More-detailed *curricula vitae* are provided for the senior team members in <u>Appendix A</u>.

Glenn R. George, MBA, PE, PhD

Dr. George, a Partner in Bates White's Energy Practice, has over 30 years of experience in the global energy sector as a nuclear engineer, policymaker, investment banker, and economic consultant. He has both an engineering degree and an MBA from Cornell, a PhD from Harvard, and is a graduate of the US Department of Energy's ("DOE") Bettis Reactor Engineering School. He is an expert in utility, nuclear, and construction matters, including transactions, disputes, and rate cases. Dr. George served at the US Office of Naval Reactors and US Defense Nuclear Facilities Safety Board, with responsibility for (*inter alia*) nuclear facility planning and cost.

Steven L. Krahn, DPA, BCEE

Dr. Krahn has over 40 years of experience in the nuclear and high-hazard industry sector as a nuclear and systems engineer, senior policymaker, and risk/safety management expert. He is a professor of Nuclear Environmental Engineering at Vanderbilt University and Senior Nuclear Consultant in Bates White's Energy Practice. He has engineering degrees from the University of Wisconsin and the University of Virginia, a Doctorate of Public Administration ("DPA") from the University of Southern California, and is a graduate of the DOE's Bettis Reactor Engineering School. He is an expert in nuclear and high-hazard facility design/construction, safety/risk assessment, hazardous waste management, and regulatory matters.

David R. Gallay, DSc, PE

Dr. Gallay has over 40 years of experience as an engineering manager and operations research analyst. He is currently an Associate Professor of Finance at George Mason University and a Senior Nuclear Cost Consultant in Bates White's Energy Practice. He holds a DSc in engineering management with a concentration in economics, finance, and cost engineering from George Washington University, a master's degree in civil engineering from the Purdue University, a master's degree in systems management from the University of Southern California, and a bachelor's degree in engineering from the US Military Academy at West Point.

Karen E. Morgan, MA, CFA, CRRA

Ms. Morgan has more than 25 years of experience, specializing in utility rate and regulatory matters, including research on cost of equity capital for public utilities, capital market forecasting, financial statement analysis, and other utility issues related to regulatory practice. She has a BA in Economics (Honours) from Queen's University (Kingston) and an MA in Economics from the University of Western Ontario. She holds the Chartered Financial Analyst ("CFA") designation and is a Certified Rate of Return Analyst ("CRRA"). She is a manager in the Bates White Energy Practice.

Alexei Sothoron, MS

Mr. Sothoron holds a master's degree in Data Analytics Engineering, with a concentration in Financial Engineering, from George Mason University. His undergraduate majors were Accounting, Finance, and Information Systems. His work experience includes four internships, statistics tutoring, and a graduate teaching assistant position for multiple classes.

IV. GOING-IN ASSUMPTIONS

IV.A. Project Scope of D2O Storage Project Construction Cost Estimate

Bates White undertook the analysis with the objective of producing an estimate of OPG's cost to construct and commission the D2O Storage Project on the current site, within the restricted area of the Darlington nuclear facility.

In our analysis, the D2O Storage Project construction cost estimate comprises three main components: 1) the cost to pay a construction contractor to engineer, procure, and construct the heavy water storage facility; 2) owner's cost for contract administration and engineering oversight and approvals; and 3) interest during construction. The cost estimate includes all costs up to and including owner's acceptance, commissioning, and contract close-out. Thus, it does not include ongoing O&M costs beyond commissioning.

IV.B. State of Knowledge

In developing the cost estimate, we assumed that we had perfect knowledge of project scope, design requirements (*e.g.*, the need for seismic design), and actual site conditions, including previously contaminated soil, a constrained work area, cold weather, and water ingress.

In this but-for scenario, we estimated costs using methods that would be appropriate before construction was undertaken, but after all environmental studies and requisite permits had been obtained, for the overall refurbishment project. We believe this enhances the comparability of our cost estimate with estimates produced in the course of the actual D2O Storage Project.

Finally, we assumed that the design specifications of the facility "as constructed" reflected final requirements, incorporating both initial requirements and subsequent modifications. This is consistent with the assumption of

perfect knowledge. We utilized the design reflected in available business case summaries and engineering documents (*e.g.*, structural and systems changes, seismic enhancement, and spill containment).⁴

Despite perfect knowledge, variability in some factors—including labour productivity, weather, and the need for modest rework, *inter alia*—is an unavoidable part of any construction project. The probability distributions shown in this report reflect such variance. In addition, for reasons discussed more fully in Section VI.C, we also include a modest management reserve (an element of owner's cost) to hedge against unknown risks through the project's construction phase and into the turnover and commissioning phases.

IV.C. Construction Timeline

We reviewed the schedule information in the documents provided.⁵ However, we believe—consistent with the assumed perfect knowledge—it is appropriate to use in our analysis a shorter timeline than that which actually occurred. Based on our professional experience, we established a project construction timeline of six years, including typical delays due to weather and other factors, but no unusually long gaps. On the basis of our professional experience with comparable projects, it is our judgment that this timeline is consistent with a nuclear project of this magnitude progressing to completion with reasonably foreseeable challenges, but without allowance, for example, for changing EPC contractor mid-project. We begin our six-year construction timeline in 2013 to reflect the need to support the larger DRP.

IV.D. Commissioning and Close-Out

Consistent with our experience on comparable projects, commissioning preparations were assumed to take place during the six months prior to the declaration of construction completion and turnover of the facility from the EPC contractor to the owner. Commissioning itself was assumed to take place over the four months following turnover of the facility to the owner. Project close-out activities were assumed to take six months after completion of commissioning.

IV.E. Spend Profiles

We estimated construction costs in as-spent or "overnight" Canadian dollars, *i.e.*, nominal dollars, rather than in constant dollars pegged to a particular year in the construction process. As noted above, our analysis assumes a six-year construction timeline, starting at the beginning of 2013 with planning and design, and ending at the end of 2018, just prior to commissioning activities. The total cost includes an estimated amount spent in the year prior to the start of construction (2012) to cover costs associated with the owner's contracting effort prior to contract award. Costs associated with commissioning preparations begin in 2018, with the actual commissioning evolution taking place in the first four months of 2019, and close-out activities following.

We used Canadian government data to derive the de-escalation factors. The final estimate is in "then-year" Canadian dollars, *i.e.*, Canadian dollars in the year they were expended.

In general, we estimated costs for parts, components, systems, and labour from the bottom up, using wellrecognized engineering cost estimation tools and techniques, described below. To assist in costing out specific major components, we referred to and evaluated the quoted cost for reasonableness through: review of actual vendor quotes, purchase orders, or invoices where available. Where necessary, we converted costs from US to Canadian dollars using a purchase date (derived from review of the aforementioned records) and the associated average annual exchange rate obtained from the US Federal Reserve.⁶

⁴ Appendix B provides a listing of all documents which were relied upon.

⁵ The schedule presented in the 2018 OPG Business Case Summary ("BCS") indicated preliminary design and contract solicitation began in 2007, the EPC contract was awarded in 2008, engineering and design were substantially completed at the end of May 2015, construction would be completed by the end of 2018, with commissioning in November 2019 and project close-out in May 2020.

⁶ Board of Governors of the Federal Reserve System, "Foreign Exchange Rates—H.10," accessed April 26, 2020, <u>https://www.federalreserve.gov/releases/H10/hist/</u>

IV.F. Financing

To estimate the project's financing cost during construction, we assumed each year's construction costs would incur a carrying charge (simple interest) for an average of two years, calculated using the actual OPG end-of-year project financing interest rates for the D2O Storage Project (see Table 2 below).⁷

| Table 2: End-of-Year Financing Rates | | | |
|--------------------------------------|----------------------------|--|--|
| Year | End-of-year financing rate | | |
| 2012 | 5.03% | | |
| 2013 | 5.03% | | |
| 2014 | 5.03% | | |
| 2015 | 5.26% | | |
| 2016 | 5.23% | | |
| 2017 | 4.89% | | |
| 2018 | 4.40% | | |
| 2019 | 4.08% | | |

IV.G. Class-Level Designation of Estimate

AACE International's *Cost Estimate Classification System*⁸ provides guidelines for applying the general principles of estimate classification to cost estimates used to evaluate, approve, and/or fund projects. These guidelines are widely accepted and are used extensively in the nuclear industry.⁹ The Cost Estimate Classification System maps the phases and stages of project cost estimating to a standard project scope definition maturity and quality matrix, as shown in Table 3 below.

⁷ Project financing interest rates provided by OPG and applied over a two-year carrying period.

⁸ Association for the Advancement of Cost Estimation ("AACE") International, AACE International Recommended Practice No. 45R-08 Cost Estimate Classification System – As Applied for the Building and General Construction Industries, December 2012.

⁹ For example, the US Department of Energy uses these guidelines in its cost estimating guide. See Department of Energy, *Cost Estimating Guide, DOE G 413.21A*, June 6, 2018, 15-16. The British Columbia Department of Transportation also uses these guidelines. Ministry of Transportation and Infrastructure, "Project Cost Estimating Guidelines," Version 01.02, September 30, 2013, *available at https://www2.gov.bc.ca/assets/gov/driving-and-transportation/transportation-infrastructure/planning/guidelines/cost_estimating_guidance.pdf.*

Table 3: Cost Estimate Classification System for the Building and General Construction Industries¹⁰

| | Primary characteristic | Secondary characteristics | | | | |
|----------|---|--|--|---|--|--|
| Estimate | Maturity level of project definition deliverables | End usage | Methodology | Expected accuracy range | | |
| class | As % of complete definition | Typical purpose of estimate | Typical estimating method | Typical variation in low and high rangesª | | |
| Class 5 | 0% to 2% | Functional area, or concept screening | SF (ft ²) or m ² factoring, parametric models, judgment, or analogy | L: -20% to -30% H: +30% to +50% | | |
| Class 4 | 1% to 15% | Or schematic design or concept study | Parametric models, assembly driven models | L: -10% to -20% H: +20% to +30% | | |
| Class 3 | 10% to 40% | Design development, budget authorization, feasibilitySemi-detailed unit costs with assembly level line items | | L: -5% to -15% H: +10% to +20% | | |
| Class 2 | 30% to 75% | Control or bid/tender, semi-detailed | Detailed unit cost with "forced" (assumed) detailed take-off | L: -5% to -10% H: +5% to +15% | | |
| Class 1 | 65% to 100% | Check estimate or pre- bid/tender, change order | Detailed unit cost with detailed take-off | L: -3% to -5% H: +3% to +10% | | |

Note a): The state of construction complexity and availability of applicable reference cost data affect the range markedly. The +/- value represents the typical percentage variation of actual cost from the cost estimate after application of contingency (typically a 50% level of confidence) for given scope.

The primary drivers of risk and uncertainty associated with a particular estimate are the complexity of the project, the quality of reference cost estimating data, the robustness of the assumptions used to prepare the estimate, and the estimating techniques employed.¹¹ The table above illustrates the typical ranges of accuracy associated with building and general construction industries. Based on the assumptions and methods discussed in this report, our estimate would, in our opinion, be classified as a **Class 2 estimate**, with a degree of accuracy ranging from between 5% and 10% below the mean cost, to between 5% and 15% above the mean cost.¹²

IV.H. Summary

Our D2O Storage Project construction cost estimate comprises three main components: 1) the cost to pay a construction contractor to engineer, procure, and construct the heavy water storage facility; and 2) owner's cost for engineering, procurement, and construction oversight, contract administration, and facility commissioning activities; and 3) interest during construction. The cost estimate includes all costs through owner's acceptance and facility commissioning activities.

Our estimate is not meant to represent an "ideal" cost or a "perfect" build. The estimated cost assumes a six-year construction timeline, for a FOAK project located within the exclusion zone of an operating nuclear facility, on a constricted and previously contaminated building site. It incorporates costs associated with the dewatering requirements that resulted from water ingress due to the building's location on the north shore of Lake Ontario, in a region subject to weather extremes, particularly in winter. Commissioning activities are assumed to conclude within four months of the completion of construction. Our probabilistic analysis reflects typical variability in labour productivity, weather, the need for modest rework, and other factors.

¹⁰ AACE International, AACE International Recommended Practice No. 45R-08 Cost Estimate Classification System – As Applied for the Building and General Construction Industries, December 2012, Table 1.

¹¹ AACE International, AACE International Recommended Practice No. 45R-08 Cost Estimate Classification System – As applied for the Building and General Construction Industries, December 2012, p. 3.

¹² "Typically, this provides an 80% confidence level that the actual cost will fall within the bounds of the low and high ranges. The estimate confidence interval or accuracy range is driven by the reliability of the scope information available at the time of the estimate in addition to the other variables and risk identified above." AACE International, AACE International Recommended Practice No. 56R-08, Cost Estimate Classification System – As Applied for the Building

V. METHODOLOGY AND APPROACH

V.A. Overview of Estimating Approach

We followed a five-step process to develop our cost estimate for the D2O Storage Project as shown in Figure 2 below. In simplest terms, the methodological approach taken for each of the four principal cost components (Steps 1 through 4) was to obtain the total overnight or 2019 dollar amounts for each component, convert these amounts to Canadian dollars in the year they were expended ("then-year" costs) assuming a six-year construction timeline with commissioning in the first four months of the seventh year, and impute a financing cost (Step 5) based on the projected costs incurred during each year, using an interest rate provided by OPG. Throughout, we have applied our collective judgment, based on more than 100 person-years of experience acquired analyzing major construction projects of similar size and scope at nuclear sites across North America and indeed around the world.¹³

Figure 2: Steps in Developing the Construction Cost Estimate.



This five-step approach also allows us to apply a standard structure used by the US Energy Information Agency ("EIA"), among other authorities, to decompose and display construction cost estimates. This structure separates costs incurred by an EPC contractor, encompassing direct (construction materials and labour), indirect (project management, engineering, etc.), and facility commissioning support activities (component and preliminary system testing, information for system procedures, and facility turnover), from the costs incurred by the owner of the facility (final system testing, commissioning). In addition, the EIA reporting structure differentiates sums set aside for the EPC contractor's contingency and fee, from costs (*e.g.*, financing) borne by the owner.

V.B. Step 1: EPC Direct Costs Excluding Contingency and Fee

We built the estimate of direct costs by pricing individual items and summing these prices to arrive at an aggregate cost estimate, *i.e.*, a "bottom-up" approach. Specifically, the direct costs reflect our estimate of costs for procuring and constructing or installing the items in the project's Bill of Quantities ("BOQ").¹⁴ The BOQ is a 151-page document identifying thousands of individual items required for the D2O Storage Project. The items are organized in seven main categories, each with three or more subsections:¹⁵

- Architectural/Structural (Civil)
- Process Systems Tie-in
- Process Systems

¹³ Further detail is provided in the *curricula vitae* of team members found in <u>Appendix A.</u>

¹⁴ Ontario Power Generation, Bill of Quantities, October 25, 2019.

¹⁵ These seven categories correspond to Sections B–H of the BOQ. Section A of the BOQ summarizes the vendor-procured specialty items delivered to OPG that are included in Sections B–H.

- Process Support Systems
- Building Support Systems Tie-in (Mechanical)
- Building Support Systems (Mechanical), and
- Electrical.

We deflated the 2019 "overnight" costs to "then-year" dollars to reflect the value of the cost in the year in which the cost would have occurred under our assumed six-year construction timeline.

V.C. Step 2: EPC Contingency and Fee

The EPC contractor contingency is an allowance of funds that provides some protection for typical, unavoidable sources of risk and uncertainty, including labour productivity, the weather, the need for modest amounts of rework, variations in the quantity of inputs required, delivery problems, and the like. We modelled the uncertainty of our cost estimates, and estimated the cost amount that would increase the odds of not overrunning the cost estimate from 1:1 (50% probability of no overrun vs. 50% probability of overrun) to 2:1 odds (67% probability of no overrun vs. 33% probability of overrun). The estimated cost amount equals 4.86% of the direct cost estimate calculated in Step 1.

The EPC contractor fee, in contrast, is the amount an EPC contractor needs to earn to cover its general and administrative overhead costs, and to compensate its debt holders and equity investors for financing the firm. Based on our experience, we estimated a fee rate of 10%. This rate is composed of 4% to cover the EPC contractor's overhead costs, and a 6% margin to cover its cost of capital. This 10% fee comports with standard or typical EPC industry practice.

V.D. Step 3: EPC Indirect and Commissioning Support Costs

This cost component consists of the EPC contractor's indirect costs and its costs associated with commissioning activities. Indirect costs comprise expenses for the EPC contractor's engineering and design services, field office engineering support, construction management, and procurement. These costs vary from project to project and, typically, information about them is proprietary. For each area of expense, we evaluated the scope of work and determined the types and number of staff required, the wages appropriate for those positions (including a cost allocation for the employees' fringe benefits and EPC contractor's overhead costs and margin), and the proportion of time that each staff position would devote to the D2O Storage Project. We then reviewed standard, notional construction sequencing (*e.g.*, as described in the *Cost Estimating Guidelines for Generation IV Nuclear Energy Systems*)¹⁶ to develop time-phased spend plans for each technical and project management specialty. The costs associated with these spend plans were deflated and assigned to each year of the construction timeline.

Facility commissioning support activities include preparing for final system testing and facility turnover, and supporting development of system operating and testing procedures, ultimately leading into contract close-out.

V.E. Step 4: Owner's Cost Excluding Financing

The owner's cost estimate reflects our estimate of 1) owner's project management, including engineering oversight; construction oversight; procurement oversight; contract award, oversight, and administration; and various reviews, inspections, and approvals required as part of a construction project of this type; 2) owner's facility commissioning and close-out cost; and 3) a modest management reserve.

¹⁶The Economic Modeling Working Group, *Cost Estimating Guidelines for Generation IV Nuclear Energy Systems*, Rev. 4.2, GIF/EMWG/2007/004, Generation IV International Forum, September 26, 2007, hereinafter referred to as the "EMWG Guidelines." Data are provided in US dollars and converted to Canadian dollars.

V.F. Step 5: Financing Costs

Financing costs for an assumed spend pattern were added based on OPG's applicable financing cost for each year of our six-year construction period and that portion of year seven in which commissioning and close-out costs were incurred by the owner.

V.G. Price Deflators

As noted above, we adjusted the estimated 2019 overnight costs to reflect Canadian dollars in the year they were expended. We did so by deflating the dollar amounts using the deflator factors in Table 4. For example, if we estimated a cost of \$500 for an item in 2019 dollars, and the expenditure to procure and install that item would have occurred in 2015, we must deflate the cost to 2015 dollars. To determine the 2015 cost, we would divide \$500 by the deflator factor 1.167.¹⁷ The resulting 2015 amount would be \$427.27.

| Year | Inflation Index | Deflator |
|------|--------------------|----------|
| 2013 | 89.48 | 1.179 |
| 2014 | 90.23 | 1.170 |
| 2015 | 90.43 | 1.167 |
| 2016 | 96.40 | 1.095 |
| 2017 | 100.00 | 1.055 |
| 2018 | 104.63 | 1.009 |
| 2019 | 105.53 | 1.000 |

Table 4: Deflator Factors, 2013 to 2019.

We developed the deflator factors from Statistics Canada price index data.¹⁸

VI. CONSTRUCTION COST ESTIMATE

Our construction cost estimate for the D2O Storage Project is **\$512.1 million**, based on a six-year construction timeline commencing in 2013 and ending in 2018, followed by commissioning (which is assumed to take place over the four months following completion of construction and turnover of the facility to the owner) and close-out (which is completed six months thereafter). The breakout of this total cost is depicted in Table 5.

¹⁷ Rounded for purposes of the discussion.

¹⁸ Statistics Canada, "Building Construction Price Indexes, by Type of Building," accessed November 23, 2019, <u>https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1810013501</u>.

Table 5: D2O Storage Project Construction Cost Estimate (Dollars in Millions)

| | Cost |
|--|---------|
| EPC contractor costs | |
| Direct costs w/o fee and contingency | \$303.3 |
| Fee and contingency | \$46.6 |
| Direct costs with fee and contingency | \$349.9 |
| Indirect costs | \$69.9 |
| EPC commissioning support | \$4.5 |
| EPC contractor total project cost | \$424.3 |
| Owner's costs | |
| Owner's cost less financing, commissioning and close-out | \$35.3 |
| Owner's commissioning and close-out costs | \$6.8 |
| Total project cost less financing | \$466.5 |
| Financing cost | \$45.6 |
| Total cost | \$512.1 |

The accuracy level of this estimate is **Class 2**, which implies that we are 80% confident that the costs would fall in a range between 15% above and 10% below our point estimate of **\$512.1 million**. We depict graphically the probability distribution of total construction cost in Figure 3 below.¹⁹

Figure 3: Probability Distribution of Estimated Total Cost of the D2O Storage Project



As shown on Figure 3, the **P90 cost is \$559.4 million**, *i.e.*, there is a 90% probability that actual cost would fall below this estimate.

In the following subsections, using estimated spend plans (over time), we decompose the total cost into the five steps of our methodological approach, as shown in Figure 2 above: the EPC contractor's direct cost excluding contingency or fee; the EPC contractor's contingency and fee; the EPC contractor's indirect and commissioning support costs; the owner's costs including the costs associated with commissioning and close-out, but excluding financing; and the financing cost. Each of these cost elements will be addressed with respect to the methodology

¹⁹ All cost distributions presented in this report were derived from the Class 2 criterion: +15/-10% with 80% confidence. The one-sided 90% confidence interval identifies the number below which 90% of the probability distribution falls. In other words, we are 90% confident that the true cost would fall at or below the P90 estimate.

applied, sources of cost information, adjustments made, and particular tools (including expert judgment and experience) used to obtain the final estimate.

VI.A. EPC Contractor's Direct Costs

The EPC contractor's direct cost comprises the contractor's direct cost plus contingency and fee.²⁰ Determining the total EPC contractor's direct cost comprises the first two steps of our five-step methodological approach. In Step 1, we estimate the direct costs without contingency or fee. In Step 2, we use that amount to infer a contingency allowance and then compute a fee associated with the estimated direct costs plus the contingency.

VI.A.1. Step 1: Direct Costs of Construction without Contingency or Fee

The direct costs of construction without contingency or fee reflect the deflated overnight costs derived from cost data in RSMeans,²¹ vendor invoices and purchase orders, productivity adjustments, labour wage adjustments, and cost factors from EMWG Guidelines.

We validated and clarified the data provided by the BOQ, as appropriate, by review of detailed design information. This design information principally comprised system descriptions and as-built system drawings. We used the design information to validate important system information, such as numbers of tanks installed, component capacities, and other technical details important to accurately pricing systems. We also used this technical information to clarify aspects of the BOQ by reviewing the completed system design to ensure that we fully understood the functions and operation of components and subsystems. Together, this corroboration of BOQ-provided data ensured that the cost estimate addressed all relevant systems, components, and parts, and avoided any double-counting.

To produce our estimate of the EPC direct costs, we used two pricing guides: RSMeans for estimating the costs (materials, labour, and equipment) of routine construction, and the EMWG Guidelines²² to factor in the added construction and installation costs required to meet nuclear safety and quality standards.

VI.A.1.a. RSMeans

RSMeans is the standard source for routine construction cost data throughout North America. The RSMeans online cost database was our primary source of cost data. This database provided the Canadian dollardenominated prices for the materials and parts, as well as typical union labour rates in the Toronto metropolitan area for late 2019. For items not priced in the RSMeans database, we obtained vendor prices from vendors' online sites.

We adjusted certain "default" RSMeans prices to more accurately reflect D2O Storage Project costs. The degree to which the data needed to be adjusted was based on our review of the design information for the D2O Storage Project, and then comparing that design information to design and construction of standard commercial buildings.

The adjustments for material costs were based on interpolations either from RSMeans data, where available but an exact match could not be identified, or from an average of advertised vendor prices (when more than one quote could be found). For specialized equipment and nuclear-class materials, we used two methods: either reviewing vendor invoice data (which is a good proxy for competitively procured equipment and materials), or adjusting the RSMeans base cost data by cost factors from the EMWG guidelines, as discussed below.

An example of the first type of adjustment was information used to price concrete. The BOQ called for concrete with 35 MPa compressive strength, but RSMeans had data only for 34 MPa and 41 MPa concrete. We analyzed the pricing data from several concrete vendors with different compressive strengths, identified the trend, and interpolated the 35 MPa concrete cost from the existing RSMeans price data.

²⁰ The EPC contractor also earns a fee on indirect costs, but we accounted for this through our wage multiplier for those costs.

²¹ RSMeans data from Gordian, <u>https://www.rsmeansonline.com/</u>, accessed repeatedly from October 25, 2019 to February 1, 2020.

²² Data are provided in US dollars and converted to Canadian dollars.

The second type of adjustment was used to determine the price of particular pipe valves and fittings, for example. The BOQ listed stainless steel pipe valves and fittings, but the RSMeans database contains data only for carbon steel valves and fittings. We used vendor prices for stainless steel valves, piping, and fittings—of similar sizes and types—to infer and apply a cost differential from the reported costs for similar carbon steel components in RSMeans.

Adjustments to RSMeans labour costs captured the contractor's daily and weekly work schedules, union labour rates prescribed in OPG contracts, labour productivity, and added materials and labour costs associated with nuclear-class items specified in the BOQ. For example, RSMeans labour costs were adjusted to address the following:

- OPG contractor wages, which we determined by review of the various trade collective agreements to be different from standard Toronto metropolitan area wages²³
- Crew size for installing nuclear-class and other nuclear-related materials, which would include welders for all-welded systems and quality assurance personnel, and
- OPG contractor productivity, where we needed to take into account site-specific challenges.

We briefly describe the rationales for the adjustments:

- The labour costs in the RSMeans database are based on a standard 5-day, 8 hour-per-day workweek with no overtime. This standard workweek does not apply to the labour force working on the D2O Storage Project. The D2O Storage Project construction workers are on a 4-day, 10 hour-per-day workweek schedule, with 2 hours a day of overtime. We adjusted labour costs accordingly.
- The labour costs in the RSMeans database are premised on a 66% productivity rate typical for a nonnuclear industrial construction project. This rate is substantially higher than the achievable productivity rate on the D2O Storage Project. Based on our experience on numerous other nuclear construction projects, and our review and extrapolation of the findings in two OPG-sponsored labour productivity studies,²⁴ it is our expert opinion that an average 39% productivity factor would be appropriate for the D2O Storage Project. This is consistent with our understanding of the confined space, security restrictions, and radiological controls in which the workforce had to operate and with our experience in nuclear construction projects in the United States and elsewhere.²⁵
- The RSMeans database does not contain data for procuring or installing nuclear-class designated
 materials or parts. Thus, for those items in the BOQ that require nuclear standards and quality assurance
 requirements, we supplemented the RSMeans data with cost factors drawn from the EMWG guidelines.
 This document presents cost factors for nuclear-class commodities, piping, and the associated labour
 required to place or install and inspect those commodities, piping, and components. These commodities
 comprised nuclear-class formwork, embedded metal, reinforcing steel bars, and structural steel.
- The RSMeans database contains cost data based on 2019 prices and wages in Canadian dollars for the Toronto metropolitan area. We converted ("deflated") those 2019 prices to reflect cost values in the *year in which the costs were incurred*. We converted the 2019 costs to then-year dollars with price deflators derived from Statistics Canada price indices.²⁶ We performed this calculation for each cost to reflect the value of the cost in the year in which we expected that particular cost to occur.

²⁴ Rigden Lhawang, Pratheep Srikantha, Mihai Balan, and Fatimah Al Ubaid, Wrench Time Analysis Study: 1st Site Visit Report, Nuclear Design Laboratory Faculty of Energy Systems and Nuclear Science, University of Ontario Institute of Technology, Oshawa, Canada, April 2018; Faithful+Gould, Ontario Power Generation Darlington NGS Heavy Water Management Building Estimate Report, January 2012; "Wrench Time D2O.R1," data as of August 2018. ²⁵ Bates White team members toured the D2O Storage Project in October 2019 and were able to experience the project confines first-hand.

²³ Contracts are available from the Electrical Power Systems Construction Association ("EPSCA") website https://www.epsca.org/.

²⁶ Building Price Index, <u>https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1810013501#timeframe</u>, accessed between November 1, 2019 and January 31, 2020.

While we could estimate costs for nearly all the items in the BOQ, there were two sets of exceptions. The first set related to a limited number of specialty items, while the second set related to drainage costs associated with the subgrade excavated site.²⁷

With respect to specialty items, we reviewed a set of 32 actual vendor invoices and OPG purchase orders for specialty items, such as tritium air monitors and nuclear-grade tanks. These invoices identified costs and dates of delivery for these specialty items. While there were relatively few items in this category, compared with the very large number of components purchased for the project, they represented a significant source of materials cost to the project. See Appendix C, Table C-10 for a listing of these specialty items.

We reviewed these vendor invoices, evaluated the quoted cost for its reasonableness, incorporated information from the invoices into our schedule analysis, and determined appropriate materials costs to incorporate into the estimate.²⁸ Our opinion regarding their reasonableness rests on four considerations:

- Such major purchases would normally be the subject of a competitive procurement process, with various
 forms of pre- and post-contract reviews, which we could not readily replicate but the results of which
 would be unlikely to differ from the actual purchases.
- We reviewed evidence that the EPC contractor in this instance had indeed implemented a formal procurement process typical for projects of this type, complexity, and size.²⁹
- Based on our experience, none of the costs appears to be unreasonable.
- For certain items (*e.g.*, large tanks), the procured cost appears to be at the low end of the range we might consider reasonable.
- For some other items (*e.g.*, certain valves) where we could make a comparison with costs reported by RSMeans, the procured cost clearly falls in the reasonable range.

With respect to the drainage costs associated with the subgrade excavated site, we determined that the dewatering and soil management efforts were so distinctive (with associated environmental controls) and occurred over such a long period, that their costs could not be readily estimated using RSMeans or other available data.³⁰ However, after we reviewed the procedures and system design in use, these actual costs are in our opinion representative of the costs that a planner or estimator with perfect knowledge with respect to project scope, design requirements, duration, and site conditions would have included.

Further detail on the above adjustments is provided in Appendix C.

VI.A.1.b. EMWG Guidelines

The RSMeans database did not contain detailed cost information for materials and labour used to construct the nuclear containment structure below-grade (seismically qualified dike) or the process piping systems that would hold or carry radioactive material. Thus, we supplemented our cost information from RSMeans with parametric cost factors (described below) from the EMWG guidelines.³¹ This guide provides pricing data for nuclear installations acquired by the DOE over an extended time period. The information was recently updated by the Economic Working Group of the Generation IV International Forum. We describe the adjustment factors we used from this guide in <u>Appendix C</u>.

https://www.corelogic.com/solutions/marshall-swift.aspx); and Dodge Data & Analytics, "Solutions That Grow Your Business," accessed April 26, 2020, https://www.construction.com/.

³¹ EMWG guidelines.

²⁷ BOQ item B33.05, "Yard drainage temporary provision (civil)."

²⁸ Prices for these specialty items were converted to Canadian dollars if priced otherwise and escalated to 2019 dollars as required based on the assumed timeline and the date of the invoice.

²⁹ OPG, Detailed Materials Estimate, Part 1 and Part 2, and *Procurement Tracking File-2Nov2015.xlsx*.

³⁰ Marshall & Swift Valuation Service, "The Gold Standard of Building Cost Data," accessed April 26, 2020,

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 19 of 350

CONFIDENTIAL ATTORNEY WORK PRODUCT

VI.A.1.c. Modified Parametric Analysis

Having determined the "baseline" cost, we identified certain assumptions and cost elements that required further review and recalculation using a probabilistic model. This approach generally leads to cost estimates with levels of accuracy higher than estimates derived from parametric estimation and lower than estimates developed through a detailed bottom-up approach. This approach required, as appropriate, that we explicitly model the uncertainty associated with each cost element within the overall cost model. The result is an estimated range of costs for the project, which is more robust and transparent than utilizing a point estimate of costs and adding an arbitrary factor to account for risk and uncertainty. The method also supports a sophisticated approach for assigning an allowance for contingency.

VI.A.1.d. Estimate of Direct Costs without Contingency and Fee

The initial estimate of overnight direct costs is \$371.6 million. (See additional detail in <u>Appendix D</u>.) This initial estimate incorporates amounts, identified directly on vendor invoices and purchases orders and inferred by RSMeans, to cover the EPC contractor's overhead and profit. We removed these amounts ("inferred amounts") in calculating the estimate of the 2019 overnight costs for the BOQ items. The resulting estimate of overnight direct costs after removing these inferred amounts is \$337.8 million, as shown in Table 6 below.

| | Materials | Labour | Equipment | Total | | | |
|----------------------------------|-------------------------------|-------------|----------------|---------|--|--|--|
| | All | Costs inclu | de Inferred An | nounts | | | |
| Construction | \$33.3 | \$55.0 | \$0.3 | \$88.6 | | | |
| Process systems | \$70.7 | \$212.3 | \$0.0 | \$283.0 | | | |
| Initial Estimate of overnight | Initial Estimate of overnight | | | | | | |
| direct costs | \$104.0 | \$267.3 | \$0.4 | \$371.6 | | | |
| Overnight direct costs with infe | \$337.8 | | | | | | |

Table 6: EPC Overnight Direct Costs (Dollars in Millions).

We converted the estimate of 2019 overnight costs of \$337.8 million to amounts for each year of our six-year construction period. Summing the annual costs from each year's spend plan results in our estimate of the direct costs of construction, without fee or contingency, equal to **\$303.3 million**, as shown in Table 5 above and in Table 7 below. This estimate forms the base amount from which we estimated the EPC contractor's contingency allowance and fee to cover its overhead costs and profit, consistent with the EMWG and EIA framework.

Table 7: EPC Direct Costs (Dollars in Millions)

| | Overnight costs | "Then- year" costs |
|---|--------------------|--------------------------|
| Direct costs without fee or contingency | \$337.8 | \$303.3 |

This estimate of direct costs without fee or contingency of **\$303.3 million** is consistent with a Class 2 level of accuracy. The **P90 cost is \$348.0 million**. A graphic of the cost distribution for the EPC contractor's direct cost without fee or contingency is shown in Figure 4.

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 20 of 350

CONFIDENTIAL ATTORNEY WORK PRODUCT

Figure 4: Probability Distribution of EPC Direct Cost without Fee or Contingency



VI.A.2. Step 2: Contingency and Fee

Despite our assumption of perfect knowledge with respect to project scope, design requirements, and site conditions, we must also take into account the unavoidable variability in performing any construction work. As noted above, this variability reflects actual versus assumed quantities of materials consumed, labour productivity, modest required rework, weather conditions, etc. EPC contractors typically build some degree of contingency into their cost estimate, and resulting contract price, to reflect this variability and to reduce the likelihood of a contract cost overrun.

While it is common to assign a standard percentage of the base cost (say 10%) to compute a contingency allowance, we view that approach as arbitrary. We prefer a more sophisticated approach for determining the contingency allowance. Such an approach is premised on the notion that the contingency is a function of the desired probability that the final project cost will not overrun the estimate. Thus, we modelled the uncertainty of our cost estimates and derived a contingency amount that would increase the EPC contractor's odds of not overrunning its direct costs estimate from 1:1 to 2:1. This is equivalent to saying that the contingency amount would decrease the probability of a cost overrun from 50% to 33.3%. Based on a point estimate for direct costs of \$303.3 million derived in Step 1, we calculated a **contingency amount of \$14.7 million**, representing 4.86% of the point estimate.

In addition to the contingency allowance, we estimated the EPC contractor's fee rate at 10%. This rate comprises 4% to cover the EPC contractor's overhead costs and a 6% margin to cover its cost of capital. **The fee amount is \$31.8 million**, equal to 10% applied to the sum of direct costs (\$303.3 million) and contingency (\$14.7 million).

We added the **total fee and contingency of \$46.6 million** to our direct cost estimate without fee or contingency of \$303.3 million developed in Step 1 to calculate the direct costs with fee and contingency of **\$349.9 million**, as shown in Table 5.

As shown in Figure 5, the **P90 cost is \$396.2 million**, *i.e.*, there is a 90% probability that actual cost would fall below this estimate.

Figure 5: Probability Distribution of Estimated EPC Direct Cost with Contingency and Fee

$A_{i} = 0$ A_{i

Direct Cost with Contingency and Fee

VI.A.3. Spend Plan for the EPC Direct Project Cost

The following tables (Table 8 through Table 11) depict direct costs in Canadian dollars in the year the dollars were expended, *i.e.*, the spend profiles. The first two profiles reflect estimated construction costs, with one profile for construction materials and equipment, and one profile for construction labour costs. These two profiles comprise the costs for the required items in Section B of the BOQ.

The other two profiles reflect what we identified as process systems costs. These are the estimated then-year costs for the process, building support, and electrical items described in Sections C through H in the BOQ. We present one profile for process systems materials and equipment, and one profile for process systems labour.

In each table, the first column identifies the year in which we modelled that cost would occur. The second column contains our estimate of the EPC contractor's direct cost without contingency and fee. The third column contains an allocated contingency allowance to hedge against a direct cost overrun. The fourth column reflects the EPC contractor's fee for both its direct cost and allocated contingency allowance. The fifth column is the total of the direct cost with contingency and fee.

VI.A.3.a. Construction Materials and Equipment Spend Profile

Table 8: Construction Materials and Equipment (Dollars in Millions)

| Year | Without contingency or fee | Contingency (4.86%) | Fee (10%) | Year totalª |
|-------|----------------------------------|------------------------|--------------|----------------|
| 2013 | \$7.1 | \$0.3 | \$0.7 | \$8.2 |
| 2014 | \$7.2 | \$0.3 | \$0.8 | \$8.3 |
| 2015 | \$5.9 | \$0.3 | \$0.6 | \$6.8 |
| 2016 | \$4.2 | \$0.2 | \$0.4 | \$4.8 |
| 2017 | \$1.4 | \$0.1 | \$0.2 | \$1.7 |
| 2018 | \$0.8 | \$0.0 | \$0.1 | \$0.9 |
| Total | \$26.6 | \$1.3 | \$2.8 | \$30.7 |

^a Totals may not sum due to rounding.

VI.A.3.b. Construction Labour Spend Profile

Table 9: Construction Labour Spend Profile (Dollars in Millions)

| Year | Without Contingency Fee contingency (4.86%) (10%) or fee | | Fee (10%) | Year totalª |
|-------|--|-------|--------------|----------------|
| 2013 | \$11.7 | \$0.6 | \$1.2 | \$13.5 |
| 2014 | \$11.8 | \$0.6 | \$1.2 | \$13.6 |
| 2015 | \$9.6 | \$0.5 | \$1.0 | \$11.1 |
| 2016 | \$6.9 | \$0.3 | \$0.7 | \$7.9 |
| 2017 | \$2.4 | \$0.1 | \$0.2 | \$2.7 |
| 2018 | \$1.2 | \$0.1 | \$0.1 | \$1.4 |
| Total | \$43.5 | \$2.1 | \$4.6 | \$50.2 |

^a Totals may not sum due to rounding.

VI.A.3.c. Process Systems Materials Spend Profile

Table 10: Process Systems Materials Spend Profile (Dollars in Millions)

| Year | Without contingency or fee | Contingency (4.86%) | Fee (10%) | Year totalª |
|-------|----------------------------------|------------------------|--------------|----------------|
| 2013 | \$10.9 | \$0.5 | \$1.1 | \$12.6 |
| 2014 | \$16.5 | \$0.8 | \$1.7 | \$19.0 |
| 2015 | \$13.8 | \$0.7 | \$1.4 | \$15.9 |
| 2016 | \$8.8 | \$0.4 | \$0.9 | \$10.2 |
| 2017 | \$4.6 | \$0.2 | \$0.5 | \$5.3 |
| 2018 | \$1.6 | \$0.1 | \$0.2 | \$1.8 |
| Total | \$56.1 | \$2.7 | \$5.9 | \$64.7 |

^a Totals may not sum due to rounding.

VI.A.3.d. Process Systems Labour Spend Profile

Table 11: Process Systems Labour Spend Profile (Dollars in Millions)

| Year | Without Contingency or Fee | ut Contingency Fee ency (4.86%) (10%) ee | | Year Totalª |
|-------|----------------------------------|--|--------|----------------|
| 2013 | \$16.4 | \$0.8 | \$1.7 | \$18.9 |
| 2014 | \$16.5 | \$0.8 | \$1.7 | \$19.0 |
| 2015 | \$24.8 | \$1.2 | \$2.6 | \$28.6 |
| 2016 | \$35.3 | \$1.7 | \$3.7 | \$40.7 |
| 2017 | \$41.1 | \$2.0 | \$4.3 | \$47.5 |
| 2018 | \$43.0 | \$2.1 | \$4.5 | \$49.7 |
| Total | \$177.1 | \$8.6 | \$18.6 | \$204.3 |

^a Totals may not sum due to rounding.

VI.B. Step 3: EPC Indirect Costs, Commissioning Support and Close-Out Costs

VI.B.1. Indirect Costs

RSMeans (and its competitors in the cost handbook industry) does not collect and report **indirect costs**. Consequently, we developed our own estimate of these costs based on our team's collective experience. We identified eight areas, differentiated by role and in time phase of delivery that the EPC contractor would need to have staffed to meet its needs in engineering and procurement:

• Civil engineering—Engineering to support site preparation, design of the above-grade building framework and related assemblies, and exterior site modifications

- Electrical engineering—Engineering to address power systems, distribution, and instrumentation and controls
- Engineering support—Maintenance of drawings, technical manuals, reports, and processing of changes thereto
- Mechanical engineering—Engineering to address piping system design, including pumps, valves, and associated equipment
- Procurement—Functions associated with purchasing major components and commodities, and obtaining required services used in construction of the facility
- Project management—Developing, implementing, and monitoring control functions associated with the plans and schedules necessary for project execution
- Nuclear mechanical engineering—Specialty engineering for nuclear-grade mechanical systems, and
- Nuclear structural engineering—Specialty engineering for design of the seismically qualified dike and associated equipment.

To estimate costs associated with these functions, we developed a model of the staff in each function, addressing both skill mix (engineer, analyst, supervisor, etc.) and required capacity (numbers of each skill). Next, we determined, based on our experience and the project schedule, the time-phased staffing profile for each specialty, shown in Table 12 below. Finally, we obtained representative salary figures for personnel in the EPC contractor organization using the Glassdoor website.³² We assumed that most of the staff members performing those functions would be located primarily at the EPC contractor's home office and would work on the project on an asneeded basis. Our resulting estimate for the EPC contractor's indirect costs is **\$69.9 million**, with a **P90 value of \$74.5 million**. Additional information is found in Appendix E.

VI.B.1.a. Probability Distribution of the EPC Contractor's Indirect Cost

The probability distribution of the EPC contractor's indirect cost estimate is depicted in Figure 6.



Figure 6: Probability Distribution of EPC Contractor's Indirect Cost

VI.B.1.b. Spend Plan for the EPC Contractor's Indirect Cost

The spend plan for the EPC contractor's indirect cost is depicted in Table 12.

³² Glassdoor, "Ontario Power Generation Reviews," accessed repeatedly in January 2020, <u>https://www.glassdoor.com/Reviews/Ontario-Power-Generation-Reviews-E9274.htm.</u>

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 24 of 350

CONFIDENTIAL ATTORNEY WORK PRODUCT

| Year | Project mgmt. | Procurement | Civil engineering | Mechanical engineering | Nuclear mechanical engineering | Nuclear structural engineering | Electrical engineering | Engineering support | Total |
|-------|------------------|-------------|----------------------|---------------------------|--------------------------------------|--------------------------------------|------------------------|------------------------|--------|
| 2013 | \$2.0 | \$1.5 | \$1.0 | \$0.5 | \$1.5 | \$1.3 | \$0.7 | \$1.4 | \$10.0 |
| 2014 | \$2.8 | \$3.0 | \$1.0 | \$0.8 | \$2.0 | \$1.4 | \$0.7 | \$2.1 | \$13.8 |
| 2015 | \$2.8 | \$3.1 | \$0.8 | \$1.1 | \$2.0 | \$1.0 | \$1.0 | \$2.8 | \$14.5 |
| 2016 | \$2.9 | \$1.6 | \$0.5 | \$1.1 | \$2.1 | \$0.7 | \$1.5 | \$3.0 | \$13.6 |
| 2017 | \$1.5 | \$0.8 | \$0.6 | \$1.2 | \$1.7 | \$0.4 | \$1.5 | \$3.1 | \$10.8 |
| 2018 | \$1.1 | \$0.9 | \$0.3 | \$0.6 | \$1.2 | \$0.4 | \$1.2 | \$1.6 | \$7.2 |
| Total | \$13.1 | \$11.0 | \$4.2 | \$5.3 | \$10.5 | \$5.2 | \$6.7 | \$14.1 | \$69.9 |

Table 12: Spend Plan for the EPC Indirect Cost (Dollars in Millions)

VI.B.2. EPC's Commissioning and Close-out Costs

With respect to the **EPC contractor's commissioning support costs**, we assumed commissioning preparations start approximately six months prior to the declaration of construction complete and turnover of systems from the EPC contractor to the owner. During those six months, the EPC contractor would help develop procedures, train two owner crews, and provide technical support during commissioning tests conducted by the owner.

Contract close-out (a fairly straightforward administrative process involving mostly contracting and legal staff) takes place subsequent to the completion of commissioning. It is our experience that these costs are normally accounted for by the EPC contractor in structuring its fee.

Table 13 presents the costs for mechanical engineering support and electrical commissioning costs.

Table 13: EPC Contractor Commissioning Support Costs (Dollars in Millions)

| | EPC contractor commissioning |
|---------------------|---------------------------------|
| | support |
| Mechanical | \$1.6 |
| Engineering support | \$0.8 |
| Electrical | \$2.1 |
| Total EPC | \$4.5 |

Additional information on commissioning costs is found in Appendix F.

VI.C. Step 4: Owner's Cost, Excluding Financing

Our estimate for the **owner's cost**, excluding financing, encompasses three elements: owner's **project management** activities (including contract award, EPC oversight, and contract administration); owner's facility **commissioning** activities, including testing, acceptance, and turnover; and **management reserve**.

Cost guides provide limited quantitative data on which to base an estimate of owner's cost. Consequently, we used our collective experience in analyzing other major construction projects, along with several available qualitative treatments,³³ to develop the size and composition of an owner's team necessary to manage the construction contract. We then used salary data of typical positions at OPG available from the Sunshine List, together with Glassdoor and other online sources, to estimate staffing costs.³⁴

³³ For example, a qualitative discussion of the makeup of owner's cost is provided in US Energy Information Agency, *Capital Cost Estimates for Utility Scale Electricity Generating Plants*, November 2016.

³⁴ Glassdoor, "Ontario Power Generation Reviews," accessed repeatedly in January 2020, <u>https://www.glassdoor.com/Reviews/Ontario-Power-Generation-Reviews-E9274.htm</u> and the Ontario Sunshine List, accessed April 26, 2020, <u>https://www.ontariosunshinelist.com/</u>.
With respect to **project management cost**, we estimated that an owner on a project of this nature would have two teams: an engineering oversight team and a project management team, with a combined strength of approximately 30 people. Some of the 30 people would work on the D2O Storage Project in a full-time capacity, others on an as-needed basis.

We also assumed that the owner would draft the statement of work for the project, solicit proposals, and choose an EPC contractor in 2012, the year prior to contract award in our 2013–2018 project time period. This timing is consistent with our experience.

With respect to **owner's commissioning cost**, as with EPC contractor commissioning support, we assumed commissioning preparations took place during the six months prior to declaration of construction complete and turnover of the systems from the EPC contractor. During this period, the owner would receive procedure development support from the EPC contractor (including assistance in training of staff), but the owner would be responsible for the final development and approval of all operating and test procedures. During commissioning, which occurs during the four months following the completion of construction and project turnover, the owner is responsible for testing and the performance of all system grooming (*e.g.*, adjustments, preventive maintenance). Subsequent to commissioning, contract close-out takes place.

Contract close-out is an administrative process that mostly involves contracting and legal staff. The owner sometimes waits six months or even a year to conduct the close-out process. We included owner's contract close-out cost within owner's commissioning cost.³⁵

With respect to **management reserve**, we assumed that the owner would want to set aside a modest reserve to hedge against unknown risks in the construction phase and into the turnover and commissioning phases. Because the risks are unknown (*i.e.*, they constitute *uncertainties* rather than risks per se), we had no basis for calculating a precise number as we did with the EPC contractor's contingency. We believe this is fully consistent with our assumption of perfect knowledge with respect to project scope, design requirements, and site conditions. Based on our professional experience and judgment, we applied a heuristic rate of 2% of the estimated EPC contractor's total project cost to determine the reserve amount. This 2% management reserve is at the low end of industry practice. Although it would not necessarily be spent, the owner's management reserve would need to be included in an overall construction cost estimate.

We calculate a total owner's cost, excluding financing, of \$42.1 million, as follows:

Table 14: Owner's Costs excluding Financing (Dollars in Millions)

| | Owner's |
|------------------------|---------|
| | costs |
| Project management | \$26.8 |
| Facility commissioning | \$6.8 |
| and contract close-out | |
| Management reserve | \$8.5 |
| Total owner's costs | \$42.1 |

Further detail is available in Appendix G.

VI.C.1.a. Probability Distribution of the Owner's Cost Excluding Financing

The probability distribution of the owner's cost, excluding commissioning, close-out and financing, is depicted in Figure 7.

³⁵ For the purposes of estimation, we assumed a notional duration of six months for contract close-out efforts, ensuing with the completion of commissioning. This duration is consistent with our experience for fixed-price nuclear project contracts.

Figure 7: Probability Distribution of Owner's Cost Less Commissioning, Close-Out and Financing



As shown in Figure 7, the mean value is \$35.3 million and the P90 value is \$36.9 million.

The probability distribution of the owner's commissioning and close-out costs is depicted in Figure 8.

Figure 8: Probability Distribution of Owner's Cost of Commissioning and Close-Out



Owner Commissioning and Close-Out Cost

As shown in Figure 8, the mean value is \$6.8 million and the P90 value is \$7.9 million.

VI.C.1.b. Spend Plan for the Owner's Cost

Our estimated spend plan for the owner's cost is presented below and includes a small amount in 2012 to capture costs associated with drafting the statement of work for the project, solicitation of proposals, and selecting an EPC contractor prior to contract award. The amount in 2018 includes a management reserve of \$8.5 million and certain commissioning costs. Amounts in 2019 incorporate commissioning and contract close-out costs.

Table 15: Owner's Cost Spend Profile (Dollars in Millions)

| Year | Owner's Cost | Commissioning Costs | Total |
|-------|--------------|------------------------|--------|
| 2012 | \$3.3 | N/A | \$3.3 |
| 2013 | \$2.8 | N/A | \$2.8 |
| 2014 | \$3.6 | N/A | \$3.6 |
| 2015 | \$3.8 | N/A | \$3.8 |
| 2016 | \$4.3 | N/A | \$4.3 |
| 2017 | \$4.4 | N/A | \$4.4 |
| 2018 | \$13.1 | \$4.8 | \$17.9 |
| 2019 | N/A | \$2.0 | \$2.0 |
| Total | \$35.3 | \$6.8 | \$42.1 |

VI.D. Step 5: Financing Cost

A project like the D2O Storage Project can be financed in any of several ways, including, for example, accumulating all principal and compound interest for the entire duration of the project in a construction loan account. For regulated utility companies in Ontario, we understand a more typical approach is to capture construction costs in a Construction Work in Progress ("CWIP") account, which incurs a carrying charge (simple interest) at a prescribed interest rate. As elements of a project are deemed used and useful in a partial in-service process, they are moved from CWIP into rate base and are no longer subject to the carrying charge. In our analysis, we assume that each year's capital cost in our modeled six-year spend plan sits in CWIP and is subject to an interest charge for an average of two years before the corresponding elements of the project are declared in-service and moved into rate base. We believe this is a conservative approach, which is consistent with the assumptions made in Section IV of this report, and comports with our experience on similar projects.

To implement this approach, we calculate two years of simple (not compound) interest on the annual cost developed in Steps 1 through 4, using OPG's applicable project financing interest rate in each year.³⁶ The sum of these annual interest charges is the overall financing cost for the project. Project financing interest rates used by OPG are shown in Table 16 below. In calculating the estimated financing costs, the rates at the end of the year were used for consistency. Our cost model assumes end-of-year dollar values for all costs incurred in 2012–2018. We note that, instead of the year-end rate, we use a rate of 4.3% for commissioning costs incurred in the first four months of 2019. This figure is interpolated between the end-of-year rates for 2018 and 2019.

| Year | Average Annual Rate | End-of- Year Rate |
|------|------------------------|----------------------|
| 2012 | 5.06% | 5.03% |
| 2013 | 5.03% | 5.03% |
| 2014 | 5.03% | 5.03% |
| 2015 | 5.15% | 5.26% |
| 2016 | 5.26% | 5.23% |
| 2017 | 5.02% | 4.89% |
| 2018 | 4.45% | 4.40% |
| 2019 | 4.24% | 4.08% |

Table 16: Annual Project Financing Interest Rates, 2012 through 2019

³⁶ Project financing rates provided by OPG.

VI.D.1. Probability Distribution of Financing Cost

Because of uncertainty in year-end costs, we estimated financing costs commensurate with uncertainty in the underlying project costs. We concluded that the cost would be **\$45.6 million**, with a **P90 value of \$47.7 million**.

The probability distribution of the financing cost is depicted in Figure 9.

Figure 9: Probability Distribution of Financing Cost



Financing Cost

VI.D.2. Spend Plan and Annual Financing Cost

Our estimated spend plan and calculated financing cost are depicted in Table 17. This includes financing costs associated with spending related to owner's contracting efforts prior to the contract award. Further detail on the financing costs is provided in <u>Appendix H.</u>

| Year | Cost Requiring Financing for Two Years | Interest Rate ³⁷ | Financing Cost (Interest Charge) |
|-------|---|--------------------------------|---|
| 2012 | \$3.3 | 5.03% | \$0.2 |
| 2013 | \$65.9 | 5.03% | \$3.5 |
| 2014 | \$77.2 | 5.03% | \$7.2 |
| 2015 | \$80.7 | 5.26% | \$8.3 |
| 2016 | \$81.4 | 5.23% | \$8.5 |
| 2017 | \$72.3 | 4.89% | \$7.5 |
| 2018 | \$82.0 | 4.40% | \$6.8 |
| 2019 | \$2.8 | 4.30% | \$3.6 |
| Total | \$465.7 | | \$45.6 |

Table 17: Estimated Spend Plan and Financing Cost (Dollars in Millions)

³⁷ The 2019 interest rate is an interpolation of the end-of-year 2018 rate of 4.40% and the end-of-year 2019 rate of 4.08% as costs were incurred in the first four months of 2019.

VI.E. Summary of Costs

The total of the above costs is our cost estimate for the D2O Storage Project from design up to and including facility commissioning and project close-out. The **mean estimated cost is \$512.1 million**, summarized in Table 18 below. The assumed construction period comprised the six years 2013–2018. The accuracy level of this estimate is Class 2, which implies that we are 80% confident that the costs fall in a range between +15% above and -10% below our point estimate of \$512.1 million. The corresponding **P90 cost is \$559.4 million**.

Table 18: D2O Storage Project Construction Cost Estimate (Dollars in Millions), 2013-2019

| | Cost |
|--|---------|
| EPC contractor costs | |
| Direct costs w/o fee and contingency | \$303.3 |
| Fee and contingency | \$46.6 |
| Direct costs with fee and contingency | \$349.9 |
| Indirect costs | \$69.9 |
| EPC commissioning support | \$4.5 |
| EPC contractor total project cost | \$424.3 |
| Owner's costs | |
| Owner's cost less financing, commissioning and close-out | \$35.3 |
| Owner's commissioning and close-out costs | \$6.8 |
| Total project cost less financing | \$466.5 |
| Financing cost | \$45.6 |
| Total cost | \$512.1 |

VII. CORROBORATING ANALYSES

The FOAK nature of the D2O Storage Project makes the determination of definitive comparable estimates of total construction cost difficult. The following analyses are provided to document assessments we performed of the reasonableness of our cost estimate.

VII.A. Consistency with EMWG and EIA Data

In other sections of this report, we have discussed our use of insights, data, and methods described in guidance documents developed by the EIA³⁸ and the Generation IV International Forum's Economic Modelling Working Group (EMWG)³⁹. In this section, we will use several of the reported results contained in these two guides to provide insight on the reasonableness of several of our estimates of direct costs.

In Section VI.A, we discuss and then tabulate the direct EPC costs (materials plus labour) associated with constructing the D2O Storage Project. In that section, we report this value in several formats. For purposes of this comparison, we evaluated the reasonableness of the relative fractions of direct costs (materials plus labour) estimated for civil, mechanical, and electrical portions of the project; we derived these costs for the D2O Storage Project using detailed data reported in <u>Appendix D</u>. We evaluate reasonableness by comparing our derived costs with the relative proportions of such costs that are estimated by EIA for new nuclear construction projects and by EMWG for historical nuclear construction projects.

A comparison between the EIA data and our estimates, based on the percentage of total direct cost (material plus labour), appears in Table 19 below.

³⁸ US Energy Information Administration, *Capital Cost Estimates for Utility Scale Electricity Generating Plants*, Independent Statistics and Analysis report series, November 2016, Section 12, "Advanced Nuclear."

³⁹ Generation IV International Forum, *Cost Estimating Guidelines for Generation IV Nuclear Energy Systems* (Revision 4.2), September 26, 2007, Appendix G.

Table 19: Corroboration of Cost Breakdown (Percent of Direct Costs)

| Cost category | D2O Storage Project estimate (from data in Appendix D) | EIA | EMWG | Average (of three estimates) | Standard deviation (%) |
|-------------------------|--|-----|-------|------------------------------------|------------------------------|
| Civil construction | | | | | |
| (Materials + Labour) | 23.8% | 30% | 20.2% | 24.7% | 5.0 |
| Electrical construction | | | | | |
| (Materials + Labour) | 18.8% | 11% | 14.1% | 14.6% | 3.9 |
| Mechanical construction | | | | | |
| (Materials + Labour) | 57.4% | 59% | 65.8% | 60.7% | 4.5 |

It can be seen from the above comparison that our estimates generally fall within plus/minus one standard deviation of the average of all three. This comparison provides an indication that our construction cost estimate for the D2O Storage Project is broadly consistent with other nuclear project data.

VII.B. Lang Factor Analysis

Lang factors were introduced by H. J. Lang in *Chemical Engineering* magazine in 1947 as a method for estimating the total installation cost for plants and equipment.⁴⁰ Similar to nuclear facilities, chemical processing facilities require large outlays of capital, can take extended periods to construct, and are subject to enhanced regulatory scrutiny during their design and construction. The Lang factor is estimated as the ratio of the total cost of building a facility to the cost of its major technical components. The costs included in deriving the Lang factors include "delivered process equipment cost, material and labour for site improvements, foundations, steel, buildings piping, electrical, controls, both design and construction costs, and overhead costs including insurance, taxes, contingency, field and office expense, temporary construction facilities, and contractor fee."⁴¹ They do not include owner's costs such as land, interest during construction, and O&M.

The application of the Lang factor can be expressed as follows:

Total installed cost = Equipment cost * Lang factor

While construction materials and methods have changed substantially since Lang factors were first introduced in the late 1940s, they continue to be updated, cited, and used today. Based on a recent and much larger dataset than the one used to derive the original Lang factors, the average Lang factor for a chemical liquid process plant is estimated at 5.12.⁴² A chemical liquid process project is the type of project most similar to the D2O Storage Project for which Lang factors are provided. In discussing the range of values for the Lang factor, the author of the study noted that for those projects with estimated Lang factors in the range of 7 to 10, the "prevalent, common trait [was a] process requiring very large steel structures and vertical pipeways."⁴³ This is also noted by the EIA, which states, "Lang factors vary slightly between processing plant type" for certain costs, but "the cost for piping for fluid processing plants is significantly larger than the cost for plants processing more solid materials."⁴⁴ The figure below illustrates the range of Lang factors encompassing the mean of 5.12.

⁴⁰ Hans J. Lang, "Cost Relationships in Preliminary Cost Estimation," *Chemical Engineering* (October 1947); Hans J. Lang, "Simplified Approach to Preliminary Cost Estimates," *Chemical Engineering* (June 1948).

⁴¹ T. E. Wolf, "Lang Factor Cost Estimates, 2013, available at <u>http://www.primgrcap.com/langfactorestimating.html.</u>

⁴² Wolf's database of over 200 projects was reduced to include on EPC projects. The resulting sample of 58 projects comprised 55% refining projects and 45% petrochemical and chemical, with 25% being under \$30 million and 50% under \$100 million in cost. The project data were collected over a period of more than 40 years.

⁴³ T. E. Wolf, "Lang Factors, an Update," citing T. E. Wolf, "An Update on Lang Factors," *Hydrocarbon Processing*, vol. 94, no. 8 (2015), *available at* <u>http://primgrcap.com/estimateslangfactorupdate.html</u>

⁴⁴ US Energy Information Agency, "Engineering Economic Analysis Guide: Liquid Fuels Technologies," December 2015.

Figure 10: Lang Factor: Total Installed Cost (TOT) to Equipment Cost, fluid process plants, n=5845



To our knowledge, there is no Lang factor specific to a nuclear processing plant. We were able to identify a PhD dissertation from Iowa State University titled "Reprocessing of Long-Cooled Nuclear Fuel: Process Description and Plant Design," which in part addressed the costs of a nuclear chemical processing plant. The author states that a Lang factor, defined as the sum of the Lang factors for each subcomponent, can be used to determine the cost for a nuclear reprocessing plant.⁴⁶ Further, the author notes that the "major components of the [fixed capital cost] for a nuclear reprocessing plant and a conventional chemical plant can be assumed to be the same; however, in the case of nuclear reprocessing, radioactivity and criticality considerations lead to inclusion of additional items.⁷⁴⁷ Therefore, "Because of the stringent specifications of a nuclear reprocessing plant, usually the most conservative (highest) values for the subfactors have been chosen.⁷⁴⁸

Based on the above, for the D2O Storage Project, given the complexities of both the build and the systems involved, there is no reason to believe that the appropriate Lang factor would be any less than the 5.12 factor appropriate for a liquid chemical liquid processing plant. However, given that the hazards associated with the D2O Storage Project include radioactivity, but do not involve a nuclear criticality concern, its hazards can be assessed as somewhat higher than a typical process chemical facility, but not as high as a nuclear fuel reprocessing facility. The range of Lang factors above this level suggest that somewhat higher potential total construction cost estimates could be appropriate, but herein we have maintained use of 5.12 to be conservative.

In our analysis, total materials cost equates to the cost of all elements on the BOQ. The total installed costs for these items are approximately \$97.9 million on a deflated, then-year basis. These costs are derived from data in Table 8 and Table 10, summing the totals for each table. Multiplying the \$95.4 million by 5.12, which represents a conservative estimate of the factor appropriate for a nuclear processing plant, results in estimated total construction costs for the D2O Storage Project of approximately **\$488.5 million**, excluding financing cost. This falls within approximately 5% of our total cost estimate of \$466.5 million (excluding financing cost).

Applying a higher Lang factor to reflect a *nuclear* construction project (as is frequently done) would of course produce an even higher estimated cost.⁴⁹

133. ⁴⁸ Okan H. Zabunoglu, "Reprocessing of Long-Cooled Nuclear Fuel: Process Description and Plant Design" (PhD diss. Iowa State University, 1988),

 ⁴⁵ T. E. Wolf, "Lang Factors, an Update," citing T. E. Wolf, "An Update on Lang Factors," *Hydrocarbon Processing*, 94, no. 8 (2015), Figure 2, available at http://primgrcap.com/langfactorestimating.html.
⁴⁶ Okan H. Zabunoglu, "Reprocessing of Long-Cooled Nuclear Fuel: Process Description and Plant Design" (PhD diss. Iowa State University, 1988), p.

 ⁴⁷ Okan H. Zabunoglu, "Reprocessing of Long-Cooled Nuclear Fuel: Process Description and Plant Design" (PhD diss. Iowa State University, 1988), p.

pp. 134–35. ⁴⁹ Applying a Lang factor of 6.862, representing one standard deviation above the mean value of 5.12, results in an estimated cost of approximately \$582 million.

VII.C. Comparables

As noted, the D2O Storage Project is a FOAK facility and directly comparable projects do not exist. There are, however, two DOE nuclear projects designed to process radioactive materials which have been constructed, or have been under construction, during the same overall time period, such that the costs for these projects could potentially be useful as a means to test the reasonableness of our estimate for the D2O Storage Project.

The DOE projects are the Salt Waste Process Facility ("SWPF"), located at the Savannah River Site in Aiken, South Carolina, and the Integrated Waste Treatment Unit ("IWTU"), located at the Idaho National Laboratory in Idaho Falls, Idaho. Members of the Bates White team have first-hand knowledge of these projects. Both represent large nuclear facilities that perform chemical processing functions on radioactive liquids. The materials that they process are at a somewhat elevated hazard level from the heavy water processed and stored in the D2O Storage Project. However, similar to the D2O Storage Project, they contain large runs of process piping and significant tankage, coupled with electrical and service systems, together with automated instrumentation and controls. Also, similar to the D2O Storage Project, they were constructed on existing nuclear facility sites, with the potential for dealing with contaminated soil and industrial congestion, and are subject to strict nuclear safety and guality requirements. Additional information is found in Appendix I.

Estimates of the cost of the D2O Storage Project with reference to the costs for these projects can be made on a variety of bases. These include relative values for linear feet of process piping, quantity of storage, and facility square footage. The table below presents these data for the D2O Storage Project:

Table 20: D2O Storage Project Information

| | D2O Storage Project |
|---|---------------------|
| Linear feet of process piping | 31,000 |
| Liquid storage capacity (m ³) | 2,100 |
| Size (ft ²) | 32,750 |

Utilizing the corresponding data for the SWPF and IWTU projects, estimated costs for the D2O Storage Project can be derived by applying the relative value of the D2O Storage Project data to the cost of the US DOE comparable. The results are shown in the tables below using the relative square footage for both projects and relative amount of process piping for the SWPF project.⁵⁰ Other data were either unavailable or produced estimates for the cost of the D2O Storage Project which we considered to be unreasonable, as they were either extremely low or extremely high.⁵¹

Our estimated D2O Storage Project costs falls well within, and toward the low end of, the range (\$394 million to \$849 million) produced by this analysis.

Table 21: Estimated Cost of D2O Storage Project Based on SWPF

| | D2O Storage Project | SWPF Project | Relative Factor | Estimated D2O Storage Project Cost (dollars in millions) |
|-------------------------------|---------------------------|-----------------|--------------------|--|
| | (1) | (2) | (3) = (1)/(2) | (4) = (3) * \$3.05bn |
| Linear feet of process piping | 31,000 | 111,341 | 0.28 | \$849 |
| Size (ft ²) | 32,750 | 140,000 | 0.23 | \$713 |
| Cost of project – CAD billion | | \$3.05 | | |

⁵⁰ To the extent that the costs for the two DOE projects are not calculated on the same basis as our estimate of \$512.1 million (*i.e.*, as the sum of asspent dollars), the estimated D2O Storage Project costs derived using the costs for the DOE projects may be too high. ⁵¹ Utilizing relative storage capacity at the SWPF produced an estimated cost for the D2O Storage Project of less than \$25 million calculated as

^{(2,100/320,000)*\$3.05} billion. In the case of the IWTU, the relative storage at the D2O Storage Project was over four times larger than the DOE project resulting in an estimated cost of more than \$5 billion for the D2O Storage Project calculated as (2,100/517.4) * (\$1.31 billion).

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 33 of 350

CONFIDENTIAL ATTORNEY WORK PRODUCT

Table 22: Estimated Cost of D2O Based on IWTU

| | D2O Storage Project | IWTU Project | Relative Factor | Estimated D2O Storage Project Cost (dollars in millions) | |
|-------------------------------------|---------------------------|-----------------|--------------------|--|----------------------|
| | (1) | (2) | (3) = (1)/(2) | (4a) = (3) * \$1.31bn | (4b) = (3) * \$635 m |
| Size (ft ²) | 32,750 | 53,000 | 0.62 | \$809 | \$394 |
| Cost of project – CAD billion | | \$1.31 | | | |
| Construction complete – CAD million | | \$635 | | | |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 34 of 350

Appendix A. Team Members

GLENN R. GEORGE, MBA, PE, PHD

Partner, Bates White Economic Consulting

AREAS OF EXPERTISE

- Expert testimony in regulatory proceedings and litigation matters
- Regulatory strategy, asset valuation, and transaction support
- Technical and financial assessment of energy technologies and projects
- Construction disputes (construction cost and delay analysis)
- Economic analysis of nuclear power plants and related facilities

EDUCATION

- PhD, Public Policy (with a focus on energy economics and regulation), Harvard University
- Certificate, Nuclear Engineering, Bettis Reactor Engineering School, US Department of Energy
- MBA, with Distinction, Cornell University
- BS, Engineering, with Distinction, Cornell University

SUMMARY OF EXPERIENCE

Dr. Glenn R. George is a seasoned advisor and expert witness in the global power and utilities, nuclear, oil and gas, mining, manufacturing, water, chemical/petrochemical, transport, and related infrastructure sectors. Drawing on his background as an engineer, economist, and business manager, he applies deep expertise in strategy, policy, regulation, technology, finance, and risk assessment to business challenges facing companies, regulators, and investors. His areas of specialization include asset valuation, risk assessment, and regulatory testimony, together with power generation (especially nuclear). His consulting work addresses regulatory strategy, transactions, and new business models, while his litigation support work focuses on complex commercial litigation and international arbitration related to energy facilities, contract disputes, and construction delays and cost overruns.

In prior positions, Dr. George served at US Office of Naval Reactors and US Defense Nuclear Facilities Safety Board, with responsibility for (*inter alia*) nuclear facility planning, cost estimation, and construction. He remains an active member of numerous organizations, including the American Economic Association, American and International Bar Associations, American Nuclear Society, and the American Society of Mechanical Engineers. In 2011 he was awarded the American Nuclear Society Presidential Citation for his response to the Fukushima accident. He is a registered professional engineer (PE) in the District of Columbia.

RELEVANT TESTIMONY

Expert witness (2019-present) on behalf of defendants in *Eddystone Rail Company, LLC* v. *Bridger Logistics*, et al., an ongoing litigation matter in the US Court for the Eastern District of Pennsylvania. The case involves a contract dispute regarding an oil transloading facility in Eddystone, Pennsylvania. The facility, which was built, owned, and operated by plaintiff, was used as part of defendants' logistics chain, whereby crude oil from



North Dakota was ultimately shipped to a refinery on the Delaware River. Plaintiff alleges that, among other wrongful actions, defendants abandoned the business of transporting oil when prices dropped in 2015-2016, effectively stranding plaintiff's USD170 million investment in the transloading facility. Analysis addressed defendants' counterclaim that, but for construction delays and various inadequacies in the design and operation of the transloading facility, significantly more oil could have been shipped to the refinery and additional profits made from use of the facility while oil prices remained favorable. Expert report quantified those counterclaim damages in a series of five counterfactual scenarios, opining that the counterclaims might total as much as USD74 million.

- Expert witness (2018-present) on behalf of defense in *Desert Sunlight 250, LLC, and Desert Sunlight 300, LLC* v. *United States*, an ongoing matter in the US Court of Federal Claims (COFC 17-1826C). Plaintiffs seek nearly USD60 million in damages stemming from their reduced payments pursuant to Section 1603 of the American Recovery and Reinvestment Act of 2009, which provided for a cash grant in lieu of tax credit for certain qualified investments in renewable energy property, including solar power projects. Dr. George's expert reports address whether plaintiffs' claimed cost basis (in excess of USD2 billion) properly excludes any intangible, grant-ineligible property and whether the US Treasury should award any additional amounts. Testimony presents an analysis of intangible property included in plaintiffs' claimed basis, including abovemarket power purchase agreements and a US Department of Energy loan guarantee.
- Expert witness (2018-present) on behalf of defense in *Silver State Power South, LLC v. United States*, an ongoing matter in the US Court of Federal Claims (COFC 18-266T). Plaintiff seek nearly USD140 million in damages stemming from its reduced payment pursuant to Section 1603 of the American Recovery and Reinvestment Act of 2009, which provided for a cash grant in lieu of tax credit for certain qualified investments in renewable energy property, including solar power projects. Dr. George's expert reports address whether plaintiff's claimed cost basis (nearly USD1 billion) properly excludes any intangible, grant-ineligible property and whether the US Treasury should award any additional amounts. Testimony presents an analysis of intangible property included in plaintiff's claimed basis, including an above-market power purchase agreement and an indemnity provision.
- Expert testimony and analytical support (2017-2018) on behalf of Uganda in *Democratic Republic of the Congo* v. *Uganda*, an ongoing matter at the International Court of Justice at The Hague. Developed an exhaustive critique of the damages methodology employed by the DRC.
- Expert testimony and analytical support (2016-2017) on behalf of ATK/EnergySolutions in a prominent procurement dispute against the UK Nuclear Decommissioning Authority (NDA) in the Supreme Court of the UK (*ATK* v. *NDA*, UKSC 34). The matter involved a GBP 6.1 billion contract to decommission nuclear facilities in the UK. As lead expert witness, helped develop detailed cost estimates for decommissioning a large number of nuclear sites, foregone fees from the contract, and lost profits from future opportunities in the global decommissioning market, all within a complex but-for analysis. The case settled.
- Expert witness on behalf of the US Department of Justice in a confidential matter (2016–2017) involving valuation of a 6 GW portfolio of power generation assets in North America. The matter settled.
- Expert witness in a confidential matter (2016) involving valuation of a 4 GW portfolio of power generation assets in North America in connection with a bankruptcy filing.
- Expert witness on behalf of applicant before the Regulatory Commission of Alaska (2015–2016). At issue in the rate case was the applicability of the Operating Ratio method of rate regulation.
- Expert witness on behalf of defense in *HEAL Utah*, et al. v. *Kane County Water Conservancy District*, et al., in Utah District Court for the 7th District of Utah (No. 120700009). Plaintiffs sought relief, which would have been tantamount to a government expropriation of nuclear power plant development rights associated with a tract of land. The Court rejected the claim *in toto* and accepted the testimony given on behalf of the defendant.

- Expert witness on behalf of defense in the matter *DOCA Company, as Successor to Caldon Company Limited Partnership v. Advanced Measurement and Analysis Group Inc. and Westinghouse Electric Company, LLC*, in US District Court for the Western District of Pennsylvania (Civil Action No. 04-1951). Addressed the claimed quantum of damages due to alleged Lanham Act violation. The case settled.
- Submitted expert testimony on behalf of defense in ARRA *Energy Company I, ARRA Energy Company II, and ARRA Energy Company v. United States*, in the US Court of Federal Claims (COFC No. 10-84C). Case involved government funding for certain infrastructure projects. Addressed the claimed quantum of damages due to alleged foregone future sales resulting from an abrupt change in public policy. The case settled.
- Expert witness on behalf of defense in *Arbitration under the International Commercial Arbitration Act (Ontario), Between Cameco Bruce Holdings II Inc.*, et al., *and British Energy Ltd.*, et al. Case involved sale of a nuclear power plant in Canada. Addressed the condition of certain key components and systems at the time of sale; the adequacy of disclosure of those conditions pursuant to the purchase and sale agreement; the appropriateness of the operator's corrective actions; and the potential impact on plant operation, projected life, value, and quantum of damages.
- Served as a non-testifying expert in a confidential international arbitration concerning significant schedule delays and cost overruns in construction of the Olkiluoto 3 nuclear power plant in Finland.
- Expert witness on behalf of defense in *Consolidated Edison Company of New York, Inc. v. United States*, in the US Court of Federal Claims (COFC No. 04-0033C). The case involved one of the largest damage claims against the US government, involving Indian Point power plant. Addressed both liability for and quantum of damages. The court denied the claim *in toto*.

RELEVANT CONSULTING EXPERIENCE

Advised the Government of Dubai on its nuclear power construction program (2018-2019).

- Provided lead commercial due diligence support to the US Department of Energy (DOE) Loan Program Office in connection with over USD20 billion in proposed loan guarantees to support four new nuclear power plants a proposed uranium enrichment plant (2009-2017), and a dozen other (non-nuclear) facilities.
- On behalf of the UK government (2016), performed a cost-benefit analysis of its nuclear regulatory regime.
- Advised a major investor-owned electric utility company in the Midwest on a strategy for new nuclear generation capacity, with an emphasis on the value of the utility's construction/operating license (2014–2015).
- Advised Tokyo Electric Power Co. and the government of Japan (METI) in multiple projects on electric power market reform in Japan, to create regulatory mechanisms for recovery of Fukushima accident-related cleanup and nuclear compensation costs, and to determine the contours of competitive electric retailers in the future market and the role of nuclear power in that market (2013–2015).
- Assessed Federal Energy Regulatory Commission formula ratemaking processes at a major northeastern utility company and for a regional transmission organization (2013–2014).
- Advised the government of Lithuania on the acquisition of new nuclear power plants to replace the Ignalina nuclear station. The analysis addressed the relative cost (both up-front capital and levelized over the lifetime of the generation asset) of nuclear and various competing non-nuclear generation technologies.
- Provided strategic advice and analysis to Exelon Corp. regarding its new nuclear power plant projects.
- In a series of engagements (2006-2010) with Atomic Energy of Canada, Ltd. (AECL), provided strategic advice to senior management regarding AECL's product line, global sales initiative, US market entry and licensing strategy, refurbishment business, and other matters.

Assisted the Ontario IESO (1999) in its establishment; creation of market rules; and implementation of underlying policies, procedures, and systems to enable Ontario's transition to a competitive wholesale market.

RELEVANT PUBLICATIONS

- "Electricity Market Reform in Japan: Bumpy Road Ahead" (with Hans-Martin Ihle and Miura Wataru) *Public Utilities Fortnightly*, 154, no. 8 (August 2016), pp. 18–25.
- "Beyond Loan Guarantees: Fostering US Nuclear Investment in a Post-Fukushima World" (with Collin Cain). Conference paper, Center for Research in Regulated Industries, Rutgers University, May 2011.
- "Nuclear Development Snapshots" (with Edward Kee). Energy in East Europe 177 (2009), pp. 7-9.
- "Financing New Nuclear Capacity: Will the 'Nuclear Renaissance' Be a Self-Sustaining Reaction?" *Electricity Journal* 20, no. 3 (2007), pp. 12–20.
- "The Naval Reactors Program: From *Nautilus* to the Millennium" (with Lisa Megargle George). *Nuclear News*, October 1998, pp. 26–33.
- "Negotiated Safety: Intragovernmental Risk Regulation in the US Nuclear Weapons Complex." PhD dissertation, Harvard University, 1995.
- "Naval Nuclear Aspects of Cooperative Denuclearization." In *Cooperative Denuclearization: From Pledges to Deeds*, Graham T. Allison, Ashton B. Carter, Steven E. Miller, and Philip Zelikow, eds. Cambridge, MA: Harvard University, 1993.

STEVEN L. KRAHN, DPA, BCEE

Affiliated Expert, Bates White Economic Consulting

AREAS OF EXPERTISE

- Nuclear and chemical process systems engineering
- Complex construction cost analysis
- Safety analysis
- Regulatory analysis

EDUCATION

- Doctorate, Public Administration, University of Southern California, 2001
- MS, Materials Science, University of Virginia, 1994
- BS, Metallurgical Engineering, University of Wisconsin, 1978
- Certificate (MS Equivalent), Nuclear Engineering, Bettis Reactor Engineering School, US Department of Energy, 1980
- Certificate, Management and Leadership, The Sloan School, Massachusetts Institute of Technology, 2009

SUMMARY OF EXPERIENCE

Dr. Krahn is Professor of the Practice of Nuclear Environmental Engineering in the Department of Civil and Environmental Engineering at Vanderbilt University, where he teaches three courses in high-hazard facility environmental engineering, performs research, and consults to the industry. Immediately prior to joining Vanderbilt, he served in the US Department of Energy as the Deputy Assistant Secretary (DAS) for Safety & Security, where he provided senior technical leadership to DOE's USD 6-7B/year nuclear waste processing/management, and environmental restoration program and was the senior executive responsible for approving nuclear safety bases for high-hazard facilities. He is an internationally recognized expert in the construction and engineering associated with nuclear facilities and, together with Dr. George, was retained as an expert witness before the UK High Court in *ATK* v. *NDA*, the largest nuclear construction case in UK history.

Dr. Krahn has more than 40 years of nuclear safety, systems engineering, and regulatory/regulatory analysis/interface experience, along with leadership in technical and project management, in positions of increasing responsibility in government, private industry and the military. Some of his work highlights include:

- For five years led the federal organization responsible for independent nuclear safety and worker safety oversight/regulation of the US nuclear weapons complex.
- Provided technical and regulatory consulting to a major, industry-led revamping of the regulatory process for advanced nuclear technologies—including several briefings to the NRC Staff and a briefing to the NRC Advisory Committee on Reactor Safeguards ("ACRS").
- Elected to the ASME Plant Standards Committee on Plant Systems Design, Subcommittee on Risk-Informed Design of Hazardous Facilities
- Served as Deputy Technical Director of an independent nuclear safety oversight and systems engineering technical review of the major US environmental restoration and nuclear weapons complex and programs.
- Led applied research programs that provided risk assessment and regulatory analysis/risk communication insights regarding the potential use of MOX fuel for a large southeastern US electrical utility.

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 38 of 350



- Technical direction and leadership for a major DOE engineering and research program in waste processing and process chemistry.
- Direction and management of a USD25 million division in an engineering services company, which provided nuclear/ES&H regulatory analysis and high hazard systems engineering consulting to the commercial power industry, NASA, and the DOE.
- Technical and regulatory review of numerous, complex engineering and systems issues at nuclear reactors and processing facilities, radioactive waste processing plants, and environmental restoration projects.
- His technical project management highlights include:
- Participation in the independent technical, project management and cost review of a major new radioactive waste process system design for the USD16B+ Waste Treatment Plant at the Hanford Site
- Developing the methodology and participating in the independent project management review of the completion schedule for the 4 billion (FY 2000 USD), 8-year Rocky Flats Environmental Restoration Project
- Technical direction of the USD30 million/year R&D program for a DOE program office focused on nuclear and chemical waste processing/management; and
- Leadership and management of the 140 (FY 1986 USD) million complex overhaul of a nuclear fast attack submarine and the nuclear work packages of two fast attack submarines.

RELEVANT PUBLICATIONS

- "Understanding and Effectively Managing Conservatisms in Safety Analysis of Non-Reactor Nuclear Facilities," with M. Modarres and J. O'Brien. *Nuclear Technology*, vol. 206, no. 11 (November 2020).
- "Comparing the Environmental Impacts of Uranium- and Thorium-Based Fuel Cycles with Different Recycle Options" (with T. Ault and A. Croff). *Progress in Nuclear Energy*, vol. 100 (May 2017): 114-134.
- "The Reemergence of the Thorium Fuel Cycle: A Special Issue of Nuclear Technology," with A. Worrall, *Nuclear Technology*, vol. 194, no. 2 (May 2016): iii-iv.
- "A Preliminary Analysis of Key Issues in Chemical Industry Accident Reports" (with L. Fyffe, J. Clarke, D. Kosson, and J. Hutton). *Safety Science*, vol. 82 (February 2016): 368-73.
- "Radiological Impacts and Regulation of Rare Earth Elements in Non-Nuclear Energy Production" (with T. Ault and A. Croff). *Energies*, vol. 8 (March 2015): 2066-081.
- "Assessment of the Potential of By-Product Recovery of Thorium to Satisfy Demands of a Future Thorium Fuel Cycle" (with T. Ault and A. Croff). *J. Nuclear Technology*, vol. 189, no. 2 (February 2015): 152–62.
- "Estimating Worker Collective Doses from a Revised Approach to Managing Commercial Nuclear Fuel" (with B. Burkhardt, A. Croff, and A. Sowder). *Radwaste Solutions*, vol. 22, no. 1 (January/June 2015).
- "Evaluating the Radiological Risk to Workers from the US Once-Through Nuclear Fuel Cycle" (with A. Croff, B. Smith, J. Clarke, A. Sowder, and A. Machiels). *J. Nuclear Technology*, vol. 185, no. 2 (February 2014): 192-207.
- "System of Systems Engineering—Past Emerging to Evolving?" invited article and special edition editor, *Int. J. System of Systems Engineering*, vol. 3, nos. 1&2 (2012): 12.

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 40 of 350

DAVID R. GALLAY, DSC, PE

Affiliated Expert, Bates White Economic Consulting

AREAS OF EXPERTISE

- Seasoned engineering manager and operations research analyst
- Project management
- Engineering economics
- Managerial finance

EDUCATION

- DSc, Engineering Management, The George Washington University, 2002
- MS, Systems Management, University of Southern California, 1981
- MS, Civil Engineering, Purdue University, 1978
- BS, Engineering, United States Military Academy, 1972
- Professional Engineer, Virginia

SUMMARY OF EXPERIENCE

Dr. Gallay has over 40 years of experience as an engineering manager and operations research analyst. He is currently an Associate Professor of Finance at George Mason University.

Previously, Dr. Gallay was vice president of Infrastructure Analytics at LMI, a nonprofit research and advisory organization. He also served as the senior LMI executive overseeing LMI's support to the US DOE's Office of Engineering and Construction Management in providing external independent reviews of major construction projects.

He has been retained repeatedly by US DOE senior management to serve on teams of outside experts to review the department's plans for investments in capital infrastructure to carry out high-cost initiatives, such as the design and construction of capital assets required for the disposal of the national stocks of surplus plutonium and the treatment of nuclear waste.

For the US Army Corps of Engineers, Dr. Gallay conducted a forensic cost analysis to determine the root cause of a five-fold cost overrun of the multi-billion-dollar replacement project of the Olmstead Lock and Dam on Ohio River.

For the state of Washington, he assessed the reasonableness and validity of the state's cost estimates, finance plans, and implementation plans of two multi-billion-dollar projects: the replacement of the Alaska Way Viaduct and the State Route 520 bridge.

RELEVANT PUBLICATIONS

"Review of Project Controls for the Olmsted Locks and Dam Project," LMI Report CE209T1 (with John P. Turbeville), April 2012.

"Chief Administrative Officer of the House of Representatives Workplace Requirements Needs Analysis and Feasibility Study," LMI Report HR001T1 (with Jonathan Adams, *et al.*), February 2011.



- "Removal versus Interim Safe Storage of the 100-KE Reactor Core: A Cost Comparison," LMI Report WSR 70T1, August 2009.
- "External Technical Review of the Hanford K Basins Sludge Treatment Project," Department of Energy (with David S. Kosson, *et al.*), June 2009.
- "External Technical Review of System Planning for Low-Activity Waste Treatment at Hanford," Department of Energy (with David S. Kosson, *et al.*), November 2008.
- "External Technical Review of the Plutonium Preparation Project at Savannah River Site," Department of Energy (with David S. Kosson, *et al.*), October 2008.
- "External Review of the Business Case Proposal for a Multipurpose Computational Data Center at ORNL,) LMI Report DE823T1 (with Kristie Bissell, *et al.*), September 2008.
- "Public-Private Partnerships for Financing Federal Capital: Useful or Chimerical," *Public Works Management & Policy*, 11 (October 2006): 139-51.
- "PNNL Lease Restructuring Proposal: Independent Review," LMI Report DE629T1 (with Amita Singh, *et al.*), July 2006.
- "Alternative Financing of the Science and Technology Laboratory at the Idaho National Laboratory," LMI Report DE630T1 (with Kristie Bissell, *et al.*), May 2006.
- "Acquiring Two Facilities at Pacific Northwest Laboratory Through Alternative Financing", LMI Report DE626T1 (with Amita Singh, *et al.*), March 2006.
- "Hanford Waste Treatment and Immobilization Plant Project: After-Action Fact-Finding Review," Report DE535T1 (with Jonathan Adams, *et al.*), January 2006.
- "Alternative Financing of the Theory and Computing Sciences Facility at Argonne National Laboratory," LMI Report DE533T1 (with Kristie Bissell), January 2006.
- "Alternatives to the Federal Aviation Administration's Alaska Region Housing Program," LMI Report CE503T1 (with Monisha Mittal, *et al.*), November 2005.
- "Alternative Financing of the Administrative and Technical Support Facilities at the Y-12 Complex," LMI Report DE525T1 Rev. 1 (with Kristie Bissell, *et al.*), February 2005.
- "Alternative Financing of the Multi-Program Research Facility at Oak Ridge National Laboratory," LMI Report DE522T1 Rev. 1 (with Kristie Bissell, *et al.*), November 2004.
- "National Park Service Alternative Housing Assessment," LMI Report INT20R1 (with Eve Meek), March 2003.
- "The Army's Facility Construction and Maintenance Process: An Assessment," LMI Report AR009R1 (with Mark Corfman, *et al.*), December 2000.

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 42 of 350

KAREN MORGAN, MA, CFA, CRRA

Manager, Bates White Economic Consulting

AREA OF EXPERTISE

- Utility cost of capital
- Utility finance and accounting
- Utility regulatory modeling
- Utility cost of service
- Utility rate regulation
- Canadian utility regulation

EDUCATION

- Certified Rate of Return Analyst (CRRA), 1995
- Chartered Financial Analyst (CFA), 1994
- MA, Economics, University of Western Ontario, 1983
- BA (Hons.), Economics, Queen's University at Kingston, 1982

SUMMARY OF EXPERIENCE

- On behalf of the Nova Scotia Utility and Review Board, provided oral and written testimony (with co-author) concerning the application by Nova Scotia Power Maritime Link Incorporated for approval of the 2020 Interim Cost Assessment (Matter M09277) and written testimony (with co-author) for approval of the 2021 Interim Cost Assessment (Matter M09810).
- On behalf of the Nova Scotia Utility and Review Board, provided oral and written testimony (with co-authors) concerning the application by Nova Scotia Power, Inc. for approval of its 2020–2022 Fuel Stability Plan (Matter M09288).
- On behalf of the Mississippi Public Utilities Staff before the Mississippi Public Service Commission in Docket No. 2015-UN-049 (Atmos Mississippi), provided Staff with an assessment of the rate rider as a tool to recover the costs, recommended enhancements and alternatives, and provided an assessment of the impact on the financial indicators of Atmos Mississippi of the rider as proposed and under various scenarios arising from the testimony of other witnesses.
- Supported the preparation of over 150 cost of capital studies and testimonies for presentation before public utility commissions in both the United States and Canada including the generic rate of return cases in both Alberta and British Columbia. Testimonies incorporated the assessment of the impact of business risk factors (*e.g.*, competition, rate design, contractual arrangements) on capital structure and equity return requirements.

Clients included electric utilities (ATCO Inc., Ameren, Maritime Electric, Newfoundland and Labrador Hydro, Newfoundland Power Inc., Northwest Territories Power Inc., Ontario Power Generation, Nova Scotia Power Inc.), pipelines (ATCO Pipelines, Enbridge Line 9, Laclede Pipeline, Plateau Pipeline, Platte Pipeline), gas utilities (AltaGas Utilities, Ameren, FortisBC Energy Inc., Enbridge Gas Distribution, Gazifére), water utilities (EPCOR – White Water, EPCOR – French Creek) and telecoms (Newfoundland Telephone, Northwestel, Stentor)



SELECTED OTHER WORK

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 43 of 350

| Client | Issue | Date |
|--------------------------------------|---|-------------|
| Nova Scotia Utility and Review Board | NSPI Base Cost of Fuel, Maritime Link | 2019, 2020 |
| Mississippi Public Utilities Staff | Hypothetical Capital Structures | 2018 |
| Hawaii Public Utilities Commission | RFP Assessment | 2018 |
| Ohio Public Utilities Commission | SSO and PIPP Auctions | 2018 - 2020 |
| Oregon Public Utility Commission | RFP Assessment | 2017 - 2019 |
| California Parties | Energy Crisis Settlements | 2017 - 2018 |
| Nova Scotia Utility and Review Board | NSPI FAM Monitor, Fuel Audit | 2017 - 2019 |
| Illinois Commerce Commission | Energy, Capacity and ZEC Auctions | 2017 - 2020 |
| New Jersey Board of Public Utilities | BGS FP and CIEP Auctions | 2017 - 2020 |
| Mississippi Public Utilities Staff | Transmission & Distribution Plan Analysis | 2016 - 2020 |
| National Biodiesel Board | Renewable Fuel Standards | 2016 - 2017 |
| International Chamber of Commerce | Petrochemical Contract Dispute | 2016 |
| Mississippi Public Utilities Staff | Purchased Power Agreements | 2015 |
| Occidental Chemical Corporation | Qualifying Facility | 2015 |
| Greater Toronto Airports Authority | Financial Performance Metrics | 2012 |
| Heritage Gas | Criteria for a Mature Utility | 2011 |
| Alberta Utilities | Management Fee on CIAC | 2011 |
| Maritimes & Northeast Pipeline | Return on Escrow Account | 2010 |
| Nova Scotia Power | Calculation of ROE | 2009 |
| Alberta Oilsands Pipeline | Cash Working Capital | 2007 |
| New Brunswick Power Distribution | Interest Coverage/Capital Structure | 2007 |
| Heritage Gas | Revenue Deficiency Account | 2006 |
| Hydro Québec | Cash Working Capital | 2005 |
| Nova Scotia Power | Cash Working Capital | 2005 |
| Ontario Electricity Distributors | Stand-Alone Income Taxes | 2005 |
| Caisse Centrale de Réassurance | Collateral Damages | 2004 |
| Hydro Québec | Cost of Debt | 2004 |
| Enbridge Gas New Brunswick | AFUDC | 2004 |
| Heritage Gas | Deferral Accounts | 2004 |
| ATCO Electric | Carrying Costs on Deferral Account | 2001 |
| Newfoundland & Labrador Hydro | Rate Base, Cash Working Capital | 2001 |
| Gazifère Inc. | Cash Working Capital | 2000 |
| Newfoundland & Labrador Hydro | Cost of Service | 2000 |
| Gas Company of Hawaii | Cost of Service | 2000 |

Appendix B. Information Considered and Relied Upon

Documents Received from OPG

| Description | Unique Document Count |
|---|-----------------------------|
| Animation of D2O Build | 1 |
| DNGS HWMB WA Overview 3D Animation rev PA.mp4 | 1 |
| Approvals | 7 |
| 2006 Developmental Release BCS.pdf | 1 |
| 2011 Draft Developmental BCS.pdf | 1 |
| 2012 Full Definition BCS.pdf | 1 |
| 2012 Partial Execution BCS.pdf | 1 |
| 2013 Full Execution BCS.pdf | 1 |
| 2015 Superseding Full Execution BCS.pdf | 1 |
| 2018 Superseding Full Execution BCS.pdf | 1 |
| BOQ comments from OPG | 1 |
| OPG comments.xlsx | 1 |
| CNSC Correspondence | 33 |
| Regulatory Correspondence_All HMBW West Annex Reg Corrs.xls | 1 |
| Regulatory Correspondence_August 2013 - August 2019, 32 CNSC and OPG letters | 32 |
| Design Documents | 13 |
| Design Plan ~12320-10001, 10002, 10004, 1005 (Several Revisions) | 11 |
| Design Plan with design rev R01.pdf | 1 |
| Modification Design Requirements 2017.pdf | 1 |
| Design Manual | 25 |
| Design Manual_Active Drainage_628411-0000-79710-45DM-0001_00.pdf | 1 |
| Design Manual_Beetles Leak Detection_628411-0000-63861-48DM-0001_00.pdf | 1 |
| Design Manual_Building Structure_628411-0000-23800-41DM-0001_00 accepted.pdf | 1 |
| Design Manual_Chilled Water_628411-0000-73870-45DM-0001_00.pdf | 1 |
| Design Manual_Cranes Hoist_628411-0000-76100-41DM-0001_00.pdf | 1 |
| Design Manual_D2O Clean Up_628411-0000-38410-45DM-0001_00.pdf | 1 |
| Design Manual_D2O Supply and TRF Feed_628411-0000-38110-45DM-0001_00.pdf | 1 |
| Design Manual_Downgraded D2O_628411-0000-38500-45DM-0001_00.pdf | 1 |
| Design Manual_Drum Handling_NK38-DM-38910-00001000.pdf | 1 |
| Design Manual_Electrical Distribution_NK38-DM-53000-00001 with acceptance stamp.pdf | 1 |
| Design Manual_FAA GM_628411-0000-62330-48DM-0001_00.pdf | 1 |
| Design Manual_FAA TM_628411-0000-62341-48DM-0001_00.pdf | 1 |
| Design Manual_Fire Protection_628411-0000-67870-48DM-0001_00.pdf | 1 |
| Design Manual_Fire Standpipe_628411-0000-60215-48DM-0001.pdf | 1 |

| Design Manual_Grounding DM_628411-0000-57600-47DM-0001 R00 (NK38-DM-57600 R001 | |
|--|---|
| Grounding) with acceptance.pdf | 1 |
| Design Manual_Hand Foot Monitors_628411-0000-62321-48DM-0001_00.pdf | 1 |
| Design Manual_HVAC_628411-0000-73690-45DM-0001_00.pdf | 1 |
| Design Manual_Inactive Drainage_628411-0000-79110-45DM-0001_00.pdf | 1 |
| Design Manual_Instrument Air_628411-0000-75160-45DM-0001_00.pdf | 1 |
| Design Manual_Liquid Recovery Sump Pump_628411-0000-38210-45DM-0001_00.pdf | 1 |
| Design Manual_PA_628411-0000-60215-48DM-0001.pdf | 1 |
| Design Manual_Stack Monitor_Accepted_NK38-DM-67989-10002 R001.pdf | 1 |
| Design Manual_Steam_628411-0000-73210-45DM-0001_00.pdf | 1 |
| Design Manual_Steam_628411-0000-73680-45DM-0002_00.pdf | 1 |
| Design Manual_Vapour Recovery_NK38-DM-38300-00001000.pdf | 1 |
| Dewatering Modification Design | 1 |

Dewatering Modification Design

Drawings-SPEC

Dewatering Modification Design Req.pdf

135

1

| 1. SPEC Document List.xlsx | 1 |
|---|---|
| Design_Specification_DS_NK38-SPEC-53300-00025 through 00027 | 3 |
| Design_Specification_MSD_NK38-SPEC-53300-00001, 00002, 00022, 00023_000.pdf | 4 |
| Design_Specification_NK38-SPEC-69891-10004_000.pdf | 1 |
| Design_Specification_NK38-SPEC-72709-10001_000.pdf | 1 |
| Design_Specification_NK38-SPEC-79110-10002_003.pdf | 1 |
| Design_Specification_NK38-SPEC-79710-10001 and 10002 | 2 |
| Design_Specification_NK38-TSE-57100-10016-00001 and 00002 | 2 |
| Design_Specification_Technical Specification_NK38-Technical Specification-23865-10001 through 10004 | 4 |
| Design_Specification_Technical Specification_NK38-Technical Specification-38000-10002_000.pdf | 1 |
| Design_Specification_Technical Specification_NK38-Technical Specification-38110-10003_000.pdf | 1 |
| Design_Specification_Technical Specification_NK38-Technical Specification-38500-10002_000.pdf | 1 |
| Design_Specification_Technical Specification_NK38-Technical Specification-53300-10001 through 10004 | 4 |
| Design_Specification_Technical Specification_NK38-Technical Specification-53508-10010 through 10013 | 4 |
| Design_Specification_Technical Specification_NK38-Technical Specification-56184-10007_000.pdf | 1 |
| Design_Specification_Technical Specification_NK38-Technical Specification-62330-10002_001.pdf | 1 |
| Design_Specification_Technical Specification_NK38-Technical Specification-62341-10002, 10004, | ~ |
| and 10000 | 3 |
| Design_Specification_Technical Specification_NK38-Technical Specification-63800-10002 and 10003 | 2 |
| Design_Specification_Technical Specification_NK38-Technical Specification-63861-10001_000.pdf | I |
| and 10006 | 3 |
| Design_Specification_Technical Specification_NK38-Technical Specification-65560-10001_000.pdf | 1 |
| Design_Specification_Technical Specification_NK38-Technical Specification-67270-10001_000.pdf | 1 |
| Design_Specification_Technical Specification_NK38-Technical Specification-67270-10002_000.pdf | 1 |
| Design_Specification_Technical Specification_NK38-Technical Specification-67369-10001_003.pdf | 1 |
| Design_Specification_Technical Specification_NK38-Technical Specification-67989-10004_002.pdf | 1 |
| Design Specification Technical Specification NK38-Technical Specification-73680-10003, 10111. | |
| 10113, and 10021 | 4 |
| Design_Specification_Technical Specification_NK38-Technical Specification-73870-10002 through 10004 | 3 |

_

| Design_Specification_Technical Specification_NK38-Technical Specification-76158-10001 through 10003 | 3 |
|---|-----|
| Design_Specification_Technical Specification_NK38-Technical Specification-79000-10001_000.pdf | 1 |
| Design_Specification_Technical Specification_NK38-TS-12320-10001-000.pdf | 1 |
| Design_Specification_TSE_NK38-SPEC-53300-00024_000.pdf | 1 |
| Design_Specification_TSE_NK38-TSE-53300-10002 through 10005 | 4 |
| Design_Specification_TSE_NK38-TSE-57100-10005_000.pdf | 1 |
| Design_Specification_TSE_NK38-TSE-57100-10012 - 10022 | 11 |
| Design_Specification_TSI_NK38-TSI-60230-60280-10001_000.pdf | 1 |
| Design_Specification_TSI_NK38-TSI-60414-10003_000.pdf | 1 |
| Design_Specification_TSI_NK38-TSI-60482-10001_001.pdf | 1 |
| Design_Specification_TSI_NK38-TSI-60482-10002_0001_001.pdf | 1 |
| Design_Specification_TSI_NK38-TSI-60712-10001 and 10002 | 2 |
| Design_Specification_TSI_NK38-TSI-60770-10003_001.pdf | 1 |
| Design_Specification_TSI_NK38-TSI-63800-10004_000.pdf | 1 |
| Design_Specification_TSI_NK38-TSI-63811-10001_000.pdf | 1 |
| Design_Specification_TSI_NK38-TSI-63821-10001_000.pdf | 1 |
| Design_Specification_TSI_NK38-TSI-67387-10001 and 10003 | 2 |
| Design_Specification_TSI_NK38-TSI-67870-10002_001.pdf | 1 |
| Design_Specification_TSI_NK38-TSI-67911-10001_000.pdf | 1 |
| Design_Specification_TSM_NK38-TSM-38000-10002_001.pdf | 1 |
| Design_Specification_TSM_NK38-TSM-38110-10003 through 10006 | 4 |
| Design_Specification_TSM_NK38-TSM-38300-10001_002.pdf | 1 |
| Design_Specification_TSM_NK38-TSM-38500-10002_000.pdf | 1 |
| Design_Specification_TSM_NK38-TSM-73680-10001 (2 revisions) and 10003 through 10005 | 5 |
| Design_Specification_TSM_NK38-TSM-73870-10002_002.pdf | 1 |
| Design_Specification_TSM_NK38-TSM-75160-10001_001.pdf | 1 |
| Design_Specification_VSS_NK38-VSS-38000-10006, 1007, 10014, 10015, 10018-10020 | 7 |
| Design_Specification_VSS_NK38-VSS-38110-10020-10022, 10025, 10027-10030, 10038 | 9 |
| Design_Specification_VSS_NK38-VSS-38210-10004_001.pdf | 1 |
| Design_Specification_VSS_NK38-VSS-38300-10001 and 10003 | 2 |
| Design_Specification_VSS_NK38-VSS-38410-10002_000.pdf | 1 |
| Design_Specification_VSS_NK38-VSS-38500-10008_000.pdf | 1 |
| Design_Specification_VSS_NK38-VSS-63811-10004_002.pdf | 1 |
| Design_Specification_VSS_NK38-VSS-73680-10009, 10019, 10024, and 10025 | 4 |
| Design_Specification_VSS_NK38-VSS-73870-10028, 10029, 10032, 10042, 10043, 10046 | 6 |
| Engineering Changes | 2 |
| Design_Engineering Change_DSGN-120349.pdf | 1 |
| Design_Engineering Change_DSGN-120352.pdf | 1 |
| Engineering Changes-DSGN | 120 |
| 1 EC List for Desument Library Honry Le vlay | 4 |

| 1. EC List for Document Library - Henry Lo.xlsx | 1 |
|---|---|
| Design_Engineering Change_DSGN-120226.pdf | 1 |
| Design_Engineering Change_DSGN-120340, 120341, 120343 (2 revisions), 120345 | 5 |
| Design_Engineering Change_DSGN-120351 & 120353 | 2 |
| Design_Engineering Change_DSGN-120364 - 120366 & 120369 | 4 |
| Design_Engineering Change_DSGN-120400 through 120406, 120408 & 120415 | 8 |

| Design_Engineering Change_DSGN-120421_Volume 1 through 5 | 5 |
|--|----|
| Design_Engineering Change_DSGN-120422 through 120424, 120427, 120428, 120448, 120452 | 7 |
| Design_Engineering Change_DSGN-120471 through 120479 (two revisions of several) | 12 |
| Design_Engineering Change_DSGN-120480, 120481, 120483, 120485, 120488 through 120494 (two revisions of two files) | 12 |
| Design_Engineering Change_DSGN-120523, 120557, 120577, 120588 | 4 |
| Design_Engineering Change_DSGN-120615, 120616, 120643, 120670 | 4 |
| Design_Engineering Change_DSGN-120719, 120720, 120784 | 3 |
| Design_Engineering Change_DSGN-120906.pdf | 1 |
| Design_Engineering Change_DSGN-121133, 121146 (two revisions), 121147 | 4 |
| Design_Engineering Change_DSGN-121318 through 121320, 121323, 121326, 121327 (two revisions of two files) | 8 |
| Design_Engineering Change_DSGN-121447 and 121579 | 2 |
| Design_Engineering Change_DSGN-121736_Volume 1 and 2 | 2 |
| Design_Engineering Change_DSGN-121805 and 121835 (2 revisions) | 3 |
| Design_Engineering Change_DSGN-122210, 122212, and 122222 | 3 |
| Design_Engineering Change_DSGN-123123, 123130, 123678, 123679 | 4 |
| Design_Engineering Change_DSGN-124052, 124304, 124819 | 3 |
| Design_Engineering Change_DSGN-125434.pdf | 1 |
| Design_Engineering Change_DSGN-127218 and 127532 | 2 |
| Design_Engineering Change_DSGN-129058.pdf | 1 |
| Design_Engineering Change_DSGN-133014, 133064, 133066 | 3 |
| Design_Engineering Change_DSGN-135082.pdf | 1 |
| Design_Engineering Change_DSGN-135347.pdf | 1 |
| Design_Engineering Change_DSGN-137109, 137110, 137115, 137116, 131120, 137121, 137134, 137136 through 137141 | 13 |

Organizational Charts

| Black&McDonald - D2O Org Chart - 01Aug2014.pdf | 1 |
|--|---|
| Black&McDonald_2014.01.14_D2O Team.pdf | 1 |
| Black&McDonald_Core Team Employee List.pdf | 1 |
| CanAtom_D2O Commissioning Organization Chart (May 1, 2019 and May 23, 2019 versions) | 2 |
| CanAtom_D2O Org Chart April, 2019.pdf | 1 |
| CanAtom_D2O Project Org Chart 04-05-19.pdf | 1 |
| D2O OPG Org Chart 24-Feb-2015.pdf | 1 |
| D2O Storage Project OPG Communication Matrix Rev6.pdf | 1 |
| EllisDon - D2O Team - July 2014.pdf | 1 |
| EllisDon D2O - 7334 Org Chart - Dec. 24-13.pdf | 1 |
| OPG - Simplified Org Chart April, 2019.pdf | 1 |
| OPG-CAN Zipperplan Apr 2019_1.pdf | 1 |
| RCMT - D2O Team - 24July2014.docx | 1 |
| RCMT D2O Project - Organization Control Chart R2 (Draft A 2014-07-24).docx | 1 |
| SNC Aecon_D20 Early Works Org Chart 11-1-17.pdf | 1 |
| SNC Aecon_D2O Project Org Chart - March 30 2016.pdf | 1 |
| SNC Aecon_D2O Project Org Chart -20160817.pdf | 1 |
| | |

18

| P6 Schedules, Critical Path | 10 |
|--|--------|
| Dec 2012_Schedule_31555 Presentation.pdf | 1 |
| Dec 2012_Schedule_48070014-LTR-019.pdf | 1 |
| Dec 2012_Schedule_BMPGR120302 - HWMBWA - DNGS Heavy Water Management Building | |
| West Annex.pdf | 1 |
| Jan 2013_31555 After 03Jan13 DD Update.pdf | 1 |
| Jan 2013_Schedule_431555 NR Layout for BM.pdf | 1 |
| Jan 2013_Schedule_Visio-2013.01.07_D20_Storage_Simple Schedule.pdf | 1 |
| July 2012 - Heavy Water Mnmnt Building WA - DNGS Heavy Water Management Building | 1 |
| Nov 2012 Schedule 48070014 -I TR-013 pdf | 1 |
| Nov 2012 Schedule_DNGS - (D2O) HWMBWA Schedule_Submission - Nov-07-2012 pdf | 1 |
| Sen 2012 Schedule D20-TOTAL SCHEDULE-Sen 142012 (2) ndf | 1 |
| | • |
| P6 Schedules, SNC and AECON | 23 |
| Schedule_Visio-HWMB WA Roadmap R0-E dd-Apr-12-2019.pdf | 1 |
| Apr 2015_Schedule_JV ORIGINAL BASELINE - 2015-09-24-D2O-JV-Scheudle.pdf | 1 |
| D20 Phase 2 Full Schedule dd 23-Aug-2019(1).pdf | 1 |
| D2O Full Construction Schedule dd 19-July-19.pdf | 1 |
| D2O Full Schedule (8 examples April through June 2019) | 8 |
| D2O_Schedule_ Driving Critical activities (March & December 2016 and February 2017 versions) | 3 |
| D2O-Schedule-Full schedule ad 26-Apr-19.pdf | 1 |
| Dec 2015_D2O_Schedule_Childal Path20151203.pdf | 1 |
| Mar 2016 D2O Schedule Critical Stream20160311 pdf | 1 |
| Mar 2016_D2O_Schedule_ Chical Science 100311.pdf | 1 |
| Nov 2015 D2O Schedule Near Critical Path20151124 pdf | 1 |
| Nov 2015 D2O Complete Schedule20151110 (2 parts) | 2 |
| | - |
| Seismic Classification | 20 |
| AMEC report re Seismic Capacity of West Annex.pdf | 1 |
| DA Direction on Seismic Design Reqts.pdf | 1 |
| Darlington GS A Heavy Water Management Building Seismic Analysis (1984).pdf | 1 |
| Design COMS Decl Form.pdf | 1 |
| Memo re Seismic Design Bldg Loads.pdf | 1 |
| Memo re Seismic Dike_April 2016_Const Rev Record.pdf | 1 |
| Memo re Team Tech Rev.pdf | 1 |
| Memo re technical review odf | 1 |
| Nuclear Safety Design Guide Common Mode Incidents Seismic Design (revisions 5, 6, and 7) | י ז |
| RCMT Engineering Turnover Seismic Dike ndf | 1 |
| RCMT Seismic Prs ndf | 1 |
| RCMT Technical Record.pdf | 1 |
| Response Seismic Design Bldg Loads.pdf | 1 |
| Scoping Phase COMS Presentation.pptx | 1 |
| SEISMIC DIKE TOP SLAB DESIGN - HANDOVER.pdf | 1 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 49 of 350

CONFIDENTIAL ATTORNEY WORK PRODUCT

| Tech Review Record EC.pdf | |
|-----------------------------|--|
| Technical Review Record.pdf | |

| Soil Management | |
|--|--|
| Borehole Drilling Investigation.pdf | |
| Elev Tritium Levels.pdf | |
| Elevated Tritium Concentrations Found in Groundwater Monitoring Well Samples.pdf | |
| EXP Geotechnical Report - Additional Comments.pdf | |
| EXP Geotechnical Report D2O Site.pdf | |
| F1 soil management plan (Original and Revision 1) | |
| Foundation Structural Analysis.pdf | |
| Initial Survey for D2O Expansion - Buried Services Scan.pdf | |
| Kinectrics Soil Sampling Report.pdf | |
| Memo re Disposal&Mgmt.pdf | |
| OPG Memo-Temp Use of DNNP site with D2O Soil Management Plan attached.pdf | |
| Radiological Risks with soil.pdf | |
| RCMT re Raising the Foundation El.pdf | |
| Soil Handling Meeting.docx | |
| Soil Management plan (original and revised) | |
| Soil Sampling Mgmt-(original and update) | |
| Trow Geotechnical Report for site.pdf | |
| Valve Breakout | |
| Purchase Order 249065 Rev 004.pdf | |
| Purchase Order 249200 Rev 011.pdf | |
| Purchase Order 249243 Rev 010.pdf | |
| Purchase Order 250735 Rev 008.pdf | |
| | |

Other

| Other | 70 |
|--|----|
| Design_Specification_TSM_NK38-TSM-38000-10001_000.pdf | 1 |
| DNGS Heavy Water Management Final Report.pdf | 1 |
| 16-31555 Work Breakdown Structure.xlsx | 1 |
| 2017-01-12-D2O-Storage-Project-ETC-Jan2017.xlsx | 1 |
| 2020-2026 Regular JF2 labour rates and OT.xlsx | 1 |
| 48070014-GDP Accepted.pdf | 1 |
| 628411-K38910-52BX-0001 R01 Acknowledge.pdf | 1 |
| 628411-K53300-52BX-0001 Rev06 Signed Purchase Order - Schneider Electric.pdf | 1 |
| 628411-K53300-52BX-0002 R03 Purchase Order Cummins.pdf | 1 |
| 628411-K53300-52BX-0003 Rev00 Signed Purchase Order - Gutor.pdf | 1 |
| 628411-K53300-52BX-0004 Rev09 Signed Purchase Order - Eaton.pdf | 1 |
| 628411-K60431-52BX-0001 Rev02 Signed Purchase Order - Rosemount.pdf | 1 |
| 628411-K60712-52BX-0001 Rev06 Signed Purchase Order - Custom Control Panels.pdf | 1 |
| 628411-K62330-52BX-0001 Rev01 Signed Purchase Order - BOT Engineering.pdf | 1 |
| 628411-K62341-52BX-0001 Rev02 Signed Purchase Order - Radiation Measurement.pdf 628411-K63811-52BX-0001 Rev02 Signed Purchase Order - CCI Thermal Technologies.pdf (Revisions | 1 |
| | 2 |
| 628411-K63821-52BX-0001 Revub Signed Purchase Order - Custom Control Panels.pdf | 1 |

| 628411-K63861-52BX-0001 Rev02 Signed Purchase Order - Marsh Instrumentation.pdf | 1 |
|---|-----|
| 628411-K63891-52BX-0001 Rev02 Signed Purchase Order - Masstex Weighing Systems .pdf | 1 |
| 628411-K65560-52BX-0001 Rev01 Signed Purchase Order - Marsh Instrucmentation.pdf | 1 |
| 628411-K67870-52BX-0001 Re 04 Signed Purchase Order - Chubb Edwards.pdf (two versions) | 2 |
| 628411-K73680-52BX-0001 Rev02 Signed Purchase Order - Max-Therm.pdf | 1 |
| 628411-K73690-52BX-0001 Rev02 Signed Purchase Order - Munters.pdf | 1 |
| 628411-K73690-52BX-0003 Rev 04 Signed Purchase Order - Johnson Control.pdf (two versions) | 2 |
| 628411-K73690-52BX-0004 Rev01 Signed Purchase Order - EH Price Industries.pdf | 1 |
| 628411-K73870-52BX-0001 Rev06 Signed Purchase Order - Ellis & Watts.pdf | 1 |
| 628411-K73870-52BX-0002 Rev01 Signed Purchase Order - AFF International.pdf | 1 |
| 628411-K75160-52BX-0001 Rev04 Signed Purchase Order - Atlas Copco.pdf | 1 |
| 628411-K79710-52BX-0001 Rev01 Signed Purchase Order - KSB Pumps.pdf | 1 |
| Burns_Modus_Oversight Report_(8 reports, 3rd quarter 2013 to 4th quarter 2015) | 8 |
| Canberra Purchase Order _ 628411-K62321-52BX-0001 R01 SNC.pdf | 1 |
| Copy of HWMB-West Annex _ Major Equipment Costs Summary Jan 10 2020.xlsx | 1 |
| Copy of Weighted Average Cost of Capital.xlsx | 1 |
| D_PLAN_NK38-PLAN-38000-10016_000.pdf | 1 |
| Detailed Materials Estimate Part 1.pdf | 1 |
| Detailed Materials Estimate Part 2.pdf | 1 |
| Dewatering Work Plan LPSW Trench Rev 1 MASTER.pdf | 1 |
| Draft_10.28.2019_Bill Of Quantities.xlsx | 1 |
| Draft_10.28.2019_T5257 HWMB-WA Bill Of Quantities .pdf | 1 |
| drainage system control panelDesign_Specification_TSI_NK38-TSI-67971-10001_000.pdf | 1 |
| duplicate4 HWMB-West Annex _ Major Equipment Costs Summary.xlsx | 1 |
| HWMB-West Annex _ Major Equipment Costs Summary.xlsx | 1 |
| LTD to December 23, 2019 Audit Detail_All Lines.XLSX | 1 |
| NK38-CORR-38000-0615567 Permit to Take Water for Construction Dewatering.pdf | 1 |
| NK38-PLAN-72100-04738189 - Aquatech Dewatering Plan.pdf | 1 |
| NK38-REF-38000-0490940 Excavating Procedure.pdf | 1 |
| NK38-REF-38000-0495609 Supplementary Soil Sampling Protocol D2O Footprint Interim.pdf | 1 |
| NK38-SOW-38000-10014 R00.pdf | 1 |
| Nov 13 2017_SNC Purchase Order - Previously Compiled Info.xlsx | 1 |
| Procurement Tracking File-2Nov2015.xlsx | 1 |
| RCMT Purchase Order.pdf | 1 |
| RCMT-13720-Purchase Order-00010 Final.pdf | 1 |
| Re Valves.msg | 1 |
| Resource Dictionary and Labour Rates Combined.xlsx | 1 |
| Sample quantity take-off.pdf | 1 |
| T5257 HWMB-WA BOQ _template.pdf | 1 |
| Vendor Invoice Summary Issues 2019 12 23 P Moore response.docx | 1 |
| Vendor Summary Issues 20191219.docx | 1 |
| Grand Total | 507 |

Other Documents and Publications

Association for the Advancement of Cost Estimation International. *Recommended Practice No. 45R-08, Cost Estimate Classification System – As Applied for the Building and General Construction Industries*, December 2012.

Association for the Advancement of Cost Estimation International. *Recommended Practice No. 56R-08, Cost Estimate Classification System – As Applied for the Building and General Construction Industries*, December 2016.

Basu, P., P. Labbe, and D. Naus. "Nuclear Power Plant Concrete Structures," 22nd Conference on Structural Mechanics in Reactor Technology, San Francisco, CA, August 18-23, 2013.

Candlish, J. R. "Advances in CANDU Constructability," Nuclear Engineering and Design, vol. 109, 1988.

Chatterton, E. *The End of Acquisition Reform: Creating Guidelines to Reduce the Cost of the Weapons Systems Program Close-out Process.* MS thesis, US Air University, Maxwell Air Force Base, April 2012.

Chu, D. *Everything You Always Wanted to Know About Commissioning, But Didn't Know to Ask.* US Army Research and Development Center White Paper, September 2015.

Commission of the European Community. *Management of Tritium Contaminated Wastes: National Strategies and Practices at Some European Countries, USA and Canada*. Nuclear Science and Technology, EUR-13592, 1992.

CSA Group. Quality assurance program requirements for the supply of items and services for nuclear power plants, Category 3. Canadian National Standard N299.3-16, 2016.

Davis, K., W. Ledbetter, and J. Burati. "Measuring Design and Construction Quality Costs." *Journal of Construction Engineering Management*, vol. 115, no. 3, 1989.

Delene, J., and C. Hudson. "Cost Estimating Guidelines for Advanced Nuclear Power Technologies." Oak Ridge National Laboratory, Report ORNL/TM-10071 (Rev. 3), May 1993.

Dodge Data & Analytics. "Solutions That Grow Your Business." https://www.construction.com/.

Electrical Power Systems Construction Association. Contracts database. https://www.epsca.org/.

Faithful+Gould, Ontario Power Generation Darlington NGS Heavy Water Management Building Estimate Report, Wrench Time D2O.R1, January 2012.

Flickr. "Salt Waste Processing Facility (SWPF) at the Savannah River Site." https://www.flickr.com/photos/51009184@N06/albums/72157630135719526.

Fluor Idaho. "Integrated Waste Treatment Unit," video. https://fluor-idaho.com/projects/Projects IWTU.aspx.

Fluor Idaho. <u>"Integrated Waste Treatment Unit," description, October 2017. https://fluor-idaho.com/Documents/ProjectFiles/iwtu/IWTU_100417.pdf.</u>

Generation IV International Forum. Economic Modeling Working Group. *Cost Estimating Guidelines for Generation IV Nuclear Energy Systems*, Rev. 4.2 (GIF/EMWG/2007/004), September 26, 2007.

Glassdoor. "Ontario Power Generation Reviews," <u>https://www.glassdoor.com/Reviews/Ontario-Power-Generation-Reviews-E9274.htm.</u>

Gordian Group. RSMeans database. https://www.rsmeansonline.com/.

Government of Canada. Canadian Nuclear Safety Commission. *Conduct of Licensed Activities: Construction and Commissioning Programs*, Regulatory Document (REGDOC) 2.3.1. <u>https://nuclearsafety.gc.ca/eng/acts-and-regulations/regulatory-documents/published/html/regdoc2-3-1/index.cfm.</u>

Government of Canada. Canadian Nuclear Safety Commission. *Tritium Studies Project Synthesis Report*, Report INFO-0800, Rev. 1, January 2011.

Government of Canada. Statistics Canada. Building Construction Price Index. https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1810013501.

Greatmats. "Categories." www.greatmats.com.

Heinze, Kurt. Cost Management of Capital Projects. New York: Marcel Dekker, Inc., 1996.

Humphreys, Kenneth K. Jelen's Cost and Optimization Engineering, 3rd ed. New York: McGraw-Hill, Inc., 1991.

Humphreys, Kenneth K., ed. Project and Cost Engineers' Handbook, 4th ed. New York: Marcel Dekker, 2005.

International Atomic Energy Agency. *Commissioning Guidelines for Nuclear Power Plants*. IAEA Nuclear Energy Series, NP-T-2.10.

Lang, Hans J. "Cost Relationships in Preliminary Cost Estimation." Chemical Engineering (October 1947).

Lang, Hans J. "Simplified Approach to Preliminary Cost Estimates." Chemical Engineering (June 1948).

Lhawang, Rigden, Pratheep Srikantha, Mihai Balan, and Fatimah Al Ubaid. *Wrench Time Analysis Study: 1st Site Visit Report*, Nuclear Design Laboratory Faculty of Energy Systems and Nuclear Science, University of Ontario Institute of Technology, Oshawa, Canada, April 2018.

Lovering, J., A. Yip, and T. Nordhaus, "Historical Costs of Global Nuclear power Reactors." *Energy Policy,* vol. 91 (2016).

Marshall & Swift Valuation Service. *The Gold Standard of Building Cost Data*. <u>https://www.corelogic.com/solutions/marshall-swift.aspx</u>.

Merrow, E., S. Chapel, and C. Worthing. "A Review of Cost Estimation in New Technologies: Implications for Energy Process Plants," RAND Report R-2481-DOE, July 1979.

Merrow, E., K. Phillips, and C. Myers. *Understanding Cost Growth and Performance Shortfalls in Pioneer Process Plants*, RAND Report R-2569-DOE, September 1981.

Merrow, E. Understanding the Outcomes of Megaprojects: A Quantitative Analysis of Very Large Civilian Projects, RAND Report 3560-PSSP, March 1988.

Myers, C., R. Shangraw, M. Devey, and T. Hayashi. *Understanding Process Plant Schedule Slippage and Startup Costs*, RAND Report R-3215-PSSP/RC, June 1986.

Organisation for Economic Co-operation and Development. Nuclear Energy Agency. *Nuclear New Build: Insights into Financing and Project Management*, Report No. 7195, 2015.

Province of British Columbia. Ministry of Transportation and Infrastructure. *Project Cost Estimating Guidelines*, Version 01.02, September 30, 2013. <u>https://www2.gov.bc.ca/assets/gov/driving-and-transportation/transportation-infrastructure/planning/guidelines/cost_estimating_guidance.pdf.</u>

Province of Ontario. Sunshine List. https://www.ontariosunshinelist.com/.

Rogers, J. *Opportunity Lost: Mismanagement of the Closeout Phase of Construction Projects*, MS thesis, Purdue University, December 2012.

Rodgers, T. "An Owner's Perspective on Commissioning of Critical Facilities." *Transactions of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASRAE)*, 2005 ASHRAE Symposia, no. 111.

US Department of Energy. *Construction of Salt Waste Processing Facility (SWPF): Charting the Course for Major EM Successes in 2016–2017*, September 29, 2015. https://www.energy.gov/sites/prod/files/2015/10/f27/SheppardEMSuccessPanel%20FINAL%20FINAL.pdf.

US Department of Energy. Cost Estimating Guide (DOE G 413.21A), June 6, 2018.

US Department of Energy. Nuclear Facilities Commissioning Guide (DOE-G-413.3-23), August 2019.

US Department of Energy. *Verification of Readiness to Start Up or Restart Nuclear Facilities* (DOE Order 425.1D, Change 2), October 4, 2019.

US Department of Energy. Office of Environmental Management, Chief of Nuclear Safety. "Design and Commissioning Report" (Rev. 1), July 2017.

US Department of Energy. Energy Information Administration. *Capital Cost Estimates for Utility Scale Electricity Generating Plants* (Independent Statistics and Analysis report series), November 2016.

US Department of Energy. Energy Information Agency. *Engineering Economic Analysis Guide: Liquid Fuels Technologies*, December 2015.

US Department of Energy. Energy Information Agency. *Capital Cost Estimates for Utility Scale Electricity Generating Plants*, November 2016.

US Department of Energy. Savannah River Site. Fact Sheets. https://www.srs.gov/general/news/facts.htm.

US Federal Reserve. Foreign Exchange Rates-H.10. https://www.federalreserve.gov/releases/H10/hist/.

US General Accountability Office. *Nuclear Waste Cleanup: DOE Faces Management and Disposal Challenges with High-Level Waste at the Idaho National Laboratory* (Report GA_19-494), September 2019.

W. W. Grainger, Inc. www.grainger.com.

Wolf, Thomas E. "An Update on Lang Factors," Hydrocarbon Processing, vol. 94, no. 8 (August 2015).

Wolf, Thomas E. "Lang Factor Cost Estimates," 2013. http://www.prjmgrcap.com/langfactorestimating.html.

Wolf, Thomas E. "Lang Factors, an Update," 2015. http://www.prjmgrcap.com/estimateslangfactorupdate.html.

Zabunoglu, Okan H. *Reprocessing of Long-Cooled Nuclear Fuel: Process Description and Plant Design*. PhD diss., Iowa State University, 1988.

Appendix C. Adjustments to Direct Costs

Currency Adjustment

In a few cases, we used sources other than RSMeans for our base cost information. Some of those cost data were denominated in US dollars. We subsequently converted the US dollar values to Canadian dollars using prevailing currency exchange rates. For example, we used actual vendor invoice data for specially fabricated, long-lead items. Some of those invoices denominated the costs in US dollars. We converted those costs to values denominated in Canadian in the years the vendor presented those invoices to OPG, which we believe are representative of the timeline for such purchases in our but-for world. We then escalated those costs to 2019 equivalent values.

For other items for which RSMeans had no cost data, we used currently advertised vendor prices that were denominated in US dollars. We converted those prices to Canadian dollars using the prevailing 2019 currency exchange rate.

We used the exchange rates for the 2012-2019 period in Table C-1 when we converted US dollars to Canadian dollars. US/Canadian foreign exchange rates were sourced from the US Federal Reserve. ⁵²

Table C-1: Historical Foreign Exchange Rates, CAD/USD

| Year | CAD/USD |
|------|---------|
| 2012 | 1.03 |
| 2013 | 1.10 |
| 2014 | 1.10 |
| 2015 | 1.28 |
| 2016 | 1.32 |
| 2017 | 1.30 |
| 2018 | 1.30 |
| 2019 | 1.32 |
| | |

We derived escalation factors from a Toronto construction cost price index recorded by Statistics Canada.⁵³ The index values for the 2012-2019 period are presented in Table C-2.

 ⁵² US Federal Reserve, "Foreign Exchange Rates – H.10," accessed April 26, 2020, <u>https://www.federalreserve.gov/releases/h10/hist/dat00_ca.htm</u>.
⁵³ Statistics Canada, "Building Construction Price Indexes, by Type of Building," accessed April 26, 2020, <u>https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1810013501</u>.

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 55 of 350

CONFIDENTIAL ATTORNEY WORK PRODUCT

Table C-2: Construction Cost Price Indexes for the Toronto Area

| Year | Index |
|------|--------|
| 2012 | 90.70 |
| 2013 | 89.47 |
| 2014 | 90.22 |
| 2015 | 90.42 |
| 2016 | 96.40 |
| 2017 | 100.00 |
| 2018 | 104.62 |
| 2019 | 105.53 |

The derived escalation factors are in Table C-3. Later in our analysis, we used the inverse of those escalation factors as our deflation factors.

Table C-3: Cost Escalation Factors

| Year | Escalation factor |
|------|----------------------|
| 2012 | 1.16 |
| 2013 | 1.18 |
| 2014 | 1.17 |
| 2015 | 1.17 |
| 2016 | 1.09 |
| 2017 | 1.06 |
| 2018 | 1.01 |
| 2019 | 1.00 |
| | |

To illustrate how we applied these factors, we present the following example. Let's assume we have an historical cost of USD100 that occurred in every year from 2012 through 2018, and we want to know the appropriate adjustment factor to convert those costs to equivalent 2019 costs in Canadian dollars. See Table C-4.

The first column in Table C-4 lists the years, 2012-2019. The second column lists the US historical cost in US dollars (USD100 for this example). The third column lists the foreign exchange rate (CAD/USD) applicable for each year. The fourth column lists the escalation factor to escalate the then-year amount to a 2019 amount. The last column lists the equivalent Canadian dollar amount of the USD100 historical cost in 2019 dollars after converting US dollars to Canadian dollars and escalating that amount to a 2019 equivalent value.

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 56 of 350

CONFIDENTIAL ATTORNEY WORK PRODUCT

Table C-4 Conversion of US Currency Values to Canadian Currency Values

| Year | USD | FX | ESC | CAD |
|------|-----|------|------|--------|
| 2012 | 100 | 1.03 | 1.16 | 119.48 |
| 2013 | 100 | 1.10 | 1.18 | 129.80 |
| 2014 | 100 | 1.10 | 1.17 | 128.70 |
| 2015 | 100 | 1.28 | 1.17 | 149.76 |
| 2016 | 100 | 1.32 | 1.09 | 143.88 |
| 2017 | 100 | 1.30 | 1.06 | 137.80 |
| 2018 | 100 | 1.30 | 1.01 | 131.30 |
| 2019 | 100 | 1.32 | 1.00 | 132.00 |

Labour Cost Adjustments

Actual average hourly rates for OPG contractors were higher than the labour rates embedded in RSMeans for the Toronto metropolitan area. To determine how much higher, we computed the ratio of actual OPG contractor wage rates for various trades (*e.g.*, electrician journeyman, structural steel foreman, and plumber) to RSMeans wage rates for the same trades at comparable seniority levels. We obtained the OPG contractor rates from a Canadian government source and factored in 2 hours' worth of overtime pay daily to account for the contractor's 10-hour day. We found that the contractor's average labour rate was, on average, 1.46 times higher than the RSMeans presumed labour cost. In other words, if RSMeans reported a CAD50 per hour wage rate, the commensurate actual wage rate CAD73 per hour.

We then adjusted for differences between labour productivity on the D2O Storage Project with the premised 66% labour productivity in the RSMeans database. We derived our estimate for the OPG contractor productivity from data in two "wrench time" studies that were commissioned by OPG, but consistent with our own first-hand experience with construction projects inside the protected area of a nuclear facility. The studies estimated productivity rates for various activities performed in the projects. We combined the findings of those studies and computed an average productivity rate of 39%, which is in our opinion a reasonable and appropriate measure of expected productivity for this project.

The ratio of 66% to 39% is 1.7. We multiplied this 1.7 factor by the wage adjustment factor of 1.46 to compute a combined factor of 2.5.

The RSMeans database does not contain data that are applicable for procuring or installing materials required to meet nuclear quality standards. Thus, for those items in the BOQ requiring nuclear quality assurance requirements, we supplemented the RSMeans data with additional crew members (welders and quality assurance specialists) and adjusted for specialized material and labour costs based on cost factors in the EMWG guidelines. These guidelines present specific cost factors for nuclear class commodities, piping, and the associated labour required to place or install those commodities, piping, and components. These commodities comprised nuclear class form work, embedded metal, reinforcing steel bars, steel, piping, etc. In addition, the Guidelines provided costs for installation of non-nuclear-grade materials, for comparison purposes. We used this information to develop adjustment factors to reflect additional costs associated with procurement and installation of nuclear-grade materials.

C.2.a. Added Crew Members

For the installations required to meet nuclear safety standards, we added a welder and quality assurance member to the identified RSMeans crew. To calculate the associated labour cost, we used the basic pricing method RSMeans uses. We estimated the hourly rate and multiplied that rate by the number of hours we expected the crew member would work.

As an illustration of our approach for computing this added cost, we offer this example. Assume the requirement is to install 200 meters of pipe and, because of nuclear safety standards, the installation requires welded (rather than mechanical) joints and fixtures. These requirements would not exist in a common construction project.

Further assume that the RSMeans crew, based on common construction requirements, comprises three workers and that, after reviewing OPG union rates, we determined that an average welder's wage is \$75 per hour. The cost of an additional welder would be calculated as shown below:

- Starting crew and initial crew cost
 - \circ Crew size = 3
 - Average wage = \$75 per hour
 - Installation time = 40
 - Crew cost = Crew size x Average wage x Installation time = 3 * \$75 * 40 = \$9,000
- Add an additional welder at \$75 per hour
 - Welder factor = 1 + (1/Crew size) = 1 + 1/3
 - New crew cost = Welder factor * Crew cost = \$9,000 * (1 + 1/3) = \$12,000
 - Cost of additional welder = \$12,000 \$9,000 = \$3,000

C.2.b. Revised Material Costs

Some of the items listed in the BOQ specified Nuclear Class 3 (NC-3) or Nuclear Class 6 (NC-6) classification as identified by the Canadian Nuclear Safety Commission's quality assurance requirements. These requirements divide mechanical components into several classes.

We present below the EMWG-calculated relative cost relationships between costs for nuclear-related items and costs for non-nuclear items for ten categories of commodities (Table C-5).⁵⁴ The last column is the factor we used to adjust the base RSMeans cost data. For example, for concrete placed below-grade (for the nuclear dike), we estimated the cost of placing concrete using the RSMeans cost data and then added the product of that cost multiplied by the factor 0.5); thus, if the cost of placing a specified volume of concrete for a portion of the nuclear dike was CAD100 based on RSMeans cost data, we would have added another CAD50 (100 x 0.5) to estimate an adjusted cost of CAD150.

| Commodity | Unit | Nuclear | Non-nuclear | Ratio | Factor |
|------------------------|----------------|----------|-------------|-------|--------|
| Formwork | m ² | 31.23 | 29.14 | 1.07 | 0.07 |
| Embedded metal | kg | 13.06 | 7.87 | 1.66 | 0.66 |
| Rebar | m ² | 1278.50 | 821.92 | 1.56 | 0.56 |
| Concrete | m ³ | 208.93 | 139.20 | 1.50 | 0.50 |
| Structural steel | Mt | 4446.70 | 2008.07 | 2.21 | 1.21 |
| Misc. steel | MT | 10269.48 | 2008.07 | 5.11 | 4.11 |
| 50 mm SS weld pipe | m | 369.04 | 278.63 | 1.32 | 0.32 |
| 100 mm SS spooled pipe | m | 1549.97 | 926.29 | 1.67 | 0.67 |
| 300 mm SS spooled pipe | m | 9305.24 | 8936.30 | 1.04 | 0.04 |

Table C-5: Cost Differentials betw. Nuclear and Nonnuclear Materials

The EMWG guidelines include factors for labour hours per unit quantity for the installation of nuclear-related materials and non-nuclear-related materials that are installed in or around nuclear-related materials compared to labour hours for placing and installing common construction commodities. We used those factors to compute factors based on RSMeans presumed labour hours.

Table C-6 depicts those factors in the column labelled *Nuclear unit hr*. The third column, labelled *RSMeans hrs,* depicts the associated RSMeans data for installing the same materials in common, non-nuclear construction. The fourth column depicts the ratio of the two installation times, and the fifth column depicts the adjustment factor we applied to the RSMeans data.

⁵⁴ Note that SS designates stainless steel, here and elsewhere in this report.

This example illustrates how we applied the adjustment factor for placing concrete below-grade for the nuclear dike. We started with the RSMeans-derived labour cost for conventional construction based on the time for placing a cubic meter of concrete (average wage rate per hour time 0.76 per cubic meter of concrete). We then added to that cost the product of the factor (12.1) times the cost to arrive at our estimated labour cost.

| Commodity | Nuclear unit hours | RSMeans hours | Nuclear ratio | Factor |
|---------------------------|--------------------------|------------------|------------------|--------|
| Formwork - substructure | 6.89 | 0.76 | 9.07 | 8.07 |
| Formwork - superstructure | 12.06 | 0.76 | 15.87 | 14.87 |
| Rebar superstructure | 36.03 | 15.32 | 2.35 | 1.35 |
| Concrete -substructure | 2.62 | 0.20 | 13.10 | 12.10 |
| Concrete - superstructure | 5.23 | 0.80 | 6.54 | 5.54 |
| Steel | 58.06 | 3.50 | 16.59 | 15.59 |
| SS Pipe <50mm | 34.02 | 0.92 | 36.98 | 35.98 |
| SS Pipe >50mm | 87.59 | 1.54 | 56.73 | 55.73 |

Table C-6: Differentials betw. Nuclear-Related Installation Hrs. and RSMeans-Presumed Installation Hrs.

C.2.c. Adjustments to Labour Costs to Account for Nuclear Grade Work

We followed the same procedure for estimating labour costs for placing or installing materials requiring special treatment because they were placed or installed on or near nuclear-related materials.

Table C-7 depicts the adjustment factors for labour hours for installation of non-nuclear-related materials in or around nuclear-related materials.

| Commodity | Nonnuclear unit hours | RSMeans hours | Non-nuclear ratio | Factor |
|---------------------------|-----------------------------|------------------|----------------------|--------|
| Formwork – substructure | 5.1 | 0.760 | 6.71 | 5.71 |
| Formwork – superstructure | 9.04 | 0.76 | 11.89 | 10.89 |
| Rebar superstructure | 27.22 | 15.32 | 1.78 | 0.78 |
| Concrete – substructure | 1.96 | 0.200 | 9.8 | 8.80 |
| Concrete – Superstructure | 3.92 | 0.800 | 4.9 | 3.90 |
| Steel | 13.06 | 3.50 | 3.73 | 2.73 |
| SS Pipe <50mm | 12.75 | 0.920 | 13.87 | 12.87 |
| SS Pipe >50MM | 33.01 | 1.544 | 21.38 | 20.38 |

Table C-7: Differentials betw. Non-Nuclear-Related Installation Hrs. and RSMeans-Presumed Installation Hrs.

C.2.d. Assessment of Potential for Adjustment Factor Interaction

We examined the potential for adjustment factor interaction between the EMWG system installation rate data and the productivity factors discussed in Section C.2 above.

In performing notional second checks of the estimates of direct labour for construction of nuclear-grade mechanical systems, we identified a potential interaction, or overlap, between an adjustment that was used to reflect general site productivity and labour adjustments implied by estimates for nuclear-grade mechanical equipment installation in the EMWG guide. We summarize our assessment of both of these factors below.

The "wrench time" study done by the University of Ontario Institute of Technology ("UOIT") reviewed several DRP activities to identify major contributors to downtime, *i.e.*, time when craft personnel were not actively prosecuting

assigned tasks at the job site. UOIT surveyed several work activities over multiple shifts: installation of a motoroperated valve, installation of a check valve, and turbine-generator work.⁵⁵

Looking at the time-motion studies of the projects, downtime was ascribed to several causes, which fall in two major categories:

- Site-specific considerations (subject to specific site, labour agreements, and/or culture at site):
 - Breaks/Lunch
 - Pre-job briefs
 - Site preparation
 - Travel time
 - Waiting
 - Work stoppage
- Items common among nuclear sites:
 - Personal Protective Equipment ("PPE")
 - Permit and Permit Sign-Off
 - Activity Tooling and Equipment

Evaluation of these two categories of downtime in the UOIT report indicates that site-specific considerations accounted for an average of 69% of downtime, and items common among nuclear sites accounted for 31%; however, downtime due to donning and doffing PPE makes up a significant amount of the latter category. Without the downtime due to donning and doffing PPE (which was not required for D2O Storage Project activities), site-specific considerations would account for average of 83% of downtime and items common among nuclear sites accounted for only 17%—this breakdown is probably more representative of D2O Storage Project work.

The EMWG Guidelines do not present specific information regarding assumptions upon which it based its labour rate projections. However, some information indirectly addresses the background of the labour rates:

- Section 4.5.9: "...Only the nuclear-grade-safety-grade structures and equipment require the more elaborate procedures, documentation..." This may be true for a greenfield new reactor installation; however, it is our experience that when building a new nuclear facility interfacing with existing nuclear facilities and requirements, most or all "procedures and documentation" will more closely match the requirements for "nuclear-grade-safety-grade structures and equipment."
- Section 4.7.3.2: Under the topic "Direct Labor Productivity," the standard states: "The unit hour rates depicted in Table G.1.3 represent the productivity determined for US advanced nuclear power plant construction." It is important to note too that Table G.1.3, entitled "Bulk commodity unit hour installation rates (US)," states that the data are for "replicable plants," *i.e.*, not FOAK construction such as the D2O Storage Project.
- Section 6.5, concluding paragraph: This summary notes, "The relationship of project costs...may change for different regions. Labor productivity and composite cost per hour will likely contribute to and increase or decrease in [Levelized Unit Cost of Electricity] for the regions considered." This wording implies that the EMWG productivity factors are likely mean values.

Qualitatively combining the insights from the above excerpts, it is likely that the productivity estimates for the EMWG are mean estimates and more likely to be consistent with RSMeans-type productivity assumptions than the data-driven factors determined by the available site-specific "wrench time" studies.

⁵⁵ UOIT also evaluated work on the primary heat transfer system; however, such work is not typical of the work on the D2O Storage Project because of radiological contamination in the primary heat transfer system and the extensive use of PPE required.

To determine the nature of the productivity assumptions underlying the EMWG rate tables, we also reviewed the precursor document, "Cost Estimate Guidelines for Advanced Nuclear Power Technologies."⁵⁶ Relevant information from that document includes the following:

- Section 2.2.4: Section 2.2 is titled "General Ground Rules." Ground Rule 4 addresses direct construction cost estimates and states that such "cost estimates will be developed so that they are the most likely cost," and goes on to specify that the ground rule addresses cost estimates for quantities of materials and installation rates/costs.
- **Tables 2.2 and 2.3:** These tables are the precursors to similar tables in Appendix G of the EMWG Guidelines.
- Section 2.2.19: This ground rule describes the basis for labour rates used in Table 2.3 and notes that the productivity factor used to estimate these labour rates "were developed from a set of early nuclear projects, which did not undergo the upset and turmoil of post-TMI [Three Mile Island] backfitting experience" and further states that the values "may not be the absolute best that can be achieved" but that "they represent a data set sufficient for the purpose of consistent cost estimates."

These excerpts support our view that EMWG productivity factors are mean estimates and that combining the reduced wrench time productivity estimate with the EMWG installation rate data is a reasonable approach and should produce reliable results.

Adjustments to Reflect Stainless Steel as Material of Construction

The pipe valves and pipe fixtures listed in the BOQ were specified as stainless steel. The RSMeans database did not contain data for stainless steel valves or pipe fixtures. It contained cost data only for carbon steel valves and fixtures. Thus, we developed cost factors to better reflect the actual costs of those items.

C.3.a. Pipes and Fixtures

We first developed an adjustment factor for stainless steel. We did that by finding vendor quotes for various types and sizes of stainless steel fixtures and comparing those prices with RSMeans prices for carbon steel fixtures of the same types and sizes. We found that, on average, stainless steel fixtures were 2.5 times more costly than comparable carbon steel fixtures. Thus, we applied an adjustment factor of 2.5 to the RSMeans unit price value.

We present our analysis below.57

https://www.grainger.com/search?searchBar=true&searchQuery=stainless+seel+flange; Caps- https://www.grainger.com/search/pipe-hose-tube-fittings/pipeproducts/pipe-fittings?sst=1&ts_optout=true&searchQuery=buttweld+pipe; Elbowshttps://www.grainger.com/search?searchBar=true&searchQuery=stainless+steel+pipe+elbow.

⁵⁶ J. Delene and C. Hudson, "Cost Estimating Guidelines for Advanced Nuclear Power Technologies," Oak Ridge National Laboratory, Report ORNL/TM-10071 (Rev. 3), May 1993.

⁵⁷ Information was pulled from Grainger.com as follows: Tees- <u>https://www.grainger.com/search/plumbing/pipe-tubing-and-fittings/pipe-</u> <u>fittings/stainless-steel-pipe-fittings?optOut=0&searchQuery=steel+pipe+fittings&sst=1</u>; Flanges-<u>http://www.grainger.com/searchQuery=steel-pipe+fittings@sst=1</u>; Flanges-<u>http://www.grainger.com/searchQuery=steel-pipe+fittings@sst=1</u>; Flanges-
| Fixture | Diameter | Carbon steel | Stainless steel | Ratio |
|---------|----------|--------------|-----------------|-------|
| | | \$/unit | \$/unit | SS/CS |
| tee | 0.250 | \$40.08 | \$90.38 | 2.25 |
| tee | 0.375 | \$40.44 | \$94.64 | 2.34 |
| tee | 0.500 | \$53.94 | \$114.14 | 2.12 |
| flange | 1.000 | \$46.89 | \$70.64 | 1.51 |
| flange | 1.250 | \$46.89 | \$114.14 | 2.43 |
| flange | 2.000 | \$56.75 | \$126.57 | 2.23 |
| caps | 0.250 | \$5.43 | \$14.56 | 2.68 |
| flange | 0.375 | \$5.27 | \$19.72 | 3.74 |
| flange | 0.500 | \$6.38 | \$21.53 | 3.37 |
| flange | 0.750 | \$9.01 | \$23.00 | 2.55 |
| elbows | 0.250 | \$3.80 | \$8.55 | 2.25 |
| elbows | 0.375 | \$3.25 | \$7.80 | 2.40 |
| elbows | 0.500 | \$3.46 | \$8.65 | 2.50 |
| elbows | 0.750 | \$7.25 | \$17.04 | 2.35 |
| elbows | 1.000 | \$7.15 | \$17.30 | 2.42 |
| elbows | 2.000 | \$22.35 | \$52.75 | 2.36 |
| Average | | \$22.40 | \$50.09 | 2.47 |

Table C-8 Cost Data for Various Sizes and Types of Pipe Fixtures

C.3.b. Adjustments for Stainless Steel Valves

The BOQ listed requirements for 541 stainless steel valves of various types. Because of the unique specifications of these valves, OPG procured specially fabricated valves directly from a vendor. We reviewed the invoices for reasonableness and used them to develop an adjustment factor. While it was helpful to know the material costs, we still had to estimate the associated labour costs to install those valves. We used data from RSMeans as the basis for our adjustment factor.

RSMeans reports costs for only one type of pipe valve: a carbon steel butterfly valve. However, these data include the associated labour for installing those valves. Based on our experience, the time to install a butterfly valve is roughly the same for any of the valves called for in the BOQ.

We then computed an average cost per valve and substituted that average cost as the material cost for each of the 541 pipe valves listed in the BOQ.

Stainless Steel Adjustment for Nuclear-Class Materials

In addition to the nuclear-grade valve requirements, the BOQ listed 665 pipe fixtures of various types and sizes that had to meet either NC-3 or NC-6 specifications. The RSMeans database did not contain cost data for nuclear-class fixtures. Thus, we developed adjustment factors to account for the additional cost of procuring those fixtures. We took a two-step approach. First, we evaluated the cost difference between similar size and function valves at grades NC-3 and NC-6 and non-nuclear-grade stainless steel valves. We used the vendor invoice cost data for nuclear class valves (described in the previous subsection) as our source of costs for the nuclear class valves. Then, using the evaluated cost differences, we developed a weighted average cost factor that we applied to each nuclear grade fixture.

We present in the table below the weighted average adjustment factor that we applied to the cost of each nucleargrade stainless steel fixtures in the BOQ subsections specifying the nuclear grade requirement. To develop this factor, we reviewed the BOQ and system design requirements for each nuclear system and determined which components were required to be Nuclear Class 3, which were Nuclear Class 6, and which were standard stainless steel. Using vendor invoices and purchase orders, reviewed for reasonableness, we calculated a factor

that represented the cost differential between NC-3, NC-6, and standard stainless steel components that were otherwise similar (*e.g.*, 1-inch check valves). By totaling the number of NC-3 and NC-6 components in a given system, we could calculate a weighted average to apply to the stainless steel components in the system to adjust for the additional cost associated with nuclear grade quality.

| BOQ section | Page | Nuclear Class 3 items | Nuclear Class 6 items | Total | Weighted average |
|-------------|-------------|-----------------------------|-----------------------------|-------|---------------------|
| C-01.01 | C-1 | 4 | 2 | 6 | 3.84 |
| C-01.02 | C-1 | 0 | 5 | 5 | 1.00 |
| C-01.03 | C-1-C-2 | 0 | 3 | 3 | 1.00 |
| C-01.04 | C-2 | 5 | 2 | 7 | 4.04 |
| C-02.01 | C-3 | 4 | 3 | 7 | 3.43 |
| C-02.02 | C-3 | 0 | 5 | 5 | 1.00 |
| C-03.01 | C-4 | 4 | 4 | 8 | 3.13 |
| D-01.04 | D-3 - D-4 | 4 | 45 | 49 | 1.35 |
| D-01.05 | D-5 | 8 | 18 | 26 | 2.31 |
| D-01.06 | D-6 | 14 | 4 | 18 | 4.31 |
| D-01.07 | D-7 - D-8 | 20 | 31 | 51 | 2.67 |
| D-01.08 | D-9 | 15 | 6 | 21 | 4.04 |
| D-01.09 | D-9 - D-10 | 4 | 14 | 18 | 1.95 |
| D-01.10 | D-10 | 7 | 4 | 11 | 3.71 |
| D-01.11 | D-11 | 9 | 10 | 19 | 3.02 |
| D-01.12 | D-11 - D-12 | 27 | 20 | 47 | 3.45 |
| D-01.13 | D-13 - D-14 | 17 | 6 | 23 | 4.15 |
| D-01.14 | D-14 | 0 | 4 | 4 | 1.00 |
| D-02.03 | D-15 - D-17 | 40 | 26 | 66 | 3.58 |
| D-02.04 | D-18 | 13 | 4 | 17 | 4.26 |
| D-03.03 | D-19 - D-21 | 37 | 32 | 69 | 3.28 |
| D-04.03 | D-23 - D-24 | 30 | 25 | 55 | 3.32 |
| D-04.04 | D-25 | 9 | 2 | 11 | 4.49 |
| D-07.01 | D-38 | 6 | 33 | 39 | 1.66 |
| E-02.02 | E-3 - E -6 | 0 | 44 | 44 | 1.00 |
| E-03.02 | E-6 - E-7 | 0 | 1 | 1 | 1.00 |
| E-03.03 | F-7 | 0 | 4 | 4 | 1 00 |

Table C-9: Nuclear Grade Stainless Steel, Weighted Average Adjustment Factors

C.3.c. Use of Vendor Quotes for a Subset of Major Component Costs

Nearly \$28 million worth of the materials required for the process systems was specially fabricated to meet nuclear quality standards or other specific D2O Storage Project expectations. Consequently, OPG procured those items directly from vendors early in the project. Because of their unique design characteristics, RSMeans (or other commercial data guides) would not have relevant cost data for us to use.

Material Costs of Vendor-Procured Items

Table C-10 provides a listing of the invoices and purchase orders reviewed.

Table C-10: List of Directly Procured Items

| Row | Equipment | Currency | Year | Amount to OPG | Cost Escalation Factor |
|-----|--|-------------------------------|------|------------------|------------------------------|
| 1 | Manufacturing and Delivery Diesel Gen Set | CAD | 2017 | 1,167,900 | 1.055 |
| 2 | Manufacturing and Delivery Switchgear | CAD | 2017 | 1,600,453 | 1.055 |
| 3 | Manufacturing and Delivery UPS | CAD | 2016 | 541,901 | 1.095 |
| 4 | Manufacturing and Delivery MCC | CAD | 2017 | 953,370 | 1.009 |
| 5 | Manufacturing and Delivery Control Panels | CAD | 2017 | 892,825 | 1.055 |
| 6 | Manufacturing and Delivery Instrumentation Air/Service Air | CAD | 2017 | 407,347 | 1.055 |
| 7 | Manufacture and Delivery Munter Drier (Munter) | CAD | 2016 | 564,754 | 1.095 |
| 8 | Manufacture and Delivery HVAC Control (JCI) | CAD | 2017 | 2,369,750 | 1.055 |
| 9 | Manufacture and Delivery Chiller (JCI) | USD | 2017 | 4,082,156 | 1.055 |
| 10 | Manufacture and Delivery Personnel Monitors | CAD | 2016 | 139,867 | 1.095 |
| 11 | Manufacture and Delivery Tritium Air Monitors | CAD | 2017 | 910,961 | 1.055 |
| 12 | Manufacture and Delivery Gamma Monitors | CAD | 2016 | 92,500 | 1.095 |
| 13 | Manufacture and Delivery Vapor Recovery Drier | CAD | 2016 | 2,993,565 | 1.095 |
| 14 | Manufacturing and Delivery Filter Unit 0-73690-FR21/FR22 | CAD | 2016 | 1,532,387 | 1.095 |
| 15 | D2O Transfer System Related Instrumentation | USD | 2106 | 565,091 | 1.445 |
| 16 | Active/Inactive Drainage Pumps | CAD | 2016 | 121,036 | 1.095 |
| 17 | D2O Liquid Recovery Pump Controls | CAD | 2017 | 160,715 | 1.095 |
| 18 | Fire Alarm System | CAD | 2017 | 41,879 | 1.055 |
| 19 | Moisture Indicating Alarm Unit | CAD | 2016 | 50,675 | 1.095 |
| 20 | Drum Heeling Vacuum Tanks | CAD | 2016 | 28,200 | 1.095 |
| 21 | 45V DC Instrument Power Supply | CAD | 2016 | 67,984 | 1.095 |
| 22 | Weigh Scale | CAD | 2016 | 28,760 | 1.095 |
| 23 | Vertical Flooded Heat Exchanger | CAD | 2016 | 415,506 | 1.095 |
| 24 | Sampling Cabinet | CAD | 2017 | 181,300 | 1.055 |
| 25 | Chilled Water System AC Units | USD | 2016 | 440,412 | 1.445 |
| 26 | Tanks (PHT, Moderator, Feed, Product) | CAD | 2016 | 3,874,395 | 1.095 |
| 27 | Heat Exchangers | | 2016 | 265,594 | 1.095 |
| 28 | Pumps | | 2016 | 1,346,925 | 1.095 |
| 29 | Valves (Diaphragm & Globe) | | 2016 | 60,452 | 1.095 |
| | Nuclear Class valves, and 3 s (RV Discharge, Cleanup, | smallest tanks Downgraded) | | 1,545,246 | |

Total Material Costs and Associated Labour Costs for Installing Vendor-Procured Items

We estimated the EPC contractor's full cost for procuring the specialty item and the labour costs associated with installing those items. We followed this basic approach in computing those estimates. First, we estimated the full price to the owner. This price comprised the EPC contractor's direct cost plus a fee.

Next, we estimated the labour costs. We started with a crew size based on information in RSMeans crew standards reference material and associated labour rates. We then estimated the time it would take to install the item. We informed our estimate by reviewing duration information of similar items reflected in the RSMeans database. We then identified the quantity of items procured. Finally, we established load factors for both the

subcontractor and EPC contractor. We used the same factors that RSMeans uses in its database. We then multiplied factors together to arrive at our labour cost estimate.

We present below a representative sample of the computations for estimating the EPC contractor's final cost for material and labour for the tanks described in Purchase Order #00246115 (see Row 29 of Table C-10 above).

EPC Contractor Final Cost

Materials cost

Cost Escalation Factor = 1.095, reflecting year of purchase Material Cost = \$3,874,395 * 1.095 = \$4,241,469.81 Contractors Fee Multiplier = 1.06, based on OPG's actual fee allowed EPC Contractor Materials Cost = \$4,241,469.81 * 1.06 = \$4,497,010.28

Labour cost

Crew Size (Plumbers) = 5 Average Wage = \$71.86/hour Hours to install = 20 Number of Units = 28 Fee multiplier for subcontractor and EPC Contractor = 1.21, per RSMeans EPC Contractor Labour Cost = 5 * \$71.86*20*28*(1.21) = \$243,461.68

EPC Contractor final cost = \$4,740,471.96

C.3.d. Miscellaneous Adjustments to Direct Costs

In this section we highlight other miscellaneous adjustments we made to the base cost data and other cost data for items not found in the RSMeans database. These additional items were either low-cost items or items with no specified required quantity, such as an allowance.

We also describe how we changed units of measures for quantities for items specified in the BOQ to equivalent units of measures used in RSMeans.

We present the highlights for BOQ Section B. The adjustments for other sections of the BOQ are presented in <u>Appendix D</u>.

- 1. BOQ Section—B Architectural/Structural
 - a. Concrete

We made four adjustments to the RSMeans data for concrete. These are described below.

Concrete Adjustment 1

The BOQ called for 35 MPa concrete. RSMeans had cost data for 34 MPa concrete, but not for 35 MPa concrete. Thus, we interpolated the cost of 35 MPa concrete and the decimal proportion increase needed to adjust the cost of 34 MPa concrete.

The data from RSMeans are presented in Table C-11.

Table C-11: RSMeans Data Used in Predicting the Cost of 35 MPa Concrete

| MPa | Cost |
|-----|--------|
| 13 | 151.76 |
| 17 | 156.10 |
| 21 | 162.11 |
| 24 | 176.69 |
| 28 | 179.94 |
| 31 | 185.36 |
| 34 | 191.87 |

Based on the results of a regression analysis, we estimated the average cost of 35 MPa concrete at CAD193.9. Given that the average cost of 34 MPa concrete is CAD191.87, we adjusted the RSMeans cost by a factor 0.011 per cubic meter of concrete.⁵⁸

Concrete Adjustment 2

The second substantive adjustment to RSMeans data took nuclear quality requirements into consideration for the nuclear dike and related concrete below-grade. In particular, we added a quality assurance specialist to the crew placing concrete. We also applied the EMWG factors as shown in Table C-5 for formwork, rebar, concrete, and the associate labour to place those materials.

Concrete Adjustments 3 and 4

The final adjustments were specific allowances for rework and weather delays. Specifically we included a 5% allowance for rework and a second 5% allowance for weather delays. These are appropriate based on our experience.

b. Metals

The BOQ expressed required units of steel beams in kilograms and the required units of steel plate in the number of plates (each). RSMeans expresses the cost of steel beams in dollars per meter and the costs of plates in kilograms. As a result, we had to convert the unit requirements for approximately two dozen BOQ items.

To do so, we identified the density of the beam (measured in kg/m) from the beam specification and then divided the required quantity (measured in kg) by this value. The resulting quotient (measured in meters) was the value we used to determine the appropriate cost in the RSMeans database.

Table C-12 shows the results of converting quantity requirements denoted in kilograms to quantity requirements in meters.

⁵⁸ Calculated as ((\$193.9 - \$191.87) / \$191.7)) = 0.0105 or, as rounded, 0.011.

| BOQ_item | Beam | mm | kg_per_m | Kg | meters |
|----------|------|-----|----------|--------|--------|
| 5.01 | W | 200 | 22 | 687 | 31.2 |
| 5.01 | W | 310 | 33 | 216 | 6.5 |
| 5.01 | W | 310 | 74 | 714 | 9.6 |
| 5.01 | W | 360 | 45 | 8,703 | 193.4 |
| 5.01 | W | 530 | 92 | 16,456 | 178.9 |
| 5.01 | W | 610 | 101 | 811 | 8.0 |
| 5.01 | W | 610 | 174 | 27,897 | 160.3 |
| 5.01 | W | 690 | 350 | 8,680 | 24.8 |
| 5.01 | W | 760 | 134 | 1,264 | 9.4 |
| 5.01 | W | 760 | 350 | 2,132 | 6.1 |
| 5.01 | W | 760 | 484 | 7,880 | 16.3 |
| 5.01 | W | 760 | 531 | 31,833 | 59.9 |

Table C-12: Quantities in kg and meters, BOQ Section B, 5.01

c. Other Adjustments for Metals

We estimated costs for three relatively inexpensive items that were not listed in RSMeans. We used advertised vendor quotes for the material costs and estimated the associated labour required to install the materials.

- Platform with a self-closing gate
- Access ladders with cages, and
- Pedestrian roof protection mats.

We illustrate our estimating approach by describing how we estimated the material and labour costs for the roof protection mats.

Step one was to find an advertised vendor quote(s). If we were able to find multiple vendor quotes, we used the average of the quoted prices. In this case, Greatmats⁵⁹ was our source for the price of the pedestrian roof protection mats. The Greatmats quote was USD9 per square foot. We then converted the cost to Canadian dollars and the size in square feet to square meters for each of the 28 required mats. Our estimate for the material costs was CAD4,332.41.

Next, we estimated the labour costs for installing those mats. Based on our collective experience in construction and informed by an RSMeans "crew standard" for installing similar items, we posited a two-person crew consisting of a roofer and a helper. We used associated rates for these trades and skill levels from the OPG contractor wage information found on Canadian government sites (See discussion in Section C.2 above). We also assumed a number of hours for placing all of the mats. We then summed the products of the wages (in CAD/hour) times the durations (in hours) to arrive at a labour cost. For consistency with how other overnight direct cost estimates were derived, we added an amount equal to that inferred by RSMeans to account for both the subcontractor's and the EPC contractor's overhead and profit.⁶⁰ For this example, the labour cost is CAD1,026.08.

⁵⁹ See Greatmats, "Categories," accessed April 26, 2020, <u>www.greatmats.com.</u>

⁶⁰ These inferred amounts are removed when deriving the sum of direct costs without fee and contingency.

Appendix D. Backup Detail on Overnight Direct Costs

The estimate of the direct costs priced thousands of items in each of seven BOQ categories. Each category comprised three or more subcategories. We depict below a summary of overnight costs for each of the BOQ sections B through H.⁶¹ Costs are denoted in 2019 or "overnight" dollars. The first column identifies the subsection in the BOQ. The second column names the subcategory. The third column is blank, except for the bottom row. The fifth column depicts the costs for the materials identified in each subsection of the BOQ. The sixth column depicts the labour costs associated with constructing or installing the materials. The seventh column depicts the sum of costs for the materials, labour, and equipment.

Table D-1: BOQ Section B – Architectural/Structural (Civil) 62

| | | | Overnight materials costs | Overnight labour costs | Overnight equipment costs | Total overnight costs | | | | | |
|---------|-----------------------------|---------|---------------------------------|---------------------------|---------------------------------|-----------------------------|--|--|--|--|--|
| Section | B, Architectural/Structural | (Civil) | | | | | | | | | |
| B_02 | Existing conditions | | \$0 | \$22,838 | \$3,467 | \$26,305 | | | | | |
| | | | | | | | | | | | |
| B_03 | Concrete | | \$5,738,350 | \$36,488,202 | \$81,435 | \$42,307,988 | | | | | |
| | | | | | | | | | | | |
| B_04 | Masonry | | \$839,676 | \$784,418 | \$0 | \$1,624,093 | | | | | |
| | | | \$0.057.050 | * 0.000.044 | \$400 500 | * 40.455.000 | | | | | |
| B_05 | Metals | | \$9,357,953 | \$6,663,611 | \$133,523 | \$16,155,086 | | | | | |
| P 07 | Thormal protection | | ¢560.775 | ¢1 501 424 | ¢77 200 | <u> </u> | | | | | |
| Б_0/ | Thermal protection | | \$009,775 | \$1,591,434 | Φ11,322 | φΖ,Ζ30,33 I | | | | | |
| B 08 | Doors windows | | \$57 296 | \$41 268 | \$0 | \$98 564 | | | | | |
| | | | <i>Q07,200</i> | φ11,200 | ψŪ | ¢00,001 | | | | | |
| B 09 | Finishings | | \$22,933 | \$228,848 | \$0 | \$251,780 | | | | | |
| _ | | | | . , | | | | | | | |
| B_31 | Earthwork | | \$303,843 | \$149,616 | \$34,430 | \$487,889 | | | | | |
| | | | | | | | | | | | |
| B_32 | Site improvement | | \$8,522 | \$780,680 | \$2,303 | \$791,504 | | | | | |
| | | | | | | | | | | | |
| B_33 | Site utilities | | \$16,394,666 | \$8,271,539 | - | \$24,666,204 | | | | | |
| | | | | | | | | | | | |
| | | Total | \$33,293,012 | 55,022,454 | \$332,480 | \$88,647,945 | | | | | |

⁶¹ Section A of the BOQ summarizes the vendor-procured specialty items delivered to OPG that are included in Sections B through H. ⁶² Per the BOQ, not all sections are included; e.g., the BOQ did not include Section B_06.

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 68 of 350

| Quantity | Line Number | Description | | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
|--------------|---------------|---|-------------------|-----|---------------|--------------------|--------------------|-------------------------------------|
| Section B 02 | Compiled | | | | | | | |
| | | | | | | | | |
| 02 Existing | Conditions | | | | | | | |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | | |
| | | | | | | | | |
| 638 | 024113175050 | Demolish, remove pavement & curb, remove bituminous pavement, 100 mm to 150 mm thick, excludes hauling and disposal fees | | | \$ - | \$ 5,601.64 | \$ 2,915.66 | \$ 8,517.30 |
| 167 | 024113176100 | Demolish, remove pavement & curb, remove concrete curbs, reinforced, excludes hauling and disposal fees | | | \$- | \$ 3,533.72 | \$ 551.10 | \$ 4,084.82 |
| | | | Labor factor: 2.5 | 15 | \$- | \$ 9,135.36 | \$ 3,466.76 | \$ 12,602.12 \$ 13,703,04 |
| | | | | 1.5 | \$ - | \$ 22,838.40 | \$ 3,466.76 | \$ 26,305.16 |

| Quantity | Line Number | Description | | | E | xt. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&I | Р | Ext. Total O&P |
|------------|-----------------|---|--------------------------|--------------------|----------|------------------------|-----------------------------|---|-----------|-------------------------|
| | | | | | | | | | | |
| 03-01 Drai | nage sub-slab | | | | | | | | | |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| 35 | 031113653050 | C.I.P. concrete forms, slab on grade, edge, wood, 180 mm to 305 mm high, 4 use, includes erecting, bracing, stripping and cleaning | | | \$ | 403.20 | \$ 2,152.50 | \$- | 4 | 2,555.70 |
| 066 | 022211100100 | Welded wire fabric, plain, sheets, 150 x 150 - W1.4 x W1.4 (10 x 10) 1.025 kg/m2, ASTM A185M, incl labor for accessories, excl material for | | | ¢ | 2 540 59 | ¢ 4 402 44 | ¢ | | 6 722 02 |
| 900 | 032211100100 | accessories | | | φ | 2,540.56 | φ 4,192.44 | Ф - | 4 | 0,733.02 |
| 242 | 033113704650 | Structural concrete, placing, slab on grade, pumped, over 150 mm thick, includes leveling (strike off) & consolidation, excludes material | | | \$ | - | \$ 8,392.56 | \$ 1,028.50 | 5 | 9,421.06 |
| 242 | 033113350400 | Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments | | | \$ | 50,892.60 | \$ - | \$- | 4 | 50,892.60 |
| | | | Formwork factor: 1.55 | 0.550645482 | \$ | 222.02 | | | \$ | 222.02 |
| | | | wire | 0.659466328 | \$ | 1,675.43 | | | \$ | 1,675.43 |
| | | | Concrete | 0.200922908 | ⇒ \$ | 25,495.65 81,227.66 | \$ 14,737.50 | \$ 1,028.5 | ⇒ D \$ | 96,993.66 |
| | | | EMWR adjustment | | | | | | | |
| | | | EMWR Concrete | 8.8 5.710526316 | | | \$ 8,392.56 \$ 18.942.00 | | 1 | 6 8,392.56 18.942.00 |
| | | | EMWR Rebar | 0.776762402 | | | \$ 3,256.53 | | 4 | 3,256.53 |
| | | | Subotal | | | | \$ 45,328.59 | | 1 | 127,584.75 |
| | | | labor factor | 1.5 | | | \$ 67,992.88 | | 1 | 67,992.88 |
| | | | Concrete strength adjust | ment | • | 0.40.05 | | | | 0.40.05 |
| | | | Concrete factor Total | 0.011 | \$ \$ | 840.25 82.067.91 | \$ 113.321.47 | \$ 1.028.5 | \$ D 9 | 840.25 196.417.88 |
| 03-02 Bas | ement Slab | | | | Ċ | | , | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, | | |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| 966 | 033113350400 | Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments | | | \$ | 203 149 80 | s . | \$. | q | \$ 203 149 80 |
| 966 | 033113702950 | Structural concrete, placing, foundation mat, pumped, over 15.2 m3, includes leveling (strike off) & consolidation, excludes material | | | s | | \$ 15.542.94 | \$ 1,893.36 | 3 5 | 5 17,436.30 |
| 140 | 031113653060 | C.I.P. concrete forms, slab on grade, edge, wood, over 305 mm, 4 use, includes erecting, bracing, stripping and cleaning | | | \$ | 2.072.00 | \$ 10,690.40 | \$ - | | 5 12,762.40 |
| 124 | 031513500050 | Waterstop, PVC, ribbed, 6 mm thick x | | | ¢ | 1 732 62 | \$ 1094.54 | ¢ | | 3 717 16 |
| 134 | 031113651100 | C.I.P. concrete forms, slab on grade, bulkhead with keyway, wood, 150 mm high, 4 uses, includes erecting, bracing, stripping and cleaning | | | э \$ | _ 221.10 | \$ <u>3.090.04</u> | \$ | 3 | 3,717.16 3,311.14 |
| 189.93 | 032111600600 | Reinforcing steel, in place, slab on grade, #10 to #22, A615M, grade 400, incl labor for accessories, excl material for accessories | | | \$ | 357,520.43 | \$ 256,538.45 | \$ - | Ş | 6 614,058.88 |
| | | | Rebar | 0.555504185 | \$ | 198,604.10 | | | \$ | 198.604.10 |
| | | | Concrete | 0.500933908 | \$ | 101,764.62 | | | \$ | 101,764.62 |
| | | | Forms | 0.550645482 | \$ | 1,140.94 | \$ 64 134 61 | | \$ | 1,140.94 |
| | | | EMW/R adjustment | 0.20 | \$ | 866,205.61 | \$ 351,980.98 | \$ 1,893.3 | 6 \$ | 1,220,079.95 |
| | | | | | | | | | | |

| | | | | | _ | | _ | | | | 1 | |
|---|---|---|--|---|--|---|---|---|--|---------------------|--|--|
| Quantity | Line Number | Description | | | E | xt. Mat. O&P | Ex | t. Labour O&P | Ext. | . Equip. O&P | 5 | xt. Total O&P |
| | | | EMWR Concrere | 12.1 | | | \$ | 129.353.84 | | | \$ | 129.353.84 |
| | | | EMWR Forms | 8.065789474 | | | \$ | 24,923.61 | | | \$ | 24,923.61 |
| | | | EMWR Rebar | 1.351827676 | | | \$ | 346,795.78 | | | \$ | 346,795.78 |
| | | | Subotal Productivity adjustment | | | | \$ | 853,054.21 | | | \$ | 1,721,153.18 |
| | | | labor factor | 1 65 | | | ¢ | 1 407 539 45 | | | ¢ | 1 407 539 45 |
| | | | Concrete strength adjust | ment | | | Ŷ | 1,407,555.45 | | | ÷ | 1,407,555.45 |
| | | | Concrete factor | 0.011 | \$ | 3,354.06 | | | | | \$ | 3,354.06 |
| | | | Total | | \$ | 869,559.66 | \$ | 2,260,593.66 | \$ | 1,893.36 | \$ | 3,132,046.68 |
| 03-03 Top | ping Slab | | | | | | | | | | _ | |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Structural concrete, ready mix, | | | | | | | | | | |
| | | heavyweight, 34 MPa, includes local | | | | | | | | | | |
| | | aggregate, sand, Portland cement | | | | | | | | | | |
| 160 | 033113350400 | all additives and treatments | | | \$ | 33.648.00 | \$ | - | \$ | - | \$ | 33.648.00 |
| | | | | | Ċ | | Ċ | | , i | | | |
| | | Structural concrete, placing, elevated | | | | | | | | | | |
| | | slab, pumped, over 254 mm thick. | | | | | | | | | | |
| | | includes leveling (strike off) & | | | | | | | | | | |
| 160 | 033113701600 | consolidation, excludes material | | | \$ | - | \$ | 5,731.20 | \$ | 696.00 | \$ | 6,427.20 |
| | | | | | | | | | | | | |
| | | C.I.P. concrete forms, slab on grade. | | | | | | | | | | |
| | | edge, wood, 180 mm to 305 mm high, | | | | | | | | | | |
| | | 4 use, includes erecting, bracing, | | | | | | | | | | |
| 26 | 031113653050 | stripping and cleaning | | | \$ | 299.52 | \$ | 1,599.00 | \$ | - | \$ | 1,898.52 |
| | | | Concrete | 0 500000000 | * | 16 055 40 | | | | | ¢ | 10 055 10 |
| | | | Concrete | 0.500933908 | \$ | 16,855.42 | | | | | \$ | 16,855.42 |
| | | | I UTITIS | 0.550045482 | ¢ | 104.93 50 967 87 | \$ | 7 330 20 | \$ | 00 323 | ¢ | 104.93 58 994 97 |
| | | | EMWR adjustment | | Ŷ | 50,501.07 | ų | 1,550.20 | Ŷ | 050.00 | ų | 00,004.07 |
| | | | EMWR Concrere | 8.8 | | | \$ | 50.434.56 | | | \$ | 50.434.56 |
| | | | EMWR Forms | 5.710526316 | | | \$ | 9,131.13 | | | \$ | 9,131.13 |
| | | | Subotal | | | | \$ | 66,895.89 | | | \$ | 118,559.77 |
| | | | Productivity adjustment | | | | | | | | | |
| | | | labor factor | 1.5 | | | \$ | 100,343.84 | | | \$ | 100,343.84 |
| | | | Concrete strength adjust | ment | • | | | | | | • | |
| | | | Concrete factor | 0.011 | \$ | 555.54 | ¢ | 467 020 72 | ¢ | 606.00 | ¢ | 240 450 44 |
| | | | Total | | Ŷ | 51,525.41 | φ | 107,235.73 | φ | 030.00 | φ | 215,455.14 |
| | | | | | - | | | | | | | |
| 03-04 - Wa | Il Below Grade | | | | | | | | | | | |
| 03-04 - Wa | Ill Below Grade | Unit Cost Estimate | | | | | | | | | | |
| 03-04 - Wa Data Relea | III Below Grade ase : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| 03-04 - Wa Data Relea | I I Below Grade ase : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| 03-04 - Wa Data Relea | I I Below Grade ase : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| 03-04 - Wa Data Relea | III Below Grade | Unit Cost Estimate | | | | | | | | | | |
| 03-04 - Wa Data Relea | III Below Grade | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local | | | | | | | | | | |
| Data Relea | II Below Grade | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement These N end water delivered evolved | | | | | | | | | | |
| 03-04 - Wa Data Relea | II Below Grade ase : Year 2020 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments | | | \$ | 431 115 00 | \$ | | \$ | | \$ | 431 115 00 |
| 03-04 - Wa Data Relea | II Below Grade ase : Year 2020 033113350400 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments | | | \$ | 431,115.00 | \$ | | \$ | | \$ | 431,115.00 |
| 2050 | III Below Grade ase : Year 2020 033113350400 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments | | | \$ | 431,115.00 | \$ | - | \$ | | \$ | 431,115.00 |
| 2050 | II Below Grade ase : Year 2020 033113350400 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, | | | \$ | 431,115.00 | \$ | | \$ | | \$ | 431,115.00 |
| 2050 | II Below Grade Ise : Year 2020 033113350400 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes | | | \$ | 431,115.00 | \$ | | \$ | | \$ | 431,115.00 |
| 2050 | II Below Grade se : Year 2020 033113350400 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, | | | \$ | 431,115.00 | \$ | - | \$ | - | \$ | 431,115.00 |
| 03-04 - Wa Data Relea 2050 2050 | II Below Grade Ise : Year 2020 033113350400 033113705350 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material | | | \$ | 431,115.00 | \$ | - 109,552.00 | \$ | - 13,366.00 | \$ | 431,115.00 122,918.00 |
| 03-04 - Wa Data Relea 2050 2050 | II Below Grade Ise : Year 2020 033113350400 033113705350 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built. | | | \$ | 431,115.00 | \$ | - 109,552.00 | \$ | - 13,366.00 | \$ | 431,115.00 122,918.00 |
| 03-04 - Wa Data Relea 2050 2050 | II Below Grade Ise : Year 2020 033113350400 033113705350 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 1 use, | | | \$ | 431,115.00 | \$ | - 109,552.00 | \$ | - 13,366.00 | \$ | 431,115.00 122,918.00 |
| 03-04 - Wa Data Relea | II Below Grade ase : Year 2020 033113350400 033113705350 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 1 use, includes erecting, bracing, stripping | | | \$ | 431,115.00 | \$ | 109,552.00 | \$ | - 13,366.00 | \$ | 431,115.00 122,918.00 |
| 2050 2050 3368 | II Below Grade ase : Year 2020 033113350400 033113705350 031113852700 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 1 use, includes erecting, bracing, stripping and cleaning | | | \$ \$ \$ | 431,115.00 - 151,728.40 | \$ | - 109,552.00 590,343.04 | \$ \$ \$ | - 13,366.00 - | \$ \$ \$ | 431,115.00 122,918.00 742,071.44 |
| 03-04 - Wa Data Relea 2050 2050 3368 | II Below Grade se : Year 2020 033113350400 033113705350 031113852700 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 1 use, includes erecting, bracing, stripping and cleaning | | | \$ \$ \$ | 431,115.00 | \$ | - 109,552.00 590,343.04 | \$ \$ \$ | - 13,366.00 - | \$ \$ \$ | 431,115.00 122,918.00 742,071.44 |
| 03-04 - Wa Data Relea 2050 2050 3368 | II Below Grade se : Year 2020 033113350400 033113705350 031113852700 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 1 use, includes erecting, bracing, stripping and cleaning Reinforcing steel. in place, walls, #25 | | | \$ \$ \$ | 431,115.00 - 151,728.40 | \$ | - 109,552.00 590,343.04 | \$ \$ \$ | - 13,366.00 - | \$ | 431,115.00 122,918.00 742,071.44 |
| 2050 2050 3368 | II Below Grade Ise : Year 2020 033113350400 033113705350 031113852700 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 1 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor | | | \$ \$ \$ | 431,115.00 - 151,728.40 | \$ | - 109,552.00 590,343.04 | \$ \$ \$ | - 13,366.00 - | \$ | 431,115.00 122,918.00 742,071.44 |
| 03-04 - Wa Data Relea | II Below Grade Ise : Year 2020 033113350400 033113705350 031113852700 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 1 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for | | | \$ \$ \$ | 431,115.00 | \$ | - 109,552.00 590,343.04 | \$ \$ \$ | - 13,366.00 - | \$ \$ \$ | 431,115.00 122,918.00 742,071.44 |
| 2050 2050 3368 293.6 | II Below Grade ISE : Year 2020 033113350400 033113705350 031113852700 032111600750 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 1 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for accessories | | | \$ \$ \$ | 431,115.00 - 151,728.40 552,666.77 | \$ | - 109,552.00 590,343.04 228,787.80 | \$ \$ \$ | - 13,366.00 | \$ \$ \$ | 431,115.00 122,918.00 742,071.44 781,454.57 |
| 2050 2050 2050 3368 293.6 | II Below Grade se : Year 2020 033113350400 033113705350 031113852700 032111600750 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 1 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for accessories | | | \$ \$ \$ | 431,115.00 151,728.40 552,666.77 | \$\$ | - 109,552.00 590,343.04 228,787.80 | \$ \$ \$ | - 13,366.00 | \$ \$ \$ | 431,115.00 122,918.00 742,071.44 781,454.57 |
| 2050 2050 2050 3368 293.6 | II Below Grade se : Year 2020 033113350400 033113705350 031113852700 032111600750 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 1 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories C.I.P. concrete forms, wall, buikhead with L hiece expanded matel knews | | | \$ \$ \$ | 431,115.00 - 151,728.40 552,666.77 | \$ | - 109,552.00 590,343.04 228,787.80 | \$ \$ \$ | - 13,366.00 | \$ \$ \$ | 431,115.00 122,918.00 742,071.44 781,454.57 |
| 2050 2050 2050 3368 293.6 | II Below Grade se : Year 2020 033113350400 033113705350 031113852700 032111600750 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 1 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories C.I.P. concrete forms, wall, buikhead with 1 piece expanded metal keyway, left in place, 300 mm wall in lieu of 3 | | | \$ \$ \$ | 431,115.00 - 151,728.40 552,666.77 | \$ | - 109,552.00 590,343.04 228,787.80 | \$ \$ \$ | - 13,366.00 | \$ \$ \$ | 431,115.00 122,918.00 742,071.44 781,454.57 |
| 2050 2050 3368 293.6 | II Below Grade ISE : Year 2020 033113350400 033113705350 031113852700 032111600750 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 1 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories C.I.P. concrete forms, wall, bulkhead with 1 piece expanded metal keyway, left in place, 300 mm wall, in lieu of 3 piece form, includes erecting, bracing. | | | \$ \$ \$ | 431,115.00 | \$\$\$ | - 109,552.00 590,343.04 228,787.80 | \$ \$ \$ | - 13,366.00 | \$ \$ \$ | 431,115.00 122,918.00 742,071.44 781,454.57 |
| 03-04 - Wa Data Relea 2050 2050 3368 293.6 269 | II Below Grade ISE : Year 2020 033113350400 033113705350 031113852700 032111600750 031113850620 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 1 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for accessories C.I.P. concrete forms, wall, buikhead with 1 piece expanded metal keyway, left in place, 300 mm wall, in lieu of 3 piece form, includes erecting, bracing, stripping and cleaning | | | \$ \$ \$ \$ | 431,115.00 - 151,728.40 552,666.77 2,337.61 | \$ \$ | - 109,552.00 590,343.04 228,787.80 4,177.57 | \$ \$ \$ \$ | - 13,366.00 | \$\$\$ | 431,115.00 122,918.00 742,071.44 781,454.57 6,515.18 |
| 2050 2050 3368 293.6 | II Below Grade se : Year 2020 033113350400 033113705350 031113852700 032111600750 031113850620 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.1.P. concrete forms, wall, job built, plywood, over 4.88 m high, 1 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for accessories C.1.P. concrete forms, wall, builkhead with 1 piece expanded metal keyway, left in place, 300 mm wall, in lieu of 3 piece form, includes erecting, bracing, stripping and cleaning | | | \$ \$ \$ \$ | 431,115.00 | \$ \$ \$ \$ | - 109,552.00 590,343.04 228,787.80 4,177.57 | \$ \$ \$ \$ | - 13,366.00 | \$ \$ \$ \$ | 431,115.00 122,918.00 742,071.44 781,454.57 6,515.18 |
| 2050 2050 3368 293.6 269 | II Below Grade se : Year 2020 033113350400 033113705350 031113852700 032111600750 031113850620 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 1 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories C.I.P. concrete forms, wall, bulkhead with 1 piece expanded metal keyway, left in place, 300 mm wall, in lieu of 3 piece form, includes erecting, bracing, stripping and cleaning Waterstop, PVC, ribbed, 6 mm thick x | | | \$ \$ \$ \$ \$ | 431,115.00 | \$ \$ \$ \$ | - 109,552.00 590,343.04 228,787.80 4,177.57 | \$ \$ \$ \$ | - 13,366.00 | \$ \$ \$ \$ | 431,115.00 122,918.00 742,071.44 781,454.57 6,515.18 |
| 03-04 - Wa Data Relea 2050 2050 3368 293.6 269 269 | II Below Grade ISE : Year 2020 033113350400 033113705350 031113852700 032111600750 031113850620 031513500050 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 1 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories C.I.P. concrete forms, wall, bulkhead with 1 piece expanded metal keyway, left in place, 300 mm wall, in lieu of 3 piece form, includes erecting, bracing, stripping and cleaning Waterstop, PVC, ribbed, 6 mm thick x 150 mm wide | | | \$ \$ \$ \$ \$ \$ | 431,115.00 | \$ | - 109,552.00 590,343.04 228,787.80 4,177.57 3,983.89 | \$ \$ \$ \$ \$ \$ | - 13,366.00 | \$ \$ \$ \$ \$ \$ | 431,115.00 122,918.00 742,071.44 781,454.57 6,515.18 7,462.06 |
| 03-04 - Wa Data Relea 2050 2050 33368 293.6 269 269 | II Below Grade ISE : Year 2020 033113350400 033113705350 031113852700 032111600750 031113850620 031513500050 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 1 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for accessories C.I.P. concrete forms, wall, bulkhead with 1 piece expanded metal keyway, left in place, 300 mm wall, in lieu of 3 piece form, includes erecting, bracing, stripping and cleaning Waterstop, PVC, ribbed, 6 mm thick x 150 mm wide | Concrete | 0.500933908 | \$ \$ \$ \$ \$ \$ | 431,115.00 - 151,728.40 552,666.77 2,337.61 3,478.17 215 960 12 | \$ \$ \$ \$ \$ | - 109,552.00 590,343.04 228,787.80 4,177.57 3,983.89 | \$ \$ \$ \$ \$ \$ | - 13,366.00 | \$ \$ \$ \$ \$ \$ \$ | 431,115.00 122,918.00 742,071.44 781,454.57 6,515.18 7,462.06 215.960.12 |
| 03-04 - Wa Data Relea 2050 2050 3368 293.6 269 269 | II Below Grade ISE : Year 2020 033113350400 033113705350 031113852700 032111600750 031113850620 031513500050 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 1 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories C.I.P. concrete forms, wall, bulkhead with 1 piece expanded metal keyway, left in place, 300 mm wall, in lieu of 3 piece form, includes erecting, bracing, stripping and cleaning Waterstop, PVC, ribbed, 6 mm thick x 150 mm wide | Concrete | 0.500933908 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 431,115.00 - 151,728.40 552,666.77 2,337.61 3,478.17 215,960.12 84,835.75 | \$ \$ \$ \$ \$ | - 109,552.00 590,343.04 228,787.80 4,177.57 3,983.89 | \$ \$ \$ \$ \$ \$ | - 13,366.00 | \$ \$ \$ \$ | 431,115.00 122,918.00 742,071.44 781,454.57 6,515.18 7,462.06 215,960.12 84.835.75 |
| 2050 2050 2050 3368 293.6 269 269 | II Below Grade se : Year 2020 033113350400 033113705350 031113852700 032111600750 031113850620 031513500050 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 1 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for accessories C.I.P. concrete forms, wall, bulkhead with 1 piece expanded metal keyway, left in place, 300 mm wall, in lieu of 3 piece form, includes erecting, bracing, stripping and cleaning Waterstop, PVC, ribbed, 6 mm thick x 150 mm wide | Concrete Forms | 0.500933908 | \$ \$ \$ \$ \$ \$ \$ \$ \$ | 431,115.00 - 151,728.40 552,666.77 2,337.61 3,478.17 215,960.12 84,835.75 307,008.70 | \$ \$ \$ \$ \$ | - 109,552.00 590,343.04 228,787.80 4,177.57 3,983.89 | \$ \$ \$ \$ \$ \$ | - 13,366.00 | \$ \$ \$ \$ \$ \$ \$ \$ | 431,115.00 122,918.00 742,071.44 781,454.57 6,515.18 7,462.06 215,960.1 215,960.1 215,960.2 |
| 2050 2050 2050 3368 293.6 269 269 | II Below Grade se : Year 2020 033113350400 033113705350 031113852700 032111600750 031113850620 031513500050 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 1 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories C.I.P. concrete forms, wall, bulkhead with 1 piece expanded metal keyway, left in place, 300 mm wall, in lieu of 3 piece form, includes erecting, bracing, stripping and cleaning Waterstop, PVC, ribbed, 6 mm thick x 150 mm wide | Concrete Forms rebar QA | 0.500933908 0.550645482 0.555504185 0.25 | \$ \$ \$ \$ \$ \$ \$ \$ \$ | 431,115.00 - 151,728.40 552,666.77 2,337.61 3,478.17 215,960.12 84,835.75 307,008.70 | \$ | - 109,552.00 590,343.04 228,787.80 4,177.57 3,983.89 57,196.95 | \$ \$ \$ \$ \$ \$ \$ | - 13,366.00 | \$ \$ \$ \$ \$ | 431,115.00 122,918.00 742,071.44 781,454.57 6,515.18 7,462.06 215,960.12 84,835.75 307,008.70 57,196.95 |
| 2050 2050 2050 3368 293.6 269 269 | II Below Grade Ise : Year 2020 033113350400 033113705350 031113852700 032111600750 031113850620 031513500050 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 1 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories C.I.P. concrete forms, wall, buikhead with 1 piece expanded metal keyway, left in place, 300 mm wall, in lieu of 3 piece form, includes erecting, bracing, stripping and cleaning Waterstop, PVC, ribbed, 6 mm thick x 150 mm wide | Concrete Forms rebar QA | 0.500933908 0.550645482 0.555504185 0.25 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 431,115.00 - 151,728.40 552,666.77 2,337.61 3,478.17 215,960.12 84,835.75 307,008.70 1,749,130.53 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | - 109,552.00 590,343.04 228,787.80 4,177.57 3,983.89 57,196.95 994,041.25 | \$ \$ \$ \$ \$ \$ \$ \$ \$ | 13,366.00 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 431,115.00 122,918.00 742,071.44 781,454.57 6,515.18 7,462.06 215,960.12 84,835.75 307,008.70 57,196.95 2,756,537.78 |
| 03-04 - Wa Data Relea 2050 2050 3368 293.6 269 269 269 | II Below Grade ISE : Year 2020 033113350400 033113705350 031113852700 032111600750 031113850620 031513500050 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 1 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories C.I.P. concrete forms, wall, buikhead with 1 piece expanded metal keyway, stripping and cleaning Waterstop, PVC, ribbed, 6 mm thick x 150 mm wide | Concrete Forms rebar QA EMWR adjustment | 0.500933908 0.550645482 0.555504185 0.25 | \$ \$ \$ \$ \$ \$ \$ \$ \$ | 431,115.00 - 151,728.40 552,666.77 2,337.61 3,478.17 215,960.12 84,835.75 307,008.70 1,749,130.53 | \$ \$ \$ \$ \$ \$ \$ | - 109,552.00 590,343.04 228,787.80 4,177.57 3,983.89 57,196.95 994,041.25 | \$ \$ \$ \$ \$ \$ \$ | | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 431,115.00 122,918.00 742,071.44 781,454.57 6,515.18 7,462.06 215,960.12 84,835.75 307,008.70 57,196.95 2, 756,537.78 |
| 03-04 - Wa Data Relea 2050 2050 33368 293.6 269 269 269 | II Below Grade ISE : Year 2020 033113350400 033113705350 031113852700 032111600750 031113850620 031513500050 | Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 1 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories C.I.P. concrete forms, wall, bulkhead with 1 piece expanded metal keyway, left in place, 300 mm wall, in lieu of 3 piece form, includes erecting, bracing, stripping and cleaning Waterstop, PVC, ribbed, 6 mm thick x 150 mm wide | Concrete Forms rebar QA EMWR adjustment EMWR Concrere | 0.500933908 0.550645482 0.555504185 0.25 12.1 8.05570474 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 431,115.00 151,728.40 552,666.77 2,337.61 3,478.17 215,960.12 84,835.75 307,008.70 1,749,130.53 | \$ \$ \$ \$ \$ \$ \$ | 109,552.00 590,343.04 228,787.80 4,177.57 3,983.89 57,196.95 994,041.25 1,325,579.20 | \$ \$ \$ \$ \$ \$ \$ | - 13,366.00 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 431,115.00 122,918.00 742,071.44 781,454.57 6,515.18 7,462.06 215,960.12 84,835.75 307,008.70 57,196.95 2,756,537.78 1,325,579.20 |

| Quantity | Line Number | Description | | | E | xt. Mat. O&P | Е | xt. Labour O&P | Ext. | Equip. O&P | | Ext. Total O&P |
|---|---|---|--|---|--|--|--|--|--|------------------------------------|--|---|
| | | | Cubatal | | | | | 7 200 404 04 | | | | 0.450.004.04 |
| | | | Productivity adjustment | | | | Þ | 7,390,484.81 | | | Þ | 9,152,981.34 |
| | | | labor factor | 1.5 | | | \$ | 11,085,727.21 | | | \$ | 11,085,727.21 |
| | | | Concrete strength adjust | ment 0.011 | \$ | 7.117.83 | | | | | \$ | 7.117.83 |
| | | | Total | | \$ | 1,756,248.35 | \$ | 18,476,212.02 | \$ | 13,366.00 | \$ | 20,245,826.37 |
| 03-05 - Rei | inf Concrete Pa | rtition Wall | | | | | | | | | | |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Structural concrete, ready mix, | | | | | | | | | | |
| | | aggregate, sand, Portland cement | | | | | | | | | | |
| 70 | | (Type I) and water, delivered, excludes | | | | 15 000 00 | | | | | | 15 000 00 |
| 76 | 033113350400 | all additives and treatments | | | \$ | 15,982.80 | \$ | - | \$ | - | \$ | 15,982.80 |
| | | Structural concrete, placing, walls, | | | | | | | | | | |
| | | pumped, 380 mm thick, includes | | | | | | | | | | |
| 76 | 033113705350 | excludes material | | | \$ | - | \$ | 4,061.44 | \$ | 495.52 | \$ | 4,556.96 |
| | | | | | | | | · | | | | |
| | | C.I.P. concrete forms, wall, job built, | | | | | | | | | | |
| | | includes erecting, bracing, stripping | | | | | | | | | | |
| 496 | 031113852750 | and cleaning | | | \$ | 12,226.40 | \$ | 70,159.20 | \$ | - | \$ | 82,385.60 |
| | | | | | | | | | | | | |
| | | to #57, A615M, grade 400, incl labor | | | | | | | | | | |
| | | for accessories, excl material for | | | | | | | | | | |
| 9.88 | 032111600750 | accessories | | | \$ | 18,597.91 | \$ | 7,698.99 | \$ | - | \$ | 26,296.90 |
| | | | Concrete | 0.500933908 | \$ | 8,006.33 | | | | | \$ | 8,006.33 |
| | | | Forms | 0.550645482 | \$ | 6,732.41 | | | | | \$ | 6,732.41 |
| | | | rebar OA | 0.555504185 | \$ | 10,331.22 | \$ | 1.924.75 | | | \$ \$ | 10,331.22 |
| | | | . | | \$ | 71,877.07 | \$ | 83,844.38 | \$ | 495.52 | \$ | 156,216.96 |
| | | | EMWR adjustment | 42.4 | | | ¢ | 40 442 42 | | | ¢ | 40 4 43 43 |
| | | | EMWR Forms | 8.065789474 | | | э \$ | 565,889.34 | | | э \$ | 565,889.34 |
| | | | EMWR Rebar | 1.351827676 | | | \$ | 10,407.71 | | | \$ | 10,407.71 |
| | | | Subotal Productivity adjustment | | | | \$ | 709,284.85 | | | \$ | 781,657.43 |
| | | | labor factor | 1.5 | | | \$ | 1,063,927.27 | | | \$ | 1,063,927.27 |
| | | | Concrete strength adjust | ment | | | | | | | | |
| | | | a b c b | | • | | | | | | | |
| | | | Concrete factor Total | 0.011 | \$ \$ | 263.88 72.140.95 | \$ | 1.773.212.12 | \$ | 495.52 | \$ \$ | 263.88 1.845.848.58 |
| 03-06 Rein | of Concrete Par | tition Wall 200m thick | Concrete factor Total | 0.011 | \$ \$ | 263.88 72,140.95 | \$ | 1,773,212.12 | \$ | 495.52 | \$ \$ | 263.88 1,845,848.58 |
| 03-06 Reir Data Relea | if Concrete Par ase : Year 2020 | tition Wall 200m thick Unit Cost Estimate | Concrete factor Total | 0.011 | \$ \$ | 263.88 72,140.95 | \$ | 1,773,212.12 | \$ | 495.52 | \$ \$ | 263.88 1,845,848.58 |
| 03-06 Reir Data Relea | n f Concrete Par ase : Year 2020 | tition Wall 200m thick Unit Cost Estimate | Concrete factor Total | 0.011 | \$ \$ | 263.88 72,140.95 | \$ | 1,773,212.12 | \$ | 495.52 | \$ \$ | 263.88 1,845,848.58 |
| 03-06 Rei n Data Relea | if Concrete Par ase : Year 2020 | tition Wall 200m thick Unit Cost Estimate | Concrete factor Total | 0.011 | \$ | 263.88 72,140.95 | \$ | 1,773,212.12 | \$ | 495.52 | \$ | 263.88 1,845,848.58 |
| 03-06 Reir Data Relea | n f Concrete Par ase : Year 2020 | tition Wall 200m thick Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local | Concrete factor Total | 0.011 | \$ | 263.88 72,140.95 | \$ | 1,773,212.12 | \$ | 495.52 | \$ | 263.88 1,845,848.58 |
| 03-06 Reir Data Relea | if Concrete Par ase : Year 2020 | tition Wall 200m thick Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement | Concrete factor Total | 0.011 | \$ | 263.88 72,140.95 | \$ | 1,773,212.12 | \$ | 495.52 | \$ | 263.88 1,845,848.58 |
| 03-06 Reir Data Relea | of Concrete Par ase : Year 2020 | tition Wall 200m thick Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments | Concrete factor Total | 0.011 | \$ | 263.88 72,140.95 | \$ | 1,773,212.12 | \$ | 495.52 | \$ \$ | 263.88 1,845,848.58 2,313.30 |
| 03-06 Rein Data Relea | n f Concrete Par Ise : Year 2020 033113350400 | tition Wall 200m thick Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls. | Concrete factor Total | 0.011 | \$ \$ | 263.88 72,140.95 2,313.30 | \$ | 1,773,212.12 | \$ | 495.52 | \$ \$ | 263.88 1,845,848.58 2,313.30 |
| 03-06 Rein Data Relea | If Concrete Par Ise : Year 2020 033113350400 | tition Wall 200m thick Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes | Concrete factor Total | 0.011 | \$ \$ | 263.88 72,140.95 2,313.30 | \$ | 1,773,212.12 | \$ | 495.52 | \$ | 263.88 1,845,848.58 2,313.30 |
| 03-06 Reir Data Relea 11 | If Concrete Par Ise : Year 2020 033113350400 033113705350 | tition Wall 200m thick Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material | Concrete factor Total | 0.011 | \$ \$ \$ | 263.88 72,140.95 2,313.30 | \$ | 1,773,212.12 | \$ | 495.52 | \$ \$ \$ | 263.88 1,845,848.58 2,313.30 659.56 |
| 03-06 Rein Data Relea 11 | If Concrete Par Ise : Year 2020 033113350400 033113705350 | tition Wall 200m thick Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, | Concrete factor Total | 0.011 | \$ \$ \$ \$ | 263.88 72,140.95 2,313.30 | \$ \$ \$ | 1,773,212.12 | \$ \$ \$ | 495.52 - 71.72 | \$ \$ \$ \$ | 263.88 1,845,848.58 2,313.30 659.56 |
| 03-06 Rein Data Relea 11 | If Concrete Par Ise : Year 2020 033113350400 033113705350 | tition Wall 200m thick Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 2 use, | Concrete factor Total | 0.011 | \$ \$ \$ \$ | 263.88 72,140.95 2,313.30 | \$ \$ | 1,773,212.12 | \$ \$ \$ | 495.52 - 71.72 | \$ \$ \$ \$ | 263.88 1,845,848.58 2,313.30 659.56 |
| 03-06 Rein Data Relea 11 11 | If Concrete Par ise : Year 2020 033113350400 033113705350 031113852750 | tition Wall 200m thick Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 2 use, includes erecting, bracing, stripping and cleaning | Concrete factor Total | 0.011 | \$ \$ \$ \$ | 263.88 72,140.95 2,313.30 - 12,226.40 | \$ \$ \$ | 1,773,212.12 - - 587.84 70.159.20 | \$ \$ \$ | 495.52 - 71.72 | \$ \$ \$ \$ | 263.88 1,845,848.58 2,313.30 659.56 82.385.60 |
| 03-06 Rein Data Relea 11 11 496 | If Concrete Par Ise : Year 2020 033113350400 033113705350 031113852750 | tition Wall 200m thick Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 2 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 | Concrete factor Total | 0.011 | \$ \$ \$ \$ \$ | 263.88 72,140.95 2,313.30 - 12,226.40 | \$ \$ \$ | 1,773,212.12 - 587.84 70,159.20 | \$ \$ \$ | 495.52 - 71.72 - | \$ \$ \$ \$ | 263.88 1,845,848.58 2,313.30 659.56 82,385.60 |
| 03-06 Rein Data Relea 11 11 496 | f Concrete Par ise : Year 2020 033113350400 033113705350 031113852750 | tition Wall 200m thick Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 2 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor | Concrete factor Total | 0.011 | \$ \$ \$ \$ \$ | 263.88 72,140.95 2,313.30 - 12,226.40 | \$ \$ \$ | 1,773,212.12 - - 587.84 70,159.20 | \$ \$ \$ \$ | 495.52 - 71.72 - | \$ \$ \$ \$ | 263.88 1,845,848.58 2,313.30 659.56 82,385.60 |
| 03-06 Rein Data Relea 11 11 496 2.15 | f Concrete Par ise : Year 2020 033113350400 033113705350 031113852750 032111600750 | tition Wall 200m thick Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 2 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for accessories | Concrete factor Total | 0.011 | \$ \$ \$ \$ \$ \$ | 263.88 72,140.95 2,313.30 - 12,226.40 4,047.12 | \$ \$ \$ \$ | 1,773,212.12 - - 587.84 70,159.20 1.675.39 | \$ \$ \$ \$ | 495.52 - 71.72 - | \$ \$ \$ \$ | 263.88 1,845,848.58 2,313.30 659.56 82,385.60 5.722.50 |
| 03-06 Rein Data Relea 11 11 496 2.15 | f Concrete Par ase : Year 2020 033113350400 033113705350 031113852750 032111600750 | tition Wall 200m thick Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 2 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for accessories | Concrete factor | 0.011 | \$ \$ \$ \$ \$ \$ \$ | 263.88 72,140.95 2,313.30 - 12,226.40 4,047.12 | \$ \$ \$ \$ | 1,773,212.12 - - 587.84 70,159.20 1,675.39 | \$ \$ \$ \$ | 495.52 - 71.72 - | \$ \$ \$ \$ \$ | 263.88 1,845,848.58 2,313.30 659.56 82,385.60 5,722.50 |
| 03-06 Rein Data Relea 11 11 496 2.15 | f Concrete Par ase : Year 2020 033113350400 033113705350 031113852750 032111600750 | tition Wall 200m thick Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 2 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for accessories | Concrete factor Total | 0.500933908 | \$ \$ \$ \$ \$ \$ \$ \$ \$ | 263.88 72,140.95 2,313.30 - 12,226.40 4,047.12 1,158.81 12,226.40 | \$ \$ \$ \$ | 1,773,212.12 - - 587.84 70,159.20 1,675.39 | \$ \$ \$ \$ \$ | 495.52 - 71.72 - | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 263.88 1,845,848.58 2,313.30 659.56 82,385.60 5,722.50 1,158.81 12 226.40 |
| 03-06 Rein Data Relea 11 11 496 2.15 | f Concrete Par ase : Year 2020 033113350400 033113705350 031113852750 032111600750 | tition Wall 200m thick Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 2 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for accessories | Concrete factor Total | 0.500933908 0.550645482 0.55564185 | \$ \$ \$ \$ \$ \$ \$ \$ \$ | 263.88 72,140.95 2,313.30 - 12,226.40 4,047.12 1,158.81 12,226.40 2,248.19 | \$ \$ \$ \$ | 1,773,212.12 - - 587.84 70,159.20 1,675.39 | \$ \$ \$ \$ | 495.52 - 71.72 - | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 263.88 1,845,848.58 2,313.30 659.56 82,385.60 5,722.50 1,158.81 12,226.40 2,248.19 |
| 03-06 Rein Data Relea 11 11 496 2.15 | f Concrete Par ase : Year 2020 033113350400 033113705350 031113852750 032111600750 | tition Wall 200m thick Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 2 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for accessories | Concrete factor Total | 0.500933908 0.550645482 0.555504185 0.25 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 263.88 72,140.95 2,313.30 - 12,226.40 4,047.12 1,158.81 12,226.40 2,248.19 | \$ \$ \$ \$ \$ | 1,773,212.12 - - 587.84 70,159.20 1,675.39 418.85 | \$ \$ \$ \$ \$ | 495.52 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 263.88 1,845,848.58 2,313.30 659.56 82,385.60 5,722.50 1,158.81 12,226.40 2,248.19 418.85 |
| 03-06 Rein Data Relea | f Concrete Par ase : Year 2020 033113350400 033113705350 031113852750 032111600750 | tition Wall 200m thick Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 2 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for accessories | Concrete factor Total | 0.500933908 0.550645482 0.555504185 0.25 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 263.88 72,140.95 2,313.30 12,226.40 4,047.12 1,158.81 12,226.40 2,248.19 34,220.22 | \$ \$ \$ \$ \$ \$ | 1,773,212.12 - - 587.84 70,159.20 1,675.39 418.85 72,841.28 | \$ \$ \$ \$ \$ \$ | 495.52 | \$ \$ | 263.88 1,845,848.58 2,313.30 659.56 82,385.60 5,722.50 1,158.81 12,226.40 2,248.19 418.85 107,133.21 |
| 03-06 Rein Data Relea | f Concrete Par ase : Year 2020 033113350400 033113705350 031113852750 032111600750 | tition Wall 200m thick Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 2 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for accessories | Concrete factor Total Concrete Forms rebar QA EMWR adjustment | 0.500933908 0.550645482 0.55564185 0.25 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 263.88 72,140.95 2,313.30 12,226.40 4,047.12 1,158.81 12,226.40 2,248.19 34,220.22 | \$ \$ \$ \$ \$ \$ | 1,773,212.12 - - 587.84 70,159.20 1,675.39 418.85 72,841.28 | \$ \$ \$ \$ \$ \$ | 495.52 | \$ \$ | 263.88 1,845,848.58 2,313.30 659.56 82,385.60 5,722.50 1,158.81 12,226.40 2,248.19 418.85 107,133.21 |
| 03-06 Rein Data Relea | f Concrete Par ase : Year 2020 033113350400 033113705350 031113852750 032111600750 | tition Wall 200m thick Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 2 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for accessories | Concrete factor Total Concrete Forms rebar QA EMWR adjustment EMWR Concrere | 0.011 0.011 0.500933908 0.550645482 0.555504185 0.25 0.25 0.25 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 263.88 72,140.95 2,313.30 12,226.40 4,047.12 1,158.81 12,226.40 2,248.19 34,220.22 | \$ \$ \$ \$ \$ \$ \$ | 1,773,212.12 587.84 70,159.20 1,675.39 418.85 72,841.28 7,112.86 | \$ \$ \$ \$ \$ \$ | 495.52 - 71.72 - 71.72 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 263.88 1,845,848.58 2,313.30 659.56 82,385.60 5,722.50 1,158.81 12,226.40 2,248.19 418.85 107,133.21 7,112.86 |
| 03-06 Rein Data Relea | f Concrete Par ase : Year 2020 033113350400 033113705350 031113852750 032111600750 | tition Wall 200m thick Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 2 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for accessories | Concrete factor Total Concrete Forms rebar QA EMWR adjustment EMWR Concrete EMWR Forms | 0.0011 0.0011 0.500933908 0.550645482 0.55504185 0.25 0.25 0.25 0.25 0.25 0.25 | \$ \$ \$ \$ \$ \$ \$ \$ \$ | 263.88 72,140.95 2,313.30 12,226.40 4,047.12 1,158.81 12,226.40 2,248.19 34,220.22 | \$ \$ \$ \$ \$ \$ \$ \$ \$ | 1,773,212.12 - - 587.84 70,159.20 1,675.39 418.85 72,841.28 7,112.86 565,889.34 2,264.24 | \$ \$ \$ \$ \$ \$ | 495.52 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 263.88 1,845,848.58 2,313.30 659.56 82,385.60 5,722.50 1,158.81 12,226.40 2,248.19 418.85 107,133.21 7,112.86 565,889.34 |
| 03-06 Rein Data Relea | f Concrete Par ase : Year 2020 033113350400 033113705350 031113852750 032111600750 | tition Wall 200m thick Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 2 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for accessories | Concrete factor Total | 0.500933908 0.500933908 0.550645482 0.55504185 0.25 12.1 8.065789474 1.351827676 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 263.88 72,140.95 2,313.30 12,226.40 4,047.12 1,158.81 12,226.40 2,248.19 34,220.22 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 1,773,212.12 - - - - - - - - - - - - - - - - - - - | \$ \$ \$ \$ \$ | 495.52 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 263.88 1,845,848.58 2,313.30 659.56 82,385.60 5,722.50 1,158.81 12,226.40 2,248.19 418.85 107,133.21 7,112.86 5565,89.34 2,264.84 6,82.400.25 |
| 03-06 Rein Data Relea | f Concrete Par ase : Year 2020 033113350400 033113705350 031113852750 032111600750 | tition Wall 200m thick Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 2 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for accessories | Concrete factor Total | 0.500933908 0.500933908 0.550645482 0.55504185 0.25 12.1 8.065789474 1.351827676 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 263.88 72,140.95 2,313.30 12,226.40 4,047.12 1,158.81 12,226.40 2,248.19 34,220.22 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 1,773,212.12 - - 587.84 70,159.20 1,675.39 418.85 72,841.28 7,112.86 565,889.34 2,264.84 648,108.32 | \$ \$ \$ \$ \$ | 495.52 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 263.88 1,845,848.58 2,313.30 659.56 82,385.60 5,722.50 1,158.81 12,226.40 2,248.19 418.85 107,133.21 7,112.86 565,889.34 2,264.84 2,264.84 652,400.25 |
| 03-06 Rein Data Relea | f Concrete Par ase : Year 2020 033113350400 033113705350 031113852750 032111600750 | tition Wall 200m thick Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 2 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories accessories | Concrete factor Total | 0.500933908 0.550645482 0.555645482 0.555504185 0.25 12.1 8.065789474 1.351827676 1.5 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 263.88 72,140.95 2,313.30 12,226.40 4,047.12 1,158.81 12,226.40 2,248.19 34,220.22 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 1,773,212.12 - - - - - - - - - - - - - - - - - - - | \$ \$ \$ \$ \$ \$ | 495.52 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 263.88 1,845,848.58 2,313.30 659.56 82,385.60 5,722.50 1,158.81 12,226.40 2,248.19 418.85 107,133.21 7,112.86 565,889.34 2,264.84 682,400.25 972,162.48 |
| 03-06 Rein Data Relea | f Concrete Par see : Year 2020 033113350400 033113705350 031113852750 032111600750 | tition Wall 200m thick Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 2 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for accessories | Concrete factor Total | 0.500933908 0.550645482 0.555645482 0.555504185 0.25 12.1 8.065789474 1.351827676 1.5 ment | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 263.88 72,140.95 2,313.30 12,226.40 4,047.12 1,158.81 12,226.40 2,248.19 34,220.22 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 1,773,212.12 - - - - - - - - - - - - - - - - - - - | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 495.52 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 263.88 1,845,848.58 2,313.30 659.56 82,385.60 5,722.50 1,158.81 12,226.40 2,248.19 418.85 107,133.21 7,112.86 565,889.34 2,264.84 682,400.25 972,162.48 |
| 03-06 Rein Data Relea | f Concrete Par see : Year 2020 033113350400 033113705350 031113852750 032111600750 | tition Wall 200m thick Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 2 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for accessories | Concrete factor Total | 0.500933908 0.550645482 0.55564185 0.25 12.1 8.065789474 1.351827676 1.5 ment 0.011 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 263.88 72,140.95 2,313.30 - 12,226.40 4,047.12 1,158.81 12,226.40 2,248.19 34,220.22 34,220.22 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 1,773,212.12 - - 587.84 70,159.20 1,675.39 418.85 72,841.28 7,112.86 565,889.34 2,264.84 648,108.32 972,162.48 | \$ \$ \$ \$ \$ \$ \$ | 495.52 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 263.88 1,845,848.58 2,313.30 659.56 82,385.60 5,722.50 1,158.81 12,226.40 2,248.19 418.85 107,133.21 7,112.86 565,889.34 2,264.84 682,400.25 972,162.48 |
| 03-06 Rein Data Relea | f Concrete Par ase : Year 2020 033113350400 033113705350 031113852750 032111600750 | tition Wall 200m thick Unit Cost Estimate Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 2 use, includes erecting, bracing, stripping and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for accessories | Concrete factor Total | 0.500933908 0.550645482 0.555504185 0.25 12.1 8.065789474 1.351827676 1.5 ment 0.011 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 263.88 72,140.95 2,313.30 2,313.30 12,226.40 4,047.12 1,158.81 12,226.40 2,248.19 34,220.22 38,19 34,258.42 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 1,773,212.12 - - - - - - - - - - - - - - - - - - - | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 495.52 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 263.88 1,845,848.58 2,313.30 659.56 82,385.60 5,722.50 1,158.81 12,226.40 2,248.19 418.85 107,133.21 7,112.86 565,889.34 2,264.84 682,400.25 972,162.48 38.19 1,654,600.92 |

| Quantity | Line Number | Description | | | E | ct. Mat. O&P | E | ct. Labour O&P | Ext. | Equip. O&P | E | xt. Total O&P |
|------------|---|---|------------------------------------|-------------|----|------------------|--------|--------------------|------|------------|----------|---------------|
| Data Relea | ase · Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| Data Holoc | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| 57 | 033113350400 | Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments | | | \$ | 11,987.10 | \$ | <u>-</u> | \$ | - | \$ | 11,987.10 |
| 57 | 033113705350 | Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, evolutes material | | | s | _ | s | 3 046 08 | \$ | 371 64 | s | 3 4 17 72 |
| 500 | 000000000000000000000000000000000000000 | C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 2 use, includes erecting, bracing, stripping | | | Ŷ | 40.054.00 | ę | 3,040.00 | Ŷ | 371.04 | ¢ | 04.040.00 |
| 566 | 031113852750 | and cleaning Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for | | | \$ | 13,951.90 | \$ | 80,060.70 | \$ | - | \$ | 94,012.60 |
| 11.12 | 032111600750 | accessories | | | \$ | 20,932.07 | \$ | 8,665.26 | \$ | - | \$ | 29,597.33 |
| | | | Concrete | 0.500933908 | \$ | 6,004.74 | | | | | \$ | 6,004.74 |
| | | | Forms | 0.550645482 | \$ | 7,682.55 | | | | | \$ | 7,682.55 |
| | | | rebar | 0.555504185 | \$ | 11,627.85 | ¢ | 2 166 32 | | | \$ | 11,627.85 |
| | | | QA | 0.25 | • | 70 400 00 | | 2,100.32 | • | | .p | 2,100.52 |
| | | | | | \$ | 72,186.22 | \$ | 93,938.36 | \$ | 3/1.64 | \$ | 166,496.21 |
| | | | EMWR adjustment | | | | | | | | | |
| | | | EMWR Concrere | 12.1 | | | \$ | 36,857.57 | | | \$ | 36,857.57 |
| | | | EMWR Forms | 8.065789474 | | | \$ | 645,752.75 | | | \$ | 645,752.75 |
| | | | EMWR Rebar | 1.351827676 | | | \$ | 11,713.94 | | | \$ | 11,713.94 |
| | | | Subotal | | | | \$ | 788,262.61 | | | \$ | 860,820.47 |
| | | | Productivity adjustment | | | | | | | | | |
| | | | labor factor | 1.5 | | | \$ | 1,182,393.92 | | | \$ | 1,182,393.92 |
| | | | Concrete strength adjust | ment | | | | | | | | |
| | | | Concrete factor | 0.011 | \$ | 197.91 | | | | | \$ | 197.91 |
| | | | Total | | \$ | 72,384.13 | \$ | 1,970,656.53 | \$ | 371.64 | \$ | 2,043,412.30 |
| 03-08 Rein | of Concrete Sus | spended Slab | | | | | | | - | | | |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| 1 | 033113350400 | Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes oll additives and traditionations. | | | ¢ | 210.20 | ¢ | | ¢ | | ¢ | 210 20 |
| | 033113330400 | Structural concrete, placing, elevated slab, pumped, 150 mm to 254 mm thick, includes leveling (strike off) & | | | Ŷ | 210.30 | φ | | φ | | ψ | 210.50 |
| 1 | 033113701500 | consolidation, excludes material | | | \$ | - | \$ | 40.36 | \$ | 4.92 | \$ | 45.28 |
| 6 | 031113353050 | C.I.P. concrete forms, elevated slab, floor, hung from steel beams, 2 use, includes shoring, erecting, bracing, stripping and cleaning | | | \$ | 189.18 | \$ | 461.28 | \$ | - | \$ | 650.46 |
| | | Reinforcing steel, in place, elevated slabs, #13 to #22, A615M, grade 400, incl labor for accessories, excl material | | | | | | | | | | |
| 1 | 032111600400 | tor accessories | | | \$ | 1,882.38 | \$ | 1,064.98 | \$ | - | \$ | 2,947.36 |
| | | | Concrete | 0.500933908 | \$ | 105.35 | | | | | \$ | 105.35 |
| | | | Forms | 0.550645482 | \$ | 104.17 | | | | | \$ | 104.17 |
| | | | OA | 0.555504185 | \$ | 1,045.67 | \$ | 266.25 | | | \$ | 1,045.67 |
| | | | × | 0.23 | \$ | 3,537.05 | \$ | 1,832.87 | \$ | 4.92 | \$ | 5,374.83 |
| | | | EMWR adjustment | | | | | AFF /- | | | | |
| | | | EMWR Concrere | 5.710526316 | | | ֆ Տ | 355.17 2.634.15 | | | ş Ş | 2 634 15 |
| | | | EMWR Rebar | 0.776762402 | | | \$ | 827.24 | | | \$ | 827.24 |
| | | | Subotal Productivity adjustment | | | | \$ | 5,649.42 | | | \$ | 9,191.39 |
| | | | labor factor | 1.5 | | | \$ | 8,474.13 | | | \$ | 8,474.13 |
| | | | Concrete strength adjust | ment | | | | | | | | • |
| | | | Total | 0.011 | \$ | 3.47 3.540.52 | \$ | 14.123.55 | s | 4.92 | \$ \$ | 3.47 |

| Quantity | Line Number | Description | | | E | kt. Mat. O&P | Ext. Labour O&P | Ext. | Equip. O&P | E | xt. Total O&P |
|------------|------------------|---|--------------------------|-------------|----|--------------|------------------------------|------|------------|----|---------------|
| 03-09 Reir | of Concrete Cor | nposite Slab | | | | | | | | | |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | Structural concrete, ready mix | | | | | | | | | |
| | | heavyweight, 34 MPa, includes local | | | | | | | | | |
| | | aggregate, sand, Portland cement | | | | | | | | | |
| 677 | 033113350400 | (Type I) and water, delivered, excludes | | | ¢ | 142 272 10 | ¢ | ¢ | | ¢ | 142 272 10 |
| 077 | 033113350400 | an additives and treatments | | | φ | 142,373.10 | ъ - | φ | - | φ | 142,373.10 |
| | | Structural concrete, placing, elevated | | | | | | | | | |
| | | slab, pumped, over 254 mm thick, | | | | | | | | | |
| 677 | 033113701600 | includes leveling (strike off) & | | | ¢ | | \$ 24 250 14 | ¢ | 2 044 05 | ¢ | 27 105 00 |
| 011 | 000110101000 | | | | Ŷ | | φ 24,200.14 | Ŷ | 2,044.00 | Ψ | 21,100.00 |
| | | C.I.P. concrete forms, elevated slab, | | | | | | | | | |
| | | edge forms, 178 mm to 305 mm high, | | | | | | | | | |
| 148 | 031113357070 | bracing, stripping and cleaning | | | \$ | 2.991.08 | \$ 24.424.44 | \$ | - | \$ | 27.415.52 |
| | | 0. 11 0 0 | | | | | | | | | |
| | | Reinforcing steel, in place, elevated | | | | | | | | | |
| | | slabs, #13 to #22, Ab15M, grade 400, incluator for accessories, exclusterial | | | | | | | | | |
| 286.37 | 032111600400 | for accessories | | | \$ | 539,057.16 | \$ 304,978.32 | \$ | - | \$ | 844,035.48 |
| | | | | | | | | | | | |
| | | | EMM/D adjustment | | \$ | 684,421.34 | \$ 353,652.90 | \$ | 2,944.95 | \$ | 1,041,019.19 |
| | | | EMWR dujustment | 12 1 | | | \$ 293 426 69 | | | \$ | 293 426 69 |
| | | | EMWR Forms | 8.065789474 | | | \$ 197,002.39 | | | \$ | 197,002.39 |
| | | | EMWR Rebar | 1.351827676 | | | \$ 412,278.13 | | | \$ | 412,278.13 |
| | | | Subotal | | | | \$ 1,256,360.12 | | | \$ | 1,943,726.41 |
| | | | Productivity adjustment | 4 5 | | | ¢ 4 004 E40 40 | | | • | 4 994 640 49 |
| | | | Concrete strength adjust | nent 1.5 | | | \$ 1,884,940.18 | | | Ş | 1,884,540.18 |
| | | | Weather factor | 0.011 | \$ | 1,566.14 | | | | \$ | 1,566.14 |
| | | | Total | | \$ | 685,987.48 | \$ 3,140,900.30 | \$ | 2,944.95 | \$ | 3,829,832.73 |
| 03-10 Reir | of Concrete Cur | b | | | | | | | | | |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | Structural concrete, ready mix, | | | | | | | | | |
| | | heavyweight, 34 MPa, includes local | | | | | | | | | |
| | | aggregate, sand, Portland cement | | | | | | | | | |
| 11 | 033113350400 | (Type I) and water, delivered, excludes all additives and treatments | | | \$ | 2 313 30 | s - | \$ | _ | \$ | 2 313 30 |
| | | | | | Ť | 2,010.00 | Ŷ | Ť | | Ť | 2,010.00 |
| | | | | | | | | | | | |
| | | Structural concrete, placing, slab on | | | | | | | | | |
| | | grade, pumped, over 150 mm thick, | | | | | | | | | |
| 11 | 033113704650 | Includes leveling (strike off) & consolidation excludes material | | | \$ | | \$ 381.48 | \$ | 46 75 | \$ | 428 23 |
| | | | | | Ť | | ¢ 001110 | Ť | 10.10 | Ť | 120.20 |
| | | | | | | | | | | | |
| | | C.I.P. concrete forms, elevated slab, | | | | | | | | | |
| | | edge forms, 178 mm to 305 mm high, | | | | | | | | | |
| 76 | 031113357070 | 1 use, includes shoring, erecting, | | | ¢ | 1 535 06 | ¢ 12.542.29 | ¢ | | ¢ | 14 079 24 |
| 10 | 001110007070 | | | | φ | 1,000.90 | ψ 12,042.28 | φ | - | φ | 14,070.24 |
| | | | | | \$ | 3,849.26 | \$ 12,923.76 | \$ | 46.75 | \$ | 16,819.77 |
| | | | EMWR adjustment | | | | | | | | |
| | | | EMWR Concrere | 12.1 | | | \$ 4,615.91 \$ 104.463.30 | | | \$ | 4,615.91 |
| | | | EMWR Rebar | 1.351827676 | | | \$ | | | \$ | - |
| | | | Subotal | | | | \$ 118,703.06 | | | \$ | 122,599.07 |
| | | | Productivity adjustment | | | | | | | | |
| | | | labor factor | 1.5 | | | \$ 178,054.59 | | | \$ | 178,054.59 |
| | | | Concrete strength adjust | 0.011 | \$ | 25.45 | | | | s | 25.45 |
| | | | Total | 0.011 | \$ | 3,874.71 | \$ 296,757.65 | \$ | 46.75 | \$ | 300,679.10 |
| 03-11 Rein | of Concrete Slal | b | | | | | | | | | |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | Structural concrete, ready mix, | | | | | | | | | |
| | | neavyweight, 34 MPa, includes local | | | | | | | | | |
| | | (Type I) and water, delivered, excludes | | | | | | | | | |
| 118 | 033113350400 | all additives and treatments | | | \$ | 24,815.40 | \$ - | \$ | - | \$ | 24,815.40 |
| | | | | | | | | | | | |
| | | Structural concrete, placing, slab on | | | | | | | | | |
| | | includes leveling (strike off) & | | | | | | | | | |
| 118 | 033113704650 | consolidation, excludes material | | | \$ | - | \$ 4,092.24 | \$ | 501.50 | \$ | 4,593.74 |

| | | | | | | | | | 5 | |
|------------|-----------------|---|------------------------------------|-------------|-----|-----------|-------------------------------|-----------------|----|---|
| Quantity | | Description | | | Ev | | Ext. Labour O [®] D | Ext Equip OPD | | Ext. Total OPD |
| Quantity | | Description | | | = * | | EXI. Labour O&P | EXI. Equip. O&P | | EXI. TOTALOGP |
| | | | | | | | | | | |
| | | C.I.P. concrete forms, elevated slab, | | | | | | | | |
| | | edge forms, 178 mm to 305 mm high, | | | | | | | | |
| | | 1 use, includes shoring, erecting, | | | | | | | | |
| 23 | 031113357070 | bracing, stripping and cleaning | | | \$ | 464.83 | \$ 3,795.69 | \$ - | \$ | 4,260.52 |
| | | | | | | | | | | |
| | | Reinforcing steel, in place, elevated | | | | | | | | |
| | | slabs, #13 to #22, A615M, grade 400, | | | | | | | | |
| | | incl labor for accessories, excl material | | | | | | | | |
| 33.88 | 032111600400 | for accessories | | | \$ | 63,775.03 | \$ 36,081.52 | \$- | \$ | 99,856.56 |
| | | | | | | | | | | |
| | | | | | \$ | 89,055.26 | \$ 43,969.45 | \$ 501.50 | \$ | 133,526.22 |
| | | | EMWR adjustment | | | | | | | |
| | | | EMWR Concrere | 12.1 | | | \$ 49,516.10 | | \$ | 49,516.10 |
| | | | | 8.065/894/4 | | | \$ 30,615.24 | | 3 | 30,615.24 |
| | | | EMWK KEDdr | 1.35182/6/6 | | | \$ 48,776.00 \$ 470.070.70 | | 4 | 48,776.00 |
| | | | Suboldi Broductivity adjuctment | | | | \$ 1/2,8/6./9 | | 4 | 262,433.56 |
| | | | labor factor | 1.5 | | | ¢ 250 345 49 | | e | 250 245 49 |
| | | | Concrete strength adjust | ment | | | \$ 235,315.16 | | 4 | 200,010.10 |
| | | | Concrete factor | 0.011 | ¢ | 272 97 | | | ¢ | 272 97 |
| | | | Total | 0.011 | ç | 89 328 23 | \$ 432 191 97 | \$ 501.50 | ę | 522 021 71 |
| 03-12 Roir | of Concrete Pac | | TOLAI | | φ | 09,520.25 | \$ 452,151.57 | φ 501.50 | 4 | 522,021.71 |
| Data Dala | | Unit Cost Estimate | | | | | | | | |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | Structural concrete, roady mix | | | | | | | | |
| | | beauweight 34 MPa includes local | | | | | | | | |
| | | aggregate sand Portland cement | | | | | | | | |
| | | (Type I) and water delivered excludes | | | | | | | | |
| 7 | 033113350400 | all additives and treatments | | | \$ | 1 472 10 | s - | s - | 9 | 1 472 10 |
| | | | | | Ť | 1,112.10 | Ŷ | Ŷ | | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, |
| | | Structural concrete, placing, slab on | | | | | | | | |
| | | grade, pumped, over 150 mm thick. | | | | | | | | |
| | | includes leveling (strike off) & | | | | | | | | |
| 7 | 033113704650 | consolidation, excludes material | | | \$ | - | \$ 242.76 | \$ 29.75 | \$ | 272.51 |
| | | | | | | | | | | |
| | | C.I.P. concrete forms, elevated slab, | | | | | | | | |
| | | edge forms, 178 mm to 305 mm high, | | | | | | | | |
| | | 1 use, includes shoring, erecting, | | | | | | | | |
| 5 | 031113357070 | bracing, stripping and cleaning | | | \$ | 101.05 | \$ 825.15 | \$ - | \$ | 926.20 |
| | | | | | | | | | | |
| | | | | | \$ | 1,573.15 | \$ 1,067.91 | \$ 29.75 | \$ | 2,670.81 |
| | | | EMWR adjustment | | | | | | | |
| | | | EMWR Concrere | 12.1 | | | \$ 2,937.40 | | \$ | 2,937.40 |
| | | | EMWR Forms | 8.065789474 | | | \$ 6,655.49 | | \$ | 6,655.49 |
| | | | EMWR Rebar | 1.351827676 | | | \$- | | \$ | - |
| | | | Subotal | | | | \$ 10,660.79 | | \$ | 12,263.69 |
| | | | Productivity adjustment | | | | | | | |
| | | | labor factor | 1.5 | | | \$ 15,991.19 | | \$ | 15,991.19 |
| | | | Concrete strength adjust | ment | | | | | | |
| | | | Concrete factor | 0.011 | \$ | 16.19 | | | \$ | 16.19 |
| | | | Total | | \$ | 1,589.34 | \$ 26,651.98 | \$ 29.75 | \$ | 28,271.07 |
| 03-13 Rou | ghen surface le | evel channel | | | | | | | | |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | Channel framing, structural steel, field | | | | | | | | |
| | | tabricated, C200x17, incl cutting & | | | | | | • | | |
| 56 | 051223400672 | welding | | | \$ | 2,278.08 | \$ 12,364.80 | \$ 970.48 | 9 | 15,613.36 |
| | | | Labor fact 0.7 | | \$ | 2,278.08 | \$ 12,364.80 | \$ 970.48 | \$ | 15,613.36 |
| | | | Labor factor: 2.5 | 1.5 | | | \$ 18,547.20 | | \$ | 18,547.20 |
| 02 44 5 | f Comercia Ci | | Concrete ractor | 0.011 | \$ | 25.06 | * | ¢ 070.00 | \$ | 25.06 |
| 03-14 Reir | if Concrete Sia | | lotal | | \$ | 2,303.14 | \$ 30,912.00 | \$ 970.48 | \$ | 34,185.62 |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | Structural concrete, ready mix. | | | | | | | | |
| | | heavyweight, 34 MPa, includes local | | | | | | | | |
| | | aggregate, sand, Portland cement | | | | | | | | |
| | | (Type I) and water, delivered, excludes | | | | | | | | |
| 91 | 033113350400 | all additives and treatments | | | \$ | 19,137.30 | \$ - | \$ - | \$ | 19,137.30 |
| | | | | | | | | | | |
| | | Structural concrete, placing, slob or | | | | | | | | |
| | | drade pumped over 150 mm thick | | | | | | | | |
| | | includes leveling (strike off) & | | | | | | | | |
| 91 | 033113704650 | consolidation, excludes material | | | \$ | _ | \$ 3,155,88 | \$ 386.75 | 9 | 3,542,63 |
| | | | | | | | 2, | | | 2,2.2.00 |
| | | | | | | | | | | |
| | | C.I.P. concrete forms, elevated slab, | | | | | | | | |
| | | eage forms, 178 mm to 305 mm high, | | | | | | | | |
| | | i use, includes shoring, electing, | | | | | | | | |

| | | | | | | | | | | - | |
|------------|-----------------|---|-------------------|-------|---------|--------------|-----------------------|------------|---------------|---------|---------------|
| Quantity | Line Number | Description | | | E: | kt. Mat. O&P | Ext. Labour O&P | Ex | t. Equip. O&P | E | xt. Total O&P |
| 33.88 | 032111600400 | Reinforcing steel, in place, elevated slabs, #13 to #22, A615M, grade 400, incl labor for accessories, excl material for accessories | | | ¢ | 63 775 03 | \$ 36.081.5 | 0 e | | ¢ | 00 856 56 |
| 33.00 | 032111000400 | | | | φ | 05,775.05 | φ 30,001.3. | φ | - | φ | 33,030.30 |
| | | | | | \$ | 83,195.27 | \$ 41,547.8 | 2 \$ | 386.75 | \$ | 125,129.85 |
| | | | Labor factor: 2.5 | 1.5 | | | \$ 62,321.7 | 3 | | \$ | 62,321.73 |
| | | | Concrete factor | 0.011 | \$ ¢ | 210.51 | ¢ 102.969.5 | . e | 296 75 | \$ ¢ | 210.51 |
| 03-15 Reir | of Concrete Bul | khead Curb | rotar | | Ÿ | 03,403.70 | φ 100,000.0 | , , | 500.75 | Ψ | 107,002.03 |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| 2 | 033113350400 | Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments | | | \$ | 420.60 | \$- | \$ | - | \$ | 420.60 |
| 2 | 033113704650 | Structural concrete, placing, slab on grade, pumped, over 150 mm thick, includes leveling (strike off) & consolidation, excludes material | | | \$ | - | \$ 69.3 | 6 \$ | 8.50 | \$ | 77.86 |
| | | C.I.P. concrete forms, elevated slab, edge forms, 178 mm to 305 mm high, 1 use, includes shoring, erecting, | | | | | | | | | |
| 13 | 031113357070 | bracing, stripping and cleaning | | | \$ | 262.73 | \$ 2,145.3 |) \$ | - | \$ | 2,408.12 |
| | | | | | \$ | 683.33 | \$ 2,214.7 | 5 \$ | 8.50 | \$ | 2,906.58 |
| | | | Labor factor: 2.5 | 1.5 | | | \$ 3,322.1 | 3 | | \$ | 3,322.13 |
| | | | Concrete factor | 0.011 | \$ | 4.63 | ¢ = = = = = = = = = = | | 9 50 | \$ | 4.63 |
| 03-16 Reir | forced Concre | te Bulkhead Beam | i otai | | Ŷ | 007.90 | φ 5,550.0 | , , | 0.50 | Ŷ | 0,233.33 |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| 1 | 033113350400 | Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and traatments | | | ¢ | 210 30 | ¢ | ¢ | | ¢ | 210 30 |
| | 000110000400 | | | | Ŷ | 210.00 | Ŷ | Ŷ | | Ŷ | 210.00 |
| 1 | 033113704650 | Structural concrete, placing, slab on grade, pumped, over 150 mm thick, includes leveling (strike off) & consolidation, excludes material | | | \$ | - | \$ 34.6 | 3 \$ | 4.25 | \$ | 38.93 |
| 3 | 031113357070 | C.I.P. concrete forms, elevated slab, edge forms, 178 mm to 305 mm high, 1 use, includes shoring, erecting, bracing, stripping and cleaning | | | \$ | 60.63 | \$ 495.0 | 9 \$ | - | \$ | 555.72 |
| | | | | | • | 970.09 | ¢ 500.7 | , . | 4.95 | ¢ | 904.05 |
| | | | Labor factor: 2.5 | 1.5 | Ŷ | 210.93 | \$ 794.6 | ş | 4.20 | \$ | 794.66 |
| | | | Concrete factor | 0.011 | \$ | 2.31 | | | | \$ | 2.31 |
| 00 17 7 | 4 O | mandad Clab | Total | | \$ | 273.24 | \$ 1,324.4 | 3 \$ | 4.25 | \$ | 1,601.92 |
| Data Bala | IT Concrete Sus | Unit Cost Estimato | | | | | | | | | |
| | ase . rear 2020 | | | | | | | | | | |
| 23 | 033113350400 | Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments | | | \$ | 4,836.90 | \$ - | \$ | - | \$ | 4,836.90 |
| | | Structural concrete, placing, slab on grade, pumped, over 150 mm thick, includes leveling (strike off) & | | | | | | | | | |
| 7 | 033113704650 | consolidation, excludes material | | | \$ | - | \$ 242.7 | 6 \$ | 29.75 | \$ | 272.51 |
| | | C.I.P. concrete forms, elevated slab, edge forms, 178 mm to 305 mm high, 1 use, includes shoring, erecting, | | | | | | | | | |
| 7 | 031113357070 | bracing, stripping and cleaning | | | \$ | 141.47 | \$ 1,155.2 | \$ | - | \$ | 1,296.68 |

| Quantity | Line Number | Description | | | Ex | t. Mat. O&P | E | xt. Labour O&P | Ext. Equip. | . O&P | | Ext. Total O&P |
|------------|-----------------|---|-----------------------------|-------------|----------|-------------|--------|----------------|-------------|-------|---------|----------------|
| 1.6 | 032111600400 | Reinforcing steel, in place, elevated slabs, #13 to #22, A615M, grade 400, incl labor for accessories, excl material for accessories | | | \$ | 3,011.81 | \$ | 1,703.97 | \$ | _ | \$ | 4,715.78 |
| | | | | | • | 7 000 40 | • | | • | | • | 44 404 07 |
| | | | Labor factor: 2.5 | 15 | \$ | 7,990.18 | Ş | 3,101.94 | \$ 2 | 29.75 | \$ ¢ | 11,121.87 |
| | | | Concrete factor | 0.011 | \$ | 53.21 | Ψ | 4,002.01 | | | \$ | 53.21 |
| 03-18 Slab | on Grade | | Total | | \$ | 8,043.39 | \$ | 7,754.85 | \$ | 29.75 | \$ | 15,827.99 |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| 12 | 030513250950 | Aggregate, sand, washed, for concrete, loaded at the pit, prices per m3, includes material only | | | \$ | 576.84 | \$ | - | \$ | _ | \$ | 576.84 |
| 24 | 031513500050 | Waterstop, PVC, ribbed, 6 mm thick x 150 mm wide | | | \$ | 310.32 | \$ | 355.44 | \$ | | \$ | 665.76 |
| 24 | | C.I.P. concrete forms, slab on grade, bulkhead with keyway, wood, 150 mm high, 4 uses, includes erecting, | | | Ŷ | 010.02 | Ŷ | 000.44 | Ŷ | | Ų | 000.70 |
| 13 | 031113651100 | bracing, stripping and cleaning | | | \$ | 21.45 | \$ | 299.78 | \$ | - | \$ | 321.23 |
| 25 | 033113350400 | Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments | | | \$ | 5,257.50 | \$ | - | \$ | - | \$ | 5,257.50 |
| 13 | 031113357070 | C.I.P. concrete forms, elevated slab, edge forms, 178 mm to 305 mm high, 1 use, includes shoring, erecting, broging stripping and elevating | | | ¢ | 262.73 | ¢ | 2 145 20 | ¢ | | e | 2 409 12 |
| 15 | 031113337070 | Structural concrete, placing, slab on grade, pumped, over 150 mm thick | | | φ | 202.13 | φ | 2,143.35 | φ | - | φ | 2,400.12 |
| 25 | 033113704650 | includes leveling (strike off) & consolidation, excludes material | | | \$ | - | \$ | 867.00 | \$ 1 | 06.25 | \$ | 973.25 |
| 19.94 | 032111600400 | Reinforcing steel, in place, elevated slabs, #13 to #22, A615M, grade 400, incl labor for accessories, excl material for accessories | | | ¢ | 25 464 04 | ¢ | 20.064.22 | ¢ | | ¢ | 55 529 26 |
| 10.04 | 032111000400 | ior accessories | | | φ | 55,404.04 | φ | 20,004.22 | ф Ф | - | φ | 55,526.20 |
| | | | | | \$ | 41,892.88 | \$ | 23,731.83 | \$ 1 | 06.25 | \$ | 65,730.96 |
| | | | EMWR adjustment | 40.4 | | | * | 40 400 70 | | | * | 40 400 70 |
| | | | EMWR Concrere EMWR Forms | 8.065789474 | | | ֆ Տ | 10,490.70 | | | ې \$ | 10,490.70 |
| | | | EMWR Rebar | 1.351827676 | | | \$ | 27,123.37 | | | \$ | 27,123.37 |
| | | | Subotal | | | | \$ | 78,650.16 | | | \$ | 120,649.29 |
| | | | labor factor | 1.5 | | | \$ | 117.975.24 | | | \$ | 117.975.24 |
| | | | Concrete strength adjust | ment | | | | | | | | |
| | | | Concrete factor | 0.011 | \$ \$ | 57.83 | ¢ | 196 625 40 | ¢ 4 | 06.25 | \$ ¢ | 57.83 |
| 03-19 Wall | Below Grade | | lotai | | φ | 41,550.71 | φ | 190,023.40 | φ I | 00.25 | φ | 230,002.37 |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes | | | | | | | | | | |
| 25 | 033113350400 | all additives and treatments | | | \$ | 5,257.50 | \$ | - | \$ | - | \$ | 5,257.50 |
| | | Structural concrete, placing, slab on grade, pumped, over 150 mm thick, includes leveling (strike off) & | | | | | | | | | | |
| 25 | 033113704650 | consolidation, excludes material | | | \$ | - | \$ | 867.00 | \$ 1 | 06.25 | \$ | 973.25 |
| 83 | 031113852700 | C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 1 use, includes erecting, bracing, stripping and cleaning | | | \$ | 3,739.15 | \$ | 14.548.24 | \$ | _ | \$ | 18.287.39 |

| 0 | I for Alexandree | Benediction | | | _ | | | | - | | | |
|------------|------------------|---|--------------------------|------------------|----------|-------------------|----------|------------|------|------------|----------|--------------------|
| Quantity | Line Number | Description | | | E | xt. Mat. O&P | Ext. La | bour O&P | Ext. | Equip. O&P | | Ext. Total O&P |
| 24 | 031113850620 | C.I.P. concrete forms, wall, bulkhead with 1 piece expanded metal keyway, left in place, 300 mm wall, in lieu of 3 piece form, includes erecting, bracing, stripping and cleaning | | | \$ | 208.56 | \$ | 372.72 | \$ | - | \$ | 581.28 |
| | | Waterstop, PVC, ribbed, 6 mm thick x | | | | | | | | | | |
| 24 | 031513500050 | 150 mm wide | | | \$ | 310.32 | \$ | 355.44 | \$ | - | \$ | 665.76 |
| 25 | 030513800050 | integral waterproofing, add to cost of regular concrete | | | \$ | 953.00 | \$ | - | \$ | - | \$ | 953.00 |
| | | | | | s | 10.468.53 | \$ | 16.143.40 | \$ | 106.25 | \$ | 26.718.18 |
| | | | EMWR adjustment | | Ť | , | | , | • | | Ť | , |
| | | | EMWR Concrere | 12.1 | | | \$ | 10,490.70 | | | \$ | 10,490.70 |
| | | | EMWR Forms | 8.065789474 | | | \$ | 117,343.04 | | | \$ | 117,343.04 |
| | | | Subotal | 1.351827676 | | | э \$ | 143.977.14 | | | ې \$ | 154.551.92 |
| | | | Productivity adjustment | | | | Ť | 140,077.14 | | | Ť | 104,001.02 |
| | | | labor factor | 1.5 | | | \$ | 215,965.71 | | | \$ | 215,965.71 |
| | | | Concrete strength adjust | ment | • | 57.00 | | | | | • | 57.00 |
| | | | Concrete factor | 0.011 | \$ | 57.83 | \$ | 359 942 85 | \$ | 106 25 | ş | 370 575 47 |
| 03-20 Reir | of Concrete Cor | nposite Slab | | | Ţ | 10,020.00 | Ŷ | 000,042.00 | Ŷ | 100.20 | Ť | 010,010.41 |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes | | | | | | | | | | |
| 26 | 033113350400 | all additives and treatments | | | \$ | 5,467.80 | \$ | - | \$ | - | \$ | 5,467.80 |
| 26 | 033113704650 | Structural concrete, placing, slab on grade, pumped, over 150 mm thick, includes leveling (strike off) & consolidation, excludes material | | | \$ | - | \$ | 901.68 | \$ | 110.50 | \$ | 1,012.18 |
| 13 | 031113357070 | C.I.P. concrete forms, elevated slab, edge forms, 178 mm to 305 mm high, 1 use, includes shoring, erecting, bracing, stripping and cleaning | | | \$ | 262.73 | \$ | 2,145.39 | \$ | _ | s | 2.408.12 |
| 26 | 030513800050 | Waterproofing and dampproofing, integral waterproofing, add to cost of regular concrete | | | \$ | 991.12 | \$ | _ | \$ | - | \$ | 991.12 |
| 12 | 020512900050 | Waterproofing and dampproofing, integral waterproofing, add to cost of | | | ¢ | 405 56 | ¢ | | ¢ | | e | 405.56 |
| 10 | 030313600050 | | | | φ | 490.00 | φ | - | φ | - | ¢ | 490.00 |
| | | | | | \$ | 7,217.21 | \$ | 3,047.07 | \$ | 110.50 | \$ | 10,374.78 |
| | | | EMWR adjustment | 40.4 | | | ¢ | 10.040.00 | | | | 40.040.00 |
| | | | EMWR Concrere | 12.1 8.065789474 | | | \$ \$ | 17,304 26 | | | \$ \$ | 10,910.33 |
| | | | EMWR Rebar | 1.351827676 | | | \$ | - | | | \$ | - |
| | | | Subotal | | | | \$ | 31,261.66 | | | \$ | 38,589.37 |
| | | | Productivity adjustment | | | | ¢ | 46 000 40 | | | | 40 000 10 |
| | | | Concrete strength adjust | ment | | | φ | 40,092.49 | | | ¢ | 40,092.49 |
| | | | Concrete factor Total | 0.011 | \$ \$ | 60.15 7,277.36 | \$ | 78,154.16 | \$ | 110.50 | \$ \$ | 60.15 85,542.01 |
| 03-21 Low | Strength Conc | rete Fill | | | | | | | | | | |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| 70 | 035216130020 | Insulating roof fill, portland cement and foaming agent | | | \$ | 15,083.60 | \$ | 7,646.80 | \$ | 970.90 | \$ | 23,701.30 |
| | | | | | | 45 000 00 | | 7 646 66 | | 070.00 | | 00 704 00 |
| | | | Labor factor: 2.5 | 1.5 | Þ | 15,063.60 | \$ | 11.470.20 | \$ | 970.90 | \$ \$ | 23,701.30 |
| | | | Concrete factor | 0.011 | \$ | 165.92 | | , | | | \$ | 165.92 |

| Quantity | Line Number | Description | | | Ev | t Mat O&P | Ext. Labour O&P | Ext Equip (| 18.P | | Ext. Total O&P |
|-------------|-----------------|--|--------------------------|-------------|----|-----------|-----------------|-------------|------|---------|----------------|
| Quantity | Line Number | Description | | | L^ | | | | /041 | | |
| 03-22 Strip | Footing | | Total | | \$ | 15,249.52 | \$ 19,117.00 | \$ 970 | .90 | \$ | 35,337.42 |
| Data Relea | ise : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | Structural concrete, ready mix, | | | | | | | | | |
| | | heavyweight, 34 MPa, includes local | | | | | | | | | |
| | | (Type I) and water, delivered, excludes | | | | | | | | | |
| 4 | 033113350400 | all additives and treatments | | | \$ | 841.20 | \$- | \$ | - | \$ | 841.20 |
| | | | | | | | | | | | |
| | | Structural concrete placing slab on | | | | | | | | | |
| | | grade, pumped, over 150 mm thick, | | | | | | | | | |
| | | includes leveling (strike off) & | | | | | | | | | |
| 4 | 033113704650 | consolidation, excludes material | | | \$ | - | \$ 138.72 | \$ 17 | .00 | \$ | 155.72 |
| | | | | | | | | | | | |
| | | C.I.P. concrete forms, elevated slab, | | | | | | | | | |
| | | edge forms, 178 mm to 305 mm high, | | | | | | | | | |
| 0 | 031113357070 | 1 use, includes shoring, erecting, | | | ¢ | 191 90 | ¢ 1 / 95 27 | ¢ | | ¢ | 1 667 16 |
| 9 | 031113337070 | bracing, suppling and cleaning | | | φ | 101.09 | φ 1,403.27 | φ | - | φ | 1,007.10 |
| | | | | | | | | | | | |
| | | Reinforcing steel, in place, elevated | | | | | | | | | |
| | | slabs, #13 to #22, A615M, grade 400, | | | | | | | | | |
| 0.34 | 032111600400 | Incl labor for accessories, excl material for accessories | | | \$ | 640.01 | \$ 362.09 | \$ | - | s | 1 002 10 |
| 0.01 | 002111000100 | | | | Ť | 010101 | ¢ 002.00 | Ţ. | | Ť | 1,002.10 |
| | | | | | | | | | | | |
| | | C.I.P. concrete forms, slab on grade, | | | | | | | | | |
| | | bulkhead with keyway, wood, 150 mm | | | | | | | | | |
| 11 | 031113651100 | bracing, stripping and cleaning | | | \$ | 18.15 | \$ 253.66 | \$ | - | \$ | 271.81 |
| | | | | | | | | | | | |
| | | | | | \$ | 1,681.25 | \$ 2,239.74 | \$ 17 | .00 | \$ | 3,937.99 |
| | | | EMWR adjustment | 8.8 | | | \$ 1 220 74 | | | s | 1 220 74 |
| | | | EMWR Forms | 5.710526316 | | | \$ 8,481.67 | | | \$ | 8,481.67 |
| | | | EMWR Rebar | 0.776762402 | | | \$ 281.26 | | | \$ | 281.26 |
| | | | Subotal | | | | \$ 12,223.41 | | | \$ | 13,921.66 |
| | | | labor factor | 15 | | | \$ 18 335 11 | | | \$ | 18 335 11 |
| | | | Concrete strength adjust | ment | | | • 10,000.11 | | | Ť | 10,000.11 |
| | | | Concrete factor | 0.011 | \$ | 9.25 | | | | \$ | 9.25 |
| 02 22 Eou | adation Wall | | lotal | | \$ | 1,690.50 | \$ 30,558.52 | \$ 17 | .00 | \$ | 32,266.02 |
| Data Relea | ise : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | Structural concrete, ready mix, beauweight 34 MPa, includes local | | | | | | | | | |
| | | aggregate, sand, Portland cement | | | | | | | | | |
| | | (Type I) and water, delivered, excludes | | | | | | | | | |
| 3 | 033113350400 | all additives and treatments | | | \$ | 630.90 | \$ - | \$ | - | \$ | 630.90 |
| | | | | | | | | | | | |
| | | Structural concrete, placing, slab on | | | | | | | | | |
| | | grade, pumped, over 150 mm thick, | | | | | | | | | |
| 3 | 033113704650 | Includes leveling (strike off) & | | | \$ | | \$ 104.04 | \$ 10 | 75 | ¢ | 116 70 |
| 5 | 000110704000 | consolidation, excludes matchai | | | Ψ | | ψ 104.04 | ψ 12 | | Ψ | 110.75 |
| | | | | | | | | | | | |
| | | C.I.P. concrete forms, wall, job built, | | | | | | | | | |
| | | plywood, over 4.88 m high, 1 use, | | | | | | | | | |
| 17 | 031113852700 | and cleaning | | | \$ | 765.85 | \$ 2,979.76 | \$ | - | \$ | 3,745.61 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | Reinforcing steel, in place, walls, #25 | | | | | | | | | |
| | | for accessories, excl material for | | | | | | | | | |
| 1 | 032111600750 | accessories | | | \$ | 1,882.38 | \$ 779.25 | \$ | - | \$ | 2,661.63 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | Waterproofing and dampproofing | | | | | | | | | |
| | | integral waterproofing, add to cost of | | | | | | | | | |
| 3 | 030513800050 | regular concrete | | | \$ | 114.36 | \$ - | \$ | - | \$ | 114.36 |
| | | | | | \$ | 3,393.49 | \$ 3,863,05 | \$ 13 | .75 | \$ | 7 269 29 |
| | | | EMWR adjustment | | * | 3,000.43 | - 0,000.00 | ÷ 14 | | , v | 7,203.23 |
| | | | EMWR Concrere | 8.8 | | | \$ 915.55 | | | \$ | 915.55 |
| | | | EMWR Forms | 5.710526316 | | | \$ 17,016.00 | | | \$ ¢ | 17,016.00 |
| | | | Subotal | 3.110102402 | | | \$ 22,399.89 | | | \$ | 25,806.13 |
| | | | Productivity adjustment | | | | | | | | |

| 0 | 1 Sec. Manufacture | Description | | | _ | | E. () - K - W OAD | | | 5-4 T-4-1 01D |
|------------|--------------------|---|--------------------------|-------------|-----|--------------|--------------------------|-----------------|----|----------------|
| Quantity | Line Number | Description | | | E | xt. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | | Ext. Total O&P |
| | | | labor factor | 1.5 | | | \$ 33,599.84 | | \$ | 33,599.84 |
| | | | Concrete strength adjust | ment | ¢ | 6.94 | | | ¢ | 6.94 |
| | | | Total | 0.011 | \$ | 3.400.43 | \$ 55.999.73 | \$ 12.75 | \$ | 59.412.91 |
| 03-24 Reir | of Concrete Sla | b | | | | | | | | |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | Structural concrete, ready mix, | | | | | | | | |
| | | heavyweight, 34 MPa, includes local | | | | | | | | |
| | | aggregate, sand, Portland cement | | | | | | | | |
| 8 | 033113350400 | all additives and treatments | | | \$ | 1,682.40 | \$- | \$ - | \$ | 1,682.40 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | Structural concrete, placing, slab on grade, pumped, over 150 mm thick | | | | | | | | |
| | | includes leveling (strike off) & | | | | | | | | |
| 8 | 033113704650 | consolidation, excludes material | | | \$ | - | \$ 277.44 | \$ 34.00 | \$ | 311.44 |
| | | | | | | | | | | |
| | | Poinforcing stool in place walls #25 | | | | | | | | |
| | | to #57, A615M, grade 400, incl labor | | | | | | | | |
| | | for accessories, excl material for | | | | | | | | |
| 1.91 | 032111600750 | accessories | | | \$ | 3,595.35 | \$ 1,488.37 | \$ - | \$ | 5,083.71 |
| | | | | | ¢ | 5 277 75 | ¢ 1765.91 | \$ 24.00 | ¢ | 7 077 55 |
| | | | EMWR adjustment | | φ | 5,211.15 | φ 1,705.01 | φ 54.00 | φ | 7,077.55 |
| | | | EMWR Concrere | 8.8 | | | \$ 2,441.47 | | \$ | 2,441.47 |
| | | | EMWR Forms | 5.710526316 | | | \$ - | | \$ | - |
| | | | EMWR Rebar | 0.776762402 | | | \$ 1,156.11 | | \$ | 1,156.11 |
| | | | Productivity adjustment | | | | \$ 5,363.39 | | Þ | 10,675.13 |
| | | | labor factor | 1.5 | | | \$ 8,045.09 | | \$ | 8,045.09 |
| | | | Concrete strength adjust | ment | | | | | | |
| | | | Concrete factor | 0.011 | \$ | 18.51 | * 40.400.40 | | \$ | 18.51 |
| 03-25 Stut | Column | | lotal | | \$ | 5,296.26 | \$ 13,408.48 | \$ 34.00 | \$ | 18,738.73 |
| Data Relea | ase · Year 2020 | Unit Cost Estimate | | | | | | | | |
| Data Holot | 100 . 1001 2020 | | | | | | | | | |
| | | | | | | | | | | |
| | | C.I.P. concrete forms, column, square, | | | | | | | | |
| | | plywood, 610 mm x 610 mm, 1 use, | | | | | | | | |
| 4 | 031113256500 | and cleaning | | | \$ | 193.04 | \$ 561.72 | s - | \$ | 754.76 |
| | | 5 | | | | | | | | |
| | | Structural concrete, placing, slab on | | | | | | | | |
| | | grade, pumped, over 150 mm thick, | | | | | | | | |
| 1 | 033113704650 | consolidation, excludes material | | | \$ | - | \$ 34.68 | \$ 4.25 | \$ | 38.93 |
| | | , | | | , T | | | | Ť | |
| | | Structural concrete, ready mix, | | | | | | | | |
| | | heavyweight, 34 MPa, includes local | | | | | | | | |
| | | aggregate, sand, Portland cement | | | | | | | | |
| 1 | 033113350400 | (Type I) and water, delivered, excludes all additives and treatments | | | \$ | 210 30 | \$ - | s - | \$ | 210 30 |
| | | | | | Ť | 210.00 | Ŷ | Ŷ | Ť | 210.00 |
| | | Reinforcing steel, in place, walls, #25 | | | | | | | | |
| | | to #57, A615M, grade 400, incl labor | | | | | | | | |
| 03 | 032111600750 | for accessories, excl material for | | | \$ | 564 71 | \$ 233.78 | \$ - | \$ | 798.49 |
| 0.0 | 002111000700 | | | | Ψ | 004.11 | φ 200.10 | Ŷ | Ŷ | 100.40 |
| | | | | | \$ | 968.05 | \$ 830.18 | \$ 4.25 | \$ | 1,802.48 |
| | | | EMWR adjustment | | | | | | • | 005.40 |
| | | | EMWR Concrere | 5 710526316 | | | \$ 305.18 \$ 3.207.72 | | ş | 305.18 |
| | | | EMWR Rebar | 0.776762402 | | | \$ 181.59 | | \$ | 181.59 |
| | | | Subotal | | | | \$ 4,524.67 | | \$ | 5,496.97 |
| | | | Productivity adjustment | | | | | | | |
| | | | labor factor | ment | | | \$ 6,787.01 | | \$ | 6,787.01 |
| | | | Concrete factor | 0.011 | \$ | 2.31 | | | \$ | 2.31 |
| | | | Total | | \$ | 970.36 | \$ 11,311.68 | \$ 4.25 | \$ | 12,286.29 |
| 03-26 Reir | of Concrete Par | tition Wall | | | | | | | | |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | Characteristic and a state in the state | | | | | | | | |
| | | heavyweight, 34 MPa, includes local | | | | | | | | |
| | | aggregate, sand, Portland cement | | | | | | | | |
| | 022112250400 | (Type I) and water, delivered, excludes | | | c | 044.00 | ¢ | ¢ | c | 044.00 |
| 4 | 033113330400 | an auditives and treatments | | | Ф | 841.20 | φ - | φ - | Φ | 041.20 |

| | | | | | | | | | - | |
|------------|-----------------|--|--------------------------|-------------|----|--------------|-----------------|-----------------|--------|----------------|
| a | | | | | _ | | | | | |
| Quantity | Line Number | Description | | | E: | xt. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | | Ext. Total O&P |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | Structural concrete, placing, slab on | | | | | | | | |
| | | grade, pumped, over 150 mm thick, | | | | | | | | |
| | | includes leveling (strike off) & | | | | | | | | |
| 4 | 033113704650 | consolidation, excludes material | | | \$ | - | \$ 138.72 | \$ 17.00 | \$ | 155.72 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | C.I.P. concrete forms, wall, job built, | | | | | | | | |
| | | plywood, over 4.88 m high, 1 use, | | | | | | | | |
| | | includes erecting, bracing, stripping | | | | | | | | |
| 29 | 031113852700 | and cleaning | | | \$ | 1,306.45 | \$ 5,083.12 | \$- | \$ | 6,389.57 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | Beinfereing steel in place wells #25 | | | | | | | | |
| | | to #57 AG1EM grade 400 includer | | | | | | | | |
| | | to #57, A615W, grade 400, Incliabor | | | | | | | | |
| 0.7 | 000444000750 | for accessories, exci material for | | | | 4 0 4 7 0 7 | 6 545 40 | • | | 4 000 44 |
| 0.7 | 032111600750 | accessories | | | \$ | 1,317.67 | \$ 545.48 | \$ - | \$ | 1,863.14 |
| | | | | | | | | | | |
| | | | | | \$ | 3,465.32 | \$ 5,767.32 | \$ 17.00 | \$ | 9,249.63 |
| | | | EMWR adjustment | | | | | | | |
| | | | EMWR Concrere | 8.8 | | | \$ 1,220.74 | | \$ | 1,220.74 |
| | | | EMWR Forms | 5.710526316 | | | \$ 29,027.29 | | \$ | 29,027.29 |
| | | | EMWR Rebar | 0.776762402 | | | \$ 423.71 | | \$ | 423.71 |
| | | | Subotal | | | | \$ 36,439.05 | | \$ | 39,921.36 |
| | | | Productivity adjustment | | | | | | | |
| | | | labor factor | 1.5 | | | \$ 54,658,58 | | \$ | 54.658.58 |
| | | | Concrete strength adjust | ment | | | • • • •,•••••• | | - | 0 1,000.00 |
| | | | Concrete factor | 0.011 | ¢ | 9.25 | | | ¢ | 9.25 |
| | | | Total | 0.011 | ¢ | 2 474 57 | ¢ 04.007.64 | ¢ 47.00 | Ψ ¢ | 04 590 20 |
| 02 07 Dein | f Comencia Cial | • | TOLAI | | φ | 3,474.57 | \$ 91,097.04 | φ 17.00 | φ | 94,509.20 |
| 03-27 Rein | if Concrete Sia | | | | | | | | | |
| Data Relea | ise : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | . | | | | | | | | |
| | | Structural concrete, ready mix, | | | | | | | | |
| | | heavyweight, 34 MPa, includes local | | | | | | | | |
| | | aggregate, sand, Portland cement | | | | | | | | |
| | | (Type I) and water, delivered, excludes | | | | | | | | |
| 6 | 033113350400 | all additives and treatments | | | \$ | 1,261.80 | \$- | \$- | \$ | 1,261.80 |
| | | | | | | | | | | |
| | | Chrystenel comparts, plasing, sight on | | | | | | | | |
| | | Structural concrete, placing, slab on | | | | | | | | |
| | | grade, pumped, over 150 mm tnick, | | | | | | | | |
| | | includes leveling (strike off) & | | | | | | | | |
| 6 | 033113704650 | consolidation, excludes material | | | \$ | - | \$ 208.08 | \$ 25.50 | \$ | 233.58 |
| | | | | | | | | | | |
| | | C L P. concrete forms, elevated slab | | | | | | | | |
| | | odgo forms, 179 mm to 305 mm high | | | | | | | | |
| | | 1 use includes charing creating | | | | | | | | |
| 2 | 004440057070 | has singly stringing and sharing, | | | ¢ | c0.c2 | ¢ 405.00 | ¢ | ¢ | <i>EEE</i> 70 |
| 3 | 031113357070 | bracing, supping and cleaning | | | \$ | 00.03 | \$ 495.09 | э - | Þ | 000.72 |
| | | | | | | | | | | |
| | | Reinforcing steel in place elevated | | | | | | | | |
| | | slabs #13 to #22 A615M grade 400 | | | | | | | | |
| | | includer for accessories evolution | | | | | | | | |
| 35 | 032111600400 | for accessories | | | \$ | 65 883 30 | \$ 37 274 30 | \$ - | \$ | 103 157 60 |
| 33 | 552111000400 | | | | φ | 00,000.00 | φ 51,214.30 | ÷ - | φ | 103,137.00 |
| | | Welded wire fabric, plain, sheets, 100 x | | | | | | | | |
| | | 100 - W4 x W4 (100 x 100) 4.148 | | | | | | | | |
| | | kg/m2, ASTM A185M, incl labor for | | | | | | | | |
| | | accessories, excl material for | | | | | | | | |
| 41 | 032211100700 | accessories | | | \$ | 404.26 | \$ 249.28 | \$ - | \$ | 653.54 |
| | | | | | | | | | - | |
| | | | | | \$ | 67,609,99 | \$ 38 226 75 | \$ 25.50 | ¢ | 105 862 24 |
| | | | Labor factor: 2.5 | 15 | * | 01,000.09 | \$ 57.240.42 | ÷ 20.00 | ¢ | 57 240 42 |
| | | | Concrete factor | 1.5 | • | 42.00 | ÷ 57,340.13 | | ÷ | 42.00 |
| 02 20 0-1 | f Conorata Cla | | Total | 0.011 | ÷ | 13.00 | ¢ 07.700.00 | ¢ 07.50 | ¢. | 10.00 |
| 03-28 Rein | in Concrete Sla | | IULdi | | \$ | 67,623.87 | ə 95,566.88 | | \$ | 163,216.24 |
| Data Relea | ise : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | Structural concrete, ready mix, | | | | | | | | |
| | | heavyweight, 34 MPa, includes local | | | | | | | | |
| | | aggregate, sand, Portland cement | | | | | | | | |
| | | (Type I) and water, delivered, excludes | | | | | | | | |
| 9 | 033113350400 | all additives and treatments | | | \$ | 1,892.70 | \$ - | \$ - | \$ | 1,892.70 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | Structural concrete, placing, slab on | | | | | | | | |
| | | grade, pumped, over 150 mm thick, | | | | | | | | |
| | | includes leveling (strike off) & | | | | | | | | |
| 9 | 033113704650 | consolidation excludes material | | | \$ | | \$ 312.12 | \$ 38.25 | \$ | 350 37 |

| | | | | | | | | | | | 0 | |
|------------|--|---|-------------------|-------|------|--------------|--------|-----------------|----------|---------------|-----|------------------|
| 0 | The state of the s | Bernstellen | | | _ | | | | | | | |
| Quantity | Line Number | Description | | | E | xt. Mat. O&P | | Ext. Labour O&P | EX | t. Equip. O&P | | Ext. Total O&P |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | CLD concrete forms, alguated alph | | | | | | | | | | |
| | | odgo formo, 179 mm to 205 mm bigh | | | | | | | | | | |
| | | edge forms, 178 mm to 305 mm nigh, | | | | | | | | | | |
| - | 004440057070 | Tuse, includes shoring, erecting, | | | ~ | 404.05 | | 005 45 | | | • | 000.00 |
| Э | 031113357070 | bracing, surpping and cleaning | | | ¢ | 101.05 | ¢ | 829.19 | \$ | - | Þ | 926.20 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Reinforcing steel, in place, elevated | | | | | | | | | | |
| | | slabs, #13 to #22, A615M, grade 400, | | | | | | | | | | |
| | | incl labor for accessories, excl material | | | | | | | | | | |
| 1 | 032111600400 | for accessories | | | \$ | 1,882.38 | \$ | 1,064.98 | \$ | - | \$ | 2,947.36 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Welded wire fabric, plain, sheets, 100 x | | | | | | | | | | |
| | | 100 - W4 x W4 (100 x 100) 4.148 | | | | | | | | | | |
| | | kg/m2, ASTM A185M, incl labor for | | | | | | | | | | |
| | | accessories, excl material for | | | | | | | | | | |
| 69 | 032211100700 | accessories | | | \$ | 680.34 | \$ | 419.52 | \$ | - | \$ | 1 099 86 |
| 00 | 002211100100 | | | | Ŷ | 000.01 | Ψ | 110.02 | Ŷ | | Ŷ | 1,000.00 |
| | | | | | ¢ | A EEG 47 | e | 0 604 77 | ¢ | 20.25 | e | 7 946 49 |
| | | | Labor faster 2.5 | | φ | 4,556.47 | - P | 2,021.77 | φ | 30.25 | - P | 7,210.49 |
| | | | Labor factor: 2.5 | 1.5 | | | \$ | 3,932.66 | | | \$ | 3,932.66 |
| | | | Concrete factor | 0.011 | \$ | 20.82 | | | | | \$ | 20.82 |
| 03-29 Prec | ast Wall Panel | | Total | | \$ | 4,577.29 | \$ | 6,554.43 | \$ | 38.25 | \$ | 11,169.96 |
| Data Relea | se · Vear 2020 | Unit Cost Estimate | | | | | | | | | | |
| Data Nelea | 15e . Teal 2020 | onit oost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Precast wall papel smooth grav | | | | | | | | | | |
| | | uningulated high rise 3.05 m x 6.10 m | | | | | | | | | | |
| 004 | 004540500750 | uninsulated, high lise, 5.05 hi x 6.10 hi | | | ~ | 040 500 00 | | 54.040.40 | ~ | 00 400 04 | ~ | 000 507 50 |
| 984 | 034513500750 | x 150 mm thick, 21 mPa | | | \$ | 612,520.32 | \$ | 54,848.16 | \$ | 22,199.04 | \$ | 689,567.52 |
| | | | | | | | | | | | | |
| | | | | | \$ | 612,520.32 | \$ | 54,848.16 | \$ | 22,199.04 | \$ | 689,567.52 |
| | | | Labor factor: 2.5 | 1.5 | | | \$ | 82,272.24 | | | \$ | 82,272.24 |
| | | | Concrete factor | 0.011 | \$ | 6,737,72 | | | | | \$ | 6,737,72 |
| 03-30 Proc | act Wall Panel | | Total | | é | 619 258 04 | ¢ | 137 120 40 | ¢ | 22 199 04 | ¢ | 778 577 48 |
| Data Palac | ASL Wall Faller | Unit Cost Estimato | Total | | φ | 015,250.04 | φ | 137,120.40 | φ | 22,199.04 | φ | 110,511.40 |
| Data Relea | 15e . Teal 2020 | Unit COSt Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Propost well popul amonth grov | | | | | | | | | | |
| | | riecast waii parier, sinootin, gray, | | | | | | | | | | |
| | | uninsulated, high rise, 3.05 m x 6.10 m | | | | 705 400 00 | | | | | | |
| 1165 | 034513500750 | x 150 mm thick, 21 mPa | | | \$ | 725,189.20 | \$ | 64,937.10 | \$ | 26,282.40 | \$ | 816,408.70 |
| | | | | | | | | | | | | |
| | | | | | \$ | 725,189.20 | \$ | 64,937.10 | \$ | 26,282.40 | \$ | 816,408.70 |
| | | | Labor factor: 2.5 | 1.5 | | | \$ | 97.405.65 | | | \$ | 97.405.65 |
| | | | Concrete factor | 0.011 | \$ | 7.977.08 | | | | | ŝ | 7.977.08 |
| 03-31 Proc | ast Wall Panel | | Total | | ¢ | 733 166 28 | ¢ | 162 342 75 | ¢ | 26 282 40 | ¢ | 921 791 /3 |
| Data Balas | Voor 2020 | Unit Cost Estimato | lotai | | Ψ | 755,100.20 | Ψ | 102,542.75 | Ψ | 20,202.40 | Ψ | 521,751.45 |
| Data Relea | ise . real 2020 | Unit COSt Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Propost wall panel amosthe start | | | | | | | | | | |
| | | uningulated high rise 2.05 m v 0.40 | | | | | | | | | | |
| | 024540500755 | uninsulated, high lise, 3.05 m x 6.10 m | | | ~ | 07.074.05 | - | 0 /00 / 1 | | 1 070 10 | | 10 7 17 5 |
| 61 | 034513500750 | x 150 mm thick, 21 mPa | | | \$ | 37,971.28 | \$ | 3,400.14 | \$ | 1,376.16 | \$ | 42,747.58 |
| | | | | | | | | | | | | |
| | | | | | \$ | 37,971.28 | \$ | 3,400.14 | \$ | 1,376.16 | \$ | 42,747.58 |
| | | | Labor factor: 2.5 | 1.5 | | | \$ | 5.100.21 | | | \$ | 5.100.21 |
| | | | Concrete factor | 0.011 | \$ | 417.68 | | ., | | | \$ | 417.68 |
| | | | Total | | ¢ | 38 399 06 | ¢ | 8 500 25 | ¢ | 1 376 46 | ¢ | 18 265 47 |
| 02 22 Dece | act Darol Ma | | i otai | | Ŷ | 30,300.30 | Ŷ | 0,000.35 | φ | 1,570.10 | φ | -0,200.47 |
| 03-32 Prec | ast Fallel wall | | | | | | | | | | | |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Precast wall panel, smooth, gray, | | | | | | | | | | |
| | | uninsulated, high rise, 3.05 m x 6.10 m | | | | | | | | | | |
| 151 | 034513500750 | x 150 mm thick. 21 mPa | | | \$ | 93,994,48 | \$ | 8,416,74 | \$ | 3.406.56 | \$ | 105.817.78 |
| | | | | | - | 11,001.10 | Ĵ | 0,0.74 | * | 2,700.00 | - | |
| | | | | | • | 02 004 40 | | 0 440 74 | | 2 400 50 | | 405 047 70 |
| | | | Labor Gater 2.5 | | Þ | 93,994.48 | \$ | 8,416.74 | \$ | 3,406.56 | \$ | 105,817.78 |
| | | | Labor factor: 2.5 | 1.5 | | | \$ | 12,625.11 | | | \$ | 12,625.11 |
| | | | Concrete factor | 0.011 | \$ | 1,033.94 | | | | | \$ | 1,033.94 |
| | | | Total | | \$ | 95,028.42 | \$ | 21,041.85 | \$ | 3,406.56 | \$ | 119,476.83 |
| | | | | | | | | | | | | |
| | | | | | \$ | 5,465,095,56 | \$ | 31,728,871,58 | \$ | 77,557,15 | \$ | 37,271,524,27 |
| | | | | | 4 | 5,.05,055.50 | Ŷ | 51, 20,0, 1.50 | 4 | | ¥ | 5, 1, 1, 52 1.27 |
| | | | Powork | 0.05 | ¢ | 272 254 70 | ÷ | 1 586 442 50 | ¢ | 3 977 00 | ¢ | 1 862 576 21 |
| | | | NEWUIK | 0.05 | ₽ | 2/3,254.78 | ≯ | 1,300,443.58 | Þ | 3,877.86 | Þ | 1,003,570.21 |
| | | | | | | | | | | | | |
| | | | Weather delay | 0.1 | | | \$ | 3,172,887.16 | | | \$ | 3,172,887.16 |
| | | | Total | | \$! | 5,738,350.33 | \$ | 36,488,202.31 | \$ | 81,435.01 | \$ | 42,307,987.64 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
|------------|----------------|--|--|---------------|-----------------|-----------------|----------------|
| | | | | | | | |
| 04 Masonr | у | | | | | | |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | |
| | | | | | | | |
| 20 | 042210261250 | Concrete block, foundation wall, normal weight, hollow, 17 Mpa, 300 mm x 200 mm x 400 mm, includes mortar, vertical reinforcing and horizontal joint reinforcing every other course, excludes scaffolding | | \$ 6,505.20 | \$ 2,771.20 | \$ - | \$ 6,023.80 |
| 312 | 042210261250 | Concrete block, foundation wall, normal weight, hollow, 17 Mpa, 300 mm x 200 mm x 400 mm, includes mortar, vertical reinforcing and horizontal joint reinforcing every other course, excludes scaffolding | | \$ 101 481 12 | \$ 43,230,72 | s - | \$ 93 971 28 |
| 449 | 042210261250 | Concrete block, foundation wall, normal weight, hollow, 17 Mpa, 300 mm x 200 mm x 400 mm, includes mortar, vertical reinforcing and horizontal joint reinforcing every other course, excludes scaffolding | | \$ 146,041.74 | \$ 62,213.44 | \$- | \$ 135,234.31 |
| | | Concrete block, foundation wall, normal weight, hollow, 17 Mpa, 300 mm x 200 mm x 400 mm, includes mortar, vertical reinforcing and horizontal joint reinforcing every other course, excludes | | | | | |
| 249 | 042210261250 | scaffolding | | \$ 80,989.74 | \$ 34,501.44 | ş - | \$ 74,996.31 |
| 13 | 042210261250 | Concrete block, foundation wall, normal weight, hollow, 17 Mpa, 300 mm x 200 mm x 400 mm, includes mortar, vertical reinforcing and horizontal joint reinforcing every other course, excludes scaffolding | | \$ 4,228.38 | \$ 1,801.28 | \$ - | \$ 3,915.47 |
| 20 | 042210261250 | Concrete block, foundation wall, normal weight, hollow, 17 Mpa, 300 mm x 200 mm x 400 mm, includes mortar, vertical reinforcing and horizontal joint reinforcing every other course, excludes scaffolding | | \$ 6,505.20 | \$ 2,771.20 | \$- | \$ 6,023.80 |
| 151 | 042210261250 | Concrete block, foundation wall, normal weight, hollow, 17 Mpa, 300 mm x 200 mm x 400 mm, includes mortar, vertical reinforcing and horizontal joint reinforcing every other course, excludes scaffolding | | \$ 49,114.26 | \$ 20,922.56 | \$ - | \$ 45,479.69 |
| 41 | 042210261250 | Concrete block, foundation wall, normal weight, hollow, 17 Mpa, 300 mm x 200 mm x 400 mm, includes mortar, vertical reinforcing and horizontal joint reinforcing every other course, excludes scaffolding | | \$ 13,335.66 | \$ 5,680.96 | \$ - | \$ 12,348.79 |
| 274 | 042210261250 | Concrete block, foundation wall, normal weight, hollow, 17 Mpa, 300 mm x 200 mm x 400 mm, includes mortar, vertical reinforcing and horizontal joint reinforcing every other course, excludes scaffolding | | \$ 89,121.24 | \$ 37,965.44 | \$- | \$ 82,526.06 |
| 568 | 042210261250 | Concrete block, foundation wall, normal weight, hollow, 17 Mpa, 300 mm x 200 mm x 400 mm, includes mortar, vertical reinforcing and horizontal joint reinforcing every other course, excludes scaffolding | | \$ 184,747.68 | \$ 78,702.08 | \$ - | \$ 171,075.92 |

| | | | | | | | | | | 0 | | |
|----------|--------------|---|-------------------|-----|------|-----------|--------|------------|----------|----------|------|-------------|
| Quantity | Line Number | Description | | | Ext. | Mat. O&P | Ext. L | abour O&P | Ext. Equ | uip. O&P | Ext | . Total O&P |
| | | | | | | | | | | | | |
| | | Control joint, rubber, for double wythe | | | | | | | | | | |
| 103 | 040523130020 | 200 mm minimum wall (Brick/CMU) | | | \$ | 2,274.24 | \$ | 554.14 | \$ | - | \$ | 1,691.26 |
| | | Expansion joint, polyethylene foam, 25 | | | | | | | | | | |
| 257 | 031516302800 | mm X 300 mm | | | \$ | 7,406.74 | \$ | 1,845.26 | \$ | - | \$ | 5,548.63 |
| 40 | 070440400000 | Firestopping, construction joints, | | | • | 0 700 40 | • | 000.00 | ٠ | | • | 4 050 44 |
| 19 | 078413100860 | Concrete/CMO wall joints, Toomm wide | | | \$ | 0,738.10 | \$ | 983.06 | \$ | - | Ф | 4,352.14 |
| | | ties, wire, mill galvanized, 6 mm | | | | | | | | | | |
| 3 | 040519162800 | diameter, up to 175 mm wide | | | \$ | 1,227.60 | \$ | 188.10 | \$ | - | \$ | 801.90 |
| | | Masonry anchors, mesh wall ties, hot dip | | | | | | | | | | |
| 41 | 040519161440 | long x 300 mm wide | | | \$ | 23,894.80 | \$ | 3,191.85 | \$ | - | \$ | 15,139.25 |
| | | Masonry anchors, column flange wall | | | | | | | | | | |
| 50 | 040510162800 | ties, wire, mill galvanized, 6 mm | | | ¢ | 24 442 80 | ¢ | 2 600 20 | ¢ | | ¢ | 15 770 70 |
| - 59 | 040319102800 | | | | φ | 24,142.00 | φ | 3,099.30 | φ | - | φ | 15,770.70 |
| | | Masonry anchors, mesh wall ties, hot dip galvanized, 13 mm, 16 gauge, 300 mm | | | | | | | | | | |
| 33 | 040519161440 | long x 300 mm wide | | | \$ | 19,232.40 | \$ | 2,569.05 | \$ | - | \$ | 12,185.25 |
| | | Masonry anchors, column flange wall | | | | | | | | | | |
| 2 | 040519162800 | ties, wire, mill galvanized, 6 mm diameter, up to 175 mm wide | | | \$ | 818.40 | \$ | 125.40 | \$ | - | \$ | 534.60 |
| | | Masonry anchors, mesh wall ties, hot dip | | | | | | | | | | |
| 0 | 040540404440 | galvanized, 13 mm, 16 gauge, 300 mm | | | • | 4 740 40 | • | 000 55 | ٠ | | • | 4 407 75 |
| 3 | 040519161440 | long x 300 mm wide | | | \$ | 1,748.40 | \$ | 233.55 | \$ | - | \$ | 1,107.75 |
| | | Masonry anchors, column flange wall ties, wire, mill galvanized, 6 mm | | | | | | | | | | |
| 20 | 040519162800 | diameter, up to 175 mm wide | | | \$ | 8,184.00 | \$ | 1,254.00 | \$ | - | \$ | 5,346.00 |
| | | Masonry anchors, mesh wall ties, hot dip | | | | | | | | | | |
| 6 | 040519161440 | galvanized, 13 mm, 16 gauge, 300 mm long x 300 mm wide | | | \$ | 3.496.80 | \$ | 467.10 | \$ | - | \$ | 2.215.50 |
| | | Masonry anchors, column flance wall | | | | ., | | | | | | , |
| | | ties, wire, mill galvanized, 6 mm | | | | | | | | | | |
| 36 | 040519162800 | diameter, up to 175 mm wide | | | \$ | 14,731.20 | \$ | 2,257.20 | \$ | - | \$ | 9,622.80 |
| | | Masonry anchors, mesh wall ties, hot dip galvanized, 13 mm, 16 gauge, 300 mm | | | | | | | | | | |
| 75 | 040519161440 | long x 300 mm wide | | | \$ | 43,710.00 | \$ | 5,838.75 | \$ | - | \$ | 27,693.75 |
| | | | | | \$ 8 | 39.675.76 | \$ | 313,767.08 | \$ | - | \$ | 733,604,96 |
| | | | | | | , | • | ., | | | • | , |
| | | | | | \$ 8 | 39,675,76 | \$ | 313,767,08 | \$ | - | \$ | 733,604,96 |
| | | | Labor factor: 2.5 | 1.5 | ų O. | , | \$ | 470,650.62 | • | | \$ | 470,650.62 |
| | | | Total | | \$83 | 9,675.76 | \$ 78 | 84,417.70 | | | \$1, | 624,093.46 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&F | Ext. Equip. O&P | Ext. Total O&P |
|--------------|---------------|--|--|---------------|-----------------|-----------------|----------------|
| | | | | | | | |
| 05_01 Metal | s First Floor | Unit Cost Estimate | | | | | |
| Data Releas | e . Teal 2020 | Unit Cost Estimate | | | | | |
| 7 | 051223751300 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W310x33, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ 988.75 | \$ 142.94 | \$ 57.19 | \$ 1,188.88 |
| 10 | 051223751560 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W310x74, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ 3.220.50 | \$ 237.40 | \$ 95.80 | \$ 3.553.70 |
| | | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W360x44, A992 steel, shop | | | | | |
| 193 | 051223752100 | tabricated, incl shop primer, bolted connections Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W530x92, A992 steel, shop | | \$ 37,293.39 | \$ 3,856.14 | \$ 1,542.07 | \$ 42,691.60 |
| 179 | 051223754500 | fabricated, incl shop primer, bolted connections Structural steel beam or girder, 90 metric ton project, 1 | | \$ 71,805.85 | \$ 4,446.36 | \$ 1,346.08 | \$ 77,598.29 |
| 8 | 051223754500 | to 2 story building, W530x92, A992 steel, shop fabricated, incl shop primer, bolted connections Structural steel beam or girder, 90 metric ton project, 1 | | \$ 3,209.20 | \$ 198.72 | \$ 60.16 | \$ 3,468.08 |
| 160 | 051223755300 | to 2 story building, W610x101, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ 70,512.00 | \$ 3,708.80 | \$ 1,128.00 | \$ 75,348.80 |
| 25 | 051223755960 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W690x240, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ 25,990.00 | \$ 565.75 | \$ 170.50 | \$ 26,726.25 |
| | | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W760x147, A992 steel, shop | | | | | |
| 9 | 051223756100 | fabricated, incl shop primer, bolted connections Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W760x284, A992 steel, shop | | \$ 5,746.05 | \$ 194.22 | \$ 58.68 | \$ 5,998.95 |
| 6 | 051223756580 | fabricated, incl shop primer, bolted connections | | \$ 7,458.00 | \$ 139.08 | \$ 41.94 | \$ 7,639.02 |
| 16 | 051223756580 | to 2 story building, W760x284, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ 19,888.00 | \$ 370.88 | \$ 111.84 | \$ 20,370.72 |
| 60 | 051223756580 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W760x284, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ 74,580.00 | \$ 1,390.80 | \$ 419.40 | \$ 76,390.20 |
| 65 | 051223400400 | Angle framing, structural steel, 100 mm and larger, field fabricated, incl cutting & welding | | \$ 148.85 | \$ 785.8 | \$ 61.75 | \$ 996.45 |
| 1026 | 051223175400 | Column, structural tubing, rectangular, heavy section, 175 to 250 mm W, incl shop primer, cap & base plate, bolts | | \$ 4,032.18 | \$ 687.42 | \$ 277.02 | \$ 4,996.62 |
| 15422 | 051223175400 | Column, structural tubing, rectangular, heavy section, 175 to 250 mm W, incl shop primer, cap & base plate, bolts | | \$ 60.608.46 | \$ 10.332.74 | \$ 4,163,94 | \$ 75.105.14 |
| 31 | 051223750320 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W200x22, A992 steel, shop fabricated inclusion primer, bolted connections | | \$ 2005.22 | \$ 924.1 | \$ 371.60 | \$ 4 201 02 |
| 01 | 001220100020 | | | \$ 388,476,45 | \$ 27,981.2 | \$ 9,906,06 | \$ 426.363.72 |
| 05-02 Metals | s Second Floo | r | | • ••••,• | • | • •,•••••• | • |
| Data Releas | e : Year 2020 | Unit Cost Estimate | | | | | |
| 3 | 051223400400 | Angle framing, structural steel, 100 mm and larger, field | | \$ 6.87 | \$ 36.2 | \$ 285 | \$ 45.99 |
| | 001220400400 | Angle framing, structural steel, 100 mm and larger, field | | • • • • • • | 00.2 | • 2.00 | • • • • • • • |
| 1254 | 051223400400 | Angle framing, structural steel, 100 mm and larger, field | | \$ 2,871.66 | \$ 15,160.86 | \$ 1,191.30 | \$ 19,223.82 |
| 3945 | 051223400400 | fabricated, incl cutting & welding Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W310x39, A992 steel, shop | | \$ 9,034.05 | \$ 47,695.05 | \$ 3,747.75 | \$ 60,476.85 |
| 5 | 051223751500 | fabricated, incl shop primer, bolted connections Structural steel beam or girder, 90 metric ton project, 1 | | \$ 836.20 | \$ 102.10 | \$ 40.85 | \$ 979.15 |
| 63 | 051223751580 | to 2 story building, W310x86, A992 steel, shop fabricated, incl shop primer, bolted connections Structural steel beam or girder, 90 metric ton project, 1 | | \$ 23,492.70 | \$ 1,495.62 | \$ 603.54 | \$ 25,591.86 |
| 264 | 051223751700 | to 2 story building, W310x107, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ 122,311.20 | \$ 7,431.60 | \$ 2,962.08 | \$ 132,704.88 |
| 11044 | 051223175400 | Column, structural tubing, rectangular, heavy section, 175 to 250 mm W, incl shop primer, cap & base plate, bolts | | \$ 43,402.92 | \$ 7,399.48 | \$ 2,981.88 | \$ 53,784.28 |
| 502 | 051223774400 | project, over 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ 2,274.06 | \$ 808.22 | \$ 326.30 | \$ 3,408.58 |
| 60 | 051223774400 | Column base plates, structural, heavy, 90 metric ton project, over 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ 271.80 | \$ 96.60 | \$ 39.00 | \$ 407.40 |
| 157 | 051223400600 | Channel framing, structural steel, 200 mm and larger, field fabricated, incl cutting & welding | | \$ 370.52 | \$ 1,672.05 | \$ 130.31 | \$ 2,172.88 |

| Quantity | Line Number | Description | | Ext | t. Mat. O&P | Ext | Labour O&P | Ext. Equip. O&P | E | ct. Total O&P |
|--------------|--------------------------------|--|--|-----|-------------|-----|------------|-----------------|----|---------------|
| 696 | 051223400400 | Angle framing, structural steel, 100 mm and larger, field fabricated, incl cutting & welding | | \$ | 1.593.84 | \$ | 8.414.64 | \$ 661.20 | \$ | 10.669.68 |
| 30 | 051223400400 | Angle framing, structural steel, 100 mm and larger, field fabricated, incl cutting & welding | | \$ | 68.70 | \$ | 362.70 | \$ 28.50 | \$ | 459.90 |
| 347 | 051223400600 | Channel framing, structural steel, 200 mm and larger, field fabricated, incl cutting & welding | | \$ | 818.92 | \$ | 3,695.55 | \$ 288.01 | \$ | 4,802.48 |
| Total | | | | \$ | 207,353.44 | \$ | 94,370.74 | \$ 13,003.57 | \$ | 314,727.75 |
| 05-03 Metals | 5 | Unit Cost Estimate | | | | | | | | |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | | | | |
| 25 | 051223752300 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W360x51, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ | 5,480.50 | \$ | 552.00 | \$ 221.75 | \$ | 6,254.25 |
| 31 | 051223753700 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W460x74, A992 steel, shop fabricated, incl shop primer, bolted connections Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W610x82, A992 steel, shop | | \$ | 9,983.55 | \$ | 872.65 | \$ 265.98 | \$ | 11,122.18 |
| 24 | 051223754900 | fabricated, incl shop primer, bolted connections Structural steel beam or girder 90 metric ton project 1 | | \$ | 8,542.80 | \$ | 556.32 | \$ 169.20 | \$ | 9,268.32 |
| 75 | 051223755300 | to 2 story building, W610x101, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ | 33.052.50 | \$ | 1.738.50 | \$ 528.75 | \$ | 35.319.75 |
| 18 | 051223755700 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W610x125, A992 steel, shop fabricated, incl shop primer, bolled connections Structural steel beam or girder, 90 metric ton project, 1 | | \$ | 9,763.20 | \$ | 427.32 | \$ 130.14 | \$ | 10,320.66 |
| 12 | 051223755720 | to 2 story building, W610x140, A992 steel, shop | | ¢ | 25 301 10 | ¢ | 997 08 | \$ 303.66 | ¢ | 26 691 84 |
| 43 | 051223755740 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W610x155, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ | 28,911.05 | \$ | 1,068.12 | \$ 320.78 | \$ | 30,299.95 |
| 8 | 051223755780 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W610x217, A992 steel, shop fabricated, incl shop primer, bolted connections Structural steel beam or girder, 90 metric ton project, 1 | | \$ | 7,548.40 | \$ | 198.72 | \$ 59.68 | \$ | 7,806.80 |
| 10 | 051223755780 | to 2 story building, W610x217, A992 steel, shop fabricated, incl shop primer, bolted connections Structural steel beam or girder, 90 metric ton project, 1 | | \$ | 9,435.50 | \$ | 248.40 | \$ 74.60 | \$ | 9,758.50 |
| 165 | 051223755800 | to 2 story building, W690x125, A992 steel, shop fabricated, incl shop primer, bolted connections Structural steel beam or girder, 90 metric top project, 1 | | \$ | 89,496.00 | \$ | 3,588.75 | \$ 1,085.70 | \$ | 94,170.45 |
| 28 | 051223755920 | to 2 story building, W690x170, A992 steel, shop fabricated incl shop primer bolted connections | | \$ | 20 566 00 | \$ | 633 64 | \$ 190.96 | \$ | 21 390 60 |
| 55 | 051223755940 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W690x217, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ | 51,895.25 | \$ | 1,244.65 | \$ 375.10 | \$ | 53,515.00 |
| 18 | 051223755960 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W690x240, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ | 18.712.80 | \$ | 407.34 | \$ 122.76 | \$ | 19,242,90 |
| | | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W690x240, A992 steel, shop | | | | - | | | | 1,2.2.00 |
| 10 | 051223755960 | fabricated, incl shop primer, bolted connections Structural steel beam or girder 90 metric ton project 1 | | \$ | 10,396.00 | \$ | 226.30 | \$ 68.20 | \$ | 10,690.50 |
| 10 | 051223755960 | to 2 story building, W690x240, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ | 10,396.00 | \$ | 226.30 | \$ 68.20 | \$ | 10,690.50 |
| | | | | \$ | 339,570.65 | \$ | 12,986.09 | \$ 3,985.46 | \$ | 356,542.20 |
| 05-04 Metals | - Roof e : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| 1551 | 051223400400 | Angle framing, structural steel, 100 mm and larger, field fabricated, incl cutting & welding | | \$ | 3,551.79 | \$ | 18,751.59 | \$ 1,473.45 | \$ | 23,776.83 |
| 3992 | 051223400650 | Channel framing, structural steel, less than 200 mm, field fabricated, incl cutting & welding | | \$ | 9,421.12 | \$ | 63,672.40 | \$ 4,990.00 | \$ | 78,083.52 |
| 148 | 051223400400 | Angle framing, structural steel, 100 mm and larger, field fabricated, incl cutting & welding | | \$ | 338.92 | \$ | 1,789.32 | \$ 140.60 | \$ | 2,268.84 |
| 28 | 051223400400 | Angle framing, structural steel, 100 mm and larger, field fabricated, incl cutting & welding | | \$ | 64.12 | \$ | 338.52 | \$ 26.60 | \$ | 429.24 |
| 25 | 051223400400 | Angle framing, structural steel, 100 mm and larger, field fabricated, incl cutting & welding | | \$ | 57.25 | \$ | 302.25 | \$ 23.75 | \$ | 383.25 |
| 5 | 051223751520 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W310x52, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ | 1,130.00 | \$ | 110.40 | \$ 44.35 | \$ | 1,284.75 |

| Quantity | Line Number | Description | | Ext. | Mat. O&P | Ext. | Labour O&P | Ext. Equip. O&P | E | ct. Total O&P |
|----------------------------|---------------|---|--|------|------------|------|------------|----------------------|----|---------------|
| | | Structural steel beam or girder, 90 metric ton project, 1 | | | | | | | | |
| 39 | 051223751560 | to 2 story building, W310x74, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ | 12,559.95 | \$ | 925.86 | \$ 373.62 | \$ | 13,859.43 |
| 27 | 051223752300 | to 2 story building, W360x51, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ | 5,918.94 | \$ | 596.16 | \$ 239.49 | \$ | 6,754.59 |
| 14 | 051223752320 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W360x64, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ | 3.875.90 | \$ | 309.12 | \$ 124.18 | \$ | 4.309.20 |
| 40 | 051000750700 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W460x74, A992 steel, shop | | ŕ | 45 459 40 | ¢ | 1 251 20 | ¢ 444.04 | ¢ | 17 001 44 |
| 40 | 051223753700 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W610x101, A992 steel, shop | | Ş | 13,436.40 | Φ | 1,351.20 | φ 411.0 4 | Ŷ | 17,221.44 |
| 101 | 051223755300 | fabricated, incl shop primer, bolted connections Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W610x125, A992 steel shop | | \$ | 44,510.70 | \$ | 2,341.18 | \$ 712.05 | \$ | 47,563.93 |
| 27 | 051223755700 | fabricated, incl shop primer, bolted connections Structural steel beam or girder, 90 metric ton project, 1 | | \$ | 14,644.80 | \$ | 640.98 | \$ 195.21 | \$ | 15,480.99 |
| 17 | 051223755720 | to 2 story building, W610x140, A992 steel, shop fabricated, incl shop primer, bolted connections Channel framing, structural steel, 200 mm and larger | | \$ | 10,277.35 | \$ | 403.58 | \$ 122.91 | \$ | 10,803.84 |
| 1765 | 051223400600 | field fabricated, incl cutting & welding | | \$ | 4,165.40 | \$ | 18,797.25 | \$ 1,464.95 | \$ | 24,427.60 |
| | | | | \$ | 125,974.64 | \$ | 110,329.81 | \$ 10,343.00 | \$ | 246,647.45 |
| 05-05 Roof Data Release | e · Year 2020 | Unit Cost Estimate | | | | | | | | |
| Data Neleas | e . Tear 2020 | | | | | | | | | |
| 241 | 051223754900 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W610x82, A992 steel, shop fabricated incl shop primer, bolted connections | | \$ | 85 783 95 | \$ | 5 586 38 | \$ 1,699,05 | \$ | 93 069 38 |
| | | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W610x155, A992 steel, shop | | | | • | 0,000.000 | • ., | | |
| 44 | 051223755740 | fabricated, incl shop primer, bolted connections Structural steel beam or girder, 90 metric ton project, 1 | | \$ | 29,583.40 | \$ | 1,092.96 | \$ 328.24 | \$ | 31,004.60 |
| 19 | 051223755760 | fabricated, incl shop primer, bolted connections | | \$ | 14,277.55 | \$ | 471.96 | \$ 141.74 | \$ | 14,891.25 |
| | | | | | | | | | | |
| 05-06 Platf+ | A5:B11orms | | | \$ | 129,644.90 | \$ | 7,151.30 | \$ 2,169.03 | \$ | 138,965.23 |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| | | Angle framing, structural steel, 100 mm and larger, field | | | | | | | | |
| 175 | 051223400400 | fabricated, incl cutting & welding | | \$ | 400.75 | \$ | 2,115.75 | \$ 166.25 | \$ | 2,682.75 |
| 52 | 051222400450 | Angle framing, structural steel, less than 100 mm, field | | ¢ | 125.09 | ¢ | 1 067 05 | ¢ 94.97 | ¢ | 1 277 20 |
| | 001220400400 | Tablicated, inclicating & weiging | | à | 125.06 | φ | 1,007.95 | φ 04.2 <i>1</i> | ą | 1,277.30 |
| | | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W310x39, A992 steel, shop | | | | | | | | |
| 42 | 051223751500 | fabricated, incl shop primer, bolted connections Structural steel beam or girder, 90 metric ton project, 1 | | \$ | 7,024.08 | \$ | 857.64 | \$ 343.14 | \$ | 8,224.86 |
| 5 | 051223751560 | to 2 story building, W310x74, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ | 1,610.25 | \$ | 118.70 | \$ 47.90 | \$ | 1,776.85 |
| 3 | 051223751740 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W310x129, A992 steel, shop fabricated incl shop primer, bolted connections | | \$ | 1 678 05 | \$ | 84 45 | \$ 33.66 | \$ | 1 796 16 |
| | 001220101110 | | | Ŷ | 1,070.00 | Ŷ | 01110 | • • • • • • • • • • | Ť | 1,100.10 |
| 05 07 Maaaa | | | | \$ | 10,838.21 | \$ | 4,244.49 | \$ 675.22 | \$ | 15,757.92 |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| 288 | 051223400400 | Angle framing, structural steel, 100 mm and larger, field fabricated, incl cutting & welding | | \$ | 659.52 | \$ | 3,481.92 | \$ 273.60 | \$ | 4,415.04 |
| 15 | 051223400672 | Channel framing, structural steel, field fabricated, C200x17, incl cutting & welding | | \$ | 610.20 | \$ | 3,312.00 | \$ 259.95 | \$ | 4,182.15 |
| 60 | 051223400400 | Angle framing, structural steel, 100 mm and larger, field fabricated, incl cutting & welding | | \$ | 137.40 | \$ | 725.40 | \$ 57.00 | \$ | 919.80 |
| 50 | | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W310x33, A992 steel, shop | | Ŧ | | | . 20. 10 | | | 510100 |
| 11 | 051223751300 | fabricated, incl shop primer, bolted connections | | \$ | 1,553.75 | \$ | 224.62 | \$ 89.87 | \$ | 1,868.24 |
| 11 | 051223751560 | to 2 story building, W310x74, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ | 3,542.55 | \$ | 261.14 | \$ 105.38 | \$ | 3,909.07 |
| | | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W360x39, A992 steel, shop | | | | | | | | |
| 21 | 051223751900 | fabricated, incl shop primer, bolted connections | | \$ | 3,512.04 | \$ | 380.31 | \$ 153.09 | \$ | 4,045.44 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
|--------------|---------------|--|--|---------------|-----------------|-----------------|----------------|
| 33 | 051223754900 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W610x82, A992 steel, shop fabricated, incl shop primer, bolted connections Structural steel beam or girder. 90 metric ton project 1 | | \$ 11,746.35 | \$ 764.94 | \$ 232.65 | \$ 12,743.94 |
| 10 | 051223755500 | to 2 story building, W610x113, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ 4,915.50 | \$ 231.80 | \$ 70.50 | \$ 5,217.80 |
| 364 | 051223400400 | Angle framing, structural steel, 100 mm and larger, field fabricated, incl cutting & welding | | \$ 833.56 | \$ 4,400.76 | \$ 345.80 | \$ 5,580.12 |
| 05 09 Stoire | | | | \$ 27,510.87 | \$ 13,782.89 | \$ 1,587.84 | \$ 42,881.60 |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | |
| | | Structural steal beam or sinder 00 metric ten project 1 | | | | | |
| 9 | 051223750140 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W150x30, A992 steel, shop fabricated, incl shop primer, bolted connections Structural steel beam or girder, 90 metric ton project, 1 | | \$ 1,159.38 | \$ 268.29 | \$ 107.91 | \$ 1,535.58 |
| 30 | 051223751900 | to 2 story building, W360x39, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ 5,017.20 | \$ 543.30 | \$ 218.70 | \$ 5,779.20 |
| 680 | 051223175400 | Column, structural tubing, rectangular, heavy section, 175 to 250 mm W, incl shop primer, cap & base plate, bolts | | \$ 2,672.40 | \$ 455.60 | \$ 183.60 | \$ 3,311.60 |
| | | | | \$ 8,848.98 | \$ 1,267.19 | \$ 510.21 | \$ 10,626.38 |
| 05-09 Metals | - Hoist | Unit Cost Estimate | | | | | |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | |
| 6 | 051223750740 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W250x49, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ 1,274.64 | \$ 195.42 | \$ 78.24 | \$ 1,548.30 |
| 10 | 051223750350 | to 2 story building, W200x31, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ 1,356.00 | \$ 298.10 | \$ 119.90 | \$ 1,774.00 |
| | | | | \$ 2,630.64 | \$ 493.52 | \$ 198.14 | \$ 3,322.30 |
| 05-10 Metals | Hoist | Unit Cost Estimate | | | | | |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | |
| 12 | 051223177000 | Column, structural, 2-tier, W250x67, A992 steel, incl shop primer, splice plates, bolts | | \$ 3,484.92 | \$ 208.68 | \$ 83.16 | \$ 3,776.76 |
| 19 | 051223176800 | Column, structural, 2-tier, W200x36, A992 steel, incl shop primer, splice plates, bolts Column, structural, 2-tier, W250x67, A992 steel, incl | | \$ 2,941.39 | \$ 315.78 | \$ 126.16 | \$ 3,383.33 |
| 12 | 051223177000 | shop primer, splice plates, bolts | | \$ 3,484.92 | \$ 208.68 | \$ 83.16 | \$ 3,776.76 |
| 19 | 051223176800 | Column, structural, 2-tier, W200x36, A992 steel, incl shop primer, splice plates, bolts Column, structural tubing, heavy section, A500GrB, 100 to 150 mm square, incl shop primer, cap & base plate. | | \$ 2,941.39 | \$ 315.78 | \$ 126.16 | \$ 3,383.33 |
| 30 | 051223173600 | bolts | | \$ 117.90 | \$ 11.40 | \$ 4.50 | \$ 133.80 |
| 30 | 051223173600 | Column, structural tubing, heavy section, A500GrB, 100 to 150 mm square, incl shop primer, cap & base plate, bolts | | \$ 117.90 | \$ 11.40 | \$ 4.50 | \$ 133.80 |
| | | | | \$ 13,088.42 | \$ 1,071.72 | \$ 427.64 | \$ 14,587.78 |
| 05-11 Metals | - Pipe Rack | Unit Coot Entire to | | | | | |
| Data Release | e : Year 2020 | | | | | | |
| 146 | 051223400400 | Angle framing, structural steel, 100 mm and larger, field fabricated, incl cutting & welding | | \$ 334.34 | \$ 1,765.14 | \$ 138.70 | \$ 2,238.18 |
| 894 | 051223400400 | Angle framing, structural steel, 100 mm and larger, field fabricated, incl cutting & welding Structural steel beam or girder, 90 metric ton project, 1 | | \$ 2,047.26 | \$ 10,808.46 | \$ 849.30 | \$ 13,705.02 |
| 10 | 051000750140 | to 2 story building, W150x30, A992 steel, shop | | ¢ 1 288 20 | ¢ 208.10 | ¢ 110.00 | ¢ 1,706,20 |
| 10 | 031223730140 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W200x22, A992 steel, shop | | φ 1,200.20 | φ 296.10 | \$ 119.90 | \$ 1,700.20 |
| 213 | 051223750320 | fabricated, incl shop primer, bolted connections | | \$ 20,580.06 | \$ 6,349.53 | \$ 2,553.87 | \$ 29,483.46 |
| 05-12 Metals | - Column | | | \$ 24,249.86 | \$ 19,221.23 | \$ 3,661.77 | \$ 47,132.86 |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | |
| 65 | 051223750140 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W150x30, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ 8,373.30 | \$ 1,937.65 | \$ 779.35 | \$ 11,090.30 |
| | | | | \$ 8,373.30 | \$ 1,937.65 | \$ 779.35 | \$ 11,090.30 |
| 05-13 Metals | - Base plate | | | | | | |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | |

| | | | | | Page 88 of 350 | | | | | | |
|----------|--------------|--|--|---------|----------------|---------|-----------|-----------------|---------|----------|--|
| Quantity | Line Number | Description | | Ext. Ma | t. O&P | Ext. La | abour O&P | Ext. Equip. O&P | Ext. To | otal O&P | |
| | | | | | | | | | | | |
| 147 | 051223774400 | Column base plates, structural, heavy, 90 metric ton project, over 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ | 665.91 | \$ | 236.67 | \$ 95.55 | \$ | 998.13 | |
| | | | | | | | | | | | |
| | | | | \$ | 665.91 | \$ | 236.67 | \$ 95.55 | \$ | 998.13 | |
| | | | | | | | | | | | |

| Quantity | Line Number | Description | | Ex | t. Mat. O&P | Ext. | Labour O&P | Ext. Equip. O&P | E | kt. Total O&P |
|--------------|-----------------|--|--|--------|--------------|------|-------------|--|----------|---------------|
| 05-14 - Meta | ls - Monorail | | | | | | | | | |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| 18 | 051223750740 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W250x49, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ | 3,823.92 | \$ | 586.26 | \$ 234.72 | \$ | 4,644.90 |
| 11 | 051223750500 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W200x46, A992 steel, shop fabricated incl shop primer, bolted connections | | \$ | 2 200 11 | \$ | 358 27 | \$ 143.44 | \$ | 2 701 82 |
| | 001220100000 | | | Ψ • | 2,200.11 | Ŷ | 0.00.27 | • • • • • • | Ŷ | 2,701.02 |
| 05-15 Metals | Vent STack | | | \$ | 6,024.03 | \$ | 944.53 | \$ 3/8.16 | \$ | 7,346.72 |
| Data Release | e · Year 2020 | Unit Cost Estimate | | | | | | | | |
| Data Hoload | 5 . Tour 2020 | | | | | | | | | |
| 68 | 051223400400 | Angle framing, structural steel, 100 mm and larger, field fabricated, incl cutting & welding | | \$ | 155.72 | \$ | 822.12 | \$ 64.60 | \$ | 1,042.44 |
| 7 | 054000400070 | Channel framing, structural steel, field fabricated, | | • | 004 70 | ¢ | 4 5 4 5 0 0 | ¢ 404.04 | <u>_</u> | 4 054 07 |
| / | 051223400672 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building. W150x30, A992 steel, shop | | \$ | 284.76 | \$ | 1,545.60 | \$ 121.31 | \$ | 1,951.67 |
| 3 | 051223750140 | fabricated, incl shop primer, bolted connections Structural steel beam or girder, 90 metric ton project, 1 | | \$ | 386.46 | \$ | 89.43 | \$ 35.97 | \$ | 511.86 |
| _ | 054000750400 | to 2 story building, W360x44, A992 steel, shop | | • | 4 959 94 | • | 400.00 | • • • • • • • • • • • • • • • • • • | • | |
| 7 | 051223752100 | fabricated, incl shop primer, bolted connections Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W460x68, A992 steel, shop | | \$ | 1,352.61 | \$ | 139.86 | \$ 55.93 | \$ | 1,548.40 |
| 6 | 051223753520 | fabricated, incl shop primer, bolted connections | | \$ | 1,776.36 | \$ | 162.30 | \$ 48.66 | \$ | 1,987.32 |
| OF 4C Matala | Francina | | | \$ | 3,955.91 | \$ | 2,759.31 | \$ 326.47 | \$ | 7,041.69 |
| Dete Deleger | s - Framing | Unit Cost Estimate | | | | | | | | |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | | | | |
| 13 | 051223752500 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W360x179, A992 steel, shop fabricated, incl shop primer, bolted connections | | s | 10.062.65 | \$ | 322.92 | \$ 129.87 | \$ | 10.515.44 |
| 10 | | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W360x179, A992 steel, shop | | Ţ | 10,002.00 | Ŷ | 022.02 | • .20.07 | Ţ | |
| 13 | 051223752500 | fabricated, incl shop primer, bolted connections Structural steel beam or girder, 90 metric ton project, 1 | | \$ | 10,062.65 | \$ | 322.92 | \$ 129.87 | \$ | 10,515.44 |
| 13 | 051223752500 | fabricated, incl shop primer, bolted connections | | \$ | 10,062.65 | \$ | 322.92 | \$ 129.87 | \$ | 10,515.44 |
| 13 | 051223752500 | to 2 story building, W360x179, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ | 10,062.65 | \$ | 322.92 | \$ 129.87 | \$ | 10,515.44 |
| 13 | 051223752500 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W360x179, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ | 10,062.65 | \$ | 322.92 | \$ 129.87 | \$ | 10,515.44 |
| Total | Plate | | | \$ | 50,313.25 | \$ | 1,614.60 | \$ 649.35 | \$ | 52,577.20 |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| 254 | 051223774400 | Column base plates, structural, heavy, 90 metric ton project, over 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ | 1,150.62 | \$ | 408.94 | \$ 165.10 | \$ | 1,724.66 |
| 282 | 051223774400 | Column base plates, structural, heavy, 90 metric ton project, over 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ | 1,277.46 | \$ | 454.02 | \$ 183.30 | \$ | 1,914.78 |
| | | Column base plates, structural, heavy, 90 metric ton project, over 68 kg each, A992 steel, shop fabricated, | | | | | | | | |
| 198 | 051223774400 | incl shop primer | | \$ | 896.94 | \$ | 318.78 | \$ 128.70 \$ 477.10 | \$ | 1,344.42 |
| 05-18 - Colu | mn - grd and Un | per Levels | | Ŷ | 3,325.02 | φ | 1,101.74 | φ 4//.1U | ą | 4,303.00 |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| 9 | 051223750140 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W150x30, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ | 1,159.38 | \$ | 268.29 | \$ 107.91 | \$ | 1,535.58 |
| 1857 | 051223751740 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W310x129, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ | 1,038,712.95 | \$ | 52,274.55 | \$ 20,835.54 | \$ | 1,111,823.04 |
| | | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W310x129, A992 steel, shop | | | | | | | | |
| 30 | 051223751740 | fabricated, incl shop primer, bolted connections | | \$ | 16,780.50 | \$ | 844.50 | \$ 336.60 | \$ | 17,961.60 |

| | | | | | | | | | • | | |
|--------------|---------------|--|--|----|--------------|-----|--------------|---------|-----------|----|---------------|
| Quantity | Line Number | Description | | E | xt. Mat. O&P | Ext | . Labour O&P | Ext. Eq | uip. O&P | E | kt. Total O&P |
| 45 | 051223751740 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W310x129, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ | 25,170.75 | \$ | 1,266.75 | \$ | 504.90 | \$ | 26,942.40 |
| 15 | 051223751740 | Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W310x129, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ | 8,390.25 | \$ | 422.25 | \$ | 168.30 | \$ | 8,980.80 |
| | | | | \$ | 1,090,213.83 | \$ | 55,076.34 | \$ | 21,953.25 | \$ | 1,167,243.42 |
| 05-19 Base I | Plate | | | | | | | | | | |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| 428 | 051223774400 | Column base plates, structural, heavy, 90 metric ton project, over 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ | 1,938.84 | \$ | 689.08 | \$ | 278.20 | \$ | 2,906.12 |
| 167 | 051223774400 | Column base plates, structural, heavy, 90 metric ton project, over 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ | 756.51 | \$ | 268.87 | \$ | 108.55 | \$ | 1.133.93 |
| 93 | 051223774400 | Column base plates, structural, heavy, 90 metric ton project, over 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ | 421.29 | \$ | 149.73 | \$ | 60.45 | \$ | 631.47 |
| 345 | 051223774400 | Column base plates, structural, heavy, 90 metric ton project, over 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ | 1,562.85 | \$ | 555.45 | \$ | 224.25 | \$ | 2,342.55 |
| 41.5 | 051223774400 | Column base plates, structural, heavy, 90 metric ton project, over 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ | 188.00 | \$ | 66.82 | \$ | 26.98 | \$ | 281.79 |
| 18.8 | 051223774400 | Column base plates, structural, heavy, 90 metric ton project, over 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ | 85.16 | \$ | 30.27 | \$ | 12.22 | \$ | 127.65 |
| 11.8 | 051223774400 | Column base plates, structural, heavy, 90 metric ton project, over 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ | 53.45 | \$ | 19.00 | \$ | 7.67 | \$ | 80.12 |
| | | | | \$ | 5,006.10 | \$ | 1,779.22 | \$ | 718.32 | \$ | 7,503.63 |

| Quantity | Line Number | Description | | Ext | . Mat. O&P | Ext | . Labour O&P | Ext. Equip. O&P | Ex | t. Total O&P |
|---------------|---------------------|---|--|-----|------------|-----|--------------|---|----------|--------------|
| 05-20 Metal | Decking | | | | | | | | | |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| 863 | 053113506000 | Metal floor decking, steel, non-cellular, composite, galvanized, 76 mm D, 16 gauge | | \$ | 83,236.35 | \$ | 11,046.40 | \$ 647.25 | \$ | 94,930.00 |
| | | | | • | | • | 44.040.40 | ¢ 047.05 | • | |
| 05-21 Motal | Decking 2nd Ele | or | | ð. | 03,230.35 | Þ | 11,046.40 | \$ 647.25 | Þ | 94,930.00 |
| Data Release | e · Vear 2020 | Unit Cost Estimate | | | | | | | | |
| Data Neleasi | C . TCal 2020 | Shint Oost Estimate | | | | | | | | |
| 883 | 053113505100 | Metal floor decking, steel, non-cellular, composite, galvanized, 38 mm D, 16 gauge | | \$ | 75,849.70 | \$ | 8,732.87 | \$ 520.97 | \$ | 85,103.54 |
| | | | | • | | • | | | • | |
| 05 22 Motol | Decking Boof | | | \$ | 75,849.70 | \$ | 8,732.87 | \$ 520.97 | \$ | 85,103.54 |
| 05-22 Wetai | Decking Roor | Helt Oriet Fatherets | | | | | | | | |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| 917 | 053113505100 | Metal floor decking, steel, non-cellular, composite, galvanized, 38 mm D, 16 gauge | | \$ | 78,770.30 | \$ | 9,069.13 | \$ 541.03 | \$ | 88,380.46 |
| | | | | \$ | 78,770,30 | \$ | 9.069.13 | \$ 541.03 | \$ | 88,380,46 |
| 05-23 Metal | Decking Pipe Ch | nase | | • | | Ť | 0,000110 | • | Ť | 00,000110 |
| Data Release | e · Year 2020 | Unit Cost Estimate | | | | | | | | |
| Data Release | 0 . 1001 2020 | | | | | | | | | |
| 27 | 053113506000 | Metal floor decking, steel, non-cellular, composite, galvanized, 76 mm D, 16 gauge | | \$ | 2,604.15 | \$ | 345.60 | \$ 20.25 | \$ | 2,970.00 |
| | | | | | | | | | | |
| | | | | \$ | 2,604.15 | \$ | 345.60 | \$ 20.25 | \$ | 2,970.00 |
| 05-24 to 28 l | Platforms at Elev | vation | | | | | | | | |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| 19 | 055313700422 | Floor grating, steel, painted, 31x5 mm bearing bars @ 30 mm OC, cross bars @ 100 mm OC, up to 28 m2, field fabricated from panels | | \$ | 2,983.00 | \$ | 2,403.12 | \$ 1,116.25 | \$ | 6,502.37 |
| 8 | 055119500100 | Stair, shop fabricated, steel, 1200 mm W, incl pipe railing, stringers, grating treads w/ safety nosing, per riser | | s | 4.000.00 | \$ | 741.76 | \$ 50.80 | \$ | 4,792,56 |
| - | | Stair, shop fabricated, steel, 1050 mm W, incl pipe | | | ., | - | | | Ť | ., |
| | | railing, stringers, grating treads w/ safety nosing, per | | | | | | | | |
| 3 | 055119500020 | riser | | \$ | 1,290.00 | \$ | 238.23 | \$ 16.29 | \$ | 1,544.52 |
| | | Stair, shop fabricated, steel, 1050 mm W, incl pipe | | | | | | | | |
| 0 | 055440500000 | railing, stringers, grating treads w/ safety nosing, per | | ¢ | 4 000 00 | ¢ | 000.00 | ¢ 40.00 | <u>_</u> | 4 5 4 4 5 0 |
| 3 | 055119500020 | | | \$ | 1,290.00 | \$ | 238.23 | \$ 16.29 | \$ | 1,544.52 |
| 22 | 055216500020 | Railing, industrial, weided, steel pipe, 2 rails, 1050 mm high, posts @ 1500 OC, 38 mm dia x 1050 mm H, shop fabricated | | \$ | 3,102.00 | \$ | 784.52 | \$ 53.68 | \$ | 3,940.20 |
| з | 055133230820 | Ladder, shop fabricated, alternating tread, 68-degree incline, steel, 2.4 m vertical rise, 67.6 kg, non-standard paint color. | | ¢ | 7 950 00 | ¢ | 1 369 44 | \$ 363.00 | ¢ | 0 682 53 |
| Ŭ | 100.00200020 | | | ÷ | .,500.00 | ÷ | .,500.44 | - 000.00 | Ÿ | 0,002.00 |
| | | | | • | | • | | • • • • • • • | • | |
| 05 00 40 00 | Distinguise of Elec | | | \$ | 20,615.00 | \$ | 5,775.30 | \$ 1,616.40 | \$ | 28,006.70 |
| 05-29 to 33 | | | | | | | | | | |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| | | Floor grating, steel, painted, 31x5 mm bearing bars @ | | | | | | | | |
| 180 | 055313700433 | field fabricated from papels | | ¢ | 20 673 00 | ¢ | 23 004 72 | ¢ 11 102 75 | ¢ | 64 681 47 |
| 109 | 035313700422 | Stair shop fabricated steel 1050 mm W inclusion | | φ | 29,073.00 | φ | 23,904.72 | φ 11,103.75 | Ŷ | 04,001.47 |
| | | railing, stringers, grating treads w/ safety posing per | | | | | | | | |
| 9 | 055119500020 | riser | | \$ | 3,870.00 | \$ | 714.69 | \$ 48.87 | \$ | 4,633.56 |

| | | | | | | | | Ũ | | |
|---------------|-------------------|---|--|------|-----------|-----|--------------|-----------------|----|---------------|
| Quantity | Line Number | Description | | Ext. | Mat. O&P | Ext | . Labour O&P | Ext. Equip. O&P | E | kt. Total O&P |
| 8 | 055119500020 | Stair, shop fabricated, steel, 1050 mm W, incl pipe railing, stringers, grating treads w/ safety nosing, per riser | | \$ | 3,440.00 | \$ | 635.28 | \$ 43.44 | \$ | 4,118.72 |
| 6 | 055119500020 | Stair, shop fabricated, steel, 1050 mm W, incl pipe railing, stringers, grating treads w/ safety nosing, per riser | | \$ | 2,580.00 | \$ | 476.46 | \$ 32.58 | \$ | 3,089.04 |
| 3 | 055119500020 | Stair, shop fabricated, steel, 1050 mm W, incl pipe railing, stringers, grating treads w/ safety nosing, per riser | | \$ | 1,290.00 | \$ | 238.23 | \$ 16.29 | \$ | 1,544.52 |
| | | | | \$ | 40,853.00 | \$ | 25,969.38 | \$ 11,244.93 | \$ | 78,067.31 |
| 05-34 to 39 F | Platforms at Elev | vation | | | | | | | | |
| Data Release | a · Vear 2020 | Unit Cost Estimate | | | | | | | | |
| Data Neleaso | e . Teal 2020 | onit oost Estimate | | | | | | | | |
| 283 | 055216500020 | Railing, industrial, welded, steel pipe, 2 rails, 1050 mm high, posts @ 1500 OC, 38 mm dia x 1050 mm H, shop fabricated | | \$ | 39,903.00 | \$ | 10,091.78 | \$ 690.52 | \$ | 50,685.30 |
| 17 | 055133130300 | Ladder, shop fabricated, aluminum, 500 mm W, bolted to concrete, incl cage | | \$ | 7,990.00 | \$ | 3,104.03 | \$ 211.82 | \$ | 11,305.85 |
| 2 | 055133130300 | Ladder, shop fabricated, aluminum, 500 mm W, bolted to concrete, incl cage | | \$ | 940.00 | \$ | 365.18 | \$ 24.92 | \$ | 1,330.10 |
| 1 | 055133130300 | Ladder, shop fabricated, aluminum, 500 mm W, bolted to concrete, incl cage | | \$ | 470.00 | \$ | 182.59 | \$ 12.46 | \$ | 665.05 |
| | | Selective demolition, miscellaneous metal fences & | | | | | | | | |
| 22 | 024113660200 | gates, chain link kennels, 1800 mm - 3600 mm long | | \$ | - | \$ | 3,009.16 | \$ - | \$ | 3,009.16 |
| 58 | 055313701400 | Floor grating, steel, field fabricated from panels, for curved toe or kick plate, add | | \$ | 3,422.00 | \$ | - | \$- | \$ | 3,422.00 |
| | | | | \$ | 52,725.00 | \$ | 16,752.74 | \$ 939.72 | \$ | 70,417.46 |
| 05-40 Platfor | rms - Beams and | d Brace | | | | | | | | |
| Data Release | a · Vear 2020 | Unit Cost Estimate | | | | | | | | |
| Buta Noicust | 5 . Tour 2020 | | | | | | | | | |
| 7161 | 051223175400 | Column, structural tubing, rectangular, heavy section, 175 to 250 mm W, incl shop primer, cap & base plate, bolts | | \$ | 28.142.73 | \$ | 4,797,87 | \$ 1.933.47 | \$ | 34.874.07 |
| 4265 | 051223400450 | Angle framing, structural steel, less than 100 mm, field fabricated, incl cutting & welding | | \$ | 10.065.40 | \$ | 85.939.75 | \$ 6.781.35 | \$ | 102.786.50 |
| 132 | 051223400400 | Angle framing, structural steel, 100 mm and larger, field fabricated, incl cutting & welding | | \$ | 302.28 | \$ | 1,595.88 | \$ 125.40 | \$ | 2,023.56 |
| 343 | 051223400400 | Angle framing, structural steel, 100 mm and larger, field fabricated, incl cutting & welding | | \$ | 785.47 | \$ | 4,146.87 | \$ 325.85 | \$ | 5,258.19 |
| 55 | 051223400600 | Channel framing, structural steel, 200 mm and larger, field fabricated, incl cutting & welding | | \$ | 129.80 | \$ | 585.75 | \$ 45.65 | \$ | 761.20 |
| 1304 | 051223400600 | Channel framing, structural steel, 200 mm and larger, field fabricated, incl cutting & welding | | \$ | 3,077.44 | \$ | 13,887.60 | \$ 1,082.32 | \$ | 18,047.36 |
| 7991 | 051223400600 | Channel framing, structural steel, 200 mm and larger, field fabricated, incl cutting & welding | | \$ | 18,858.76 | \$ | 85,104.15 | \$ 6,632.53 | \$ | 110,595.44 |
| 324 | 051223400600 | Channel framing, structural steel, 200 mm and larger, field fabricated, incl cutting & welding | | \$ | 764.64 | \$ | 3,450.60 | \$ 268.92 | \$ | 4,484.16 |
| | | | | ¢ | 62 126 52 | ¢ | 199 508 47 | \$ 17 195 49 | ¢ | 278 830 48 |

| Quantity | Line Number | Description | | Ext. | Mat. O&P | Ext | . Labour O&P | Ext. Equip. O&P | E | kt. Total O&P |
|---------------|------------------|--|--|------|-----------|-----|--------------|-----------------|----|---------------|
| 05-41 to 44 | Platform support | ts | | | | | | | | |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| 9734 | 051223400400 | Angle framing, structural steel, 100 mm and larger, field fabricated, incl cutting & welding | | \$ | 22,290.86 | \$ | 117,684.06 | \$ 9,247.30 | \$ | 149,222.22 |
| 223 | 051223175400 | Column, structural tubing, rectangular, heavy section, 175 to 250 mm W, incl shop primer, cap & base plate, bolts | | \$ | 876.39 | \$ | 149.41 | \$ 60.21 | \$ | 1,086.01 |
| 1 | 055413200300 | Floor plate, steel checkered plate, pit or trench cover and frame, 600 to 900 mm W x 6 mm T, field fabricated | | \$ | 130.00 | \$ | 299.57 | \$ 20.45 | \$ | 450.02 |
| 1 | 055413200300 | Floor plate, steel checkered plate, pit or trench cover and frame, 600 to 900 mm W x 6 mm T, field fabricated | | \$ | 130.00 | \$ | 299.57 | \$ 20.45 | \$ | 450.02 |
| 60 | 051223400450 | Angle framing, structural steel, less than 100 mm, field fabricated, incl cutting & welding | | \$ | 141.60 | \$ | 1,209.00 | \$ 95.40 | \$ | 1,446.00 |
| 914 | 051223774400 | project, over 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ | 4,140.42 | \$ | 1,471.54 | \$ 594.10 | \$ | 6,206.06 |
| | | | | \$ | 27,709.27 | \$ | 121,113.15 | \$ 10,037.91 | \$ | 158,860.33 |
| 05-45 Stairs | 1 | Unit Coot Estimate | | | | | | | | |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | | | | |
| 145 | 055513504100 | Stair tread, bar grating, steel, anti-skid, with nosing, galvanized, 31 mm x 5 mm bearing bars, 278mm deep x 1200 mm long, excludes stringers and bolts | | \$ | 18,415.00 | \$ | 4,550.10 | \$- | \$ | 22,965.10 |
| 53 | 051223400672 | Channel framing, structural steel, field fabricated, C200x17, incl cutting & welding | | \$ | 2,156.04 | \$ | 11,702.40 | \$ 918.49 | \$ | 14,776.93 |
| 35 | 051223400672 | Channel framing, structural steel, field fabricated, C200x17, incl cutting & welding | | \$ | 1,423.80 | \$ | 7,728.00 | \$ 606.55 | \$ | 9,758.35 |
| 41 | 051223400672 | Channel framing, structural steel, field fabricated, C200x17, incl cutting & welding | | \$ | 1,667.88 | \$ | 9,052.80 | \$ 710.53 | \$ | 11,431.21 |
| 60 | 051223400672 | Channel framing, structural steel, field fabricated, C200x17, incl cutting & welding | | \$ | 2,440.80 | \$ | 13,248.00 | \$ 1,039.80 | \$ | 16,728.60 |
| 55 | 055313700424 | Floor grating, steel, painted, 31x5 mm bearing bars @ 30 mm OC, cross bars @ 100 mm OC, over 28 m2, field fabricated from panels | | \$ | 7,865.00 | \$ | 4,655.20 | \$ 2,164.80 | \$ | 14,685.00 |
| 59 | 055213502050 | 2-line pipe rail with pickets and attached handrail, steel, primed, 38 mm pipe, 13 mm pickets @ 113 mm OC, 1050 mm high, shop fabricated, straight & level | | \$ | 31,565.00 | \$ | 4,488.72 | \$ 306.21 | \$ | 36,359.93 |
| 41 | 051223400476 | Angle framing, structural steel, 76x76x9.5 mm, field fabricated, incl cutting & welding | | \$ | 1,042.63 | \$ | 5,703.10 | \$ 448.13 | \$ | 7,193.86 |
| | | | | \$ | 66,576.15 | \$ | 61,128.32 | \$ 6,194.51 | \$ | 133,898.98 |
| 05-46 Stair 2 | . Voor 2020 | Unit Cost Estimato | | | | | | | | |
| Data Neleast | e . Teal 2020 | onit oost Estimate | | | | | | | | |
| | | Stair tread, bar grating, steel, anti-skid, with nosing, | | | | | | | | |
| 128 | 055513504100 | 1200 mm long, excludes stringers and bolts | | \$ | 16,256.00 | \$ | 4,016.64 | \$- | \$ | 20,272.64 |
| 46 | 051223400672 | C200x17, incl cutting & welding | | \$ | 1,871.28 | \$ | 10,156.80 | \$ 797.18 | \$ | 12,825.26 |
| 29 | 051223400672 | C200x17, incl cutting & welding | | \$ | 1,179.72 | \$ | 6,403.20 | \$ 502.57 | \$ | 8,085.49 |
| 34 | 051223400672 | C200x17, incl cutting & welding | | \$ | 1,383.12 | \$ | 7,507.20 | \$ 589.22 | \$ | 9,479.54 |
| 73 | 051223400672 | C200x17, incl cutting & welding | | \$ | 2,969.64 | \$ | 16,118.40 | \$ 1,265.09 | \$ | 20,353.13 |
| 44 | 055313700424 | 30 mm OC, cross bars @ 100 mm OC, over 28 m2, field fabricated from panels | | s | 6 292 00 | \$ | 3 724 16 | \$ 173184 | \$ | 11 748 00 |
| 34 | 051223400476 | Angle framing, structural steel, 76x76x9.5 mm, field | | \$ | 864 62 | \$ | 4 729 40 | \$ 371.62 | s | 5 965 64 |
| | 031223400470 | 2-line pipe rail with pickets and attached handrail, steel, primed, 38 mm pipe, 13 mm pickets @ 113 mm OC, | | Ŷ | 004.02 | Ŷ | 4,723.40 | ¢ 071.02 | Ų | 5,505.04 |
| 46 | 055213502050 | 1050 mm high, shop fabricated, straight & level | | \$ | 24,610.00 | \$ | 3,499.68 | \$ 238.74 | \$ | 28,348.42 |
| 05-47 Sump | pit | | | \$ | 55,426.38 | \$ | 56,155.48 | \$ 5,496.26 | \$ | 117,078.12 |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| 6 | 051223400476 | Angle framing, structural steel, 76x76x9.5 mm, field fabricated, incl cutting & welding | | \$ | 152.58 | \$ | 834.60 | \$ 65.58 | \$ | 1,052.76 |
| | | | | \$ | 152.58 | \$ | 834.60 | \$ 65.58 | \$ | 1,052.76 |
| 05-48 Loadii | ng Dock Extensi | on Unit Cost Estimato | | | | | | | | |
| Data Release | e . real 2020 | | | | | | | | | |
| 504 | 051223400400 | Angle framing, structural steel, 100 mm and larger, field fabricated, incl cutting & welding | | \$ | 1,154.16 | \$ | 6,093.36 | \$ 478.80 | \$ | 7,726.32 |
| 28 | 051223400600 | Channel framing, structural steel, 200 mm and larger, field fabricated incl cutting & welding | | \$ | 66.08 | \$ | 298.20 | \$ 23.24 | \$ | 387 52 |
| 20 | 10.120100000 | | | ¥ | 00.00 | Ψ | 200.20 | - 20.24 | Ψ | 001.02 |

| Quantity | Line Number | Description | | Ext | . Mat. O&P | Ext | . Labour O&P | Ext. Equip. O&P | Ex | t. Total O&P |
|-------------------------------|---------------------------------|--|--|-----|------------|-----|--------------|-----------------|--------|--------------|
| 2374 | 051223400600 | Channel framing, structural steel, 200 mm and larger, field fabricated, incl cutting & welding | | \$ | 5.602.64 | \$ | 25,283,10 | \$ 1.970.42 | \$ | 32,856,16 |
| 1844 | 051223400600 | Channel framing, structural steel, 200 mm and larger, field fabricated incl cutting & welding | | ¢ | 4 351 84 | ¢ | 19 638 60 | \$ 1,530,52 | ç | 25 520 96 |
| 1011 | 001220100000 | Structural steel beam or girder, 90 metric ton project, 1 | | Ŷ | 4,001.04 | Ų | 10,000.00 | ¢ 1,000.02 | Ų | 20,020.00 |
| 25 | 051223751500 | fabricated, incl shop primer, bolted connections | | \$ | 4,181.00 | \$ | 510.50 | \$ 204.25 | \$ | 4,895.75 |
| 3 | 051223751900 | to 2 story building, W360x39, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ | 501.72 | \$ | 54.33 | \$ 21.87 | \$ | 577.92 |
| | | Structural steel beam or girder, 90 metric ton project, 1 | | | | İ | | | Ť | |
| 22 | 051223752300 | fabricated, incl shop primer, bolted connections | | \$ | 4,822.84 | \$ | 485.76 | \$ 195.14 | \$ | 5,503.74 |
| 2 | 051223754500 | to 2 story building, W530x92, A992 steel, shop fabricated, incl shop primer, bolted connections | | \$ | 802.30 | \$ | 49.68 | \$ 15.04 | \$ | 867.02 |
| | | | | | | | | | | |
| 05-49 Colum | ns | | | \$ | 21,482.58 | \$ | 52,413.53 | \$ 4,439.28 | \$ | 78,335.39 |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | | | | |
| 2412 | 051223400600 | Channel framing, structural steel, 200 mm and larger, field fabricated, incl cutting & welding | | \$ | 5,692.32 | \$ | 25,687.80 | \$ 2,001.96 | \$ | 33,382.08 |
| | | | | \$ | 5,692.32 | \$ | 25,687.80 | \$ 2,001.96 | \$ | 33,382.08 |
| 05-50 - Base | Plate | | | | , | | | | | , |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | | | | |
| 29 | 051223774400 | Column base plates, structural, heavy, 90 metric ton project, over 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ | 131.37 | \$ | 46.69 | \$ 18.85 | \$ | 196.91 |
| | | Column base plates, structural, heavy, 90 metric ton | | | | | | | | |
| 36 | 051223774400 | incl shop primer | | \$ | 163.08 | \$ | 57.96 | \$ 23.40 | \$ | 244.44 |
| | | | | \$ | 294.45 | \$ | 104.65 | \$ 42.25 | \$ | 441.35 |
| 05-51 to 53 I Data Release | Loading Dock E e : Year 2020 | unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| 30 | 055313100134 | Floor grating, aluminum, 38 x 5 mm bearing bars @ 30 mm OC, cross bars @ 100 mm OC, over 28 m2, field fabricated from panels | | \$ | 13,200.00 | \$ | 898.80 | \$ 61.20 | \$ | 14,160.00 |
| 72 | 053113505100 | Metal floor decking, steel, non-cellular, composite, galvanized, 38 mm D, 16 gauge | | \$ | 6,184.80 | \$ | 712.08 | \$ 42.48 | \$ | 6,939.36 |
| 4.5 | 055133130300 | Ladder, shop fabricated, aluminum, 500 mm W, bolted to concrete, incl cage | | \$ | 2,115.00 | \$ | 821.66 | \$ 56.07 | \$ | 2,992.73 |
| | | | | ¢ | 21 499 80 | ¢ | 2 432 54 | \$ 159.75 | ¢ | 24 092 09 |
| 05-54 - 56 C | ondensate Platf | orm | | Ť | 21,455.00 | Ψ | 2,402.04 | ¢ 105.75 | Ţ. | 24,032.03 |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | Railing, industrial, welded, steel pipe, 2 rails, 1050 mm | | | | | | | | |
| 6 | 055216500020 | fabricated Railing industrial welded steel pine 2 rails 1050 mm | | \$ | 846.00 | \$ | 213.96 | \$ 14.64 | \$ | 1,074.60 |
| 5 | 055216500020 | high, posts @ 1500 OC, 38 mm dia x 1050 mm H, shop fabricated | | \$ | 705.00 | \$ | 178.30 | \$ 12.20 | \$ | 895.50 |
| 9.48 | 051223650450 | Steel plate, structural, for connections & stiffeners, 19 mm T, shop fabricated, incl shop primer | | \$ | 5 570 45 | \$ | 5 735 40 | \$ _ | \$ | 11 305 85 |
| 4.83 | 051223650100 | Steel plate, structural, for connections & stiffeners, 6 mm T_shop fabricated incl shop primer | | \$ | 949.67 | \$ | 1 669 80 | \$ - | \$ | 2 619 47 |
| 7.5 | 051223650100 | Steel plate, structural, for connections & stiffeners, 6 mm T, shop fabricated incl shop primer | | \$ | 1 474 65 | \$ | 1 815 00 | \$ - | \$ | 3 289 65 |
| 3.0 | 051223650300 | Steel plate, structural, for connections & stiffeners, 9 mm T_shop fabricated incl shop primer | | ¢ | 1 1/5 82 | ¢ | 726.00 | ¢ - | ¢ | 1 871 82 |
| 5.9 | 051223030300 | Steel plate, structural, for connections & stiffeners, 9 | | ¢ | 1,143.02 | φ | 720.00 | ф - | Ģ | 1,071.02 |
| 4.32 | 051223050300 | Steel plate, structural, for connections & stiffeners, 13 | | \$ | 1,209.22 | \$ | 053.40 | \$ <u>-</u> | ۵ ۵ | 1,922.02 |
| 1.14 | 051223650400 | Steel plate, structural, for connections & stiffeners, 13 | | \$ | 444.43 | \$ | 145.20 | \$ - | \$ | 589.63 |
| 3.3 | 051223650400 | mm T, shop fabricated, incl shop primer Steel plate, structural, for connections & stiffeners, 13 | | \$ | 1,286.51 | \$ | 363.00 | \$ - | \$ | 1,649.51 |
| 0.75 | 051223650400 | mm T, shop fabricated, incl shop primer Steel plate, structural, for connections & stiffeners, 19 | | \$ | 292.39 | \$ | 72.60 | \$ - | \$ | 364.99 |
| 7.56 | 051223650450 | mm T, shop fabricated, incl shop primer Steel plate, structural, for connections & stiffeners. 19 | | \$ | 4,442.26 | \$ | 653.40 | \$- | \$ | 5,095.66 |
| 2.79 | 051223650450 | mm T, shop fabricated, incl shop primer Steel plate structural for connections & stiffeners, 10 | | \$ | 1,639.40 | \$ | 217.80 | \$ - | \$ | 1,857.20 |
| 9.18 | 051223650450 | mm T, shop fabricated, incl shop primer | | \$ | 5,394.17 | \$ | 653.40 | \$- | \$ | 6,047.57 |
| 6.66 | 051223650450 | mm T, shop fabricated, incl shop primer | | \$ | 3,913.42 | \$ | 435.60 | \$ - | \$ | 4,349.02 |

| Quantity | Line Number | Description | | E | xt. Mat. O&P | Ex | . Labour O&P | Ext. Equip. O&P | E | xt. Total O&P |
|----------------|------------------|---|--|----|--------------|----|--------------|-----------------|----|---------------|
| 1.2 | 051223650500 | Steel plate, structural, for connections & stiffeners, 25 mm T, shop fabricated, incl shop primer | | \$ | 942.42 | \$ | 72.60 | \$ - | \$ | 1,015.02 |
| Total | | | | \$ | 30,315.81 | \$ | 13,605.46 | \$ 26.84 | \$ | 43,948.11 |
| 05-54 - 56 C | ondensate Platfe | orm | | | | | | | | |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | | | | |
| 6 | 055216500020 | Railing, industrial, welded, steel pipe, 2 rails, 1050 mm high, posts @ 1500 OC, 38 mm dia x 1050 mm H, shop fabricated | | \$ | 846.00 | \$ | 213.96 | \$ 14.64 | \$ | 1,074.60 |
| 5 | 055216500020 | Railing, industrial, welded, steel pipe, 2 rails, 1050 mm high, posts @ 1500 OC, 38 mm dia x 1050 mm H, shop fabricated | | \$ | 705.00 | \$ | 178.30 | \$ 12.20 | \$ | 895.50 |
| | | Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, | | | | | | | | |
| 29767 | 051223774300 | Incl shop primer Column base plates, structural, light, 90 metric ton | | \$ | 129,188.78 | \$ | 52,687.59 | \$ - | \$ | 181,876.37 |
| 26540 | 051223774300 | project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ | 115,183.60 | \$ | 46,975.80 | \$- | \$ | 162,159.40 |
| 39800 | 051223774300 | Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ | 172,732.00 | \$ | 70,446.00 | \$- | \$ | 243,178.00 |
| 54259 | 051223774300 | Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ | 235,484.06 | \$ | 96,038.43 | \$- | \$ | 331,522.49 |
| 17003 | 051223774300 | project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ | 73,793.02 | \$ | 30,095.31 | \$ - | \$ | 103,888.33 |
| 56991 | 051223774300 | Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ | 247,340.94 | \$ | 100,874.07 | \$ - | \$ | 348,215.01 |
| | | Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, | | | | | | | | |
| 14718 | 051223774300 | Column base plates, structural, light, 90 metric ton | | \$ | 63,876.12 | \$ | 26,050.86 | \$ - | \$ | 89,926.98 |
| 166169 | 051223774300 | incl shop primer | | \$ | 721,173.46 | \$ | 294,119.13 | \$- | \$ | 1,015,292.59 |
| 67895 | 051223774300 | project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer Column base plates, structural light 90 metric ton | | \$ | 294,664.30 | \$ | 120,174.15 | \$- | \$ | 414,838.45 |
| 245014 | 051223774300 | project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer Column base plates, structural, light, 90 metric ton | | \$ | 1,063,360.76 | \$ | 433,674.78 | \$ - | \$ | 1,497,035.54 |
| 193439 | 051223774300 | project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ | 839,525.26 | \$ | 342,387.03 | \$- | \$ | 1,181,912.29 |
| 37680 | 051223774300 | Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ | 163,531.20 | \$ | 66,693.60 | \$ - | \$ | 230,224.80 |
| | | | | \$ | 4,121,404.50 | \$ | 1,680,609.01 | \$ 26.84 | \$ | 5,802,040.35 |
| 05-57 Pipe C | Chase | | | | | | | | | |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | | | | |
| 4 | 051223650400 | Steel plate, structural, for connections & stiffeners, 13 mm T, shop fabricated, incl shop primer | | \$ | 1,559.40 | \$ | | \$- | \$ | 1,559.40 |
| 32 | 051223400474 | fabricated, incl cutting & welding | | \$ | 663.68 | \$ | 3,921.28 | \$ 306.56 | \$ | 4,891.52 |
| 16 | 051223400474 | fabricated, incl cutting & welding | | \$ | 331.84 | \$ | 1,960.64 | \$ 153.28 | \$ | 2,445.76 |
| 05 50 Baar | Ping | | | \$ | 2,554.92 | \$ | 5,881.92 | \$ 459.84 | \$ | 8,896.68 |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | | | | |
| 2010 1 1010030 | | | | | | | | | | |
| 19 | 052119106400 | Individual steel bearing plate, 150 x 150 x 6 mm, with J- hook | | \$ | 272.08 | \$ | 82.46 | \$ - | \$ | 354.54 |
| 2 | 052119106400 | hook | | \$ | 28.64 | \$ | 8.68 | \$- | \$ | 37.32 |
| 4 | 052119106400 | hook | | \$ | 57.28 | \$ | 17.36 | \$ - | \$ | 74.64 |
| 1 | 052119106400 | hook | | \$ | 14.32 | \$ | 4.34 | \$- | \$ | 18.66 |
| 05 50 Emb | ddod Plates | | | \$ | 372.32 | \$ | 112.84 | \$ - | \$ | 485.16 |
| Data Release | e : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| 36 | 051223774300 | Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ | 156.24 | \$ | 63.72 | \$ - | \$ | 219.96 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ex | t. Total O&P |
|------------|---------------|--|--|---------------|-----------------|-----------------|----|--------------|
| 39 | 051223774300 | Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ 169.26 | \$ 69.03 | \$- | \$ | 238.29 |
| 50 | 051223774300 | Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ 217.00 | \$ 88.50 | \$- | \$ | 305.50 |
| 456 | 051223774300 | Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ 1,979.04 | \$ 807.12 | \$- | \$ | 2,786.16 |
| 113 | 051223774300 | Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ 490.42 | \$ 200.01 | \$- | \$ | 690.43 |
| 113 | 051223774300 | Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ 490.42 | \$ 200.01 | \$- | \$ | 690.43 |
| 237 | 051223774300 | project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ 1,028.58 | \$ 419.49 | \$- | \$ | 1,448.07 |
| 57 | 051223774300 | project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer Column base plates, structural, light, 90 metric ton | | \$ 247.38 | \$ 100.89 | \$- | \$ | 348.27 |
| 157 | 051223774300 | project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer Column base plates, structural, light, 90 metric ton | | \$ 681.38 | \$ 277.89 | \$- | \$ | 959.27 |
| 237 | 051223774300 | project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer Column base plates, structural, light, 90 metric ton | | \$ 1,028.58 | \$ 419.49 | \$- | \$ | 1,448.07 |
| 130 | 051223774300 | project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer Column base plates, structural, light, 90 metric ton | | \$ 564.20 | \$ 230.10 | \$- | \$ | 794.30 |
| 237 | 051223774300 | project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer Column base plates, structural, light, 90 metric ton | | \$ 1,028.58 | \$ 419.49 | \$- | \$ | 1,448.07 |
| 130 | 051223774300 | project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer Column base plates, structural, light, 90 metric ton | | \$ 564.20 | \$ 230.10 | \$- | \$ | 794.30 |
| 130 | 051223774300 | project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer Column base plates, structural, light, 90 metric ton | | \$ 564.20 | \$ 230.10 | \$- | \$ | 794.30 |
| 19 | 051223774300 | project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer Column base plates, structural, light, 90 metric ton | | \$ 82.46 | \$ 33.63 | \$- | \$ | 116.09 |
| 60 | 051223774300 | project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer Column base plates, structural, light, 90 metric ton project up to 68 kg acch. A992 steel, shop fabricated | | \$ 260.40 | \$ 106.20 | \$- | \$ | 366.60 |
| 28 | 051223774300 | incl shop primer Column base plates, structural, light, 90 metric ton project up to 68 kg each A992 steel, shop fabricated | | \$ 121.52 | \$ 49.56 | \$- | \$ | 171.08 |
| 318 | 051223774300 | incl shop primer Column base plates, structural, light, 90 metric ton project up to 68 kg each A992 steel, shop fabricated | | \$ 1,380.12 | \$ 562.86 | \$- | \$ | 1,942.98 |
| 5 | 051223774300 | incl shop primer Column base plates, structural, light, 90 metric ton project up to 68 kg each. A992 steel, shop fabricated | | \$ 21.70 | \$ 8.85 | \$- | \$ | 30.55 |
| 47 | 051223774300 | incl shop primer | | \$ 203.98 | \$ 83.19 | \$ - | \$ | 287.17 |
| 05_60-61_E | nbedment | Unit Cost Estimate | | φ 11,273.00 | \$ 4,000.23 | ÷ - | Ŷ | 13,073.03 |
| | 5 . Four 2020 | Column base plates structural light 90 metric ton | | | | | | |
| 232 | 051223774300 | project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer Column base plates, structural, light, 90 metric ton | | \$ 1,006.88 | \$ 410.64 | \$- | \$ | 1,417.52 |
| 25 | 051223774300 | project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer Column base plates, structural, light, 90 metric ton | | \$ 108.50 | \$ 44.25 | \$- | \$ | 152.75 |
| 47 | 051223774300 | project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer Column base plates, structural, light, 90 metric ton | | \$ 203.98 | \$ 83.19 | \$- | \$ | 287.17 |
| 94 | 051223774300 | project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer Column base plates, structural, light, 90 metric ton | | \$ 407.96 | \$ 166.38 | \$- | \$ | 574.34 |
| 170 | 051223774300 | project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer Column base plates, structural, light, 90 metric ton | | \$ 737.80 | \$ 300.90 | \$- | \$ | 1,038.70 |
| 94 | 051223774300 | project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer Column base plates, structural, light, 90 metric ton | | \$ 407.96 | \$ 166.38 | \$- | \$ | 574.34 |
| 188 | 051223774300 | project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer | | \$ 815.92 | \$ 332.76 | \$ - | \$ | 1,148.68 |
| Quantity | Line Number | Description | | | E | Ext. Mat. O&P | Ext. Labour O& | Þ | xt. Equip. O&P | | Ext. Total O&P |
|----------|--------------|---|---------------------------------|-------|-----------------|-----------------------------------|----------------------------------|-----------|----------------|----|----------------|
| 25 | 051223774300 | Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer | | | \$ | 108 50 | \$ 44.2 | 5 \$ | | \$ | 152 75 |
| 339 | 051223774300 | Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer | | | \$ | 1,471.26 | \$ 600.0 | 3 \$ | - | \$ | 2,071.29 |
| 59 | 051223774300 | Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer | | | \$ | 256.06 | \$ 104.4 | 3 \$ | _ | \$ | 360.49 |
| 112 | 051000774000 | Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, | | | ¢ | 400.42 | ¢ | 1 0 | | ¢ | 600.42 |
| 113 | 051223774300 | Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, | | | Þ | 490.42 | \$ 200.0 | 1 \$ | - | \$ | 690.43 |
| 8 | 051223774300 | Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, | | | \$ | 34.72 | \$ 14.1 | 5\$ | - | \$ | 48.88 |
| 79 | 051223774300 | incl shop primer Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, | | | \$ | 342.86 | \$ 139.8 | 3 \$ | - | \$ | 482.69 |
| 141 | 051223774300 | incl shop primer Column base plates, structural, light, 90 metric ton | | | \$ | 611.94 | \$ 249.5 | 7\$ | - | \$ | 861.51 |
| 154 | 051223774300 | incl shop primer Column base plates, structural, light, 90 metric ton | | | \$ | 668.36 | \$ 272.5 | 3\$ | - | \$ | 940.94 |
| 38 | 051223774300 | project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer Column base plates, structural, light, 90 metric ton | | | \$ | 164.92 | \$ 67.2 | 6 \$ | - | \$ | 232.18 |
| 170 | 051223774300 | project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer | | | \$ | 737.80 | \$ 300.9 | 5 \$ | - | \$ | 1,038.70 |
| 60 | 051223774300 | project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer | | | \$ | 260.40 | \$ 106.2 |)\$ | - | \$ | 366.60 |
| 25 | 051223774300 | Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer | | | \$ | 108.50 | \$ 44.2 | 5\$ | - | \$ | 152.75 |
| 531 | 051223774300 | Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer | | | \$ | 2.304.54 | \$ 939.8 | 7\$ | - | \$ | 3.244.41 |
| 24 | 051223774300 | Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer | | | \$ | 104 16 | \$ 42.4 | 3 \$ | | \$ | 146 64 |
| 00 | 051220114000 | Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, ind shop primer | | | ¢ | 201.02 | ¢ 455.7 | - ¢ | | ¢ | 507.00 |
| 00 | 031223774300 | Column base plates, structural, light, 90 metric ton project up to 68 kg each A992 steel, shop fabricated | | | φ | 361.92 | φ 155.7 | , ¢ | | ¢ | 557.08 |
| 112 | 051223774300 | incl shop primer Column base plates, structural, light, 90 metric ton | | | \$ | 486.08 | \$ 198.2 | 4 \$ | - | \$ | 684.32 |
| 85 | 051223774300 | project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer | | | \$ | 368.90 | \$ 150.4 | 5\$ | - | \$ | 519.35 |
| | | | | | \$ | 12,590.34 | \$ 5,134.7 | 7 \$ | - | \$ | 17,725.11 |
| | | | Labor factor: 2.5 | 1.5 | \$ | 7,240,195.51 | \$ 2,665,444.4 \$ 3,998,166.6 | 4 \$ 5 | 133,522.55 | \$ | 10,039,162.49 |
| | | | Steel factor | 0.175 | \$ \$ | 1,267,034.21 8,507,229.72 | | | | | |
| | | | 05.62 10% allow Total | 10% | \$ \$ | 850,722.97 <i>9,357,952.70</i> | \$ 6,663,611.1 |) \$ | 133,522.55 | \$ | 16,155,086.35 |

| Quantity | Line Number | Description | | Ext | . Mat. O&P | Ext. | Labour O&P | Ext | . Equip. O&P | Ext | . Total O&P |
|------------|-----------------|--|--|-----|------------|------|------------|-----|--------------|-----|-------------|
| B_07_01 | | | | | | | | | | | |
| Data Relea | ise : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| 966 | 071213200700 | Membrane waterproofing, on slabs, glass fiber fabric, 3 ply, mopped | | \$ | 22,585.08 | \$ | 26,536.02 | \$ | 4,916.94 | \$ | 54,038.04 |
| 278 | 071213200700 | Membrane waterproofing, on slabs, glass fiber fabric, 3 ply, mopped | | \$ | 6,499.64 | \$ | 7,636.66 | \$ | 1,415.02 | \$ | 15,551.32 |
| D 07 02 | | | | \$ | 29,084.72 | \$ | 34,172.68 | \$ | 6,331.96 | \$ | 69,589.36 |
| Data Relea | ise · Year 2020 | Unit Cost Estimate | | | | | | | | | |
| Duid Holoc | | | | | | | | | | | |
| | | | | | | | | | | | |
| 1735 | 071213200400 | Membrane waterproofing, on slabs, glass fiber fabric, 2 ply, mopped | | \$ | 29,894.05 | \$ | 45,057.95 | \$ | 8,310.65 | \$ | 83,262.65 |
| | | | | \$ | 29,894.05 | \$ | 45,057.95 | \$ | 8,310.65 | \$ | 83,262.65 |
| B_07_03 | | Unit Cost Estimate | | | | | | | | | |
| Data Relea | ise : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| 3885 | 072113101670 | Wall insulation, rigid, isocyanurate, foil faced, both sides, 4' x 8' sheet, 3" thick | | \$ | 18,104.10 | \$ | 4,195.80 | \$ | - | \$ | 22,299.90 |
| | | | | s | 18 104 10 | s | 4 195 80 | ¢ | _ | \$ | 22 299 90 |
| B_07_04 | | | | Ψ | 10,104.10 | Ψ | 4,133.00 | Ψ | - | Ψ | 22,233.30 |
| Data Relea | ise : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| 456 | 076526100080 | Self-adhering sheet or roll flashing, cross laminated, HDPE, 25 Mil, 12" | | \$ | 383.04 | \$ | 319.20 | \$ | - | \$ | 702.24 |
| | | | | ¢ | 392.04 | ¢ | 210.20 | ¢ | | ¢ | 702.24 |
| B_07_05 | | | | Ψ | 505.04 | Ψ | 515.20 | Ψ | - | Ψ | 102.24 |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 902 | 075423100180 | Thermoplastic-polyolefin roofing (TPO), 1.5 mm, heat welded seams, loose laid and ballasted (49 kg/m2) | | \$ | 14,801.82 | \$ | 5,908.10 | \$ | 487.08 | \$ | 21,197.00 |
| 902 | 072113101960 | Wall insulation, rigid, extruded polystyrene, 172kPa compressive strength, 75mm thick, 2 64m2 K/W | | \$ | 24 363 02 | \$ | 10 445 16 | \$ | - | \$ | 34 808 18 |
| 002 | 012110101000 | | | ÷ | 21,000102 | Ť | 10,110.10 | Ţ | | Ţ | 0 1,000110 |
| 902 | 072613101200 | Vapor retarders, building paper, polyethylene vapor barrier, standard, 0.25mm thick | | \$ | 1,416.14 | \$ | 2,065.58 | \$ | - | \$ | 3,481.72 |
| 000 | 070040400400 | Roof deck insulation, fiberboard high density, 75mm thick, 0.67m2.K/W, fastening | | ¢ | 40.004.00 | ¢ | 0.000.50 | ¢ | | ¢ | 05 004 40 |
| 902 | 072210100130 | excitued | | φ | 10,021.90 | ф | 0,999.52 | φ | - | φ | 25,021.48 |
| | | | | \$ | 58,602.94 | \$ | 25,418.36 | \$ | 487.08 | \$ | 84,508.38 |
| B 07 07 | | | | | | | | | | | |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 23 | Mats | Pedestrian roof protection mats | | \$ | 4,332.42 | | 1026 | \$ | - | \$ | 5,358.50 |
| | | | | \$ | 4,332.42 | \$ | 1,026.08 | \$ | - | \$ | 5,358.50 |
| B_07_08 | | | | | | | | | | | |
| Data Relea | ise : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |

| Quantity | Line Number | Description | | Ex | t. Mat. O&P | Ext | . Labour O&P | Ext | t. Equip. O&P | Ex | t. Total O&P |
|--------------------------|-------------------------|--|--|----|-------------|-----|--------------|-----|---------------|----|--------------|
| 153 | 077126100020 | Reglet, aluminum, in parapet, 0.635mm thick | | \$ | 1.380.06 | \$ | 1.556.01 | \$ | - | \$ | 2.936.07 |
| | | | | ¢ | 1 380 06 | ¢ | 1 556 01 | ¢ | | ¢ | 2 936 07 |
| B_07_09 | | | | Ť | 1,000.00 | Ŷ | 1,000.01 | Ψ | _ | Ţ. | 2,500.07 |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| 64 | 075423100180 | Thermoplastic-polyolefin roofing (TPO), 1.5 mm, heat welded seams, loose laid and ballasted (49 kg/m2) | | \$ | 1,050.24 | \$ | 419.20 | \$ | 34.56 | \$ | 1,504.00 |
| 0 | 075510100150 | Protected membrane roofing components, | | \$ | <u>_</u> | \$ | _ | \$ | _ | \$ | _ |
| 64 | 072113101960 | Wall insulation, rigid, extruded polystyrene, 172kPa compressive strength, 75mm thick, 2 64m2 K/W | | ¢ | 1 728 64 | ¢ | 7/1 12 | ¢ | _ | ¢ | 2 469 76 |
| 64 | 072613101200 | Vapor retarders, building paper, polyethylene vapor barrier, standard, 0.25mm thick | | ¢ | 100.48 | ę | 146.56 | ¢ | | ¢ | 247.04 |
| 64 | 072216100130 | Roof deck insulation, fiberboard high density, 75mm thick, 0.67m2.K/W, fastening | | ¢ | 1 278 72 | ¢ | 140.00 | ¢ | | ¢ | 1 775 36 |
| 04 | 072210100130 | excluded | | φ | 1,270.72 | φ | 490.04 | φ | - | φ | 1,775.50 |
| B_07_10 tł | 1ru B_07_13 | | | \$ | 4,158.08 | \$ | 1,803.52 | \$ | 34.56 | \$ | 5,996.16 |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| 1 | Para Assem | Parapet and flashing assembly | | \$ | - | \$ | - | \$ | - | \$ | - |
| 1 | Para Assem | Parapet and flashing assembly | | \$ | - | \$ | - | \$ | - | \$ | - |
| 1 | Flash Ass | Flashing Assembly | | \$ | - | \$ | - | \$ | - | \$ | - |
| 1 | 221426134680 | Drain, roof, main, all aluminum, 12" low profile dome, 8" pipe size | | \$ | 890.09 | \$ | 143.45 | \$ | | \$ | 1,033.54 |
| R 07 14 | | | | \$ | 890.09 | \$ | 143.45 | \$ | - | \$ | 1,033.54 |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| 34725 | 078116101551 | Sprayed fireproofing, intumescent epoxy fireproofing on wire mesh, 2 hour rating, exterior use, 3/8" thick | | \$ | 402,462.75 | \$ | 500,387.25 | \$ | 62,157.75 | \$ | 965,007.75 |
| | | | | \$ | 402,462.75 | \$ | 500,387.25 | \$ | 62,157.75 | \$ | 965,007.75 |
| 07_15 Fire Data Relea | stops se : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| 12 | 078413100640 | Firestopping, structural penetrations, through walls, steel beams, W900 x 201 | | \$ | 4,124.76 | \$ | 3,149.04 | \$ | - | \$ | 7,273.80 |
| 4 | 078413100640 | Firestopping, structural penetrations, through walls, steel beams, W900 x 201 | | \$ | 1,374.92 | \$ | 1,049.68 | \$ | | \$ | 2,424.60 |
| 13 | 078413100640 | Firestopping, structural penetrations, through walls, steel beams, W900 x 201 | | \$ | 4,468.49 | \$ | 3,411.46 | \$ | - | \$ | 7,879.95 |
| 2 | 078413100640 | Firestopping, structural penetrations, through walls, steel beams, W900 x 201 | | \$ | 687.46 | \$ | 524.84 | \$ | - | \$ | 1,212.30 |
| 6 | 078413100640 | Firestopping, structural penetrations, through walls, steel beams, W900 x 201 | | \$ | 2,062.38 | \$ | 1,574.52 | \$ | - | \$ | 3,636.90 |
| 7 | 078413100640 | Firestopping, structural penetrations, through walls, steel beams, W900 x 201 | | \$ | 2,406.11 | \$ | 1,836.94 | \$ | - | \$ | 4,243.05 |

| Quantity | Line Number | Description | | Ext. M | Mat. O&P | Ext. | Labour O&P | Ext. | Equip. O&P | Ex | t. Total O&P |
|----------|--------------|---|--|--------|----------|------|------------|------|------------|----|--------------|
| 2 | 078413100640 | Firestopping, structural penetrations, through walls, steel beams, W900 x 201 | | \$ | 687.46 | \$ | 524.84 | \$ | - | \$ | 1,212.30 |
| 2 | 078413100300 | Firestopping, non metallic piping, non insulated, through walls, 100mm dia | | \$ | 302.80 | \$ | 157.70 | \$ | - | \$ | 460.50 |
| 3 | 078413100300 | Firestopping, non metallic piping, non insulated, through walls, 100mm dia | | \$ | 454.20 | \$ | 236.55 | \$ | - | \$ | 690.75 |
| 3 | 078413100300 | Firestopping, non metallic piping, non insulated, through walls, 100mm dia | | \$ | 454.20 | \$ | 236.55 | \$ | - | \$ | 690.75 |
| 1 | 078413100130 | Firestopping, metallic piping, non insulated, through walls, 150mm dia | | \$ | 18.89 | \$ | 65.30 | \$ | - | \$ | 84.19 |
| 1 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 12.34 | \$ | 56.06 | \$ | - | \$ | 68.40 |
| 5 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 61.70 | \$ | 280.30 | \$ | - | \$ | 342.00 |
| 2 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 24.68 | \$ | 112.12 | \$ | - | \$ | 136.80 |
| 15 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 185.10 | \$ | 840.90 | \$ | - | \$ | 1,026.00 |
| 4 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 49.36 | \$ | 224.24 | \$ | - | \$ | 273.60 |
| 1 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 12.34 | \$ | 56.06 | \$ | - | \$ | 68.40 |
| 1 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 12.34 | \$ | 56.06 | \$ | - | \$ | 68.40 |
| 1 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 12.34 | \$ | 56.06 | \$ | - | \$ | 68.40 |
| 1 | 078413100130 | Firestopping, metallic piping, non insulated, through walls, 150mm dia | | \$ | 18.89 | \$ | 65.30 | \$ | - | \$ | 84.19 |
| 1 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 12.34 | \$ | 56.06 | \$ | - | \$ | 68.40 |
| 3 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 37.02 | \$ | 168.18 | \$ | - | \$ | 205.20 |
| 5 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 61.70 | \$ | 280.30 | \$ | - | \$ | 342.00 |
| 2 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 24.68 | \$ | 112.12 | \$ | - | \$ | 136.80 |
| 3 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 37.02 | \$ | 168.18 | \$ | - | \$ | 205.20 |
| 1 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 12.34 | \$ | 56.06 | \$ | - | \$ | 68.40 |
| 1 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 12.34 | \$ | 56.06 | \$ | - | \$ | 68.40 |
| 1 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 12.34 | \$ | 56.06 | \$ | - | \$ | 68.40 |
| 1 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 12.34 | \$ | 56.06 | \$ | - | \$ | 68.40 |
| 3 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 37.02 | \$ | 168.18 | \$ | - | \$ | 205.20 |
| 1 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 12.34 | \$ | 56.06 | \$ | - | \$ | 68.40 |
| 1 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 12.34 | \$ | 56.06 | \$ | - | \$ | 68.40 |
| 3 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 37.02 | \$ | 168.18 | \$ | - | \$ | 205.20 |

| Quantity | Line Number | Description | | Ext. | Mat. O&P | Ext | Labour O&P | Ext | . Equip. O&P | Ext | t. Total O&P |
|----------|--------------|---|--|------|----------|-----|------------|-----|--------------|-----|--------------|
| 5 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 61.70 | \$ | 280.30 | \$ | - | \$ | 342.00 |
| 1 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 12.34 | \$ | 56.06 | \$ | - | \$ | 68.40 |
| 1 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 12.34 | \$ | 56.06 | \$ | - | \$ | 68.40 |
| 2 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 24.68 | \$ | 112.12 | \$ | - | \$ | 136.80 |
| 1 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 12.34 | \$ | 56.06 | \$ | - | \$ | 68.40 |
| 2 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 24.68 | \$ | 112.12 | \$ | - | \$ | 136.80 |
| 22 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 271.48 | \$ | 1,233.32 | \$ | - | \$ | 1,504.80 |
| 25 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 308.50 | \$ | 1,401.50 | \$ | - | \$ | 1,710.00 |
| 5 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 61.70 | \$ | 280.30 | \$ | - | \$ | 342.00 |
| 1 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 12.34 | \$ | 56.06 | \$ | - | \$ | 68.40 |
| 1 | 078413100120 | Firestopping, metallic piping, non insulated, through walls, 100mm dia | | \$ | 12.34 | \$ | 56.06 | \$ | - | \$ | 68.40 |
| 1 | 078413100290 | Firestopping, non metallic piping, non insulated, through walls, 50mm dia | | \$ | 78.43 | \$ | 65.30 | \$ | - | \$ | 143.73 |
| 1 | 078413100110 | Firestopping, metallic piping, non insulated, through walls, 50mm dia | | \$ | 5.51 | \$ | 49.28 | \$ | - | \$ | 54.79 |
| 1 | 078413100110 | Firestopping, metallic piping, non insulated, through walls, 50mm dia | | \$ | 5.51 | \$ | 49.28 | \$ | - | \$ | 54.79 |
| 2 | 078413100130 | Firestopping, metallic piping, non insulated, through walls, 150mm dia | | \$ | 37.78 | \$ | 130.60 | \$ | - | \$ | 168.38 |
| 1 | 078413100110 | Firestopping, metallic piping, non insulated, through walls, 50mm dia | | \$ | 5.51 | \$ | 49.28 | \$ | - | \$ | 54.79 |
| 6 | 078413100110 | Firestopping, metallic piping, non insulated, through walls, 50mm dia | | \$ | 33.06 | \$ | 295.68 | \$ | - | \$ | 328.74 |
| 6 | 078413100200 | Firestopping, metallic piping, insulated, through walls, 50mm dia | | \$ | 77.34 | \$ | 295.68 | \$ | - | \$ | 373.02 |
| 2 | 078413100210 | Firestopping, metallic piping, insulated, through walls, 100mm dia | | \$ | 37.64 | \$ | 112.12 | \$ | - | \$ | 149.76 |
| 5 | 078413100300 | Firestopping, non metallic piping, non insulated, through walls, 100mm dia | | \$ | 757.00 | \$ | 394.25 | \$ | - | \$ | 1,151.25 |
| | | Firestopping, ductwork, insulated and non | | | | | | | | | |
| 1 | 078413100470 | angle, through walls, 600mm x 1200mm | | \$ | 125.49 | \$ | 197.12 | \$ | - | \$ | 322.61 |
| 1 | 078413100470 | Firestopping, ductwork, insulated and non insulated, rectangular, with stiffener/closure angle, through walls, 600mm x 1200mm | | \$ | 125.49 | \$ | 197.12 | \$ | - | \$ | 322.61 |
| _1 | 078413400470 | Firestopping, ductwork, insulated and non insulated, rectangular, with stiffener/closure | | ¢ | 125 40 | ¢ | 107 10 | ¢ | | ¢ | 200.64 |
| | 070410100470 | Firestopping, ductwork, insulated and non | | Ų | 123.49 | φ | 197.12 | φ | - | φ | 522.01 |
| 1 | 078413100470 | angle, through walls, 600mm x 1200mm | | \$ | 125.49 | \$ | 197.12 | \$ | - | \$ | 322.61 |

| Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 102 of 350 | | | | | | | | | | | | |
|---|--------------|---|-------------------|-----|----|--------------|-----|-------------|----|---------------|-------------|-------------|
| Quantity | Line Number | Description | | | E | xt. Mat. O&P | Ext | Labour O&P | Ex | t. Equip. O&P | Ext | . Total O&P |
| 1 | 078413100470 | Firestopping, ductwork, insulated and non insulated, rectangular, with stiffener/closure angle. through walls. 600mm x 1200mm | | | \$ | 125.49 | \$ | 197.12 | \$ | - | \$ | 322.61 |
| 1 | 078413100470 | Firestopping, ductwork, insulated and non insulated, rectangular, with stiffener/closure angle, through walls, 600mm x 1200mm | | | \$ | 125.49 | \$ | 197.12 | \$ | - | \$ | 322.61 |
| 1 | 078413100470 | Firestopping, ductwork, insulated and non insulated, rectangular, with stiffener/closure angle, through walls, 600mm x 1200mm | | | \$ | 125.49 | \$ | 197.12 | \$ | - | \$ | 322.61 |
| | | | | | ¢ | 20 492 25 | ¢ | 22 402 25 | ¢ | | ¢ | 42 075 60 |
| | | | | | φ | 20,402.23 | φ | 22,493.35 | φ | - | φ | 42,375.00 |
| | | | | | \$ | 569,774.50 | \$ | 636,573.65 | \$ | 77,322.00 | \$1, | 283,670.15 |
| | | | Labor factor: 2.5 | 1.5 | * | E60 774 E0 | \$ | 954,860.48 | * | 77 222 00 | \$ | 954,860.48 |
| | | | TULAI | | ⇒ | 509,774.50 | γI | ,591,434.13 | ⇒ | //,522.00 | ې ۷, | 230,530.63 |

| Quantity | Line Number | Description | | Ext. | Mat. O&P | Ext. | Labour O&P | Ext. E | quip. O&P | Ex | t. Total O&P |
|-----------------------|-----------------|--|--|---------|----------|---------|------------|---------|-----------|---------|--------------|
| B_08_01 | | | | | | | | | | | |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| 4 | 081313150360 | Doors, fire, steel, flush, "B" label, 90 minutes, full panel, 1.30 mm, 914 mm x 2134 mm | | \$ | 1,879.84 | \$ | 310.40 | \$ | - | \$ | 2,190.24 |
| 2 | 081313131120 | Doors, commercial, steel, flush, full panel, hollow core, hollow metal, 1.2 mm, 914 mm x 2134 mm x 44 mm thick | | \$ | 841.38 | \$ | 145.50 | \$ | - | \$ | 986.88 |
| 4 | 081213130100 | Frames, steel, knock down, hollow metal, single, 1.5 mm, up to 146 mm deep, 914 mm x 2134 mm | | \$ | 712.52 | \$ | 310.40 | \$ | - | \$ | 1.022.92 |
| 2 | 081213130100 | Frames, steel, knock down, hollow metal, single, 1.5 mm, up to 146 mm deep, 914 mm x 2134 mm | | \$ | 356 26 | \$ | 155 20 | \$ | <u>.</u> | \$ | 511 46 |
| _ | 087120300020 | Door hardware, door closer, rack and pinion, adjustable backcheck, 3 way mount, all sizes regular area to the size of the si | | ¢ | 778.60 | ¢ | /10.20 | ¢ | | ¢ | 1 107 02 |
| - | 007 120300020 | | | Ψ | 110.00 | Ψ | 410.02 | Ψ | _ | Ψ | 1,107.02 |
| 6 | 088165101500 | Wire glass, pinstripe, obscure, 6 mm thick | | \$ | 4,173.00 | \$ | 603.12 | \$ | - | \$ | 4,776.12 |
| D 00 00 | | | | \$ | 8,741.60 | \$ | 1,943.94 | \$ | | \$ | 10,685.54 |
| B_08_02 Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| 1 | 081213130100 | Frames, steel, knock down, hollow metal, single, 1.5 mm, up to 146 mm deep, 914 mm x 2134 mm | | ¢ | 178 13 | ¢ | 77 60 | ¢ | | ¢ | 255 73 |
| 1 | 081213150360 | Doors, fire, steel, flush, "B" label, 90 minutes, full panel, 1.30 mm, 914 mm x | | ¢ | 460.06 | ¢ | 77.60 | ¢ | | ¢ | 547.50 |
| | 061313150360 | Door hardware, door closer, rack and pinion, adjustable backcheck, 3 way mount, | | \$ | 409.90 | þ | 77.00 | Þ | - | Þ | 547.56 |
| 1 | 087120300020 | all sizes, regular arm | | \$ | 194.65 | \$ | 104.83 | \$ | - | \$ | 299.48 |
| 1 | 088165101500 | Wire glass, pinstripe, obscure, 6 mm thick | | \$ | 695.50 | \$ | 100.52 | \$ | - | \$ | 796.02 |
| | | | | \$ | 1.538.24 | \$ | 360.55 | \$ | - | \$ | 1.898.79 |
| B_08_03 | | | | | , | | | | | | , |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| 2 | 081213130100 | Frames, steel, knock down, hollow metal, single, 1.5 mm, up to 146 mm deep, 914 mm x 2134 mm | | \$ | 356.26 | \$ | 155.20 | \$ | - | \$ | 511.46 |
| 2 | 081313150360 | Doors, fire, steel, flush, "B" label, 90 minutes, full panel, 1.30 mm, 914 mm x 2134 mm | | \$ | 939.92 | \$ | 155.20 | \$ | - | \$ | 1.095.12 |
| 2 | 081213130100 | Frames, steel, knock down, hollow metal, single, 1.5 mm, up to 146 mm deep, 914 mm x 2134 mm | | \$ | 356.26 | \$ | 155.20 | \$ | - | \$ | 511.46 |
| 2 | 081313131120 | Doors, commercial, steel, flush, full panel, hollow core, hollow metal, 1.2 mm, 914 mm x 2134 mm x 44 mm thick | | \$ | 841.38 | \$ | 145.50 | \$ | - | \$ | 986.88 |
| 2 | 087120300020 | Door hardware, door closer, rack and pinion, adjustable backcheck, 3 way mount, all sizes, regular arm | | \$ | 389.30 | \$ | 209.66 | \$ | - | \$ | 598.96 |
| 0 | 000105101500 | Wire clean ninetrine -h 0 11 | | ¢ | 1 204 00 | ¢ | 004.04 | ¢ | | ¢ | 1 500 0 1 |
| 2 | 000100101500 | whe glass, phistipe, obscure, 6 mm thick | | э \$ | 4 274 12 | ф \$ | 201.04 | э \$ | - | Ф \$ | 5 295 92 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
|------------|----------------|--|--|---------------------------|-----------------|-----------------|--|
| B_08_04 | | | | | | | |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | |
| 2 | 081213130100 | Frames, steel, knock down, hollow metal, single, 1.5 mm, up to 146 mm deep, 914 mm x 2134 mm | | \$ 356.26 | \$ 155.20 | \$- | \$ 511.46 |
| 2 | 081313131720 | Doors, commercial, steel, insulated, full panel, 1.2 mm, 914 mm x 2032 mm x 44 mm thick | | \$ 841.38 | \$ 164.90 | \$- | \$ 1,006.28 |
| 1 | 081213130100 | Frames, steel, knock down, hollow metal, single, 1.5 mm, up to 146 mm deep, 914 mm x 2134 mm | | \$ 178.13 | \$ 77.60 | \$- | \$ 255.73 |
| 1 | 081313131720 | Doors, commercial, steel, insulated, full panel, 1.2 mm, 914 mm x 2032 mm x 44 mm thick | | \$ 420.69 | \$ 82.45 | \$- | \$ 503.14 |
| 1 | 081213130100 | Frames, steel, knock down, hollow metal, single, 1.5 mm, up to 146 mm deep, 914 mm x 2134 mm | | \$ 178.13 | \$ 77.60 | \$- | \$ 255.73 |
| 1 | 081313150360 | Doors, fire, steel, flush, "B" label, 90 minutes, full panel, 1.30 mm, 914 mm x 2134 mm | | \$ 469.96 | \$ 77.60 | \$- | \$ 547.56 |
| 1 | 087120300020 | Door hardware, door closer, rack and pinion, adjustable backcheck, 3 way mount, all sizes, regular arm | | \$ 194.65 | \$ 104.83 | \$- | \$ 299.48 |
| | | | | ¢ 0.000.00 | ¢ 740.40 | ¢ | ¢ 0.70.00 |
| B 08 05 | | | | \$ 2,639.20 | \$ 740.18 | \$ - | \$ 3,379.38 |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | |
| 1 | 081213130100 | Frames, steel, knock down, hollow metal, single, 1.5 mm, up to 146 mm deep, 914 mm x 2134 mm | | \$ 178.13 | \$ 77.60 | \$- | \$ 255.73 |
| 1 | 081313150360 | Doors, fire, steel, flush, "B" label, 90 minutes, full panel, 1.30 mm, 914 mm x 2134 mm | | \$ 469.96 | \$ 77.60 | \$- | \$ 547.56 |
| 1 | 087120300020 | Door hardware, door closer, rack and pinion, adjustable backcheck, 3 way mount, all sizes, regular arm | | \$ 194.65 | \$ 104.83 | \$- | \$ 299.48 |
| | | | | \$ 842.74 | \$ 260.03 | \$- | \$ 1,102.77 |
| B_08_06 | N 0000 | Unit Coot Estimate | | | | | |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | |
| 1 | 081313131590 | Doors, hollow metal, commercial, steel, flush, full panel, hollow core, 44 mm thick, 0.0598mm, 1219 mm x 2134 mm | | \$ 617.77 | \$ 68.87 | \$- | \$ 686.64 |
| 1 | 081213133600 | Frames, steel, knock down, hollow metal, single, 2 mm, 146 mm deep, 1219 mm x 2134 mm | | \$ 213.76 | \$ 82.45 | \$- | \$ 296.21 |
| 4 | 081313150360 | Doors, fire, steel, flush, "B" label, 90 minutes, full panel, 1.30 mm, 914 mm x 2134 mm | | \$ 1,879.84 | \$ 310.40 | \$- | \$ 2,190.24 |
| Δ | 081213130100 | Frames, steel, knock down, hollow metal, single, 1.5 mm, up to 146 mm deep, 914 mm x 2134 mm | | \$ 712.52 | \$ 310.40 | \$ | \$ 1 022 92 |
| | 001210100100 | Frames, steel, knock down, hollow metal, single, 1.5 mm, up to 146 mm deep, 914 | | • 170.02 | • | • | • |
| 1 | 001213130100 | Doors, commercial, steel, insulated, full panel, 1.2 mm, 813 mm x 2134 mm x 44 | | φ 1/8.13 • · · · · · · | ۵ ۲۲.60 | ъ - | 255.73 400.65 |
| 1 | 081313131740 | | | ə 420.69 | \$ 77.60 | ծ - | ۶ 498.29 |
| 1 | 081313150370 | Doors, fire, steel, flush, "B" label, 90 minutes, full panel, 1.30 mm, 1219 mm x 2134 mm | | \$ 606.40 | \$ 82.45 | \$- | \$ 688.85 |
| 1 | 081213133600 | Frames, steel, knock down, hollow metal, single, 2 mm, 146 mm deep, 1219 mm x 2134 mm | | \$ 213.76 | \$ 82.45 | \$- | \$ 296.21 |
| 1 | 081213130100 | Frames, steel, knock down, hollow metal, single, 1.5 mm, up to 146 mm deep, 914 mm x 2134 mm | | \$ 178.13 | \$ 77.60 | \$ - | \$ 255.73 |

| Quantity | Line Number | Description | | Ext. | Mat. O&P | Ext. | Labour O&P | Ext. Equip. O&P | E | t. Total O&P |
|------------|--------------------------------|---|--|----------|-----------|----------|---------------------------|-----------------|----------|--------------|
| 1 | 081313150360 | Doors, fire, steel, flush, "B" label, 90 minutes, full panel, 1.30 mm, 914 mm x 2134 mm | | \$ | 469.96 | \$ | 77.60 | \$- | \$ | 547.56 |
| 2 | 081213130100 | Frames, steel, knock down, hollow metal, single, 1.5 mm, up to 146 mm deep, 914 mm x 2134 mm | | \$ | 356.26 | \$ | 155.20 | \$- | \$ | 511.46 |
| 2 | 081313131120 | Doors, commercial, steel, flush, full panel, hollow core, hollow metal, 1.2 mm, 914 mm x 2134 mm x 44 mm thick | | \$ | 841.38 | \$ | 145.50 | \$- | \$ | 986.88 |
| 6 | 087120300020 | Door hardware, door closer, rack and pinion, adjustable backcheck, 3 way mount, all sizes, regular arm | | \$ | 1,167.90 | \$ | 628.98 | \$ - | \$ | 1,796.88 |
| 5 | 088165101500 | Wire glass, pinstripe, obscure, 6 mm thick | | \$ \$ | 3,477.50 | \$ \$ | 502.60 2 679 70 | \$ - | \$ \$ | 3,980.10 |
| B_08_07 | | | | Ŷ | 11,334.00 | φ | 2,013.10 | - | φ | 14,013.70 |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | |
| 2 | 083323102000 | Doors, rolling service, steel, manual, fire, class A, 0.9 mm, 2438 mm x 2438 mm high, incl. hardware | | \$ | 2,653.00 | \$ | 1,988.50 | \$- | \$ | 4,641.50 |
| 2 | 083323104500 | Doors, rolling service, steel, manual, motor operators for, to 4267 mm x 4267 mm opening | | \$ | 2,008.70 | \$ | 560.66 | \$- | \$ | 2,569.36 |
| 2 | 083313100300 | Doors, specialty, coiling, counter, manual, galvanized steel, UL label, 1219 mm roll-up, 1829 mm long, incl. frame and hardware | | \$ | 2,198.20 | \$ | 1,377.40 | \$- | \$ | 3,575.60 |
| 2 | 087920100220 | Door hardware, for sliding closet door, track and hanger, single | | \$ | 125.02 | \$ | 126.60 | \$- | \$ | 251.62 |
| | | | | \$ | 6,984.92 | \$ | 4,053.16 | \$ - | \$ | 11,038.08 |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | Doors, hollow metal, commercial, steel, flush, full panel, hollow core, 1-3/4" thick, 16 | | | | | | | | |
| 2 | 081313131530 | ga., 2'-8" x 6'-8" | | \$ | 962.66 | \$ | 124.16 | \$- | \$ | 1,086.82 |
| | | | | \$ | 962.66 | \$ | 124.16 | \$- | \$ | 1,086.82 |
| B_08_09 | | Unit Cost Estimate | | | | | | | | |
| Data Relea | se : Year 2020 081213130100 | Frames, steel, knock down, hollow metal, single, 1.5 mm, up to 146 mm deep, 914 mm x 2134 mm | | \$ | 178.13 | \$ | 77.60 | \$ - | \$ | 255.73 |
| 1 | 081313150360 | Doors, fire, steel, flush, "B" label, 90 minutes, full panel, 1.30 mm, 914 mm x 2134 mm | | \$ | 469.96 | \$ | 77.60 | \$- | \$ | 547.56 |
| 1 | 088165101000 | Wire glass, polished wire, diamond, clear, 6 mm thick | | \$ | 417.30 | \$ | 100.52 | \$ - | \$ | 517.82 |
| D 08 40 | | | | \$ | 1,065.39 | \$ | 255.72 | \$- | \$ | 1,321.11 |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| 1 | 083113101350 | Doors, specialty, access, fire rated, with lock, metal, 914 mm x 914 mm | | \$ | 428.27 | \$ | 82.45 | \$ - | \$ | 510.72 |
| 1 | 083113101650 | Doors, specialty, access, fire rated, with lock, stainless steel, 457 mm x 457 mm | | \$ | 314.57 | \$ | 68.87 | \$- | \$ | 383.44 |
| 1 | 083113101350 | Doors, specialty, access, fire rated, with lock, metal, 914 mm x 914 mm | | \$ | 428.27 | \$ | 82.45 | \$- | \$ | 510.72 |
| | | | | \$ | 1,171.11 | \$ | 233.77 | \$ - | \$ | 1,404.88 |

| Quantity | Line Number | Description | | E> | t. Mat. O&P | Ext | Labour O&P | Ext. Equip. O&P | Ex | t. Total O&P |
|------------|----------------|--|--|----|-------------|-----|------------|-----------------|----|--------------|
| B 08 11 | | | | | | | | | | |
| Data Relea | se · Year 2020 | Unit Cost Estimate | | | | | | | | |
| 1 | 081213130100 | Frames, steel, knock down, hollow metal, single, 1.5 mm, up to 146 mm deep, 914 mm x 2134 mm | | \$ | 178.13 | \$ | 77.60 | \$ - | \$ | 255.73 |
| 1 | 081313150360 | Doors, fire, steel, flush, "B" label, 90 minutes, full panel, 1.30 mm, 914 mm x 2134 mm | | \$ | 469.96 | \$ | 77.60 | \$- | \$ | 547.56 |
| 1 | 087120300020 | Door hardware, door closer, rack and pinion, adjustable backcheck, 3 way mount, all sizes, regular arm | | \$ | 194.65 | \$ | 104.83 | \$ - | \$ | 299.48 |
| 1 | 088165101000 | Wire glass, polished wire, diamond, clear, 6 mm thick | | \$ | 417.30 | \$ | 100.52 | \$ - | \$ | 517.82 |
| | | | | \$ | 1,260.04 | \$ | 360.55 | \$ - | \$ | 1,620.59 |
| B_08_12 | | | | | | | | | | |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | |
| 5 | 081213130100 | Frames, steel, knock down, hollow metal, single, 1.5 mm, up to 146 mm deep, 914 mm x 2134 mm | | \$ | 890.65 | \$ | 388.00 | \$ - | \$ | 1,278.65 |
| 5 | 081313150360 | Doors, fire, steel, flush, "B" label, 90 minutes, full panel, 1.30 mm, 914 mm x 2134 mm | | \$ | 2,349.80 | \$ | 388.00 | \$- | \$ | 2,737.80 |
| 3 | 081213130100 | Frames, steel, knock down, hollow metal, single, 1.5 mm, up to 146 mm deep, 914 mm x 2134 mm | | \$ | 534.39 | \$ | 232.80 | \$- | \$ | 767.19 |
| 3 | 081313150360 | Doors, fire, steel, flush, "B" label, 90 minutes, full panel, 1.30 mm, 914 mm x 2134 mm | | \$ | 1,409.88 | \$ | 232.80 | \$ - | \$ | 1,642.68 |
| 2 | 081313131120 | Doors, commercial, steel, flush, full panel, hollow core, hollow metal, 1.2 mm, 914 mm x 2134 mm x 44 mm thick | | \$ | 841.38 | \$ | 145.50 | \$- | \$ | 986.88 |
| 2 | 081213130100 | Frames, steel, knock down, hollow metal, single, 1.5 mm, up to 146 mm deep, 914 mm x 2134 mm | | \$ | 356.26 | \$ | 155.20 | \$ - | \$ | 511.46 |
| 1 | 081213133620 | Frames, steel, knock down, hollow metal, 2 mm, up to 146 mm D, 2134 mm H, 1829 mm W, double | | \$ | 167.52 | \$ | 102.82 | \$ - | \$ | 270.34 |
| 2 | 081313131120 | Doors, commercial, steel, flush, full panel, hollow core, hollow metal, 1.2 mm, 914 mm x 2134 mm x 44 mm thick | | \$ | 841.38 | \$ | 145.50 | \$ - | \$ | 986.88 |
| 1 | 081213133620 | Frames, steel, knock down, hollow metal, 2 mm, up to 146 mm D, 2134 mm H, 1829 mm W, double | | \$ | 167.52 | \$ | 102.82 | \$ - | \$ | 270.34 |
| 2 | 081313150360 | Doors, fire, steel, flush, "B" label, 90 minutes, full panel, 1.30 mm, 914 mm x 2134 mm | | \$ | 939.92 | \$ | 155.20 | \$ - | \$ | 1,095.12 |
| 12 | 087120300020 | Door hardware, door closer, rack and pinion, adjustable backcheck, 3 way mount, all sizes, regular arm | | \$ | 2,335.80 | \$ | 1,257.96 | \$ - | \$ | 3,593.76 |
| 5 | 088165101000 | Wire glass, polished wire, diamond, clear, 6 mm thick | | \$ | 2,086.50 | \$ | 502.60 | \$- | \$ | 2,589.10 |
| | | | | \$ | 12.921.00 | \$ | 3,809.20 | \$ - | \$ | 16.730.20 |

| Quantity | Line Number | Description | | | Ex | t. Mat. O&P | Ext | . Labour O&P | Ext. Equip. O&P | Ex | t. Total O&P |
|------------|-----------------|--|-------------------|-----|----|-------------|-----|--------------|-----------------|----|--------------|
| B 08 13 | | | | | | | | | | | |
| Data Relea | ise · Year 2020 | Unit Cost Estimate | | | | | | | | | |
| 1 | 081313131530 | Doors, hollow metal, commercial, steel, flush, full panel, hollow core, 1-3/4" thick, 16 ga., 2'-8" x 6'-8" | | | \$ | 481.33 | \$ | 62.08 | \$- | \$ | 543.41 |
| 2 | 081313150540 | Doors, fire, flush, "B" label, 90 minutes, composite, 20 ga., 2'-8" x 6'-8" | | | \$ | 1,137.00 | \$ | 145.50 | \$- | \$ | 1,282.50 |
| | | | | | \$ | 1,618.33 | \$ | 207.58 | \$- | \$ | 1,825.91 |
| B_08_14 | | | | | | | | | | | |
| Data Relea | ise : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| 1 | 081213133620 | Frames, steel, knock down, hollow metal, 2 mm, up to 146 mm D, 2134 mm H, 1829 mm W, double | | | \$ | 167.52 | \$ | 102.82 | \$- | \$ | 270.34 |
| 2 | 081313131120 | Doors, commercial, steel, flush, full panel, hollow core, hollow metal, 1.2 mm, 914 mm x 2134 mm x 44 mm thick | | | \$ | 841.38 | \$ | 145.50 | \$- | \$ | 986.88 |
| | | | | | | | | | | | |
| | | | | | \$ | 1,008.90 | \$ | 248.32 | \$ - | \$ | 1,257.22 |
| B_08_15 | | | | | | | | | | | |
| Data Relea | ise : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| 1 | 081213130100 | Frames, steel, knock down, hollow metal, single, 1.5 mm, up to 146 mm deep, 914 mm x 2134 mm | | | \$ | 178.13 | \$ | 77.60 | \$- | \$ | 255.73 |
| 1 | 081313150360 | Doors, fire, steel, flush, "B" label, 90 minutes, full panel, 1.30 mm, 914 mm x 2134 mm | | | \$ | 469.96 | \$ | 77.60 | \$- | \$ | 547.56 |
| | | | | | | | | | | | |
| B 40 45 | | | | | \$ | 648.09 | \$ | 155.20 | \$ - | \$ | 803.29 |
| B_08_16 | N/ 0000 | Unit Coot Estimate | | | | | | | | | |
| Data Relea | ise : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| 1 | 089116100320 | Stainless steel louvers, movable blades, commercial grade, 18" x 18" | | | \$ | 285.26 | \$ | 53.41 | \$- | \$ | 338.67 |
| | | | | | \$ | 285.26 | \$ | 53.41 | \$ - | \$ | 338.67 |
| | | | | | | | | | | | |
| | | | | | \$ | 57,295.60 | \$ | 16,507.27 | \$ - | \$ | 73,802.87 |
| | | | Labor factor: 2.5 | 1.5 | * | E7 30E C0 | \$ | 24,760.91 | | \$ | 24,760.91 |
| | | | | | Þ | 57,295.60 | Þ | 41,208.18 | | \$ | 98,503.78 |

| | | | | | | | | | | 0 | | |
|------------|-------------------|--|-------------------|-----|-----|--------------|----|---------------|-----|--------------|----|---------------|
| Quantity | Line Number | Description | | | E | xt. Mat. O&P | Ex | t. Labour O&P | Ext | . Equip. O&P | E | kt. Total O&P |
| 09_04 Wal | ll Finish | | | | | | | | | | | |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| 3025 | 099123723210 | Paints & coatings, walls & ceilings, interior, masonry or concrete block, latex paint, primer plus 2 finish coats, smooth, roller | | | \$ | 11,101.75 | \$ | 44,800.25 | \$ | - | \$ | 55,902.00 |
| 760 | 099123723210 | Paints & coatings, walls & ceilings, interior, masonry or concrete block, latex paint, primer plus 2 finish coats, smooth, roller | | | \$ | 2,789.20 | \$ | 11,255.60 | \$ | - | \$ | 14,044.80 |
| 2359 | 099123723210 | Paints & coatings, walls & ceilings, interior, masonry or concrete block, latex paint, primer plus 2 finish coats, smooth, roller | | | \$ | 8,657.53 | \$ | 34.936.79 | \$ | - | \$ | 43,594.32 |
| | | | | | , i | | Ċ | | · | | | |
| | | | | | \$ | 22 548 48 | \$ | 90 992 64 | \$ | | \$ | 113 541 12 |
| 09_05_thr | u_07 Loading docl | k extension | | | | ,0 101 10 | Ť | | Ť | | Ť | |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| 12 | 092910300450 | Gypsum wallboard, on walls, fire resistant, taped & finished, 13 mm thick | | | \$ | 78.24 | \$ | 170.88 | \$ | - | \$ | 249.12 |
| | | | | | | | | | | | | |
| 12 | 099123750250 | Dry fall painting, walls, wallboard and smooth plaster, two coats, spray | | | \$ | 25.56 | \$ | 47.16 | \$ | - | \$ | 72.72 |
| | | | | | | | | | | | | |
| 48 | 092910302100 | Gypsum wallboard, on walls, fire resistant, 16 mm thick, incl. no finish | | | \$ | 280.32 | \$ | 328.32 | \$ | - | \$ | 608.64 |
| | | | | | • | | | | | | | |
| | | | | | \$ | 384.12 | \$ | 546.36 | \$ | - | \$ | 930.48 |
| | | | | | \$ | 22.932.60 | \$ | 91.539.00 | \$ | - | \$ | 114.471.60 |
| | | | Labor factor: 2.5 | 1.5 | Ŧ | | \$ | 137,308.50 | Ŧ | | \$ | 137,308.50 |
| | | | Total | | \$ | 22,932.60 | \$ | 228,847.50 | | | \$ | 251,780.10 |

| Quantity | Line Number | Description | | | E | xt. Mat. O&P | Ex | t. Labour O&P | Ext | t. Equip. O&P | E | ct. Total O&P |
|------------|-----------------|---|-------|-----|---------|--------------|-----------------|-------------------------|-----|---------------|----------|--------------------------------|
| | | | | | | | | | | | | |
| 31-Earthw | ork | | | | | | | | | | | |
| Data Relea | ise : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| 0.26 | 311110100020 | Clearing & grubbing, cut & chip light trees, to 150 mm diameter | | | \$ | - | \$ | 2,240.16 | \$ | 1,367.11 | \$ | 3,607.27 |
| 13698 | 312316434200 | Excavating, large volume projects, 152,905 plus Bm3, 6.12 m3 bucket, loader, 60% fill factor, restricted loading trucks | | | \$ | - | \$ | 7,533.90 | \$ | 21,916.80 | \$ | 29,450.70 |
| 53 | 312323240400 | Compaction, atructural, select fill, 200 mm lifts, sheepsfoot or wobbly wheel roller | | | \$ | - | \$ | 46.11 | \$ | 80.56 | \$ | 126.67 |
| 288 | 312316166035 | Structural excavation for minor structures, bank measure, for spread and mat footings, elevator pits, and small building foundations, common earth, .57 m3 bucket, machine excavation, bydraulic backhoe | | | ¢ | | ¢ | 5 480 64 | ¢ | 3 755 52 | ¢ | 0 236 16 |
| 200 | 312310100035 | excavation, hydraulic backhoe | | | Ф | - | Ф | 5,460.04 | Þ | 3,755.52 | Ф | 9,230.10 |
| 219 | 031113204000 | C.I.P. concrete forms, beams, sides only, vertical, plywood, 915 mm high, 1 use, includes shoring, erecting, bracing, stripping and cleaning | | | \$ | 19,869.87 | \$ | 26,937.00 | \$ | - | \$ | 46,806.87 |
| | | Excavating, bulk, dozer, open site, bank measure, common earth, 60 kW | | | | | | | | | | |
| 55 | 312316462220 | dozer, 45 m haul Backfill, structural, common earth, 60 | | | \$ | | \$ | 361.90 | \$ | 187.00 | \$ | 548.90 |
| 45 | 312323142220 | stockpile, excludes compaction | | | \$ | - | \$ | 120.15 | \$ | 62.55 | \$ | 182.70 |
| 16 | 316213233200 | Prestressed concrete piles, square, 12 m long, 300 mm square, priced using 200 piles, excludes pile caps or mobilization | | | \$ | 1,812.32 | \$ | 496.32 | \$ | 201.12 | \$ | 2,509.76 |
| 000 | 242242402005 | Rock bolts, hollow core, prestressable, ASTM A615, 50 mm diameter, 3 m | | | ¢ | 070 445 50 | ¢ | 10.040.00 | ¢ | | ¢ | 004 757 50 |
| 3 | 313313102065 | Rock bolts, hollow core, prestressable, ASTM A615, 50 mm diameter, 3 m long | | | ф \$ | 3,745.50 | \$ | 13,342.09 | \$ | | ф \$ | 3,924.99 |
| 312 | 312316131000 | Excavating, trench or continuous footing, common earth, 1.5 m3 excavator, 3 m to 4.3 m deep, excludes sheeting or dewatering | | | \$ | _ | \$ | 989.04 | \$ | 670 80 | \$ | 1 659 84 |
| 0470 | 212216422220 | Excavating, large volume projects, 152,905 Bm3, 6.12 m3 bucket, loader, 110% fill factor, unrestricted | | | ¢ | | ¢ | 0.440.50 | ¢ | 6 400 04 | ¢ | 0.000.44 |
| 8478 | 512316430200 | | | | \$ | - | ф | 2,119.50 | \$ | 0,188.94 | \$ | 8,308.44 |
| | | | | | \$ | 303,843.19 | \$ | 59,846.30 | \$ | 34,430.40 | \$ | 398,119.89 |
| | | | | | \$ | 303,843.19 | \$ | 59,846.30 | \$ | 34,430.40 | \$ | 398,119.89 |
| | | | Total | 1.5 | \$ | 303,843.19 | \$ \$ | 89,769.45 149,615.75 | \$ | 34,430.40 | \$ \$ | 89,769.45 487,889.34 |

| Quantity | Line Number | Description | | | E | t. Mat. O&P | Ex | t. Labour O&P | Ext. | Equip. O&P | E | ct. Total O&P |
|------------|-----------------|--|-------------------|-----|----|-------------|----------|---------------------------------|------|------------|-----------------|------------------------------|
| | | | | | | | | | | | | |
| 32 Site Im | provements | | | | | | | | | | | |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| 23 | 030513251050 | Aggregate, stone, 19 to 38 mm, prices per m3, includes material only | | | \$ | 1,435.89 | \$ | - | \$ | - | \$ | 1,435.89 |
| 57 | 030513250950 | Aggregate, sand, washed, for concrete, loaded at the pit, prices per m3, includes material only | | | \$ | 2,739.99 | \$ | - | \$ | - | \$ | 2,739.99 |
| 57 | 042210190200 | Concrete block, insulation inserts, styrofoam, 200 mm x 400 mm, 150 mm thick, plant installed, add to block prices | | | \$ | 1,529.31 | \$ | - | \$ | | \$ | 1,529.31 |
| 5 | 033113350400 | Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments | | | \$ | 1 051 50 | \$ | _ | \$ | | \$ | 1 051 50 |
| 5 | 031113653060 | C.I.P. concrete forms, slab on grade, edge, wood, over 305 mm, 4 use, includes erecting, bracing, stripping and cleaning | | | \$ | 74.00 | \$ | 381.80 | \$ | - | \$ | 455.80 |
| 0.68 | 032111600400 | Reinforcing steel, in place, elevated slabs, #13 to #22, A615M, grade 400, incl labor for accessories, excl material for accessories | | | ¢ | 1 280 02 | ¢ | 724 10 | ¢ | _ | ¢ | 2 004 20 |
| 0.00 | 002111000400 | Security bollards, SS, lighted, group of 3. | | | φ | 1,200.02 | φ | 724.19 | ψ | - | φ | 2,004.20 |
| 2 | 321713138900 | includes hydraulic controls | | | \$ | 120,047.40 | \$ | 96,498.80 | \$ | - | \$ | 216,546.20 |
| 1 | 321713138910 | Security bollards, SS, lighted, group of 5, includes hydraulic controls | | | \$ | 104,692.50 | \$ | 64,785.00 | \$ | - | \$ | 169,477.50 |
| 11 | 323113200920 | Fence, chain link industrial, galvanized steel, 4.9 mm wire, 65 mm posts @ 3 m O.C., 2400 mm high, includes excavation, in concrete excludes barbed wire | | | \$ | 1 963 28 | \$ | 333.96 | \$ | 64 68 | ¢ | 2 361 92 |
| | 020110200020 | Chain link fence, gates, residential, single, 1.2m, includes concrete, hinges, latch | | | Ŷ | 1,000.20 | Ţ | 000.00 | ÷ | 0.00 | Ţ | 2,001102 |
| 2 | 323113800110 | and post hardware | | | \$ | 415.96 | \$ | 330.86 | \$ | 64.62 | \$ | 811.44 |
| 1 | 321713138900 | includes hydraulic controls | | | \$ | 60,023.70 | \$ | 48,249.40 | \$ | - | \$ | 108,273.10 |
| 92 | 321613130435 | Cast-in place concrete curbs & gutters, straight, wood forms, 0.17 m3/m, 150 mm high curb, 150 mm thick gutter, 750 mm wide includes concrete | | | \$ | 8 114 40 | \$ | 4 030 52 | \$ | - | \$ | 12 144 92 |
| | | Structural concrete, in place, handicap access ramp (28 MPa), w/ 150 mm curb, railing both sides, 1.52 m wide, includes forms(4 uses), Grade 400 rebar, concrete (Portland cement Type I), placing and | | | | | | | | | | |
| 25 | 033053404535 | finishing Structural concrete, in place, handicap | | | \$ | 39,972.50 | \$ | 47,612.00 | \$ | 392.25 | \$ | 87,976.75 |
| | | railing both sides, 1.52 m wide, includes forms(4 uses), Grade 400 rebar, concrete (Portland cement Type I), placing and | | | | | | | | | | |
| 23 | 033053404535 | finishing | | | \$ | 36,774.70 | \$ | 43,803.04 | \$ | 360.87 | \$ | 80,938.61 |
| 111 | 321216130480 | and large paved areas, wearing course, 100 mm thick, no hauling included | | | \$ | 3,028.08 | \$ | 268.62 | \$ | 120.99 | \$ | 3,417.69 |
| | | Structural concrete, in place, equipment pad (21 MPa), 2400 x 2400 x 250 mm, includes forms(4 uses), Grade 400 rebar, concrete (Portland cement Type I), | | | | | | | | | | |
| 3 | 033053403580 | placing and finishing | | | \$ | 1,414.62 | \$ | 1,586.13 | \$ | 13.11 | \$ | 3,013.86 |
| 1082 | 329223101000 | over 557 m2 | | | \$ | 3,451.58 | \$ | 1,568.90 | \$ | 140.66 | \$ | 5,161.14 |
| 25 | 107316207500 | 3.6 m w, 8 mm, excl. foundations | | | \$ | 8,521.50 | \$ | 2,098.75 | \$ | 1,145.75 | \$ | 11,766.00 |
| | | | | | \$ | 396,530.93 | \$ | 312,271.97 | \$ | 2,302.93 | \$ | 711,105.82 |
| | | | Labor factor: 2.5 | 1.5 | \$ | 8,521.50 | \$ \$ | 312,271.97 468,407.96 | \$ | 2,302.93 | \$ \$ | 711,105.82 468,407.96 |
| | | | Total | | \$ | 8,521.50 | \$ | 780,679.93 | \$ | 2,302.93 | \$ | 791,504.36 |

| Quantity | Line Number | Description | | | E | xt. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ex | t. Total O&P |
|-----------------|------------------|--|------------------|------|----|--------------|---|-----------------|---------|------------------|
| 33_01 Und | erground inactiv | ve drainage line | | | | | | | | |
| _ Data Relea | ise : Year 2020 | Unit Cost Estimate | | | | | | | | |
| 13 | 221113481110 | Pipe, fittings & valves, steel, black, grooved joint, 100 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC | | | \$ | 1,257.49 | \$ 1,354.99 | \$- | \$ | 2,612.48 |
| 1 | 221113485820 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 100 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 294.29 | \$ 62.44 | \$ - | \$ | 356.73 |
| 1 | 221113485820 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 100 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor. excl joint coupling material | | | \$ | 294 29 | \$ 62.44 | \$ - | s | 356.73 |
| 2 | 221113484120 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 150 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 535.08 | \$ 178.54 | \$ - | \$ | 713.62 |
| | | Gasket and bolt set, for flanges, 1034 kPa, 50 mm | | | | | | | | |
| 1 | 221113470630 | pipe size | | | \$ | 10.08 | \$ 61.40 | \$- | \$ | 71.48 |
| 6 | 221113484820 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 150 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor. excl joint coupling material | | | \$ | 2,593.08 | \$ 786.36 | \$ - | \$ | 3.379.44 |
| | | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 100 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint | | | | | | | | |
| 6 | 221113484100 | coupling material Pipe, fittings & valves, tee, steel, painted, grooved | | | \$ | 574.20 | \$ 343.68 | \$ - | \$ | 917.88 |
| 1 | 221113484800 | joint, 100 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 160.52 | \$ 84.11 | \$- | \$ | 244.63 |
| 10 | 221112470620 | Gasket and bolt set, for flanges, 1034 kPa, 50 mm | | | ¢ | 494.04 | ¢ 700.00 | ¢ | ¢ | 020.24 |
| 13 | 221113470030 | אואר איז | Q2 welder and QA | 0.67 | φ | 131.04 | \$ 119.03 | φ - | э \$ | 929.24 119.03 |
| | | | Q1 welder and QA | 1.00 | | | \$ 84.11 | | \$ | 84.11 |
| | | | | | \$ | 5,850.07 | \$ 3,935.30 | \$- | \$ | 9,785.37 |
| | | | Labor factor | 1.50 | 6 | E 050 07 | \$ 5,902.95 | | \$ ¢ | 5,902.95 |
| 33 02 Sub | drain | | lotal | | \$ | 5,850.07 | \$ 9,838.24 | | \$ | 15,688.31 |
| Data Relea | ise : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| 270 | 331413254530 | Water supply distribution piping, piping polyvinyl chloride, pressure pipe, 150 mm, AWWA C900, Class 150, SDR 18, excludes excavation or backfill | | | \$ | 7,362.90 | \$ 7,033.50 | \$- | \$ | 14,396.40 |
| 16 | 331413254530 | Water supply distribution piping, piping polyvinyl chloride, pressure pipe, 150 mm, AWWA C900, Class 150, SDR 18, excludes excavation or backfill | | | \$ | 436.32 | \$ 416.80 | \$ - | \$ | 853 12 |
| | 231110201000 | | | | ÷ | 100.02 | + | | ¥ | 500.12 |
| 7 | 221112762200 | Elbow, 90 Deg., plastic, PVC, socket joint, 150 | | | ¢ | 957 15 | ¢ 006.04 | ¢ | ¢ | 1 954 00 |

| Quantity | Line Number | Description | | | Ex | t. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
|------------|-----------------|--|----------------------|------|-----|-------------|---|-----------------|---|
| | | | | | | | | | |
| 11 | 221113762490 | Tee, plastic, PVC, socket joint, 150 mm, schedule 80 | | | \$ | 2,275.13 | \$ 2,349.82 | \$- | \$ 4,624.95 |
| 4 | 221113764946 | Double wye, plastic, ABS, non-pressure, socket joint, 150 mm x 100 mm, type DWV | | | \$ | 707.96 | \$ 792.56 | \$- | \$ 1,500.52 |
| | | Excavating, chain trencher, utility trench, common earth, 9 kW, 200 mm wide, 900 mm deep, | | | | | | | |
| 22 | 312316140750 | operator walking | | | \$ | - | \$ 164.78 | \$ 48.84 | \$ 213.62 |
| 20 | 312323160200 | Fill by borrow and utility bedding, for pipe and conduit, sand, dead or bank, excludes compaction | | | ¢ | 472 20 | \$ 308.40 | \$ 48.20 | \$ 828.80 |
| 20 | 512525100200 | Compaction | | | φ | 472.20 | φ 300.40 | φ 40.20 | φ 020.00 |
| 95 | 221113762640 | Coupling, plastic, PVC, socket joint, 150 mm, schedule 80 | | | \$ | 10,069.05 | \$ 13,529.90 | \$- | \$ 23,598.95 |
| | | | | | ¢ | 22 490 74 | ¢ 05 500 70 | ¢ 07.04 | ¢ 47.070.45 |
| | | | Labor factor | 1.50 | -\$ | 22,100.71 | \$ 38,389.05 | \$ 97.04 | \$ 38,389.05 |
| | | | Total | | \$ | 22,180.71 | \$ 63,981.75 | | \$ 86,162.46 |
| 33_03 Cut | and cap | Unit Cost Estimate | | | | | | | |
| Data Relea | ise : Year 2020 | Unit Cost Estimate | | | | | | | |
| 270 | 212216140750 | Excavating, chain trencher, utility trench, common earth, 9 kW, 200 mm wide, 900 mm deep, exceptor welking | | | ¢ | | ¢ 2,022,20 | \$ 500.40 | ¢ 2,621,70 |
| 270 | 312310140750 | | | | φ | - | φ 2,022.30 | φ 599.40 | φ 2,021.70 |
| 270 | 312316141750 | Excavating, chain trencher, utility trench, common earth, 200 mm wide, 900 mm deep, backfill by band includes compaction add | | | \$ | | \$ 3,580,20 | \$ 456.30 | \$ 4,036,50 |
| 210 | 512510141750 | nand, includes compaction, add | | | φ | - | φ 3,300.20 | φ 430.30 | φ 4,050.50 |
| 1 | 221113484950 | Pipe, fittings & valves, coupling, steel, painted, standard flexible grooved joint 20 mm diameter | | | \$ | 28.30 | \$ 7.95 | \$ - | \$ 36.25 |
| | 221110404000 | | | | Ŷ | 20.00 | φ 1.00 | Ŷ | φ 00.20 |
| | | | | | | | | | |
| 2 | 221113484950 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 20 mm diameter | | | \$ | 56.60 | \$ 15.90 | \$ - | \$ 72.50 |
| | | | | | | | | | |
| 2 | 221113484950 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 20 mm diameter | | | \$ | 56.60 | \$ 15.90 | \$- | \$ 72.50 |
| | | | O1 welder and OA | 1.00 | | | \$ 39.75 | | \$ 39.75 |
| | | | ~ • • • • • • | | \$ | 141.50 | \$ 5,682.00 | \$ 1,055.70 | \$ 6,879.20 |
| | | | Labor factor | 1.50 | ¢ | 444 50 | \$ 8,523.00 | | \$ 8,523.00 |
| | | | | | Ŷ | 141.50 | φ 14,205.00 | | φ 14,340.50 |
| 33_04 Cut | and cap | | | | | | | | |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | |
| | | | | | | | | | |
| 2 | 221113/8/050 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 20 mm diameter | | | ¢ | 56 60 | \$ 15.90 | \$ | \$ 72.50 |
| 2 | 221113404950 | standard, nexible, grooved joint, 20 min diameter | | | φ | 50.00 | φ 15.90 | ψ - | φ 12.50 |
| | | Pipe, fittings & valves, coupling, steel, painted, | | | | | | | |
| 1 | 221113485010 | standard, flexible, grooved joint, 80 mm diameter | | | \$ | 55.05 | \$ 21.16 | \$- | \$ 76.21 |
| | | Pine fittings & valves counting steel painted | | | | | | | |
| 1 | 221113485110 | standard, flexible, grooved joint, 300 mm diameter | | | \$ | 421.89 | \$ 69.66 | \$ - | \$ 491.55 |
| | | | | 1.00 | | | + | | + |
| | | | Q1 weider and QA | 1.00 | \$ | 533.54 | \$ 106./2 \$ 213.44 | \$ - | \$ 106.72 \$ 746.98 |
| | | | Labor factor | 1.50 | | | \$ 320.16 | | \$ 320.16 |
| | | | Total | | \$ | 533.54 | \$ 533.60 | | \$ 1,067.14 |

| - | | | | | | | | | | _ | |
|------------|----------------------|------------------------------------|-----------|--------|----|---------------|-----|--------------|-----------------|----|---------------|
| Quantity | Line Number | Description | | | Ex | t. Mat O&P | Ext | . Labour O&P | Ext. Equip. O&P | Ex | t. Total O&P |
| 33_05 Yard | I drainage temporary | provision | | | | | | | | | |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | Soil Management and Dewatering (ba | sed on ac | tuals) | | | | | | | |
| | | | | | | | | | | | |
| | | Trailers | | | \$ | 2,468,700.00 | \$ | 1,234,350.00 | | \$ | 3,703,050.00 |
| | | Design and Fabrication (F1) | | | \$ | 6,739,200.00 | \$ | 3,369,600.00 | | \$ | 10,108,800.00 |
| | | Soil management | | | \$ | 1,068,600.00 | \$ | 534,300.00 | | \$ | 1,602,900.00 |
| | | Restoration | | | \$ | 401,700.00 | \$ | 200,850.00 | | \$ | 602,550.00 |
| | | Dewatering - installation | | | \$ | 3,510,000.00 | \$ | 1,755,000.00 | | \$ | 5,265,000.00 |
| | | Services (contractor 1) | | | \$ | 1,505,400.00 | \$ | 752,700.00 | | \$ | 2,258,100.00 |
| | | Services (contractor 2) | | | \$ | 672,360.00 | \$ | 336,180.00 | | \$ | 1,008,540.00 |
| | | | | | | | | | | | |
| | | | | | \$ | 16,365,960.00 | \$ | 8,182,980.00 | | \$ | 24,548,940.00 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | \$ | 16,394,665.82 | \$ | 8,271,538.59 | 0 | \$ | 24,666,204.41 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 114 of 350

CONFIDENTIAL ATTORNEY WORK PRODUCT

Table D-2: BOQ Section C – Process Systems Tie-in

| | | | Overnight materials costs | Overnight labour costs | Overnight equipment costs | Total overnight costs |
|---------|-----------------------------|-------|---------------------------------|---------------------------|---------------------------------|-----------------------------|
| Sectior | n C, Process Systems Tie-in | | | | | |
| C_01 | PHT and Moderator D2O Sys | tems | \$323,434 | \$2,419,604 | \$20,933 | \$2,763,971 |
| | | | | | | |
| C_02 | TRF Feed Product System | | \$147,893 | \$536,758 | \$0 | \$684,652 |
| | | | | | | |
| C_03 | D20 Clean-up Systems | | \$366,414 | \$361,896 | \$0 | \$728,309 |
| | | | | | | |
| C_04 | Active Drain Systems | | \$3,799 | \$195,186 | \$0 | \$198,985 |
| | | | | | | |
| C_05 | Inactive Drain System | | \$2,405 | \$30,058 | \$0 | \$32,463 |
| | | | | | | |
| | | Total | \$843,946 | \$3,543,501 | \$20,933 | \$4,408,380 |

| Quantity | Line Number | Description | | | Ext. | . Mat. O&P | Ex | t. Labour O&P | Ext. Ec | quip. P | E | xt. Total O&P |
|------------|-----------------|---|--------------------------|-------------|------|------------|---------|---------------|---------|------------|---------|---------------|
| | | | | | | | | | | | | |
| C_01_01 T | ie into mod D20 | supply system | | | | | | | | | | |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| 1 | 221113643610 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 304, includes couplings and hangers 3 m OC | | | \$ | 193.45 | \$ | 82.56 | \$ | _ | \$ | 276.01 |
| | | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling | | | | | | | | | | |
| 1 | 221113484070 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl ioint coupling labor, excl ioint | | | \$ | 50.42 | \$ | 31.99 | \$ | - | \$ | 82.41 |
| 1 | 221113484770 | coupling material | | | \$ | 77.18 | \$ | 46.96 | \$ | - | \$ | 124.14 |
| | | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl | | | | | | | | | | |
| 1 | 221113488020 | joint coupling material | | | \$ | 43,498.65 | \$ | 34.57 | \$ | - | \$ | 43,533.22 |
| 1 | 221113644310 | Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC Pine, fittings & valves, coupling, steel | | | \$ | 105.99 | \$ | 50.05 | \$ | | \$ | 156.04 |
| | | painted, rigid style, grooved joint, 25 mm | | | | | | | | | | |
| 1 | 221113484908 | diameter | | | \$ | 39.10 | \$ | 7.95 | \$ | - | \$ | 47.05 |
| 1 | 221113484908 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm diameter | | | \$ | 39.10 | \$ | 7.95 | \$ | - | \$ | 47.05 |
| 1 | 221113484950 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 20 mm diameter | | | \$ | 28.30 | \$ | 7.95 | \$ | - | \$ | 36.25 |
| 1 | 221112484050 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 20 mm diameter | | | ¢ | 28.20 | e | 7.05 | ¢ | | e | 36.25 |
| | 221113404930 | | | | Ψ | 20.50 | φ | 7.90 | Ψ | - | φ | 50.25 |
| | | | | | \$ | 44,060.49 | \$ | 277.93 | \$ | - | \$ | 44,338.42 |
| | | | O1 Buttweld Welder&OA | 1 | | | \$ | 82.56 | | | \$ | 82.56 |
| | | | P Buttweld Welder&QA | 2 | | | \$ | 390.74 | | | \$ | 390.74 |
| | | | Welder Q1 | 0.5 | | | \$ | 41.28 | | | \$ | 41.28 |
| | | | Welder P | 1 | | | \$ | 195.37 | | | \$ | 195.37 |
| | | | Base subtotal labor | 5.5 | | | \$ | 1,106.21 | | | \$ | 45,166.70 |
| | | | EMWG pipe factor | 35.97826087 | | | \$ | 39,799.33 | | | \$ | 39,799.33 |
| | | | Subtotal with EMGW | 1 5 | | | \$ ¢ | 40,905.54 | | | \$ ¢ | 84,966.03 |
| | | | SS premium fixtures 2.5x | 2.5 | \$ | 656.00 | ې | 01,000.01 | | | \$ | 656.00 |
| | | | sutotal material | | \$ | 44,716.49 | | | | | \$ | 146,980.33 |
| | | | NC SS factor | 0.324480494 | \$ | 14,509.63 | ÷ | 102 262 84 | | | \$ | 14,509.63 |
| C_01_02 T | ie into PHT D20 | supply system | | | 4 | 55,220.12 | Ŧ | 102,203.04 | | | Ŧ | 101/409.90 |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| 3 | 221113643610 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 304, includes couplings and hangers 3 m OC | | | \$ | 580.35 | \$ | 247.68 | \$ | - | \$ | 828.03 |

| Quantity | Line Number | Description | | | Ex | xt. Mat. O&P | Ext. Labour O&P | E | Ext. Equip. O&P | E | xt. Total O&P |
|------------|------------------|--|--------------------------|-------------|---------|--------------|-----------------------|-----|--------------------|----------|------------------------|
| 1 | 221113643610 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 304, includes couplings and hangers 3 m OC | | | \$ | 193.45 | \$ 82.56 | \$ | - | \$ | 276.01 |
| 1 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 77.18 | \$ 46.96 | \$ | _ | \$ | 124.14 |
| 1 | 221113484080 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 65 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | s | 50.42 | \$ 35.60 | - 5 | | \$ | 86.02 |
| | | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 80 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl | | | | 44 504 77 | | Ŷ | | | |
| 1 | 221113488030 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 14,564.77 | \$ 47.95 | · • | | \$ | 14,612.76 |
| 1 | 221113484960 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter | | | \$ | 28.30 | \$ 7.95 | \$ | - | \$ | 36.25 |
| 1 | 221113484970 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 32 mm diameter | | | \$ | 36.53 | \$ 9.96 | \$ | | \$ | 46.49 |
| | | | subtotal | | \$ | 30,095.77 | \$ 513.27 | \$ | - | \$ | 30,609.04 |
| | | | Welder Q1 Welder P | 0.5 | | | \$ 413.83 \$ 99.44 | | | \$ \$ | 413.83 99.44 |
| | | | QA inspection | 0.5 | | | \$ 256.64 | | | \$ | 256.64 |
| | | | Base subtotal labor | | | | \$ 1,283.18 | | | \$ | 31,378.95 |
| | | | EMWG pipe factor | 35.97826087 | | | \$ 46,166.40 | | | \$ | 46,166.40 |
| | | | Labor factor 2.5x | 1.5 | | | \$ 71.174.37 | | | ₽ | 71.174.37 |
| | | | SS premium fixtures 2.5x | 1.5 | \$ | 288.65 | + · _/_· | | | \$ | 288.65 |
| | | | sutotal material | 0.224400404 | \$ | 30,384.42 | | | | \$ | 149,008.36 |
| | | | INC 35 IdClor | 0.324480494 | э \$ | 9,859.15 | \$ 118.623.95 | | | ې ج | 9,859.15 158.867.51 |
| | | | | | | ., | , | | | Ť | |
| C_01_03 R | elocation of dis | charge line | | | | | | | | | |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 11 | 134713161030 | Cathodic protection, anodes, magnesium type, 21.8 kg, underground storage tanks | | | \$ | 2,538.14 | \$ 6,243.93 | \$ | 549.34 | \$ | 9,331.41 |
| 1080 | 312316131344 | Excavating, trench or continuous footing, common earth, 1.9 m3 excavator, 6 m to 7.3 m deep, excludes sheeting or dewatering | | | \$ | | \$ 2,700.00 | \$ | 3,909.60 | \$ | 6,609.60 |
| 687 | 312323160050 | Fill by borrow and utility bedding, for pipe and conduit, crushed or screened bank run gravel, excludes compaction | | | \$ | 19,023.03 | \$ 10,593.54 | \$ | 1,655.67 | \$ | 31,272.24 |
| 70 | 2422224 | Fill by borrow and utility bedding, borrow, select fill for shoulders and embankments, | | | | 0.050.15 | | | 001 05 | • | 0.000.00 |
| 70 | 312323160035 | spread IIII, with front-end loader | | | Ф | 2,256.10 | φ 172.90 | \$ | 201.80 | Ф | 2,690.80 |

| Quantity | Line Number | Description | | | E | xt. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Е | xt. Total O&P |
|------------|-----------------|--|--------------------------|---------------------|----------|-----------------|--------------------------------|--------------------|----------|--------------------------|
| | | | | | | | | | | |
| 4 | 015433407070 | Rent trench box, 4400 kg, 3.0 m x 6.1 m, Incl. Hourly Oper. Cost. | | | \$ | - | \$- | \$ 13,510.76 | \$ | 13,510.76 |
| 60 | 333111203160 | Public sanitary utility sewerage piping, piping HDPE Corrugated Type S with watertight gaskets, 750 mm diameter, excludes excavation or backful | | | ¢ | 9 519 60 | \$ 2,094,60 | \$ 240.60 | ¢ | 11 854 80 |
| 00 | 555111205100 | | | | Ψ | 3,513.00 | φ 2,034.00 | φ 240.00 | Ψ | 11,004.00 |
| 5 | 333111253905 | Public sanitary utility sewerage piping, 22 1/2 degree elbow, polyvinyl chloride pipe, B & S, 600 mm diameter, SDR 35 | | | \$ | 12,088.00 | \$ 765.85 | \$- | \$ | 12,853.85 |
| 334 | 312323160200 | Fill by borrow and utility bedding, for pipe and conduit, sand, dead or bank, excludes compaction | | | \$ | 7,885.74 | \$ 5,150.28 | \$ 804.94 | \$ | 13,840.96 |
| 60 | 226653603200 | Pipe, plastic, epoxy, fiberglass filament wound, B&S joint, 300 mm Diameter, excludes couplings and hangers | | | \$ | 16,963.20 | \$ 15,119.40 | \$- | \$ | 32,082.60 |
| | | Public sanitary utility sewerage piping, piping | | | | | | | | |
| 1 | 333111253775 | SDR 35, 90< elbow, 600 mm diameter | | | \$ | 3,437.53 | \$ 153.17 | \$- | \$ | 3,590.70 |
| | | Weld rod, steel, 3 mm diameter, 225 kg to | | | | | | | | |
| 20 | 050523900660 | 900 kg, type 7018 Low Hydrogen | | | \$ | 174.60 | \$- | \$- | \$ | 174.60 |
| 1 | 333111253775 | Public sanitary utility sewerage piping, piping SDR 35, 90< elbow, 600 mm diameter | | | \$ | 3,437.53 | \$ 153.17 | \$- | \$ | 3,590.70 |
| 1 | | 1/4" x 3" carbon steel bar Cadweld mold | | | \$ \$ | 82.66 407.29 | \$ 1,715.78 \$ 1,715.78 | | \$ \$ | 1,798.44 2 123 07 |
| 20 | | Sleeve for making cadweld | | | \$ | 1,373.59 | \$ 1,715.78 | | \$ | 3,089.37 |
| | | | Q2 | 0.3333333333 | \$ | 79,187.00 | \$ 48,294.18 \$ 5,039.80 | \$ 20,932.71 | \$ \$ | 148,413.89 5,039.80 |
| | | | Skwk QA inspection | 0.3333333333 0.5 | | | \$ 357.40 \$ 2,698.60 | | \$ \$ | 357.40 2,698.60 |
| | | | Base subtotal labor | | | | \$ 56,389.98 | | \$ | 156,509.69 |
| | | | EMWG pipe factor | 12.86956522 | | | \$ 725,714.46 \$ 782 104 44 | | \$ | 725,714.46 882 224 15 |
| | | | Labor factor 2.5x | 1.5 | | | \$ 1,173,156.65 | | \$ | 1,173,156.65 |
| | | | SS premium fixtures 2.5x | 1.5 | \$ ¢ | - | | | \$ ¢ | 2 055 290 90 |
| | | | NC SS factor | 0.324480494 | \$ | 25,694.64 | | | \$ | 25,694.64 |
| | | | | | \$ | 104,881.64 | \$ 1,955,261.09 | \$ 20,932.71 | \$2 | 2,081,075.44 |
| C_01_04 T | ie into upgrade | sysem for HWMB West Annex | | | | | | | | |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| 1 | 221113451560 | Elbow, 90 Deg., steel, cast iron, black, straight, threaded, extra heavy weight, 40 mm | | | s | 100.33 | \$ 71.72 | s - | \$ | 172.05 |
| | | Elbow, 90 Deg., steel, cast iron, black, | | | Ţ | | | | | |
| 1 | 221113451580 | straight, threaded, extra heavy weight, 50 mm | | | \$ | 123.48 | \$ 79.46 | \$- | \$ | 202.94 |
| 4 | 221113440600 | Pipe, steel, black, threaded, 40 mm diameter, schedule 40, Spec. A-53, includes coupling and clevis hanger assembly sized for covering 3 m OC | | | ¢ | 120.64 | \$ 225.29 | ¢ | ¢ | 264.02 |
| 4 | 221113440000 | | | | φ | 125.04 | φ 200.20 | • - | φ | 504.92 |
| | | Pipe, steel, black, threaded, 15 mm diameter, schedule 40, Spec. A-53, includes coupling and clevis hanger assembly sized | | | | | | | | |
| 2 | 221113440560 | for covering, 3 m OC | | | \$ | 29.94 | \$ 82.56 | \$ - | \$ | 112.50 |

| Quantity | Line Number | Description | | | E | Ext. Mat. O&P | Ex | t. Labour O&P | Ext. Equip. | Е | xt. Total O&P |
|------------|-----------------|---|--------------------------------------|-------------|----|---------------|---------|---------------|--------------|---------|---------------------|
| | | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl | | | | | | | | | |
| 2 | 221113488010 | joint coupling material | | | \$ | 86,997.30 | \$ | 105.28 | \$- | \$ | 87,102.58 |
| 1 | 221113484980 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 40 mm diameter | | | \$ | 39.62 | \$ | 11.87 | \$- | \$ | 51.49 |
| | | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 65 | | | | | | | | | |
| 1 | 221113485000 | mm diameter | | | \$ | 49.91 | \$ | 17.91 | \$ - | \$ | 67.82 |
| 1 | 221113485000 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 65 mm diameter | | | \$ | 49.91 | \$ | 17.91 | \$- | \$ | 67.82 |
| | | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 | | | | | | | | | |
| 1 | 221113484960 | mm diameter | | | \$ | 28.30 | \$ | 7.95 | \$- | \$ | 36.25 |
| 2 | 221113484960 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter | | | \$ | 56.60 | \$ | 15.90 | \$ - | \$ | 72.50 |
| | | | | | | | | | | | |
| 1 | 221113484960 | painted, standard, flexible, grooved joint, 25 mm diameter | | | \$ | 28.30 | \$ | 7.95 | \$- | \$ | 36.25 |
| | | Pipe, fittings & valves, tee, steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price incl joint coupling labor, excl joint | | | | | | | | | |
| 1 | 221113484760 | coupling material | | | \$ | 77.18 | \$ | 36.12 | \$- | \$ | 113.30 |
| | | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint | | | | | | | | | |
| 1 | 221113484770 | coupling material | | | \$ | //.18 | \$ | 46.96 | \$- | \$ | 124.14 |
| | | | | | \$ | 87,787.69 | \$ | 736.87 | | \$ | 88,524.56 |
| | | | Q1 Buttweld Welder&QA | \$ 1.00 | | | \$ | 151.18 | | \$ | 151.18 |
| | | | Welder Q1 | \$ 2.00 | | | э \$ | 422.28 | | э \$ | 422.28 |
| | | | Welder P | 1 | | | \$ | 314.59 | | \$ | 314.59 |
| | | | QA Inspection Base subtotal labor | 0.5 | | | \$ | 368.44 | | \$ | 368.44 90.410.53 |
| | | | EMWG pipe factor | 35.97826087 | | | \$ | 94,365.04 | | \$ | 94,365.04 |
| | | | Subtotal with EMGW | | | | \$ | 96,987.88 | | \$ | 184,775.57 |
| | | | Labor factor 2.5x | 1.5 | ¢ | 1 975 99 | \$ | 145,481.82 | | \$ | 145,481.82 |
| | | | subtotal material | 2.5 | \$ | 89.763.67 | | | | \$ | 332,233.36 |
| | | | NC SS factor | 0.324480494 | \$ | 29,126.56 | | | | \$ | 29,126.56 |
| | | | | | \$ | 118,890.22 | \$ | 242,469.69 | | \$ | 361,359.92 |
| C_01_05 D | 20 tanks piping | j and equipment | | | | | | | | | |
| Data Relea | se . Tear 2020 | onit oost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| 10 | 078413100180 | Firestopping, metallic piping, non insulated, through floors, 300mm dia | | | \$ | 192.30 | \$ | 394.20 | \$- | \$ | 586.50 |
| | | | | | | | | | | | |
| | | | Labor factor 2 5v | 1 5 | \$ | 192.30 | \$ | 394.20 | | \$ ¢ | 586.50 |
| | | | | 1.5 | \$ | 192.30 | ې \$ | 985.50 | | \$ | 1,177.80 |
| | | | | | \$ | 323,433.85 | \$ | 2,419,604.07 | \$ 20,932.71 | \$2 | 2,763,970.63 |
| | | | | | | | | | | | |

| C 0.2 01 The into TGF Incoming Data Absence: Year 2000 Unit C 051 Estimate Image: Control of the interview of program in | Quantity | Line Number | Description | | | E | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | E | xt. Total O&P |
|---|---------------|--------------------|--|--------------------------|-------------|----|---------------|-----------------|--------------------|----|---------------|
| U. Y. J. In and the incoming and outpool of system Data Revenue Vare 2003 Unit Cost Estimate A Part, filtrag & values, elsow, 45 Deg, or one planetice, edd 1 southing particle outpoint denotes or edd 1 southing particle outpoint denotes of the southing particle outpoint denotes outpoint denotes of the southing particle outpoint denotes outpoint denotes of the southing particle outpoint denotes outpoint denotes outpoint denotes outpoint denotes outpoint denotes outpoint denotes outpoint outpoint denotes outpoint denotes outpoint denotes | | | | | | | | | | | |
| Data Messae 1 Year 200 UNIT COST ESTIMATO 4 22111364070 Pas. filtings & values, educe, 40 Deg, or Deg. status, edu 1, approximation and page 1000 metalled (proximation) prop. filtings & values, educe, not page and page 1000 metalled (proximation) prop. filtings & values, educe, not page prop. filtings & values, walue, lattering, prop. prop. filtings & values, walue, lattering, prop. prop. filtings & values, walue, lattering, prop. prop. filtings & values, educed, prop. prop. filtings & values, coupling, status, prop. filtings & values, coup | C_02_01 Tie I | into TRF incoming | and outgoing system | | | | | | | | |
| A Part. Elings & volves, steel, painted, grower paint, 0 Part. Elings & volves, steel, painted, grower paint, 0 Part. Elings & volves, steel, painted, grower paint, 0 Part. Elings & volves, steel, painted, grower paint, 0 Part. Elings & volves, steel, painted, grower paint, 0 Part. Elings & volves, steel, painted, grower paint, 0 Part. Elings & volves, steel, painted, grower paint, 0 Part. Elings & volves, steel, painted, grower paint, 0 Part. Elings & volves, steel, painted, grower paint, 0 Part. Elings & volves, steel, painted, grower paint, 0 Part. Elings & volves, steel, painted, grower paint, 0 Part. Elings & volves, steel, painted, grower paint, 0 Part. Elings & volves, steel, painted, grower paint, 0 Part. Elings & volves, steel, painted, grower paint, 0 Part. Elings & volves, steel, painted, grower paint, 0 Part. Elings & volves, steel, painted, grower paint, 0 Part. Elings & volves, painted, grower painted, 0 Part. Elings & volves, painted, dives, painted, grower painted, 0 Part. Elings & volves, painted, grower painted, 0 Part. Elings & volves, painted, | Data Release | : Year 2020 | Unit Cost Estimate | | | | | | | | |
| 4 2211344070 Figs. fitting & values, ethor, 40 Deg or by Deg. table, painted, ethor, well considered and generic ex.341 consider methand only per pin for values, ethor, 40 Deg or by Deg. fitting & values, ethor, 40 Deg or copping finational analysis and paint company painted analysis and painted analysis and painted analysis and painted and painted analysis painted analysis and painted and painted and painted analysis analysis and painted and painted analysis and painted analysis and painted analysis and painted analysis and painted analysis and painted analysis and painted analysis analysis and painted analysis and painted analysis and painted analysis and painted analysis analysis and painted analysis and painted analysis and painted analysis and painted analysis analysis and painted analysis analysis and painted analysis and painted analysis and painted analysis analysis | | | | | | | | | | | |
| 2 2211348970 Pper, fittings & values, taset, gainted, or operating interval only per pint or installed price. Ind (per pint) or instal | 4 | 221113484070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 201.68 | \$ 127.96 | \$ - | \$ | 329.64 |
| 3 Z2113469020 Pipe, fittings & valves, valve, butterfly, standard trin, grooved joint, 50 mm gipes and 10 coping mentalised mody per joint for installed price, incl 2 position handle. \$ 95,059.96 \$ 103.71 \$ - \$ \$ 95,163. 4 Z2113649020 Pipe, stainless stell, threaded, 50 mm diameter \$ 96,059.96 \$ 103.71 \$ - \$ \$ 95,163. 5 Z211364910 Pipe, stainless stell, threaded, 50 mm diameter \$ 96,725 \$ 412.80 \$ - \$ \$ 1,104. 5 Z211364910 Pipe, stainless stell, threaded, 50 mm diameter \$ 967.25 \$ 412.80 \$ - \$ \$ 1,380. 7 2 Pipe, fittings & valves, coping, stell, painted, stell, threaded, 50 mm diameter \$ 967.25 \$ 412.80 \$ - \$ \$ 1,380. 1 Z2113649800 Pipe, fittings & valves, coping, stell, painted, stell, threaded, 50 mm diameter \$ 97,702.5 \$ 1,104.5 \$ 98,770.5 1 Z2113649800 Pipe, fittings & valves, coping, stell, grooved joint, 20 mm diameter \$ 97,702.5 \$ 1,104.5 \$ 98,770.5 1 Z2113649800 Pipe, fittings & valves, coping, stell, grooved joint, 20 mm diameter \$ 97,702.5 \$ 1,003.5 \$ 98,770.5 1 Z211364900 Pipe, fittings & valves, coping, stell, grooved joint, 20 mm diameter \$ 97,702.5 \$ 1,003.5 \$ 98,770.5 1 S 200.5 \$ 97,702.5 \$ 1,003.5 \$ 97,702. | 2 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 154.36 | \$ 93.92 | \$ - | \$ | 248.28 |
| 3 22111364000 Bud pain couping instanta 5 9(03:56) 5 1(03) 5 5 9(03:56) 5 1(03) 5 5 5 9(03:56) 5 7(73:80) 5 3(30:24) 5 5 5 1(104) 5 221113643610 coupings and hangers 3 m OC Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 304, includes coupings and hangers 3 m OC \$ 967.25 \$ 412.80 \$ | 2 | 224442499020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, out light outplice metrical | | | ¢ | 05.050.06 | ¢ 402.74 | ¢ | ¢ | 05 100 07 |
| 4 221113643010 diameter, schedule 40, type 30, includes member, standard, fab, type 304, includes per statiless steel, threaded, 50 mm diameter, schedule 40, type 304, includes per statiless steel, threaded, 50 mm diameter, schedule 40, type 304, includes per statiless steel, threaded, 50 mm diameter, standard, fab, type 304, includes per statiless steel, threaded, 50 mm diameter, standard, fab, type 304, includes per statiless steel, threaded, 50 mm diameter, standard, fab, type 304, includes per statiles, statiles, type 304, includes, type 304, includes per statiles, statiles, type 304, includes, | 3 | 221113488020 | Pipe, stainless steel, threaded, 50 mm | | | \$ | 95,059.96 | \$ 103.71 | \$ - | \$ | 95,163.67 |
| 5 22113643910 couplings at harbers 3 m OC. 5 967.25 5 412.80 5 5 1.380. 3 22113643910 couplings at harbers 3 m OC. S 84.90 S 22.85 S - S 108. 3 221134849800 25 mm diameter. S 84.90 S 22.85 S - S 108. 1 22113484950 20 mm diameter. S 20.80 S 7.95 S - S 36.9 1 22113484950 20 mm diameter. S 20.80 S 7.95 S - S 36.7 1 22113484950 20 mm diameter. S 20.80 S 7.95 S - S 36.7 1 22113484950 20 mm diameter. S 9.02.01 5 S 371.52 S 371.52 S 371.52 S 371.52 S 371.52 S 374.25 S 374.25 | 4 | 221113643610 | diameter, schedule 40, type 304, includes couplings and hangers 3 m OC | | | \$ | 773.80 | \$ 330.24 | \$- | \$ | 1,104.04 |
| 3 221113043010 Dop, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 20 mm diameter \$ 9 2.21113484950 \$ 2.8.80 \$ - \$ 108 1 221113484950 20 mm diameter \$ 9.8.97,20 \$ - \$ 9 2.8.30 \$ 7.95 \$ - \$ 36,370 1 221113484950 20 mm diameter \$ 9.7,270.25 \$ 1,100.43 \$ 9 \$ 9,770.25 \$ 1,100.43 \$ 9,370 \$ 9,370 \$ 9,370 \$ 9,371 \$ 9,371 \$ 9,371 \$ 9,371 \$ 9,373 \$ 3,371,52 \$ 3,371,52 \$ 3,371,52 \$ 3,371,52 \$ 3,371,52 \$ 3,371,52 \$ 3,371,52 \$ 3,371,52 \$ 3,371,52 \$ 3,371,52 \$ 3,371,52 \$ 3,371,52 \$ 3,371,52 \$ 3,371,52 \$ 3,371,52 \$ 3,371,52 \$ 3,371,52 \$ 3,374,220,53 \$ | 5 | 221112642610 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 304, includes couplings and bagcars 2 m OC | | | ¢ | 067.25 | ¢ 412.90 | ¢ | • | 1 290 05 |
| 3 221113484990 25 mm diameter \$ 84.90 \$ 23.85 \$ - \$ \$ 108. 1 221113484950 Pipe, fittings & valves, coupling, sted, grooved joint, 20 mm diameter \$ 97.270.25 \$ 1,100.43 \$ 98.370. 1 221113484950 20 mm diameter Buttweid P80A \$ 20.00 \$ 7.95 \$ - \$ \$ 36. 1 20 mm diameter Buttweid P80A \$ 20.00 \$ 371.52 \$ 371 | 5 | 221113043010 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, | | | φ | 907.23 | φ 412.00 | φ - | Ŷ | 1,360.03 |
| 1 221113484900 paintede, standard, flexble, grooved joint, 20 mm diameter \$ 28.30 \$ 7.95 \$ - \$ \$ 36.4 2 0 443.76 \$ 443.76 \$ 443.76 \$ 443.76 0 0.5 \$ 37.152 \$ 37.152 \$ 37.152 \$ 37.152 0 0.5 \$ 37.152 \$ 37.152 \$ 37.152 \$ 37.152 \$ 37.152 0 0.5 \$ 37.152 <td< td=""><td>3</td><td>221113484960</td><td>25 mm diameter Pipe, fittings & valves, coupling, steel,</td><td></td><td></td><td>\$</td><td>84.90</td><td>\$ 23.85</td><td>\$-</td><td>\$</td><td>108.75</td></td<> | 3 | 221113484960 | 25 mm diameter Pipe, fittings & valves, coupling, steel, | | | \$ | 84.90 | \$ 23.85 | \$- | \$ | 108.75 |
| 9 221113484040 Pipe, fittings & valves, elbow, 45 Deg, or opuly priorit for installed price, incl joint coupling inderient andly per joint for installed price, incl joint coupling labor, excl 9 77.02 \$ 143.76 \$ 94.834.6 \$ 443.76 \$ 443.76 \$ 443.76 \$ 443.76 \$ 443.76 \$ 443.76 \$ 443.76 \$ 443.76 \$ 443.76 \$ 443.76 \$ 344.46 \$ 344.46 \$ 344.46 \$ 344.46 \$ 344.46 \$ 344.46 \$ 344.86 \$ 344.86 \$ 344.84 \$ 35.97826087 \$ 94.894.64 \$ 344.84 \$ 34.843.85 \$ 3146.298.30 \$ 3148.295 \$ 314.82.95 \$ 314.82.95 \$ 314.82.95 \$ 314.82.95 \$ 314.82.95 \$ 314.82.95 \$ 314.82.95 \$ 314.82.95 \$ 314.82.95 \$ 314.82.95 \$ 314.83.8 \$ \$ \$ | 1 | 221113484950 | painted, standard, flexible, grooved joint, 20 mm diameter | | | \$ | 28.30 | \$ 7.95 | \$- | \$ | 36.25 |
| Buttweid P&QA \$ 2.00 443.76 \$ 443.76 Welder Q1 0.5 \$ 371.52 \$ 714.52 \$ 711.52 \$ 714.52 \$ 711.52 \$ 711.52 \$ 711.52 \$ 711.52 \$ 711.52 \$ 711.52 \$ 711.52 \$ 711.52 \$ 711.52 \$ 711.52 \$ 711.52 \$ 711.52 \$ 711.52 \$ 711.52 \$ 711.52 \$ 711.52 \$ 711 | | | | | | \$ | 97,270.25 | \$ 1,100.43 | | \$ | 98,370.68 |
| Welder Q1 0.5 \$ 371.52 \$ 371.52 \$ 371.52 Welder P 1 \$ 357.39 \$ 357.39 \$ 357.39 QA inspection 0.5 \$ 364.46 \$ 364.46 Base subtotal labor \$ 2,637.56 \$ 99.907 E Composition \$ 57826087 \$ 94.894.64 \$ 94.894.64 Subtotal with EMGW \$ 97.532.20 \$ 146.298.30 \$ 146.298.30 \$ 146.298.30 Sobtotal with EMGW \$ 31.942.95 \$ 146.298.30 \$ 146.298.30 \$ 146.298.30 Sobtotal with EMGW \$ 97.532.20 \$ 134.205 \$ 31.422.95 \$ 31.422.95 Sobtotal with EMGW \$ 97.532.30 \$ 146.298.30 \$ 146.298.30 \$ 146.298.30 Sobtotal material \$ Sobtotal material \$ 31.942.95 \$ 31.942.95 \$ 374.216.7 Data Release : Year 2020 Unit Cost Estimate \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | | | | Buttweld P&QA | \$ 2.00 | | | 443.76 | | \$ | 443.76 |
| Welder P 1 \$ 37.39 \$ 37.39 \$ 37.39 \$ 37.39 QA inspection 0.5 \$ 364.46 \$ 84.4 \$ 84.84 \$ 84.84 Base subtoal labor 5 2,637.56 \$ 99,907. \$ 94,894.64 <td></td> <td></td> <td></td> <td>Welder Q1</td> <td>0.5</td> <td></td> <td></td> <td>\$ 371.52</td> <td></td> <td>\$</td> <td>371.52</td> | | | | Welder Q1 | 0.5 | | | \$ 371.52 | | \$ | 371.52 |
| QA inspection 0.5 \$ 364.46 \$ 99.907. Base subtotal labor \$ 2,637.56 \$ 99.907. EMWG pipe factor 35.97826087 \$ 94,894.64 <td></td> <td></td> <td></td> <td>Welder P</td> <td>1</td> <td></td> <td></td> <td>\$ 357.39</td> <td></td> <td>\$</td> <td>357.39</td> | | | | Welder P | 1 | | | \$ 357.39 | | \$ | 357.39 |
| Base subtotal labor \$ 2,637.56 \$ 99,907. EMWG pipe factor 35,97826087 \$ 94,894.4 \$ 94,727.1 \$ | | | | QA inspection | 0.5 | | | \$ 364.46 | | \$ | 364.46 |
| Bit Subtrail with EMWG pie factor 35.97826087 \$ 94,894.64 \$ 94,894.64 Subtrail with EMGW Labor factor 2.5x 1.5 \$ 94,894.64 \$ 94,894.64 Subtrail with EMGW Labor factor 2.5x 1.5 \$ 146,298.30 \$ 146,298.30 Subtrail with EMGW Labor factor 2.5x 2.5 \$ 1,173.10 \$ 146,298.30 \$ 146,298.30 NC factor 0.324480494 \$ 98,443.35 \$ \$ 37,4216.7 NC factor 0.324480494 \$ 130,386.30 \$ 243,830.49 \$ 374,216.7 Data Release : Year 2020 Unit Cost Estimate | | | | Base subtotal labor | | _ | | \$ 2,637.56 | | \$ | 99,907.81 |
| Subtotal with EMGW \$ 97,532.20 \$ 194,802. Labor factor 2.5x 1.5 \$ 146,298.30 \$ 146,298.30 SS premium fixtures 2.5x 2.5 \$ 1,173.10 \$ 98,443.35 \$ 342,273. NC factor 0.324480494 \$ 11,942.95 \$ 31,942.25 \$ 31,942.25 C_02_02 Tie into TRF and project system for West Annex | | | | EMWG pipe factor | 35.97826087 | | | \$ 94,894.64 | | \$ | 94,894.64 |
| Labor factor 2.5x 1.5 \$ 146,298.30 \$ 146,298.30 SS premium fixtures 2.5x 2.5 \$ 1,173.10 \$ 342,273.30 subtotal material \$ 98,443.35 \$ 34,243.50 \$ 342,273.30 NC factor 0.324480494 \$ 31,942.95 \$ 31,942.95 \$ 374,216.70 Data Release : Year 2020 Unit Cost Estimate Image: Cost of the set of the s | | | | Subtotal with EMGW | | | | \$ 97,532.20 | | \$ | 194,802.45 |
| SS premium fixtures 2.5x 2.5 \$ 1,173.10 \$ 1,173.10 subtotal material \$ 98,443.35 \$ 342,273. NC factor 0.324480494 \$ 31,942.95 \$ 31,942.95 C 02_02 Tie into TRF and project system for West Annex \$ 130,386.30 \$ 243,830.49 \$ 374,216.7 Data Release : Year 2020 Unit Cost Estimate \$ 130,386.30 \$ 243,830.49 \$ 374,216.7 Pipe, fittings & valves, elbow, 45 Deg, or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling material only) per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling material \$ 453.78 \$ 143.46 \$ - \$ 597.1 Pipe, fittings & valves, etes, ete, add 1 coupling (material only per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling material \$ 453.78 \$ 143.46 \$ - \$ 597.1 | | | | Labor factor 2.5x | 1.5 | | | \$ 146,298.30 | | \$ | 146,298.30 |
| subtotal material \$ 98,443.35 \$ 342,273 NC factor 0.324480494 \$ 31,942.95 \$ 31,942.95 C_02_02 Tie into TRF and project system for West Annex \$ 130,386.30 \$ 243,830.49 \$ 374,216.7 Data Release : Year 2020 Unit Cost Estimate Image: Cost Estest Estimate< | | | | SS premium fixtures 2.5x | 2.5 | \$ | 1,173.10 | | | \$ | 1,173.10 |
| NC factor 0.324480494 \$ 31,942.95 \$ 31,942.95 C_02_02 Tie Into TRF and project system for West Annex Data Release : Year 2020 Unit Cost Estimate S 31,942.95 Pipe, fittings & valves, elbow, 45 Deg, or 90 Deg, steel, painted, grooved joint, 25 mm diameter, add 1 coupling material only) per joint for installed price, incl joint coupling material pripe, fittings & valves, tee, steel, painted, grooved joint, 25 \$ 453.78 \$ 143.46 \$ - \$ 597.30 9 221113484040 Coupling labor, excl joint coupling material only) per joint for installed price, incl joint coupling material pripe, fittings & valves, tee, steel, painted, grooved joint, 25 \$ 453.78 \$ 143.46 \$ - \$ 597.30 9 221113484040 Coupling labor, excl joint coupling material only per joint for installed price, incl joint coupling material pripe, fittings & valves, tee, steel, painted, grooved joint, 25 \$ 453.78 \$ 143.46 \$ - \$ 597.30 | | | | subtotal material | | \$ | 98,443.35 | | | \$ | 342,273.84 |
| 9 221113484040 Pipe, fittings & valves, elbow, 45 Deg, or 90 Deg, steel, painted, grooved joint, 25 mm diameter, add 1 coupling material only) per joint for installed price, incl joint coupling material price, incl joint coupling material only per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling material only per joint for installed price, incl joint coupling | | | | INC factor | 0.324480494 | \$ | 31,942.95 | | | \$ | 31,942.95 |
| C_02_02 Tie into TRF and project system for West Annex Data Release : Year 2020 Unit Cost Estimate Pipe, fittings & valves, elbow, 45 Deg, or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling material \$ 453.78 \$ 143.46 \$ - \$ 597.35 Pipe, fittings & valves, elbow, 45 Deg, or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling material \$ 453.78 \$ 143.46 \$ - \$ 597.35 Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl \$ - \$ 597.35 | | | | | | \$ | 130,386.30 | \$ 243,830.49 | | \$ | 374,216.79 |
| Data Release : Year 2020 Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling material pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl installed price, incl joint coupling la | C 02 02 Tie | into TRE and proje | ct system for West Annoy | | | | | | | | |
| Plata Release - Teal 2020 Unit COST Estimate Pipe, fittings & valves, elbow, 45 Deg, or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material \$ 453.78 \$ 143.46 \$ - \$ 597.1 Pipe, fittings & valves, elbow, 45 Deg, or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling material only) per joint for installed price, incl joint coupling material \$ 453.78 \$ 143.46 \$ - \$ 597.1 Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl \$ - \$ 20112495400 \$ - \$ 04.05 \$ - \$ 04.05 | Dete Balance | Weer 2000 | Unit Cost Estimate | | | | | | | | |
| 9 221113484040 Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material \$ 453.78 \$ 143.46 \$ - \$ 597.10 9 221113484040 Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl \$ - \$ 597.10 | Data Release | : Year 2020 | Unit Cost Estimate | | | | | | | | |
| Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material \$ 453.78 \$ 143.46 \$ - \$ 597. Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl \$ - \$ 597. | | | | | | | | | | | |
| Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl | 9 | 221113484040 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 453.78 | \$ 143.46 | \$ - | \$ | 597.24 |
| | | 004440464740 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl | | | | | | | | |

| Quantity | Line Number | Description | | | E | xt. Mat. O&P | Ext. I | Labour O&P | Ext. Equip. O&P | E | xt. Total O&P |
|----------|--------------|--|--------------------------------------|-------------|----|--------------|---------|--------------|--------------------|----|---------------|
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 8,062.00 | \$ | 26.32 | \$- | \$ | 8,088.32 |
| 18 | 221113644330 | Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 3,000.60 | \$ | 1,049.58 | \$- | \$ | 4,050.18 |
| 2 | 221113484950 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 20 mm diameter | | | \$ | 56.60 | \$ | 15.90 | \$- | \$ | 72.50 |
| 1 | 221113484960 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter | | | \$ | 28.30 | \$ | 7.95 | \$- | \$ | 36.25 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | Subtotal | | \$ | 11,678.46 | \$ | 1,267.46 | | \$ | 12,945.92 |
| | | | Welder Q1 | 0.5 | | | • | | | \$ | - |
| | | | Welder P | 1 | | | \$ | 1,267.46 | | \$ | 1,267.46 |
| | | | QA Inspection Base subtetal labor | 0.5 | | | \$ | 033./3 | | \$ | 633.73 |
| | | | EMWC pipe factor | 25 07926097 | | | .⇒ ¢ | 3,100.05 | | ¢ | 14,047.11 |
| | | | Subtotal with EMGW | 55.57820087 | | | э ¢ | 117,002.32 | | ¢ | 178 849 63 |
| | | | Labor factor 2 5x | 1.5 | | | \$ | 175 756 75 | | \$ | 175 756 75 |
| | | | SS premium fixtures 2.5x | 2.5 | \$ | 1.539.65 | 4 | 1. 5,. 50.75 | | ŝ | 1.539.65 |
| | | | subtotal material | 210 | \$ | 13,218.11 | | | | \$ | 306,146.03 |
| | | | NC factor | 0.324480494 | \$ | 4,289.02 | | | | \$ | 4,289.02 |
| | | | | | \$ | 17,507.13 | \$ 2 | 292,927.92 | | \$ | 310,435.04 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | \$ | 147,893.43 | \$ 5 | 536,758.41 | | \$ | 684,651.83 |

| Quantity | Line Number | Description | | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ex | t. Total O&P |
|---------------------|-------------------|---|-------------------------|-------------|---------------|------------------------|-----------------|----|--------------|
| | | | | | | | | | |
| C_03_01 Tie into cl | ean up system for | HWMB West Annex | | | | - | | | |
| Data Release : Year | 2020 | Unit Cost Estimate | | | | | | | |
| | | Elbow, 90 Deg., steel, cast iron, black, straight, | | | | | | | |
| 3 | 221113451560 | threaded, extra heavy weight, 40 mm | | | \$ 300.99 | \$ 215.16 | \$- | \$ | 516.15 |
| | | | | | | | | | |
| 3 | 221113451850 | lee, steel, cast iron, black, straight, threaded, extra heavy weight 40 mm | | | \$ 478.50 | \$ 331.26 | s - | \$ | 809 76 |
| 0 | 221110401000 | exite neavy weight, 40 mm | | | φ 410.00 | φ 001.20 | Ψ - | Ψ | 000.70 |
| 3 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandle excl joint counting material | | | \$ 130 495 95 | \$ 78.96 | s - | \$ | 130 574 91 |
| Ū | 221110100010 | | | | ¢ 100,100.00 | ¢ 70.00 | Ŷ | Ť | 100,01 1.01 |
| 3 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ 130,495.95 | \$ 78.96 | \$- | \$ | 130,574.91 |
| | | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and | | | | | | | |
| 9 | 221113644360 | hangers 3 m OC | | | \$ 3,009.87 | \$ 743.04 | \$ - | \$ | 3,752.91 |
| 0 | 004440044000 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and | | | ¢ 4.000.00 | A 047.00 | • | • | 4 050 07 |
| 3 | 221113644360 | nangers 3 m OC | | | \$ 1,003.29 | \$ 247.68 | ъ - | \$ | 1,250.97 |
| 3 | 221113484950 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 20 mm diameter | | | \$ 84.90 | \$ 23.85 | \$ - | \$ | 108.75 |
| | | Pine fittings & valves coupling steel painted | | | | | | | |
| 3 | 221113484950 | standard, flexible, grooved joint, 20 mm diameter | | | \$ 84.90 | \$ 23.85 | \$ - | \$ | 108.75 |
| 3 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle. excl joint coupling material | | | \$ 1,188,51 | \$ 78.96 | s - | \$ | 1.267.47 |
| | | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, | | | | | | | |
| 3 | 221113488010 | incl 2 position handle, excl joint coupling material | | | \$ 1,188.51 | \$ 78.96 | \$ - | \$ | 1,267.47 |
| | | | | | | | | | |
| | | | subtotal | | \$ 268,331.37 | \$ 1,900.68 | \$ - | \$ | 270,232.05 |
| | | | Buttweld P&QA | \$ 2.00 | | \$ 315.84 | | \$ | 315.84 |
| | | | Waldar O1 | | | | | \$ | 270,547.89 |
| | | | Welder Q1 | 0.5 | | \$ 768.57 \$ 363.54 | | \$ | 768.57 |
| | | | QA inspection | 0.5 | | \$ 566.06 | | \$ | 566.06 |
| | | | Base subtotal labor | | | \$ 3,914.69 | | \$ | 272,246.06 |
| | | | EMWG pipe factor | 35.97826087 | | \$ 140,843.56 | | \$ | 140,843.56 |
| | | | Subtotal with EMGW | 1 6 | | \$ 144,758.24 | | \$ | 413,089.61 |
| | | | S premium fixtures 2 5v | 1.5 | \$ 8 315 79 | \$ 217,137.36 | | ş | 217,137.36 |
| | | | subtotal material | 2.5 | \$ 276.647.15 | | | \$ | 638,542,75 |
| | | | NC adjustment | 0.324480494 | \$ 89,766.60 | | | \$ | 89,766.60 |
| | | | | | \$ 366,413.75 | \$ 361,895.61 | | \$ | 728,309.36 |

| Quantity | Line Number | Description | | | Ext. Mat. O&P | | Ext. Labour O&P | | Ext. Equip. O&P | | xt. Total O&P |
|--------------------|-----------------|--|--------------------------|---------------|---------------|-------------|-----------------|------------|-----------------|--------|---------------|
| | | | | | | | | | | | |
| C_04_01 Mechanie | cal Mods to the | loading bay | | | | | | | | | |
| Data Release : Yea | r 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| 28 | 221113440580 | Pipe, steel, black, threaded, 25 mm diameter, schedule 40, Spec. A-53, includes coupling and clevis hanger assembly sized for covering, 3 m OC | | | s | 806.68 | s | 1 387 12 | s - | \$ | 2 193 80 |
| 20 | 221110440000 | 00 | | | Ψ | 000.00 | Ψ | 1,007.12 | Ŷ - | Ŷ | 2,100.00 |
| 1 | 221113440600 | Pipe, steel, black, threaded, 40 mm diameter, schedule 40, Spec. A-53, includes coupling and clevis hanger assembly sized for covering, 3 m OC | | | \$ | 32.41 | \$ | 58.82 | \$ - | \$ | 91.23 |
| | | | | | | | | | | | |
| 4 | 221113484040 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 201.68 | \$ | 63.76 | \$- | \$ | 265.44 |
| | | | | | | | | | | | |
| 1 | 221113484040 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | s | 50.42 | s | 15.94 | ¢ . | ¢ | 66 36 |
| | 221113404040 | Joint coupling material | | | ψ | 30.42 | ψ | 15.54 | Ψ - | Ψ | 00.00 |
| 1 | 221113484060 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | ¢ | 50.42 | ¢ | 24.25 | ¢ | 4 | 74 67 |
| 1 | 221113404000 | joint coupling material | | | ¢ | 50.42 | ¢ | 24.20 | ş - | þ | 74.07 |
| 1 | 221113484910 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 40 mm diameter | | | \$ | 39.10 | \$ | 11.87 | \$- | \$ | 50.97 |
| | | Pine fittings & valves valve butterfly standard | | | | | | | | | |
| 4 | 221112488010 | trim, grouved joint 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling | | | | 0 1 4 7 4 6 | • | 26.22 | ¢ | | 0 170 49 |
| 1 | 221113400010 | material | | | ¢ | 2,147.10 | ¢ | 20.32 | ş - | þ | 2,173.40 |
| 29 | 220719106870 | Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service iacket 25 mm vall. 25 mm van pipe size | | | s | 118.90 | s | 558.83 | s - | s | 677.73 |
| | | , | | | | | | | Ť | | |
| 2 | 221113484960 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter | | | \$ | 56.60 | \$ | 15.90 | \$- | \$ | 72.50 |
| | | | | | | | | | | | |
| 2 | 221113481050 | Pipe, fittings & valves, steel, black, grooved joint, 25 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC | | | s | 47.34 | s | 82.56 | \$- | \$ | 129.90 |
| | | | | | | | | | | Ť. | |
| 1 | 232120701020 | Steam trap, cast iron body, float and thermostatic type, threaded, 103 kPa, 25 mm pipe size | | | \$ | 218.15 | \$ | 54.18 | \$ - | \$ | 272.33 |
| | | Steel wire strainers, galvanized, rectangular | | | | | | | | | |
| 1 | 077123106600 | 50mm x 75mm | | | \$ | 30.51 | \$ | 5.69 | \$ - | \$ | 36.20 |
| | | | Valve adjustment | | \$ | 3,799.37 | \$ | 2,305.24 | | \$ | 6,104.61 |
| | | | Welder Q1 | 0.5 | | | \$ | 29.41 | | \$ | 29.41 |
| | | | | 1 | | | э ¢ | 2,186.55 | | ¢ ¢ | 2,186.55 |
| | | | Base subtotal labor | 0.5 | | | \$ | 5,629 18 | | \$ | 9,428 55 |
| | | | EMWG pipe factor | 12.86956522 | | | \$ | 72,445,10 | | \$ | 72.445.10 |
| | | | Subtotal with EMGW | 22.2.33300522 | | | \$ | 78,074.28 | | \$ | 81,873.65 |
| | | | Labor factor 2.5x | 1.5 | | | \$ | 117,111.42 | | \$ | 117,111.42 |
| | | | SS premium fixtures 2.5x | 2.5 | \$ | - | | | | \$ | - |
| | | | subtotal material | | \$ | 3,799.37 | | | | | |
| | | | NC adjustment | 0 | \$ | | | 105 105 55 | | | 100.005.05 |
| | | | | | \$ | 3,/99.37 | > | 195,185.70 | | 5 | 198,985.07 |

| Quantity | Line Number | Description | | | Ext. Mat. O&P | | Ext. Mat. O&P | | Ext. Labour O& | | abour O&P Ext. Equip. O&P | | Ext. Total O& | |
|-------------|-----------------------|--|---------------------|-------------|---------------|----------|---------------|-----------|----------------|----------|---------------------------|-----------|---------------|--|
| | | | | | | | | | | | | | | |
| C_05_01 Tie | e-in to inactive plar | t drainage | | | | | | | | | | | | |
| Data Releas | e : Year 2020 | Unit Cost Estimate | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 5 | 221113440610 | Pipe, steel, black, threaded, 50 mm diameter, schedule 40, Spec. A-53, includes coupling and clevis hanger assembly sized for covering, 3 m OC | | | \$ | 128.65 | \$ | 366.35 | \$ | - | \$ | 495.00 | | |
| 1 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 2,147.16 | \$ | 34.57 | \$ | <u>-</u> | \$ | 2,181.73 | | |
| 1 | 221113484070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl int coupling material | | | ¢ | 50.42 | ¢ | 31.00 | ¢ | | ¢ | 82.41 | | |
| 1 | 221113484980 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 40 mm diameter | | | ¢ | 39.62 | ç | 11.87 | ¢ | | ç | 51.49 | | |
| 1 | 221113484980 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 40 mm diameter | | | \$ | 39.62 | \$ | 11.87 | \$ | - | \$ | 51.49 | | |
| | | | | | | | | | | | | | | |
| | | | Valve adjustment | | \$ | 2,405.47 | \$ | 456.65 | | | \$ | 2,862.12 | | |
| | | | Welder Q1 | 0.5 | | | \$ | 183.18 | | | \$ | 183.18 | | |
| | | | Welder P | 1 | | | \$ | 90.30 | | | \$ | 90.30 | | |
| | | | QA inspection | 0.5 | | | \$ | 136.74 | | | \$ | 136.74 | | |
| | | | Base subtotal labor | 12 00050523 | | | \$ | 866.86 | | | \$ | 3,272.33 | | |
| | | | EMWG pipe factor | 12.86956522 | | | \$ | 11,156.14 | | | \$ | 11,156.14 | | |
| | | | Sublotal With EMGW | 1.5 | | | \$ | 12,023.01 | | | \$ | 14,428.48 | | |
| | | | Labor factor 2.5X | 1.5 | * | | \$ | 18,034.51 | | | \$ | 18,034.51 | | |
| | | | subtotal material | 2.5 | \$ | 2 405 47 | | | | | \$ | - | | |
| | | | NC adjustment | 0 | ¢ | 2,405.47 | | | | | \$ ¢ | 32,402.98 | | |
| | | | | 0 | \$ | 2,405.47 | \$ | 30,057.51 | | | \$ | 32,462.98 | | |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 124 of 350

CONFIDENTIAL ATTORNEY WORK PRODUCT

Table D-3: BOQ Section D – Process Systems

| | | | Overnight materials costs | Overnight labour costs | Overnight equipment costs | Total overnight costs |
|--------|---------------------------------|-------|---------------------------------|---------------------------|---------------------------------|-----------------------------|
| Sectio | n D, Process Systems | | | | | |
| D_01 | PHT and Moderator D20 Systems | ; | \$13,162,668 | \$88,356,852 | \$0 | \$101,519,520 |
| | | | | | | |
| D_02 | TRF Feed Product System | | \$3,873,897 | \$21,873,005 | \$0 | \$25,746,901 |
| | | | | | | |
| D_03 | Downgraded D20 System | | \$3,471,832 | \$12,291,023 | \$0 | \$15,762,855 |
| | | | | | | |
| D_04 | D2O Clean-up System | | \$2,151,089 | \$10,075,943 | \$0 | \$12,227,032 |
| | | | | | | |
| D_05 | Active Drain System | | \$646,245 | \$8,567,081 | \$0 | \$9,213,327 |
| | | | | | | |
| D_06 | Inactive Drain System | | \$72,395 | \$218,299 | \$0 | \$290,694 |
| | | | | | | |
| D_07 | Drum Handling and Cleaning Syst | tems | \$1,079,312 | \$9,712,983 | \$0 | \$10,792,296 |
| | | | | | | |
| | | Total | \$24,457,439 | \$151,095,187 | \$0 | \$175,552,626 |

| Quantity | Line Number | Description | | | | Ext. Mat. O&P | | Ext. Labour O&P | E | kt. Equip. O&P | | Ext. Total O&P |
|-------------|------------------------------|---|---------------------------|------|----------|---------------|----------|-----------------|----|-------------------|----------|----------------|
| | | | | | | | | | | | | |
| D_01_01 Ed | uipment tanks a | and pumps Unit Cost Estimate | | | | | | | | | | |
| Data Noroat | 1001 2020 | | | | | | | | | | | |
| 28 | OPG PO #0024 | Tanks (PHT, Moderator, Feed, Product) | | | \$ | 4,495,958.00 | \$ | 243,461.70 | | | \$ | 4,739,419.70 |
| 3 | OPG PO #0024 OPG PO #0024 | Pumps | | | \$ \$ | 308,202.80 | \$ \$ | 3,130.22 | | | \$ \$ | 311,333.02 |
| | | | | | Ť | .,, | Ť | , | | | Ť | .,, |
| | | | _ . | | \$ | 6,367,170.80 | \$ | 264,329.84 | \$ | - | \$ | 6,631,500.64 |
| | | | Tank crew Heat ex crew | 0.2 | | | \$ \$ | 48,692.34 | | | \$ \$ | 48,692.34 |
| | | | Pump crew | 0.33 | | | \$ | 5,912.64 | | | \$ | 5,912.64 |
| | | | subtotal labor | 4.5 | | | \$ | 319,978.23 | | | \$ | 6,687,149.03 |
| | | | SS premium fixtures 2.5x | 2.5 | \$ | <u>-</u> | \$ | 479,967.34 | | | \$ \$ | 479,967.34 |
| | | | | | \$ | 6,367,170.80 | \$ | 799,945.57 | | | \$ | 7,167,116.37 |
| | | | | | | | | | | | | |
| D_01_02 Pi | pe supports and | I misc fittings | | | | | | | | | | |
| Data Releas | se : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, steel, black, | | | | | | | | | | |
| | | grooved joint, 50 mm diameter, schedule | | | | | | | | | | |
| 4 | 221113481080 | 3 m OC | | | \$ | 144.08 | \$ | 262.12 | \$ | - | \$ | 406.20 |
| | | Pine fittings & volves steel black | | | | | | | | | | |
| | | grooved joint, 50 mm diameter, schedule | | | | | | | | | | |
| _ | | 40, includes coupling & clevis type hanger | | | • | 100.10 | • | 007.05 | • | | • | 507.75 |
| 5 | 221113481080 | 3 m OC | | | \$ | 180.10 | \$ | 327.65 | \$ | - | \$ | 507.75 |
| | | Pipe, fittings & valves, steel, black, | | | | | | | | | | |
| | | grooved joint, 25 mm diameter, schedule | | | | | | | | | | |
| 6 | 221113481050 | 3 m OC | | | \$ | 142.02 | \$ | 247.68 | \$ | - | \$ | 389.70 |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, steel, black, arooved joint, 40 mm diameter, schedule | | | | | | | | | | |
| | | 40, includes coupling & clevis type hanger | | | | | | | | | | |
| 10 | 221113481070 | 3 m OC | | | \$ | 313.80 | \$ | 510.80 | \$ | - | \$ | 824.60 |
| | | Pipe, fittings & valves, steel, black, | | | | | | | | | | |
| | | grooved joint, 40 mm diameter, schedule | | | | | | | | | | |
| 5 | 221113481070 | 40, includes coupling & clevis type hanger 3 m OC | | | \$ | 156.90 | \$ | 255.40 | \$ | - | \$ | 412.30 |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, steel, black, | | | | | | | | | | |
| | | 40, includes coupling & clevis type hanger | | | | | | | | | | |
| 2 | 221113481090 | 3 m OC | | | \$ | 122.46 | \$ | 165.12 | \$ | - | \$ | 287.58 |
| | | Pipe, fittings & valves, steel, black, | | | | | | | | | | |
| | | grooved joint, 65 mm diameter, schedule | | | | | | | | | | |
| 5 | 221113481090 | 40, includes coupling & clevis type hanger 3 m OC | | | \$ | 306.15 | \$ | 412.80 | \$ | - | \$ | 718.95 |
| | | | | | Ċ | | | | | | | |
| | | Pipe, fittings & valves, steel, black, | | | | | | | | | | |
| | | 40, includes coupling & clevis type hanger | | | | | | | | | | |
| 6 | 221113481100 | 3 m OC | | | \$ | 487.74 | \$ | 563.46 | \$ | - | \$ | 1,051.20 |
| | | Pipe, fittings & valves, steel. black. | | | | | | | | | | |
| | | grooved joint, 80 mm diameter, schedule | | | | | | | | | | |
| 22 | 221113481100 | 40, includes coupling & clevis type hanger 3 m OC | | | \$ | 1.788.38 | \$ | 2.066.02 | \$ | - | \$ | 3.854.40 |
| | | | | | | , | | | | | | |
| | | Pipe, fittings & valves, steel, black, | | | | | | | | | | |
| | | 40, includes coupling & clevis type hanger | | | | | | | | | | |
| 2 | 221113481110 | 3 m OC | | | \$ | 193.46 | \$ | 208.46 | \$ | - | \$ | 401.92 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| 386 | 221113470630 | Gasket and bolt set, for flanges, 1034 kPa, 50 mm pipe size | | | \$ | 3.890.88 | \$ | 23,700,40 | \$ | _ | \$ | 27.591.28 |
| | | | | | | 5,000.00 | | | - | | | |
| | | | | | \$ | 7,725.97 | \$ | 28,719.91 | \$ | - | \$ | 36,445.88 |
| | | | Welder Q1 | 0.5 | | | \$ | 1,707.93 | | | \$ | 1,707.93 |
| | | | Welder P | 1 | | | \$ | 1,603.65 | | | \$ | 1,603.65 |
| | | | subtotal labor | 0.5 | | | ₽ \$ | 33,687.28 | | | \$ | 41,413.25 |
| | | | Labor factor 2.5x | 1.5 | | | \$ | 50,530.92 | | | \$ | 50,530.92 |

| Quantity | Line Number | Description | | | | Ext. Mat. O&P | Ext. Labour O&P | | Ext. Labour O&P | | Ext. Labour O&P Ext. Equip. O&P | | | Ext. Total O&P |
|-------------|---------------|--|--------------------------|-----|----|---------------|-----------------|-----------|-----------------|---|------------------------------------|------------|--|----------------|
| | | | SS premium fixtures 2.5x | 2.5 | \$ | 9,587.73 | | 84 318 30 | | | \$ | 9,587.73 | | |
| | | | | | Þ | 17,513.70 | P | 84,218.20 | | | Þ | 101,531.90 | | |
| D_01_03 We | est Annex PHT | pump suction piping | | | | | | | | | | | | |
| Data Releas | e : Year 2020 | onit cost Estimate | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 100 mm | | | | | | | | | | | | |
| 12 | 221113643640 | diameter, schedule 40, type 304, includes couplings and hangers 3 m OC | | | \$ | 5.865.36 | \$ | 1.721.40 | \$ | - | \$ | 7.586.76 | | |
| | | | | | | | | , . | İ | | | | | |
| | | | | | | | | | | | | | | |
| | | Dine steinless steel threaded 100 mm | | | | | | | | | | | | |
| | | diameter, schedule 40, type 304, includes | | | | | | | | | | | | |
| 38 | 221113643640 | couplings and hangers 3 m OC | | | \$ | 18,573.64 | \$ | 5,451.10 | \$ | - | \$ | 24,024.74 | | |
| | | | | | | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or | | | | | | | | | | | | |
| | | mm diameter, add 1 coupling (material | | | | | | | | | | | | |
| 8 | 221113484040 | only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 403.36 | \$ | 127.52 | \$ | - | \$ | 530.88 | | |
| | | | | | Ť | | Ť | | Ť | | Ť | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg, or | | | | | | | | | | | | |
| | | 90 Deg., steel, painted, grooved joint, 100 | | | | | | | | | | | | |
| | | only) per joint for installed price, incl joint | | | | | | | | | | | | |
| 5 | 221113484100 | coupling labor, excl joint coupling material | | | \$ | 478.50 | \$ | 286.40 | \$ | - | \$ | 764.90 | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or | | | | | | | | | | | | |
| | | 90 Deg., steel, painted, grooved joint, 40 | | | | | | | | | | | | |
| | | only) per joint for installed price, incl joint | | | | | | | | | | | | |
| 1 | 221113484060 | coupling labor, excl joint coupling material | | | \$ | 50.42 | \$ | 24.25 | \$ | - | \$ | 74.67 | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or | | | | | | | | | | | | |
| | | 90 Deg., steel, painted, grooved joint, 100 | | | | | | | | | | | | |
| | | only) per joint for installed price, incl joint | | | | | | | | | | | | |
| 10 | 221113484100 | coupling labor, excl joint coupling material | | | \$ | 957.00 | \$ | 572.80 | \$ | - | \$ | 1,529.80 | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or | | | | | | | | | | | | |
| | | 90 Deg., steel, painted, grooved joint, 100 | | | | | | | | | | | | |
| | | only) per joint for installed price, incl joint | | | | | | | | | | | | |
| 26 | 221113484100 | coupling labor, excl joint coupling material | | | \$ | 2,488.20 | \$ | 1,489.28 | \$ | - | \$ | 3,977.48 | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or | | | | | | | | | | | | |
| | | 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material | | | | | | | | | | | | |
| 0 | 001110404000 | only) per joint for installed price, incl joint | | | ¢ | 040.70 | ¢ | 140.40 | ¢ | | ¢ | 000 00 | | |
| 9 | 221113484030 | coupling labor, exci joint coupling material | | | \$ | 842.76 | \$ | 143.46 | \$ | - | \$ | 986.22 | | |
| | | | | | | | | | | | | | | |
| | | Pipe, fittings & valves, flange, black steel | | | | | | | | | | | | |
| | | painted, with grooved face for gasket, | | | | | | | | | | | | |
| | | grooved joint, class 125 and 150, 80 mm pipe size, add 1 coupling (material onlγ) | | | | | | | | | | | | |
| 2 | 221113485800 | per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 440 42 | \$ | 92.88 | \$ | _ | \$ | 533 30 | | |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 127 of 350

| | | | | | | Ext. Equip | |
|----------|---------------|---|--|---------------|-----------------|------------|----------------|
| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | O&P | Ext. Total O&P |
| 4 | 221113485820 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 100 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 1,177.16 | \$ 249.76 | \$- | \$ 1,426.92 |
| 8 | 221113484950 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 20 mm diameter | | \$ 226.40 | \$ 63.60 | \$- | \$ 290.00 |
| 1 | 221113484950 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 20 mm diameter | | \$ 28.30 | \$ 7.95 | \$ - | \$ 36.25 |
| | 0044404040404 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 80 mm | | | | | 0 |
| 8 | 221113484916 | diameter Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, | | \$ 518.64 | \$ 169.28 | \$ - | \$ 687.92 |
| 2 | 221113485030 | 100 mm diameter Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, | | \$ 158.46 | \$ 57.80 | \$ - | \$ 216.26 |
| 2 | 221113485030 | 100 mm diameter Pipe, fittings & valves, tee, steel, painted, grooved joint, 100 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, | | \$ 158.46 | \$ 57.80 | \$ - | \$ 216.26 |
| 1 | 221113484800 | excl joint coupling material Pipe, fittings & valves, tee, steel, painted, grooved joint, 100 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, evel joint coupling labor, | | \$ 1,123.64 | \$ 588.77 | \$ - | \$ 1,712.41 |
| 2 | 221113484800 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 100 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 321.04 | \$ 168.22 | s - | \$ 244.03 |
| 1 | 221113484990 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter | | \$ 42.70 | \$ 15.94 | \$ - | \$ 58.64 |
| 2 | 221113485030 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 100 mm diameter | | \$ 158.46 | \$ 57.80 | \$ - | \$ 216.26 |
| 1 | 221113485030 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 100 mm diameter | | \$ 79.23 | \$ 28.90 | \$- | \$ 108.13 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 128 of 350

| | | | i. | | | | | | • | | |
|----------|--------------|---|----|----|---------------|----|-----------------|----|-----------|----|----------------|
| Quantity | Line Number | Description | | | Ext. Mat. O&P | | Ext. Labour O&P | E) | t. Equip. | | Ext. Total O&P |
| | | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe | | | | | | | O&P | | |
| 1 | 221113488010 | joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 8,062.66 | \$ | 26.32 | \$ | - | \$ | 8,088.98 |
| 8 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandle exclusion coupling material | | \$ | 64 501 28 | \$ | 210.56 | \$ | | \$ | 64 711 84 |
| 8 | 221113488050 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 100 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle. excl ioint coupling material | | \$ | 64,501,28 | \$ | 520.16 | \$ | _ | \$ | 65.021.44 |
| 2 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandle act loint coupling material | | ¢ | 16 125 32 | ¢ | 52.64 | ¢ | | ¢ | 16 177 06 |
| 8 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandle exclusion coupling material | | ¢ | 64 501 28 | ¢ | 210.56 | ¢ | | ¢ | 64 711 84 |
| | 221113400010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 100 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | Ψ | 04,301.20 | Ψ | 210.00 | Ψ | - | ψ | 04,711.04 |
| 2 | 221113488050 | handle, excl joint coupling material Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 100 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | \$ | 16,125.32 | \$ | 130.04 | \$ | - | \$ | 16,255.36 |
| 8 | 221113488050 | handle, excl joint coupling material Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 304, includes couplings and hangers 3 m OC | | \$ | 8,062.66 | \$ | 466.48 | \$ | | \$ | 8,127.68 |
| 4 | 221113643560 | Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 304, includes couplings and hangers 3 m OC | | \$ | 185.24 | \$ | 200.20 | \$ | - | \$ | 385.44 |
| 1 | 221113643580 | Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 304, includes couplings and hangers 3 m OC | | \$ | 90.55 | \$ | 58.31 | \$ | - | \$ | 148.86 |
| 1 | 221113643560 | Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 304, includes couplings and hangers 3 m OC | | \$ | 46.31 | \$ | 50.05 | \$ | _ | \$ | 96.36 |
| 1 | 221113484912 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter | | \$ | 49.39 | s | 15.94 | \$ | _ | \$ | 65.33 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 129 of 350

| | | | | | | | | | E | t Equip | - | |
|-------------|----------------|---|--------------------------|------------|----|---------------|---------|-----------------|----|----------|---------|----------------|
| Quantity | Line Number | Description | | | | Ext. Mat. O&P | | Ext. Labour O&P | E, | O&P | | Ext. Total O&P |
| 1 | 221113484960 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter | | | \$ | 28.30 | \$ | 7.95 | \$ | <u>.</u> | \$ | 36.25 |
| | | Gasket and bolt set, for flanges, 1034 kPa, | | | | | | | | | | |
| 8 | 221113470630 | 50 mm pipe size | | | \$ | 80.64 | \$ | 491.20 | \$ | | \$ | 571.84 |
| 2 | 221113484918 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 100 mm diameter | | | \$ | 180.08 | \$ | 57.80 | \$ | - | \$ | 237.88 |
| 8 | 221112484018 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 100 mm | | | ¢ | 720.32 | ¢ | 231.20 | \$ | | ¢ | 051.52 |
| 0 | 221113404910 | diameter | | | ¢ | 720.32 | ¢ | 231.20 | ¢ | - | ¢ | 951.52 |
| | | | | | \$ | 278,237.70 | \$ | 14,253.45 | \$ | - | \$ | 292,491.15 |
| | | | Sampling | | | | \$ | 19,057.50 | | | \$ | 19,057.50 |
| | | | Welder Q1 | 0.5 | | | \$ ¢ | 6,040.26 | | | \$ | 6,040.26 |
| | | | OA inspection | 0.5 | | | ຈ \$ | 3.975.00 | | | ֆ Տ | 3.975.00 |
| | | | Base subtotal labor | | | | \$ | 45,235.94 | | | \$ | 323,473.64 |
| | | | EMWG pipe factor | 35.9782609 | | | \$ | 1,627,510.27 | | | \$ | 1,627,510.27 |
| | | | Subtotal with EMGW | 15 | | | \$ | 1,672,746.21 | | | \$ ¢ | 1,950,983.91 |
| | | | SS premium fixtures 2.5x | 2.5 | \$ | 88.278.50 | Ą | 2,509,119.51 | | | φ \$ | 88.278.50 |
| | | | Material subtotal | | \$ | 366,516.20 | | | | | \$ | 4,548,381.71 |
| | | | NC factor | 0 | \$ | | | | | | \$ | |
| D 01 04 W | lest Annex PHT | Pump discharge nining | | | Ş | 366,516.20 | Ş | 4,181,865.51 | | | \$ | 4,548,381.71 |
| Data Releas | se : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| 65 | 221113643560 | Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 304, includes couplings and hangers 3 m OC | | | \$ | 3,010.15 | \$ | 3,253.25 | \$ | | \$ | 6,263.40 |
| 3 | 221113643610 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 304, includes couplings and hangers 3 m OC | | | \$ | 580.35 | \$ | 247.68 | \$ | - | \$ | 828.03 |
| 143 | 221113644320 | Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 17,215.77 | \$ | 7,304.44 | \$ | - | \$ | 24,520.21 |
| 116 | 221113644330 | Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 19,337.20 | \$ | 6,763.96 | \$ | - | \$ | 26,101.16 |
| 5 | 221113644360 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 1,672.15 | \$ | 412.80 | \$ | _ | \$ | 2,084.95 |
| 2 | 221113644360 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 668.86 | \$ | 165.12 | \$ | | \$ | 833.98 |
| 2 | 221113644360 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 668.86 | \$ | 165.12 | \$ | - | \$ | 833.98 |
| 72 | 221113644360 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 24,078.96 | \$ | 5,944.32 | \$ | - | \$ | 30,023.28 |
| | | Pipe, stainless steel, threaded, 100 mm diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 54 | 221113644390 | couplings and hangers 3 m OC | | | \$ | 37,507.32 | \$ | 7,746.30 | \$ | - | \$ | 45,253.62 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 130 of 350

| | | | | | | Ext. Equip | |
|----------|--------------|--|--|---------------|-----------------|-------------|-----------------|
| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | O&P | Ext. Total O&P |
| 3 | 221113484030 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 280.92 | \$ 47.82 | \$- | \$ 328.74 |
| | | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | | | | |
| ŏ | 221113484030 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | \$ /49.12 | ¢ 127.52 | \$ - | \$ 870.04 |
| 41 | 221113484030 | coupling labor, excl joint coupling material | | \$ 3,839.24 | \$ 653.54 | \$- | \$ 4,492.78 |
| 23 | 221113484040 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 1,159.66 | \$ 366.62 | \$ - | \$ 1.526.28 |
| 2 | 221112494070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling these availables price analysis | | £ 100.94 | ¢ 63.00 | ¢ | ¢ 464.92 |
| 2 | 221113484070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | \$ 100.84 | \$ 53.98 | \$ - | \$ 104.82 |
| 25 | 221113484070 | coupling labor, excl joint coupling material Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | \$ 1,260.50 | \$ 799.75 | \$ - | \$ 2,060.25 |
| 13 | 221113464090 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint | | φ 1,143./4 | a 303.42 | \$ - | φ 1,707.10 |
| 2 | 221113485780 | coupling labor, excl joint coupling material Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint | | \$ 329.28 | \$ 69.14 | \$- | \$ 398.42 |
| 2 | 221113485780 | coupling labor, excl joint coupling material | | \$ 329.28 | \$ 69.14 | \$- | \$ 398.42 |
| 1 | 221113485780 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 164.64 | \$ 34.57 | \$- | \$ 199.21 |
| | 204442405700 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint | | 6 000 00 | | | 6 000 10 |
| 2 | 221113403760 | couping labor, exci joint couping material | | ψ 329.20 | ψ 09.14 | ψ - | ψ 390.42 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 131 of 350

| | | | | | | Tuge To | |
|----------|--------------|---|--|---------------|-----------------|--------------------|----------------|
| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
| 12 | 221113485780 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material Pipe, fittings & valves, flange, black steel, | | \$ 1,975.68 | \$ 414.84 | \$ - | \$ 2,390.52 |
| 4 | 221113485800 | painted, with grooved face for gasket, grooved joint, class 125 and 150, 80 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material Pine fittings & valves, coupling, steel | | \$ 880.84 | \$ 185.76 | \$ - | \$ 1,066.60 |
| 4 | 221113484950 | painted, standard, flexible, grooved joint, 20 mm diameter | | \$ 113.20 | \$ 31.80 | \$- | \$ 145.00 |
| 3 | 221113484960 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter | | \$ 84.90 | \$ 23.85 | \$- | \$ 108.75 |
| 1 | 221113484980 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 40 nm diameter | | \$ 39.62 | \$ 11.87 | \$ - | \$ 51.49 |
| 3 | 221113485000 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 65 mm diameter | | \$ 149.73 | \$ 53.73 | \$- | \$ 203.46 |
| 1 | 221113484700 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 100.33 | \$ 21.16 | \$ - | \$ 121.49 |
| 4 | 221113484700 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 401.32 | \$ 84.64 | \$ - | \$ 485.96 |
| 5 | 221113484740 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 385.90 | \$ 121.25 | \$ - | \$ 507.15 |
| 4 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 308.72 | \$ 187.84 | \$ - | \$ 496.56 |
| 5 | 221113484740 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 385.90 | \$ 121.25 | \$ - | \$ 507.15 |
| 4 | 221113484740 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 308.72 | \$ 97.00 | \$ - | \$ 405.72 |
| 2 | 221113484760 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 154.36 | \$ 72.24 | \$ - | \$ 226.60 |
| 10 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 771.80 | \$ 469.60 | \$- | \$ 1,241.40 |

| Quantity | Line Number | Description | | | Ext. Mat. O&P | | Ext. Labour O&P | E: | xt. Equip. | | Ext. Total O&P |
|----------|--------------|---|--|----|---------------|----|-----------------|----|------------|----|----------------|
| | 224442484700 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, out load eventione entering | | ¢ | 211.00 | ¢ | 120.04 | ¢ | U&P | ¢ | 242.02 |
| 2 | 221113484790 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, | | \$ | 211.98 | \$ | 130.04 | \$ | - | \$ | 342.02 |
| 3 | 221113484980 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint. | | Ъ | 118.86 | \$ | 35.61 | \$ | - | \$ | 154.47 |
| 5 | 221113484990 | 50 mm diameter Pipe, fittings & valves, coupling, steel, | | \$ | 213.50 | \$ | 79.70 | \$ | - | \$ | 293.20 |
| 6 | 221113484990 | painted, standard, flexible, grooved joint, 50 mm diameter | | \$ | 256.20 | \$ | 95.64 | \$ | | \$ | 351.84 |
| 1 | 221113484908 | painted, rigid style, grooved joint, 25 mm diameter | | \$ | 39.10 | \$ | 7.95 | \$ | - | \$ | 47.05 |
| 3 | 221113484908 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm diameter | | \$ | 117.30 | \$ | 23.85 | \$ | - | \$ | 141.15 |
| 7 | 221113488240 | Pipe, fittings & valves, valve, butterfly, stainless steel trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandle, excl joint coupling material | | \$ | 56 438 62 | \$ | 184 24 | \$ | | \$ | 56 622 86 |
| 11 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 88,689.26 | \$ | 289.52 | \$ | | \$ | 88,978.78 |
| | 221112488040 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | ¢ | 000.00 | ¢ | 26.22 | ¢ | | ¢ | 0.000.00 |
| 2 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandle excl ioint coupling material | | \$ | 16 125 32 | ÷ | 69.14 | \$ | | Ŷ | 16 194 46 |
| 4 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 32,250,64 | \$ | 138.28 | \$ | | \$ | 32,388,92 |
| 2 | 221112400020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 80 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandle, or licit coupling material | | ¢ | 24 197 09 | ¢ | 142.07 | ¢ | | ¢ | 24 224 05 |
| 2 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandle oxid ioint coupling material | | ¢ | 16 125 32 | ę | 52.64 | ¢ | Ī | ¢ | 16 177 06 |
| 2 | 004440400040 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bondle, or di joint cavitation | | ¢ | 10,120.32 | 9 | 52.04 | ψ | | φ | 10,177.30 |
| 2 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price ind 2 presition. | | \$ | 10,125.32 | \$ | 52.64 | \$ | | Φ | 16,177.96 |
| 2 | 221113488020 | handle, excl joint coupling material | | \$ | 16,125.32 | \$ | 69.14 | \$ | - | \$ | 16,194.46 |
Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 133 of 350

| Quantity | Line Number | Description | | | Ext. Mat. O&P | | Ext. Labour O&P | E | xt. Equip. O&P | | Ext. Total O&P |
|----------|------------------------------|--|--|----|---------------------|----------|-----------------|----------|-------------------|----|---------------------|
| 2 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 16,125.32 | \$ | 69.14 | \$ | - | \$ | 16,194.46 |
| 2 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 16,125,32 | \$ | 69.14 | \$ | _ | \$ | 16,194.46 |
| 3 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 24,187.98 | \$ | 103.71 | \$ | | \$ | 24,291.69 |
| 2 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 16,125.32 | \$ | 52.64 | \$ | <u>.</u> | \$ | 16,177.96 |
| 1 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 8,062.66 | \$ | 34.57 | \$ | <u>.</u> | \$ | 8,097.23 |
| 2 | 221113488030 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 80 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandle excl joint coupling material | | \$ | 16 125 32 | \$ | 95.98 | \$ | _ | \$ | 16 221 30 |
| 1 | 221112488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 80 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandle, or up light percent | | ¢ | 12,120.02 | ¢ | 47.00 | ¢ | | ¢ | 12 545 64 |
| | 221113400030 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | ¢ | 40,490.05 | Ŷ | 47.55 | \$ | - | Ŷ | 43,540.04 |
| | 221113466010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | \$ | 43,496.05 | \$ | 20.32 | • | - | \$ | 43,524.97 |
| 1 | 221113488010 232120880120 | handle, excl joint coupling material Venturi flow, measuring device, 25 mm diameter | | \$ | 43,498.65 344.72 | \$ \$ | 26.32 42.83 | \$ \$ | - | \$ | 43,524.97 387.55 |
| 1 | 221113485030 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 100 mm diameter | | \$ | 79.23 | \$ | 28.90 | \$ | | \$ | 108.13 |
| 6 | 221113484950 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 20 mm diameter | | \$ | 169.80 | \$ | 47.70 | \$ | | \$ | 217.50 |
| 2 | 221113484950 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 20 mm diameter | | \$ | 56.60 | \$ | 15.90 | \$ | - | \$ | 72.50 |
| | 00111010101000 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, | | ¢ | 110.00 | • | 24.00 | • | | • | 445.00 |
| 6 | 221113484960 | 25 mm diameter Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter | | \$ | 113.20 | \$ | 31.80 | \$ | | \$ | 217 50 |
| U | | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, | | Ψ | 109.00 | Ψ | 47.70 | Ŷ | | Ψ | 217.30 |
| 2 | 221113484770 | excl joint coupling material Gasket and bolt set, for flanges, 1034 kPa, | | \$ | 154.36 | \$ | 93.92 | \$ | - | \$ | 248.28 |
| 1 | 221113470630 | 50 mm pipe size | | \$ | 10.08 | \$ | 61.40 | \$ | - | \$ | 71.48 |

| Quantity | Line Number | Description | | | | Ext. Mat. O&P | | Ext. Labour O&P | E | xt. Equip. O&P | | Ext. Total O&P |
|-------------|----------------|---|--------------------------|-------------|----|---------------|--------|-----------------|----|-------------------|----------|----------------|
| | | | | | | | | | | | | |
| | | | Consuline | | \$ | 623,920.18 | \$ | 39,059.10 | \$ | - | \$ | 662,979.28 |
| | | | Sampling Waldan Q1 | 0.5 | | | \$ | 19,057.50 | | | \$ | 19,057.50 |
| | | | Welder Q1 | 0.5 | | | ¢ | 4,092.42 | | | þ ¢ | 4,092.42 |
| | | | Welder QZ | 0.33 | | | ¢ | 2,502.10 | | | ¢ ¢ | 2,502.10 |
| | | | Ω inspection | 1 | | | ¢ ¢ | 29,127.97 | | | ę | 29,802 49 |
| | | | Base subtotal labor | 1 | | | | 117,721,57 | | | \$ | 741.641.75 |
| | | | EMWG pipe factor | 35.9782609 | | | \$ | 4.235.417.36 | | | \$ | 4.235.417.36 |
| | | | Subtotal with EMGW | 55157 62005 | | | \$ | 4,353,138.93 | | | \$ | 4,977,059.11 |
| | | | Labor factor 2.5x | 1.5 | | | \$ | 6,529,708.39 | | | \$ | 6,529,708.39 |
| | | | SS premium fixtures 2.5x | 2.5 | \$ | 44,505.63 | | | | | \$ | 44,505.63 |
| | | | Material subtotal | | \$ | 668,425.81 | | | | | \$ | 11,551,273.12 |
| | | | NC factor | 0.32448049 | \$ | 54,203.65 | | | | | \$ | 54,203.65 |
| | | | | | \$ | 722,629.46 | \$ | 10,882,847.31 | | | \$ | 11,605,476.77 |
| | | | | | | | | | | | | |
| D_01_05 W | est Annex PHT | tank inlet and vent piping | | | | | | | | | | |
| Data Releas | se : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 25 mm | | | | | | | | | | |
| | | diameter, schedule 40, type 304, includes | | | | | | | | | | |
| 1 | 221113643580 | couplings and hangers 3 m OC | | | \$ | 90.55 | \$ | 58.31 | \$ | - | \$ | 148.86 |
| | | | | | | | | | | | | |
| | | Ding staiplass staal threaded 15 mm | | | | | | | | | | |
| | | diameter, schedule 40, type 304, includes | | | | | | | | | | |
| 5 | 221113643560 | couplings and hangers 3 m OC | | | \$ | 231 55 | \$ | 250.25 | \$ | _ | \$ | 481 80 |
| Ū | 221110040000 | | | | Ψ | 201.00 | Ψ | 200.20 | Ψ | | Ψ | 401.00 |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 25 mm | | | | | | | | | | |
| 2 | 001110010500 | diameter, schedule 40, type 304, includes | | | ¢ | 101 10 | • | 116.60 | ¢ | | ¢ | 207 72 |
| 2 | 221113043360 | couplings and hangers 3 m OC | | | ф | 101.10 | ¢ | 110.02 | Þ | - | ф | 291.12 |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 20 mm | | | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 11 | 221113644320 | couplings and hangers 3 m OC | | | \$ | 1,324.29 | \$ | 561.88 | \$ | - | \$ | 1,886.17 |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 50 mm | | | | | | | | | | |
| 50 | 001110011000 | diameter, schedule 40, type 316, includes | | | ¢ | 17 200 26 | • | 4 000 40 | ¢ | | ¢ | 04 600 40 |
| 52 | 221113044300 | couplings and hangers 5 m OC | | | φ | 17,390.30 | φ | 4,295.12 | φ | - | φ | 21,003.40 |
| | | Pipe, stainless steel, threaded, 50 mm | | | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 114 | 221113644360 | couplings and hangers 3 m OC | | | \$ | 38,125.02 | \$ | 9,411.84 | \$ | - | \$ | 47,536.86 |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 100 mm | | | | | | | | | | |
| 40 | 004440044000 | diameter, schedule 40, type 316, includes | | | ¢ | 07 700 00 | | 5 700 00 | | | ~ | 00 504 00 |
| 40 | 221113644390 | couplings and hangers 3 m OC | | | \$ | 27,783.20 | \$ | 5,738.00 | \$ | - | \$ | 33,521.20 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or | | | | | | | | | | |
| | | mm diameter, add 1 coupling (material | | | | | | | | | | |
| | | only) per joint for installed price incligint | | | | | | | | | | |
| 1 | 221113484030 | coupling labor, excl joint coupling material | | | \$ | 93.64 | \$ | 15.94 | \$ | - | \$ | 109.58 |
| | | | | | Ť | | Ť | | Ť | | - | |
| | | | | | | | | | | | | |
| | | Pipe fittings & valves elbow 45 Deg or | | | | | | | | | | |
| | | 90 Deg., steel, painted, grooved joint, 20 | | | | | | | | | | |
| | | mm diameter, add 1 coupling (material | | | | | | | | | | |
| | | only) per joint for installed price, incl joint | | | | | | | | | | |
| 8 | 221113484030 | coupling labor, excl joint coupling material | | | \$ | 749.12 | \$ | 127.52 | \$ | - | \$ | 876.64 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or | | | | | | | | | | |
| | | 90 Deg., steel, painted, grooved joint, 50 | | | | | | | | | | |
| | | mm diameter, add 1 coupling (material | | | | | | | | | | |
| 20 | 221113484070 | coupling labor, exclusion coupling material | | | ¢ | 1 008 /0 | ¢ | 639.80 | ¢ | _ | ¢ | 1 6/8 20 |
| 20 | 221110404070 | coupling labor, exci joint coupling matchai | | | Ψ | 1,000.40 | Ψ | 000.00 | Ψ | - | Ψ | 1,040.20 |
| | | | | | | | | | | | | |
| | | Pine fittings & values elhow 45 Dec. or | | | | | | | | | | |
| | | 90 Deg., steel, painted, grooved joint, 50 | | | | | | | | | | |
| | | mm diameter, add 1 coupling (material | | | | | | | | | | |
| | | only) per joint for installed price, incl joint | | | | | | | | | | |
| 15 | 221113484070 | coupling labor, excl joint coupling material | | | \$ | 756.30 | \$ | 479.85 | \$ | - | \$ | 1,236.15 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or | | | | | | | | | | |
| | | 90 Deg., steel, painted, grooved joint, 50 | | | | | | | | | | |
| | | mm diameter, add 1 coupling (material | | | | | | | | | | |
| 0.4 | 00111010101070 | only) per joint for installed price, incl joint | | | • | | ~ | 004.00 | | | | 0.554.51 |
| 31 | 221113484070 | coupling labor, exci joint coupling material | | | Ф | 1,563.02 | \$ | 991.69 | \$ | - | ф | 2,554.71 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 135 of 350

| | | | | | | | | | ugo iot | | 000 |
|----------|---------------|--|--|----|---------------|----|-----------------|----|-----------|----|----------------|
| Quantity | Line Number | Description | | | Ext. Mat. O&P | | Ext. Labour O&P | E | t. Equip. | | Ext. Total O&P |
| 2 | 221113484090 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 175.96 | \$ | 86.68 | \$ | <u> </u> | \$ | 262.64 |
| 7 | 221113484000 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl init coupling material | | ¢ | 615 86 | ¢ | 303 38 | ¢ | _ | ¢ | 910 24 |
| , | 2211134040530 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint | | • | 100.00 | Ŷ | 400.74 | Ŷ | | Ŷ | 503.00 |
| | 221113403700 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 80 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint | | φ | 493.92 | ð | 103.71 | Þ | _ | \$ | 597.63 |
| 1 | 221113485800 | coupling labor, excl joint coupling material Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor. | | \$ | 220.21 | \$ | 46.44 | \$ | | \$ | 266.65 |
| 1 | 221113484770 | excl joint coupling material Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, | | \$ | 77.18 | \$ | 46.96 | \$ | - | \$ | 124.14 |
| 16 | 221113484770 | excl joint coupling material Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm | | \$ | 1,234.88 | \$ | 751.36 | \$ | | \$ | 1,986.24 |
| 4 | 221113484908 | diameter Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm | | \$ | 156.40 | Ş | 31.80 | \$ | - | \$ | 188.20 |
| 2 | 221113484908 | diameter Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm | | \$ | 78.20 | \$ | 15.90 | \$ | | \$ | 94.10 |
| 2 | 221113484908 | diameter Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle. excl joint coupling material | | \$ | 16.125.32 | \$ | 52.64 | \$ | - | \$ | 47.05 |
| 8 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 64,501.28 | \$ | 276.56 | \$ | - | \$ | 64,777.84 |
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 8.062.66 | \$ | 26.32 | \$ | | \$ | 8.088.98 |
| | | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | | | | | | | | |
| 8 | 221113488010 | nandle, exci joint coupling material | | \$ | 64,501.28 | \$ | 210.56 | \$ | - | \$ | 64,711.84 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 136 of 350

| | | | | | | | | | ſ | -age 130 | 0 | 350 |
|-------------|----------------|--|--------------------------|------------|----|---------------|----|-----------------|----|------------|----|----------------|
| Quantity | Line Number | Description | | | | Ext Mat OPP | | Ext. Labour OPP | E | kt. Equip. | | Ext. Total OPP |
| Quantity | Line Number | Description | | | | EXI. Mat. O&P | | Ext. Labour O&P | | O&P | | Ext. Total O&P |
| 1 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 8,062.66 | \$ | 34.57 | \$ | _ | \$ | 8,097.23 |
| | | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | | | | | | | | | |
| 2 | 221113488020 | handle, excl joint coupling material Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, | | | \$ | 16,125.32 | \$ | 69.14 | \$ | - | \$ | 16,194.46 |
| 1 | 221113484960 | 25 mm diameter Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, | | | \$ | 28.30 | \$ | 7.95 | \$ | - | \$ | 36.25 |
| 1 | 221113484960 | 25 mm diameter | | | \$ | 28.30 | \$ | 7.95 | \$ | - | \$ | 36.25 |
| 20 | 221113470630 | 50 mm pipe size | | | \$ | 201.60 | \$ | 1,228.00 | \$ | - | \$ | 1,429.60 |
| | | | | | \$ | 270,024.98 | \$ | 25,992.69 | \$ | - | \$ | 296,017.67 |
| | | | Sampling | | | | \$ | 19,057.50 | | | \$ | 19,057.50 |
| | | | Welder Q1 | 0.5 | | | \$ | 9,939.73 | | | \$ | 9,939.73 |
| | | | Welder Q2 | 0.33 | | | \$ | 1,912.67 | | | \$ | 1,912.67 |
| | | | Welder P | 0.5 | | | \$ | 3,056.62 | | | \$ | 3,056.62 |
| | | | QA inspection | 1 | | | \$ | 14,909.01 | | | \$ | 14,909.01 |
| | | | Base subtotal labor | | | | \$ | 74,868.21 | | | \$ | 344,893.19 |
| | | | EMWG pipe factor | 35.9782609 | | | \$ | 2,693,628.11 | | | \$ | 2,693,628.11 |
| | | | Subtotal with EMGW | | | | \$ | 2,768,496.32 | | | \$ | 3,038,521.30 |
| | | | Labor factor 2.5x | 1.5 | | | \$ | 4,152,744.49 | | | \$ | 4,152,744.49 |
| | | | SS premium fixtures 2.5x | 2.5 | \$ | 18,800.98 | | | | | \$ | 18,800.98 |
| | | | Materialsl subtotla | | \$ | 288,825.96 | | | | | \$ | 7,210,066.76 |
| | | | NC factor | 0.32448049 | \$ | 6,100.55 | | | | | \$ | 6,100.55 |
| | | | | | \$ | 294,926.50 | \$ | 6,921,240.81 | | | \$ | 7,216,167.31 |
| | | | | | | | | | | | | |
| D_01_06 W | est annex mod | pump suction piping | | | | | | | | | | |
| Data Releas | se : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| 3 | 221113644320 | Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 361.17 | \$ | 153.24 | \$ | - | \$ | 514.41 |
| 2 | 221112614220 | Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes | | | ¢ | 261 17 | ¢ | 152.04 | ¢ | | ¢ | 514.41 |
| 3 | 221113044320 | couplings and hangers 3 m OC | | | Þ | 301.17 | Ŷ | 155.24 | Þ | - | ¢ | 514.41 |
| 37 | 221113644360 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 12,373.91 | \$ | 3,054.72 | \$ | - | \$ | 15,428.63 |
| | | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed orice incl joint | | | | | | | | | | |
| 8 | 221113484030 | coupling labor, excl joint coupling material | | | \$ | 749.12 | \$ | 127.52 | \$ | - | \$ | 876.64 |
| 13 | 221113484080 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 65 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor. excl ioint coupling material | | | \$ | 655.46 | s | 462.80 | \$ | | \$ | 1,118,26 |
| 13 | 221113404080 | ocaping labor, exer joint coupling material | | | ψ | 000.40 | ψ | 402.00 | φ | | ψ | 1,110.20 |
| | | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 65 mm diameter, add 1 coupling (material | | | | | | | | | | |
| 10 | 221113484080 | only) per joint for installed price, incl joint | | | \$ | 957 09 | ¢ | 676.40 | ¢ | | \$ | 1 63/ 39 |
| 19 | 221110404060 | souphing labor, exci joint coupling material | | | Ψ | 901.90 | ψ | 070.40 | Ψ | - | ψ | 1,034.30 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 137 of 350

| | | | | | | Page 15 | 1 01 350 |
|----------|--------------|--|------|---------------------|-----------------|--------------------|----------------|
| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. | Ext. Total O&P |
| 1 | 221113484780 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 65 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 77.18 | \$ 53.15 | <u>0≰</u> ₽ \$- | \$ 130.33 |
| 7 | 221113484780 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 65 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 540.26 | \$ 372.05 | \$ - | \$ 912.31 |
| 4 | 221113485790 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 65 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl init coupling material | | \$ 819.08 | \$ 154.80 | \$ - | \$ 973.88 |
| 2 | 221113485780 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 329.28 | \$ 69.14 | \$ - | \$ 398.42 |
| 2 | 221113484990 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter | | \$ 85.40 | \$ 31.88 | \$- | \$ 117.28 |
| 7 | 221113485000 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 65 mm diameter | | \$ 349.37 | \$ 125.37 | \$- | \$ 474.74 |
| 1 | 221113484980 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 40 mm diameter | | \$ 39.62 | \$ 11.87 | \$- | \$ 51.49 |
| 1 | 221113484980 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 40 mm diameter | | \$ 39.62 | \$ 11.87 | \$- | \$ 51.49 |
| 1 | 221113484980 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 40 mm diameter | | \$ 39.62 | \$ 11.87 | \$- | \$ 51.49 |
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ 8,062.66 | \$ 26.32 | \$- | \$ 8,088.98 |
| 7 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ 56,438.62 | \$ 184.24 | \$ - | \$ 56,622.86 |
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandle exclinit coupling material | | \$ 8,062,66 | \$ 26.32 | \$ - | \$ 8,088.98 |
| | | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 80 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | 0,002.00 | 20.32 | | 0,000.80 |
| g | 221113488030 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, and 2 position. | | ə <u>391,487.85</u> | ə 431.91 | ۵ - | ¢ 391,919.76 |
| 7 | 221113488010 | handle, excl joint coupling material | | \$ 304,490.55 | \$ 184.24 | \$ - | \$ 304,674.79 |

| Quantity | Line Number | Description | | | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. | | Ext. Total O&P |
|-------------|----------------|---|--------------------------|------------|----|---------------|--------------------------------|-------------|---------|----------------------------|
| | | | | | | | | 001 | | |
| | | Pipe, fittings & valves, coupling, steel, | | | | | | | | |
| | | painted, rigid style, grooved joint, 25 mm | | | | | | | | |
| 1 | 221113484908 | diameter | | | \$ | 39.10 | \$ 7.95 | \$- | \$ | 47.05 |
| | | | | | | | | | | |
| | | Pipe, fittings & valves, coupling, steel, | | | | | | | | |
| 1 | 221113484914 | diameter | | | \$ | 56.08 | \$ 17.91 | \$ - | \$ | 73 99 |
| | 2211101010111 | | | | ÷ | 00.00 | ¢ mor | Ŷ | Ť | 10.00 |
| | | Pipe, fittings & valves, coupling, steel. | | | | | | | | |
| | | painted, standard, flexible, grooved joint, | | | | | | | | |
| 1 | 221113484960 | 25 mm diameter | | | \$ | 28.30 | \$ 7.95 | \$ - | \$ | 36.25 |
| | | | | | | | | | | |
| | | Pipe, fittings & valves, coupling, steel, | | | | | | | | |
| 1 | 221113484912 | diameter | | | \$ | 49.39 | \$ 15.94 | \$ - | \$ | 65.33 |
| | 221110101012 | | | | ÷ | 10.00 | ¢ 10.01 | Ŷ | Ť | 00.00 |
| | | Pipe, fittings & valves, coupling, steel. | | | | | | | | |
| | | painted, rigid style, grooved joint, 65 mm | | | | | | | | |
| 1 | 221113484914 | diameter | | | \$ | 56.08 | \$ 17.91 | \$- | \$ | 73.99 |
| | | | | | | | | | | |
| | | Pipe, fittings & valves, coupling, steel, | | | | | | | | |
| 1 | 221113484014 | painted, rigid style, grooved joint, 65 mm | | | ¢ | 56.08 | ¢ 17.01 | ¢ | ¢ | 73.00 |
| 1 | 221113404914 | diameter | | | φ | 50.00 | φ 17.91 | φ - | φ | 15.55 |
| | | Pine fittings & valves coupling steel | | | | | | | | |
| | | painted, standard, flexible, grooved joint, | | | | | | | | |
| 1 | 221113484960 | 25 mm diameter | | | \$ | 28.30 | \$ 7.95 | \$- | \$ | 36.25 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | 004440470000 | Gasket and bolt set, for flanges, 1034 kPa, | | | ¢ | 40.00 | ¢ 045.00 | • | | 005.00 |
| 4 | 221113470630 | 50 mm pipe size | | | \$ | 40.32 | \$ 245.60 | ъ - | \$ | 285.92 |
| | | Ding fittings & values coupling steel | | | | | | | | |
| | | painted rigid style grooved joint 100 mm | | | | | | | | |
| 2 | 221113484918 | diameter | | | \$ | 180.08 | \$ 57.80 | \$- | \$ | 237.88 |
| | | | | | | | | | | |
| | | Pipe, fittings & valves, coupling, steel, | | | | | | | | |
| _ | | painted, rigid style, grooved joint, 125 mm | | | | | | | | |
| 7 | 221113484920 | diameter | | | \$ | 813.96 | \$ 249.20 | \$ - | \$ | 1,063.16 |
| | | | | | \$ | 787 668 27 | \$ 6 969 07 | s . | \$ | 794 637 34 |
| | | | Sampling | | ÷ | 101,000.21 | \$ 19.057.50 | Ť | \$ | 19.057.50 |
| | | | Welder Q1 | 0.5 | | | \$ 2,845.97 | | \$ | 2,845.97 |
| | | | Welder P | 1 | | | \$ 1,277.14 | | \$ | 1,277.14 |
| | | | QA inspection | 0.5 | | | \$ 2,061.55 | | \$ | 2,061.55 |
| | | | Base subtotal labor | 35 0782600 | | | \$ 32,211.23 ¢ 1 158 003 05 | | ¢ | 819,879.50 1 158 903 95 |
| | | | Subtotal with EMGW | 33.9762009 | | | \$ 1,158,905.95 | | 9 \$ | 1,978,783.44 |
| | | | Labor factor 2.5x | 1.5 | | | \$ 1,786,672.76 | | \$ | 1,786,672.76 |
| | | | SS premium fixtures 2.5x | 2.5 | \$ | 15,074.20 | | | \$ | 15,074.20 |
| | | | Materials subtotal | 0.00440040 | \$ | 802,742.47 | | | \$ | 3,780,530.40 |
| | | | INC factor | 0.32448049 | \$ | 4,891.28 | ¢ 2 077 797 02 | | \$ | 4,891.28 |
| D 01 07 W | est annext mod | pump discharge piping | | | | 007,033.73 | \$ 2,577,707.95 | | P | 5,765,421.05 |
| Data Releas | se : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 15 mm | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | |
| 5 | 221113644310 | couplings and hangers 3 m OC | | | \$ | 529.95 | \$ 250.25 | \$- | \$ | 780.20 |
| | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 15 mm | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | |
| 33 | 221113644310 | couplings and hangers 3 m OC | | | \$ | 3,497.67 | \$ 1,651.65 | \$- | \$ | 5,149.32 |
| | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 20 mm | | | | | | | | |
| | 0044450 | diameter, schedule 40, type 316, includes | | | | | • | • | | |
| 5 | 221113644320 | couplings and hangers 3 m OC | | | \$ | 601.95 | \$ 255.40 | \$- | \$ | 857.35 |
| | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 20 mm | | | | | | | | |
| 400 | 004440044000 | diameter, schedule 40, type 316, includes | | | • | 15 500 5 1 | 0 0 000 00 | • | | 00.440.55 |
| 129 | 221113644320 | couplings and hangers 3 m OC | | | \$ | 15,530.31 | \$ 6,589.32 | \$ - | \$ | 22,119.63 |
| | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 25 mm | | | | | | | | |
| 78 | 221113644330 | couplings and bangers 3 m OC | | | \$ | 13 002 60 | \$ 1.548.18 | \$ | ¢ | 17 550 78 |
| | | | | | * | .0,002.00 | | - | Ψ | ,000.70 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 139 of 350

| Quantity | Line Number | Description | | | Ext. Mat. O&P | | Ext. Labour O&P | E | ct. Equip. O&P | | Ext. Total O&P |
|----------|--------------|--|--|----|---------------|----|-----------------|----|-------------------|----|----------------|
| 48 | 221113644330 | Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 8,001.60 | \$ | 2,798.88 | \$ | | \$ | 10,800.48 |
| 72 | 221113644360 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 24,078.96 | \$ | 5,944.32 | \$ | - | \$ | 30,023.28 |
| 5 | 221113644360 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 1,672.15 | \$ | 412.80 | \$ | - | \$ | 2,084.95 |
| 198 | 221113644360 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 66,217.14 | \$ | 16,346.88 | \$ | - | \$ | 82,564.02 |
| 12 | 221113644360 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 4,013.16 | \$ | 990.72 | \$ | | \$ | 5,003.88 |
| | | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | | | | | | | | |
| 21 | 221113484030 | coupling labor, excl joint coupling material | | \$ | 1,966.44 | \$ | 334.74 | \$ | - | \$ | 2,301.18 |
| 8 | 221113484030 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor. excl ioint coupling material | | \$ | 749.12 | \$ | 127.52 | \$ | | \$ | 876.64 |
| 43 | 221113484030 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 4.026.52 | \$ | 685.42 | \$ | _ | \$ | 4,711.94 |
| 17 | 221112494040 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint eventing theter availables price analysis | | ¢ | 967.14 | ¢ | 270.08 | ¢ | | ¢ | 1 129 12 |
| | 221113404040 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | φ | 007.14 | Ŷ | 210.90 | Ŷ | - | Ŷ | 1,120.12 |
| | 221113484040 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material | | \$ | 554.02 | \$ | 1/5.34 | \$ | | \$ | 729.96 |
| 16 | 221113484060 | coupling labor, excl joint coupling material | | \$ | 806.72 | \$ | 388.00 | \$ | - | \$ | 1,194.72 |
| 1 | 221113484070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 50,42 | \$ | 31.99 | \$ | - | \$ | 82.41 |
| | 0044-005-00 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | | | | | • | | | |
| 1 | 221113484070 | coupling labor, exci joint coupling material | | \$ | 50.42 | Þ | 31.99 | \$ | - | \$ | 82.41 |

| Quantity | Line Number | Description | | | Ext. Mat. O&P | | Ext. Labour O&P | E> | ct. Equip. | | Ext. Total O&P |
|----------|------------------------------|--|--|----------|-----------------|----|-----------------|----|------------|----------|-----------------|
| 16 | 221113484070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 806.72 | \$ | 511.84 | \$ | - | \$ | 1,318.56 |
| 44 | 221113484070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 2,218.48 | \$ | 1,407.56 | \$ | - | \$ | 3,626.04 |
| 2 | 221113485780 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 329.28 | \$ | 69.14 | \$ | <u>-</u> | \$ | 398.42 |
| 2 | 221112495790 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling these avel init coupling material | | ¢ | 220.28 | ¢ | 60.14 | ¢ | | ¢ | 200.42 |
| Z | 221113403700 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint | | φ | 323.20 | Ŷ | 05.14 | Ŷ | - | Ŷ | 590.42 |
| 3 | 221113485780 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint | | \$ | 493.92 | \$ | 103.71 | \$ | | \$ | 597.63 |
| 14 | 221113485780 | coupling labor, excl joint coupling material Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint | | \$ | 2,304.96 | \$ | 483.98 | \$ | - | \$ | 2,788.94 |
| 1 | 221113485780 | coupling labor, excl joint coupling material Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint | | \$ | 164.64 | \$ | 34.57 | \$ | - | \$ | 199.21 |
| 1 | 221113485780 | coupling labor, excl joint coupling material Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, | | \$ | 164.64 | \$ | 34.57 | \$ | - | \$ | 199.21 |
| 6 | 221113484990 221113484950 | 50 mm diameter Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 20 mm diameter | | \$ \$ | 42.70 169.80 | \$ | 15.94 47.70 | \$ | - | \$ \$ | 58.64 217.50 |
| 2 | 221113484950 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 20 mm diameter | | \$ | 56.60 | \$ | 15.90 | \$ | - | \$ | 72.50 |
| 1 | 221113484970 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 32 mm diameter | | \$ | 36.53 | \$ | 9.96 | \$ | - | \$ | 46.49 |
| 1 | 221113484970 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 32 mm diameter | | \$ | 36.53 | \$ | 9.96 | \$ | - | \$ | 46.49 |
| 2 | 221113484990 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter | | \$ | 85.40 | \$ | 31.88 | \$ | | \$ | 117.28 |

| | CONFIDENTIAL | ATTORNEY | WORK | PRODUCT |
|--|--------------|----------|------|---------|
|--|--------------|----------|------|---------|

| Quantity | Line Number | Description | | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equi |) . | Ext. Total O&P |
|----------|--------------|--|--|----|---------------|-----------------|-----------|------------|----------------|
| 1 | 221113484700 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 100.33 | \$ 21.16 | \$ - | : | \$ 121.49 |
| 1 | 221113484700 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 100.33 | \$ 21.16 | \$- | ę | \$ 121.49 |
| 3 | 221113484740 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 231.54 | \$ 72.75 | \$ - | : | \$ 304.29 |
| 1 | 221112484740 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, evel joint coupling material | | ¢ | 77 19 | \$ 24.25 | ¢ | | 101.43 |
| | 221110404740 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, | | Ų | 71.10 | ų <u>1410</u> | φ - | | |
| 1 | 221113484760 | excl joint coupling material Pipe, fittings & valves, tee, steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, | | \$ | //.18 | \$ 36.12 | \$ - | | 5 113.30 |
| 1 | 221113484760 | excl joint coupling material Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed notice, incl joint coupling labor | | \$ | 77.18 | \$ 36.12 | \$ - | : | \$ 113.30 |
| 2 | 221113484740 | excl joint coupling material | | \$ | 154.36 | \$ 48.50 | \$- | : | \$ 202.86 |
| 2 | 221113484700 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 200.66 | \$ 42.32 | \$- | : | \$ 242.98 |
| 1 | 221113484700 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, evel joint coupling material | | ¢ | 100.33 | ¢ 21.16 | ¢ | | s 121.40 |
| 10 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 771.80 | \$ 469.60 | \$ - | | 5 1.241.40 |
| | | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm | | | | | | | |
| 1 | 221113484908 | diameter Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 40 mm | | \$ | 39.10 | \$ 7.95 | \$ - | : | \$ 47.05 |
| 1 | 221113484910 | diameter Pipe, fittings & valves, coupling, steel, | | \$ | 39.10 | \$ 11.87 | \$- | : | \$ 50.97 |
| 11 | 221113484912 | painted, rigid style, grooved joint, 50 mm diameter | | \$ | 543.29 | \$ 175.34 | \$- | : | \$ 718.63 |
| 7 | 221113484912 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter | | \$ | 345.73 | \$ 111.58 | \$- | : | \$ 457.31 |
| 3 | 221113484912 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter | | \$ | 148.17 | \$ 47.82 | \$- | : | \$ 195.99 |
| | | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 65 mm | | | | | | | |
| 1 | 221113484914 | diameter Pipe, fittings & valves, coupling, steel, | | \$ | 56.08 | \$ 17.91 | \$ - | : | 5 73.99 |
| 1 | 221113484910 | painted, rigid style, grooved joint, 40 mm diameter | | \$ | 39.10 | \$ 11.87 | \$ - | 5 | \$ 50.97 |

| CONFIDENTIAL | ATTORNEY | WORK | PRODUCT |
|--------------|----------|------|---------|
|--------------|----------|------|---------|

| | | | | | | | | | J | | |
|----------|--------------|--|--|----|---------------|----|-----------------|----|------------|----|----------------|
| Quantity | Line Number | Description | | | Ext. Mat. O&P | | Ext. Labour O&P | E | xt. Equip. | | Ext. Total O&P |
| | | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for incelled price incl 2 presiden | | | | | | | U&P | | |
| 6 | 221113488010 | handle, excl joint coupling material | | \$ | 260,991.90 | \$ | 157.92 | \$ | - | \$ | 261,149.82 |
| 12 | 004440400040 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | ¢ | 501.000.000 | ¢ | 245.04 | ¢ | | ¢ | 500.000.64 |
| 12 | 221113488010 | nandie, exci joint coupling material | | Ъ | 521,983.80 | \$ | 315.84 | \$ | - | \$ | 522,299.64 |
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 43,498.65 | \$ | 26.32 | \$ | _ | \$ | 43,524.97 |
| | | , | | | | | | | | | |
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandle exclusion coupling material | | \$ | 43 498 65 | s | 26 32 | \$ | | \$ | 43 524 97 |
| | 221113400010 | nandie, exer joint coupling matchai | | Ψ | +0,+00.00 | Ψ | 20.02 | Ψ | _ | Ψ | 40,024.01 |
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle. excl ioint coupling material | | \$ | 43.498.65 | \$ | 26.32 | \$ | _ | \$ | 43.524.97 |
| | 221110100010 | nanalo, one jenn oo aping material | | Ť | 10,100.00 | Ť | 20.02 | Ť | | Ţ | 10,02 1.01 |
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle. excl ioint coupling material | | \$ | 43.498.65 | \$ | 26.32 | \$ | _ | \$ | 43.524.97 |
| | | ······································ | | Ť | , | | | Ť | | Ť | , |
| 10 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 3,961.70 | \$ | 345.70 | \$ | _ | \$ | 4,307.40 |
| 2 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle. excl ioint coupling material | | \$ | 792.34 | \$ | 52.64 | \$ | - | \$ | 844.98 |
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandle act licit coupling material | | ¢ | 306 17 | ¢ | 26 32 | ¢ | | ¢ | 422.49 |
| | 221113400010 | | | φ | 390.17 | φ | 20.32 | ¢ | - | φ | 422.49 |
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 396.17 | \$ | 26.32 | \$ | - | \$ | 422.49 |
| 8 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 3,169.36 | \$ | 276.56 | \$ | - | \$ | 3,445.92 |
| | | | | | ., | | | | | | ., |
| 4 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl ioint coupling material | | \$ | 173,994 60 | \$ | 138.28 | \$ | _ | \$ | 174,132,88 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 143 of 350

| | | | | | | | | 43 01 330 | | |
|--|---|---|--|--------------------------|--|---|---|--|--|---|
| - ··· | | | | | | | | Ext. Equip. | | |
| Quantity | Line Number | Description | | | - | Ext. Mat. O&P | Ext. Labour O&P | O&P | | Ext. Total O&P |
| 3 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 1.188.51 | \$ 78.96 | \$ - | \$ | 1,267,47 |
| 2 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandle exclinit coupling material | | | s | 792 34 | \$ 52.64 | \$ - | \$ | 844 98 |
| - | 221110400010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | | Ŷ | 102.04 | Ç <u><u> </u></u> | ţ | Ŷ | 011.00 |
| 1 | 221113488010 | handle, excl joint coupling material Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, | | | \$ | 396.17 | \$ 26.32 | \$ - | \$ | 422.49 |
| 9 | 221113484960 221113484960 | 25 mm diameter Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter | | | \$ | 254.70 | \$ 71.55 \$ 71.55 | \$ - \$ - | \$ | 326.25 |
| 50 | 221113470630 | Gasket and bolt set, for flanges, 1034 kPa, 50 mm pipe size | | | \$ | 504.00 | \$ 3,070.00 | \$ - | \$ | 3,574.00 |
| | | | | | | | | | | |
| | | | | | \$ | 1,299,618.89 | \$ 50,673.59 | \$- | \$ | 1,350,292.48 |
| | | | Sampling | | | | \$ 19,057.50 | | \$ | 19,057.50 |
| | | | Welder Q1 | 0.5 | | | \$ 11,856.32 | | \$ | 11,856.32 |
| | | | Welder P | 1 | | | \$ 26,960.96 | | \$ | 26,960.96 |
| | | | QA inspection | 1 | | | \$ 38,817.28 | | \$ | 38,817.28 |
| | | | Base subtotal labor | | | | \$ 147,365.64 | | \$ | 1,446,984.53 |
| | | | EMWG pipe factor | 35.9782609 | | | \$ 5,301,959.44 | | \$ | 5,301,959.44 |
| | | | Subtotal with EMGW | | | | \$ 5,449,325.08 | | \$ | 6,748,943.97 |
| | | | | | | | | | | |
| | | | Labor factor 2.5x | 1.5 | | | \$ 8,173,987.62 | | \$ | 8.173.987.62 |
| _ | | | Labor factor 2.5x | 1.5 | \$ | 52 029 78 | \$ 8,173,987.62 | | \$ \$ | 8,173,987.62 52 029 78 |
| | | | Labor factor 2.5x SS premium fixtures 2.5x Materials subtotal | 1.5 2.5 | \$ ¢ | 52,029.78 | \$ 8,173,987.62 | | \$ \$ | 8,173,987.62 52,029.78 |
| | | | Labor factor 2.5x SS premium fixtures 2.5x Materials subtotal | 1.5 2.5 | \$ \$ | 52,029.78 1,351,648.67 | \$ 8,173,987.62 | | \$ \$ \$ | 8,173,987.62 52,029.78 14,974,961.36 |
| | | | Labor factor 2.5x SS premium fixtures 2.5x Materials subtotal NC factor | 1.5 2.5 0.32448049 | \$ \$ \$ | 52,029.78 1,351,648.67 16,882.65 | \$ 8,173,987.62 | | \$ \$ \$ | 8,173,987.62 52,029.78 14,974,961.36 16,882.65 |
| D. 04. 09.W | | | Labor factor 2.5x SS premium fixtures 2.5x Materials subtotal NC factor | 1.5 2.5 0.32448049 | \$ \$ \$ | 52,029.78 1,351,648.67 16,882.65 1,368,531.31 | \$ 8,173,987.62 \$ 13,623,312.70 | | \$ \$ \$ \$ | 8,173,987.62 52,029.78 14,974,961.36 16,882.65 14,991,844.01 |
| D_01_08 W | est annex mod | tank inlet and vent piping | Labor factor 2.5x SS premium fixtures 2.5x Materials subtotal NC factor | 1.5 2.5 0.32448049 | \$ \$ \$ | 52,029.78 1,351,648.67 16,882.65 1,368,531.31 | \$ 8,173,987.62 \$ 13,623,312.70 | | \$ \$ \$ \$ | 8,173,987.62 52,029.78 14,974,961.36 16,882.65 14,991,844.01 |
| D_01_08 W Data Releas | est annex mod se : Year 2020 | tank inlet and vent piping Unit Cost Estimate | Labor factor 2.5x SS premium fixtures 2.5x Materials subtotal NC factor | 1.5 2.5 0.32448049 | \$ \$ \$ | 52,029.78 1,351,648.67 16,882.65 1,368,531.31 | \$ 8,173,987.62 \$ 13,623,312.70 | | \$ \$ \$ \$ | 8,173,987.62 52,029.78 14,974,961.36 16,882.65 14,991,844.01 |
| D_01_08 W Data Releas | est annex mod se : Year 2020 | tank inlet and vent piping Unit Cost Estimate | Labor factor 2.5x SS premium fixtures 2.5x Materials subtotal NC factor | 1.5 2.5 0.32448049 | \$ \$ \$ | 52,029.78 1,351,648.67 16,882.65 1,368,531.31 | \$ 8,173,987.62 \$ 13,623,312.70 | | \$ \$ \$ \$ | 8,173,987.62 52,029.78 14,974,961.36 16,882.65 14,991,844.01 |
| D_01_08 W Data Releas | est annex mod se : Year 2020 | tank inlet and vent piping Unit Cost Estimate | Labor factor 2.5x SS premium fixtures 2.5x Materials subtotal NC factor | 1.5 2.5 0.32448049 | \$ \$ \$ | 52,029.78 1,351,648.67 16,882.65 1,368,531.31 | \$ 8,173,987.62 \$ 13,623,312.70 | | \$ \$ \$ \$ | 8,173,987.62 52,029.78 14,974,961.36 16,882.65 14,991,844.01 |
| D_01_08 W Data Releas | est annex mod se : Year 2020 221113644310 | tank inlet and vent piping Unit Cost Estimate Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | Labor factor 2.5x SS premium fixtures 2.5x Materials subtotal NC factor | 1.5 2.5 0.32448049 | \$ \$ \$ \$ | 52,029.78 1,351,648.67 16,882.65 1,368,531.31 | \$ 8,173,987.62 \$ 13,623,312.70 \$ 250.25 | \$ - | \$ \$ \$ \$ | 8,173,987.62 52,029.78 14,974,961.36 16,882.65 14,991,844.01 |
| D_01_08 W Data Releas 5 | est annex mod se : Year 2020 221113644310 221113644310 | tank inlet and vent piping Unit Cost Estimate Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | Labor factor 2.5x SS premium fixtures 2.5x Materials subtotal NC factor | 1.5 2.5 0.32448049 | \$ \$ \$ \$ | 52,029.78 1,351,648.67 16,882.65 1,368,531.31 529.95 | \$ 8,173,987.62 \$ 13,623,312.70 \$ 250.25 \$ 250.25 | \$ - \$ - | \$ \$ \$ \$ \$ | 8,173,987.62 52,029.78 14,974,961.36 16,882.65 14,991,844.01 780.20 780.20 |
| D_01_08 W Data Releas 5 5 | est annex mod se : Year 2020 221113644310 221113644310 221113644320 | tank inlet and vent piping Unit Cost Estimate Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | Labor factor 2.5x SS premium fixtures 2.5x Materials subtotal NC factor | 1.5 2.5 0.32448049 | \$ \$ \$ \$ \$ | 52,029.78 1,351,648.67 16,882.65 1,368,531.31 529.95 529.95 601.95 | \$ 8,173,987.62 \$ 13,623,312.70 \$ 250.25 \$ 250.25 \$ 255.40 | \$ - \$ - | \$ \$ \$ \$ \$ \$ \$ \$ \$ | 8,173,987.62 52,029.78 14,974,961.36 16,882.65 14,991,844.01 780.20 780.20 857.35 |
| D_01_08 W Data Releas 5 5 5 | est annex mod se : Year 2020 221113644310 221113644320 221113644320 | tank inlet and vent piping Unit Cost Estimate Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | Labor factor 2.5x SS premium fixtures 2.5x Materials subtotal NC factor | 1.5 2.5 0.32448049 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 52,029.78 1,351,648.67 16,882.65 1,368,531.31 529.95 529.95 601.95 1,203.90 | \$ 8,173,987.62 \$ 13,623,312.70 \$ 250.25 \$ 250.25 \$ 255.40 \$ 510.80 | \$ - \$ - \$ - | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 8,173,987.62 52,029.78 14,974,961.36 16,882.65 14,991,844.01 780.20 780.20 857.35 |
| D_01_08 W Data Releas 5 5 5 10 | est annex mod se : Year 2020 221113644310 221113644310 221113644320 221113644320 221113644320 | tank inlet and vent piping Unit Cost Estimate Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | Labor factor 2.5x SS premium fixtures 2.5x Materials subtotal NC factor | 1.5 2.5 0.32448049 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 52,029.78 1,351,648.67 16,882.65 1,368,531.31 529.95 529.95 601.95 1,203.90 20,734.66 | \$ 8,173,987.62 \$ 13,623,312.70 \$ 250.25 \$ 250.25 \$ 255.40 \$ 510.80 \$ 5,118.72 | \$ - \$ - \$ - \$ - | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 8,173,987.62 52,029.78 14,974,961.36 16,882.65 14,991,844.01 780.20 780.20 857.35 1,714.70 25,853.38 |
| D_01_08 W Data Releas 5 5 5 10 62 160 | est annex mod se : Year 2020 221113644310 221113644310 221113644320 221113644320 221113644360 | tank inlet and vent piping Unit Cost Estimate Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | Labor factor 2.5x SS premium fixtures 2.5x Materials subtotal NC factor | 1.5 2.5 0.32448049 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 52,029.78 1,351,648.67 16,882.65 1,368,531.31 529.95 529.95 601.95 1,203.90 20,734.66 53,508.80 | \$ 8,173,987.62 \$ 13,623,312.70 \$ 250.25 \$ 250.25 \$ 255.40 \$ 510.80 \$ 5,118.72 \$ 13,209.60 | \$ - \$ - \$ - \$ - \$ - | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 8,173,987.62 52,029.78 14,974,961.36 16,882.65 14,991,844.01 780.20 780.20 857.35 1,714.70 25,853.38 66,718.40 |
| D_01_08 W Data Releas 5 5 5 10 62 160 22 | est annex mod se : Year 2020 2211113644310 2211113644310 2211113644320 2211113644320 2211113644360 2211113644360 | tank inlet and vent piping Unit Cost Estimate Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | Labor factor 2.5x SS premium fixtures 2.5x Materials subtotal NC factor | 1.5 2.5 0.32448049 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 52,029.78 1,351,648.67 16,882.65 1,368,531.31 529.95 529.95 601.95 1,203.90 20,734.66 53,508.80 15,280.76 | \$ 8,173,987.62 \$ 13,623,312.70 \$ 250.25 \$ 250.25 \$ 255.40 \$ 510.80 \$ 5,118.72 \$ 13,209.60 \$ 3.155.90 | \$ - \$ - \$ - \$ - \$ - \$ - | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 8,173,987.62 52,029.78 14,974,961.36 16,882.65 14,991,844.01 780.20 780.20 857.35 1,714.70 25,853.38 66,718.40 18,436.66 |
| D_01_08 W Data Releas | est annex mod se : Year 2020 221113644310 221113644310 221113644320 221113644320 221113644360 221113644360 221113644390 | tank inlet and vent piping Unit Cost Estimate Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC Pipe, stainless steel, threaded, 100 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | Labor factor 2.5x SS premium fixtures 2.5x Materials subtotal NC factor | 1.5 2.5 0.32448049 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 52,029.78 1,351,648.67 16,882.65 1,368,531.31 529.95 529.95 601.95 1,203.90 20,734.66 53,508.80 15,280.76 | \$ 8,173,987.62 \$ 13,623,312.70 \$ 250.25 \$ 250.25 \$ 255.40 \$ 5,118.72 \$ 13,209.60 \$ 3,155.90 \$ 15.94 | \$ - \$ - \$ - \$ - \$ - \$ - \$ - | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 8,173,987.62 52,029.78 14,974,961.36 16,822.65 14,991,844.01 780.20 780.20 857.35 1,714.70 25,853.38 66,718.40 18,436.66 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 144 of 350

| | | | | | | | Page 14 | | | | 44 01 330 | | |
|--------------|--------------|--|---------------|------|----------|---------------|---------|-----------------|-----|----------|-----------|----------------|--|
| A 111 | | | | | | | | | Ext | . Equip. | | | |
| Quantity | Line Number | Description | | | | Ext. Mat. O&P | | Ext. Labour O&P | | O&P | | Ext. Total O&P | |
| 8 | 221113484030 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 749.12 | \$ | 127.52 | \$ | | \$ | 876.64 | |
| 27 | 221113484060 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl init coupling material | | | \$ | 1 361 34 | \$ | 654 75 | \$ | _ | s | 2.016.09 | |
| 2 | 221113484060 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, avdi bits coupling material | | | ¢ | 151.26 | ¢ | 72.75 | ¢ | | ¢ | 224.01 | |
| 32 | 221113484000 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ \$ | 1,613.44 | \$ | 1,023.68 | \$ | | \$ | 2,637.12 | |
| 36 | 221113484070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 1,815.12 | \$ | 1,151.64 | \$ | _ | \$ | 2,966.76 | |
| 1 | 221112484000 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling tables, and init coupling material | | | ¢ | 97.09 | ¢ | 42.24 | ¢ | | ¢ | 124.22 | |
| 1 | 221113484090 | coupling labor, excl joint coupling material | | | \$ | 87.98 | \$ | 43.34 | \$ | - | \$ | 131.32 | |
| 6 | 221113484090 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 527.88 | \$ | 260.04 | \$ | _ | \$ | 787.92 | |
| 2 | 221113485780 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl ioint coupling material | | | \$ | 329.28 | s | 69.14 | s | | \$ | 398.42 | |
| 1 | 221113485800 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 80 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 220.21 | \$ | 46.44 | \$ | _ | \$ | 266.65 | |
| 2 | 221113484960 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter | | | \$ | 56.60 | \$ | 15.90 | \$ | - | \$ | 72.50 | |
| 1 | 221113484960 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter | | | \$ | 28.30 | s | 7.95 | \$ | _ | \$ | 36.25 | |
| | | | | | Ψ | 20.00 | * | 1.35 | Ŷ | | Ψ | 00.20 | |
| 25 | 221113470630 | Gasket and bolt set, for flanges, 1034 kPa, 50 mm pipe size | | | \$ | 252.00 | \$ | 1,535.00 | \$ | - | \$ | 1,787.00 | |
| | | | | | \$ | 99.676.14 | \$ | 27,775.01 | \$ | _ | \$ | 127.451.15 | |
| | | | Sampling | | Ţ | | \$ | 19,057.50 | | | \$ | 19,057.50 | |
| | | | Welder Q1 | 0.5 | | | \$ | 9,339.07 | | | \$ | 9,339.07 | |
| | | | Welder Q2 | 0.33 | | | \$ | 1,051.97 | | | \$ | 1,051.97 | |
| | | | Welder P | 1 | | | \$ | 5,940.97 | | | \$ | 5,940.97 | |
| | | | QA inspection | 1 | | | \$ | 16,332.01 | | | \$ | 16,332.01 | |

| | | | | | | | | | | - | | |
|-------------|-----------------|---|--------------------------|------------|----|-------------|----|-----------------|----|------------|----------|----------------|
| Quantity | Lino Numbor | Description | | | | Ext Mat O&P | | Ext. Labour O&P | E | xt. Equip. | | Ext. Total OSP |
| Quantity | Line Number | Description | | | | | | | | 0&P | | |
| | | | Base subtotal labor | | | | \$ | 79,496.52 | | | \$ | 179,172.66 |
| | | | EMWG pipe factor | 35.9782609 | | | \$ | 2,860,146.65 | | | \$ | 2,860,146.65 |
| | | | Subtotal with EMGW | | | | \$ | 2,939,643.18 | | | \$ | 3,039,319.32 |
| | | | Labor factor 2.5x | 1.5 | | | \$ | 4,409,464.77 | | | \$ | 4,409,464.77 |
| | | | SS premium fixtures 2.5x | 2.5 | \$ | 18,215.43 | | | | | \$ | 18,215.43 |
| | | | materialst subtotal | | \$ | 117,891.57 | | | | | \$ | 7,466,999.51 |
| | | | NC factor | 0.32448049 | \$ | 5,910.55 | | | | | \$ | 5,910.55 |
| | | | | | \$ | 123,802.12 | \$ | 7,349,107.95 | | | \$ | 7,472,910.06 |
| D_01_09 W | est annex vapor | r recovry piping | | | | | | | | | | |
| Data Releas | se : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pine stainless steel threaded 15 mm | | | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 5 | 221113644310 | couplings and hangers 3 m OC | | | \$ | 529.95 | \$ | 250.25 | \$ | - | \$ | 780.20 |
| | | | | | | | | | | | | |
| | | Disc. stainless start three dad. 45 mm | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 15 mm | | | | | | | | | | |
| F | 001110011010 | diameter, schedule 40, type 316, includes | | | ¢ | E20.0E | ¢ | 250.25 | ¢ | | ¢ | 700.00 |
| 5 | 221113644310 | couplings and hangers 3 m OC | | | \$ | 529.95 | \$ | 250.25 | \$ | - | \$ | 780.20 |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 15 mm | | | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 5 | 221113644310 | couplings and hangers 3 m OC | | | \$ | 529.95 | \$ | 250.25 | \$ | - | \$ | 780.20 |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 20 mm | | | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 5 | 221113644320 | couplings and hangers 3 m OC | | | \$ | 601.95 | \$ | 255.40 | \$ | - | \$ | 857.35 |
| | | | | | | | | | | | | |
| | | Dine stainlass steel threaded 50 mm | | | | | | | | | | |
| | | diameter schedule 40, type 316, includes | | | | | | | | | | |
| 60 | 221113644360 | couplings and bangers 3 m OC | | | \$ | 20.065.80 | \$ | 4 953 60 | \$ | | \$ | 25 019 40 |
| 00 | 221110044000 | | | | Ψ | 20,000.00 | Ŷ | 4,000.00 | Ψ | | Ψ | 20,010.40 |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 50 mm | | | | | | | | | | |
| 00 | 001110011000 | diameter, schedule 40, type 316, includes | | | ¢ | 00 754 40 | ¢ | 6 604 90 | ¢ | | ¢ | 22.250.20 |
| 00 | 221113044300 | couplings and hangers 3 m OC | | | ¢ | 20,704.40 | ¢ | 0,004.00 | ¢ | - | Ф | 33,359.20 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or | | | | | | | | | | |
| | | 90 Deg., steel, painted, grooved joint, 20 | | | | | | | | | | |
| | | mm diameter, add 1 coupling (material | | | | | | | | | | |
| | 004440404000 | only) per joint for installed price, incl joint | | | ÷ | 00.04 | | 45.04 | • | | ^ | 400 50 |
| 1 | 221113484030 | coupling labor, excl joint coupling material | | | \$ | 93.64 | \$ | 15.94 | \$ | - | \$ | 109.58 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or | | | | | | | | | | |
| | | 90 Deg., steel, painted, grooved joint, 50 | | | | | | | | | | |
| | | mm diameter, add 1 coupling (material | | | | | | | | | | |
| | | only) per joint for installed price, incl joint | | | | | | | | | | |
| 19 | 221113484070 | coupling labor, excl joint coupling material | | | \$ | 957.98 | \$ | 607.81 | \$ | - | \$ | 1,565.79 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg, or | | | | | | | | | | |
| | | 90 Deg., steel, painted, grooved joint, 50 | | | | | | | | | | |
| | | mm diameter, add 1 coupling (material | | | | | | | | | | |
| | | only) per joint for installed price, incl joint | | | | | | | | | | |
| 53 | 221113484070 | coupling labor, excl joint coupling material | | | \$ | 2,672.26 | \$ | 1,695.47 | \$ | - | \$ | 4,367.73 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pipe fittings & valves flange black steel | | | | | | | | | | |
| | | painted, with grooved face for dasket | | | | | | | | | | |
| | | grooved joint, class 125 and 150, 50 mm | | | | | | | | | | |
| | | pipe size, add 1 coupling (material only) | | | | | | | | | | |
| | | per joint for installed price, incl joint | | | | | | | | | | |
| 4 | 221113485780 | coupling labor, excl joint coupling material | | | \$ | 658.56 | \$ | 138.28 | \$ | - | \$ | 796.84 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ex | t. Equip. | Ext. Total O&P |
|----------|--------------|--|--|-----------------|-----------------|----|-----------|-----------------|
| 4 | 221113485780 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 658.56 | \$ 138.28 | \$ | - | \$ 796.84 |
| 47 | 221113485780 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 7,738.08 | \$ 1,624.79 | \$ | - | \$ 9,362.87 |
| 4 | 221113485790 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 65 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 819.08 | \$ 154.80 | \$ | - | \$ 973.88 |
| 12 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 926.16 | \$ 563.52 | \$ | - | \$ 1,489.68 |
| 4 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 308.72 | \$ 187.84 | \$ | - | \$ 496.56 |
| 4 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 308.72 | \$ 187.84 | \$ | - | \$ 496.56 |
| 16 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 1,234.88 | \$ 751.36 | \$ | - | \$ 1,986.24 |
| 4 | 221113484990 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter | | \$ 170.80 | \$ 63.76 | \$ | | \$ 234.56 |
| 1 | 221113484990 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter | | \$ 42.70 | \$ 15.94 | \$ | - | \$ 58.64 |
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ 8,062.66 | \$ 26.32 | \$ | _ | \$ 8,088.98 |
| 1 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ 8.062.66 | \$ 34.57 | \$ | | \$ 8,097,23 |
| 3 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ 24,187.98 | \$ 103.71 | \$ | - | \$ 24,291.69 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 147 of 350

| Quantity | Line Number | Description | | | | Ext. Mat. O&P | | Ext. Labour O&P | EX | CC. Equip. | | Ext. Total O&P |
|-------------|-----------------|--|---------------------|------------|--------|---------------|----------|-----------------|----------|------------|----------|----------------|
| 2 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 16,125.32 | \$ | 52.64 | \$ | - | \$ | 16,177.96 |
| 3 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 24,187.98 | \$ | 103.71 | \$ | - | \$ | 24,291.69 |
| 3 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl ioint coupling material | | | \$ | 24 187 98 | \$ | 103.71 | \$ | | \$ | 24 291 69 |
| 6 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl ioint coupling material | | | \$ | 260,991,90 | \$ | 207.42 | \$ | _ | \$ | 261,199.32 |
| 6 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 260,991.90 | s | 207.42 | \$ | - | \$ | 261,199.32 |
| 20 | 221112488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandle, out joint coupling material | | | ¢ | 161 252 20 | ¢ | 601.40 | ¢ | | ¢ | 161 044 60 |
| 20 | 221113400020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | | φ | 101,233.20 | Ŷ | 091.40 | Ŷ | | ψ | 101,944.00 |
| 6 | 221113488010 | handle, excl joint coupling material Pressure regulator, steam, high capacity, bronze body, stainless steel trim, threaded, 20 mm diameter | | | \$ | 48,375.96 | Ş | 157.92 | Ş | - | \$ | 48,533.88 |
| 4 | 221119263040 | Pressure regulator, steam, high capacity, bronze body, stainless steel trim, threaded, 25 mm diameter | | | \$ | 15,435.00 | \$ \$ | 171.32 | \$ \$ | _ | \$ | 15,606,32 |
| 1 | 221113484960 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter | | | \$ | 28.30 | \$ | 7.95 | \$ | - | \$ | 36.25 |
| | | | | | ¢ | 024 204 50 | ¢ | 20 742 42 | ¢ | | ¢ | 052.006.02 |
| | | | Sampling | | Ψ | 331,304.50 | \$ | 19,057.50 | φ | | \$ | 19,057.50 |
| | | | Welder Q1 | 0.5 | | | \$ | 5,856.60 | | | \$ | 5,856.60 |
| | | | Welder P | 1 | | | \$ ¢ | 8,999.23 | | | \$ ¢ | 8,999.23 |
| | | | Base subtotal labor | 1 | | | ⊅ \$ | 69.481.59 | | | \$ \$ | 14,000.866.09 |
| | | | EMWG pipe factor | 35.9782609 | | | \$ | 2,499,826.77 | | | \$ | 2,499,826.77 |
| | | | Subtotal with EMGW | | | | \$ | 2,569,308.36 | | | \$ | 3,500,692.86 |
| | | | Labor factor 2.5x | 1.5 | ¢ | 444.900.40 | \$ | 3,853,962.54 | | | \$ | 3,853,962.54 |
| | | | Materials subtotal | 2.5 | Դ Տ | 114,862.40 | | | | | ຈ \$ | 7,469,517,80 |
| | | | NC factor | 0.32448049 | \$ | 37,270.61 | | | | | \$ | 37,270.61 |
| | | | | | \$ | 1,083,517.51 | \$ | 6,423,270.90 | | | \$ | 7,506,788.41 |
| D_01_10 W | est annex vapor | r recovery drain piping | | | | | | | | | | |
| Data Releas | se : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316. includes | | | | | | | | | | |
| 45 | 221113644320 | couplings and hangers 3 m OC Pipe, stainless steel, threaded, 25 mm | | | \$ | 5,417.55 | \$ | 2,298.60 | \$ | - | \$ | 7,716.15 |
| 37 | 221113644330 | diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 6,167.90 | \$ | 2,157.47 | \$ | - | \$ | 8,325.37 |
| | | | | | | | | | | | | |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 148 of 350

| | | | | | | | | Fage 1 | | | | 140 01 330 | | |
|--------------|---|--|--------------------------|------------|----|---------------|----|-----------------|----|-----|----|----------------------|--|--|
| Quantitu | ntity Line Number Description Ext. Labour O&P | | E | xt. Equip. | | | | | | | | | | |
| Quantity | Line Number | Description | | | | EXI. Mat. OoP | | EXt. Labour O&P | | O&P | | Ext. Total O&P | | |
| 2 | 221113484030 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 187.28 | \$ | 31.88 | \$ | - | \$ | 219.16 | | |
| 13 | 221113484030 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl init coupling material | | | \$ | 1 217 32 | \$ | 207.22 | \$ | _ | \$ | 1 424 54 | | |
| | 2211101010100 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | | • | 1,217.02 | • | | • | | • | 1,12,00 | | |
| 17 | 221113484040 | Coupling labor, excl joint coupling material Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint | | | \$ | 857.14 | \$ | 270.98 | \$ | - | \$ | 1,128.12 | | |
| 2 | 221113485780 | coupling labor, excl joint coupling material Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, | | | \$ | 329.28 | \$ | 69.14 | \$ | | \$ | 398.42 | | |
| 2 | 221113484740 | excl joint coupling material Pipe, fittings & valves, coupling, steel, painted standard flexible grooved joint | | | \$ | 154.36 | \$ | 48.50 | \$ | - | \$ | 202.86 | | |
| 2 | 221113484960 | 25 mm diameter Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, | | | \$ | 56.60 | \$ | 15.90 | \$ | · | \$ | 72.50 | | |
| 1 | 221113484740 | excl joint coupling material Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | | \$ | 77.18 | \$ | 24.25 | \$ | - | \$ | 101.43 | | |
| 8 | 221113488010 221113470630 | Gasket and bolt set, for flanges, 1034 kPa, 50 mm pipe size | | | \$ | 130,495.95 | \$ | 491.20 | \$ | - | \$ | 130,574.91 571.84 | | |
| | | | | | | | | | | | | /= | | |
| | | | Welder P | 1 | \$ | 145,041.20 | \$ | 5,694.10 | \$ | - | Ş | 150,735.30 | | |
| | | | OA inspection | 1 | | | \$ | 5,694.10 | | | \$ | 5,694,10 | | |
| | | | Base subtotal labor | - | | | \$ | 17.082.30 | | | \$ | 162.123.50 | | |
| | | | EMWG pipe factor | 35.9782609 | | | \$ | 614,591.45 | | | \$ | 614,591.45 | | |
| | | | Subtotal with EMGW | | | | \$ | 631,673.75 | | | \$ | 776,714.95 | | |
| | | | Labor factor 2.5x | 1.5 | | | \$ | 947,510.62 | | | \$ | 947,510.62 | | |
| | | | SS premium fixtures 2.5x | 2.5 | \$ | 7,399.50 | | | | | \$ | 7,399.50 | | |
| | | | Subtotal material | 0 22440040 | \$ | 152,440.70 | | | | | \$ | 1,731,625.06 | | |
| | | | INC TACLOF | 0.32448049 | \$ | 49,464.03 | | 1 570 194 20 | | | \$ | 49,464.03 | | |
| D 01 11 W | est annex 87m | aley tie in piping | | | Ŧ | 201,904.73 | Þ | 1,575,104.30 | | | P | 1,101,009.10 | | |
| Data Release | e · Year 2020 | Unit Cost Estimate | | | | | | | | | | | | |
| Data Meleds | . 10ai 2020 | Chit COSt Estimate | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 20 | 221113644310 | Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 2,119.80 | \$ | 1,001.00 | \$ | - | \$ | 3,120.80 | | |

| | | | | 1 | | | | _ | 0 | | |
|----------|------------------------------|--|--|----|---------------|----------|-----------------|----------|-----------|----------|----------------|
| Quantity | Line Number | Description | | | Ext. Mat. O&P | | Ext. Labour O&P | E | t. Equip. | | Ext. Total O&P |
| 5 | 221113644320 | Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 601.95 | \$ | 255.40 | \$ | - | \$ | 857.35 |
| 73 | 221113644360 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 24,413.39 | \$ | 6,026.88 | \$ | - | \$ | 30,440.27 |
| 37 | 221113644360 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 12,373.91 | \$ | 3,054.72 | \$ | - | \$ | 15,428.63 |
| 34 | 221113644390 | Pipe, stainless steel, threaded, 100 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 23,615.72 | \$ | 4,877.30 | \$ | - | \$ | 28,493.02 |
| 20 | 221113484030 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 1,872.80 | \$ | 318.80 | \$ | | \$ | 2,191.60 |
| 41 | 221113484060 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl init coupling material | | \$ | 2 067 22 | \$ | 994 25 | \$ | | \$ | 3 061 47 |
| | 221110404000 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | ţ | 2,001.22 | Ŷ | 001.20 | ţ | | ţ | 0,001.41 |
| 2 | 221113484070 | coupling labor, excl joint coupling material Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, | | \$ | 100.84 | \$ | 63.98 | \$ | - | \$ | 164.82 |
| 25 | 221113484770 | excl joint coupling material Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, eval leint coupling labor, | | \$ | 1,929.50 | \$ | 1,174.00 | \$ | - | \$ | 3,103.50 |
| 10 | 221113464770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, | | \$ | 7/1.60 | \$ | 409.00 | \$ | - | 2 | 1,241.40 |
| 2 | 221113484790 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, | | \$ | 211.98 | \$ | 130.04 | \$ | | \$ | 342.02 |
| 10 | 221113484790 221113484916 | excl joint coupling material Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 80 mm diameter | | \$ | 1,059.90 | \$ \$ | 21.16 | \$ \$ | - | \$ \$ | 1,710.10 |
| 6 | 221113484912 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter | | \$ | 296.34 | \$ | 95.64 | \$ | - | \$ | 391.98 |
| 3 | 221113484912 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter | | \$ | 148.17 | \$ | 47.82 | \$ | _ | \$ | 195.99 |

| Quantity | Line Number | Description | | | | Ext. Mat. O&P | | Ext. Labour O&P | E | xt. Equip. O&P | | Ext. Total O&P |
|-------------|----------------|--|--------------------------|------------|----------|---------------|---------|-----------------|----------|-------------------|-----------|---------------------------|
| | | Pipe fittings & valves coupling steel | | | | | | | | | | |
| 2 | 221113484916 | painted, rigid style, grooved joint, 80 mm diameter | | | \$ | 129.66 | \$ | 42.32 | \$ | - | \$ | 171.98 |
| | | Pipe, fittings & valves, coupling, steel. | | | | | | | | | | |
| 1 | 221113484916 | painted, rigid style, grooved joint, 80 mm diameter | | | \$ | 64.83 | \$ | 21.16 | \$ | | \$ | 85.99 |
| | | Pine fittings & valves tee steel nainted | | | Ì | | | | ľ | | Ť | |
| | | grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for | | | | | | | | | | |
| 1 | 221113484770 | installed price, incl joint coupling labor, | | | \$ | 77 18 | \$ | 46.96 | \$ | | \$ | 124 14 |
| | 221110404110 | Pipe fittings & valves valve butterfly | | | Ŷ | 11.10 | Ų | 40.00 | Ų | | Ŷ | 124.14 |
| | | standard trim, grooved joint, 40 mm pipe | | | | | | | | | | |
| 8 | 221113488010 | joint for installed price, incl 2 position | | | \$ | 64 501 28 | \$ | 210.56 | \$ | | \$ | 64 711 84 |
| Ū | 221110400010 | Pine fittings & values value butterfly | | | Ŷ | 04,001.20 | Ų | 210.00 | V | | Ŷ | 04,711.04 |
| | | standard trim, grooved joint, 40 mm pipe | | | | | | | | | | |
| 4 | 221112488010 | joint for installed price, incl 2 position | | | ¢ | 32 250 64 | ¢ | 105.28 | ¢ | | ¢ | 32 355 02 |
| 4 | 221113466010 | | | | φ | 32,230.04 | φ | 105.26 | φ | - | φ | 32,300.92 |
| | | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, | | | • | 000 40 | • | | • | | • | |
| 8 | 221113484960 | 25 mm diameter | | | \$ | 226.40 | \$ | 63.60 | \$ | - | \$ | 290.00 |
| | | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, | | | | | | | | | | |
| 4 | 221113484960 | 25 mm diameter | | | \$ | 113.20 | \$ | 31.80 | \$ | - | \$ | 145.00 |
| | | Gasket and bolt set, for flanges, 1034 kPa, | | | | | | | | | | |
| 2 | 221113470630 | 50 mm pipe size | | | \$ | 20.16 | \$ | 122.80 | \$ | - | \$ | 142.96 |
| | | | Wolder 01 | 0.5 | \$ | 169,031.50 | \$ | 19,825.27 | \$ | - | \$ | 188,856.77 |
| | | | Welder Q1 Welder Q2 | 0.5 | | | چ \$ | 4,973.24 | | | ٦ \$ | 4,973.24 |
| | | | Welder P | 1 | | | \$ | 5.001.49 | | | \$ | 5.001.49 |
| | | | QA inspection | 1 | | | \$ | 11,600.50 | | | \$ | 11,600.50 |
| | | | Base subtotal labor | | | | \$ | 43,026.26 | | | \$ | 212,057.76 |
| | | | EMWG pipe factor | 35.9782609 | | | \$ | 1,548,010.13 | | | \$ | 1,548,010.13 |
| | | | Subtotal with EMGW | | | | \$ | 1,591,036.39 | | | \$ | 1,760,067.89 |
| - | | | Labor factor 2.5x | 1.5 | • | 00.007.00 | \$ | 2,386,554.58 | | | \$ | 2,386,554.58 |
| | | | SS premium fixtures 2.5x | 2.5 | \$ ¢ | 22,887.03 | | | | | \$ | 22,887.03 4 160 E00 E0 |
| | | | NC factor | 0 32448049 | Ф | 62 273 82 | | | | | \$ \$ | 4,109,509.50 |
| | | | | 0.52110015 | \$ | 254,192.34 | \$ | 3,977,590.97 | | | \$ | 4,231,783.32 |
| D_01_12 W | est Annex tunn | el and 94m elev tie in piping | | | | | | | | | | |
| Data Releas | se : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pine stainless steel threaded 15 mm | | | | | | | | | | |
| 19 | 22111364/310 | diameter, schedule 40, type 316, includes | | | ¢ | 5 193 51 | ¢ | 2 452 45 | ¢ | _ | ¢ | 7 645 96 |
| | 221110044010 | | | | V | 0,100.01 | Ų | 2,102.10 | Ų | | Ŷ | 1,040.00 |
| | | Pipe, stainless steel, threaded, 20 mm | | | | | | | | | | |
| 5 | 221113644320 | diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 601.95 | \$ | 255.40 | \$ | - | \$ | 857.35 |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 37 | 221113644330 | couplings and hangers 3 m OC | | | \$ | 6,167.90 | \$ | 2,157.47 | \$ | - | \$ | 8,325.37 |
| | | Pipe, stainless steel, threaded, 25 mm | | | | | | | | | | |
| 35 | 221113644330 | diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 5,834.50 | \$ | 2,040.85 | \$ | - | \$ | 7,875.35 |
| | | | | | | ., | | ., | | | | , |
| | | Pipe, stainless steel, threaded, 50 mm | | | | | | | | | | |
| 163 | 221113644360 | couplings and hangers 3 m OC | | | \$ | 54,512.09 | \$ | 13,457.28 | \$ | - | \$ | 67,969.37 |

| | | | | | | | | | age 10 | | 550 |
|----------|----------------|--|------|----|---------------|----|-----------------|----|-----------|----|----------------|
| Quantity | Line Number | Description | | | Ext. Mat. O&P | | Ext. Labour O&P | Ex | t. Equip. | | Ext. Total O&P |
| 278 | 221113644360 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 92,971.54 | \$ | 22,951.68 | \$ | <u>-</u> | \$ | 115,923.22 |
| 20 | 221113644360 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 6,688.60 | \$ | 1,651.20 | \$ | _ | \$ | 8,339.80 |
| 287 | 221113644390 | Pipe, stainless steel, threaded, 100 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 199.344.46 | s | 41,170,15 | \$ | _ | \$ | 240.514.61 |
| 21 | 221113644300 | Pipe, stainless steel, threaded, 100 mm diameter, schedule 40, type 316, includes countings and bangers 3 m OC | | ¢ | 14 586 18 | ¢ | 3,012.45 | ¢ | | ¢ | 17 598 63 |
| 21 | 221113044330 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | φ | 14,300.10 | Ŷ | 5,012.45 | Ψ | - | Ŷ | 17,580.65 |
| 19 | 221113484030 | coupling labor, excl joint coupling material Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, and init coupling material | | \$ | 1,779.16 | \$ | 302.86 | \$ | - | \$ | 2,082.02 |
| 42 | 221113484030 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 468.20 | \$ | 79.70 | \$ | - | \$ | 4,602.36 |
| 2 | 00444040404040 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | | 454.00 | | 17 00 | • | | • | 100.00 |
| 3 | 221113404040 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | φ | 131.20 | Ŷ | 47.02 | Ŷ | - | ψ | 195.08 |
| 4 | 221113484040 | coupling labor, excl joint coupling material Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | \$ | 201.68 | \$ | 63.76 | \$ | - | \$ | 265.44 |
| 11 | 221113484040 | coupling labor, excl joint coupling material | | \$ | 554.62 | \$ | 175.34 | \$ | - | \$ | 729.96 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 152 of 350

| | | | | | | Page 152 | | | | 2 01 350 | | |
|----------|---------------|---|------|----|---------------|----------|-----------------|----|------------|----------|----------------|--|
| Quantity | Line Number | Description | | | Ext. Mat. O&P | | Ext. Labour O&P | E | xt. Equip. | | Ext. Total O&P | |
| 9 | 221113484040 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 453.78 | \$ | 143.46 | \$ | - Uar | \$ | 597.24 | |
| 25 | 221113484060 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 1,260.50 | \$ | 606.25 | \$ | _ | \$ | 1,866.75 | |
| 60 | 221113484060 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl init coupling material | | \$ | 3 025 20 | ¢ | 1 455 00 | \$ | | \$ | 4 480 20 | |
| 00 | 2211101010100 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | ¢ | 4,450,66 | ¢ | 705 77 | ¢ | | ¢ | 1,905.40 | |
| 23 | 221113484070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | \$ | 1,159.66 | \$ | 735.77 | \$ | - | \$ | 1,895.43 | |
| 3 | 221113484070 | coupling labor, excl joint coupling material Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | \$ | 151.26 | \$ | 95.97 | \$ | - | \$ | 247.23 | |
| 96 | 221113484070 | coupling labor, excl joint coupling material Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling material | | \$ | 4,840.32 | \$ | 3,071.04 | \$ | | \$ | 7,911.36 | |
| 3 | 221113484090 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 263.94 | \$ | 130.02 | \$ | _ | \$ | 393.96 | |
| 28 | 221113484090 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 2,463.44 | \$ | 1,213.52 | \$ | - | \$ | 3,676.96 | |
| 93 | 221113484090 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 8,182.14 | \$ | 4,030.62 | \$ | - | \$ | 12,212.76 | |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 153 of 350

| | | | | | | Fage 155 | | | | 3 01 330 | | |
|----------|------------------------------|---|--|----|---------------|----------|-----------------|----|-----------------|----------|----------------|--|
| Quantity | Line Number | Description | | | Ext. Mat. O&P | | Ext. Labour O&P | Ex | t. Equip. | | Ext. Total O&P | |
| 6 | 221113484000 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl init coupling material | | ¢ | 527 88 | ¢ | 260.04 | ¢ | <u>0&</u> P | ¢ | 787 02 | |
| 0 | 221110404030 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm | | Ψ | 327.00 | Ų | 200.04 | Ŷ | | Ψ | 101.02 | |
| 1 | 221113484908 | diameter Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm | | \$ | 39.10 | \$ | 7.95 | \$ | · | \$ | 47.05 | |
| 1 | 221113484908 | diameter Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 40 mm | | \$ | 39.10 | \$ | 7.95 | \$ | | \$ | 47.05 | |
| 1 | 221113484910 | diameter Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 80 mm | | \$ | 39.10 | \$ | 11.87 | \$ | - | \$ | 50.97 | |
| 1 | 221113484916 | diameter Pipe fittings & valves, coupling, steel | | \$ | 64.83 | \$ | 21.16 | \$ | | \$ | 85.99 | |
| 2 | 221113484916 | painted, rigid style, grooved joint, 80 mm diameter | | \$ | 129.66 | \$ | 42.32 | \$ | - | \$ | 171.98 | |
| 1 | 221113484740 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 77.18 | \$ | 24.25 | \$ | | \$ | 101.43 | |
| 1 | 221113484740 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 77.18 | \$ | 24.25 | \$ | - | \$ | 101.43 | |
| 6 | 221113484760 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 463.08 | \$ | 216.72 | \$ | _ | \$ | 679.80 | |
| 4 | 004440404770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, used loide outset for each start steel | | ¢ | 77.40 | ¢ | 40.00 | ŕ | | ¢ | 124.44 | |
| | 221113404770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, | | φ | 77.10 | Ŷ | 40.90 | Ŷ | | Ŷ | 124.14 | |
| 1 | 221113484790 221113484980 | exci joint coupling material Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 40 mm diameter | | \$ | 105.99 | \$ | 65.02 | \$ | - | \$ | 617.88 | |
| 3 | 221113484980 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 40 mm diameter | | \$ | 118.86 | \$ | 35.61 | \$ | - | \$ | 154.47 | |
| 5 | 221113484990 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter | | \$ | 213.50 | \$ | 79.70 | \$ | - | \$ | 293.20 | |

| Quantity | Line Number | Description | | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. | Ext. Total O&P |
|----------|--------------|--|---------------------|------------|---------------|-------------------------------|-------------|------------------------------|
| | | | | | | | Udr | |
| 1 | 221113484990 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter | | | \$ 42.70 | \$ 15.94 | \$- | \$ 58.64 |
| 2 | 221113484990 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter | | | \$ 85.40 | \$ 31.88 | s - | \$ 117.28 |
| _ | | Pipe, fittings & valves, coupling, steel, | | | • | • • • • • • • • • | Ť | • |
| 1 | 221113484990 | painted, standard, flexible, grooved joint, 50 mm diameter | | | \$ 42.70 | \$ 15.94 | \$- | \$ 58.64 |
| 9 | 221113485010 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 80 mm diameter | | | \$ 495.45 | \$ 190.44 | \$ - | \$ 685.89 |
| | | Pipe, fittings & valves, coupling, steel, | | | | | | |
| 1 | 221113485010 | 80 mm diameter | | | \$ 55.05 | \$ 21.16 | \$- | \$ 76.21 |
| 4 | 221112485010 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, | | | ¢ 55.05 | ¢ 21.46 | ¢ | ¢ 70.04 |
| 1 | 221113485010 | 80 mm diameter | | | \$ 55.05 | \$ 21.16 | \$ - | \$ 76.21 |
| | | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | | | | | |
| 6 | 221113488010 | handle, excl joint coupling material | | | \$ 48,375.96 | \$ 157.92 | \$- | \$ 48,533.88 |
| | | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | | | | | |
| 1 | 221113488010 | handle, excl joint coupling material | | | \$ 8,062.66 | \$ 26.32 | \$- | \$ 8,088.98 |
| | | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | | | | | |
| 1 | 221113488010 | handle, excl joint coupling material | | | \$ 8,062.66 | \$ 26.32 | \$- | \$ 8,088.98 |
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandle exclusion coupling material | | | \$ 8,062,66 | \$ 26.32 | \$ - | \$ 8,088,98 |
| • | 221110400010 | narcie, exer joint coupling matchai | | | 0,002.00 | φ 20.52 | ψ | φ 0,000.30 |
| 24 | 221113484960 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter | | | \$ 679.20 | \$ 190.80 | \$ - | \$ 870.00 |
| 2.1 | | | | | 013.20 | 100.00 | | |
| 1 | 221113484960 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter | | | \$ 28.30 | \$ 7.95 | \$- | \$ 36.25 |
| | | Gasket and bolt set, for flances, 1034 kPa | | | | | | |
| 61 | 221113470630 | 50 mm pipe size | | | \$ 614.88 | \$ 3,745.40 | \$- | \$ 4,360.28 |
| | | | Welder O1 | 0.5 | \$ 492,101.20 | \$ 107,561.29 \$ 22,020,20 | \$ - | \$ 599,662.49 |
| | | | Welder Q2 | 0.5 | | \$ 22,029.36 \$ 14,727.53 | | \$ 22,029.36 \$ 14,727.53 |
| | | | Welder P | 1 | | \$ 19,319.98 | | \$ 19,319.98 |
| | | | Base subtotal labor | 1 | | \$ 219,715.03 | | \$ 711,816.23 |
| | | | EMWG pipe factor | 35.9782609 | | \$ 7,904,964.55 | | \$ 7,904,964.55 |
| | | | Subtotal with EMGW | | | \$ 8,124,679.57 | | \$ 8,616,780.77 |

| Quantity | Line Number | Description | | | | Ext. Mat. O&P | | Ext. Labour O&P | E | xt. Equip. O&P | | Ext. Total O&P |
|-------------|----------------|---|--------------------------|------------|---------|---------------|----|-----------------|----|-------------------|---------|----------------|
| | | | Labor factor 2.5x | 1.5 | | | \$ | 12,187,019.36 | | | \$ | 12,187,019.36 |
| | | | SS premium fixtures 2.5x | 2.5 | \$ | 84,091.33 | | | | | \$ | 84,091.33 |
| | | | NC factor | 0.32448049 | э \$ | 136,131.66 | | | | | ₽ \$ | 136,131.66 |
| | | | | | \$ | 712,324.18 | \$ | 20,311,698.93 | | | \$ | 21,024,023.11 |
| D_01_13 W | est annex 100m | elev tie in piping | | | | | | | | | | |
| Data Releas | e : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Disc. staisland start three dark 45 mm | | | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 35 | 221113644310 | couplings and hangers 3 m OC | | | \$ | 3,709.65 | \$ | 1,751.75 | \$ | - | \$ | 5,461.40 |
| | | Pipe stainless steel threaded 25 mm | | | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 70 | 221113644330 | couplings and hangers 3 m OC | | | \$ | 11,669.00 | \$ | 4,081.70 | \$ | - | \$ | 15,750.70 |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 25 mm | | | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 74 | 221113644330 | couplings and hangers 3 m OC | | | \$ | 12,335.80 | \$ | 4,314.94 | \$ | - | \$ | 16,650.74 |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 50 mm | | | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 107 | 221113644360 | couplings and hangers 3 m OC | | | \$ | 35,784.01 | \$ | 8,833.92 | \$ | - | \$ | 44,617.93 |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 50 mm | | | | | | | | | | |
| | ~~~~~~ | diameter, schedule 40, type 316, includes | | | • | 07 450 40 | • | 0.040.70 | | | • | 10 700 00 |
| 112 | 221113644360 | couplings and hangers 3 m OC | | | \$ | 37,456.16 | \$ | 9,246.72 | \$ | - | \$ | 46,702.88 |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 100 mm | | | | | | | | | | |
| 74 | 004440044000 | diameter, schedule 40, type 316, includes | | | • | 10 045 40 | | 40 404 05 | | | • | 50 500 40 |
| - 71 | 221113644390 | couplings and hangers 3 m OC | | | \$ | 49,315.18 | \$ | 10,184.95 | \$ | - | \$ | 59,500.13 |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or | | | | | | | | | | |
| | | 90 Deg., steel, painted, grooved joint, 20 | | | | | | | | | | |
| | | only) per joint for installed price, incl joint | | | | | | | | | | |
| 15 | 221113484030 | coupling labor, excl joint coupling material | | | \$ | 1,404.60 | \$ | 239.10 | \$ | - | \$ | 1,643.70 |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or | | | | | | | | | | |
| | | 90 Deg., steel, painted, grooved joint, 25 | | | | | | | | | | |
| | | mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | | | | | | | | | |
| 3 | 221113484040 | coupling labor, excl joint coupling material | | | \$ | 151.26 | \$ | 47.82 | \$ | - | \$ | 199.08 |
| | | | | | | | | | | | | |
| | | Pipe fittings & values elbow 45 Deg. or | | | | | | | | | | |
| | | 90 Deg., steel, painted, grooved joint, 25 | | | | | | | | | | |
| | | mm diameter, add 1 coupling (material | | | | | | | | | | |
| 22 | 221113484040 | coupling labor, excl joint coupling material | | | \$ | 1,109.24 | \$ | 350.68 | \$ | - | \$ | 1,459.92 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg. steel painted grooved joint 25 | | | | | | | | | | |
| | | mm diameter, add 1 coupling (material | | | | | | | | | | |
| 17 | 221113484040 | only) per joint for installed price, incl joint | | | ¢ | 857 14 | ¢ | 270.08 | ¢ | | ¢ | 1 128 12 |
| 17 | 221110404040 | couping labor, exci joint couping matchai | | | Ψ | 007.14 | Ψ | 210.00 | Ψ | - | Ψ | 1,120.12 |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or | | | | | | | | | | |
| | | mm diameter, add 1 coupling (material | | | | | | | | | | |
| | | only) per joint for installed price, incl joint | | | | | | | | | | |
| 5 | 221113484060 | coupling labor, excl joint coupling material | | | \$ | 252.10 | \$ | 121.25 | \$ | - | \$ | 373.35 |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or | | | | | | | | | | |
| | | 90 Deg., steel, painted, grooved joint, 50 | | | | | | | | | | |
| | | only) per joint for installed price, incl joint | | | | | | | | | | |
| 19 | 221113484070 | coupling labor, excl joint coupling material | | | \$ | 957.98 | \$ | 607.81 | \$ | - | \$ | 1,565.79 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 156 of 350

| Quantity | Line Number | Description | | | | Ext. Mat. O&P | | Ext. Labour O&P | E | kt. Equip. | | Ext. Total O&P |
|-------------|----------------|--|--------------------------|------------|----------|-------------------------|----------|-----------------------|----|------------|----------|------------------------------|
| | | | | | | | | | | 0&P | | |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 80 | | | | | | | | | | |
| | | mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | | | | | | | | | |
| 31 | 221113484090 | coupling labor, excl joint coupling material | | | \$ | 2,727.38 | \$ | 1,343.54 | \$ | - | \$ | 4,070.92 |
| | | Pipe, fittings & valves, coupling, steel, | | | | | | | | | | |
| 1 | 221113484910 | painted, rigid style, grooved joint, 40 mm diameter | | | \$ | 39.10 | \$ | 11.87 | \$ | - | \$ | 50.97 |
| | | Pipe, fittings & valves, coupling, steel. | | | | | | | | | | |
| 1 | 221113484012 | painted, rigid style, grooved joint, 50 mm | | | ¢ | 40.30 | ¢ | 15.04 | ¢ | | ¢ | 65.33 |
| | 221110404012 | | | | Ψ | 40.00 | Ų | 10.04 | Ψ | | Ψ | 00.00 |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, coupling, steel, | | | | | | | | | | |
| 2 | 221113484916 | painted, rigid style, grooved joint, 80 mm diameter | | | \$ | 129.66 | \$ | 42.32 | \$ | - | \$ | 171.98 |
| | | | | | | | | | | | | |
| | | grooved joint, 25 mm diameter, add 1 | | | | | | | | | | |
| | | coupling (material only) per joint for installed price, incl joint coupling labor, | | | | | | | | | | |
| 2 | 221113484740 | excl joint coupling material | | | \$ | 154.36 | \$ | 48.50 | \$ | - | \$ | 202.86 |
| | | Pipe, fittings & valves, tee, steel, painted, | | | | | | | | | | |
| | | grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for | | | | | | | | | | |
| 1 | 221112494760 | installed price, incl joint coupling labor, | | | ¢ | 77 10 | ¢ | 26.12 | ¢ | | ¢ | 112.20 |
| 1 | 221113404700 | exci joint coupling material | | | ¢ | //.10 | Þ | 30.12 | ¢ | - | ¢ | 113.30 |
| | | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 40 mm | | | | | | | | | | |
| 3 | 221113484910 | diameter | | | \$ | 117.30 | \$ | 35.61 | \$ | - | \$ | 152.91 |
| | | Pipe, fittings & valves, coupling, steel, | | | | | | | | | | |
| 1 | 221113484912 | diameter | | | \$ | 49.39 | \$ | 15.94 | \$ | - | \$ | 65.33 |
| | | Pipe, fittings & valves, coupling, steel, | | | | | | | | | | |
| 2 | 221113484916 | painted, rigid style, grooved joint, 80 mm diameter | | | \$ | 129.66 | \$ | 42.32 | \$ | - | \$ | 171.98 |
| | | Dies Stillerer Osselver sicher beitreffe | | | | | | | | | | |
| | | standard trim, grooved joint, 40 mm pipe | | | | | | | | | | |
| | | size, add 1 coupling (material only) per joint for installed price, incl 2 position | | | | | | | | | | |
| 7 | 221113488010 | handle, excl joint coupling material | | | \$ | 56,438.62 | \$ | 184.24 | \$ | - | \$ | 56,622.86 |
| | | Gasket and holt set for flanges 1034 kPa | | | | | | | | | | |
| 40 | 221113470630 | 50 mm pipe size | | | \$ | 403.20 | \$ | 2,456.00 | \$ | - | \$ | 2,859.20 |
| | | Dipo fittingo 8 volvos coupling stast | | | | | | | | | | |
| | | painted, standard, flexible, grooved joint, | | | | 000.40 | | | • | | • | |
| 8 | 221113484960 | 25 mm diameter | | | \$ | 226.40 | \$ | 63.60 | \$ | - | \$ | 290.00 |
| | | | Welder Q1 | 0.5 | \$ | 215,543.76 | \$ \$ | 44,347.62 9,754.41 | \$ | - | \$ \$ | 259,891.38 9,754.41 |
| | | | Welder Q2 | 0.33 | | | \$ | 3,394.98 | | | \$ | 3,394.98 |
| | | | OA inspection | 0.5 | | | \$ \$ | 14,653.85 | | | \$ \$ | 14,653.85 |
| | | | Base subtotal labor | | | | \$ | 86,052.49 | | | \$ | 301,596.25 |
| | | | EMWG pipe factor | 35.9782609 | | | \$ | 3,096,018.75 | | | \$ | 3,096,018.75 |
| | | | Labor factor 2.5x | 1.5 | | | \$ | 3,182,071.24 | | | \$ \$ | 3,397,615.00 4,773,106,86 |
| | | | SS premium fixtures 2.5x | 2.5 | \$ | 22,088.35 | Ŧ | ., | | | \$ | 22,088.35 |
| | | | Subtotal materials | 0.22440040 | \$ | 237,632.11 | | | | | \$ | 8,192,810.21 |
| | | | | 0.52448049 | \$ \$ | 51,626.51 289,258.62 | \$ | 7,955,178.10 | | | \$ \$ | 51,626.51 8,244,436.72 |
| D_01_14 Sa | ampling panel | | | | | | | | | | | |
| Data Releas | se : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 10 mm | | | | | | | | | | |
| 40 | 221113644300 | couplings and hangers 3 m OC | | | \$ | 3,807.20 | \$ | 1,981.60 | \$ | - | \$ | 5,788.80 |

| | | | | | | | | | | 0 | | |
|----------|--------------|--|--------------------------|-------------|--------|---------------|--------|-----------------|----|-------------------|--------|----------------|
| Quantity | Line Number | Description | | | | Ext. Mat. O&P | | Ext. Labour O&P | E | xt. Equip. O&P | | Ext. Total O&P |
| 10 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 80,626.60 | \$ | 263.20 | \$ | - | \$ | 80,889.80 |
| 7 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 56,438.62 | \$ | 184.24 | \$ | <u>-</u> | \$ | 56,622.86 |
| 7 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 56,438.62 | \$ | 184.24 | \$ | <u>.</u> | \$ | 56,622.86 |
| 7 | 221112489010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandle out joint coupling material | | | ¢ | 2 772 40 | ¢ | 194 24 | ¢ | | ¢ | 2 057 42 |
| 1 | 678/11- | Sampling papel | | | ф Ф | 2,773.19 | ¢ 2 | 2 782 /2 | φ | - | ф Ф | 2,907.40 |
| | 020411- | | | | Ψ | 210,403.10 | φ | 2,702.42 | | | ψ | 210,247.02 |
| | | | | | \$ | 410,549.33 | \$ | 5,579.94 | \$ | - | \$ | 416,129.27 |
| | | | Welder P | 1 | | | \$ | 5,579.94 | | | \$ | 5,579.94 |
| | | | QA inspection | 0.5 | | | \$ | 2,789.97 | | | \$ | 2,789.97 |
| | | | Base subtotal labor | | | | \$ | 13,949.85 | | | \$ | 424,499.18 |
| | | | EMWG pipe factor | 35.9782609 | | | \$ | 501,891.25 | | | \$ | 501,891.25 |
| | | | Subtotal with EMGW | | | | \$ | 515,841.10 | | | \$ | 926,390.43 |
| | | | Labor factor 2.5x | 1.5 | | | \$ | 773,761.65 | | | \$ | 773,761.65 |
| | | | SS premium fixtures 2.5x | 2.5 | \$ | 6,932.98 | | | | | \$ | 6,932.98 |
| | | | Subtotal material | 0 224400 40 | \$ | 417,482.31 | | | | | \$ | 1,707,085.05 |
| | | | NC factor | 0.32448049 | \$ | 135,464.86 | * | 1 200 602 75 | | | \$ | 135,464.86 |
| | | | | | \$ | 552,947.17 | \$ | 1,289,602.75 | | | \$ | 1,842,549.92 |
| | | | Total | | \$ | 13,162,668.40 | \$ | 88,356,852.00 | \$ | - | \$ | 101,519,520.40 |

| Quantity | Line Number | Description | | | Ext. | Mat. O&P | Ext. L | _abour O&P | Ext. Equip. O&P | E | tt. Total O&P |
|----------------|------------------|--|--------------------------|------------|------|----------|---------|------------|-----------------|----------|---------------|
| D 02 01 Equip | mont tanks and r | | | | | | | | | | |
| D_02_01 Equip | Year 2020 | Unit Cost Estimate | | | | | | | | | |
| Duia Horodoo . | 2020 | | | | | | | | | | |
| | | See D01.01 | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| D 02 02 Pipe s | upports | | | | | | | | | | |
| Data Release : | Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 70 | 221113470628 | Gasket and bolt set, for flanges, 1034 kPa, 40 mm pipe size | | | \$ | 347 20 | \$ | 3 720 50 | s - | \$ | 4 067 70 |
| 10 | 221113470020 | Pipe, steel, black, threaded, 40 mm | | | Ψ | 047.20 | Ψ | 0,720.00 | Ψ - | Ψ | 4,001.10 |
| | | diameter, schedule 40, Spec. A-53, | | | | | | | | | |
| 5 | 221113440600 | includes coupling and clevis hanger | | | \$ | 162.05 | \$ | 294 10 | ¢ _ | ¢ | 456 15 |
| 5 | 221113440000 | Pipe, steel, black, threaded, 50 mm | | | Ψ | 102.00 | Ψ | 204.10 | Ψ | Ψ | 400.10 |
| | | diameter, schedule 40, Spec. A-53, | | | | | | | | | |
| 7 | 221113440610 | includes coupling and clevis hanger | | | \$ | 180 11 | \$ | 512.89 | ¢ | ¢ | 693.00 |
| , | 221113440010 | Pipe, steel, black, threaded, 65 mm | | | Ψ | 100.11 | Ψ | 012.00 | Ψ - | Ψ | 000.00 |
| | | diameter, schedule 40, Spec. A-53, | | | | | | | | | |
| 5 | 221113440620 | includes coupling and clevis hanger | | | ¢ | 210.05 | ¢ | 460 55 | ¢ | ¢ | 680 50 |
| 5 | 221113440020 | assembly sized for covering, of the CO | | | Ψ | 210.35 | Ψ | 409.00 | ψ - | Ψ | 000.00 |
| | | Pipe, steel, black, threaded, 80 mm | | | | | | | | | |
| | | includes coupling and clevis hanger | | | | | | | | | |
| 5 | 221113440630 | assembly sized for covering, 3 m OC | | | \$ | 267.55 | \$ | 546.95 | \$- | \$ | 814.50 |
| Total | | | | | \$ | 1.167.86 | \$ | 5.543.99 | \$ - | s | 6.711.85 |
| | | | Welder P | 1 | Ť. | ., | \$ | 5,543.99 | | \$ | 5,543.99 |
| | | | QA inspection | 1 | | | \$ | 5,543.99 | | \$ | 5,543.99 |
| | | | Labor factor 2.5x | 1.5 | | | э \$ | 24,947.96 | | ⊅ \$ | 24,947.96 |
| | | | SS premium fixtures 2.5x | 0.32448049 | \$ | 68.45 | | | | \$ | 68.45 |
| | | | | | \$ | 1,236.31 | Ş | 41,579.93 | | Ş | 42,816.23 |
| D_02_03 West | annex TRF pump | suction discharge piping | | | | | | | | | |
| Data Release : | Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 10 mm | | | | | | | | | |
| 95 | 221113644300 | diameter, schedule 40, type 316, includes | | | \$ | 9 042 10 | \$ | 4 706 30 | ¢ | ¢ | 13 748 40 |
| 55 | 221113044300 | | | | Ψ | 5,042.10 | Ψ | 4,700.00 | Ψ - | Ψ | 10,740.40 |
| | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 10 mm | | | | | | | | | |
| 5 | 221113644300 | diameter, schedule 40, type 316, includes | | | \$ | 475.90 | \$ | 247 70 | ¢ _ | ¢ | 723.60 |
| 0 | 221110011000 | | | | Ų | 110.00 | Ŷ | 211.10 | Ŷ | V | 120.00 |
| | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 15 mm | | | | | | | | | |
| 5 | 221113644310 | diameter, schedule 40, type 316, includes | | | ¢ | 520 05 | \$ | 250.25 | ¢ | ¢ | 780.20 |
| • | 00 | | | | Ŷ | 020.00 | Ψ | 200.20 | Ţ, | Ψ | 700.20 |
| | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 15 mm | | | | | | | | | |
| 5 | 221113644310 | diameter, schedule 40, type 316, includes | | | \$ | 529 95 | \$ | 250.25 | \$ | \$ | 780.20 |
| 5 | | | | | Ŷ | 029.90 | Ψ | 200.20 | - | Ψ | 730.20 |
| | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 20 mm | | | | | | | | | |
| 5 | 221113644320 | diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 601.95 | \$ | 255 40 | \$ - | \$ | 857 35 |
| | | , , , | | | | | | | | - | 231.00 |

| CONFIDE | NTIAL AT | TORNEY WORK PRODUCT | | | | | | Fileo E Pag | d 2021-08-1 B-2020-029 J3 Attachment ge 159 of 35 | 17 90 .4 1 50 | |
|----------|--------------|---|--|-----|------------|-----|------------|-------------------|---|---------------------------|--------------|
| Quantity | Line Number | Description | | Ext | . Mat. O&P | Ext | Labour O&P | Ext. | Equip. O&P | Ex | t. Total O&P |
| 5 | 221113644320 | Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 601.95 | \$ | 255.40 | \$ | | \$ | 857.35 |
| 5 | 221113644320 | Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 601.95 | \$ | 255.40 | \$ | - | \$ | 857.35 |
| 84 | 221113644320 | Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 10,112.76 | \$ | 4,290.72 | \$ | - | \$ | 14,403.48 |
| 5 | 221113644330 | Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 833.50 | \$ | 291.55 | \$ | - | \$ | 1,125.05 |
| 5 | 221113644330 | Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 833.50 | \$ | 291.55 | \$ | - | \$ | 1,125.05 |
| 40 | 221113644330 | Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 6,668.00 | \$ | 2,332.40 | \$ | - | \$ | 9,000.40 |
| 29 | 221113644330 | Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 4.834.30 | \$ | 1,690.99 | \$ | - | \$ | 6,525.29 |
| 5 | 221113644360 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and bangers 3 m OC | | \$ | 1 672 15 | \$ | 412 80 | \$ | - | \$ | 2 084 95 |
| 5 | 221113481080 | Pipe, fittings & valves, steel, black, grooved joint, 50 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC | | ¢ | 180 10 | ¢ | 327.65 | ¢ | _ | ¢ | 507.75 |
| 70 | 221112044200 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes | | ÷ | 26 440 07 | Ŷ | 6 500 04 | Ŷ | | Ŷ | 20 040 04 |
| 79 | 221113644360 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes | | \$ | 26,419.97 | \$ | 6,522.24 | \$ | - | \$ | 32,942.21 |
| 208 | 221113644360 | couplings and hangers 3 m OC Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316. includes | | \$ | 69,561.44 | \$ | 17,172.48 | \$ | | \$ | 86,733.92 |
| 15 | 221113644360 | couplings and hangers 3 m OC | | \$ | 5,016.45 | \$ | 1,238.40 | \$ | - | \$ | 6,254.85 |
| 85 | 221113644360 | couplings and hangers 3 m OC Pipe, stainless steel, threaded, 100 mm | | \$ | 28,426.55 | \$ | 7,017.60 | \$ | | \$ | 35,444.15 |
| 98 | 221113644390 | diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 68,068.84 | \$ | 14,058.10 | \$ | - | \$ | 82,126.94 |

| | 1 | | | | | | | | .ge : ee ei ei | | |
|----------|--------------|--|--|----|--------------|------|------------|-----|----------------|----|---------------|
| Quantity | Line Number | Description | | E | kt. Mat. O&P | Ext. | Labour O&P | Ext | . Equip. O&P | E | ct. Total O&P |
| 53 | 221113484030 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 4,962.92 | \$ | 844.82 | \$ | - | \$ | 5,807.74 |
| 2 | 221113484040 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 100.84 | \$ | 31.88 | \$ | - | \$ | 132.72 |
| 9 | 221113484040 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 453.78 | \$ | 143.46 | \$ | - | \$ | 597.24 |
| | | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | | | | | | | | |
| 18 | 221113484040 | coupling labor, excl joint coupling material Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | \$ | 907.56 | \$ | 286.92 | \$ | | \$ | 1,194.48 |
| 4 | 221113484060 | coupling labor, excl joint coupling material Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | \$ | 201.68 | \$ | 97.00 | \$ | - | \$ | 298.68 |
| 14 | 221113484060 | coupling labor, excl joint coupling material Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | \$ | 705.88 | \$ | 339.50 | \$ | - | \$ | 1,045.38 |
| 8 | 221113484070 | Coupling labor, excl joint coupling material Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | \$ | 403.36 | \$ | 255.92 | \$ | - | \$ | 7 050 00 |
| 2 | 221113404070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling befor evaluated price material | | ¢ | 4,430.90 | ¢ | 2,013.12 | ¢ | | ¢ | 164.82 |
| 2 | 221113404070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 65 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | φ | 100.04 | φ | 00.98 | φ | | Ŷ | 104.02 |
| 3 | 221113484080 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 65 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | Ŷ | 151.26 | \$ | 106.80 | φ | - | Ŷ | 258.06 |
| 16 | 221113484080 | coupling labor, excl joint coupling material | | \$ | 806.72 | \$ | 569.60 | \$ | - | \$ | 1,376.32 |

| Quantity | Line Number | Description | | Ext | t. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ex | t. Total O&P |
|----------|--------------|--|--|-----|-------------|-----------------|-----------------|----|--------------|
| 3 | 221113484090 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 263.94 | \$ 130.02 | \$ - | \$ | 393.96 |
| 31 | 221113484090 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor. excl ioint coupling material | | \$ | 2.727.38 | \$ 1.343.54 | \$- | \$ | 4.070.92 |
| | | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per ioint for installed price, incl ioint | | | | | | | |
| 4 | 221113485780 | coupling labor, excl joint coupling material | | \$ | 658.56 | \$ 138.28 | \$- | \$ | 796.84 |
| 4 | 221112405700 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, avd. ioint coupling material | | ¢ | 659.56 | ¢ 120.20 | ¢ | ¢ | 706 94 |
| 4 | 221113463760 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint | | φ | 030.30 | φ 136.26 | φ - | φ | 1 30.04 |
| 9 | 221113485780 | coupling labor, excl joint coupling material | | \$ | 1,481.76 | \$ 311.13 | \$- | \$ | 1,792.89 |
| 20 | 221113485780 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 3 292 80 | \$ 691.40 | \$ - | \$ | 3 984 20 |
| | | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 65 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint | | | | | | • | |
| 6 | 221113485790 | coupling labor, excl joint coupling material Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 80 mm pipe size, add 1 coupling (material only) | | \$ | 1,228.62 | \$ 232.20 | \$ - | \$ | 1,460.82 |
| 3 | 221113485800 | per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 660.63 | \$ 139.32 | \$- | \$ | 799.95 |
| 1 | 221113485780 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 164.64 | \$ 34.57 | \$- | \$ | 199.21 |
| | 224442405700 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint | | ¢ | 220.20 | ¢ 60.44 | | | 200.40 |
| 2 | 221113485780 | coupling labor, exci joint coupling material | | \$ | 329.28 | ə 69.14 | ъ - | \$ | 398.42 |
| | | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint | | | | | | | |
| 1 | 221113485780 | coupling labor, excl joint coupling material | | \$ | 164.64 | \$ 34.57 | \$ - | \$ | 199.21 |

| | | | | | | | EB-2020-0 | 290 | |
|----------|--------------|--|--|----------|---------|-----------------|-------------------------|---------------------|---------------|
| CONFIDE | NTIAL AT | TORNEY WORK PRODUCT | | | | | Attachme Page 162 of | 13.4 nt 1 350 | |
| Quantity | Line Number | Description | | Ext. Mat | . O&P | Ext. Labour O&P | Ext. Equip. O&F | E | xt. Total O&P |
| 1 | 221113485780 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 164.64 | \$ 34.57 | \$ - | \$ | 199.21 |
| 1 | 221113485780 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor. excl joint coupling material | | s | 164.64 | \$ 34.57 | \$ - | \$ | 199.21 |
| 1 | 221113485790 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 65 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 204.77 | \$ 38.70 | \$ - | \$ | 243.47 |
| 1 | 221113485790 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 65 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 204.77 | \$ 38.70 | \$- | \$ | 243.47 |
| 1 | 221113485780 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 164 64 | \$ 34 57 | \$ - | \$ | 199.21 |
| 4 | 221113484950 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 20 mm diameter | | \$ | 113.20 | \$ 31.80 | \$ - | \$ | 145.00 |
| 4 | 221113484960 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter | | \$ | 113.20 | \$ 31.80 | \$- | \$ | 145.00 |
| 4 | 221113484990 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter | | \$ | 170.80 | \$ 63.76 | \$- | \$ | 234.56 |
| 4 | 221113485000 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 65 mm diameter | | \$ | 199.64 | \$ 71.64 | \$ - | \$ | 271.28 |
| 4 | 221113485010 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 80 mm diameter | | \$ | 220.20 | \$ 84.64 | \$- | \$ | 304.84 |
| 4 | 221113485010 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 80 mm diameter | | \$ | 220.20 | \$ 84.64 | \$- | \$ | 304.84 |
| 8 | 221113484700 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 802.64 | \$ 169.28 | \$- | \$ | 971.92 |
| 10 | 221113484700 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 1 | ,003.30 | \$ 211.60 | \$- | \$ | 1,214.90 |

Filed 2021-08-17

| CONFIDENTIAL | ATTORNEY | MOBK | PRODITCT |
|--------------|----------|------|----------|
| CONFIDENTIAL | ALIOKNEI | MOKK | FRODUCI |

| Quantity | Line Number | Description | | Ext. Mat. O& | P | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
|----------|--------------|--|--|--------------|--------|-----------------|-----------------|----------------|
| 4 | 221113484740 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 308 | .72 \$ | \$ 97.00 | \$ - | \$ 405.72 |
| | | Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, | | | | | | |
| 2 | 221113484740 | excl joint coupling material Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, | | \$ 154 | .36 \$ | \$ 48.50 | \$- | \$ 202.86 |
| 2 | 221113484740 | excl joint coupling material Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, | | \$ 154 | .36 \$ | \$ 48.50 | \$ - | \$ 202.86 |
| 2 | 221113484770 | excl joint coupling material Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, | | \$ 154 | .36 \$ | s 93.92 | \$ - | \$ 248.28 |
| 2 | 221113484770 | excl joint coupling material Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, | | \$ 154 | .36 \$ | \$ 93.92 | \$ - | \$ 248.28 |
| 2 | 221113484770 | excl joint coupling material Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, | | \$ 154 | .36 \$ | \$ 93.92 | \$- | \$ 248.28 |
| 21 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, and light coupling material | | \$ 1,620 | .78 \$ | 986.16 | \$ - | \$ 2,606.94 |
| 4 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, and ising acualing material | | \$ 300 | .72 \$ | 02.02 | ¢ - | \$ 490.50 |
| 5 | 221113404770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | ¢ 520 | .50 ¢ | 93.92 225.10 | φ - | \$ 246.20 |
| 8 | 221113484790 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 40 mm diameter | | \$ 312 | .80 \$ | 5 94.96 | \$ - \$ - | \$ 407.76 |
| 1 | 221113484914 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 65 mm diameter | | \$ 56 | .08 \$ | 5 17.91 | \$- | \$ 73.99 |
| 17 | 221113484912 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter | | \$ 839 | .63 \$ | 5 270.98 | \$ - | \$ 1,110.61 |

| Quantity | Line Number | Description | | E | ct. Mat. O&P | Ext. Labou | r O&P | Ext. Equip. O&P | Ex | ct. Total O&P |
|----------|--------------|--|--|----|--------------|------------|--------|-----------------|----|---------------|
| 6 | 221113484912 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter | | \$ | 296.34 | \$ | 95.64 | \$- | \$ | 391.98 |
| 4 | 221113484914 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 65 mm diameter | | \$ | 224.32 | \$ | 71.64 | \$- | \$ | 295.96 |
| 1 | 221113484910 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 40 mm diameter | | \$ | 39.10 | \$ | 11.87 | \$- | \$ | 50.97 |
| 4 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 173,994.60 | \$ | 105.28 | \$- | \$ | 174,099.88 |
| 16 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 695,978.40 | \$ | 421.12 | \$- | \$ | 696,399.52 |
| 4 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 173,994.60 | \$ | 105.28 | \$- | \$ | 174,099.88 |
| 2 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | ¢ | 86 997 30 | ¢ | 52 64 | \$ | \$ | 87 049 94 |
| - | | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | Ţ | 00,001.00 | • | 02.01 | • | | 01,010.01 |
| 4 | 221113488010 | handle, excl joint coupling material Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per licit for installed netro, incl 2 neotice | | \$ | 173,994.60 | \$ | 105.28 | \$ - | \$ | 174,099.88 |
| 3 | 221113488010 | handle, excl joint coupling material | | \$ | 130,495.95 | \$ | 78.96 | \$- | \$ | 130,574.91 |
| | | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl.2 position | | | | | | | | |
| 1 | 221113488010 | handle, excl joint coupling material | | \$ | 43,498.65 | \$ | 26.32 | \$- | \$ | 43,524.97 |
| | | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | • | | | 70.00 | | | 100 57 1 0 1 |
| 3 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 80 mm pipe size, add 1 coupling (material only) per loipt for installed neise incl or subtime | | φ | 130,495.95 | р | 78.96 | φ - | \$ | 130,574.91 |
| 12 | 221113488030 | handle, excl joint coupling material | | \$ | 96,751.92 | \$ | 575.88 | \$ - | \$ | 97,327.80 |
| | | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | | | | | | | |
| 4 | 221113488010 | handle, excl joint coupling material | | \$ | 173,994.60 | \$ | 105.28 | \$ - | \$ | 174,099.88 |

| Quantity | Line Number | Description | | | E | Ext. Mat. O&P | | t. Labour O&P | Ext. Equip. O&P | E | Ext. Total O&P |
|----------|--------------|--|--------------------------|------------|----|---------------|----------|---------------|-----------------|----------|------------------------------|
| | | | | | | | | | | | |
| 2 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 86,997.30 | \$ | 52.64 | \$- | \$ | 87,049.94 |
| 3 | 221112488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandle, exclusion coupling material | | | ¢ | 24 187 08 | ¢ | 78.06 | ¢ | ¢ | 24 266 94 |
| 5 | 221113400010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | | Ψ | 24,107.30 | Ψ | 70.30 | φ - | Ŷ | 24,200.54 |
| 11 | 221113488020 | handle, excl joint coupling material | | | \$ | 88,689.26 | \$ | 380.27 | \$- | \$ | 89,069.53 |
| 4 | 221113488030 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 80 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 32,250.64 | \$ | 191.96 | \$- | \$ | 32,442.60 |
| | | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | | | | | | | | |
| 4 | 221113488010 | handle, excl joint coupling material | | | \$ | 32,250.64 | \$ | 105.28 | \$ - | \$ | 32,355.92 |
| | 001110100010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | | • | 04 504 00 | • | 010.50 | | | |
| 8 | 221113488010 | handle, excl joint coupling material | | | \$ | 64,501.28 | \$ | 210.56 | \$ - | \$ | 64,711.84 |
| 2 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 16,125.32 | \$ | 52.64 | \$- | \$ | 16,177.96 |
| | | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, | | | | | | | | | |
| 6 | 221113484960 | 25 mm diameter | | | \$ | 169.80 | \$ | 47.70 | \$ - | \$ | 217.50 |
| | | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, | | | | | | | | | |
| 4 | 221113484960 | 25 mm diameter | | | \$ | 113.20 | \$ | 31.80 | \$ - | \$ | 145.00 |
| | 221112424060 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm disportor. | | | ¢ | 112.20 | ¢ | 21.90 | ¢ | ¢ | 145.00 |
| 4 | 221113484960 | | | | \$ | 113.20 | \$ | 31.80 | ф - | \$ | 145.00 |
| Total | | | Wolder 01 | 0.5 | \$ | 2,494,678.35 | \$ | 77,085.29 | \$- | \$ | 2,571,763.64 |
| | | | Welder Q1 Welder Q2 | 0.5 | | | \$ \$ | 4,686.03 | | \$ \$ | 4,686.03 |
| | | | Welder P | 1 | | | \$ | 40,719.36 | | \$ | 40,719.36 |
| | | | QA inspection | 1 | | | \$ | 63,589.34 | | \$ | 63,589.34 |
| | | | EMWG pipe factor | 35.9782609 | | | ֆ \$ | 7,349,062.64 | | \$ \$ | 2,098,942.33 7,349,062.64 |
| | | | Subtotal with EMGW | | | | \$ | 7,553,326.62 | | \$ | 10,048,004.97 |
| | | | Labor factor 2.5x | 1.5 | | | \$ | 11,329,989.92 | | \$ | 11,329,989.92 |
| | | | SS premium fixtures 2.5x | 0.32448049 | \$ | 11,184.21 | | | | \$ | 11,184.21 |
| | | | subtotal materials | | \$ | 2,505,862.56 | | | | \$ | 21,389,179.10 |

| Quantity | Line Number | Description | | | Ext. Mat. O&P | | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
|----------------|------------------|--|-----------|------------|---------------|-------------|------------------|-----------------|-----------------|
| | | | NC factor | 0.32448049 | \$ | 813,103.52 | ¢ 10 002 216 E4 | | \$ 813,103.52 |
| D_02_04 West | annex TRF tank i | nlet and vent piping | | | \$ J | ,318,900.08 | \$ 18,883,310.54 | | \$22,202,282.62 |
| Data Release : | Year 2020 | Unit Cost Estimate | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes | | | | | | | |
| 5 | 221113644310 | couplings and hangers 3 m OC | | | \$ | 529.95 | \$ 250.25 | \$- | \$ 780.20 |
| | | Pipe, stainless steel, threaded, 15 mm | | | | | | | |
| 5 | 221112644210 | diameter, schedule 40, type 316, includes | | | ¢ | 520.05 | ¢ 250.25 | ¢ | ¢ 790.20 |
| 5 | 221113044310 | | | | Ψ | 525.55 | φ 230.23 | φ - | φ 700.20 |
| | | Pipe, stainless steel, threaded, 20 mm | | | | | | | |
| 1 | 221113644320 | couplings and hangers 3 m OC | | | \$ | 120.39 | \$ 51.08 | \$- | \$ 171.47 |
| | | Pine stainless steel threaded 50 mm | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | |
| 73 | 221113644360 | couplings and hangers 3 m OC | | | \$ | 24,413.39 | \$ 6,026.88 | \$ - | \$ 30,440.27 |
| | | Pipe, stainless steel, threaded, 100 mm | | | | | | | |
| 44 | 221113644390 | couplings and hangers 3 m OC | | | \$ | 30,561.52 | \$ 6,311.80 | \$- | \$ 36,873.32 |
| | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg. steel painted grooved joint 20 | | | | | | | |
| | | mm diameter, add 1 coupling (material | | | | | | | |
| 1 | 221113484030 | only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 93.64 | \$ 15.94 | \$ - | \$ 109.58 |
| | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or | | | | | | | |
| | | mm diameter, add 1 coupling (material | | | | | | | |
| 4 | 221113484030 | only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 374.56 | \$ 63.76 | \$- | \$ 438.32 |
| | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg. steel painted grooved joint 50 | | | | | | | |
| | | mm diameter, add 1 coupling (material | | | | | | | |
| 14 | 221113484070 | only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 705.88 | \$ 447.86 | \$ - | \$ 1,153.74 |
| | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or | | | | | | | |
| | | mm diameter, add 1 coupling (material | | | | | | | |
| 23 | 221113484070 | only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 1,159.66 | \$ 735.77 | \$- | \$ 1,895.43 |
| | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or | | | | | | | |
| | | mm diameter, add 1 coupling (material | | | | | | | |
| 4 | 221113484100 | only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 382.80 | \$ 229.12 | \$ - | \$ 611.92 |
| | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or | | | | | | | |
| | | mm diameter, add 1 coupling (material | | | | | | | |
| 5 | 221113484090 | only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 439.90 | \$ 216.70 | \$ - | \$ 656.60 |
| | | | | | | | | | |
| | | Pipe, fittings & valves, tee, steel, painted, | | | | | | | |
| | | coupling (material only) per joint for | | | | | | | |
| 8 | 221113484770 | installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 617.44 | \$ 375.68 | \$ - | \$ 993.12 |
| | | | | | | | | | |
| | | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket | | | | | | | |
| | | grooved joint, class 125 and 150, 50 mm | | | | | | | |
| | | pipe size, add 1 coupling (material only) per joint for installed price, incl joint | | | | | | | |
| 3 | 221113485780 | coupling labor, excl joint coupling material | | | \$ | 493.92 | \$ 103.71 | \$ - | \$ 597.63 |

| CONFIDENTIAL ATTORNEY WORK PRODUCT | | | | | | | | | | | |
|------------------------------------|-------------|-------------|--|--|--|--|--|--|--|--|--|
| Quantity | Line Number | Description | | | | | | | | | |
| | | | | | | | | | | | |

| Filed 2021-08-17 |
|------------------|
| EB-2020-0290 |
| J3.4 |
| Attachment 1 |
| Page 167 of 350 |

| Quantity | Line Number | Description | | | Е | Ext. Mat. O&P | | t. Labour O&P | Labour O&P Ext. Equip. O&P | | Ext. Total O&P |
|----------|--------------|--|--------------------------|------------|----------|--------------------------|---------|------------------|----------------------------|----------|----------------------------|
| 1 | 221113485800 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 80 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 220.21 | \$ | 46.44 | \$- | \$ | 266.65 |
| 1 | 221113484914 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 65 mm diameter | | | \$ | 56.08 | \$ | 17.91 | \$- | \$ | 73.99 |
| 2 | 221113484912 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter | | | \$ | 98.78 | \$ | 31.88 | \$- | \$ | 130.66 |
| | | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | | | | | | | | |
| 3 | 221113488020 | handle, excl joint coupling material Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per | | | \$ | 130,495.95 | \$ | 103.71 | \$ - | \$ | 130,599.66 |
| 4 | 221113488020 | joint for installed price, incl 2 position handle, excl joint coupling material Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per | | | \$ | 173,994.60 | \$ | 138.28 | \$ - | \$ | 174,132.88 |
| 1 | 221113488010 | joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 8,062.66 | \$ | 26.32 | \$- | \$ | 8,088.98 |
| 4 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 32,250.64 | \$ | 105.28 | \$- | \$ | 32,355.92 |
| 2 | 221113484960 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter | | | \$ | 56.60 | \$ | 15.90 | \$ - | \$ | 72.50 |
| 5 | 221113484970 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 32 mm diameter | | | \$ | 182.65 | \$ | 49.80 | \$ - | \$ | 232.45 |
| Total | | | | | \$ | 405,841.17 | \$ | 15,614.32 | \$- | \$ | 421,455.49 |
| | | | Welder Q1 | 0.5 | | | \$ | 3,268.53 | | \$ | 3,268.53 |
| | | | Welder Q2 | 0.33 | | | \$ | 2,103.93 | | Ş | 2,103.93 |
| | | | QA inspection | 1 | | | \$ | 8,137.93 | | \$ | 8,137.93 |
| | | | subtotal labor | | | | \$ | 31,890.18 | | \$ | 437,731.35 |
| | | | EMWG pipe factor | 35.9782609 | | | \$ ¢ | 1,147,353.10 | | \$ | 1,147,353.10 |
| | | | Labor factor 2.5x | 1.5 | | | ₽ \$ | 1,768,864.91 | | \$ \$ | 1,365,084.44 |
| | | | SS premium fixtures 2.5x | 2.5 | \$ | 12,205.30 | 1 | -,,00 | | \$ | 12,205.30 |
| | | | Subtotal materials | 0 22440040 | \$ | 418,046.47 | | | | \$ | 3,366,154.65 |
| | | | INC Factor | 0.32448049 | \$ \$ | 135,647.93 553.694.40 | \$ | 2,948,108.18 | | \$ \$ | 135,647.93 3,501,802.57 |
| | | | | | | | | | | Ţ | |
| | | | Total | | \$ 3 | \$ 3,873,896.79 | | \$ 21,873,004.64 | | \$ | 25,746,901.43 |

| Quantity | l ine Number | Description | | | Ext Mat O&P | | Ext Labour O&P | | Ext. Equip. | | Ext. Total O&P | |
|------------|-----------------|---|--------------------------|-----|-------------|-----------|----------------|-----------|-------------|-----|----------------|-----------|
| quantity | | | | | | | | | | 0&P | | |
| D 02 01 E | auinmont tank | s and numps | | | | | | | | | | |
| Data Relea | Quipment tanks | Unit Cost Estimate | | | | | | | | | | |
| Data Neice | 130 . Tear 2020 | onit oost Estimate | | | | | | | | | | |
| | | See D01.01 | | | | | | | | | | |
| | | | | | | | | | | | | |
| D_03_02 F | Pipe Supports | Unit On at Entiments | | | | | | | | | | |
| Data Relea | ise : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Casket and holt set for flanges, 1034 kPa | | | | | | | | | | |
| 126 | 221113470628 | 40 mm pipe size | | | \$ | 624.96 | \$ | 6,696.90 | \$ | - | \$ | 7,321.86 |
| | | | | | | | | | | | | |
| | | | | | \$ | 624.96 | \$ | 6,696.90 | \$ | - | \$ | 7,321.86 |
| | | | Welder P | 1 | | | \$ ¢ | 6,696.90 | | | Ş | 6,696.90 |
| | | | subtotal labor | - | | | \$ | 20,090.70 | | | \$ | 20,715.66 |
| | | | Labor factor 2.5x | 1.5 | | | \$ | 30,136.05 | | | \$ | 30,136.05 |
| | | | SS premium fixtures 2.5x | 2.5 | \$ | - | | 50 000 75 | | | | |
| | | | | | ş | 624.96 | ş | 50,226.75 | | | \$ | 50,851./1 |
| D_03_03 V | Vest annex dow | ngraded pump suction | | | | | | | | | | |
| Data Relea | ise : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 15 mm | | | | | | | | | | |
| 5 | 221113644310 | couplings and hangers 3 m OC | | | \$ | 529.95 | \$ | 250.25 | \$ | - | \$ | 780.20 |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 15 mm | | | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 10 | 221113644310 | couplings and hangers 3 m OC | | | \$ | 1,059.90 | \$ | 500.50 | \$ | - | \$ | 1,560.40 |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 20 mm | | | | | | | | | | |
| 5 | 221113644320 | couplings and hangers 3 m OC | | | \$ | 601.95 | \$ | 255.40 | \$ | - | \$ | 857.35 |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 20 mm | | | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 10 | 221113644320 | couplings and hangers 3 m OC | | | \$ | 1,203.90 | \$ | 510.80 | \$ | - | \$ | 1,714.70 |
| | | | | | | | | | | | | |
| | | diameter schedule 40 type 316 includes | | | | | | | | | | |
| 101 | 221113644320 | couplings and hangers 3 m OC | | | \$ | 12,159.39 | \$ | 5,159.08 | \$ | - | \$ | 17,318.47 |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 25 mm | | | | | | | | | | |
| 10 | 221113644330 | diameter, schedule 40, type 316, includes | | | ¢ | 1 667 00 | ¢ | 583 10 | ¢ | | ¢ | 2 250 10 |
| 10 | 221113044330 | coupings and hangers 5 m CC | | | Ψ | 1,007.00 | Ψ | 303.10 | Ψ | - | Ψ | 2,230.10 |
| | | Pine stainless steel threaded 25 mm | | | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 119 | 221113644330 | couplings and hangers 3 m OC | | | \$ | 19,837.30 | \$ | 6,938.89 | \$ | - | \$ | 26,776.19 |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 50 mm | | | | | | | | | | |
| 129 | 221113644360 | couplings and hangers 3 m OC | | | \$ | 43.141.47 | \$ | 10.650.24 | \$ | | \$ | 53,791,71 |
| | | | | | | ., | | | | | | |
| | | Pipe, stainless steel, threaded, 50 mm | | | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 7 | 221113644360 | couplings and hangers 3 m OC | | | \$ | 2,341.01 | \$ | 577.92 | \$ | - | \$ | 2,918.93 |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 50 mm | | | | | | | | | | |
| 5 | 221113644360 | couplings and hangers 3 m OC | | | \$ | 1,672.15 | \$ | 412.80 | \$ | - | \$ | 2,084.95 |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 50 mm | | | | | | | | | | |
| 07 | 004440044077 | diameter, schedule 40, type 316, includes | | | | 0.000.0 | | 0.000 / 5 | | | | 44.000.00 |
| 27 | 221113644360 | couplings and hangers 3 m OC | | | \$ | 9,029.61 | \$ | 2,229.12 | \$ | - | \$ | 11,258.73 |
| | | Dina staining start (include 50 | | | | | | | | | | |
| | | ripe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 44 | 221113644360 | couplings and hangers 3 m OC | | | \$ | 14,714.92 | \$ | 3,632.64 | \$ | - | \$ | 18,347.56 |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 100 mm | | | | | | | | | | |
| 25 | 221113644390 | diameter, schedule 40, type 316, includes | | | \$ | 17 364 50 | \$ | 3 586 25 | \$ | | \$ | 20 950 75 |
| | | | | | Ŧ | ,001.00 | - | 2,000.20 | ÷ | | - | 00000 |
| Quantity | Line Number | Description | | Ex | t. Mat. O&P | Ex | t. Labour O&P | Ex | t. Equip. O&P | E | xt. Total O&P |
|----------|--------------|--|--|----|-------------|----|---------------|----|------------------|----|---------------|
| 6 | 221113484908 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm diameter | | \$ | 234.60 | \$ | 47.70 | \$ | - | \$ | 282.30 |
| 20 | 221113484030 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 1,872.80 | \$ | 318.80 | \$ | - | \$ | 2,191.60 |
| 64 | 221113484030 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 5,992.96 | \$ | 1,020.16 | \$ | - | \$ | 7,013.12 |
| 6 | 221113484040 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 302.52 | \$ | 95.64 | \$ | - | \$ | 398.16 |
| 58 | 221113484040 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 2,924.36 | \$ | 924.52 | \$ | - | \$ | 3,848.88 |
| 15 | 221113484060 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 756.30 | \$ | 363.75 | \$ | _ | \$ | 1,120.05 |
| 42 | 221113484060 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 2,117.64 | \$ | 1,018.50 | \$ | - | \$ | 3,136.14 |
| 5 | 221113484060 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor exclinit coupling material | | \$ | 252 10 | s | 121 25 | \$ | | \$ | 373 35 |
| 8 | 221113484070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling dator excl joint coupling material | | \$ | 403 36 | \$ | 255 92 | \$ | _ | \$ | 659.28 |
| 24 | 221110101010 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | ¢ | 4 240.00 | • | 200.02 | ¢ | | ¢ | 4 077 04 |
| | 221113464070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | Ş | 1,210.06 | \$ | 101.10 | \$ | - | • | 1,977.04 |
| 1 | 221113484090 | Coupling labor, excl joint coupling material Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) | | \$ | 615.86 | \$ | 303.38 | \$ | - | \$ | 919.24 |
| 2 | 221113485780 | Pipe, joint for installed price, incl joint coupling labor, excl joint coupling material Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm | | \$ | 329.28 | \$ | 69.14 | \$ | - | \$ | 398.42 |
| 2 | 221113485780 | pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 329.28 | \$ | 69.14 | \$ | - | \$ | 398.42 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
|----------|--------------|--|--|----------------------------|-----------------|--------------------|----------------|
| 2 | 221112495790 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, avd joint coupling material | | ¢ 220.29 | s 60.14 | c | \$ 208.42 |
| 16 | 221112495790 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint counting labor, excl joint coupling material | | ¢ 2624.24 | ¢ 553.17 | ¢ | ¢ 3,197,36 |
| 7 | 221113485780 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 2,034.24 \$ 1,152.48 | \$ 333.12 | \$ - \$ - | \$ 1,394.47 |
| 1 | 221112485800 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 80 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, avd joint coupling material | | ¢ 220.21 | ¢ 46.44 | ¢ | \$ 266.65 |
| 6 | 221113483800 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm diameter | | \$ 234.60 | \$ 40.44 | \$ - | \$ 282.30 |
| 2 | 221113484908 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm diameter | | \$ 78.20 | \$ 15.90 | \$- | \$ 94.10 |
| 2 | 221113484912 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter | | \$ 98.78 | \$ 31.88 | \$ - | \$ 130.66 |
| 4 | 221113484914 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 65 mm diameter | | \$ 224.32 | \$ 71.64 | \$- | \$ 295.96 |
| 2 | 221113484916 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 80 mm diameter | | \$ 129.66 | \$ 42.32 | \$- | \$ 171.98 |
| 4 | 221113484700 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 401.32 | \$ 84.64 | \$- | \$ 485.96 |
| 2 | 221112101700 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl | | ¢ 200.00 | 6 (2.40) | ¢ | ¢ 204.47 |
| | 221113404700 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl | | φ 300.88 | 9 03.40 | φ - | φ 304.41 |
| 2 | 221113484740 | joint coupling material Pipe, fittings & valves, tee, steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed once, incl joint coupling takes and | | \$ 154.36 | \$ 48.50 | \$ - | \$ 202.86 |
| 1 | 221113484760 | installed price, incligent coupling labor, excl joint coupling material Pipe, fittings & valves, tee, steel, painted, | | \$ 77.18 | \$ 36.12 | \$ - | \$ 113.30 |
| 1 | 221113484770 | grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 77.18 | \$ 46.96 | \$ - | \$ 124.14 |
| | | Pipe, fittings & valves, tee, steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for | | | | | |
| 12 | 221113484760 | installed price, incl joint coupling labor, excl joint coupling material | | \$ 926.16 | \$ 433.44 | \$ - | \$ 1,359.60 |

| Quantity | Line Number | Description | | Ex | t. Mat. O&P | Ext | . Labour O&P | Ex | t. Equip. O&P | E | Ext. Total O&P |
|----------|--------------|--|--|----|-------------|---------|--------------|----|------------------|----|----------------|
| 4 | 221113484760 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 308.72 | \$ | 144.48 | \$ | - | \$ | 453.20 |
| 1 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 77.18 | \$ | 46.96 | \$ | - | \$ | 124.14 |
| 1 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 77.18 | \$ | 46.96 | \$ | | \$ | 124.14 |
| 1 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 77.18 | \$ | 46.96 | \$ | - | \$ | 124.14 |
| 5 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 385.90 | s | 234.80 | \$ | - | \$ | 620.70 |
| 1 | 221112484700 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl loint coupling material | | ¢ | 105.00 | ¢ | 65.02 | ¢ | | ¢ | 171.04 |
| 13 | 221113484790 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 40 mm diameter | | \$ | 515.06 | э \$ | 154.31 | \$ | | \$ | 669.37 |
| 12 | 221113484980 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 40 mm diameter | | \$ | 475.44 | \$ | 142.44 | \$ | | \$ | 617.88 |
| 1 | 221113484990 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter | | \$ | 42.70 | \$ | 15.94 | \$ | - | \$ | 58.64 |
| 2 | 221113484990 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter | | \$ | 85.40 | \$ | 31.88 | \$ | - | \$ | 117.28 |
| 2 | 221113484980 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 40 mm diameter | | \$ | 79.24 | \$ | 23.74 | \$ | | \$ | 102.98 |
| 5 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 217,493.25 | s | 131.60 | \$ | - | \$ | 217,624.85 |
| | | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | | | | | | | | |
| 12 | 221113488010 | handle, excl joint coupling material Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per | | \$ | 521,983.80 | \$ | 315.84 | \$ | | \$ | 522,299.64 |
| 4 | 221113488010 | joint for installed price, incl 2 position handle, excl joint coupling material Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint 40 mm pine | | \$ | 173,994.60 | \$ | 105.28 | \$ | - | \$ | 174,099.88 |
| 1 | 221113488010 | size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 43,498.65 | \$ | 26.32 | \$ | | \$ | 43,524.97 |
| 1 | 221112400040 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandle, oxel joint coupling metaind | | ¢ | 12 109 65 | ¢ | 26.22 | ¢ | | 6 | 42 504 07 |
| | 221113400010 | nandie, exci joint coupling material | | φ | 45,490.05 | φ | 20.32 | φ | - | ψ | 45,524.97 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
|----------|--------------|---|--|---------------|-----------------|--------------------|----------------|
| 2 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ 86,997.30 | \$ 52.64 | \$- | \$ 87,049.94 |
| 3 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ 130,495.95 | \$ 78.96 | \$- | \$ 130,574.91 |
| 2 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, exc l joint coupling material | | \$ 86,997.30 | \$ 52.64 | \$- | \$ 87,049.94 |
| | | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | | | | |
| 8 | 221113488010 | handle, excl joint coupling material Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | \$ 347,989.20 | \$ 210.56 | \$ - | \$ 348,199.76 |
| 4 | 221113488010 | handle, excl joint coupling material Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price ind 2 position | | \$ 173,994.60 | \$ 105.28 | \$ - | \$ 174,099.88 |
| 7 | 221113488010 | handle, excl joint coupling material | | \$ 56,438.62 | \$ 184.24 | \$- | \$ 56,622.86 |
| 3 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ 24,187.98 | \$ 78.96 | \$- | \$ 24,266.94 |
| 2 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandle, act loint coupling material | | ¢ 16 125 32 | \$ 52.64 | ٩ ـ ٩ | \$ 16 177 06 |
| 2 | 221113400010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | ψ 10,123.02 | φ 32.04 | ų - | ¢ 10,177.50 |
| 3 | 221113488020 | handle, excl joint coupling material | | \$ 24,187.98 | \$ 103.71 | \$- | \$ 24,291.69 |
| 3 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle.exc loint coupling material | | \$ 24,187,98 | \$ 103.71 | \$- | \$ 24,291,69 |
| | | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | , | | · | |
| 3 | 221113488010 | handle, excl joint coupling material Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per | | \$ 24,187.98 | \$ 78.96 | \$ - | \$ 24,266.94 |
| 6 | 221113488010 | joint for installed price, incl 2 position handle, excl joint coupling material | | \$ 48,375.96 | \$ 157.92 | \$ - | \$ 48,533.88 |
| 10 | 221113644310 | Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes coublings and hangers 3 m OC | | \$ 1,059.90 | \$ 500.50 | \$ - | \$ 1 560 40 |
| 10 | 221113044310 | Pipe, stainless steel, threaded, 20 mm | | ÷ 1,000.90 | ÷ 000.00 | ÷ - | ÷ 1,000.40 |
| 5 | 221113644320 | diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ 601.95 | \$ 255.40 | \$ - | \$ 857.35 |
| | | Pipe, stainless steel, threaded, 20 mm | | | 200.70 | | |
| 6 | 221113644320 | diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ 722.34 | \$ 306.48 | \$ - | \$ 1,028.82 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. | Ext. Total O&P |
|----------|----------------|--|--|---------------|-----------------|-------------|---|
| | | Pipe stainless steel threaded 25 mm | | | | - Cui | |
| 106 | 221113644330 | diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ 17.670.20 | \$ 6.180.86 | \$ - | \$ 23.851.06 |
| | | Pipe, stainless steel, threaded, 50 mm | | | , , , , , , , | · | |
| 28 | 221113644360 | diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ 9,364.04 | \$ 2,311.68 | \$- | \$ 11,675.72 |
| | | Pipe, stainless steel, threaded, 50 mm | | | | | |
| 55 | 221113644360 | diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ 18,393.65 | \$ 4,540.80 | \$ - | \$ 22,934.45 |
| | | Pipe, stainless steel, threaded, 100 mm | | | | | |
| 138 | 221113644390 | couplings and hangers 3 m OC | | \$ 95,852.04 | \$ 19,796.10 | \$- | \$ 115,648.14 |
| | | Pipe, fittings & valves, elbow, 45 Deg, or | | | | | |
| | | 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material | | | | | |
| 4 | 221113484030 | only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 374.56 | \$ 63.76 | \$- | \$ 438.32 |
| | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 | | | | | |
| | | mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | | | | |
| 7 | 221113484030 | coupling labor, excl joint coupling material | | \$ 655.48 | \$ 111.58 | \$- | \$ 767.06 |
| | | Pipe, fittings & valves, elbow, 45 Deg, or | | | | | |
| | | 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material | | | | | |
| 4 | 221113484040 | only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 201.68 | \$ 63.76 | \$ - | \$ 265.44 |
| | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg. steel painted grooved joint 25 | | | | | |
| | | mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | | | | |
| 20 | 221113484040 | coupling labor, excl joint coupling material | | \$ 1,008.40 | \$ 318.80 | \$- | \$ 1,327.20 |
| | | Pine fittings & valves elbow 45 Deg or | | | | | |
| | | 90 Deg., steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material | | | | | |
| 6 | 221113484060 | only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 302.52 | \$ 145.50 | \$ - | \$ 448.02 |
| Ū | 2211101010000 | oodpang labor, oxor joant oodpang material | | ¢ 002.02 | • | ÷ | • |
| | | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg. steel painted grooved joint 40 | | | | | |
| | | mm diameter, add 1 coupling (material | | | | | |
| 11 | 221113484060 | coupling labor, excl joint coupling material | | \$ 554.62 | \$ 266.75 | \$- | \$ 821.37 |
| | | Pipe fittings & valves elbow 45 Deg or | | | | | |
| | | 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material | | | | | |
| 2 | 221113484070 | only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 100.84 | \$ 63.98 | s - | \$ 164.82 |
| _ | 22111010101010 | | | ¢ 100.01 | • ••••• | Ŷ | ¢ 101.02 |
| | | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 | | | | | |
| | | mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | | | | |
| 18 | 221113484070 | coupling labor, excl joint coupling material | | \$ 907.56 | \$ 575.82 | \$ - | \$ 1,483.38 |
| | | Pipe, fittings & valves, elbow, 45 Deg. or | | | | | |
| | | 90 Deg., steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material | | | | | |
| 6 | 221113484090 | only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 527.88 | \$ 260.04 | \$ - | \$ 787.92 |
| | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or | | | | | |
| | | mm diameter, add 1 coupling (material | | | | | |
| 32 | 221113484090 | coupling labor, excl joint coupling material | | \$ 2,815.36 | \$ 1,386.88 | \$ - | \$ 4,202.24 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
|----------|------------------------------|--|--|-----------------------|----------------------|--------------------|----------------------------|
| 2 | 221113484760 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 154.36 | \$ 72.24 | \$- | \$ 226.60 |
| 1 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 77.18 | \$ 46.96 | \$ - | \$ 124.14 |
| 7 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 540.26 | \$ 328.72 | \$ - | \$ 868.98 |
| | 201112484700 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl | | ¢ 010.00 | ¢ (20.12 | ¢ | ¢ 242.02 |
| 2 | 221113484790 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, avdi bit coupling material | | \$ 211.90 | \$ 130.04 | ъ - | \$ <u>342.02</u> |
| 3 | 221113463760 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 80 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint | | • 493.94 | 5 103.71 | \$ - | \$ 597.00 |
| 2 | 221113485800 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm | | \$ 440.42 | . \$ 92.88 | \$ - | \$ 533.30 |
| 3 | 221113484912 221113484916 | diameter Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 80 mm diameter | | \$ 49.39 \$ 194.49 | \$ 15.94 \$ 63.48 | \$ - \$ - | \$ 65.33 \$ 257.97 |
| 1 | 221113484910 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 40 mm diameter | | \$ 39.10 | \$ 11.87 | \$ - | \$ 50.97 |
| 2 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ 16,125.32 | 2 \$ 52.64 | \$ - | \$ 16,177.96 |
| | 004440400000 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 80 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | 0.000.00 | | | A A A A A A A A A A |
| 1 | 221113488030 | nandie, excl joint coupling material Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | \$ 8,062.66 | \$ 47.99 | \$ - | \$ 8,110.65 |
| 1 | 221113488020 | handle, excl joint coupling material Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price incl 2 nosition | | \$ 8,062.66 | \$ 34.57 | \$- | \$ 8,097.23 |
| 2 | 221113488020 | handle, excl joint coupling material | | \$ 16,125.32 | \$ 69.14 | \$ - | \$ 16,194.46 |
| | | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | | | | |
| 3 | 221113488010 | handle, excl joint coupling material | | \$ 24,187.98 | \$ 78.96 | \$ - | \$ 24,266.94 |

| Quantity | Line Number | Description | | | | Ext. Mat. O&P | Ex | t. Labour O&P | E | kt. Equip. O&P | I | Ext. Total O&P |
|----------|---------------|--|--------------------------|------------|---------|---------------|----------|---------------------------------------|---------|-------------------|---------|----------------|
| 4 | 2244424880.10 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandlo, orgical licit accurding motorial | | | ¢ | 9.062.66 | ¢ | 26.22 | ¢ | | ¢ | 0.000.00 |
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandlo, ory licit coupling material | | | ¢ | 173 004 60 | ¢ | 105.22 | ¢ | | ¢ | 174,000,98 |
| 4 | 221113488010 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter | | | ф \$ | 28.30 | \$ \$ | 7.95 | ф \$ | - | э \$ | 36.25 |
| 1 | 221113484960 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter | | | \$ | 28.30 | \$ | 7.95 | \$ | - | \$ | 36.25 |
| 1 | 221113484960 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter | | | \$ | 28.30 | \$ | 7.95 | \$ | | \$ | 36.25 |
| | | | | | | | | | | | | |
| | | | | | \$ | 2,604,588.48 | \$ | 83,768.27 | \$ | - | \$ | 2,688,356.75 |
| | | | Welder Q1 | 0.5 | | | \$ | 13,280.97 | | | \$ | 13,280.97 |
| | | | Welder Q2 | 0.33 | | | \$ | 7,794.12 | | | \$ | 7,794.12 |
| | | | Welder P | 1 | | | \$ | 3,246.15 | | | \$ | 3,246.15 |
| | | | QA Inspection | 1 | | | \$ | 24,321.23 | | | \$ | 24,321.23 |
| | | | EMMC pipe factor | 25 0792600 | | | \$ ¢ | 132,410.73 | | | \$ ¢ | 2,/30,999.21 |
| | | | Subtotal with EMGW | 33.9762009 | | | ⊅ ¢ | 4,705,907.91 | | | ф ¢ | 7 500 907 12 |
| | | | Labor factor 2 5v | 15 | | | ¢ ¢ | 7 344 477 96 | | | ¢ ¢ | 7,300,907.12 |
| | | | SS premium fixtures 2 5v | 2.5 | \$ | 16 217 83 | ę | , , , , , , , , , , , , , , , , , , , | | | s | 16 217 83 |
| | | | subtotal materials | 2.5 | \$ | 2.620.806.31 | | | | | \$ | 14.861.602.90 |
| | | | NC factor | 0.32448049 | \$ | 850,400.52 | | | | | \$ | 850,400.52 |
| | | | | | \$ | 3,471,206.83 | \$1 | 2,240,796.60 | | | \$ | 15,712,003.43 |
| | | | | | | | | | | | | |
| | | | Total | | \$ | 3,471,831.79 | \$1 | 2,291,023.35 | | | \$ | 15,762,855.14 |

| | | | | | | | | - | | |
|------------|-----------------|---|----------------|-----|----------|--------------|----------------------------|-----------------|---------|---------------|
| Quantity | Line Number | Description | | | E | kt. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ex | t. Total O&P |
| | | | | | | | | | | |
| D_04_01 E | quipment tanks | and pumps | | | | | | | | |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | See D01 01 | | | | | | | | |
| | | See D01.01 | | | | | | | | |
| | | | | | | | | | | |
| D 04 02 B | ing Supports | | | | | | | | | |
| D_04_02 P | | Unit Cost Estimate | | | | | | | | |
| Data Relea | Se . Teal 2020 | Unit COSt Estimate | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | Gasket and bolt set, for flanges, 1034 | | | | | | | | |
| 28 | 221113470628 | kPa, 40 mm pipe size | | | \$ | 138.88 | \$ 1,488.20 | \$- | \$ | 1,627.08 |
| | | | | | | | | | | |
| | | | | | \$ | 138.88 | \$ 1,488.20 | \$ - | \$ | 1,627.08 |
| | | | Welder P | 1 | | | \$ 1,488.20 | | \$ | 1,488.20 |
| | | | QA Inspection | 1 | | | \$ 1,400.20 ¢ 4,464.60 | | ф ф | 1,400.20 |
| | | | Labor factor 2 | 15 | | | \$ 7,707.00 \$ 6,606.00 | | -р С | 6 6 6 6 6 0 0 |
| | | | SS premium fi | 2.5 | \$ | 347 20 | φ 0,050.50 | | ŝ | 347 20 |
| | | | 55 premium n | 2.5 | Ś | 486.08 | \$ 11.161.50 | | ŝ | 11.647.58 |
| | | | | | Ŧ | | + | | - | |
| D_04_03 V | lest annex clea | nup pump suction | | | | | | | | |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 15 mm | | | | | | | | |
| 40 | 004440044040 | diameter, schedule 40, type 316, includes | | | ~ | 4 050 00 | ¢ 500.50 | ۴ | • | 4 500 40 |
| 10 | 221113644310 | couplings and hangers 3 m OC | | | \$ | 1,059.90 | \$ 500.50 | р - | \$ | 1,560.40 |
| | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 15 mm | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | |
| 5 | 221113644310 | couplings and hangers 3 m OC | | | \$ | 529.95 | \$ 250.25 | \$- | \$ | 780.20 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 20 mm | | | | | | | | |
| 15 | 221112644220 | couplings and hangers 3 m OC | | | ¢ | 1 905 95 | ¢ 766.20 | ¢ | ¢ | 2 572 05 |
| 10 | 221113044320 | couplings and hangers 5 m OC | | | φ | 1,005.05 | φ /00.20 | φ - | φ | 2,072.00 |
| | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 20 mm | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | |
| 56 | 221113644320 | couplings and hangers 3 m OC | | | \$ | 6,741.84 | \$ 2,860.48 | \$- | \$ | 9,602.32 |
| | | | | | | | | | | |
| | | Din a stainleas staal three dad. OF more | | | | | | | | |
| | | diameter schedule 40 type 316 includes | | | | | | | | |
| 5 | 221113644330 | couplings and hangers 3 m OC | | | \$ | 833.50 | \$ 291.55 | \$ - | \$ | 1,125.05 |
| - | | | | | Ť | | • | • | Ť | ., |
| | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 25 mm | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | |
| 85 | 221113644330 | couplings and hangers 3 m OC | | | \$ | 14,169.50 | \$ 4,956.35 | \$- | \$ | 19,125.85 |
| | | | | | | | | | | |
| | | Pine, stainless steel, threaded, 25 mm | | | | | | | | |
| | | diameter schedule 40 type 316 includes | | | | | | | | |
| 7 | 221113644330 | couplings and hangers 3 m OC | | | \$ | 1,166.90 | \$ 408.17 | \$ - | \$ | 1,575.07 |
| | | | | | | , | | | | , |
| | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 50 mm | | | | | | | | |
| | 00447007 | diameter, schedule 40, type 316, includes | | | | | • | • | | |
| 14 | 221113644360 | couplings and hangers 3 m OC | | | \$ | 4,682.02 | \$ 1,155.84 | \$ - | \$ | 5,837.86 |
| | | | | | | | | | | |
| | | Pipe stainless steel threaded 15 mm | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | |
| 5 | 221113644310 | couplings and hangers 3 m OC | | | \$ | 529.95 | \$ 250.25 | \$ - | \$ | 780.20 |
| | | | | | | | | | | |

| CONFII | DENTIAL A | TTORNEY WORK PRODUCT | | | | | | Attachme | J3.4 ent 1 | |
|----------|------------------------------|--|--|-------------|---------|---------------------|----------------------------|---------------|---------------|--------------|
| | | | | | | | | Page 1// of | 350 | |
| Quantity | Line Number | Description | | Ext. Mat | . O&P | Ext. Labour O& | Ex | t. Equip. O&P | Ex | t. Total O&P |
| 5 | 221113644360 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ 1, | ,672.15 | \$ 412.8 | D \$ | - | \$ | 2,084.95 |
| 25 | 221113644390 | Pipe, stainless steel, threaded, 100 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ 17. | ,364.50 | \$ 3,586.2 | 5\$ | - | \$ | 20,950.75 |
| 1 | 221113484950 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 20 mm diameter | | \$ | 28.30 | \$ 7.9 | 5\$ | - | \$ | 36.25 |
| 1 | 221113484960 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter | | \$ | 28.30 | \$ 7.9 | 5 \$ | - | \$ | 36.25 |
| 1 | 221113484030 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor. excl ioint coupling material | | \$ | 93.64 | \$ 15.9 | 4 \$ | _ | s | 109.58 |
| · | | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | • | | • | | | Ţ | |
| 1 | 221113484030 | coupling labor, excl joint coupling material Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | \$ | 93.64 | \$ 15.9 | 4 \$ | - | \$ | 109.58 |
| 59 | 221113484030 | coupling labor, excl joint coupling material Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | \$ 5, | 524.76 | \$ 940.4 | 6 \$ | · | \$ | 6,465.22 |
| 2 | 221113484040 | coupling labor, excl joint coupling material Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint | | \$ | 100.84 | \$ 31.8 | 3\$ | | \$ | 132.72 |
| 33 | 221113484040 221113484040 | coupling labor, excl joint coupling material Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 1, \$ | 663.86 | \$ 526.0 \$ 79.7 | 2 \$ 0 \$ | - | \$ | 2,189.88 |

Filed 2021-08-17 EB-2020-0290

| | | | Û. | | | Tage 170 0 | 550 |
|----------|--------------|--|----|-----------------|-----------------|-----------------|----------------|
| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
| 1 | 221113484060 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 50.42 | \$ 24.25 | \$ - | \$ 74.67 |
| 11 | 221113484060 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 554.62 | \$ 266.75 | \$- | \$ 821.37 |
| 1 | 221113484090 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 87.98 | \$ 43.34 | \$- | \$ 131.32 |
| 12 | 221113484090 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 1.055.76 | \$ 520.08 | \$ - | \$ 1,575.84 |
| 0 | 004440405700 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint | | | | | 000 40 |
| 2 | 221113463760 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint | | \$ 329.20 | \$ 03.14 | ф - | \$ 390.42 |
| 4 | 221113485780 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint | | \$ 658.56 | \$ 138.28 | \$ - | \$ 796.84 |
| 7 | 221113485780 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint | | \$ 1,152.48 | \$ 241.99 | Ş - | \$ 1,394.47 |
| 2 | 221113485780 | coupling labor, exci joint coupling material Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 80 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint | | ə <u>329.28</u> | ə 69.14 | Ş - | |
| 1 | 221113485800 | coupling labor, excl joint coupling material | | \$ 220.21 | \$ 46.44 | \$- | \$ 266.65 |

| | 1 | | 0 | | | | r ago rro o | |
|----------|--------------|--|---|--------|----------|-----------------|-----------------|----------------|
| Quantity | Line Number | Description | | Ext. N | lat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
| 6 | 221113484908 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm diameter | | \$ | 234.60 | \$ 47.70 | \$- | \$ 282.30 |
| 1 | 221113484908 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm diameter | | \$ | 39.10 | \$ 7.95 | \$- | \$ 47.05 |
| 2 | 221113484908 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm diameter | | \$ | 78.20 | \$ 15.90 | \$- | \$ 94.10 |
| 1 | 221113484910 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 40 mm diameter | | \$ | 39.10 | \$ 11.87 | \$- | \$ 50.97 |
| 2 | 221112494010 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 40 mm | | ¢ | 78.20 | ¢ 23.74 | ¢ | \$ 101.04 |
| 2 | 221113464910 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm | | ¢ | 78.20 | ¢ 23.14 | Ф - | \$ 101.94 |
| 2 | 221113484912 | diameter Pipe, fittings & valves, coupling, steel, | | \$ | 98.78 | \$ 31.88 | \$ - | \$ 130.66 |
| 2 | 221113484912 | Pipe, fittings & valves, coupling, steel, | | \$ | 98.78 | \$ 31.88 | \$- | \$ 130.66 |
| 1 | 221113484916 | painted, rigid style, grooved joint, 80 mm diameter | | \$ | 64.83 | \$ 21.16 | \$- | \$ 85.99 |
| 3 | 221113484916 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 80 mm diameter | | \$ | 194.49 | \$ 63.48 | \$- | \$ 257.97 |
| 4 | 221112494700 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, ovel joint coupling material | | ¢ | 401 33 | ¢ 9464 | ¢ | \$ 485.06 |
| - | 221110404700 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for | | Ŷ | 401.02 | Ψ 04.04 | v - | ¥ 400.50 |
| 3 | 221113484700 | installed price, incl joint coupling labor, excl joint coupling material | | \$ | 300.99 | \$ 63.48 | \$- | \$ 364.47 |
| 5 | 221113484740 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 385.90 | \$ 121.25 | \$- | \$ 507.15 |
| | | Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, inclusite coupling lock co | | | | | | |
| 2 | 221113484740 | excl joint coupling material | | \$ | 154.36 | \$ 48.50 | \$- | \$ 202.86 |

| Quantity | Line Number | Description | | Ex | t. Mat. O&P | Ext | . Labour O&P | Ext. | Equip. O&P | Ex | t. Total O&P |
|----------|--------------|---|--|----|-------------|-----|--------------|------|------------|----|--------------|
| 1 | 221112494740 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, evel joint coupling coupling labor, | | ¢ | 77 19 | ¢ | 24.25 | ¢ | | ¢ | 101 42 |
| 3 | 221113484760 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 231.54 | \$ | 108.36 | \$ | - | \$ | 339.90 |
| 1 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 77.18 | \$ | 46.96 | \$ | - | \$ | 124.14 |
| 2 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 154.36 | \$ | 93.92 | \$ | - | \$ | 248.28 |
| 1 | 221113484790 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 105.99 | \$ | 65.02 | \$ | - | \$ | 171.01 |
| 1 | 221113484908 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm diameter | | \$ | 39.10 | \$ | 7.95 | \$ | - | \$ | 47.05 |
| 1 | 221113484910 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 40 mm diameter | | \$ | 39.10 | \$ | 11.87 | \$ | - | \$ | 50.97 |
| 1 | 221113484916 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 80 mm diameter | | \$ | 64.83 | \$ | 21.16 | \$ | - | \$ | 85.99 |
| 1 | 221113484916 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 80 mm diameter | | \$ | 64.83 | \$ | 21.16 | \$ | - | \$ | 85.99 |
| 4 | 221112400040 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | ¢ | 172 004 60 | ¢ | 105.28 | ¢ | | ¢ | 174 000 99 |
| 4 | 221113400010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price. incl 2 position | | φ | 173,994.00 | φ | 103.28 | φ | | φ | 174,039.00 |
| 10 | 221113488010 | handle, excl joint coupling material Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per | | \$ | 434,986.50 | \$ | 263.20 | \$ | - | \$ | 435,249.70 |
| 3 | 221113488010 | Joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 24,187.98 | \$ | 78.96 | \$ | - | \$ | 24,266.94 |

| | | | | | | 1 490 10 | | | | 000 | |
|----------|--------------|--|--|-----|------------|----------|---------------|-----|--------------|-----|--------------|
| Quantity | Line Number | Description | | Ext | . Mat. O&P | Ex | t. Labour O&P | Ext | . Equip. O&P | Ex | t. Total O&P |
| 2 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 16,125.32 | \$ | 52.64 | \$ | _ | \$ | 16,177.96 |
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandle, evel joint coupling material | | ¢ | 8 062 66 | ¢ | 26 32 | ¢ | | ¢ | 8 088 08 |
| I | 221113400010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | φ | 0,002.00 | φ | 20.32 | Φ | - | Ŷ | 0,000.90 |
| 2 | 221113488010 | handle, excl joint coupling material Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | \$ | 16,125.32 | \$ | 52.64 | \$ | · | \$ | 16,177.96 |
| 2 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandle, excl joint coupling material | | \$ | 8,062.66 | \$ | 26.32 | \$ | | \$ | 8,088.98 |
| 2 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandle excl joint coupling material | | ¢ | 173 004 60 | Ŷ | 105.28 | ¢ | | ę | 174 000 88 |
| 2 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandle, excl joint coupling material | | \$ | 16 125 32 | \$ | 52 64 | \$ | _ | \$ | 16 177 96 |
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 8.062.66 | \$ | 26.32 | \$ | - | \$ | 8.088.98 |
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 8,062.66 | \$ | 26.32 | \$ | | \$ | 8,088.98 |
| 5 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 40,313.30 | \$ | 131.60 | \$ | - | \$ | 40,444.90 |

| | | | | | | | | | | 1 age 102 01 | 000 | |
|------------|-----------------|--|-----------------|-------------|-----|--------------|--------|----------------|-----|---------------|--------|---|
| Quantity | Line Number | Description | | | E | xt. Mat. O&P | E | xt. Labour O&P | Ext | t. Equip. O&P | E | xt. Total O&P |
| 2 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 16.125.32 | \$ | 52.64 | \$ | | \$ | 16.177.96 |
| 5 | 221112489010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandle, over light exclusion | | | ¢ | 40 313 30 | ¢ | 121.60 | ¢ | | ¢ | 40 444 90 |
| 1 | 221113466010 | Venturi flow, measuring device, 25 mm | | | ¢ | 40,313.30 | ¢ | 131.00 | ¢ | - | ¢ | 40,444.90 |
| 1 | 221112484060 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter | | | ¢ | 28.20 | ¢ | 42.03 | ¢ | _ | ¢ | 36.25 |
| _ | 221113464960 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, | | | à | 28.30 | ¢ | 7.95 | \$ | - | ¢ | 30.25 |
| 5 | 221113484960 | 25 mm diameter Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, | | | \$ | 141.50 | \$ | 39.75 | \$ | - | \$ | 181.25 |
| 1 | 221113484970 | 32 mm diameter | | ¢ 42 072 27 | \$ | 36.53 | \$ | 9.96 | \$ | - | \$ | 46.49 |
| | | | Webb Of | a 13,9/3.3/ | φ | 1,007,021.42 | ф ф | 20,742.00 | φ | - | ф ф | 1,007,704.20 |
| | | | weider Q1 | 0.5 | | | \$ | 1,216.98 | | | \$ | 1,216.98 |
| | | | Welder Q2 | 0.33 | | | \$ | 1,195.42 | | | \$ | 1,195.42 |
| | | | Welder P | 1 | | | \$ | 14,714.70 | | | \$ | 14,714.70 |
| | | | OA inspection | 1 | | | \$ | 17,127,10 | | | \$ | 17.127.10 |
| | | | subtotal labor | | | | \$ | 54 997 05 | | | \$ | 1 122 018 47 |
| | | | EMMC pipe fo | 25 07026007 | | | Ψ ¢ | 1 070 600 22 | | | ¢ | 1,122,010.17 |
| | | | EMWG pipe ia | 33.9/62006/ | | | \$ | 1,976,096.33 | | | Þ | 1,9/0,090.33 |
| | | | Subtotal with I | EMGW | | | \$ | 2,033,695.39 | | | \$ | 3,100,/16.81 |
| | | | Labor factor 2 | 1.5 | | | \$ | 3,050,543.08 | | | \$ | 3,050,543.08 |
| | | | SS premium fi | 2.5 | \$ | 39,494.60 | | | | | \$ | 39,494.60 |
| | | | Subtotal mater | rials | \$ | 1,106,516.02 | | | | | \$ | 6,190,754.48 |
| | | | NC Class | 0.324480494 | \$ | 359.042.86 | | | | | \$ | 359.042.86 |
| | | | | | \$1 | .465.558.88 | \$ | 5.084.238.46 | | | \$ | 6.549.797.35 |
| | | | | | | , , | + | .,, | | | T | , |
| D 04 04 W | Vest annex elue | anun tank inlet | | | | | | | | | | |
| D_04_04 V | | Linit Opent Fotimet- | | | | | | | | | | |
| Data Relea | ise : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| 2 | 221113644320 | Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 240.78 | \$ | 102.16 | \$ | - | \$ | 342.94 |
| 60 | 221113644330 | Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 10,002.00 | \$ | 3,498,60 | \$ | _ | \$ | 13,500.60 |
| | | Pipe, stainless steel, threaded, 50 mm | | | | ., | | ., | | | | ., |
| 18 | 221113644360 | couplings and hangers 3 m OC | | | \$ | 6,019.74 | \$ | 1,486.08 | \$ | - | \$ | 7,505.82 |

| | | | | | | | | | - 3 | | |
|----------|--------------|--|--|-----------|-------------|----|---------------|-----|---------------|----|--------------|
| Quantity | Line Number | Description | | Ex | t. Mat. O&P | Ех | t. Labour O&P | Ext | t. Equip. O&P | Ex | t. Total O&P |
| 3 | 221113484030 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 280.92 | \$ | 47.82 | \$ | - | \$ | 328.74 |
| 4 | 221113484040 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 201.68 | \$ | 63.76 | \$ | - | \$ | 265.44 |
| 26 | 221113484040 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 1,310.92 | \$ | 414.44 | \$ | | \$ | 1,725.36 |
| 2 | 221113484060 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 100.84 | \$ | 48.50 | \$ | <u>.</u> | \$ | 149.34 |
| 2 | 221113484070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | ¢ | 100 84 | ¢ | 63.08 | \$ | | ¢ | 164 82 |
| 3 | 221113484910 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 40 mm diameter | | \$ | 117.30 | \$ | 35.61 | \$ | - | \$ | 152.91 |
| 7 | 221113484740 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 540.26 | \$ | 169.75 | \$ | - | \$ | 710.01 |
| 1 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 77.18 | \$ | 46.96 | \$ | <u>.</u> | \$ | 124.14 |
| 3 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 24,187.98 | \$ | 78.96 | \$ | <u>-</u> | \$ | 24,266.94 |
| 3 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 130,495.95 | \$ | 78.96 | \$ | <u>.</u> | \$ | 130,574.91 |
| 3 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 130,495.95 | \$ | 78.96 | \$ | <u>-</u> | \$ | 130,574.91 |
| 7 | 221113470630 | Gasket and bolt set, for flanges, 1034 kPa, 50 mm pipe size | | \$ | 70.56 | \$ | 429.80 | \$ | - | \$ | 500.36 |

| Quantity | Line Number | Description | | | E | Ext. Mat. O&P | E | xt. Labour O&P | Ex | t. Equip. O&P | Ex | t. Total O&P |
|------------|-------------------|---|----------------|-------------|--------|---------------|--------|----------------|----|---------------|------------|--------------|
| | | | | | \$ | 304 242 90 | \$ | 6 644 34 | \$ | _ | \$ | 310 887 24 |
| | | | Wolder O1 | 0.5 | Ψ | 304,242.30 | ¢ | 742.04 | Ψ | - | Ψ ¢ | 742.04 |
| | | | Welder Q1 | 0.0 | | | ф ф | 743.04 | | | ф ф | 743.04 |
| | | | weider Qz | 0.33 | | | Þ | - | | | ð Ö | - |
| | | | Welder P | 1 | | | \$ | 5,158.26 | | | \$ | 5,158.26 |
| | | | QA inspection | 1 | | | \$ | 5,901.30 | | | \$ | 5,901.30 |
| | | | subtotal labor | | | | \$ | 18,446.94 | | | \$ | 322,689.84 |
| | | | EMWG pipe fa | 35.97826087 | | | \$ | 663,688.82 | | | \$ | 663,688.82 |
| | | | Subtotal with | EMGW | | | \$ | 682,135.76 | | | \$ | 986,378.66 |
| | | | Labor factor 2 | 1.5 | | | \$ | 1,023,203.64 | | | \$ | 1,023,203.64 |
| | | | SS premium fi | 2.5 | \$ | 7.001.25 | | | | | \$ | 7.001.25 |
| | | | subtotal mater | rials | \$ | 311,244,15 | | | | | \$ | 2.016.583.55 |
| | | | NC factor | 0 324480494 | ŝ | 100 992 66 | | | | | ¢ | 100 992 66 |
| | | | NC factor | 0.521100151 | Ψ # | 412 226 91 | ÷ | 1 705 220 40 | | | Ψ | 117 576 20 |
| D 04 05 S | upply of domin | aralized water to the west appay | | | æ | 412,230.01 | P | 1,703,339.40 | | | р 4 | .,117,570.20 |
| D_04_03 3 | supply of definit | | | | | | | | | | | |
| Data Relea | ise : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 15 mm | | | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 70 | 221113644310 | couplings and hangers 3 m OC | | | \$ | 7,419.30 | \$ | 3,503.50 | \$ | - | \$ | 10,922.80 |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 20 mm | | | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 80 | 221113644320 | couplings and hangers 3 m OC | | | \$ | 9,631.20 | \$ | 4,086.40 | \$ | - | \$ | 13,717.60 |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 25 mm | | | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 85 | 221113644330 | couplings and hangers 3 m OC | | | \$ | 14,169.50 | \$ | 4,956.35 | \$ | - | \$ | 19,125.85 |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 50 mm | | | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 5 | 221113644360 | couplings and hangers 3 m OC | | | \$ | 1,672.15 | \$ | 412.80 | \$ | - | \$ | 2,084.95 |
| | | | | | | , | | | | | | , |
| | | Pipe, stainless steel, threaded, 50 mm | | | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 11 | 221113644360 | couplings and hangers 3 m OC | | | \$ | 3.678.73 | \$ | 908,16 | \$ | - | \$ | 4.586.89 |
| | | | | | - | -, | - | | - | | | ., |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or | | | | | | | | | | |
| | | 90 Deg., steel, painted, grooved joint, 20 | | | | | | | | | | |
| | | mm diameter, add 1 coupling (material | | | | | | | | | | |
| | | only) per joint for installed price, incl joint | | | | | | | | | | |
| 5 | 221113484030 | coupling labor, excl joint coupling material | | | \$ | 468.20 | \$ | 79.70 | \$ | - | \$ | 547.90 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pipe fittings & values albow 45 Deg or | | | | | | | | | | |
| | | Pipe, intilligs & valves, elbow, 45 Deg. of | | | | | | | | | | |
| | | 90 Deg., steel, painted, grooved joint, 20 | | | | | | | | | | |
| | | mm diameter, add 1 coupling (material | | | | | | | | | | |
| | | only) per joint for installed price, incl joint | | | | | | | | | | |
| 5 | 221113484030 | coupling labor, excl joint coupling material | | | \$ | 468.20 | \$ | 79.70 | \$ | - | \$ | 547.90 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg, or | | | | | | | | | | |
| | | 90 Deg. steel painted grooved joint 20 | | | | | | | | | | |
| | | mm diameter, add 1 coupling (material | | | | | | | | | | |
| | | anity) participation for installed price, inclusion | | | | | | | | | | |
| 10 | 221112404020 | only) per joint for installed price, incl joint | | | ¢ | 1 695 59 | ¢ | 200 02 | ¢ | | ¢ | 1 070 44 |
| 10 | 221113404030 | coupling labor, exci joint coupling material | | | φ | 1,005.52 | φ | 200.92 | φ | - | φ | 1,972.44 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or | | | | | | | | | | |
| | | 90 Deg., steel, painted, grooved joint, 25 | | | | | | | | | | |
| | | mm diameter, add 1 coupling (material | | | | | | | | | | |
| | | only) per joint for installed price, incl joint | | | | | | | | | | |
| 5 | 221113484040 | coupling labor, excl joint coupling material | | | \$ | 252 10 | \$ | 79 70 | \$ | _ | \$ | 331.80 |
| Ŭ | | | | | Ψ | 202.10 | Ψ | 10.70 | ~ | | ÷ | 301.00 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or | | | | | | | | | | |
| | | 90 Deg., steel, painted, grooved joint, 25 | | | | | | | | | | |
| | | mm diameter, add 1 coupling (material | | | | | | | | | | |
| | | only) per joint for installed price, incl joint | | | | | | | | | | |
| 46 | 221113484040 | coupling labor, excl joint coupling material | | | \$ | 2,319.32 | \$ | 733.24 | \$ | - | \$ | 3,052.56 |

| Quantity | Line Number | Description | | Ext. | Mat. O&P | Ex | t. Labour O&P | Ext | t. Equip. O&P | E | t. Total O&P |
|----------|--------------|--|--|------|----------|----|---------------|-----|---------------|----|--------------|
| 15 | 221113484060 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 756.30 | \$ | 363.75 | \$ | - | \$ | 1,120.05 |
| 8 | 221113484070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 403.36 | \$ | 255.92 | \$ | - | \$ | 659.28 |
| 20 | 221113484070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 1,008.40 | \$ | 639.80 | \$ | - | \$ | 1,648.20 |
| 1 | 221113484070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor. excl ioint coupling material | | \$ | 50.42 | \$ | 31.99 | \$ | _ | \$ | 82.41 |
| | | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint | | | | | | | | | 100.04 |
| 1 | 221113485780 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint | | \$ | 104.04 | \$ | 34.57 | \$ | | \$ | 199.21 |
| 3 | 221113485780 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint | | \$ | 493.92 | \$ | 103.71 | \$ | | \$ | 597.63 |
| 1 | 221113485780 | coupling labor, excl joint coupling material Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 80 mm diameter | | \$ | 64.83 | \$ | 34.57 | \$ | | \$ | 199.21 |
| 2 | 221113484700 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 200.66 | \$ | 42.32 | \$ | <u>.</u> | \$ | 242.98 |
| 3 | 221113484760 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 231.54 | \$ | 108.36 | \$ | - | \$ | 339.90 |
| 1 | 221113484740 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 77.18 | \$ | 24.25 | \$ | - | \$ | 101.43 |

J3.4 CONFIDENTIAL ATTORNEY WORK PRODUCT Attachment 1 Page 186 of 350 Quantity Line Number Ext. Mat. O&P Ext. Labour O&P Ext. Equip. O&P Ext. Total O&P Description Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, 221113484770 excl joint coupling material 46.96 \$ \$ 77.18 \$ 124.14 1 \$ Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, 221113484770 excl joint coupling material \$ 308.72 \$ 187.84 \$ 496.56 4 \$ -Pipe, fittings & valves, tee, steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, 221113484790 excl joint coupling material 1 \$ 105.99 \$ 65.02 \$ \$ 171.01 Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm 221113484912 diameter \$ 49.39 \$ 15 94 65 33 1 \$ -\$ Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm 221113484912 diameter 15.94 \$ 1 \$ 49.39 \$ \$ 65.33 Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position 221113488010 handle, excl joint coupling material 5 \$ 10,735.80 \$ 131.60 \$ \$ 10,867.40 -Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position 221113488010 handle, excl joint coupling material 8,588.64 \$ 105.28 \$ 8,693.92 4 \$ Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position 221113488010 handle, excl joint coupling material 3 \$ 6.441.48 \$ 78.96 \$ \$ 6.520.44 Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position 221113488010 handle, excl joint coupling material \$ 2,147.16 \$ 26.32 \$ \$ 2,173.48 Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position 221113488020 handle, excl joint coupling material 8,588.64 \$ 138.28 \$ 4 \$ \$ 8.726.92 -Flexible metal hose, bronze braided, bronze ends, threaded, 20 mm diameter x 221119140160 300 mm \$ 44.76 \$ 40.25 \$ \$ 85.01 1 Flexible metal hose, bronze braided, bronze ends, threaded, 20 mm diameter x 7 221119140160 300 mm \$ 313.32 \$ 281.75 \$ \$ 595.07 Insulation, pipe covering (price copper tube one size less than I.P.S.), rubber tubing flexible closed cell foam, 25 mm 100 220719108449 wall, 50 mm iron pipe size 2,838.00 \$ 2,938.00 \$ 5,776.00

Filed 2021-08-17 EB-2020-0290

J3.4 CONFIDENTIAL ATTORNEY WORK PRODUCT Attachment 1 Page 187 of 350 Quantity Line Number Ext. Mat. O&P Ext. Labour O&P Ext. Equip. O&P Ext. Total O&P Description Insulation, pipe covering (price copper tube one size less than I.P.S.), rubber tubing flexible closed cell foam, 25 mm 220719108448 wall, 40 mm iron pipe size 70 \$ 1.618.40 \$ 2.021.60 \$ \$ 3.640.00 -Insulation, pipe covering (price copper tube one size less than I.P.S.), rubber tubing flexible closed cell foam, 25 mm 90 220719108446 wall, 25 mm iron pipe size \$ 1,191.60 \$ 2,510.10 \$ \$ 3,701.70 Insulation, pipe covering (price copper tube one size less than I.P.S.), rubber tubing flexible closed cell foam, 25 mm 70 220719108445 wall, 20 mm iron pipe size \$ 1,033.90 \$ 1,952.30 \$ 2,986.20 \$ Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 221113484960 25 mm diameter 5 \$ 141.50 \$ 39.75 \$ 181.25 \$ Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 221113484960 25 mm diameter 4 \$ 113.20 \$ 31.80 \$ \$ 145.00 -Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 221113484970 32 mm diameter \$ 4 146.12 \$ 39.84 \$ \$ 185.96 89,913.30 \$ 27,454.40 \$ 117,367.70 \$ \$ Welder Q1 0.5 703.57 703.57 \$ \$ Welder Q2 0.33 \$ \$ Welder P 26.047.26 26.047.26 1 \$ \$ 26,750.83 26,750.83 QA inspection 1 \$ \$ subtotal labor 80,956.06 170,869.36 \$ \$ EMWG pipe fa 12.86956522 1,041,869.29 1,041,869.29 \$ \$ Subtotal with EMGW \$ 1,122,825.35 1,212,738.65 \$ Labor factor 2 1,684,238.03 1,684,238.03 1.5 \$ \$ SS premium fi 42.101.75 42.101.75 2.5 \$ \$ 132,015.05 \$ 2,807,063.38 \$ \$ 2,939,078.43 D_04_06 D2O cleanup system to increase flexibility Data Release : Year 2020 Unit Cost Estimate Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes 20 221113644360 couplings and hangers 3 m OC \$ 6,688.60 \$ 1,651.20 \$ \$ 8,339.80 Pipe, steel, black, threaded, 40 mm diameter, schedule 40, A-106, grade A/B seamless, includes coupling and clevis hanger assembly sized for covering, 3 m 221113440817 OC 362.70 \$ 294.10 \$ 656.80 5 \$ Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint 4 221113484030 coupling labor, excl joint coupling material \$ 374.56 \$ 63.76 \$ \$ 438.32 -Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint

151.26 \$

72.75 \$

221113484060 coupling labor, excl joint coupling material

3

224.01

Filed 2021-08-17 EB-2020-0290

| CONFII | DENTIAL A | TTORNEY WORK PRODUCT | | | | | | | | Filed 2021-08 EB-2020-0 Attachme Page 188 of | 3-17 290 J3.4 ent 1 350 | 7) 4) |
|----------|--------------|--|-----------------|-------------|----|--------------|----|----------------|----|---|-------------------------------------|------------------|
| Quantity | Line Number | Description | | | E | xt. Mat. O&P | E | kt. Labour O&P | Ex | t. Equip. O&P | E | xt. Total O&P |
| 4 | 221113484700 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 401.32 | \$ | 84.64 | \$ | - | \$ | 485.96 |
| 3 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle. excl joint coupling material | | | \$ | 130,495,95 | \$ | 78.96 | \$ | | \$ | 130.574.91 |
| - | | ······································ | | | - | , | - | | - | | | , |
| | | | | | \$ | 138,474.39 | \$ | 2,245.41 | \$ | - | \$ | 140,719.80 |
| | | | Buttweld P&Q | \$ 2.00 | | · | \$ | 273.02 | | | \$ | 273.02 |
| | | | Welder Q1 | 0.5 | | | \$ | 972.65 | | | \$ | 972.65 |
| | | | Welder Q2 | 0.33 | | | \$ | - | | | \$ | - |
| | | | Welder P | 1 | | | \$ | 300.11 | | | \$ | 300.11 |
| | | | QA inspection | 1 | | | \$ | 1,272.76 | | | \$ | 1,272.76 |
| | | | subtotal labor | | | | \$ | 5,063.95 | | | \$ | 143,538.34 |
| | | | EMWG pipe fa | 35.97826087 | | | \$ | 182,192.11 | | | \$ | 182,192.11 |
| | | | Subtotal with I | EMGW | | | \$ | 187,256.06 | | | \$ | 325,730.45 |
| | | | Labor factor 2 | 1.5 | | | \$ | 280,884.10 | | | \$ | 280,884.10 |
| | | | SS premium fi | 2.5 | \$ | 2,317.85 | | | | | \$ | 2,317.85 |
| | | | | | \$ | 140,792.24 | \$ | 468,140.16 | | | \$ | 608,932.40 |
| | | | | | | | | | | | | |
| | | | - | | | | | | | | | |
| | | | Iotal | | \$ | 2,151,089.06 | \$ | 10,075,942.91 | | | \$ | 12,227,031.97 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | | Ext. L | abour O&P | Ext. Equ | uip. O&P | Ext. | Total O&P |
|-------------|-----------------|--|--|---------------|----------|--------|-----------|----------|----------|------|-----------|
| | | | | | | | | | | | |
| D 05 01 E | winment tenko | | | | | | | | | | |
| Data Releas | se : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | See D01 01 | | | | | | | | | |
| | | | | | | | | | | | |
| D_05_02 M | echanical modif | ications to the loading bay | | | | | | | | | |
| Data Releas | se : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| | | Pipe, steel, black, threaded, 25 mm diameter, schedule 40, A-106, grade A/B seamless, includes coupling and clevis hanger assembly | | | | | | | | | |
| 28 | 221113440815 | sized for covering, 3 m OC | | \$ | 1,166.76 | \$ | 1,387.12 | \$ | - | \$ | - |
| 1 | 221113440817 | Pipe, steel, black, threaded, 40 mm diameter, schedule 40, A-106, grade A/B seamless, includes coupling and clevis hanger assembly sized for covering, 3 m OC | | \$ | 72.54 | \$ | 58.82 | \$ | _ | \$ | - |
| | 004440404040 | Pipe, fittings & valves, coupling, steel, painted, | | ¢ | 20.40 | ¢ | 44.07 | ¢ | | ¢ | |
| 1 | 221113484910 | rigid style, grooved joint, 40 mm diameter | | \$ | 39.10 | \$ | 11.87 | \$ | - | \$ | - |
| 4 | 221113484040 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 201.68 | \$ | 63.76 | \$ | _ | \$ | - |
| 1 | 221113484040 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 50.42 | \$ | 15 94 | \$ | _ | \$ | _ |
| | 22111010101010 | | | Ŷ | 00.12 | Ψ | 10.01 | Ŷ | | Ŷ | |
| 1 | 221113484060 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | ¢ | 50.42 | ¢ | 24.25 | 2 | | ¢ | |
| | 221113404000 | | | Ψ | 50.42 | Ψ | 24.20 | Ψ | - | Ψ | - |
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 2,147.16 | \$ | 26.32 | \$ | - | \$ | 2,173.48 |
| | | Pipe, fittings & valves, coupling, steel, painted. | | | | | | | | | |
| 2 | 221113484960 | standard, flexible, grooved joint, 25 mm diameter | | \$ | 56.60 | \$ | 15.90 | \$ | _ | \$ | |
| 29 | 220719107440 | Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 50 mm wall, 150 mm iron pipe size | | \$ | 762.12 | \$ | 1,227.57 | \$ | - | \$ | - |
| | | Steam trap, cast iron body, float and | | | | | | | | | |
| 1 | 232120701020 | thermostatic type, threaded, 103 kPa, 25 mm pipe size | | \$ | 218.15 | \$ | 54.18 | \$ | - | \$ | - |

| Quantity | Line Number | Description | | | Ex | t. Mat. O&P | Ext | Labour O&P | Ext | t. Equip. O&P | Ex | t. Total O&P |
|------------|-------------------|--|-----------------------|-------------|----|-------------|---------|------------|-----|---------------|---------|--------------|
| | | | | | | | | | | | | |
| 1 | 077123106600 | Steel wire strainers, galvanized, rectangular, 50mm x 75mm | | | \$ | 30.51 | \$ | 5.69 | \$ | - | \$ | - |
| | | Pipe, fittings & valves, coupling, steel, painted, | | | | | | | | | | |
| 1 | 221113484910 | rigid style, grooved joint, 40 mm diameter | | | \$ | 39.10 | \$ | 11.87 | \$ | - | \$ | - |
| | | | Waldan Of | 0.5 | \$ | 4,834.56 | \$ | 2,903.29 | \$ | - | \$ | 2,173.48 |
| | | | Welder QI Welder P | 0.5 | | | Դ \$ | 29.41 | | | ֆ \$ | 29.41 |
| | | | QA inspection | 1 | | | \$ | 2,873.88 | | | \$ | 2,873.88 |
| | | | subtotal labor | | ¢ | 4 834 56 | \$ ¢ | 8,651.05 | | | \$ ¢ | 8,651.05 |
| | | | | | ÷ | +,0J4.J0 | Ÿ | 0,051.05 | | | Ψ | 15,405.01 |
| D_05_03 A | ctive plant drain | age system and D2O liquid recovery tie in | | | | | | | | | | |
| | | | | | | | | | | | | |
| 18 | 221113440816 | Pipe, steel, black, threaded, 32 mm diameter, schedule 40, A-106, grade A/B seamless, includes coupling and clevis hanger assembly sized for covering, 3 m OC | | | \$ | 879.84 | \$ | 947.34 | \$ | _ | \$ | - |
| 5 | 221112440810 | Pipe, steel, black, threaded, 50 mm diameter, schedule 40, A-106, grade A/B seamless, includes coupling and clevis hanger assembly | | | ¢ | 200 70 | ¢ | 266.25 | ¢ | | ¢ | |
| 5 | 221113440619 | sized for covering, 5 m OC | | | ¢ | 290.70 | φ | 300.33 | φ | - | ¢ | - |
| | | | | | \$ | 1,170.54 | \$ | 1,313.69 | \$ | - | \$ | - |
| | | | Welder Q1 | 0.5 | | | \$ | 473.67 | | | \$ ¢ | 473.67 |
| | | | subtotal labor | 1 | | | э \$ | 2,261.03 | | | \$ | 947.34 |
| | | | EMWG pipe factor | 12.86956522 | | | \$ | 29,098.47 | | | \$ | 29,098.47 |
| | | | Subtotal with EMGW | 15 | | | \$ ¢ | 31,359.50 | | | \$ ¢ | 30,045.81 |
| | | | | 1.5 | \$ | 1,170.54 | ₽ \$ | 78,398.76 | | | ₽ \$ | 79,569.30 |
| D_05_04 W | est Annex active | e plant drainage discharge and vent line pipin | g | | | | | | | | | |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| 5 | 221113644310 | Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 529.95 | \$ | 250.25 | \$ | - | \$ | - |
| 12 | 221113644320 | Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 1,444.68 | \$ | 612.96 | \$ | - | \$ | _ |
| 10 | 221113644360 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 3,344.30 | \$ | 825.60 | \$ | - | \$ | - |
| 312 | 221113644360 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 104.342.16 | \$ | 25.758.72 | \$ | <u>-</u> | \$ | - |
| 0.5 | | Pipe, steel, black, threaded, 50 mm diameter, schedule 40, A-106, grade A/B seamless, includes coupling and clevis hanger assembly | | | | 0.770.40 | | 4 700 55 | | | • | |
| 5 | 221113440819 | Pipe, steel, black, threaded, 65 mm diameter, schedule 40, A-106, grade A/B seamless, includes coupling and clevis hanger assembly sized for covering, 3 m OC | | | \$ | 3,779.10 | \$ | 4,762.55 | \$ | | \$ | _ |
| 5 | 221113440822 | Pipe, steel, black, threaded, 80 mm diameter, schedule 40, A-106, grade A/B seamless, includes coupling and clevis hanger assembly sized for covering, 3 m OC | | | \$ | 488.80 | \$ | 546.95 | \$ | - | \$ | - |
| | | | | | | | | | | | | |

| Quantity | Line Number | Description | | Ext | t. Mat. O&P | Ext | Labour O&P | Ext | . Equip. O&P | Ext. Total O&P |
|----------|--------------|---|--|-----|-------------|-----|------------|-----|--------------|----------------|
| 8 | 221113644390 | Pipe, stainless steel, threaded, 100 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 5,556.64 | \$ | 1,147.60 | \$ | - | \$ - |
| 4 | 221113484030 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 374.56 | \$ | 63.76 | \$ | - | \$- |
| 9 | 221113484030 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 842.76 | \$ | 143.46 | \$ | _ | \$- |
| 5 | 221113484060 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 252 10 | \$ | 121 25 | \$ | _ | s _ |
| 45 | 221110404000 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, | | ¢ | 750.00 | • | 121.20 | Ŷ | | ¢ - |
| 15 | 221113484070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, | | \$ | 750.30 | \$ | 479.85 | \$ | - | ۍ - ۲ |
| 18 | 221113484070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, | | \$ | 907.56 | \$ | 575.82 | \$ | | \$ - |
| 90 | 221113484070 | excl joint coupling material Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, | | \$ | 4,537.80 | \$ | 2,879.10 | \$ | - | \$ - |
| 5 | 221113484090 | excl joint coupling material Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, | | \$ | 439.90 | \$ | 216.70 | \$ | | \$ - |
| 1 | 221113484090 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint | | φ | 87.98 | \$ | 43.34 | \$ | | φ - |
| 3 | 221113485780 | coupling material Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed | | \$ | 493.92 | \$ | 103.71 | \$ | - | \$ - |
| 1 | 221113485780 | coupling material | | \$ | 164.64 | \$ | 34.57 | \$ | - | \$ - |

| Quantity | Line Number | Description | | Ext. | Mat. O&P | Ext. | Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
|----------|--------------|--|--|---------|----------|---------|------------|-----------------|---------------------|
| 3 | 221113485780 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 493.92 | \$ | 103.71 | \$- | \$ - |
| 4 | 221113485780 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 658.56 | \$ | 138.28 | \$- | \$- |
| 7 | 221113485800 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 80 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | s | 1.541.47 | \$ | 325.08 | \$ - | s - |
| 1 | 221112495900 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 80 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | ¢ | 220.21 | ¢ | 46.44 | c | ¢ |
| 2 | 221113485800 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint. 50 mm diameter | | э \$ | 98.78 | э \$ | 31.88 | s - | م - ۲ |
| 1 | 221113484760 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl ioint coupling labor, excl ioint coupling material | | \$ | 77 18 | \$ | 36.12 | \$ - | s - |
| 3 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl ioint coupling labor, excl ioint coupling material | | s | 231 54 | \$ | 140.88 | \$ - | \$ - |
| 2 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | s | 154.36 | \$ | 93.92 | \$ - | s - |
| 10 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 771.80 | \$ | 469.60 | \$ - | \$ - |
| 1 | 221113484790 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 105.99 | \$ | 65.02 | \$ - | \$ - |
| 2 | 221113484990 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter | | \$ | 85.40 | \$ | 31.88 | \$- | \$- |

| Quantity | Line Number | Description | | | E | kt. Mat. O&P | Ext | Labour O&P | Ext. Equip. O&P | E | xt. Total O&P |
|----------|--------------|--|------------------------|-------------|----|--------------|----------------|--|-----------------|----------------|--|
| 1 | 221113484980 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 40 mm diameter | | | \$ | 39.62 | \$ | 11.87 | \$- | \$ | - |
| 5 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 10,735.80 | \$ | 131.60 | \$- | \$ | 10,867.40 |
| 3 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 6,441.48 | \$ | 103.71 | \$ - | \$ | 6,545.19 |
| 2 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | ¢ | 4 294 32 | ¢ | 52.64 | ¢? | ¢ | 4 346 96 |
| | 221110400010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling | | | Ŷ | 45,000,40 | Ŷ | 044.00 | • | • | 45 070 44 |
| 1 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 80 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling | | | \$ | 15,030.12 | \$ | 241.99 | \$ - | \$ | 15,272.11 |
| 3 | 221113488030 | material Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 6,441.48 | \$ | 78.06 | \$ - | \$ | 6,585.45 |
| 3 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 6.441.48 | \$ | 78.96 | \$ - \$ - | \$ | 6,520,44 |
| 2 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 4.294.32 | \$ | 52.64 | \$ - | \$ | 4,346.96 |
| 2 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 4.294.32 | \$ | 52.64 | \$ - | \$ | 4,346.96 |
| 1 | 221113488030 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 80 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 2 147 16 | \$ | 47 99 | \$ - | \$ | 2,195,15 |
| 1 | 221119140160 | Flexible metal hose, bronze braided, bronze ends, threaded, 20 mm diameter x 300 mm | | | \$ | 44.76 | \$ | 40.25 | \$ - | \$ | |
| | | | Welder Q1 Welder Q2 | 0.5 0.33 | \$ | 199,819.70 | \$ \$ \$ | 41,555.77 16,625.96 382.53 | \$ - | \$ \$ \$ | 67,547.06 16,625.96 382.53 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 194 of 350

| • | - | | | | | |
|---|----------|--|--|--|--|--|
| | | | | | | |
| | | | | | | |
| | | | | | | |

| Quantity | Line Number | Description | | | E | xt. Mat. O&P | Ext | . Labour O&P | Ext. Equip. O&P | E | Ext. Total O&P |
|----------|-------------|-------------|-----------------------|-------------|----|--------------|------|--------------|-----------------|----|----------------|
| | | | Welder P | 1 | | | \$ | 7,156.26 | | \$ | 7,156.26 |
| | | | QA inspection | 1 | | | \$ | 24,164.75 | | \$ | 24,164.75 |
| | | | subtotal labor | | | | \$ | 89,885.27 | | \$ | 115,876.56 |
| | | | EMWG pipe factor | 12.86956522 | | | \$ | 1,156,784.30 | | \$ | 1,156,784.30 |
| | | | Subtotal with EMGW | | | | \$ | 1,246,669.57 | | \$ | 1,272,660.86 |
| | | | Labor factor 2.5x | 1.5 | | | \$ | 1,870,004.35 | | \$ | 1,870,004.35 |
| | | | SS premium fixtures 2 | 2.5 | \$ | 33,340.88 | | | | \$ | 33,340.88 |
| | | | | | \$ | 233,160.58 | \$ 3 | 3,116,673.92 | | \$ | 3,349,834.50 |
| | | | | | | | | | | | |

| Quantity | Line Number | Description | | Ext | . Mat. O&P | Ext. | Labour O&P | Ext | t. Equip. O&P | Ext. Total O&P |
|------------|---------------|--|--|-----|------------|---------|---------------|-----|---------------|----------------|
| D_05_05 D2 | 20 management | buildingliquid recovery discharge pipe | | | | | | | | |
| 5 | 221113644310 | Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 529.95 | \$ | 250.25 | \$ | - | \$- |
| 50 | 221113644320 | Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 6,019.50 | \$ | 2,554.00 | \$ | - | \$- |
| 5 | 221113644330 | Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 833.50 | \$ | 291.55 | \$ | - | \$- |
| 30 | 221113644330 | Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 5,001.00 | \$ | 1,749.30 | \$ | | \$ - |
| 42 | 221113644360 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 14,046.06 | \$ | 3,467.52 | \$ | - | \$ - |
| 4 | 221113484030 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 374 56 | \$ | 63 76 | \$ | _ | \$ - |
| 32 | 221113484030 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, evel joint coupling material | | ¢ | 2 006 48 | ¢ | 510.08 | ¢ | | ¢ - |
| 13 | 221113484040 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 655.46 | Ψ \$ | 207.22 | \$ | - - | s - |
| 2 | 221112484060 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | ¢ | 100.84 | ¢ | 48.50 | ¢ | | ¢ |
| - 12 | 221112494060 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, ovel joint coupling material | | ¢ | 665 46 | ¢ | 215.05 | ¢ | | ¢ - |
| 13 | 221112405700 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | ¢ | 164 64 | Ŷ | 313.23 | ¢ | | ¢ - |
| | 221110400700 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor. excl joint | | Ų | 104.04 | Ψ | <i>ن</i> . بن | Ψ | | |
| 1 | 221113485780 | coupling material | | \$ | 164.64 | \$ | 34.57 | \$ | - | \$ - |

| Quantity | Line Number | Description | | | E | xt. Mat. O&P | Ext | . Labour O&P | Ext. Equip. O&P | E | xt. Total O&P |
|----------|------------------------------|--|--------------------|-------------|----------|-------------------|----------------|----------------|-----------------|----------|---------------|
| 3 | 221113484910 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 40 mm diameter | | | \$ | 117.30 | \$ | 35.61 | \$- | \$ | - |
| 4 | 221113484700 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 401.32 | \$ | 84.64 | \$- | \$ | - |
| 1 | 221113484740 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 77.18 | \$ | 24.25 | \$- | \$ | - |
| 2 | 221113484740 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 154.36 | \$ | 48.50 | \$- | \$ | - |
| 2 | 221113484740 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl ioint coupling labor. excl ioint coupling material | | | \$ | 154.36 | \$ | 48.50 | \$ - | \$ | |
| 3 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | ¢ | 6 441 48 | ¢ | 78.06 | ¢ | ¢ | 6 520 44 |
| | 221110400010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling | | | Ŷ | 0,111.10 | Ŷ | 70.00 | • | Ŷ | 0,020.44 |
| | 221113400010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling | | | \$ | 0,441.40 | • | 76.90 | \$ <u>-</u> | \$ | 0,020.44 |
| 4 | 221113488010 | material Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling | | | \$ | 8,588.64 | \$ | 105.28 | \$ - | \$ | 8,693.92 |
| 2 | 221113488010 | material Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling | | | \$ | 4,294.32 | \$ | 52.64 | \$ - | \$ | 4,346.96 |
| 4 | 221113488010 221113484960 | material Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter | | | \$ \$ | 8,588.64 28.30 | \$ | 105.28 7.95 | \$ - \$ - | \$ \$ | 8,693.92 |
| 10 | 221113470630 | Gasket and bolt set, for flanges, 1034 kPa, 50 mm pipe size | | | \$ | 100.80 | \$ | 614.00 | \$- | \$ | |
| | | | Welden Of | | \$ | 66,930.27 | \$ | 10,811.14 | \$- | \$ | 34,775.68 |
| | | | Welder Q1 | 0.5 | | | \$ ¢ | 1,733.76 | | \$ ¢ | 1,733.76 |
| | | | OA inspection | 1 | | | ֆ \$ | 9,077.38 | | э \$ | 9.077.38 |
| | | | subtotal labor | | | | \$ | 28,965.90 | | \$ | 52,930.44 |
| | | | EMWG pipe factor | 12.86956522 | | | \$ | 372,778.54 | | \$ | 372,778.54 |
| | | | Subtotal with EMGW | | | | \$ | 401,744.44 | | \$ | 425,708.98 |

| Quantity | Line Number | Description | | | Ex | t. Mat. O&P | Ext. | Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
|-----------|-----------------|--|-----------------------|-----|----------|------------------------|------|-------------|-----------------|---|
| | | | Labor factor 2.5x | 1.5 | | | \$ | 602,616.66 | | \$ 602,616.66 |
| | | | SS premium fixtures 2 | 2.5 | \$ \$ | 15,364.25 82,294.52 | \$ 1 | ,004,361.10 | | \$ 15,364.25 \$ 1,086,655.62 |
| D_05_06 M | anagement build | ding west annex at elev 100 | | | Ċ | - , | | ,, | | , |
| | | | | | | | | | | |
| 10 | 221113644310 | Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 1,059.90 | \$ | 500.50 | \$- | \$- |
| 15 | 221113644330 | Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 2,500.50 | \$ | 874.65 | \$- | \$- |
| 70 | 221113644360 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 23,410.10 | \$ | 5,779.20 | \$- | \$- |
| 35 | 221113644390 | Pipe, stainless steel, threaded, 100 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 24,310.30 | \$ | 5,020.75 | \$- | \$- |
| 17 | 221113644390 | Pipe, stainless steel, threaded, 100 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 11,807.86 | \$ | 2,438.65 | \$- | \$- |
| 3 | 221113484030 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 280.92 | \$ | 47.82 | \$- | \$- |
| 2 | 221113484040 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | ¢ | 100 84 | ¢ | 31 88 | s _ | \$ _ |
| 17 | 221113484070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | s | 857.14 | \$ | 543.83 | \$ - | \$ - |
| 19 | 221113484070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 957 98 | \$ | 607 81 | \$ - | s - |
| 3 | 221113484090 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 263.94 | \$ | 130.02 | \$ - | \$ - |
| 4 | 221113484090 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 351.92 | \$ | 173.36 | \$ - | \$ |

| Quantity | I in a Number | Description | | E-4 M-4 08 D | Fut Labour ORD | | |
|----------|---------------|---|--|---------------|-----------------|-----------------|----------------|
| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
| 3 | 221113484100 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 100 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 287.10 | \$ 171.84 | \$ - | \$- |
| 1 | 221113484100 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 100 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 95.70 | \$ 57.28 | \$ - | \$- |
| 1 | 221113485820 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 100 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 294.29 | \$ 62.44 | \$- | \$- |
| 1 | 221113484912 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter | | \$ 49.39 | \$ 15.94 | \$- | \$- |
| 2 | 221113484916 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 80 mm diameter | | \$ 129.66 | \$ 42.32 | \$- | \$ - |
| 1 | 221113484918 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 100 mm diameter | | \$ 90.04 | \$ 28.90 | \$- | \$- |
| 1 | 221112494770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl | | ¢ 77.19 | ¢ 46.06 | ¢ | ¢ |
| | 221113404770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl | | ¢ //.۱٥ | ý 40.50 | φ - | φ - |
| 1 | 221113484770 | joint coupling labor, excl joint coupling material Pipe, fittings & valves, tee, steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl | | \$ 77.18 | \$ 46.96 | \$- | \$ - |
| 1 | 221113484790 | joint coupling labor, excl joint coupling material Pipe, fittings & valves, tee, steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl | | \$ 105.99 | \$ 65.02 | \$- | \$- |
| 1 | 221113484790 | joint coupling labor, excl joint coupling material Pipe, fittings & valves, tee, steel, painted, grooved joint, 100 mm diameter, add 1 coupling (material only) per joint for installed price, incl | | \$ 105.99 | \$ 65.02 | \$ - | \$ - |
| 1 | 221113484800 | joint coupling labor, excl joint coupling material Pipe, fittings & valves, tee, steel, painted, grooved joint, 100 mm diameter, add 1 coupling (material only) per joint for installed price. incl | | \$ 160.52 | \$ 84.11 | \$- | \$ - |
| 1 | 221113484800 | joint coupling labor, excl joint coupling material | | \$ 160.52 | \$ 84.11 | \$- | \$ - |

| Quantity | Line Number | Description | | | Е | xt. Mat. O&P | Ex | t. Labour O&P | Ext | t. Equip. O&P | E | xt. Total O&P |
|-----------|----------------|--|----------------------------|-------------|----|--------------|--------|---------------|-----|---------------|--------|---------------|
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| 2 | 221316502820 | Drain, shower, with strainer, uniform diameter | | | \$ | 936.40 | \$ | 408 68 | \$ | _ | ¢ | _ |
| 2 | 221310302020 | | | | Ψ | 950.40 | ψ | 400.00 | Ψ | - | Ψ | - |
| | | | | | | | | | | | | |
| 10 | 004040500000 | Drain, shower, with strainer, uniform diameter | | | ¢ | E 040 40 | ¢ | 0.450.00 | ¢ | | ¢ | |
| 12 | 221310002820 | trap, bronze top, 100 mm pipe size | | | ¢ | 5,018.40 | ¢ | 2,452.08 | ф | - | ¢ | - |
| | | Pine fittings & valves counting steel painted | | | | | | | | | | |
| | | standard, flexible, grooved joint, 25 mm | | | | | | | | | | |
| 1 | 221113484960 | diameter | | | \$ | 28.30 | \$ | 7.95 | \$ | - | \$ | - |
| | | | | | | | | | | | | |
| | | Gasket and bolt set, for flanges, 1034 kPa, 50 | | | | | | | | | | |
| 2 | 221113470630 | mm pipe size | | | \$ | 20.16 | \$ | 122.80 | \$ | - | \$ | - |
| | | | | | \$ | 74,138.22 | \$ | 19,910.88 | \$ | - | \$ | - |
| | | | Welder Q1 | 0.5 | | | \$ | 7,312.57 | | | \$ | 7,312.57 |
| | | | Welder Q2 | 0.33 | | | \$ | 812.88 | | | \$ | 812.88 |
| | | | $\Omega \Delta$ inspection | 1 | | | ф ¢ | 2,047.10 | | | ф ¢ | 2,047.10 |
| | | | subtotal labor | - | | | \$ | 41.855.98 | | | \$ | 21.945.10 |
| | | | EMWG pipe factor | 12.86956522 | | | \$ | 538.668.22 | | | \$ | 538.668.22 |
| | | | Subtotal with EMGW | | | | \$ | 580,524.20 | | | \$ | 560,613.32 |
| | | | Labor factor 2.5x | 1.5 | | | \$ | 870,786.30 | | | \$ | 870,786.30 |
| | | | SS premium fixtures 2 | 2.5 | \$ | 27,623.90 | | | | | \$ | 27,623.90 |
| | | | | | \$ | 101,762.12 | \$ | 1,451,310.50 | | | \$ | 1,553,072.62 |
| | | | | | | | | | | | | |
| D_05_07 D | 20 management | building west annex elev 107 | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 50 mm | | | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 13 | 221113644360 | couplings and hangers 3 m OC | | | \$ | 4,347.59 | \$ | 1,073.28 | \$ | - | \$ | - |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 100 mm | | | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 50 | 221113644390 | couplings and hangers 3 m OC | | | \$ | 34,729.00 | \$ | 7,172.50 | \$ | - | \$ | - |
| | | | | | | | | | | | | |
| | | Pine stainless steel threaded 100 mm | | | | | | | | | | |
| | | diameter schedule 40 type 316 includes | | | | | | | | | | |
| 8 | 221113644390 | couplings and hangers 3 m OC | | | \$ | 5.556.64 | \$ | 1.147.60 | \$ | - | \$ | - |
| | | | | | Ċ | | · | , | · | | | |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or 90 | | | | | | | | | | |
| | | Deg., steel, painted, grooved joint, 50 mm | | | | | | | | | | |
| | | diameter, add 1 coupling (material only) per | | | | | | | | | | |
| 3 | 221113484070 | exclicit coupling material | | | \$ | 151 26 | \$ | 95 97 | \$ | _ | \$ | - |
| | 22111010101010 | | | | Ť | 101120 | ÷ | 00101 | ÷ | | Ť | |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or 90 | | | | | | | | | | |
| | | Deg., steel, painted, grooved joint, 50 mm | | | | | | | | | | |
| | | diameter, add 1 coupling (material only) per | | | | | | | | | | |
| 1 | 221113484070 | excl joint coupling material | | | \$ | 50 42 | \$ | 31.99 | \$ | _ | \$ | |
| | 22111010101010 | one joint couping material | | | Ť | 00.12 | ÷ | 01100 | ÷ | | Ť | |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or 90 | | | | | | | | | | |
| | | Deg., steel, painted, grooved joint, 80 mm | | | | | | | | | | |
| | | ininitial only per indicate the indicate of the initial only per | | | | | | | | | | |
| 5 | 221113484000 | exclipint coupling material | | | ¢ | 130.00 | ¢ | 216 70 | ¢ | | ¢ | |
| U U | 04030 | | | | φ | +00.00 | ψ | 210.70 | Ψ | - | Ŷ | _ |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or 90 | | | | | | | | | | |
| | | Deg., steel, painted, grooved joint, 80 mm | | | | | | | | | | |
| | | diameter, add 1 coupling (material only) per | | | | | | | | | | |
| 4 | 001110101000 | joint for installed price, incl joint coupling labor, | | | | 054.00 | ¢ | 170.00 | ¢ | | ¢ | |
| 4 | 221113484090 | exci joint coupling material | | | \$ | 351.92 | \$ | 173.36 | Ф | - | Ф | - |

| Quantity | Line Number | Description | | | E | xt. Mat. O&P | Ext | . Labour O&P | Ext | . Equip. O&P | E | ct. Total O&P |
|-----------|---------------|--|-----------------------|-------------|---------|--------------|---------|--------------|-----|--------------|---------|---------------|
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 125 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, | | | | | | | | | | |
| 1 | 221113484110 | excl joint coupling material | | | \$ | 227.41 | \$ | 71.72 | \$ | - | \$ | - |
| 1 | 221113484918 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 100 mm diameter | | | \$ | 90.04 | \$ | 28.90 | \$ | - | \$ | - |
| | | Drain, shower, with strainer, uniform diameter | | | | | | | | | | |
| 3 | 221316502820 | trap, bronze top, 100 mm pipe size | | | \$ | 1,404.60 | \$ | 613.02 | \$ | - | \$ | - |
| 1 | 221316502820 | Drain, shower, with strainer, uniform diameter trap, bronze top, 100 mm pipe size | | | \$ | 468.20 | \$ | 204.34 | \$ | | \$ | - |
| | | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm | | | | | | | | | | |
| 1 | 221113484990 | diameter | | | \$ | 42.70 | \$ | 15.94 | \$ | - | \$ | - |
| | | | Welder 01 | 0.5 | \$ | 47,859.68 | \$ ¢ | 10,845.32 | \$ | - | \$ ¢ | - |
| | | | Welder Q2 | 0.33 | | | \$ | 2,773.37 | | | э \$ | 2,773.37 |
| | | | Welder P | 1 | | | \$ | 143.90 | | | \$ | 143.90 |
| | | | QA inspection | 1 | | | \$ ¢ | 4,107.93 | | | \$ ¢ | 4,107.93 |
| | | | EMWG pipe factor | 12.86956522 | | | \$ | 245,309.01 | | | ₽ \$ | 245,309.01 |
| | | | Subtotal with EMGW | | | | \$ | 264,370.19 | | | \$ | 253,524.87 |
| | | | Labor factor 2.5x | 1.5 | • | 0 000 40 | \$ | 396,555.28 | | | \$ | 396,555.28 |
| | | | SS premium fixtures 2 | 2.5 | \$ ¢ | 8,066.13 | ¢ | 660 925 47 | | | \$ ¢ | 8,066.13 |
| D 05 08 D | 20 management | bldg el 86 7 discharge piping | | | 4 | 33,523.01 | Ψ | 000,525.47 | | | Ψ | /10,051.2/ |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| ŗ | 224442404020 | Pipe, fittings & valves, steel, black, grooved joint, 50 mm diameter, schedule 40, includes | | | ¢ | 400.40 | ¢ | 207.05 | ¢ | | ¢ | |
| 5 | 221113481080 | coupling & clevis type hanger 3 m OC | | | ф | 180.10 | Þ | 327.05 | Ф | - | Þ | - |
| | | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, | | | | | | | | | | |
| 4 | 221113484070 | excl joint coupling material | | | \$ | 201.68 | \$ | 127.96 | \$ | - | \$ | - |
| | | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl | | | | | | | | | | |
| 1 | 221113484770 | joint coupling labor, excl joint coupling material | | | \$ | 77.18 | \$ | 46.96 | \$ | - | \$ | - |
| 2 | 221112494012 | Pipe, fittings & valves, coupling, steel, painted, | | | ¢ | 09.79 | ¢ | 21.00 | ¢ | | ¢ | |
| 2 | 221113404912 | ngiù style, grooved joint, 50 min diameter | | | φ | 90.70 | φ | 51.00 | φ | - | φ | - |
| 3 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 6,441.48 | \$ | 103.71 | \$ | - | \$ | 6,545.19 |
| | | | | | | | | | | | | |
| 2 | 221113484960 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter | | | \$ | 56.60 | \$ | 15.90 | \$ | - | \$ | - |
| 2 | 221113494000 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter | | | ¢ | 85 AO | ¢ | 21.00 | ¢ | | ¢ | |
| 2 | 221113404990 | ulametel | | | φ | 00.40 | φ | 31.00 | φ | - | φ | - |

| Quantity | Line Number | Description | | | Ex | t. Mat. O&P | Ext | . Labour O&P | Ext | . Equip. O&P | E | t. Total O&P |
|-----------|---------------|---|-----------------------|-------------|--------|-------------|----------|--------------|-----|--------------|----------|--------------------|
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| 1 | 221113470630 | Gasket and bolt set, for flanges, 1034 kPa, 50 mm pipe size | | | \$ | 10.08 | \$ | 61.40 | \$ | - | \$ | - |
| | | | | | | | | | | | • | |
| | | | Welder P | 1 | \$ | 7,151.30 | \$ \$ | 747.34 | \$ | • | \$ \$ | 6,545.19 747.34 |
| | | | QA inspection | 1 | | | \$ | 747.34 | | | \$ | 747.34 |
| | | | subtotal labor | | | | \$ | 2,242.02 | | | \$ | 8,039.87 |
| | | | EMWG pipe factor | 12.86956522 | | | \$ | 28,853.82 | | | \$ | 28,853.82 |
| | | | Subtotal with EMGW | 1 5 | | | \$ | 31,095.84 | | | \$ | 36,893.69 |
| | | | Labor factor 2.5x | 1.5 | ¢ | 1 774 55 | \$ | 46,643.76 | | | \$ ¢ | 46,643.76 |
| | | | 55 premium fixtures 2 | 2.5 | ş S | 8.925.85 | \$ | 77.739.61 | | | ₽ | 86,665.46 |
| D 05 00 D | | huilding alou 07 | | | | | | , | | | | |
| D_02_09 D | 20 management | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pipe staipless steel threaded 15 mm | | | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 5 | 221113644310 | couplings and hangers 3 m OC | | | \$ | 529.95 | \$ | 250.25 | \$ | - | \$ | - |
| | | | | | | | | | | | | |
| | | Pine stainless steel threaded 20 mm | | | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 5 | 221113644320 | couplings and hangers 3 m OC | | | \$ | 601.95 | \$ | 255.40 | \$ | - | \$ | - |
| | | | | | | | | | | | | |
| | | Pipe staipless steel threaded 25 mm | | | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 5 | 221113644330 | couplings and hangers 3 m OC | | | \$ | 833.50 | \$ | 291.55 | \$ | - | \$ | - |
| | | | | | | | | | | | | |
| | | Pine stainless steel threaded 50 mm | | | | | | | | | | |
| | | diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 230 | 221113644360 | couplings and hangers 3 m OC | | | \$ | 76,918.90 | \$ | 18,988.80 | \$ | - | \$ | - |
| | | | | | | | | | | | | |
| | | Pipe fittings & volves albow 45 Deg. or 00 | | | | | | | | | | |
| | | Deg., steel, painted, grooved joint, 50 mm | | | | | | | | | | |
| | | diameter, add 1 coupling (material only) per | | | | | | | | | | |
| 40 | 221113484070 | excl ioint coupling material | | | \$ | 2.016.80 | \$ | 1.279.60 | \$ | - | \$ | - |
| | | | | | | , | | | | | | |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 Deg. or 90 | | | | | | | | | | |
| | | diameter, add 1 coupling (material only) per | | | | | | | | | | |
| 40 | 224442404070 | joint for installed price, incl joint coupling labor, | | | ¢ | 000 70 | ¢ | E44.04 | ¢ | | ¢ | |
| 16 | 221113484070 | exci joint coupling material | | | \$ | 806.72 | \$ | 511.84 | \$ | - | \$ | - |
| | | Pine fittings & valves flange black steel | | | | | | | | | | |
| | | painted, with grooved face for gasket, grooved | | | | | | | | | | |
| | | joint, class 125 and 150, 50 mm pipe size, add | | | | | | | | | | |
| | | price, incl joint coupling labor, excl joint | | | | | | | | | | |
| 2 | 221113485780 | coupling material | | | \$ | 329.28 | \$ | 69.14 | \$ | - | \$ | - |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pine fittings & valves counting steel pointed | | | | | | | | | | |
| 1 | 221113484912 | rigid style, grooved joint, 50 mm diameter | | | \$ | 49.39 | \$ | 15.94 | \$ | - | \$ | - |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| ß | 221112404040 | Pipe, fittings & valves, coupling, steel, painted, | | | ¢ | 205 40 | ¢ | 107 50 | ¢ | | ¢ | |
| 0 | 221113484912 | ngiu style, grooveu joint, so min ulameter | | | Ŷ | 395.12 | φ | 127.52 | φ | - | ¢ | - |

| | | | | | | | | | | . ago 202 0 | | • |
|----------|--------------|--|-----------------------|-------------|----|--------------|---------|---------------|-----|---------------|---------|----------------|
| Quantity | Line Number | Description | | | E> | xt. Mat. O&P | Ex | t. Labour O&P | Ext | t. Equip. O&P | E | Ext. Total O&P |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling | | | | | | | | | | |
| 8 | 221113484770 | (material only) per joint for installed price, incl | | | \$ | 617 44 | \$ | 375.68 | \$ | _ | \$ | _ |
| Ŭ | 221110101110 | Diss fittings & values equalize start printed | | | Ŷ | 011.11 | Ŷ | 010.00 | Ŷ | | Ŷ | |
| 2 | 221113484912 | rigid style, grooved joint, 50 mm diameter | | | \$ | 98.78 | \$ | 31.88 | \$ | - | \$ | - |
| 2 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 4 294 32 | \$ | 52 64 | \$ | _ | \$ | 4 346 96 |
| 2 | 221110400010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling | | | Ŷ | 7,207.02 | Ψ | 02.04 | Ŷ | | Ŷ | 4,040.00 |
| 9 | 221113488010 | material | | | \$ | 19,324.44 | \$ | 236.88 | \$ | - | \$ | 19,561.32 |
| 3 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 6 441 48 | \$ | 103 71 | \$ | _ | \$ | 6 545 19 |
| Ŭ | 221110100020 | | | | Ų | 0,111.10 | Ŷ | 100.11 | Ŷ | | Ŷ | 0,010.10 |
| 20 | 221316502820 | Drain, shower, with strainer, uniform diameter trap, bronze top, 100 mm pipe size | | | \$ | 9,364.00 | \$ | 4,086.80 | \$ | - | \$ | - |
| 3 | 221113484960 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter | | | \$ | 84 90 | \$ | 23.85 | \$ | - | \$ | - |
| 30 | 221113470630 | Gasket and bolt set, for flanges, 1034 kPa, 50 | | | ¢ | 302.40 | ¢ | 1 842 00 | ¢ | | ¢ | |
| | 221110470030 | | | | Ψ | 502.40 | ψ | 1,042.00 | φ | | ψ | - |
| | | | | | \$ | 123,009.37 | \$ | 28,543.48 | \$ | - | \$ | 30,453.47 |
| | | | Welder Q1 | 0.5 | | | \$ | 11,537.80 | | | \$ | 11,537.80 |
| | | | Welder P | 1 | | | \$ | 5,467.88 | | | \$ | 5,467.88 |
| | | | QA Inspection | 1 | | | \$ | 67 554 94 | | | \$ | 64 464 92 |
| | | | FMWG nine factor | 12,86956522 | | | ₽ \$ | 805.053.59 | | | ⊅ \$ | 805 053 59 |
| | | | Subtotal with FMGW | 12.00950522 | | | \$ | 867,608,43 | | | \$ | 869.518.42 |
| | | | Labor factor 2.5x | 1.5 | | | \$ | 1,301,412.65 | | | \$ | 1,301,412.65 |
| | | | SS premium fixtures 2 | 2.5 | \$ | 35,162.08 | | | | | \$ | 35,162.08 |
| | | | | | \$ | 158,171.45 | \$ | 2,169,021.08 | | | \$ | 2,327,192.53 |
| | | | | | | | | | | | | |
| | | | Tatal | | | 646 245 42 | * | 0 567 001 40 | | | | 0 313 336 65 |
| | | | Iotal | | Ş | 040,245.42 | Ş | 8,567,081.48 | | | ş | 9,213,326.89 |

| Quantity | Line Number | Description | Equip O&P | Total | O&P | Ext. | Mat. O&P | Ext. La | abour O&P | Ext. | Equip O&P | Ext. | Total O&P |
|-----------|-------------------|---|-----------------|-------|--------|---------|----------|----------------|-----------|------|-----------|----------|-----------|
| D_06_01 E | quipment tanks | and pumps | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | See D01 01 | | | | | | | | | | | |
| | | See D01.01 | | | | | | | | | | | |
| D_06_02 T | ie in to inactive | plant drainage | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | Pipe, fittings & valves, steel, black, | | | | | | | | | | | |
| | | grooved joint, 50 mm diameter, schedule 40, includes coupling & clevis | | | | | | | | | | | |
| 5 | 221113481080 |) type hanger 3 m OC | \$- | \$ | 101.55 | \$ | 180.10 | \$ | 327.65 | \$ | - | \$ | 507.75 |
| | | Pipe, fittings & valves, valve, butterfly, | | | | | | | | | | | |
| | | pipe size, add 1 coupling (material | | | | | | | | | | | |
| | | only) per joint for installed price, incl 2 | | | | | | | | | | | |
| 1 | 221113488020 |) material | \$- | \$ | 430.74 | \$ | 2,144.16 | \$ | 34.57 | \$ | - | \$ | 2,178.73 |
| | | Pipe, fittings & valves, elbow, 45 Deg. | | | | | | | | | | | |
| | | joint, 50 mm diameter, add 1 coupling | | | | | | | | | | | |
| | | (material only) per joint for installed | | | | | | | | | | | |
| 3 | 221113484070 |) coupling material | \$- | \$ | 82.41 | \$ | 151.26 | \$ | 95.97 | \$ | - | \$ | 247.23 |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved | | | | | | | | | | | |
| 1 | 221113484990 |) joint, 50 mm diameter | \$- | \$ | 58.64 | \$ | 42.70 | \$ | 15.94 | \$ | - | \$ | 58.64 |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | painted, rigid style, grooved joint, 50 | | | | | | | | | | | |
| 1 | 221113484912 | 2 mm diameter | \$- | \$ | 65.33 | \$ | 49.39 | \$ | 15.94 | \$ | - | \$ | 65.33 |
| | | | | | | \$ | 2,567.61 | \$ | 490.07 | \$ | - | \$ | 3,057.68 |
| | | | QA inspection | | 1 | | | ə \$ | 490.07 | | | \$ \$ | 490.07 |
| | | | subtotal labor | īv. | 1 5 | | | \$ ¢ | 1,470.21 | | | \$ \$ | 4,037.82 |
| | | | | ,, | 1.5 | , \$ | 2,567.61 | \$ | 3,675.53 | | | \$ | 6,243.14 |
| D 06 03 P | ipe supports | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| 5 | 221112470620 | Gasket and bolt set, for flanges, 1034 | ¢ | ¢ | EQ 11 | ¢ | 24.90 | ¢ | 265 75 | ¢ | | ¢ | 200 55 |
| 5 | 221113470020 | rea, 40 min pipe size | р - | φ. | 56.11 | φ | 24.00 | φ | 205.75 | φ | - | φ | 290.55 |
| | | | | | | \$ | 24.80 | \$ | 265.75 | \$ | - | \$ | 290.55 |
| | | | Welder Q1 | | 0.5 | ; | | \$ | 132.88 | | | \$ | 132.88 |
| | | | QA inspection | | 1 | | | ə \$ | 398.63 | | | \$ \$ | 398.63 |
| | | | subtotal labor | ōx | 15 | ; | | \$ \$ | 1,063.00 | | | \$ \$ | 1,087.80 |
| | | | SS premium fixt | ture | 2.5 | \$ | - | ÷ | | | | Ť | ., |
| | | | | | | \$ | 24.80 | \$ | 2,657.50 | | | Ş | 2,682.30 |
| D_06_04 H | WMB West Ann | ex inactive plant drainge | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | Pipe, fittings & valves, steel, black, grooved joint, 20 mm diameter, | | | | | | | | | | | |
| 5 | 221113481040 | schedule 40, includes coupling & clevis | \$ - | \$ | 60.82 | \$ | 120.90 | \$ | 183 20 | \$ | | \$ | 304 10 |

| Quantity | Line Number | Description | Equip.O&P | Total O&P | Ext | . Mat. O&P | Ext | Labour O&P | Ext. Equip O&P |). | Ext. | Total O&P |
|----------|--------------|--|-----------|-----------|-----|------------|-----|------------|-------------------|----|------|-----------|
| 5 | 221113481040 | Pipe, fittings & valves, steel, black, grooved joint, 20 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC | | | \$ | 120.90 | \$ | 183.20 | \$- | | \$ | 304.10 |
| 14 | 221113481040 | Pipe, fittings & valves, steel, black, grooved joint, 20 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC | | | \$ | 338.52 | \$ | 512.96 | \$- | | \$ | 851.48 |
| 12 | 221113481070 | Pipe, fittings & valves, steel, black, grooved joint, 40 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC | | | \$ | 376.56 | \$ | 612.96 | \$ - | | \$ | 989.52 |
| 185 | 221113481080 | Pipe, fittings & valves, steel, black, grooved joint, 50 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC | | | \$ | 6,663.70 | \$ | 12,123.05 | \$- | | \$ | 18,786.75 |
| 5 | 221113481090 | Pipe, fittings & valves, steel, black, grooved joint, 65 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC | | | \$ | 306.15 | \$ | 412.80 | \$- | | \$ | 718.95 |
| 5 | 221113481100 | Pipe, fittings & valves, steel, black, grooved joint, 80 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC | | | \$ | 406.45 | \$ | 469.55 | \$ - | | \$ | 876.00 |
| 12 | 221113481100 | Pipe, fittings & valves, steel, black, grooved joint, 80 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC | | | \$ | 975.48 | \$ | 1,126.92 | \$ - | | \$ | 2,102.40 |
| 3 | 221113484950 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 20 mm diameter | | | \$ | 84 90 | \$ | 23 85 | \$ | | \$ | 108 75 |
| | | Pipe, fittings & valves, coupling, steel, painted, | | | • | 040.50 | • | | • | | • | |
| 5 | 221113464990 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling | | | Þ | 213.30 | Þ | 79.70 | <u>ф</u> - | | Ð | 293.20 |
| 2 | 221113485780 | material Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed | | | \$ | 329.28 | \$ | 69.14 | \$ - | | \$ | 398.42 |
| 4 | 221113485780 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 80 mm pipe size, add 1 coupling (material only) per joint for installed | | | \$ | 658.56 | \$ | 138.28 | \$ - | | \$ | 796.84 |
| 7 | 221113485800 | price, incl joint coupling labor, excl joint coupling material Pipe, fittings & valves, flange, black steel, painted with grooved face for gasket grooved | | | \$ | 1,541.47 | \$ | 325.08 | \$ - | | \$ | 1,866.55 |
| 1 | 221113485830 | joint, class 125 and 150, 125 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 339.57 | \$ | 75.34 | \$ - | | \$ | 414.91 |
| Quantity | Line Number | Description | Equip.O&P | Total O&P | Ext | . Mat. O&P | Ext | Labour O&P | Ext. Equip. | Ex | t. Total O&P |
|----------|--------------|--|-----------|-----------|-----|------------|-----|------------|-------------|----|--------------|
| | | | | | | | | | Uar | | |
| 2 | 221113484950 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 20 mm diameter | | | \$ | 56.60 | \$ | 15.90 | \$- | \$ | 72.50 |
| 2 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 154.36 | \$ | 93.92 | \$- | \$ | 248.28 |
| 1 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl | | | ¢ | 77 18 | ¢ | 46.96 | ¢ _ | ¢ | 124 14 |
| | 004440404770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl | | | ¢ | 454.00 | ¢ | 40.00 | ¢ - | ¢ | 040.00 |
| Z | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price incl | | | Þ | 154.30 | Þ | 93.92 | \$ - | Þ | 248.28 |
| 1 | 221113484790 | joint coupling labor, excl joint coupling material | | | \$ | 105.99 | \$ | 65.02 | \$- | \$ | 171.01 |
| 9 | 221113484000 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | ¢ | 701 82 | ¢ | 390.06 | ٩ ـ ـ | ¢ | 1 181 88 |
| 1 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 2 147 16 | \$ | 34 57 | \$ - | \$ | 2 181 73 |
| 4 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 8,588.64 | \$ | 138.28 | \$ - | \$ | 8,726.92 |
| 2 | 221113488030 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 80 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 4,294.32 | \$ | 95.98 | \$- | \$ | 4,390.30 |
| | | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling | | | | | | | | | |
| 2 | 221113488010 | material Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling | | | \$ | 4,294.32 | \$ | 52.64 | Ş - | \$ | 4,346.96 |
| 2 | 221113488010 | material Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 | | | \$ | 4,294.32 | \$ | 52.64 | \$ - | \$ | 4,346.96 |
| 3 | 221113488010 | coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 6,441.48 | \$ | 78.96 | \$- | \$ | 6,520.44 |

| Quantity | Line Number | Description | Equip.O&P | Total O&P | E | xt. Mat. O&P | Ex | t. Labour O&P | E | xt. Equip. | Ext | . Total O&P |
|-----------|--------------|--|--------------------|-------------|---------|--------------|---------|---------------|----|------------|-------------|-------------|
| | | | | | | | | | | U&P | | |
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 2,147.16 | \$ | 26.32 | \$ | - | \$ | 2,173.48 |
| 1 | 221112488040 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | ¢ | 0 147 16 | ¢ | 26.22 | ¢ | | ¢ | 0 170 40 |
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 80 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling | | | \$ | 2,147.10 | \$ | 20.32 | \$ | - | \$ | 2,173.48 |
| 2 | 221113488030 | material | | | \$ | 1,142.20 | \$ | 95.98 | \$ | - | \$ | 1,238.18 |
| 1 | 221119140120 | Flexible metal hose, bronze braided, bronze ends, threaded, 10 mm diameter x 300 mm | | | \$ | 31.90 | \$ | 30.96 | \$ | - | \$ | 62.86 |
| | | Flexible metal hose, bronze braided, bronze ends, | | | | | | | | | | |
| 1 | 221119140120 | threaded, 10 mm diameter x 300 mm | | | \$ | 31.90 | \$ | 30.96 | \$ | - | \$ | 62.86 |
| | | Pipe, fittings & valves, coupling, steel, painted, | | | | | | | | | | |
| 47 | 221113484990 | standard, flexible, grooved joint, 50 mm diameter | | | \$ | 2,006.90 | \$ | 749.18 | \$ | - | \$ | 2,756.08 |
| 2 | 220719106840 | Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 25 mm wall, 15 mm iron pipe size | | | \$ | 6.96 | \$ | 35.26 | \$ | - | \$ | 42.22 |
| | | | | | ¢ | 071.10 | Ť | 00.20 | ÷ | | ¢ | 071 10 |
| | | Painting compound sealing allow | | \$ 7.164.11 | ⇒ \$ | 52.361.77 | \$ | 18.489.86 | \$ | - | ⇒ \$ | 70.851.63 |
| | | | Welder Q1 | 0.5 | | | \$ | 1,528.37 | | | \$ | 1,528.37 |
| | | | Welder Q2 | 0.33 | | | \$ | - | | | \$ | - |
| | | | Welder P | 1 | | | \$ ¢ | 15,433.13 | | | \$ | 15,433.13 |
| | | | subtotal labor | 1 | | | ⊅ ¢ | 52 412 85 | | | ф ф | 10,901.50 |
| | | | Labor factor 2.5x | 1.5 | | | φ \$ | 78,619.28 | | | φ \$ | 78,619.28 |
| | | | SS premium fixture | 2.5 | \$ | - | Ŧ | , 0,010.20 | | | Ÿ | , 0,010.20 |
| | | | | | \$ | 52,361.77 | \$ | 131,032.13 | | | \$ 1 | 183,393.90 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| D_06_05 H | WMB West Anr | nex inactive floor drainage piping | | | | | | | | | | |
| | | | | | | | | | | | | |
| 4 | 221316502800 | Drain, shower, with strainer, uniform diameter trap, bronze top, 50 mm and 80 mm pipe size | | | \$ | 1,625.84 | \$ | 718.28 | \$ | - | \$ | 2,344.12 |
| 1 | 221316502800 | Drain, shower, with strainer, uniform diameter trap, bronze top, 50 mm and 80 mm pipe size | | | \$ | 406.46 | \$ | 179.57 | \$ | - | \$ | 586.03 |
| 26 | 221113481080 | Pipe, fittings & valves, steel, black, grooved joint, 50 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC | | | \$ | 936.52 | \$ | 1,703.78 | \$ | - | \$ | 2,640.30 |
| | | Pipe, fittings & valves, steel, black, grooved joint, | | | | | | , 2 | | | | |
| 16 | 221113481100 | 80 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC | | | \$ | 1 300 64 | \$ | 1 502 56 | \$ | _ | \$ | 2 803 20 |
| 10 | 221110401100 | Pipe, fittings & valves, steel, black, grooved joint, | | | φ | 1,000.04 | Ψ | 1,002.00 | Ψ | _ | Ų | 2,000.20 |
| 70 | 221113481110 | 100 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC | | | \$ | 6,771.10 | \$ | 7,296.10 | \$ | | \$ | 14,067.20 |

| Quantity | Line Number | Description | Equip.O&P | Total O&P | Ex | t. Mat. O&P | Ext. | Labour O&P | Ext. Equip. O&P | E | Ext. Total O&P |
|----------|--------------|---|---------------|-----------|----|-------------|---------|------------|--------------------|----|-----------------|
| 12 | 221113481130 | Pipe, fittings & valves, steel, black, grooved joint, 150 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC | | | \$ | 2,333.76 | \$ | 2,092.92 | \$ - | 9 | 4,426.68 |
| 4 | 221113484916 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 80 mm diameter | | | \$ | 259.32 | \$ | 84.64 | \$- | \$ | 343.96 |
| 4 | 221113484070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 201.68 | \$ | 127.96 | \$- | 9 | 329.64 |
| 3 | 221113484070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 151 26 | \$ | 95 97 | \$ - | g | 3 247 23 |
| 2 | 224442484000 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling meterial | | | ¢ | 175.06 | ¢ | 06.69 | ¢ | | 262.64 |
| 2 | 221113464090 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint | | | φ | 175.90 | φ | 60.06 | φ - | 4 | 0 202.04 |
| 3 | 221113484090 | coupling material Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 100 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint | | | \$ | 263.94 | \$ | 130.02 | \$ - | 4 | 393.96 |
| 6 | 221113484100 | coupling material Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 100 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint | | | \$ | 574.20 | \$ | 343.68 | \$ - | 9 | 917.88 |
| 2 | 221113484100 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 150 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 535.08 | \$ | 178 54 | \$ - | | 5 1,682.78 |
| 3 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl ioint coupling labor, excl joint coupling material | | | ¢ | 231 54 | ¢ | 140.88 | ¢ - | ¢ | 372.42 |
| 4 | 221113484912 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter | | | \$ | 197.56 | \$ | 63.76 | \$- | \$ | 261.32 |
| 3 | 221113484918 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 100 mm diameter | | | \$ | 270.12 | \$ | 86.70 | \$- | \$ | 356.82 |
| 1 | 221113484922 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 150 mm diameter | | | \$ | 153.32 | \$ | 44.38 | \$- | ę | 5 197.70 |
| | | | | | \$ | 17,441.00 | \$ | 15,506.50 | \$- | \$ | 32,947.50 |
| | | | Welder Q1 | 0.5 | | | \$ | 5,529.16 | | \$ | 5,529.16 |
| | | | Welder Q2 | 0.33 | | | \$ ¢ | 771.95 | | \$ | 2 122 25 |
| | | | QA inspection | 1 | | | \$ | 8,433.45 | | \$ | 8,433.45 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 208 of 350

CONFIDENTIAL ATTORNEY WORK PRODUCT

Ext. Equip. O&P Quantity Line Number Equip.O&P Total O&P Ext. Mat. O&P Ext. Labour O&P Ext. Total O&P Description subtotal labor \$ 32,373.40 \$ 49,814.40 \$ 48,560.11 **\$ 98,374.51** Labor factor 2.5x 1.5 48,560.11 \$ \$ 17,441.00 \$ 80,933.51 Total \$ 72,395.18 \$ 218,298.66 \$ 290,560.96

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Lai | our O&P | Ext. Equip. O& | > | Ext. Total O&P |
|--------------|----------------|--|--|-----------------|----------|----------|----------------|---|----------------|
| D_07_01 West | t annex D2O dr | um handling | | | | | | | |
| | | Pipe, copper, tubing, solder, 10 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC | | | | | | | |
| 5 | 221113232120 | | | \$ 62.00 | \$ | 154.80 | \$- | : | \$ 216.80 |
| | | Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | | | | | |
| 7 | 221113644310 | Disa stailare start theread of 45 mm | | \$ 741.93 | \$ | 350.35 | \$- | : | \$ 1,092.28 |
| | | diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | | | | | |
| 5 | 221113644310 | | | \$ 529.95 | \$ | 250.25 | \$- | : | \$ 780.20 |
| | | Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | | | | | |
| 5 | 221113644320 | Pine stainless steel threaded 15 mm | | \$ 601.95 | \$ | 255.40 | \$- | - | \$ 857.35 |
| | | diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | | | | | |
| 15 | 221113644310 | Dina stainlass staal threaded 25 mm | | \$ 1,589.85 | \$ | 750.75 | \$- | 1 | \$ 2,340.60 |
| | | diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | | | | | |
| 5 | 221113644330 | | | \$ 833.50 | \$ | 291.55 | \$- | : | \$ 1,125.05 |
| | | Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | | | | | |
| 55 | 221113644330 | | | \$ 9,168.50 | \$ | 3,207.05 | \$- | : | \$ 12,375.55 |
| | | Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | | | | | |
| 50 | 221113644330 | Pine stainless steel threaded 50 mm | | \$ 8,335.00 | \$ | 2,915.50 | \$- | : | \$ 11,250.50 |
| 5 | 221113644360 | diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ 1.672.15 | \$ | 412.80 | \$ - | | \$ 2.084.95 |
| | | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | | | | | |
| 35 | 221113644360 | Pine fittings & valves elbow 45 Deg or 90 | | \$ 11,705.05 | \$ | 2,889.60 | \$- | | \$ 14,594.65 |
| | | Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | | | | | |
| 8 | 221113484030 | | | \$ 749.12 | \$ | 127.52 | \$- | : | \$ 876.64 |
| | | Pipe, nitrailys av varies, elbow, 45 beg. of so Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | | | | | |
| 10 | 221113484030 | | | \$ 936.40 | \$ | 159.40 | \$- | | \$ 1,095.80 |
| | | Pripe, nittings & vaives, elbow, 45 Deg. of 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | | | | | |
| 1 | 221113484040 | | | \$ 50.42 | \$ | 15.94 | \$- | : | \$ 66.36 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
|----------|--------------|---|--|----------------|-----------------|-----------------|----------------|
| | | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | | | |
| 28 | 221113484040 | | | \$ 1,411.76 | \$ 446.32 | \$- | \$ 1,858.08 |
| | | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | | | |
| 47 | 221113484040 | Dipa fittinga & values albaur 45 Dag at 00 | | \$ 2,369.74 | \$ 749.18 | \$- | \$ 3,118.92 |
| | | Pipe, rittings & valves, eibow, 45 Deg. of 90 Deg., steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | | | |
| 15 | 221113484060 | Pipe, fittings & valves, elbow, 45 Deg, or 90 | | \$ 756.30 | \$ 363.75 | \$- | \$ 1,120.05 |
| | | Deg, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | | | |
| 18 | 221113484070 | | | \$ 907.56 | \$ 575.82 | \$- | \$ 1,483.38 |
| | | Pipe, Indings & vaves, Italige, Joack steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | | | |
| 28 | 221113485780 | | | \$ 4,609.92 | \$ 967.96 | \$- | \$ 5,577.88 |
| | | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | | | |
| 12 | 221113485780 | | | \$ 1,975.68 | \$ 414.84 | \$- | \$ 2,390.52 |
| | | Pipe, rittings & Valves, rilange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | | | |
| 2 | 221113485780 | | | \$ 329.28 | \$ 69.14 | \$- | \$ 398.42 |
| | | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm diameter | | | | | |
| 4 | 221113484908 | Pipe fittings & volves coupling steel | | \$ 156.40 | \$ 31.80 | \$- | \$ 188.20 |
| | | painted, rigid style, grooved joint, 25 mm diameter | | | | | |
| 8 | 221113484908 | | | \$ 312.80 | \$ 63.60 | \$- | \$ 376.40 |
| | | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm diameter | | | | | |
| 2 | 221113484908 | Pine fittings & valves counting steel | | \$ 78.20 | \$ 15.90 | \$- | \$ 94.10 |
| | | painted, rigid style, grooved joint, 25 mm diameter | | | | | |
| 19 | 221113484908 | Pine fittings & values counting steel | | \$ 742.90 | \$ 151.05 | \$- | \$ 893.95 |
| | | painted, rigid style, grooved joint, 40 mm diameter | | | | | |
| 1 | 221113484910 | | | \$ 39.10 | \$ 11.87 | \$ - | \$ 50.97 |

| Quantity | Line Number | Description | | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | E | Ext. Total O&P |
|----------|--------------|---|--|----|---------------|-----------------|-----------------|----|----------------|
| | | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter | | | | | | | |
| 2 | 221113484912 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter | | \$ | 98.78 | \$ 31.88 | \$ - | \$ | 130.66 |
| 1 | 221113484912 | Pipe, fittings & valves, flange, black steel, | | \$ | 49.39 | \$ 15.94 | \$- | \$ | 65.33 |
| | | painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | | | | | |
| 1 | 221113485780 | Pine fittings & valves tee steel nainted | | \$ | 164.64 | \$ 34.57 | \$ - | \$ | 199.21 |
| e. | 001110404700 | grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | ¢ | 504.65 | ¢ 105.90 | ¢ | ¢ | 607.45 |
| C | 221113484700 | Pipe, fittings & valves, tee, steel, painted, | | Þ | 501.05 | \$ 105.80 | ъ - | Э | 007.45 |
| | | grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | | | | | |
| 4 | 221113484700 | Pipe, fittings & valves, tee, steel, painted, | | \$ | 401.32 | \$ 84.64 | \$- | \$ | 485.96 |
| | | grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | | | | | |
| 11 | 221113484740 | Pipe, fittings & valves, tee, steel, painted. | | \$ | 848.98 | \$ 266.75 | \$- | \$ | 1,115.73 |
| | | grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | | | | | |
| 20 | 221113484740 | Pine fittings & valves tee steel painted | | \$ | 1,543.60 | \$ 485.00 | \$- | \$ | 2,028.60 |
| | | grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | | | | | |
| 4 | 221113484740 | Pipe, fittings & valves, tee, steel, painted. | | \$ | 308.72 | \$ 97.00 | \$- | \$ | 405.72 |
| | | grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | | | | | |
| 3 | 221113484740 | Pipe, fittings & valves, tee, steel, painted, | | \$ | 231.54 | \$ 72.75 | \$- | \$ | 304.29 |
| | | grooved joint, 25 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | | | | | |
| 1 | 221113484740 | Pipe, fittings & valves, tee, steel, painted, | | \$ | 77.18 | \$ 24.25 | \$- | \$ | 101.43 |
| | | grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | | | | | |
| 1 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, | | \$ | 77.18 | \$ 46.96 | \$- | \$ | 124.14 |
| | | grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | | | | | |
| 10 | 221113484770 | Pipe, fittings & valves, valve, butterfly, | | \$ | 771.80 | \$ 469.60 | \$- | \$ | 1,241.40 |
| | | standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl ioint coupling material | | | | | | | |
| 5 | 221113488010 | Pipe, fittings & valves, valve, butterfly, | | \$ | 10,735.80 | \$ 131.60 | \$- | \$ | 10,867.40 |
| | | standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | | | | | |
| 4 | 221113488010 | Pipe, fittings & valves, valve. butterflv. | | \$ | 8,588.64 | \$ 105.28 | \$- | \$ | 8,693.92 |
| | | standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl init coupling material | | | | | | | |
| 7 | 221113488010 | | | \$ | 15,030.12 | \$ 184.24 | \$ - | \$ | 15,214.36 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
|----------|--------------|--|--|---------------|-----------------|-----------------|----------------|
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ 2,147.16 | \$ 26.32 | \$- | \$ 2,173.48 |
| 2 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ 4,294.32 | \$ 52.64 | \$- | \$ 4,346.96 |
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ 2,147.16 | \$ 26.32 | \$- | \$ 2,173.48 |
| 7 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ 15,030,12 | \$ 184.24 | \$ - | \$ 15 214 36 |
| 14 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ 30.060.24 | \$ 368.48 | \$. | \$ 30.428.72 |
| | 221110400010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | ¢ 50,000.24 | ¢ 500.40 | • | ¢ 30,420.72 |
| 6 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ 12,882.96 | \$ 157.92 | \$ - | \$ 13,040.88 |
| 4 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ 8,588.64 | \$ 105.28 | \$ - | \$ 8,693.92 |
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ 2,147.16 | \$ 26.32 | \$- | \$ 2,173.48 |
| 12 | 221113488010 | Water supply meter, detector, serves dual systems such as fire and domestic or process water, wide range capacity, 101 L/s, 150 mm mainline x 80 mm by-pass, UL and EM approved | | \$ 25,765.92 | \$ 315.84 | \$ - | \$ 26,081.76 |
| 1 | 221119381180 | Water supply meter, detector, serves dual systems such as fire and domestic or process water, wide range capacity, 101 L/s, 150 mm mainline x 80 mm by-pass, UL and FM approved | | \$ 13,891.50 | \$ 856.56 | \$- | \$ 14,748.06 |
| 1 | 221119381180 | Water supply meter, detector, serves dual systems such as fire and domestic or process water, wide range capacity, 101 L/s, 150 mm mainline x 80 mm by-pass, UL and FM approved | | \$ 13,891.50 | \$ 856.56 | \$- | \$ 14,748.06 |
| 1 | 221119381180 | Water supply meter, detector, serves dual systems such as fire and domestic or process water, wide range capacity, 101 L/s, 150 mm mainline x 80 mm by-pass, UL and FM approved | | \$ 13,891.50 | \$ 856.56 | \$- | \$ 14,748.06 |
| 4 | 221119381180 | Heater, residential appliances, electric, built- in, ceiling type, 1250 watt, maximum | | \$ 55,566.00 | \$ 3,426.24 | \$ - | \$ 58,992.24 |
| 1 | 113015433600 | Flexible metal hose, bronze braided, bronze ends, threaded, 10 mm diameter x 300 mm | | \$ 264.82 | \$ 232.78 | \$ - | \$ 497.60 |
| 16 | 221119140120 | | | \$ 510.40 | \$ 495.36 | \$ - | \$ 1,005.76 |

| Quantity | Line Number | Description | | | | Ext. Mat. O&P | E | Ext. Labour O&P | Ext | . Equip. O&P | E | xt. Total O&P |
|---------------|------------------|---|--------------------|-----------|--------|---------------|----|-----------------|-----|--------------|---------|---------------|
| | | Flexible metal hose, bronze braided, bronze ends, threaded, 20 mm diameter x 300 mm | | | | | | | | | | |
| | | | | | | | | | | | | |
| 19 | 221119140160 | | | | \$ | 850.44 | \$ | 764.75 | \$ | - | \$ | 1,615.19 |
| | | capacity, 610 mm x 762 mm platform | | | | | | | | | | |
| | | | | | | | | | | | | |
| 2 | 108805104000 | | | | \$ | 34,633.31 | \$ | 346.88 | | | \$ | 34,980.19 |
| | | Flexible metal hose, bronze braided, bronze ends, threaded, 20 mm diameter x 300 mm | | | | | | | | | | |
| | | | | | | | | | | | | |
| 16 | 221119140160 | | | | \$ | 716.16 | \$ | 644.00 | \$ | - | \$ | 1,360.16 |
| | | Flexible metal hose, bronze braided, bronze ends, threaded, 20 mm diameter x 300 mm | | | | | | | | | | |
| | | | | | | | | | | | | |
| 19 | 221119140160 | | | | \$ | 850.44 | \$ | 764.75 | \$ | _ | \$ | 1,615.19 |
| | | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 | | | | | | | | | | |
| | | mm diameter | | | | | | | | | | |
| 6 | 221113484960 | | | | \$ | 169.80 | \$ | 47.70 | \$ | - | \$ | 217.50 |
| - | | | | | ¢ | 328 394 35 | ¢ | 28 353 90 | ¢ | | ¢ | 356 748 25 |
| | | | Welder O1 | 0.5 | Ψ | 320,334.33 | \$ | 1,651,20 | Ψ | _ | \$ | 1.651.20 |
| | | | Welder O2 | 0.33 | | | ŝ | 1.998.64 | | | ŝ | 1.998.64 |
| | | | Welder P | 1 | | | \$ | 19,055.58 | | | \$ | 19,055.58 |
| | | | QA inspection | 1 | | | \$ | 22,705.42 | | | \$ | 22,705.42 |
| | | | subtotal labor | | | | \$ | 73,764.75 | | | \$ | 402,159.10 |
| | | | EMWG pipe factor | 35.978261 | | | \$ | 2,653,927.36 | | | \$ | 2,653,927.36 |
| | | | Subtotal with EMGW | / | | | \$ | 2,727,692.11 | | | \$ | 3,056,086.46 |
| | | | Labor factor 2.5x | 1.5 | | | \$ | 4,091,538.16 | | | \$ | 4,091,538.16 |
| | | | ss premium fixture | 2.5 | \$ | - | | | | | \$ | - |
| | | | Subtotal materials | 0 3244905 | э ¢ | 328,394.35 | | | | | \$ ¢ | 106 557 56 |
| | | | | 0.5244005 | ¢ | 434 951 91 | ¢ | 6 819 230 27 | | | ¢ | 7 254 182 18 |
| | | | | | Ψ | 454,551.51 | Ψ | 0,013,230.27 | | | Ÿ | 772547262126 |
| | | | | | | | | | | | | |
| D_07_02 to 05 | Drum filling tra | ansfer tool | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Waste handling equipment, for handling | | | | | | | | | | |
| 6 | 118226101420 | hazardous waste materials, w/charcoal & | | | \$ | 305 200 80 | \$ | 10 434 07 | \$ | | \$ | 315 634 87 |
| Ū | 110220101420 | | | | Ŷ | 000,200.00 | Ŷ | 10,404.01 | Ψ | | Ψ | 010,004.01 |
| | | Waste handling equipment, for handling | | | | | | | | | | |
| 3 | 118226101420 | HEPA filter, 208 L drum packer | | | \$ | 152,600.40 | \$ | 5,217.04 | \$ | - | \$ | 157,817.44 |
| | | Waste handling equipment, for handling | | | | | | | | | | |
| 2 | 110006101400 | hazardous waste materials, w/charcoal & | | | ¢ | 152 600 40 | ¢ | E 017 04 | ¢ | | ¢ | 157 017 44 |
| 3 | 118226101420 | HEPA liller, 208 L drum packer | | | \$ | 152,600.40 | \$ | 5,217.04 | Þ | - | \$ | 157,817.44 |
| 1 | 221123103220 | 020411-K38910-52BX-0001 | | | \$ | 33,958.95 | \$ | 10,434.07 | | | \$ | 44,393.02 |
| | | | | | \$ | 644,360.55 | \$ | 31,302.21 | \$ | - | \$ | 675.662.76 |
| | | | subtotal labor | | | | \$ | 31,302.21 | | | \$ | 675,662.76 |
| | | | EMWG pipe factor | 35.978261 | | | \$ | 1,126,199.08 | | | \$ | 1,126,199.08 |
| | | | Subtotal with EMGW | / | | | \$ | 1,157,501.29 | | | \$ | 1,801,861.84 |
| | | | Labor factor 2.5x | 1.5 | | | \$ | 1,736,251.93 | | | \$ | 1,736,251.93 |
| | | | 55 premium fixture | 2.5 | \$ | 644 260 55 | | 2 802 752 22 | | | * | 2 520 442 77 |
| | | | | | \$ | 044,360.55 | ş | 2,893,753.22 | | | ş | 3,538,113.77 |
| | | | Total | | * | 1 070 212 46 | | 0 712 002 40 | | | | 10 702 205 05 |
| | | | TUtal | | P | 1,079,312.40 | ₽ | 5,712,903.49 | | | P | 10,792,295.95 |

Table D-4: BOQ Section E – Process Support Systems

| | | | Overnight materials costs | Overnight labour costs | Overnight equipment costs | Total overnight costs |
|---------|---------------------------------|-------|---------------------------------|------------------------------|---------------------------------|-----------------------------|
| Section | E, Process Support Systems | | | | | |
| E_01 | Chilled Water Supply | | \$918,184 | \$229,815 | \$353 | \$1,148,352 |
| | | | | | | |
| E_02 | Vapor Recovery System | | \$4,587,784 | \$13,674,014 | \$0 | \$18,261,798 |
| | | | | | | |
| E_03 | Instrument & Services Air Syste | ems | \$1,471,404 | \$1,349,735 | \$413 | \$2,821,552 |
| | | | | | | |
| | | Total | \$6,977,371 | \$15,253,565 | \$765 | \$22,231,701 |

| Quantity | Line Number | Description | | | E | kt. Mat. O&P | Ex | t. Labour O&P | Ext | t. Equip. O&P | E> | t. Total O&P |
|------------|---------------------------------|---|--------------------|-----|----|--------------|----|---------------|-----|---------------|----|--------------|
| | | | | | | | | | | | | |
| E_01_01 C | hilled water equ | uipment | | | | | | | | | | |
| Data Relea | ise : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| 1 | 628411- K73870-52BX- 0002 | Water chiller, centrifugal liquid chiller, water cooled, open drive, 7040 kW (twin 3517 kW units), includes standard controle undudes under tawar | | | ¢ | 676 795 40 | ¢ | 44 400 60 | ¢ | | ¢ | 700.004.00 |
| | | controls, excludes water tower | | | φ | 070,703.40 | φ | 44,190.00 | ¢ | - | φ | 720,964.00 |
| | | | Welder Of | 0.5 | \$ | 676,785.40 | \$ | 44,198.60 | \$ | - | \$ | 720,984.00 |
| | | | Steamfitter Q7 | 0.5 | | | \$ | 11,049.65 | | | \$ | 11,049.65 |
| | | | Welder P | 1 | | | | | | | | |
| | | | QA inspection | 1 | | | \$ | 11,049.65 | | | \$ | 11,049.65 |
| | | | subtotal labor | | | | \$ | 66,297.90 | | | \$ | 743,083.30 |
| | | | Labor factor 2.5x | 1.5 | | | \$ | 99,446.85 | | | \$ | 99,446.85 |
| | | | SS premium fixture | 2.5 | | | | | | | | |
| | | | | | \$ | 676,785.40 | \$ | 165,744.75 | | | \$ | 842,530.15 |
| E_01_02 C | hilled water pip | ing and fittings | | | | | | | | | | |
| Data Relea | ise : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| 95 | 221113644390 | Pipe, stainless steel, threaded, 100 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 65.985.10 | \$ | 13.627.75 | \$ | _ | \$ | 79.612.85 |
| | | | | | • | , | - | , | | | - | , |
| 105 | 221112644260 | Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes | | | ¢ | 61 960 55 | ¢ | 15 072 60 | ¢ | | ¢ | 77 149 15 |
| 105 | 221113044300 | couplings and hangers 5 m OC | | | φ | 01,009.55 | φ | 15,275.00 | φ | - | φ | 11,143.13 |
| 300 | 221113644330 | Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 50,010.00 | \$ | 17,493.00 | \$ | - | \$ | 67,503.00 |
| 10 | 221113644330 | Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | | \$ | 1,667.00 | \$ | 583.10 | \$ | - | \$ | 2,250.10 |
| 18 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 7,131.06 | \$ | 473.76 | \$ | - | \$ | 7,604.82 |
| 16 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 6,338.72 | \$ | 421.12 | \$ | <u>-</u> | \$ | 6,759.84 |
| | | | | | | | | | | | | |
| 2 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 792.34 | \$ | 52.64 | \$ | - | \$ | 844.98 |
| 2 | 221113488050 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 100 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 1,255.38 | \$ | 130.04 | \$ | - | \$ | 1,385.42 |

| | | | | | | | | | uge 2 10 01 | 000 | |
|----------|--------------|--|--|---------|-------------|-----|--------------|-----|--------------|--------|--------------|
| Quantity | Line Number | Description | | Ex | t. Mat. O&P | Ext | . Labour O&P | Ext | . Equip. O&P | E | t. Total O&P |
| 1 | 221113488050 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 100 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle. excl joint coupling material | | s | 627 69 | \$ | 65.02 | \$ | _ | \$ | 692 71 |
| 4 | 221113485780 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 658.56 | \$ | 138.28 | \$ | - | \$ | 796.84 |
| 4 | 221113485780 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 658.56 | \$ | 138.28 | \$ | - | \$ | 796.84 |
| 12 | 221113485780 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 1,975.68 | \$ | 414.84 | \$ | - | \$ | 2,390.52 |
| | 00440405700 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint | | | 050.50 | • | 100.000 | | | • | 700.04 |
| 4 | 221113403700 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl price, incl joint | | ¢ | 658 56 | ¢ | 138.20 | ¢ | - | ¢ | 790.04 |
| 4 | 221113483780 | Venturi flow, measuring device, 80 mm | | Ŷ | 0.10.07 | φ | 130.20 | Ģ | - | φ Φ | 750.04 |
| 90 | 232120880220 | Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 25 mm wall, 80 mm iron pipe size | | ъ \$ | 662 40 | \$ | 2,106,90 | \$ | | \$ | 2,769,30 |
| 11 | 221113484100 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 100 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 1,052.70 | \$ | 630.08 | \$ | | \$ | 1,682.78 |
| 12 | 221113/8/019 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 100 mm diameter | | ¢ | 1 080 49 | ¢ | 346.90 | ¢ | | ¢ | 1 / 27 29 |
| 12 | 221110404310 | 4.4 | | Ψ | 1,000.40 | Ψ | 0-10.00 | Ψ | | Ψ | 1,721.20 |

| | | | | | | | | | | . | | |
|----------|--------------|---|--------------------|---------|----|---------------|----|-------------------------|----|----------------|---------|-------------------------|
| Quantity | Line Number | Description | | | E | Ext. Mat. O&P | Ex | t. Labour O&P | Ex | rt. Equip. O&P | Ex | t. Total O&P |
| <u></u> | | | | | | | | | | u _quipi o oii | | |
| 16 | 221113484800 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 100 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 2,568.32 | \$ | 1,345.76 | \$ | - | \$ | 3,914.08 |
| 2 | 221113484100 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 100 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 191.40 | \$ | 114.56 | \$ | - | \$ | 305.96 |
| 180 | 220719107320 | Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 50 mm wall, 15 mm iron pipe size | | | \$ | 2,185.20 | \$ | 3,468.60 | \$ | - | \$ | 5,653.80 |
| 10 | 220719107320 | Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 50 mm wall, 15 mm iron pipe size | | | \$ | 121.40 | \$ | 192.70 | \$ | <u>-</u> | \$ | 314.10 |
| 405 | 000740407000 | Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 50 mm wall, 15 mm | | | ¢ | 0.000.40 | ¢ | 2 470 55 | ¢ | | ¢ | E 100 CE |
| 33 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle. excl joint coupling material | | | \$ | 13.073.61 | \$ | 868.56 | \$ | - | \$ | 13.942.17 |
| 6 | 232120880180 | Venturi flow, measuring device, 50 mm diameter | | | \$ | 2,747.46 | \$ | 442.74 | \$ | - | \$ | 3,190.20 |
| 8 | 232120880220 | Venturi flow, measuring device, 80 mm diameter | | | \$ | 5,186.16 | \$ | 833.84 | \$ | - | \$ | 6,020.00 |
| 543 | 051223774400 | Column base plates, structural, heavy, 90 metric ton project, over 68 kg each, A992 steel, shop fabricated, incl shop primer | | | \$ | 2,459.79 | \$ | 874.23 | \$ | 352.95 | \$ | 3,686.97 |
| 18 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 7,131.06 | \$ | 473.76 | \$ | _ | \$ | 7,604.82 |
| | | | | | | | | | | | | |
| | | | D // | • | \$ | 241,398.11 | \$ | 64,070.30 | \$ | 352.95 | \$ | 305,821.36 |
| | | | Buttweld Q1&QA | \$ 1.00 | | | \$ | 1,807.12 | | | \$ | 1,807.12 |
| | | | Welder Q1 | 0.5 | | | \$ | 121,580.79 | | | \$ | 121,580.79 |
| | | | Welder P | 0.33 | | | ¢ | 4,542.58 | | | ¢ | 4,042.08 |
| | | | OA inspection | 1 | | | ¢ | 21,776.64 147 900 01 | | | Ф \$ | ∠1,776.64 147 900 01 |
| | | | subtotal labor | 1 | | | \$ | 361.677.45 | | | \$ | 603.428.51 |
| | | | Labor factor 2.5x | 1.5 | | | \$ | 542,516.17 | | | \$ | 542,516.17 |
| | | | SS premium fixture | 2.5 | \$ | 595,689.80 | - | | | | \$ | 595,689.80 |
| | | | | | \$ | 837,087.91 | \$ | 904,193.61 | \$ | 352.95 | \$1 | ,741,634.47 |
| | | | | | | | | | | | | |
| | | | Total | | \$ | 918,183.51 | \$ | 229,815.05 | \$ | 352.95 | \$1 | ,148,351.51 |

| Quantity | Line Number | Description | | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
|-------------|-------------------|---------------------------------------|--------------------------|-------------|-----------------|-----------------|-----------------|-----------------|
| | | | | | | | | |
| E_02_01 Eq | upment | | | | | | | |
| Data Releas | e : Year 2020 | Unit Cost Estimate | | | | | | |
| | | | | | | | | |
| 1 | 628411- | dryer | | | \$ 3,473,818.00 | \$ 1,043.41 | | \$ 3,474,861.41 |
| 1 | | Blower, regenerative | | | \$ 79,860.00 | \$ 173.90 | | \$ 80,033.90 |
| 1 | 628411- | DR1 Dessiccant wheel dryer | | | \$ 655,356.50 | \$ 1,043.41 | | \$ 656,399.91 |
| 5 | 233813102980 | Fume hood | | | \$ 42,545.25 | \$ 1,982.00 | \$ - | \$ 44,527.25 |
| | | | | | | | | |
| | | | | | \$ 4,251,579.75 | \$ 4,242.72 | \$- | \$ 4,255,822.47 |
| | | | Welder Q1 | 0.5 | | \$- | | \$- |
| | | | Welder Q2 | 0.33 | | \$- | | \$- |
| | | | Welder P | 1 | | \$ 4,242.72 | | \$ 4,242.72 |
| | | | QA inspection | 1 | | \$ 4,242.72 | | \$ 4,242.72 |
| | | | subtotal labor | | | \$ 12,728.15 | | \$ 4,264,307.90 |
| | | | EMWG pipe factor | 35.9/82608/ | | \$ 457,936.54 | | \$ 457,936.54 |
| | | | Subtotal with EMGW | | | \$ 4/0,664.69 | | \$ 4,722,244.44 |
| | | | Labor factor 2.5x | 1.5 | | \$ 705,997.03 | | \$ 705,997.03 |
| | | | SS premium fixtures 2.5x | 2.5 | \$ - | | | \$ |
| | | | | | \$ 4,251,579.75 | \$ 1,176,661.72 | | \$ 5,428,241.47 |
| E_02_02 Pi | ping and fittings | | | | | | | |
| Data Releas | e : Year 2020 | Unit Cost Estimate | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | Ripo, staiplass stool, throaded, 20 | | | | | | |
| | | mm diameter schedule 40 type | | | | | | |
| | | 316 includes couplings and | | | | | | |
| 15 | 221113644320 | hangers 3 m OC | | | \$ 1 805 85 | \$ 766.20 | s - | \$ 2,572,05 |
| | 221110011020 | | | | φ 1,000.00 | ¢ | ÷ | ¢ 2,012.00 |
| | | | | | | | | |
| | | Pipe, stainless steel, threaded, 25 | | | | | | |
| | | mm diameter, schedule 40, type | | | | | | |
| | | 316, includes couplings and | | | | | | |
| 15 | 221113644330 | hangers 3 m OC | | | \$ 2,500.50 | \$ 874.65 | \$- | \$ 3,375.15 |
| | | | | | | | | |
| | | Pipe, stainless steel, threaded, 50 | | | | | | |
| | | mm diameter, schedule 40, type | | | | | | |
| | | 316, includes couplings and | | | | | | |
| 15 | 221113644360 | hangers 3 m OC | | | \$ 5,016.45 | \$ 1,238.40 | \$ - | \$ 6,254.85 |
| | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 | | | | | | |
| | | Deg. or 90 Deg., steel, painted, | | | | | | |
| | | grooved joint, 20 mm diameter, | | | | | | |
| | | add i coupling (material only) per | | | | | | |
| | | joint for installed price, inclijoint | | | | | | |
| 10 | 221113484030 | material | | | \$ 936.40 | \$ 159.40 | ¢ _ | \$ 1.005.80 |
| 10 | 221113404030 | material | | | ψ 330.40 | ψ 155.40 | Ψ - | φ 1,035.00 |
| | | Pipe, fittings & valves, elbow, 45 | | | | | | |
| | | Deg. or 90 Deg., steel, painted. | | | | | | |
| | | grooved joint, 20 mm diameter, | | | | | | |
| | | add 1 coupling (material only) per | | | | | | |
| | | joint for installed price, incl joint | | | | | | |
| | | coupling labor, excl joint coupling | | | | | | |
| 4 | 221113484030 | material | | | \$ 374.56 | \$ 63.76 | \$- | \$ 438.32 |
| | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 | | | | | | |
| | | Deg. or 90 Deg., steel, painted, | | | | | | |
| | | grooved joint, 20 mm diameter, | | | | | | |
| | | ioint for installed price inclinint | | | | | | |
| | | coupling labor, excl joint coupling | | | | | | |
| 15 | 221113484030 | material | | | \$ 1 404 60 | \$ 239.10 | s - | \$ 164370 |
| | | | | | ., | | • | + ., |
| | | Pipe, fittings & valves, elbow, 45 | | | | | | |
| | | Deg. or 90 Deg., steel, painted, | | | | | | |
| | | grooved joint, 25 mm diameter, | | | | | | |
| | | add 1 coupling (material only) per | | | | | | |
| | | joint for installed price, incl joint | | | | | | |
| | | coupling labor, excl joint coupling | | | | | | |
| 15 | 221113484040 | material | | | \$ 756.30 | \$ 239.10 | \$ - | \$ 995.40 |
| | | | | | | | | |
| | | Pipe, fittings & valves, elbow, 45 | | | | | | |
| | | dropved joint 40 mm diameter | | | | | | |
| | | add 1 coupling (material only) per | | | | | | |
| | | ioint for installed price incl ioint | | | | | | |
| | | coupling labor. excl joint coupling | | | | | | |
| 1 | 221113484060 | material | | | \$ 50.42 | \$ 24.25 | \$ - | \$ 74.67 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
|----------|--------------|--|--|-------------------------|-----------------------|-----------------|--------------------------|
| 15 | 221113484060 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 756.30 | \$ 363.75 | \$- | \$ 1,120.05 |
| 2 | 221113484070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 100.84 | \$ 63.98 | \$- | \$ 164.82 |
| 15 | 221113484070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 756.30 | \$ 479.85 | \$ - | \$ 1,236.15 |
| 11 | 221113485780 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 1.811.04 | \$ 380.27 | \$ - | \$ 2 191 31 |
| | 221112485780 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | 6 464.64 | ¢ 0001 | ¢ | ¢ 2,101.01 |
| 6 | 221113485780 | material Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 104.04 \$ 087.84 | \$ 34.57 \$ 207.42 | ş - | \$ 199.21 \$ 1 195.26 |
| 16 | 221110400700 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling | | ¢ 307.04 | ¢ 201.42 | ¢ - | ¢ 1,10020 |
| 10 | 221113485780 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 20 mm diameter | | \$ 2,634.24 \$ 28.30 | \$ 553.12 \$ 7.95 | \$ - | \$ 3,187.30 \$ 36.25 |
| 2 | 221113484990 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter | | \$ 85.40 | \$ 31.88 | \$- | \$ 117.28 |
| 1 | 221113484960 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter | | \$ 28.30 | \$ 7.95 | \$- | \$ 36.25 |
| 1 | 221113484980 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 40 mm diameter | | \$ 39.62 | \$ 11.87 | \$- | \$ 51.49 |
| 1 | 221113484990 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter | | \$ 42.70 | \$ 15.94 | \$- | \$ 58.64 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
|----------|------------------------------|---|--|------------------------|-----------------------|-----------------|------------------------|
| 2 | 221113484990 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter | | \$ 85.40 | \$ 31.88 | \$- | \$ 117.28 |
| 1 | 221113484700 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 100.33 | \$ 21.16 | \$- | \$ 121.49 |
| 2 | 221113484760 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 154.36 | \$ 72.24 | \$- | \$ 226.60 |
| | | Pipe, fittings & valves, tee, steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint | | | | | |
| 4 | 221113484760 | coupling material Pipe, fittings & valves, tee, steel, painted, grooved joint, 65 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint | | \$ 308.72 | \$ 144.48 | \$ - | \$ 453.20 |
| 2 | 221113484780 | coupling material Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint | | \$ 154.36 | \$ 106.30 | \$ - | \$ 260.66 |
| 7 | 221113484770 221113484914 | coupling material Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 65 mm diameter | | \$ 540.26 \$ 168.24 | \$ 328.72 \$ 53.73 | \$ - \$ - | \$ 868.98 \$ 221.97 |
| 15 | 221113484910 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 40 mm diameter | | \$ 586.50 | \$ 178.05 | \$- | \$ 764.55 |
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ 396.17 | \$ 26.32 | \$ - | \$ 422.49 |
| 1 | 221112499010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position bandle, ext joint coupling material | | ¢ 206.17 | ¢ 26.32 | ¢ | ¢ 422.40 |
| · | 221113400010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position | | ¢ 550.11 | φ 20.02 | ų - | φ 422.43 |
| 3 | 221113488020 | handle, excl joint coupling material Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed noise, inc? a consistent | | \$ 1,188.51 | \$ 103.71 | \$ - | \$ 1,292.22 |
| 1 | 221113488010 | handle, excl joint coupling material Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for | | \$ 396.17 | \$ 26.32 | \$ - | \$ 422.49 |
| 5 | 221113488020 | Installed price, incl 2 position handle, excl joint coupling material | | \$ 1,980.85 | \$ 172.85 | \$ - | \$ 2,153.70 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
|----------|--------------|--|--|---------------|-----------------|-----------------|----------------|
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ 396.17 | \$ 26.32 | \$- | \$ 422.49 |
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ 396.17 | \$ 26.32 | \$- | \$ 422.49 |
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ 396.17 | \$ 26.32 | \$- | \$ 422.49 |
| 2 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ 792.34 | \$ 52.64 | \$- | \$ 844.98 |
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ 396.17 | \$ 26.32 | \$- | \$ 422.49 |
| 14 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 1,163.26 | \$ 1,311.10 | \$- | \$ 2,474.36 |
| 5 | 221113644330 | Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ 833.50 | \$ 291.55 | \$- | \$ 1,125.05 |
| 5 | 221113644390 | Pipe, stainless steel, threaded, 100 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ 3,472.90 | \$ 717.25 | \$- | \$ 4,190.15 |
| 5 | 221113470700 | Gasket and bolt set, for flanges, 1034 kPa, 200 mm pipe size | | \$ 174.95 | \$ 794.65 | \$- | \$ 969.60 |
| 60 | 221113470710 | Gasket and bolt set, for flanges, 1034 kPa, 250 mm pipe size | | \$ 3,858.60 | \$ 10,588.20 | \$- | \$ 14,446.80 |
| 60 | 221113470730 | Gasket and bolt set, for flanges, 1034 kPa, 350 mm pipe size | | \$ 3,704.40 | \$ 11,950.80 | \$- | \$ 15,655.20 |
| 1 | 221113484912 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter | | \$ 49.39 | \$ 15.94 | \$- | \$ 65.33 |
| 4 | 221113484912 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter | | \$ 197.56 | \$ 63.76 | \$- | \$ 261.32 |
| 1 | 221113484030 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 93.64 | \$ 15.94 | \$ - | \$ 109.58 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
|----------|---------------|--|--|--|------------------------|-----------------|----------------|
| 15 | 221113484030 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 1,404.60 | \$ 239.10 | \$- | \$ 1,643.70 |
| 50 | 221113484070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 2,521.00 | \$ 1,599.50 | \$- | \$ 4,120.50 |
| 2 | 221113484070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 100.84 | \$ 63.98 | \$ - | \$ 164.82 |
| 6 | 221113484120 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 150 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 1.605.24 | \$ 535.62 | s - | \$ 2.140.86 |
| 2 | 0011112484120 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 150 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | ¢ 525.00 | ¢ 170 E4 | c | 6 742 62 |
| 10 | 221113464120 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 150 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 2,675.40 | \$ 1/6.34 \$ 902.70 | ф - | \$ 713.62 |
| 10 | 221113404120 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 150 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | ¢ 2,013.40 | ¢ 052.70 | ¢ - | ¢ 3,000.10 |
| 2 | 221113404120 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ 207.34 | \$ 09.27 | ф - | \$ 330.81 |
| 2 | 221113485780 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | 329.28 320.28 | s 60.14 | | |

| Quantity | Line Number | Description | | Ext. M | lat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ex | tt. Total O&P |
|----------|--------------|---|--|--------|-----------|---------------------------|-----------------|----|---------------|
| 6 | 221113485880 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 350 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 9,569.70 | \$ 1,337.46 | ş - | \$ | 10,907.16 |
| 1 | 221113485880 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 350 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 1,594.95 | \$ 222.91 | \$- | \$ | 1,817.86 |
| 8 | 221113484990 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter | | \$ | 341.60 | \$ 127.52 | \$- | \$ | 469.12 |
| 2 | 221113484990 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter | | \$ | 85.40 | \$ 31.88 | \$- | \$ | 117.28 |
| 2 | 221113484980 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 40 mm diameter | | \$ | 79.24 | \$ 23.74 | \$- | \$ | 102.98 |
| 2 | 221113484990 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter | | \$ | 85.40 | \$ 31.88 | \$- | \$ | 117.28 |
| 1 | 221113485120 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 350 mm diameter | | \$ | 596.82 | \$ 92.88 | \$- | \$ | 689.70 |
| 1 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 77 18 | \$ 46.96 | \$ - | \$ | 124 14 |
| 1 | 221112494770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | ¢ | 77 19 | \$ 46.06 | c | ¢ | 124.14 |
| - 11 | 221113404770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 250 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | Ŷ | 12 200 88 | \$ <u>204236</u> | ¢ - | φ | 15 242 24 |
| 2 | 221113404040 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 350 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | ¢ | 2 097 00 | \$ 2,043.30 | ¢ - | \$ | 2 592 26 |
| | 221113464651 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved | | ф Ф | 3,007.00 | φ 495.36 | φ - | ð | 3,362.36 |
| 1 | 221113484912 | point, 50 mm diameter Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved | | \$ | 49.39 | 15.94 | ۍ - د | \$ | 65.33 |
| 8 | 221113484912 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, | | \$ | 395.12 | ¢ 127.52 | \$ - | \$ | 522.64 |
| 2 | 221113485120 | grooved joint, 350 mm diameter | | \$ | 1,193.64 | \$ 185.76 | \$ - | \$ | 1,379.40 |

| Quantity | Line Number | Description | | | E | Ext. Mat. O&P | Ext. Labour O&P | | Ext. | Equip. O&P | E | xt. Total O&P |
|----------|--------------|---|--------------------------|-------------|----|---------------|-----------------|---------------|------|------------|--------|---------------|
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 396.17 | \$ | 26.32 | \$ | - | \$ | 422.49 |
| 1 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 396.17 | \$ | 34.57 | \$ | _ | \$ | 430.74 |
| 1 | 221113488030 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 80 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, exc joint coupling material | | | | 571 10 | \$ | 47 99 | \$ | | \$ | 619.09 |
| 1 | 221119263020 | Pressure regulator, steam, high capacity, bronze body, stainless steel trim, threaded, 15 mm diameter | | | \$ | 3.395.70 | \$ | 33.54 | \$ | _ | ŝ | 3,429,24 |
| | | | | | Ť | -, | Ť | | Ŧ | | Ť | -, |
| | | | | | \$ | 87,721.76 | \$ | 41,672.14 | \$ | - | \$ | 129,393.90 |
| | | | Sampling | | | | \$ | 19,057.50 | | | \$ | 19,057.50 |
| | | | Welder Q1 | 0.5 | | | \$ | 723.21 | | | \$ | 723.21 |
| | | | Welder P | 0.33 | | | ф ¢ | 34 644 55 | | | ⊅ ¢ | 34 644 55 |
| | | | OA inspection | 1 | | | \$ | 37.228.15 | | | \$ | 37.228.15 |
| | | | subtotal labor | - | | | \$ | 135,185.94 | | | \$ | 222,907.70 |
| | | | EMWG pipe factor | 35.97826087 | | | \$ | 4,863,755.02 | | | \$ | 4,863,755.02 |
| | | | Subtotal with EMGW | | | | \$ | 4,998,940.96 | | | \$ | 5,086,662.72 |
| | | | Labor factor 2.5x | 1.5 | | | \$ | 7,498,411.43 | | | \$ | 7,498,411.43 |
| | | | SS premium fixtures 2.5x | 2.5 | \$ | 166,116.50 | | | | | \$ | 166,116.50 |
| | | | subtotal materials | 0.004400.00 | \$ | 253,838.26 | | | | | \$ | 12,751,190.65 |
| | | | NC factor | 0.324480494 | \$ | 82,365.56 | | 2 407 252 20 | | | \$ | 82,365.56 |
| | | | | | Þ | 330,203.82 | \$ I | .2,497,352.39 | | | \$1 | 2,033,330.21 |
| | | | | | | | | | | | | |
| | | | | Total | \$ | 4,587,783.57 | \$1 | 3,674,014.11 | \$ | - | \$1 | 8,261,797.68 |

| CONFI | DENTIAL A | ATTORNEY WORK PRODUCT | | | | | | | Pa | J: Attachmen ge 225 of 3 | 3.4 t 1 50 | |
|-------------------------|--|--|-------------------|----------|-------------|--------|--------------------|----------------|------|--------------------------------|------------------|------------------------|
| Quantity | Line Number | Description | | | Ext. Mat. (| O&P | Ext. Labour | O&P | Ext. | Equip. O&P | Ex | t. Total O&P |
| E_03_01 H Data Relea | leavy water mngt ase : Year 2020 | bldg wsst annex Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| 37 | 221113232260 | Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC | | | \$2,5 | 588.89 | \$ 2,3 | 10.28 | \$ | | \$ | 4,899.17 |
| | | Pipe, copper, tubing, solder, 40 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC | | | | | . | | | | | |
| 22 | 221113232240 | Pipe, copper, tubing, solder, 25 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC | | | \$ | 950.84 | \$ 1,1 | 01.10 | \$ | - | \$ | 2,051.94 |
| 128 | 221113232200 | Pipe, copper, tubing, solder, 20 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC | | | \$ 3,6 | 522.40 | \$ 4,8 | 87.04 | \$ | - | \$ | 8,509.44 |
| 8 | 221113232180 | Pipe, copper, tubing, solder, 15 mm diameter, type K, includes coupling & clevis hanger assembly 3 m OC | | | \$ | 139.92 | \$ 2 | 76.56 | \$ | - | \$ | 416.48 |
| 5 | 221113231140 | Tee, copper, wrought, copper x copper, 50 mm | | | \$ | 98.25 | \$ 1 | 67.70 | \$ | - | \$ | 265.95 |
| 3 | 221113250540 | | | | \$ | 196.02 | \$ 3 | 40.56 | \$ | - | \$ | 536.58 |
| 2 | 221319132040 | Drain, floor, medium duty, cast iron, deep flange, 175 mm diameter top, 50 mm and 80 mm pipe size | | | \$! | 512 44 | \$ 2 | 39 42 | \$ | - | \$ | 751 86 |
| | | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | · | | | | | | | |
| 2 | 221113488010 | Valves, bronze, angle, rising stem, threaded or soldered same price, 1034 kPa, 15 mm | | | \$ | 792.34 | \$ | 52.64 | \$ | - | \$ | 844.98 |
| 2 | 220523201060 | Valves, bronze, angle, rising stem, threaded or soldered same price, 1034 kPa, 20 mm | | | \$ 3 | 390.98 | \$ | 69.72 | \$ | - | \$ | 460.70 |
| 2 | 220523201070 | Valves, bronze, angle, rising stem, threaded | | | \$ 5 | 529.70 | \$ | 76.70 | \$ | - | \$ | 606.40 |
| 8 | 220523201080 | Valves, bronze, angle, rising stem, threaded | | | \$ 2,9 | 900.80 | \$ 3 | 22.72 | \$ | - | \$ | 3,223.52 |
| 5 | 220523201100 | or soldered same price, 1034 kPa, 40 mm | | | \$ 3,0 | 021.65 | \$ 2 | 96.30 | \$ | - | \$ | 3,317.95 |
| | | 1034 kPa, 50 mm | | | | | | | | | | |
| 16 | 220523201110 | Pipe, copper, tubing, solder, 20 mm diameter, type K, includes coupling & clevis hanger | | | \$ 15,6 | 538.88 | \$ 1,1 | 15.52 | \$ | - | \$ | 16,754.40 |
| 10 | 221113231180 | assembly 3 m OC | | | \$ | 319.00 | \$ 3 | 50.90 | \$ | - | \$ | 669.90 |
| | | | Welder Of | <u> </u> | \$ 31,7 | 702.11 | \$ 11,6 | 07.16 | \$ | - | \$ | 43,309.27 |
| | | | Welder P | 0.5 | | | | 67.74 | | | \$ \$ | 170.28 11,367.74 |
| | | | QA inspection | 1 | | | \$ 11,5 | 38.02 | | | \$ | 11,538.02 |
| | | | Labor factor 2.5x | 1.5 | | | \$ 34,6 \$ 52.0 | 83.20 24.80 | | | \$ \$ | 66,385.31 52.024.80 |
| | | | Total | 1.5 | \$ 31,7 | 02.11 | \$ 86,70 | 8.00 | | | \$ | 118,410.11 |
| E_03_02 lr | nstrument air for | new D2O west annex | | | | | | | | | | |
| Data Relea | ise : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Condensing unit, air cooled, compressor, 70 | | | | | | | | | | |

\$

23,607.60 \$

10,901.00 \$

2 236213100700 kW, includes standard controls

- \$ 34,508.60

Filed 2021-08-17 EB-2020-0290

| Quantity | Line Number | Description | | E | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ex | t. Total O&P |
|----------|--------------|--|--|----|---------------|-----------------|-----------------|----|--------------|
| 2 | 230943104690 | Pneumatic control system, air supply for pneumatic, tank mounted duplex compressor, starter, alternator, piping, dryer, PRV station & filter control system 4 kW | | ¢ | 75 882 20 | \$ 10 159 20 | ¢ | ¢ | 86 041 40 |
| 55 | 221113232260 | Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC | | \$ | 3,848.35 | \$ 3,434.20 | \$ - | \$ | 7,282.55 |
| 90 | 221113232240 | Pipe, copper, tubing, solder, 40 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC | | \$ | 3,889.80 | \$ 4,504.50 | \$- | \$ | 8,394.30 |
| 165 | 221113232260 | Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC | | \$ | 11,545.05 | \$ 10,302.60 | \$- | \$ | 21,847.65 |
| 7 | 221113232180 | Pipe, copper, tubing, solder, 20 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC | | \$ | 122.43 | \$ 241.99 | \$- | \$ | 364.42 |
| 11 | 221113231140 | Pipe, copper, tubing, solder, 15 mm diameter, type K, includes coupling & clevis hanger assembly 3 m OC | | \$ | 216.15 | \$ 368.94 | \$- | \$ | 585.09 |
| 6 | 221113250540 | Tee, copper, wrought, copper x copper, 50 mm | | \$ | 392.04 | \$ 681.12 | \$- | \$ | 1,073.16 |
| 2 | 221319132040 | Drain, floor, medium duty, cast iron, deep flange, 175 mm diameter top, 50 mm and 80 mm pipe size | | \$ | 512.44 | \$ 239.42 | \$- | \$ | 751.86 |
| 8 | 238316101182 | Radiant floor heating, manifold, brass, valved, 12 circuit, 25 mm | | \$ | 9,397.20 | \$ 1,244.72 | \$- | \$ | 10,641.92 |
| 4 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 1,584.68 | \$ 105.28 | \$- | \$ | 1,689.96 |
| 50 | 221113484912 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter | | \$ | 2,469.50 | \$ 797.00 | \$- | \$ | 3,266.50 |
| 4 | 220523201060 | Valves, bronze, angle, rising stem, threaded or soldered same price, 1034 kPa, 15 mm | | \$ | 781.96 | \$ 139.44 | \$- | \$ | 921.40 |
| 68 | 220523201040 | Valves, bronze, angle, rising stem, threaded or soldered same price, 1034 kPa, 8 mm | | \$ | 12,721.44 | \$ 2,167.16 | \$- | \$ | 14,888.60 |
| 20 | 220523201060 | Valves, bronze, angle, rising stem, threaded or soldered same price, 1034 kPa, 15 mm | | \$ | 3,909.80 | \$ 697.20 | \$- | \$ | 4,607.00 |
| 9 | 220523201070 | Valves, bronze, angle, rising stem, threaded or soldered same price, 1034 kPa, 20 mm | | \$ | 2,383.65 | \$ 345.15 | \$- | \$ | 2,728.80 |
| 8 | 220523201080 | Valves, bronze, angle, rising stem, threaded or soldered same price, 1034 kPa, 25 mm | | \$ | 2,900.80 | \$ 322.72 | \$- | \$ | 3,223.52 |
| 14 | 220523201100 | Valves, bronze, angle, rising stem, threaded or soldered same price, 1034 kPa, 40 mm | | \$ | 8,460.62 | \$ 829.64 | \$- | \$ | 9,290.26 |
| 5 | 220523201110 | Valves, bronze, angle, rising stem, threaded, 1034 kPa, 50 mm | | \$ | 4,887.15 | \$ 348.60 | \$- | \$ | 5,235.75 |

| Quantity | Line Number | Description | | | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | E | t. Total O&P |
|-----------|---|---|-------------------------|-------------|----------|-------------------------|-------------------------------|-----------------|----------|--------------------------------|
| | | | | | | | | | | |
| | | Valves bronze angle rising stem threaded | | | | | | | | |
| 2 | 220523201060 | or soldered same price, 1034 kPa, 15 mm | | | \$ | 390.98 | \$ 69.72 | \$- | \$ | 460.70 |
| | | | | | | | | | | |
| | | Valves, bronze, angle, rising stem, threaded | | | | | | | | |
| 4 | 220523201080 | or soldered same price, 1034 kPa, 25 mm | | | \$ | 1,450.40 | \$ 161.36 | \$- | \$ | 1,611.76 |
| | | Pump, condensate return system, duplex, float | | | | | | | | |
| 2 | 232223102150 | switch, alternator, 2 pumps with motors, 1.12 kW, 3.79 L/s, 56.9 L cast iron receiver | | | \$ | 27,783.00 | \$ 2,889.60 | \$- | \$ | 30,672.60 |
| | | | | | | | | | | |
| | | Pump, condensate return system, duplex, float switch, alternator, 2 pumps with motors, 1.12 | | | | | | | | |
| 2 | 232223102150 | kW, 3.79 L/s, 56.9 L cast iron receiver | | | \$ | 27,783.00 | \$ 2,889.60 | \$- | \$ | 30,672.60 |
| | | | | | | | | | | |
| 2 | 224112102100 | Air filter, mechanical media filtration units, | | | ¢ | 201 02 | ¢ 70.00 | ¢ | ¢ | 251.02 |
| 2 | 234113103100 | nigh enciency type, with name, supported | | | φ | 201.92 | \$ 70.00 | φ - | φ | 551.92 |
| | | Air filter mechanical modia filtration unite | | | | | | | | |
| 2 | 234113103100 | high efficiency type, with frame, supported | | | \$ | 281.92 | \$ 70.00 | \$- | \$ | 351.92 |
| | | | | | | | | | | |
| | | Tee, copper, wrought, copper x copper, | | | | | | | | |
| 50 | 221113250612 | reducing on the outlet, 8 mm | | | \$ | 964.50 | \$ 2,657.50 | \$- | \$ | 3,622.00 |
| | | | | | | | | | | |
| 4 | 232120880180 | Venturi flow, measuring device, 50 mm diameter | | | \$ | 1 831 64 | \$ 295.16 | s - | \$ | 2 126 80 |
| | 202120000100 | | | | ÷ | 1,001101 | • | • | | 2,120.00 |
| | | | Sampling | | \$ | 230,280.22 | \$ 56,932.82 \$ 19,057.50 | \$- | \$ \$ | 287,213.04 19,057.50 |
| | | | Welder Q1 | 0.5 | | | \$ 3,009.31 | | \$ | 3,009.31 |
| | | | Welder Q 5 Welder O6 | 0.5 | | | \$ 622.36 \$ 5.450.50 | | \$ \$ | 622.36 5.450.50 |
| | | | Welder Q19 | 0.33 | | | \$ 3,386.40 | | \$ | 3,386.40 |
| | | | Welder P | 1 | | | \$ 28,609.28 | | \$ | 28,609.28 |
| | | | QA Inspection | 1 | | | \$ 41,077.85 \$ 158.146.02 | | \$ \$ | 41,077.85 388,426,24 |
| | | | Labor factor 2.5x | 1.5 | | | \$ 237,219.03 | | \$ | 237,219.03 |
| | | | subtotal materials | | \$ | 230,280.22 | | | \$ | 625,645.27 |
| | | | NC factor Total | 0.324480494 | \$ \$ | 74,721.44 305,001.66 | \$ 395,365.05 | | \$ \$ | 74,721.44 |
| | | | | | | | | | | · |
| E_03_03 H | ivvivil B west anne: ase : Year 2020 | Unit Cost Estimate | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | Pipe, copper, tubing, solder, 15 mm diameter, type L. includes coupling & clevis hanger | | | | | | | | |
| 5 | 221113232140 | assembly 3 m OC | | | \$ | 68.45 | \$ 162.55 | \$- | \$ | 231.00 |
| | | Pipe, copper, tubing, solder, 15 mm diameter, | | | | | | | | |
| 5 | 221113232140 | assembly 3 m OC | | | \$ | 68.45 | \$ 162.55 | \$- | \$ | 231.00 |
| | | Pipe, copper, tubing, solder, 25 mm diameter, | | | | | | | | |
| 100 | 221112222200 | type L, includes coupling & clevis hanger | | | ¢ | 2 622 40 | ¢ 4 997 04 | ¢ | ¢ | 9 500 44 |
| 120 | 221113232200 | | | | φ | 5,022.40 | \$ 4,007.04 | φ - | φ | 0,509.44 |
| | | type L, includes coupling & clevis hanger | | | | | | | | |
| 250 | 221113232240 | assembly 3 m OC | | | \$ | 10,805.00 | \$ 12,512.50 | \$- | \$ | 23,317.50 |
| | | Pipe, copper, tubing, solder, 50 mm diameter, | | | | | | | | |
| 78 | 221113232260 | sype L, includes coupling & clevis hanger assembly 3 m OC | | | \$ | 5,457.66 | \$ 4,870.32 | \$- | \$ | 10,327.98 |
| | | | | | | | | | | |
| 2 | 221112250540 | Tee, copper, wrought, copper x copper, 50 | | | ¢ | 120.60 | \$ 007.04 | \$ | ¢ | 257 70 |
| 2 | 221113250540 | | | | φ | 130.08 | φ 227.04 | φ - | φ | 357.72 |
| | | Pipe, fittings & valves, valve, butterfly, | | | | | | | | |
| | | add 1 coupling (material only) per joint for | | | | | | | | |
| 0 | 004440400046 | installed price, incl 2 position handle, excl joint | | | | 700.0 | ¢ 50.63 | ¢ | | 044.00 |
| 2 | 221113488010 | coupility material | | | Ф | 792.34 | φ 52.64 | φ - | ф | 844.98 |

EB-2020-0290 J3.4 CONFIDENTIAL ATTORNEY WORK PRODUCT Attachment 1 Page 228 of 350 Ext. Mat. O&P Quantity Line Number Description Ext. Labour O&P Ext. Equip. O&P Ext. Total O&P Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint 221113488010 coupling material 8,319.57 \$ 552.72 \$ 8,872.29 21 \$ Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint 21 221113488020 coupling material \$ 8.319.57 \$ 725.97 \$ \$ 9 045 54 Pneumatic control system, air supply for pneumatic, tank mounted duplex compressor, starter, alternator, piping, dryer, PRV station & filter control system, 4 kW 230943104690 21 \$ 796.763.10 \$ 106.671.60 \$ \$ 903.434.70 Coupling, copper, wrought, copper x copper, 221113250700 40 20 mm \$ 122.80 \$ 1,506.80 \$ \$ 1,629.60 \$ 834,470.02 \$ 132,331.73 \$ \$ 966,801.75 Sampling 19,057.50 19,057.50 Welder O1 0.5 \$ \$ 35,557.20 Welder Q19 0.33 \$ 35.557.20 \$ Welder P 132,331.73 132,331.73 1 \$ \$ QA inspection \$ \$ subtotal labor 319,278.16 1,153,748.18 \$ \$ Labor factor 2.5x 478,917.24 478,917.24 1.5 \$ 9 834,470.02 subtotal materials \$ \$ 1.632.665.42 NC factor 0.324480494 \$ 270,769.24 ¢ 270.769.24 Total \$ 1,105,239.26 \$ 798,195.40 \$1,903,434.66 E_03_04 Relocation of the argon tank and line Data Release : Year 2020 Unit Cost Estimate Pipe, copper, tubing, solder, 25 mm diameter, type K, includes coupling & clevis hanger 19 221113231200 assembly 3 m OC \$ 899.27 \$ 754.87 \$ \$ 1,654.14 Pipe, copper, tubing, solder, 40 mm diameter, type K, includes coupling & clevis hanger 221113231240 assembly 3 m OC \$ 2,412.90 \$ 1,824.20 \$ 4,237.10 35 \$ Pipe, fittings & valves, steel, black, grooved joint, 150 mm diameter, schedule 40, includes 15 221113481130 coupling & clevis type hanger 3 m OC \$ 2,917.20 \$ 2,616.15 \$ \$ 5,533.35 Gasket and bolt set, for flanges, 1034 kPa, 50 221113470630 110.88 \$ 786.28 11 mm pipe size \$ 675.40 \$ \$ Valves, bronze body, ball, 1034 kPa, 50 mm, 4 220523201500 threaded or soldered 386.76 \$ 278.88 665.64 \$ \$ \$ Valves, bronze body, ball, 1034 kPa, 50 mm, 220523201500 threaded or soldered 1 \$ 96.69 \$ 69.72 \$ 166.41 \$ Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 4 221113484960 mm diameter \$ 113 20 \$ 31.80 \$ \$ 145 00 Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 40 4 221113484980 mm diameter \$ 158.48 \$ 47.48 \$ 205.96 Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint 221113488010 coupling material 1,584.68 \$ 105.28 \$ 1,689.96 4 \$ \$ Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint 221113488010 coupling material 396.17 \$ 26.32 \$ 422.49

Filed 2021-08-17

| Quantity | Line Number | Description | | | | Ext. Mat. O&P | Ext | t. Labour O&P | Ext | t. Equip. O&P | Ex | t. Total O&P |
|------------|-------------------|---|----------------------------|-----|----|---------------|----------|-----------------|-----|---------------|----------|-----------------|
| | | | | | | | | | 1 | | | |
| | | | | | | | | | | | | |
| 6 | | Rubber hose, 1" diam, 50 ft. long | | | \$ | 1,100.00 | \$ | 100.00 | | | \$ | 1,200.00 |
| | | Coupling, copper, wrought, copper x copper, | | | | | | | | | | |
| 1 | 221113250710 | 25 mm | | | \$ | 6.02 | \$ | 44.38 | \$ | - | \$ | 50.40 |
| | | | | | \$ | 10,182.25 | \$ | 6,574.48 | \$ | - | \$ | 16,756.73 |
| | | | Welder Q1 Welder O2 | 0.5 | | | \$ \$ | - 872.05 | | | \$ \$ | - 872.05 |
| | | | Welder P | 1 | | | \$ | 3,858.33 | | | \$ | 3,858.33 |
| | | | Labor factor 2.5x | 1.5 | | | \$ \$ | 16,957.29 | | | ⇒ \$ | 16,957.29 |
| | | | SS premium fixture | 2.5 | \$ | - 10.182.25 | \$ | 28,262,15 | | | \$ | - 38,444,40 |
| | | | | | Ÿ | 10/102.20 | Ÿ | 20/202110 | | | Ŧ | 56,11110 |
| E_03_05 R | elocation of the | oxygen tank and undergrd line | | | | | | | | | | |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pipe, copper, tubing, solder, 25 mm diameter, type K includes coupling & clevis hanger | | | | | | | | | | |
| 75 | 221113231200 | assembly 3 m OC | | | \$ | 3,549.75 | \$ | 2,979.75 | \$ | - | \$ | 6,529.50 |
| | | Valves, bronze, ball, 1034 kPa, 25 mm, | | | | | | | | | | |
| 2 | 220523201470 | threaded or soldered | | | \$ | 73.58 | \$ | 80.68 | \$ | - | \$ | 154.26 |
| _ | | Gasket and bolt set, for flanges, 1034 kPa, 50 | | | | 70.50 | • | 400.00 | | | • | 500.00 |
| / | 221113470630 | mm pipe size | | | \$ | 70.56 | \$ | 429.80 | \$ | - | \$ | 500.36 |
| | | Excavating, chain trencher, utility trench, common earth, 9 kW, 150 mm wide, 900 mm | | | | | | | | | | |
| 50 | 312316140450 | deep, operator walking | | | \$ | ; - | \$ | 249.00 | \$ | 74.00 | \$ | 323.00 |
| | | Excavating, chain trencher, utility trench. | | | | | | | | | | |
| 50 | 040040444450 | common earth, 150 mm wide, 900 mm deep, | | | | | • | 400.00 | | 00.50 | • | 550 50 |
| 50 | 312310141400 | | | | ¢ | | Э | 496.00 | Þ | 63.50 | ф | 559.50 |
| | | Excavating, chain trencher, utility trench, common earth, 9 kW, 150 mm wide, 900 mm | | | | | | | | | | |
| 5 | 312316140450 | deep, operator walking | | | \$ | - | \$ | 24.90 | \$ | 7.40 | \$ | 32.30 |
| | | Excavating, chain trencher, utility trench, | | | | | | | | | | |
| F | 212216141450 | common earth, 150 mm wide, 900 mm deep, | | | ¢ | | ¢ | 40.60 | ¢ | 6.25 | ¢ | 55 OF |
| 5 | 512510141450 | | | | φ | | φ | 49.00 | φ | 0.55 | φ | 55.95 |
| | | common earth, 9 kW, 150 mm wide, 900 mm | | | | | | | | | | |
| 5 | 312316140450 | deep, operator walking | | | \$ | - | \$ | 24.90 | \$ | 7.40 | \$ | 32.30 |
| | | Excavating, chain trencher, utility trench, | | | | | | | | | | |
| 5 | 312316141450 | common earth, 150 mm wide, 900 mm deep, backfill by hand, includes compaction, add | | | \$ | <u> </u> | \$ | 49.60 | \$ | 6.35 | \$ | 55.95 |
| Ū | 012010111100 | | | | Ţ | | Ŷ | 10100 | Ţ | 0.00 | Ŷ | 00.00 |
| | | Pipe, fittings & valves, flange, black steel, | | | | | | | | | | |
| | | painted, with grooved face for gasket, grooved joint, class 125 and 150, 50 mm pipe size, | | | | | | | | | | |
| | | add 1 coupling (material only) per joint for | | | | | | | | | | |
| 1 | 221113485780 | joint coupling material | | | \$ | 164.64 | \$ | 34.57 | \$ | - | \$ | 199.21 |
| | | | | | \$ | 3,858.53 | \$ | 4,418.80 | \$ | 165.00 | \$ | 8,442.33 |
| | | | Welder P subtotal labor | 1 | | | \$ \$ | 3,490.23 | | | \$ \$ | 3,490.23 |
| | | | Labor factor 2.5x | 1.5 | | | \$ | 11,863.55 | | | \$ | 11,863.55 |
| | | | Iotal | | \$ | 3,858.53 | \$ | 19,772.58 | \$ | 165.00 | \$ | 23,796.11 |
| E_03_06 T | ritium removal fa | cility helium supply system | | | | | | | | | | |
| Data Relea | ise : Year 2020 | Unit COSt Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes | | | | | | | | | | |
| 125 | 221113644310 | couplings and hangers 3 m OC | | | \$ | 13,248.75 | \$ | 6,256.25 | \$ | - | \$ | 19,505.00 |

| CONFIDENTIAL ATTORNEY WORK PRODUCT J3.4 Attachment 1 Page 230 of 350 | | | | | | | | | | | | |
|--|--------------|--|-------------------|-----|----|---------------|----|----------------|----|----------------|-------------|--------------|
| Quantity | Line Number | Description | | | | Ext. Mat. O&P | E | tt. Labour O&P | E | ct. Equip. O&P | Ex | t. Total O&P |
| 20 | 221113484030 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 20 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 1,872.80 | \$ | 318.80 | \$ | - | \$ | 2,191.60 |
| 14 | 221113470622 | Gasket and bolt set, for flanges, 1034 kPa, 20 mm pipe size | | | \$ | 65.38 | \$ | 585.20 | \$ | - | \$ | 650.58 |
| 90 | 312316140450 | Excavating, chain trencher, utility trench, common earth, 9 kW, 150 mm wide, 900 mm deep, operator walking | | | \$ | - | \$ | 448.20 | \$ | 133.20 | \$ | 581.40 |
| 90 | 312316141450 | Excavating, chain trencher, utility trench, common earth, 150 mm wide, 900 mm deep, backfill by hand, includes compaction, add | | | \$ | - | \$ | 892.80 | \$ | 114.30 | \$ | 1,007.10 |
| 3 | 221113484960 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter | | | \$ | 84.90 | \$ | 23.85 | \$ | - | \$ | 108.75 |
| 2 | 221113484912 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter | | | \$ | 98.78 | \$ | 31.88 | \$ | - | \$ | 130.66 |
| 1 | 221113484912 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter | | | \$ | 49.39 | \$ | 15.94 | \$ | _ | \$ | 65.33 |
| | | | | | \$ | 15 420 00 | \$ | 8 572 92 | \$ | 247 50 | \$ | 24 240 42 |
| | | | Labor factor 2.5x | 1.5 | | 10,120.00 | \$ | 12,859.38 | Ť | 241.00 | \$ | 12,859.38 |
| | | | Total | | \$ | 15,420.00 | \$ | 21,432.30 | \$ | 247.50 | \$ | 37,099.80 |
| | | | | | | | | | | | | |
| | | | Total | | \$ | 1,471,403.81 | \$ | 1,349,735.48 | \$ | 412.50 | \$ 2 | ,821,551.79 |

Filed 2021-08-17

Table D-5: BOQ Section F – Building Support Systems Tie-in

| | | | Overnight materials costs | Overnight Iabour costs | Overnight equipment costs | Total overnight costs |
|--|---------------------------------|-------|---------------------------------|------------------------------|---------------------------------|-----------------------------|
| Section F, Building Support Systems Tie-in | | | | | | |
| F_01 | Plumbing and Drainage | | \$12,926 | \$50,470 | \$0 | \$63,395 |
| | | | | | | |
| F_02 | Heating Steam and Conden System | sate | \$6,284 | \$54,509 | \$0 | \$60,793 |
| | | | | | | |
| F_03 | Fire Protection System | | \$15,905 | \$25,815 | \$0 | \$41,720 |
| | | | | | | |
| | | Total | \$35,115 | \$130,793 | \$0 | \$165,908 |

| Quantity | Line Number | Description | | | Ex | t. Mat. O&P | Ext | t. Labour O&P | Ext. Equip. O&P | Ex | t. Total O&P |
|--|---|--|---|------------|--|--|--|---|--|--|---|
| | | | | | | | | | | | |
| F_01_01 S | upply of domes | tic water to the West Annex | | | | | | | | | |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| | | Pipe, copper, tubing, solder, 50 mm diameter, | | | | | | | | | |
| | | assembly 3 m OC | | | | | | | | | |
| 75 | 221113232260 | , | | | \$ | 5,247.75 | \$ | 4,683.00 | \$- | \$ | 9,930.75 |
| | | Coupling, copper, wrought, copper x copper, | | | | | | | | | |
| 18 | 221113250718 | 50 mm | | | \$ | 311.22 | \$ | 1.105.20 | \$ - | \$ | 1.416.42 |
| | | Elbow, 90 Deg., copper, wrought, copper x | | | | | | | | | |
| 40 | 004440050400 | copper, 50 mm | | | • | 505.04 | | 4 455 04 | • | ~ | 4 000 00 |
| 16 | 221113250160 | Elbow 45 Deg. copper wrought copper x | | | \$ | 535.04 | \$ | 1,155.84 | \$ - | \$ | 1,690.88 |
| | | copper, 50 mm | | | | | | | | | |
| 4 | 221113250340 | | | | \$ | 137.88 | \$ | 288.96 | \$- | \$ | 426.84 |
| | | Tee, copper, wrought, copper x copper, 80 mm | | | | | | | | | |
| 1 | 221113250560 | | | | \$ | 179.05 | \$ | 204.34 | \$ - | \$ | 383.39 |
| | | Insulation, pipe covering (price copper tube | | | | | | | | | |
| | | one size less than I.P.S.), fiberglass with all | | | | | | | | | |
| | | service jacket, 25 mm wall, 100 mm iron pipe | | | | | | | | | |
| 75 | 220719106940 | 3126 | | | \$ | 732.75 | \$ | 2,129.25 | \$- | \$ | 2,862.00 |
| | | Coupling, copper, wrought, copper x copper, | | | | | | | | | |
| 1 | 221113250718 | 50 mm | | | \$ | 17 29 | \$ | 61 40 | \$ - | \$ | 78 69 |
| | 221110200110 | Coupling, copper, wrought, copper x copper, | | | Ť | 11.20 | Ť | 01110 | Ŷ | Ť | 10.00 |
| | | 50 mm | | | | | | | | | |
| 2 | 221113250718 | Valves bronze gate rising stem soldered | | | \$ | 34.58 | \$ | 122.80 | \$ - | \$ | 157.38 |
| | | 2069 kPa, 50 mm | | | | | | | | | |
| 1 | 220523203980 | | | | \$ | 714.68 | \$ | 69.72 | \$- | \$ | 784.40 |
| | | | | | | | | | | | |
| | | | Walder O1 | 0.5 | \$ | 7,910.24 | \$ | 9,820.51 | \$ - | \$ | 17,730.75 |
| | | | Welder Q1 Welder Q2 | 0.5 | | | ф \$ | 102.17 | | Ф \$ | 102.17 |
| | | | Welder P | 1 | | | \$ | 7,486.92 | | \$ | 7,486.92 |
| | | | QA inspection | 1 | | | \$ | - | | \$ | - |
| | | | | | | | + | | | | |
| | | | subtotal labor | | | | \$ | 17,409.60 | | \$ | 25,319.84 |
| | | | subtotal labor Labor factor 2.5 | 1.5 | | | \$ \$ | 17,409.60 26,114.40 | | \$ \$ | 25,319.84 26,114.40 |
| | | | subtotal labor Labor factor 2.5 SS premium fixt | 1.5 2.5 | \$ | - | \$ \$ 4 | 17,409.60 26,114.40 | | \$ \$ | 25,319.84 26,114.40 |
| | | | subtotal labor Labor factor 2.5 SS premium fixt Total | 1.5 2.5 | \$ \$ | - 7,910.24 | \$ \$ \$ | 17,409.60 26,114.40 43,524.00 | | \$ \$ \$ | 25,319.84 26,114.40 51,434.24 |
| | | | subtotal labor Labor factor 2.5: SS premium fixt Total | 1.5 2.5 | \$ \$ | - 7,910.24 | \$ \$ \$ | 17,409.60 26,114.40 43,524.00 | | \$ \$ \$ | 25,319.84 26,114.40 51,434.24 |
| F_01_02 jC | Construction wa | ter tie-in for HWMB West Annex | subtotal labor Labor factor 2.5: SS premium fixt Total | 1.5 2.5 | \$ \$ | - 7,910.24 | \$ \$ \$ | 17,409.60 26,114.40 43,524.00 | | \$ \$ \$ | 25,319.84 26,114.40 51,434.24 |
| F_01_02 jC Data Relea | Construction wa | ter tie-in for HWMB West Annex Unit Cost Estimate | subtotal labor Labor factor 2.5 SS premium fixt Total | 1.5 2.5 | \$ \$ | - 7,910.24 | \$ \$ \$ | 17,409.60 26,114.40 43,524.00 | | \$ \$ \$ | 25,319.84 26,114.40 51,434.24 |
| F_01_02 jC Data Relea | Construction wa se : Year 2020 | ter tie-in for HWMB West Annex Unit Cost Estimate | subtotal labor Labor factor 2.5. SS premium fixt Total | 1.5 2.5 | \$ | - 7,910.24 | \$ \$ \$ | 17,409.60 26,114.40 43,524.00 | | \$ \$ | 25,319.84 26,114.40 51,434.24 |
| F_01_02 jC Data Relea | Construction wa | ter tie-in for HWMB West Annex Unit Cost Estimate | subtotal labor Labor factor 2.5: SS premium fixt Total | 1.5 2.5 | \$ | - 7,910.24 | \$ \$ | 17,409.60 26,114.40 43,524.00 | | \$ \$ \$ | 25,319.84 26,114.40 51,434.24 |
| F_01_02 jC Data Relea | Construction wa | ter tie-in for HWMB West Annex Unit Cost Estimate Pipe, copper, tubing, solder, 50 mm diameter, ture L includes complian & alovia banger. | subtotal labor Labor factor 2.5 SS premium fixt Total | 1.5 2.5 | \$ | 7,910.24 | \$ \$ | 17,409.60 26,114.40 43,524.00 | | \$ \$ \$ | 25,319.84 26,114.40 51,434.24 |
| F_01_02 jC Data Relea | Construction was | ter tie-in for HWMB West Annex Unit Cost Estimate Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC. | subtotal labor Labor factor 2.5: SS premium fixt Total | 1.5 2.5 | \$ \$ | 7,910.24 | \$ \$ | 17,409.60 26,114.40 43,524.00 624.40 | s . | \$ \$ \$ | 25,319.84 26,114.40 51,434.24 |
| F_01_02 jC Data Relea | Construction was se : Year 2020 221113232260 | ter tie-in for HWMB West Annex Unit Cost Estimate Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC | subtotal labor Labor factor 2.5: SS premium fixt Total | 1.5 2.5 | \$ \$ | 7,910.24 699.70 | \$ \$ | 17,409.60 26,114.40 43,524.00 624.40 | ş - | \$ \$ \$ | 25,319.84 26,114.40 51,434.24 1,324.10 |
| F_01_02 jC Data Relea 10 | Construction wasse : Year 2020 221113232260 | ter tie-in for HWMB West Annex Unit Cost Estimate Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC Insulation, pipe covering (price copper tube | subtotal labor Labor factor 2.5: SS premium fixt Total | 1.5 2.5 | \$ \$ | 7,910.24 699.70 | \$ \$ \$ | 17,409.60 26,114.40 43,524.00 624.40 | ş - | \$ \$ \$ | 25,319.84 26,114.40 51,434.24 1,324.10 |
| F_01_02 jC Data Relea 10 | Construction wa se : Year 2020 221113232260 | ter tie-in for HWMB West Annex Unit Cost Estimate Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC Insulation, pipe covering (price copper tube one size less than LP.S.), fiberglass with all covering inclusion. | subtotal labor Labor factor 2.5 SS premium fixt Total | 1.5 2.5 | \$ \$ | 7,910.24 699.70 | \$ \$ \$ | 17,409.60 26,114.40 43,524.00 624.40 | ş - | \$ \$ \$ | 25,319.84 26,114.40 51,434.24 1,324.10 |
| F_01_02 jC Data Relea 10 | Construction wa se : Year 2020 221113232260 220719107320 | ter tie-in for HWMB West Annex Unit Cost Estimate Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 50 mm wall, 15 mm iron pipe size | subtotal labor Labor factor 2.5 SS premium fixt Total | 1.5 2.5 | \$ \$ | 7,910.24 699.70 24.28 | \$ \$ \$ | 17,409.60 26,114.40 43,524.00 624.40 38.54 | \$ - \$ - | \$ \$ \$ \$ | 25,319.84 26,114.40 51,434.24 1,324.10 62.82 |
| F_01_02 JC Data Relea 10 | Construction wa se : Year 2020 221113232260 220719107320 | ter tie-in for HWMB West Annex Unit Cost Estimate Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 50 mm wall, 15 mm iron pipe size | subtotal labor Labor factor 2.5 SS premium fixt Total | 1.5 2.5 | \$ \$ \$ | 7,910.24 699.70 24.28 | \$ \$ \$ \$ \$ | 17,409.60 26,114.40 43,524.00 624.40 38.54 | \$ - \$ - | \$ \$ \$ \$ | 25,319.84 26,114.40 51,434.24 1,324.10 62.82 |
| F_01_02 jC Data Relea 10 2 | Construction wa se : Year 2020 221113232260 220719107320 | ter tie-in for HWMB West Annex Unit Cost Estimate Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 50 mm wall, 15 mm iron pipe size Insulation, pipe covering (price copper tube | subtotal labor Labor factor 2.5 SS premium fixt Total | 1.5 2.5 | \$ \$ \$ | 7,910.24 699.70 24.28 | \$ \$ \$ \$ \$ | 17,409.60 26,114.40 43,524.00 624.40 38.54 | \$ - \$ - | \$ \$ \$ \$ | 25,319.84 26,114.40 51,434.24 1,324.10 62.82 |
| F_01_02 jC Data Relea 10 | Construction wa se : Year 2020 221113232260 220719107320 | ter tie-in for HWMB West Annex Unit Cost Estimate Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 50 mm wall, 15 mm iron pipe size Insulation, pipe covering (price copper tube one size less than I.P.S.), rubber tubing flexible disead early from 4.5 mm wall, 0.0 mm iron pipe | subtotal labor Labor factor 2.5 SS premium fixt Total | 1.5 | \$ \$ \$ | 7,910.24 699.70 24.28 | \$ \$ \$ \$ | 17,409.60 26,114.40 43,524.00 624.40 38.54 | \$ - \$ - | \$ \$ \$ \$ | 25,319.84 26,114.40 51,434.24 1,324.10 62.82 |
| F_01_02 jC Data Relea | Construction wase : Year 2020 221113232260 220719107320 220719108180 | ter tie-in for HWMB West Annex Unit Cost Estimate Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 50 mm wall, 15 mm iron pipe size Insulation, pipe covering (price copper tube one size less than I.P.S.), rubber tubing flexible closed cell foam, 15 mm wall, 50 mm iron pipe size | subtotal labor Labor factor 2.5 SS premium fixt Total | 1.5 | \$ \$ \$ \$ | 7,910.24 699.70 24.28 | \$ \$ \$ \$ \$ | 17,409.60 26,114.40 43,524.00 624.40 38.54 219.12 | \$ - \$ - | \$ \$ \$ \$ \$ \$ | 25,319.84 26,114.40 51,434.24 1,324.10 62.82 291.44 |
| F_01_02 jC Data Relea 10 2 | Construction wase : Year 2020 221113232260 220719107320 220719108180 | ter tie-in for HWMB West Annex Unit Cost Estimate Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 50 mm wall, 15 mm iron pipe size Insulation, pipe covering (price copper tube one size less than I.P.S.), rubber tubing flexible closed cell foam, 15 mm wall, 50 mm iron pipe size | subtotal labor Labor factor 2.5 SS premium fixt Total | 1.5 | \$ \$ \$ \$ \$ | 7,910.24 699.70 24.28 72.32 | \$ \$ \$ \$ \$ \$ | 17,409.60 26,114.40 43,524.00 624.40 38.54 219.12 | \$ - \$ - | \$ \$ \$ \$ \$ | 25,319.84 26,114.40 51,434.24 1,324.10 62.82 291.44 |
| F_01_02 jC Data Relea 10 2 8 | Construction wa se : Year 2020 221113232260 220719107320 220719108180 | ter tie-in for HWMB West Annex Unit Cost Estimate Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 50 mm wall, 15 mm iron pipe size Insulation, pipe covering (price copper tube one size less than I.P.S.), rubber tubing flexible closed cell foam, 15 mm wall, 50 mm iron pipe size | subtotal labor Labor factor 2.5 SS premium fixt Total | 1.5 2.5 | \$ \$ \$ \$ \$ | 7,910.24 699.70 24.28 72.32 | \$ \$ \$ \$ \$ \$ \$ | 17,409.60 26,114.40 43,524.00 624.40 38.54 219.12 | \$ - \$ - | \$ \$ \$ \$ \$ \$ | 25,319.84 26,114.40 51,434.24 1,324.10 62.82 291.44 |
| F_01_02 jC Data Relea 10 2 8 | Construction wa se : Year 2020 221113232260 220719107320 220719108180 221113250718 | ter tie-in for HWMB West Annex Unit Cost Estimate Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 50 mm wall, 15 mm iron pipe size Insulation, pipe covering (price copper tube one size less than I.P.S.), rubber tubing flexible closed cell foam, 15 mm wall, 50 mm iron pipe size Coupling, copper, wrought, copper x copper, 50 mm | subtotal labor Labor factor 2.5 SS premium fixt Total | 1.5 | \$ \$ \$ \$ \$ \$ | 7,910.24 699.70 24.28 72.32 17.29 | \$ \$ \$ \$ \$ \$ \$ \$ | 17,409.60 26,114.40 43,524.00 624.40 38.54 219.12 61.40 | \$ - \$ - | \$ \$ \$ \$ \$ \$ \$ | 25,319.84 26,114.40 51,434.24 1,324.10 62.82 291.44 78,69 |
| F_01_02 JC Data Relea | Construction wa se : Year 2020 221113232260 220719107320 220719108180 221113250718 | ter tie-in for HWMB West Annex Unit Cost Estimate Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 50 mm wall, 15 mm iron pipe size Insulation, pipe covering (price copper tube one size less than I.P.S.), rubber tubing flexible closed cell foam, 15 mm wall, 50 mm iron pipe size Coupling, copper, wrought, copper x copper, 50 mm | subtotal labor Labor factor 2.5 SS premium fixt Total | 1.5 | \$ \$ \$ \$ \$ \$ \$ | 7,910.24 699.70 24.28 72.32 17.29 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 17,409.60 26,114.40 43,524.00 624.40 38.54 219.12 61.40 | \$ - \$ - | \$ \$ \$ \$ \$ \$ \$ | 25,319.84 26,114.40 51,434.24 1,324.10 62.82 291.44 78.69 |
| F_01_02 JC Data Relea | Construction wa se : Year 2020 221113232260 220719107320 220719108180 221113250718 | ter tie-in for HWMB West Annex Unit Cost Estimate Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 50 mm wall, 15 mm iron pipe size Insulation, pipe covering (price copper tube one size less than I.P.S.), rubber tubing flexible closed cell foam, 15 mm wall, 50 mm iron pipe size Coupling, copper, wrought, copper x copper, 50 mm | subtotal labor Labor factor 2.5 SS premium fixt Total | 1.5 | \$ \$ \$ \$ \$ \$ | 7,910.24 699.70 24.28 72.32 17.29 | \$ \$ \$ \$ \$ \$ \$ \$ \$ | 17,409.60 26,114.40 43,524.00 624.40 38.54 219.12 61.40 | \$ - \$ - | \$ \$ \$ \$ \$ \$ | 25,319.84 26,114.40 51,434.24 1,324.10 62.82 291.44 78.69 |
| F_01_02 JC Data Relea | Construction wa se : Year 2020 221113232260 220719107320 220719108180 221113250718 221113250718 | ter tie-in for HWMB West Annex Unit Cost Estimate Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 50 mm wall, 15 mm iron pipe size Insulation, pipe covering (price copper tube one size less than I.P.S.), rubber tubing flexible closed cell foam, 15 mm wall, 50 mm iron pipe size Coupling, copper, wrought, copper x copper, 50 mm | subtotal labor Labor factor 2.5 SS premium fixt Total | 1.5 | \$ \$ \$ \$ \$ \$ \$ | 7,910.24 699.70 24.28 72.32 17.29 17.29 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 17,409.60 26,114.40 43,524.00 624.40 38.54 219.12 61.40 61.40 | \$ - \$ - \$ - | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 25,319.84 26,114.40 51,434.24 1,324.10 62.82 291.44 78.69 78.69 |
| F_01_02 JC Data Relea | Construction wa se : Year 2020 221113232260 220719107320 220719108180 221113250718 221113250718 | ter tie-in for HWMB West Annex Unit Cost Estimate Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 50 mm wall, 15 mm iron pipe size Insulation, pipe covering (price copper tube one size less than I.P.S.), rubber tubing flexible closed cell foam, 15 mm wall, 50 mm iron pipe size Coupling, copper, wrought, copper x copper, 50 mm | subtotal labor Labor factor 2.5 SS premium fixt Total | | \$ \$ \$ \$ \$ \$ \$ \$ | 7,910.24 699.70 24.28 72.32 17.29 17.29 | \$ \$ \$ \$ \$ \$ \$ \$ | 17,409.60 26,114.40 43,524.00 624.40 38.54 219.12 61.40 61.40 | \$ - \$ - \$ - | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 25,319.84 26,114.40 51,434.24 1,324.10 62.82 291.44 78.69 78.69 |
| F_01_02 jC Data Relea | Construction wa se : Year 2020 221113232260 220719107320 220719108180 221113250718 221113250718 | ter tie-in for HWMB West Annex Unit Cost Estimate Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 50 mm wall, 15 mm iron pipe size Insulation, pipe covering (price copper tube one size less than I.P.S.), rubber tubing flexible closed cell foam, 15 mm wall, 50 mm iron pipe size Coupling, copper, wrought, copper x copper, 50 mm Coupling, copper, wrought, copper x copper, 50 mm | subtotal labor Labor factor 2.5 SS premium fixt Total | | \$ \$ \$ \$ \$ \$ \$ | 7,910.24 699.70 24.28 72.32 17.29 17.29 | \$ \$ \$ \$ \$ \$ \$ \$ | 17,409.60 26,114.40 43,524.00 624.40 38.54 219.12 61.40 61.40 | \$ - \$ - \$ - \$ - | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 25,319.84 26,114.40 51,434.24 1,324.10 62.82 291.44 78.69 78.69 |
| F_01_02 jC Data Relea | Construction wa se : Year 2020 221113232260 220719107320 220719108180 221113250718 221113250718 221113250718 | ter tie-in for HWMB West Annex Unit Cost Estimate Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC Insulation, pipe covering (price copper tube one size less than LP.S.), fiberglass with all service jacket, 50 mm wall, 15 mm iron pipe size Insulation, pipe covering (price copper tube one size less than LP.S.), rubber tubing flexible closed cell foam, 15 mm wall, 50 mm iron pipe size Coupling, copper, wrought, copper x copper, 50 mm Coupling, copper, wrought, copper x copper, 50 mm | subtotal labor Labor factor 2.5 SS premium fixt Total | | \$ \$ \$ \$ \$ \$ \$ \$ \$ | 7,910.24 699.70 24.28 72.32 17.29 17.29 17.29 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 17,409.60 26,114.40 43,524.00 624.40 38.54 219.12 61.40 61.40 61.40 | \$ - \$ - \$ - \$ - \$ - \$ - | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 25,319.84 26,114.40 51,434.24 1,324.10 62.82 291.44 78.69 78.69 78.69 |
| F_01_02 jC Data Relea | Construction wa se : Year 2020 221113232260 220719107320 220719108180 221113250718 221113250718 221113250718 | ter tie-in for HWMB West Annex Unit Cost Estimate Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 50 mm wall, 15 mm iron pipe size Insulation, pipe covering (price copper tube one size less than I.P.S.), rubber tubing flexible closed cell foam, 15 mm wall, 50 mm iron pipe size Coupling, copper, wrought, copper x copper, 50 mm Coupling, copper, wrought, copper x copper, 50 mm | subtotal labor Labor factor 2.5 SS premium fixt Total | | \$ \$ \$ \$ \$ \$ \$ \$ \$ | 7,910.24 699.70 24.28 72.32 17.29 17.29 17.29 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 17,409.60 26,114.40 43,524.00 624.40 38.54 219.12 61.40 61.40 61.40 | \$ - \$ - \$ - \$ - \$ - \$ - | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 25,319.84 26,114.40 51,434.24 1,324.10 62.82 291.44 78.69 78.69 78.69 |
| F_01_02 jC Data Relea | Construction wa se : Year 2020 221113232260 220719107320 220719108180 221113250718 221113250718 221113250718 | ter tie-in for HWMB West Annex Unit Cost Estimate Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 50 mm wall, 15 mm iron pipe size Insulation, pipe covering (price copper tube one size less than I.P.S.), rubber tubing flexible closed cell foam, 15 mm wall, 50 mm iron pipe size Coupling, copper, wrought, copper x copper, 50 mm Coupling, copper, wrought, copper x copper, 50 mm Coupling, copper, wrought, copper x copper, 50 mm | subtotal labor Labor factor 2.5 SS premium fixt Total | 1.5 | \$ \$ \$ \$ \$ \$ \$ \$ | 7,910.24 699.70 24.28 72.32 17.29 17.29 17.29 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 17,409.60 26,114.40 43,524.00 624.40 38.54 219.12 61.40 61.40 61.40 | \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ - | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 25,319.84 26,114.40 51,434.24 1,324.10 62.82 291.44 78.69 78.69 78.69 |
| F_01_02 JC Data Relea | Construction wase : Year 2020 221113232260 220719107320 220719108180 221113250718 221113250718 221113250718 221113250718 221113250718 221113250718 221113250718 | ter tie-in for HWMB West Annex Unit Cost Estimate Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC Insulation, pipe covering (price copper tube one size less than 1.P.S.), fiberglass with all service jacket, 50 mm wall, 15 mm iron pipe size Insulation, pipe covering (price copper tube one size less than 1.P.S.), rubber tubing flexible closed cell foam, 15 mm wall, 50 mm iron pipe size Coupling, copper, wrought, copper x copper, 50 mm Coupling, copper, wrought, copper x copper, 50 mm Coupling, copper, wrought, copper x copper, 50 mm | subtotal labor Labor factor 2.5 SS premium fixt Total | 1.5 | \$ \$ \$ \$ \$ \$ \$ \$ | 7,910.24 699.70 24.28 72.32 17.29 17.29 17.29 33.44 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 17,409.60 26,114.40 43,524.00 624.40 38.54 219.12 61.40 61.40 61.40 72.24 | \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ - | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 25,319.84 26,114.40 51,434.24 1,324.10 62.82 291.44 78.69 78.69 78.69 105.68 |
| F_01_02 JC Data Relea | Construction wa se : Year 2020 221113232260 220719107320 220719108180 221113250718 221113250718 221113250718 221113250718 | ter tie-in for HWMB West Annex Unit Cost Estimate Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 50 mm wall, 15 mm iron pipe size Insulation, pipe covering (price copper tube one size less than I.P.S.), rubber tubing flexible closed cell foam, 15 mm wall, 50 mm iron pipe size Coupling, copper, wrought, copper x copper, 50 mm Coupling, copper, wrought, copper x copper, 50 mm Coupling, copper, wrought, copper x copper, 50 mm | subtotal labor Labor factor 2.5 SS premium fixt Total | | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 7,910.24 699.70 24.28 72.32 17.29 17.29 17.29 33.44 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 17,409.60 26,114.40 43,524.00 624.40 38.54 219.12 61.40 61.40 61.40 72.24 | \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ - | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 25,319.84 26,114.40 51,434.24 1,324.10 62.82 291.44 78.69 78.69 78.69 105.68 |
| F_01_02 JC Data Relea | Construction wa se : Year 2020 221113232260 220719107320 220719108180 221113250718 221113250718 221113250718 221113250718 | ter tie-in for HWMB West Annex Unit Cost Estimate Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 50 mm wall, 15 mm iron pipe size Insulation, pipe covering (price copper tube one size less than I.P.S.), rubber tubing flexible closed cell foam, 15 mm wall, 50 mm iron pipe size Coupling, copper, wrought, copper x copper, 50 mm Coupling, copper, wrought, copper x copper, 50 mm Elbow, 90 Deg., copper, wrought, copper x copper, 50 mm | subtotal labor Labor factor 2.5 SS premium fixt Total | | \$ \$ \$ \$ \$ \$ \$ \$ \$ | 7,910.24 699.70 24.28 72.32 17.29 17.29 17.29 33.44 | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 17,409.60 26,114.40 43,524.00 624.40 38.54 219.12 61.40 61.40 61.40 72.24 | \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ - | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | 25,319.84 26,114.40 51,434.24 1,324.10 62.82 291.44 78.69 78.69 78.69 105.68 |

| Quantity | Line Number | Description | | | E | xt. Mat. O&P | Ext | . Labour O&P | Ext. Equip. O&P | Ex | tt. Total O&P |
|----------|--------------|--|------------------|-------|----|--------------|-----|--------------|-----------------|----|---------------|
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 396.17 | \$ | 26.32 | \$- | \$ | 422.49 |
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 396.17 | \$ | 26.32 | \$- | \$ | 422.49 |
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 396.17 | \$ | 26.32 | \$- | \$ | 422.49 |
| 1 | 221119421160 | Backflow preventer, double check principle, corrosion resistant, automatic operation, gate valves, threaded, 50 mm pipe size, includes valves and four test cocks | | | \$ | 2,058.00 | \$ | 113.52 | \$- | \$ | 2,171.52 |
| 5 | 221113744500 | Pipe, plastic, PVC, 200 mm diameter, DWV, schedule 40, includes couplings 3 m OC, and hangers 3 per 3 m | | | \$ | 473.35 | \$ | 763.70 | \$- | \$ | 1,237.05 |
| 1 | 221113250718 | Coupling, copper, wrought, copper x copper, 50 mm | | | \$ | 17.29 | \$ | 61.40 | \$- | \$ | 78.69 |
| 1 | 221113484990 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter | | | \$ | 42.70 | \$ | 15.94 | \$ - | \$ | 58.64 |
| 10 | | Heat tracing | | | \$ | 275.00 | \$ | 100.00 | | \$ | 375.00 |
| | | Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 25 mm wall, 50 mm iron pipe | | | · | | | | | | |
| 2 | 220719106900 | size | | | \$ | 13.56 | \$ | 42.82 | \$ - | \$ | 56.38 |
| | | | | | \$ | 5,015.36 | \$ | 2,428.36 | \$ - | \$ | 7,443.72 |
| | | | Welder P | 1 | | | \$ | 174.92 | | \$ | 174.92 |
| | | | QA inspection | 1 | | | \$ | 174.92 | | \$ | 174.92 |
| | | | subtotal labor | | | | \$ | 2,778.20 | | \$ | 7,793.56 |
| | | | Labor factor 2.5 | 1.5 | | | \$ | 4,167.30 | | \$ | 4,167.30 |
| | | | lotal | | \$ | 5,015.36 | \$ | 6,945.50 | | \$ | 11,960.86 |
| | | | | | | | | | | | |
| | | | | Total | \$ | 12,925.60 | \$ | 50,469.50 | \$ - | \$ | 63,395.10 |

| Quantity | Line Number | Description | | | Ext. Mat. O&P | | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
|--------------|----------------|--|-------------------|-----|---------------|----------|------------------------|-----------------|-------------------------|
| | | | | | | | | | |
| F_02_01 D2O | Mngt Bldg head | der to PRV 30 | | | | | | | |
| Data Release | : Year 2020 | Unit Cost Estimate | | | | | | | |
| | | | | | | | | | |
| | | Pipe, fittings & valves, steel, black, grooved joint, 25 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC | | | | | | | |
| 4 | 221113481050 | | | | \$ | 94.68 | \$ 165.12 | \$- | \$ 259.80 |
| | | Pipe, fittings & valves, steel, black, grooved joint, 150 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC | | | | | | | |
| 4 | 221113481130 | Pipe fittings & valves tee steel painted | | | \$ | 777.92 | \$ 697.64 | \$ - | \$ 1,475.56 |
| | | grooved joint, 150 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | | | | | |
| 1 | 221113484820 | | | | \$ | 432.18 | \$ 131.06 | \$- | \$ 563.24 |
| | | Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 50 mm wall, 300 mm iron pipe size | | | | | | | |
| 4 | 220719107490 | | | | \$ | 159.76 | \$ 260.96 | \$- | \$ 420.72 |
| 4 | 000740407000 | Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 50 mm wall, 15 mm iron pipe | | | • | 10.11 | ¢ 40.07 | <u>_</u> | 0 04 44 |
| 1 | 220719107320 | size Insulation, pipe covering (price copper tube | | | \$ | 12.14 | \$ 19.27 | \$- | \$ 31.41 |
| | | one size less than I.P.S.), fiberglass with all service jacket, 50 mm wall, 300 mm iron pipe size | | | | | | | |
| 4 | 220719107490 | Ding fillings & uplugs allow 45 Day as 00 | | | \$ | 159.76 | \$ 260.96 | \$- | \$ 420.72 |
| | | Deg., steel, painted, grooved joint, 150 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | | | | | |
| 1 | 221113484120 | | | | \$ | 267.54 | \$ 89.27 | \$ - | \$ 356.81 |
| | | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter | | | | | | | |
| 1 | 221113484960 | | | | \$ | 28.30 | \$ 7.95 | \$- | \$ 36.25 |
| | | Pipe, fittings & valves, tee, steel, painted, grooved joint, 200 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | | | | | |
| 1 | 221113484830 | | | | \$ | 946.68 | \$ 158.93 | \$- | \$ 1,105.61 |
| | | standard trim, grooved joint, 150 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | | | | | |
| 1 | 221113488070 | | | | \$ | 1,260.53 | \$ 97.01 | \$- | \$ 1,357.54 |
| | | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | | | | | |
| 1 | 221113488010 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 150 mm | | | \$ | 396.17 | \$ 26.32 | \$ - | \$ 422.49 |
| | | | | | | | | | |
| 1 | 221113484922 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 150 mm diameter | | | \$ | 153.32 | \$ 44.38 | \$- | \$ 197.70 |
| 1 | 221113484922 | | | | \$ | 153.32 | \$ 44.38 | \$- | \$ 197.70 |
| | | | | | | 100.02 | | | |
| | | | Labor factor 2.5x | 1.5 | \$ | 4,842.30 | > 2,003.25 \$ 3,004.88 | ъ - | 6,845.55 \$ 3,004.88 |
| | | | Total | | \$ | 4,842.30 | \$ 5,008.13 | | \$ 9,850.43 |

| Quantity | Line Number | Description | | | E | xt. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | E | xt. Total O&P |
|---------------|----------------|--|-------------------|-----|----|--------------|------------------|-----------------|----------|---------------|
| F 02 02 L505 | -W3B | | | | | | | | | |
| Data Release | Year 2020 | Unit Cost Estimate | | | | | | | | |
| 2 | 221113481080 | Pipe, fittings & valves, steel, black, grooved joint, 50 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC | | | \$ | 72.04 | \$ 131.06 | \$- | \$ | 203.10 |
| 2 | 220719106900 | Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 25 mm wall, 50 mm iron pipe size | | | \$ | 13.56 | \$ 42.82 | \$- | \$ | 56.38 |
| 2 | 220719106920 | Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 25 mm wall, 80 mm iron pipe size | | | \$ | 14.72 | \$ 46.82 | \$ - | \$ | 61.54 |
| 1 | 221113484790 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 105.99 | \$ 65.02 | \$- | \$ | 171.01 |
| 1 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 396.17 | \$ 34.57 | \$- | \$ | 430.74 |
| | | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 | | | • | 10 70 | • | | | 50.04 |
| 1 | 221113484990 | mm diameter | | | \$ | 42.70 | \$ 15.94 | \$ - | \$ | 58.64 |
| 2 | 221113484990 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter | | | \$ | 85.40 | \$ 31.88 | \$- | \$ | 117.28 |
| | | | | | | | | | | |
| | | | | | \$ | 730.58 | \$ 368.11 | \$- | \$ | 1,098.69 |
| | | | Labor factor 2.5x | 1.5 | * | 720 50 | \$ 552.17 | - | \$ | 552.17 |
| E 02 03 D2O | Mnat Blda disc | harge to htg steam cond nining | TULAI | | P | 730.58 | \$ 920.20 | | ₽ | 1,050.00 |
| Data Boloaso | Voor 2020 | Unit Cost Estimate | | | | | | | | |
| Duta Relocido | 1001 2020 | Pipe, steel, black, threaded, 50 mm diameter, schedule 40, A-106, grade A/B | | | | | | | | |
| 2 | 221113440819 | hanger assembly sized for covering, 3 m OC | | | \$ | 116.28 | \$ 146.54 | \$- | \$ | 262.82 |
| 2 | 220719106940 | Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 25 mm wall, 100 mm iron pipe size | | | \$ | 19.54 | \$ 56.78 | \$- | \$ | 76.32 |
| | | Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 50 mm wall, 150 mm iron pipe | | | | | | | | |
| 2 | 220719107440 | size | | | \$ | 52.56 | \$ 84.66 | \$ - | \$ | 137.22 |
| 1 | 221113484760 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 77.18 | \$ 36.12 | \$- | \$ | 113.30 |
| 1 | 221113484912 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter | | | \$ | 49.39 | \$ 15.94 | s - | \$ | 65.33 |
| 1 | 221113488020 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 396.17 | \$ 34.57 | \$- | \$ | 430.74 |
| | | | | | ¢ | 744 40 | ¢ 274.04 | ¢ | ¢ | 1 005 70 |
| | | | Sampling | | φ | 711.12 | \$ 19.057.50 | φ - | \$ \$ | 19,057.50 |
| | | | Labor factor 2.5x | 1.5 | | | \$ 29,148.17 | | \$ | 29,148.17 |
| | | | Total | | \$ | 711.12 | \$ 48,580.28 | | \$ | 49,291.40 |
| | | | | | | | | | | |
| | | | Total | | \$ | 6,284.00 | \$ 54,508.68 | \$ - | \$ | 60,792.68 |

| Quantity | Line Number | Description | | | | Ext. Mat. O&P | | Ext. Labour O&P | | Ext. Equip. O&P | Ext. Total O&P | |
|------------|-----------------|--|-------------------|-------|-----|---------------|-------------------|-----------------|-----------------|-----------------|----------------|-----------|
| F_03_01 D | 20 Mngt Bldg V | Vest Annex fire protection tie in | | | | | | | | | | |
| Data Relea | ise : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | Pipe, fittings & valves, steel, black, grooved joint, 150 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC | | | | | | | | | | |
| 42 | 221113481130 | | | | | \$ | 8 168 16 | \$ | 7 325 22 | s - | \$ | 15 493 38 |
| | 221110401100 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 150 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | | Ŷ | 0,100.10 | Ŷ | 7,020.22 | ÷ - | Ŷ | 0.011.00 |
| 9 | 221113484120 | Pipe fittings & valves elbow 45 Deg or 90 Deg | | | | \$ | 2,407.86 | \$ | 803.43 | ş - | \$ | 3,211.29 |
| | | steel, painted, grooved joint, 150 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | | | | | | | | |
| 3 | 221113484120 | | | | | \$ | 802.62 | \$ | 267.81 | \$- | \$ | 1,070.43 |
| | | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 150 mm diameter | | | | | 450.00 | | | | • | 107 70 |
| 1 | 221113484922 | Dina fittings & values too steel pointed grooved | | | | \$ | 153.32 | \$ | 44.38 | \$ - | \$ | 197.70 |
| | | Pipe, illungs a varves, tee, steel, partied, grooved joint, 200 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | | | | | | | | |
| 1 | 221113484830 | | | | | \$ | 946.68 | \$ | 158.93 | \$- | \$ | 1,105.61 |
| | | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 150 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | | | | | | | | |
| 2 | 221113485840 | | | | | \$ | 740.88 | \$ | 194.02 | \$- | \$ | 934.90 |
| | | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 150 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | | | | | | | | |
| 1 | 221113488070 | Pine fittings & valves counting steel painted rigid | | | | \$ | 1,260.53 | \$ | 97.01 | \$ - | \$ | 1,357.54 |
| 1 | 221113484922 | style, grooved joint, 150 mm diameter | | | | \$ | 153.32 | \$ | 44.38 | \$- | s | 197.70 |
| | | | | | | \$ | 14,633,37 | \$ | 8,935,18 | s - | \$ | 23,568,55 |
| | | | Buttweld Q2&QA | \$ 0. | 67 | Ť | ., | \$ | 714.16 | • | \$ | 714.16 |
| | | | subtotal labor | | | | | \$ | 9,649.34 | | \$ | 24,282.71 |
| | | | Labor factor 2.5x | | 1.5 | * | 14 622 27 | \$ | 14,474.01 | | \$ | 14,474.01 |
| F 03 02 T | emporary foam | fire suppression connection | TULAI | | | P | 14,055.57 | P | 24,123.35 | | P | 30,730.72 |
| Data Relea | ise : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| Data Holoa | | | | | | | | | | | | |
| 1 | 221113481090 | Pipe, fittings & valves, steel, black, grooved joint, 65 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC | | | | \$ | 61.23 | \$ | 82.56 | \$- | \$ | 143.79 |
| | | Pine fittings & valves counting steel painted rigid | | | | | | | | | | |
| 1 | 221113484912 | style, grooved joint, 50 mm diameter | | | | \$ | 49.39 | \$ | 15.94 | \$ - | \$ | 65.33 |
| | | Pipe, fittings & valves, coupling, steel, painted, rigid | | | | | | | | | | |
| 1 | 221113484912 | style, grooved joint, 50 mm diameter | | | | \$ | 49.39 | \$ | 15.94 | \$- | \$ | 65.33 |
| | | | | | | | | | | | | |
| 1 | 221113484914 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 65 mm diameter | | | | \$ | 56.08 | \$ | 17.91 | \$- | \$ | 73.99 |
| | | Pine fittings & valves steel galvanized grooved | | | | | | | | | | |
| 2 | 221113481950 | joint, 250 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC | | | | \$ | 843.78 | \$ | 472.66 | \$- | \$ | 1,316.44 |
| | | Pipe, fittings & valves, coupling, steel, painted, rigid | | | | | | | | | | |
| 2 | 221113484914 | style, grooved joint, 65 mm diameter | | | | \$ | 112.16 | \$ | 35.82 | \$ - | \$ | 147.98 |
| 0 | 221112405000 | Pipe, fittings & valves, coupling, steel, painted, | | | | ¢ | 00.90 | ¢ | 25.00 | ¢ | \$ | 125.64 |
| 2 | 221113485000 | stanuard, liexible, grooved joint, oo mm diameter | | | | ф \$ | 99.82 1.271.85 | э \$ | 35.82 676.65 | \$ - | ф \$ | 1.948.50 |
| | | | Labor factor 2.5x | | 1.5 | • | ., | \$ | 1,014.98 | | \$ | 1,014.98 |

| Quantity | LineNumber | Description | | Ext. M | Mat. O&P | Ext | t. Labour O&P | Ext. | Equip O&P | Ext. | Total O&P |
|----------|------------|-------------|-------|--------|-----------|-----|---------------|------|-----------|------|-----------|
| | | | Total | \$ | 1,271.85 | \$ | 1,691.63 | | | \$ | 2,963.48 |
| | | | Total | \$ | 15,905.22 | \$ | 25,814.98 | \$ | - | \$ | 41,720.20 |

Table D-6: BOQ Section G – Building Support Systems⁶³

| | | | Overnight materials costs | Overnight labour costs | Overnight equipment costs | Total overnight costs |
|--------|--|-----------|------------------------------|---------------------------|---------------------------------|-----------------------------|
| Sectio | n G, Building Support Systems | | | | | |
| G_01 | Plumbing fixtures | | \$234,613 | \$198,191 | \$0 | \$432,804 |
| | | | | | | |
| G_02 | Heating Steam and Condensate S | System | \$538,700 | \$204,427 | \$0 | \$743,127 |
| | | | | | | |
| G-03 | Ventilation System | | \$2,149,976 | \$6,277,659 | \$0 | \$8,427,635 |
| | | | | | | |
| G_04 | D20 Leak Detection System | | \$9,046 | \$6,050 | \$0 | \$15,096 |
| | | | | | | |
| G_05 | Fixed Gaseous Effluent Radioacti Monitoring | iity | Carried under Sect | ion H, Electrical | | |
| | | | | | | |
| G_06 | Fixed Area Alarming Gamma and Monitors | l Tritium | Carried under Sect | ion H, Electrical | | |
| | | | | | | |
| G_07 | Fire Protection System | | \$334,234 | \$443,103 | \$0 | \$777,336 |
| | | | | | | |
| G_08 | Miscellaneous | | No quantiities in the BOQ | | | |
| | | | | | | |
| G_09 | Building Controls | | \$190,819 | \$142,896 | \$0 | \$333,715 |
| | | | | | | |
| | | Total | \$3,457,387 | \$7,272,326 | \$0 | \$10,729,713 |

 $^{^{\}rm 63}$ Section G_05 and G_06 are consistent with OPG BOQ Section G.

Filed 2021-08-17 EB-2020-0290 J3.4

| | | | | | | | | Atta | chment 1 |
|------------|--|---|-------------------|-----|----|---|--|---------------|-----------------------------|
| Quantity | Line Number | Description | | | E | ct. Mat. O&P | Ext. Labour O&P | Ext. Equip. 2 | 39xof 350 0&P |
| | | | | | | | | - Coal | |
| G_01_01 P | iumbing fixture | s | | | | | | | |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | |
| | | | | | | | | | |
| | | Industrial safety fixture, eve and face wash | | | | | | | |
| | | combination fountain, stainless steel, | | | | | | | |
| | | pedestal mounted, excludes rough-in | | | | | | | |
| 3 | 224526104200 | Dough in | | | \$ | 3,858.75 | \$ 1,068.12 | \$- | \$ 4,926.87 |
| 4 | | Rough-In Industrial safety fixture, shower, single | | | ф | 68,713.60 | \$ 4,040.40 | | \$ 73,360.00 |
| | | head, drench, ball valve, pull, freestanding, | | | | | | | |
| | | multi-nozzle, shower only, 12 spray, | | | | | | | |
| 1 | 224513106400 | excludes rough-in | | | \$ | 2,392.43 | \$ 356.04 | \$- | \$ 2,748.47 |
| | | | | | | | | | |
| | | | Lober factor 2 Ev | 1 5 | \$ | 74,964.78 | \$ 6,070.56 | \$- | \$ 81,035.34 |
| | | | Labor factor 2.5x | 1.5 | \$ | 74.964.78 | \$ 9,105.84 \$ 15.176.40 | | \$ 9,105.84 \$ 90,141.18 |
| | | | | | - | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, | + | | + |
| G 01 02 D | omestic Water | | | | | | | | |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | |
| | | | | | | | | | |
| | | Water heater, gas fired, 35.1 kW input, 416 | | | | | | | |
| | | L/hr, includes standard controls, excludes | | | | | | | |
| 1 | 223436136080 | vent | | | \$ | 10 187 10 | \$ 665.64 | s - | \$ 10 852 74 |
| | 220100100000 | Water heaters, tankless, on-demand, | | | Ψ | 10,101.10 | φ 000.01 | Ŷ | φ 10,002.11 |
| | | natural gas/propane, .6 L/s, excludes vent | | | | | | | |
| з | 223413100440 | | | | ¢ | 3 550 05 | ¢ 1 / 86 08 | \$ | \$ 5,036,13 |
| 5 | 223413109440 | Pipe, copper, tubing, solder, 15 mm | | | φ | 3,550.05 | φ 1,400.00 | φ - | φ 5,050.15 |
| | | diameter, type L, includes coupling & clevis | | | | | | | |
| 20 | 001110000140 | hanger assembly 3 m OC | | | ¢ | 272.90 | ¢ 650.00 | ¢ | ¢ 024.00 |
| 20 | 221113232140 | Pipe, copper, tubing, solder, 25 mm | | | φ | 273.00 | \$ 050.20 | φ - | φ 924.00 |
| | | diameter, type L, includes coupling & clevis | | | | | | | |
| 10 | 004440000000 | hanger assembly 3 m OC | | | • | 000.00 | • • • • • • • • • • • • • • • • • • • | • | * 004.00 |
| 10 | 221113232200 | Pipe copper tubing solder 32 mm | | | \$ | 283.00 | \$ 381.80 | \$ - | \$ 664.80 |
| | | diameter, type L, includes coupling & clevis | | | | | | | |
| | ~~ / / / ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ | hanger assembly 3 m OC | | | • | 005.00 | A A A A A A A A A A | • | A A TOO OO |
| 20 | 221113232220 | Pipe copper tubing solder 40 mm | | | \$ | 885.00 | \$ 897.80 | \$ - | \$ 1,782.80 |
| | | diameter, type L, includes coupling & clevis | | | | | | | |
| 40 | ~~ / / / ~ ~ ~ ~ / ~ | hanger assembly 3 m OC | | | • | 100.00 | 6 500 50 | • | • • • • • • • |
| 10 | 221113232240 | Pine conner tubing solder 50 mm | | | \$ | 432.20 | \$ 500.50 | \$ - | \$ 932.70 |
| | | diameter, type L, includes coupling & clevis | | | | | | | |
| | | hanger assembly 3 m OC | | | | | | | |
| 100 | 221113232260 | Insulation, pipe covering (price conner tube | | | \$ | 6,997.00 | \$ 6,244.00 | \$- | \$ 13,241.00 |
| | | one size less than I.P.S.), fiberglass with all | | | | | | | |
| | | service jacket, 25 mm wall, 80 mm iron pipe | | | | | | | |
| 40 | | size | | | | | | | |
| 10 | 220719106920 | Insulation, pipe covering (price conner tube | | | \$ | 73.60 | \$ 234.10 | \$ - | \$ 307.70 |
| | | one size less than I.P.S.), fiberglass with all | | | | | | | |
| | | service jacket, 25 mm wall, 25 mm iron pipe | | | | | | | |
| 20 | 220710106970 | size | | | ¢ | 82.00 | ¢ 295.40 | ¢ | ¢ 467.40 |
| 20 | 2207 19100870 | Insulation, pipe covering (price copper tube | | | φ | 02.00 | φ 385.40 | ψ - | ψ 407.40 |
| | | one size less than I.P.S.), fiberglass with all | | | | | | | |
| | | service jacket, 25 mm wall, 50 mm iron pipe | | | | | | | |
| 10 | 220719106900 | 5120 | | | \$ | 67.80 | \$ 214.10 | \$ | \$ 281.90 |
| 10 | 220713100300 | Insulation, pipe covering (price copper tube | | | Ψ | 07.00 | φ 214.10 | φ - | φ 201.50 |
| | | one size less than I.P.S.), fiberglass with all | | | | | | | |
| | | service jacket, 25 mm wall, 80 mm iron pipe | | | | | | | |
| 20 | 220719106920 | | | | \$ | 147 20 | \$ 468.20 | \$ - | \$ 615.40 |
| | | Insulation, pipe covering (price copper tube | | | Ť | 111.20 | + +00.20 | - | ÷ 515.+0 |
| | | one size less than I.P.S.), fiberglass with all | | | | | | | |
| | | service jacket, 25 mm wall, 80 mm iron pipe size | | | | | | | |
| 10 | 220719106920 | | | | \$ | 73.60 | \$ 234.10 | \$ - | \$ 307.70 |
| | | Insulation, pipe covering (price copper tube | | | | | | | |
| | | one size less than I.P.S.), fiberglass with all | | | | | | | |
| | | pipe size | | | | | | | |
| 200 | 220719106940 | | | | \$ | 1,954.00 | \$ 5,678.00 | \$ - | \$ 7,632.00 |

| TDENTI. | AL ATTOR | NEY WORK PRODUCT | | | | | | | Atta | chm | ent 1 |
|----------|--------------|---|--|------|----------|-----|--------------|----|------------------|------|-----------|
| Quantity | Line Number | Description | | Ext. | Mat. O&P | Ext | . Labour O&P | E | xt. Eguip 0&P | 40.0 | f 350 0&P |
| | | Coupling, copper, wrought, copper x | | | | | | | | | |
| | | copper, 50 mm | | | | | | | | | |
| 1 | 221113250718 | Coupling conner wrought conner v | | \$ | 17.29 | \$ | 61.40 | \$ | - | \$ | 78.69 |
| | | copper, 50 mm | | | | | | | | | |
| 20 | 221113250718 | | | \$ | 345.80 | \$ | 1 228 00 | \$ | _ | \$ | 1 573 80 |
| 20 | 221110200110 | Elbow, 90 Deg., copper, wrought, copper x | | Ŷ | 010.00 | Ŷ | 1,220.00 | Ŷ | | Ψ | 1,010.00 |
| | | copper, 50 mm | | | | | | | | | |
| 22 | 221113250160 | Filhow 45 Dog copport wrought copport | | \$ | 735.68 | \$ | 1,589.28 | \$ | - | \$ | 2,324.96 |
| | | copper, 50 mm | | | | | | | | | |
| 12 | 221113250340 | | | \$ | 413 64 | \$ | 866 88 | \$ | | \$ | 1 280 52 |
| | 221110200010 | Tee, copper, wrought, copper x copper, 50 | | Ť | 110101 | Ť | 000.00 | ÷ | | Ť | 1,200.02 |
| | | mm | | | | | | | | | |
| 4 | 221113250540 | Tag annual warman 50 | | \$ | 261.36 | \$ | 454.08 | \$ | - | \$ | 715.44 |
| | | mm | | | | | | | | | |
| 1 | 221113250540 | | | \$ | 65 34 | \$ | 113 52 | ¢ | _ | \$ | 178.86 |
| · | 221110200040 | Tee, copper, wrought, copper x copper, 50 | | Ψ | 00.04 | Ψ | 110.02 | Ψ | | Ψ | 170.00 |
| | | mm | | | | | | | | | |
| 1 | 221113250540 | - | | \$ | 65.34 | \$ | 113.52 | \$ | - | \$ | 178.86 |
| | | Tee, copper, wrought, copper x copper, 50 mm | | | | | | | | | |
| 1 | 221112250540 | | | ¢ | 65.24 | ¢ | 112 52 | ¢ | | ¢ | 179.96 |
| | 221113230340 | Pipe, fittings & valves, valve, butterfly, | | φ | 05.54 | φ | 113.52 | φ | - | φ | 170.00 |
| | | standard trim, grooved joint, 50 mm pipe size, add 1 coupling (material only) per joint | | | | | | | | | |
| | | for installed price, incl 2 position handle, | | | | | | | | | |
| 1 | 221113488020 | excl joint coupling material | | \$ | 396 17 | \$ | 34 57 | \$ | _ | \$ | 430 74 |
| | 221110400020 | Tee, copper, wrought, copper x copper, 50 | | Ψ | 000.17 | Ψ | 04.07 | Ψ | - | Ψ | 400.74 |
| | | mm | | | | | | | | | |
| 1 | 221113250540 | Tag annual warmak annual sama 50 | | \$ | 65.34 | \$ | 113.52 | \$ | - | \$ | 178.86 |
| | | mm | | | | | | | | | |
| 1 | 221113250540 | | | \$ | 65 34 | \$ | 113 52 | \$ | _ | \$ | 178 86 |
| · | 221110200010 | Tee, copper, wrought, copper x copper, 50 | | Ŷ | 00.01 | Ŷ | 110.02 | Ŷ | | Ψ | 110.00 |
| | | mm | | | | | | | | | |
| 3 | 221113250540 | | | \$ | 196.02 | \$ | 340.56 | \$ | - | \$ | 536.58 |
| | | standard trim, grooved joint, 50 mm pipe | | | | | | | | | |
| | | size, add 1 coupling (material only) per joint for installed price, incl 2 position handle | | | | | | | | | |
| 1 | 221113488020 | excl joint coupling material | | \$ | 396.17 | \$ | 34.57 | \$ | - | \$ | 430.74 |
| | | Pipe, fittings & valves, valve, butterfly, | | | | | | | | | |
| | | size, add 1 coupling (material only) per joint | | | | | | | | | |
| 1 | 221113488010 | for installed price, incl 2 position handle, excl joint coupling material | | \$ | 396 17 | \$ | 26.32 | \$ | _ | \$ | 422 49 |
| | | Pipe, fittings & valves, valve, butterfly, | | • | 000.11 | ¥ | 20.02 | ÷ | | ÷ | 122.70 |
| | | standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint | | | | | | | | | |
| | | for installed price, incl 2 position handle, | | | | • | | • | | • | 100.10 |
| 1 | 221113488010 | Pipe, fittings & valves, valve, butterfly, | | \$ | 396.17 | \$ | 26.32 | \$ | - | \$ | 422.49 |
| | | standard trim, grooved joint, 40 mm pipe | | | | | | | | | |
| | | for installed price, incl 2 position handle, | | | | | | | | | |
| 3 | 221113488010 | excl joint coupling material | | \$ | 1,188.51 | \$ | 78.96 | \$ | _ | \$ | 1.267.47 |
| | | Backflow preventer, double check principle, | | | , | | | | | | , |
| | | ball valves, threaded, 25 mm pipe size, | | | | | | | | | |
| | | includes valves and four test cocks | | | | | | | | | |
| 5 | 221119421030 | | | \$ | 1,435.45 | \$ | 283.80 | \$ | - | \$ | 1,719.25 |
| | | Backflow preventer, double check principle, corrosion resistant, automatic operation, | | | | | | | | | |
| | | gate valves, threaded, 40 mm pipe size, | | | | | | | | | |
| | | notados varvos and tour test courts | | | | | | | | | |
| 7 | 221119421140 | | | \$ | 9,724.05 | \$ | 556.22 | \$ | - | \$ | 10,280.27 |
| LDENTI. | AL ATTOR | NEY WORK PRODUCT | | | | | | Att | achn | nent 1 |
|-------------------------|----------------|--|-------------------|-----|-------------|-----------|-------------------------------------|-------------|----------------|------------|
| Quantity | Line Number | Description | | | Ext. | Mat. O&P | Ext. Labour O&P | Ext. Equip. | 241x | of 350 O&P |
| | | Backflow preventer, double check principle, corrosion resistant, automatic operation, gate valves, threaded, 50 mm pipe size, includes valves and four test cocks | | | | | | Uar | | |
| 2 | 221119421160 | | | | \$ | 4,116.00 | \$ 227.04 | \$- | \$ | 4,343.04 |
| 1 | 221119263100 | Pressure regulator, steam, high capacity, bronze body, stainless steel trim, threaded, 50 mm diameter | | | ¢ | 5 993 93 | \$ 73.70 | ¢. | ¢ | 6 067 72 |
| | 221110200100 | Pressure regulator, steam, high capacity, bronze body, stainless steel trim, threaded, 50 mm diameter | | | ¢ | 0,000.00 | ¢ 10.10 | • | Ŷ | 0,001.12 |
| 1 | 221119263100 | Pressure regulator, steam, high capacity, bronze body, stainless steel trim, threaded, | | | \$ | 5,993.93 | \$ 73.79 | \$ - | \$ | 6,067.72 |
| 1 | 221119263100 | 50 mm diameter | | | \$ | 5,993.93 | \$ 73.79 | \$- | \$ | 6,067.72 |
| | | | | | ¢ | 62 222 22 | ¢ 24.626.90 | ¢ | ¢ | 97 070 04 |
| | | | Labor factor 2.5x | 1.5 | Þ | 63,333.32 | \$ 24,636.89 \$ 36,955.34 | ş - | ə \$ | 36,955.34 |
| 0 04 04 0 | tauna Duainana | | | | \$ (| 53,333.32 | \$ 61,592.23 | | \$ | 124,925.55 |
| G_01_04 S Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | |
| Data Horoa | 00 I FOUL 2020 | | | | | | | | | |
| 81 | 221316202220 | Pipe, cast iron soil, one hub, service weight, 200 mm diameter, lead and oakum joints 3 m OC, includes clevis hanger assemblies 1.6 m OC | | | \$ | 19 337 13 | \$ 13 625 82 | \$ - | \$ | 32 962 95 |
| | | | | | Ų | 10,007.10 | ¢ 10,020.02 | Ŷ | Ų | 02,002.00 |
| 40 | 221316202200 | Pipe, cast iron soil, one hub, service weight, 150 mm diameter, lead and oakum joints 3 m OC, includes clevis hanger assemblies | | | ¢ | 6 207 60 | \$ 4 004 00 | \$ | ¢ | 10 301 60 |
| 40 | 221310202200 | 1.0 11 00 | | | φ | 0,297.00 | φ 4,004.00 | φ - | φ | 10,301.00 |
| 70 | 221316202160 | Pipe, cast iron soil, one hub, service weight, 100 mm diameter, lead and oakum joints 3 m OC, includes clevis hanger assemblies 1.6 m OC | | | \$ | 6,410.60 | \$ 5,996.20 | \$ - | \$ | 12,406.80 |
| 4 | 221316301830 | Reducer, cast iron soil, hub and spigot, service weight, 150 mm x 100 mm, includes lead & oakum joints | | | \$ | 271.64 | \$ 458.20 | \$- | \$ | 729.84 |
| 11 | 221316302520 | Y, cast iron soil, hub and spigot, service weight, 100 mm, includes lead & oakum joints | | | \$ | 894.19 | \$ 1,975.27 | \$- | \$ | 2,869.46 |
| 3 | 221316302540 | Y, cast iron soil, hub and spigot, service weight, 150 mm, includes lead & oakum joints | | | \$ | 577.26 | \$ 606.81 | \$- | \$ | 1,184.07 |
| 4 | 221216202540 | Y, cast iron soil, hub and spigot, service weight, 150 mm, includes lead & oakum | | | ¢ | 760.69 | ¢ 000 00 | ¢ | ¢ | 1 579 76 |
| 4 | 221010302040 | Y, cast iron soil, hub and spigot, service weight, 200 mm, includes lead & oakum | | | ψ | 703.00 | ¢ 003.08 | φ - | φ | 1,010.10 |
| 6 | 221316302550 | joints | | | \$ | 2,809.20 | \$ 2,600.64 | \$- | \$ | 5,409.84 |
| 3 | 221316302550 | Y, cast iron soil, hub and spigot, service weight, 200 mm, includes lead & oakum joints | | | \$ | 1,404.60 | \$ 1,300.32 | \$- | \$ | 2,704.92 |
| 4 | 221316302550 | Y, cast iron soil, hub and spigot, service weight, 200 mm, includes lead & oakum ioints | | | \$ | 1 872 80 | \$ 173376 | \$ - | \$ | 3 606 56 |

| in i i i | AL AIION | TDENTIAL ATTORNEY WORK PRODUCT J3.4 | | | | | | | | | | | | |
|----------|--|--|--|---|--|---|--|---|---|---|---|---|--|--|
| anterey | Line Number | Description | | | Ex | t. Mat. O&P | Ext | t. Labour O&P | E | Atta | achn 242 x | nent 1 of 350 0&P | | |
| | | | | | | | | | | U&P - | | | | |
| 6 | 221426133920 | Drain, roof, flat metal deck, cast iron body, 300 mm cast iron dome, 150 mm pipe size | | | \$ | 5,865.30 | \$ | 860.70 | \$ | - | \$ | 6,726.00 | | |
| 2 | 220576100180 | Cleanout, floor type, round or square, scoriated nickel bronze top, 150 mm pipe size | | | \$ | 1,219.16 | \$ | 460.16 | \$ | - | \$ | 1,679.32 | | |
| | | Cleanout, floor type, round or square, | | | | | | | | | | | | |
| 10 | 220576100140 | size | | | \$ | 3,258.10 | \$ | 1,284.80 | \$ | - | \$ | 4,542.90 | | |
| 6 | 220576100200 | Cleanout, floor type, round or square, scoriated nickel bronze top, 200 mm pipe size | | | \$ | 5,864.58 | \$ | 2,061.72 | \$ | <u>-</u> | \$ | 7,926.30 | | |
| | | Cleanout, floor type, round or square, | | | · | | | | · | | | | | |
| 2 | 220576100200 | sconated hicker bronze top, 200 mm pipe size | | | \$ | 1,954.86 | \$ | 687.24 | \$ | - | \$ | 2,642.10 | | |
| 16 | 221113451610 | Elbow, 90 Deg., steel, cast iron, black, straight, threaded, extra heavy weight, 100 mm | | | \$ | 14 241 44 | \$ | 3 814 24 | \$ | <u>.</u> | \$ | 18 055 68 | | |
| | | Elbow, 90 Deg., steel, cast iron, black, straight, threaded, extra heavy weight, 100 | | | | | | -, | | | | | | |
| 8 | 221113451610 | mm | | | \$ | 7,120.72 | \$ | 1,907.12 | \$ | - | \$ | 9,027.84 | | |
| 10 | 221113451610 | Elbow, 90 Deg., steel, cast iron, black, straight, threaded, extra heavy weight, 100 mm | | | \$ | 8,900.90 | \$ | 2,383.90 | \$ | - | \$ | 11,284.80 | | |
| | | Elbow, 90 Deg., steel, cast iron, black, straight, threaded, extra heavy weight, 100 | | | | | | | | | | | | |
| 6 | 221113451610 | mm | | | \$ | 5,340.54 | \$ | 1,430.34 | \$ | - | \$ | 6,770.88 | | |
| 2 | 221113451610 | Elbow, 90 Deg., steel, cast iron, black, straight, threaded, extra heavy weight, 100 mm | | | \$ | 1,780.18 | \$ | 476.78 | \$ | - | \$ | 2,256.96 | | |
| 1 | 221216200200 | Coupling, cast iron soil, no hub, cast iron clamp and neoprene gasket (by MG), 200 | | | ¢ | 104 54 | ¢ | 04.05 | ¢ | | ¢ | 040.00 | | |
| • | 221310300380 | | | | \$ | 96 314 99 | φ \$ | 48 568 95 | φ \$ | - | ф \$ | 144 883 94 | | |
| | | | Labor factor 2.5x Total | 1.5 | \$ | 96,314.99 | \$ \$ | 72,853.43 121,422.38 | Ψ | - | \$ \$ | 72,853.43 217,737.37 | | |
| | | | Tabal | | | 004 640 65 | | 400 101 00 | • | | | 100 00 1 00 | | |
| | 6 2 0 6 8 8 6 6 6 7 2 7 6 7 7 7 7 7 7 7 7 7 7 7 7 7 | 6 221426133920 2 220576100180 0 220576100200 6 220576100200 6 221113451610 8 221113451610 0 221113451610 6 221113451610 1 221113451610 2 221113451610 2 221113451610 2 221113451610 2 221113451610 | a221426133920Drain, roof, flat metal deck, cast iron body, 300 mm cast iron dome, 150 mm pipe size2220576100180Cleanout, floor type, round or square, scoriated nickel bronze top, 150 mm pipe size0220576100180Cleanout, floor type, round or square, scoriated nickel bronze top, 100 mm pipe size6220576100100Cleanout, floor type, round or square, scoriated nickel bronze top, 200 mm pipe size6220576100200Cleanout, floor type, round or square, scoriated nickel bronze top, 200 mm pipe size6220576100200Cleanout, floor type, round or square, scoriated nickel bronze top, 200 mm pipe size6221113451610Elbow, 90 Deg., steel, cast iron, black, straight, threaded, extra heavy weight, 100 mm8221113451610Elbow, 90 Deg., steel, cast iron, black, straight, threaded, extra heavy weight, 100 mm0221113451610Elbow, 90 Deg., steel, cast iron, black, straight, threaded, extra heavy weight, 100 mm1221113451610Elbow, 90 Deg., steel, cast iron, black, straight, threaded, extra heavy weight, 100 mm2221113451610Elbow, 90 Deg., steel, cast iron, black, straight, threaded, extra heavy weight, 100 mm2221113451610Elbow, 90 Deg., steel, cast iron, black, straight, threaded, extra heavy weight, 100 mm1221316308380Coupling, cast iron soil, no hub, cast iron clamp and neoprene gasket (by MG), 200 mm | a 221426133920 Drain, roof, flat metal deck, cast iron body, 300 mm cast iron dome, 150 mm pipe size a 220576100160 Cleanout, floor type, round or square, scoriated nickel bronze top, 150 mm pipe a 220576100160 Cleanout, floor type, round or square, scoriated nickel bronze top, 100 mm pipe a 220576100140 Cleanout, floor type, round or square, scoriated nickel bronze top, 200 mm pipe a 220576100200 Cleanout, floor type, round or square, scoriated nickel bronze top, 200 mm pipe a 220576100200 Size c Cleanout, floor type, round or square, scoriated nickel bronze top, 200 mm pipe a 220576100200 Size c Cleanout, floor type, round or square, scoriated nickel bronze top, 200 mm pipe a 220576100200 Size c 220576100200 Size a 22113451610 mm mm Elbow, 90 Deg, steel, cast iron, black, straight, threaded, extra heavy weight, 100 a 221113451610 mm mm Elbow, 90 Deg, steel, cast iron, black, straight, threaded, extra heavy weight, 100 a 221113451610 mm a 221113451610 mm a | a 221426133920 Drain, roof, flat metal deck, cast iron body, 300 mm cast iron dome, 150 mm pipe size Image: constant of the second secon | 5 221422133920 Drain, roof, flat metal deck, cast iron body, so ma cast iron dome, 150 mm pipe size S 2 220576100180 Cleanout, floor type, round or square, scoriated nickel bronze top, 150 mm pipe S 0 220576100180 Cleanout, floor type, round or square, scoriated nickel bronze top, 100 mm pipe S 5 220576100200 Cleanout, floor type, round or square, scoriated nickel bronze top, 200 mm pipe S 6 220576100200 Cleanout, floor type, round or square, scoriated nickel bronze top, 200 mm pipe S 2 220576100200 Cleanout, floor type, round or square, scoriated nickel bronze top, 200 mm pipe S 3 220576100200 Cleanout, floor type, round or square, scoriated nickel bronze top, 200 mm pipe S 6 221113451810 Elbow, 90 Deg., steel, cast iron, black, straight, threaded, extra heavy weight, 100 S 8 221113451810 mm S S 9 221113451810 Elbow, 90 Deg., steel, cast iron, black, straight, threaded, extra heavy weight, 100 S 9 221113451810 mm S S 1 221113451810 mm S S 1 221113451810 Elbow, 90 Deg., steel, | 3 221426133920 Drain, roof, flat metal deck, cast iron body, 300 nm cast iron dome, 150 nm pipe size \$ 5,865,30 2 220576100180 Cleanout, floor type, round or square, scotlated nickel bronze top, 150 nm pipe \$ 1,219,16 0 220576100140 Cleanout, floor type, round or square, scotlated nickel bronze top, 200 nm pipe \$ 3,258,10 8 220576100140 Cleanout, floor type, round or square, scotlated nickel bronze top, 200 nm pipe \$ \$ 5,864,58 2 220576100200 Cleanout, floor type, round or square, scotlated nickel bronze top, 200 nm pipe \$ \$ 5,864,58 2 220576100200 Cleanout, floor type, round or square, scotlated nickel bronze top, 200 nm pipe \$ \$ 1,954,86 6 221113451610 Ellow, 90 Deg, steel, cast iron, black, straight, threaded, extra heavy weight, 100 \$ \$ 7,120,72 8 221113451610 Ellow, 90 Deg, steel, cast iron, black, straight, threaded, extra heavy weight, 100 \$ \$ \$ 5,340,54 2 221113451610 Ellow, 90 Deg, steel, cast iron, black, straight, threaded, extra heavy weight, 100 \$ \$ \$ 5,340,54 2 221113451610 Ellow, 90 Deg, s | 8 22142613320 Drain, roof, flat metal deck, cast iron body, 300 nm cast iron dome, 150 nm pipe size \$ 5,865.30 \$ 2 220576100180 Cleanout, floor type, round or square, scoriated nickel bronze top, 150 nm pipe \$ 1,219.16 \$ 0 220576100140 Cleanout, floor type, round or square, scoriated nickel bronze top, 200 nm pipe \$ \$ 3,255.10 \$ 0 220576100140 Cleanout, floor type, round or square, scoriated nickel bronze top, 200 nm pipe \$ \$ \$,258.45.8 \$ 2 220576100200 Scoriated nickel bronze top, 200 nm pipe \$ \$ \$,268.45.8 \$ 2 220576100200 Scoriated nickel bronze top, 200 nm pipe \$ \$ \$,1954.86 \$ 2 220576100200 Scoriated nickel bronze top, 200 nm pipe \$ \$ \$,1954.86 \$ 3 22113451610 Elbow, 90 Deg, steel, cast iron, black, straight, threaded, extra heavy weight, 100 \$ \$ \$,1954.86 \$ 2 221113451610 Elbow, 90 Deg, steel, cast iron, black, straight, threaded, extra heavy weight, 100 \$ \$ \$,214.241.44 \$ 2 221113451610 | a 22142613320 Drain, roof, flat metal deck, cast iron body, 300 mm cast iron dome. 150 mm pipe size a a a 5. 5.865.00 s 860.70 2 220576100180 cleanout, floor type, round or square, scoriated nickb broze top, 150 mm pipe a a s 3.258.10 s 1.219.16 s 4.460.16 0 220576100140 cleanout, floor type, round or square, scoriated nickb broze top, 100 mm pipe a s 5.864.58 s 2.061.72 2 220576100200 cleanout, floor type, round or square, scoriated nickb broze top, 200 mm pipe a s 1.954.86 s 2.061.72 2 220576100200 size cleanout, floor type, round or square, scoriated nickel broze top, 200 mm pipe a s 1.954.86 s 6.67.24 2 220576100200 size cleanout, floor type, round or square, scoriated nickel broze top, 200 mm pipe s s 1.954.86 s 6.67.24 4 2201740000 size cleanout, floor type, round or square, scoriated nickel broze top, 200 mm pipe s s 1.954.86 s 6.67.24 5 22113451610 mm s s </td <td>a 2142613392 Drain. roof. fat metal deck. cast ion body. a s 5,865.30 s 960.70 s 2 22677610010 Scontialed nicke bronze top, 150 mm pipe size a a s 1,219.16 s 460.16 s 0 22677610010 Scontialed nicke bronze top, 100 mm pipe a a s 3,228.10 s 1,244.80 s 0 22677610010 Scontialed nicke bronze top, 100 mm pipe a a s 3,228.10 s 1,244.80 s 2 22677610020 Scentaled nicke bronze top, 200 mm pipe a a s 5,844.58 s 2,061.72 s 2 220776100200 Scentaled nicke bronze top, 200 mm pipe a a s 1,944.86 s 667.24 s 2 220778100200 Scentaled nicke bronze top, 200 mm pipe a a 1,944.86 s 667.24 s 2 220778100200 Elbow, 90 Deg, steel, cast ion, black, straitenty weight, 100 a a 7,120.72 s 1,907.12 s 2 21113451610<!--</td--><td>a 21422133920 Data, root, flat metal deck, cast iron body, source and iron dome, 150 mm pipe size a 5, 5,865.00 5, 865.00 5, 865.00 5, 865.00 5, 865.00 5, 865.00 5, 865.00 5, 865.00 5, 1294.60 5, 1295.70 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1494.70 5, 1494.70 5, 1494.70 5, 1494.70 5, 1494.70 5, 1494.70 5, 1494.70 5, 1494.70 5, 1494.70</td><td>a 21426133920 pan, mot, fat metal dek, cast ino, body, so multiple see a a 5, 5,665,30 a B B a<</td></td> | a 2142613392 Drain. roof. fat metal deck. cast ion body. a s 5,865.30 s 960.70 s 2 22677610010 Scontialed nicke bronze top, 150 mm pipe size a a s 1,219.16 s 460.16 s 0 22677610010 Scontialed nicke bronze top, 100 mm pipe a a s 3,228.10 s 1,244.80 s 0 22677610010 Scontialed nicke bronze top, 100 mm pipe a a s 3,228.10 s 1,244.80 s 2 22677610020 Scentaled nicke bronze top, 200 mm pipe a a s 5,844.58 s 2,061.72 s 2 220776100200 Scentaled nicke bronze top, 200 mm pipe a a s 1,944.86 s 667.24 s 2 220778100200 Scentaled nicke bronze top, 200 mm pipe a a 1,944.86 s 667.24 s 2 220778100200 Elbow, 90 Deg, steel, cast ion, black, straitenty weight, 100 a a 7,120.72 s 1,907.12 s 2 21113451610 </td <td>a 21422133920 Data, root, flat metal deck, cast iron body, source and iron dome, 150 mm pipe size a 5, 5,865.00 5, 865.00 5, 865.00 5, 865.00 5, 865.00 5, 865.00 5, 865.00 5, 865.00 5, 1294.60 5, 1295.70 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1494.70 5, 1494.70 5, 1494.70 5, 1494.70 5, 1494.70 5, 1494.70 5, 1494.70 5, 1494.70 5, 1494.70</td> <td>a 21426133920 pan, mot, fat metal dek, cast ino, body, so multiple see a a 5, 5,665,30 a B B a<</td> | a 21422133920 Data, root, flat metal deck, cast iron body, source and iron dome, 150 mm pipe size a 5, 5,865.00 5, 865.00 5, 865.00 5, 865.00 5, 865.00 5, 865.00 5, 865.00 5, 865.00 5, 1294.60 5, 1295.70 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.60 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1294.70 5, 1494.70 5, 1494.70 5, 1494.70 5, 1494.70 5, 1494.70 5, 1494.70 5, 1494.70 5, 1494.70 5, 1494.70 | a 21426133920 pan, mot, fat metal dek, cast ino, body, so multiple see a a 5, 5,665,30 a B B a< | | |

| Quantity | Line Number | Description | | | E | vt Mat O&P | Evt | Labour O&P | Evt | Equip 08P | E | vt. Total O&P |
|------------|-------------------|--|-------------------|-----------|----|--------------|---------|------------|-----|--------------|---------|---------------|
| Quantity | Ene Number | Description | | | | At. Mat. Our | LAU. | | | . Equip. Oui | - | |
| C 02 04 F | | | | | | | | | | | | |
| G_02_01 E | quipment | Unit Cost Estimato | | | | | | | | | | |
| Data Relea | Se . Teal 2020 | Shit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| 1 | 223530101080 | Heat transfer package, complete, hot water, 355 Deg. K enter, 366 Deg. K leaving, 103 kPa steam, one pump system, 16.1 L/s, includes controls, expansion tank, converter, air separator | | | ¢ | 482 165 00 | ¢ | 1 0/3 /1 | ¢ | | ¢ | 483 208 41 |
| | 223330101000 | Hydronic heating, radiator, cast iron, free standing or wall hung, adjustable brackets, 2 per wall radiator up to 30 sections | | | Ŷ | 402,100.00 | Ŷ | 1,040.41 | Ψ | | Ψ | 403,200.41 |
| 3 | 238229103250 | | \$- | \$ 107.37 | \$ | 249.27 | \$ | 72.84 | \$ | - | \$ | 322.11 |
| | | | | | | | | | | | | |
| | | | Labor factor 2 5v | 15 | \$ | 482,414.27 | \$ ¢ | 1,116.25 | \$ | - | \$ ¢ | 483,530.52 |
| | | | Total | 1.5 | \$ | 482.414.27 | ₽ \$ | 2,790.62 | | | ₽ | 485,204.89 |
| G_02_02 P | iping and fitting | IS | | | Ŧ | | Ŧ | | | | - | , |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pipe, steel, galvanized, threaded, 10 mm, schedule 40, Spec. A-53, includes coupling and clevis hanger assembly | | | | | | | | | | |
| 2 | 221113441300 | sized for covering, 3 m OC | | | \$ | 61.74 | \$ | 80.50 | \$ | - | \$ | 142.24 |
| Ę | 00144044040 | Pipe, steel, galvanized, threaded, 15 mm, schedule 40, Spec. A-53, includes coupling and clevis hanger assembly | | | • | 70.45 | • | 000.40 | • | | • | 000 55 |
| 5 | 221113441310 | sized for covering, 3 m OC | | | \$ | 76.15 | \$ | 206.40 | \$ | - | \$ | 282.55 |
| 4 | 221113441320 | Pipe, steel, galvanized, threaded, 20 mm, schedule 40, Spec. A-53, includes coupling and clevis hanger assembly sized for covering 3 m OC | | | \$ | 74 48 | s | 171 32 | \$ | _ | \$ | 245.80 |
| | | Pipe, steel, galvanized, threaded, 50 mm, schedule 40, Spec. A-53, includes | | | Ť | | Ì | | Ţ | | • | |
| 77 | 221113441360 | sized for covering, 3 m OC | | | \$ | 2,258.41 | \$ | 5,641.79 | \$ | - | \$ | 7,900.20 |
| | | Pipe, steel, galvanized, threaded, 100 mm, schedule 40, Spec. A-53, includes coupling and clevis hanger assembly | | | | | | | | | | |
| 96 | 221113441400 | sized for covering, 3 m OC | | | \$ | 9,137.28 | \$ | 12,581.76 | \$ | - | \$ | 21,719.04 |
| 1 | 221112404022 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 150 | | | ¢ | 152.22 | ¢ | 44.29 | ¢ | | ¢ | 107 70 |
| | 221113404922 | mindiameter | | | φ | 155.52 | φ | 44.50 | φ | | φ | 197.70 |
| 20 | 221112494100 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 100 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | ¢ | 1 014 00 | ¢ | 1 145 60 | ¢ | | ¢ | 2 050 60 |
| 20 | 221113484100 | coupling material | | | Ф | 1,914.00 | ¢ | 1,145.60 | Ф | - | \$ | 3,059.60 |
| 27 | 221113484070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 1,361.34 | \$ | 863.73 | \$ | - | \$ | 2,225.07 |
| | | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 100 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint | | | | | | | | | | |
| 3 | 221113484100 | coupling material | | | \$ | 287.10 | \$ | 171.84 | \$ | - | \$ | 458.94 |

| Quantity | Line Number | Description | | Ext | . Mat. O&P | Ext | . Labour O&P | Ext. E | Equip. O&P | Ex | t. Total O&P |
|----------|--------------|---|--|-----|------------|-----|--------------|--------|------------|----|--------------|
| 3 | 221113485820 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 100 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling | | \$ | 882.87 | \$ | 187.32 | \$ | - | \$ | 1,070.19 |
| 6 | 221113484770 | material | | \$ | 463.08 | \$ | 281.76 | \$ | - | \$ | 744.84 |
| 96 | 220719106940 | Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 25 mm wall, 100 mm iron pipe size | | \$ | 937.92 | \$ | 2,725.44 | \$ | - | \$ | 3,663.36 |
| 77 | 220719106900 | Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 25 mm wall, 50 mm iron pipe size | | \$ | 522.06 | \$ | 1,648.57 | \$ | | \$ | 2,170.63 |
| 4 | 220719106920 | Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 25 mm wall, 80 mm iron pipe size | | \$ | 29.44 | \$ | 93.64 | \$ | - | \$ | 123.08 |
| 7 | 220719106840 | Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 25 mm wall, 15 mm iron pipe size | | \$ | 24.36 | \$ | 123.41 | \$ | - | \$ | 147.77 |
| 96 | 220719106940 | Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 25 mm wall, 100 mm iron pipe size | | \$ | 937.92 | \$ | 2,725.44 | \$ | - | \$ | 3,663.36 |
| 77 | 220719106900 | Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 25 mm wall, 50 mm iron pipe size | | \$ | 522.06 | \$ | 1,648.57 | \$ | - | \$ | 2,170.63 |
| 4 | 221113454070 | Coupling, steel, cast iron, black, coupling, straight, merchants, threaded, standard weight, 25 mm | | \$ | 15.36 | \$ | 212.60 | \$ | - | \$ | 227.96 |
| 1 | 230523802000 | Valves, steel, cast, gate, flanged, 1034 kPa, 50 mm | | \$ | 740.96 | \$ | 96.11 | \$ | - | \$ | 837.07 |
| 2 | 230523801400 | Valves, steel, cast, check, swing type, flanged, 1034 kPa, 50 mm | | \$ | 1,765.68 | \$ | 192.22 | \$ | - | \$ | 1,957.90 |
| 3 | 230523802000 | Valves, steel, cast, gate, flanged, 1034 kPa, 50 mm | | \$ | 2,222.88 | \$ | 288.33 | \$ | - | \$ | 2,511.21 |
| 4 | 230523802000 | Valves, steel, cast, gate, flanged, 1034 | | ¢ | 2 063 84 | ¢ | 384 44 | ¢ | | ¢ | 3 348 20 |
| 4 | 230323602000 | Valves, steel, cast, gate, flanged, 1034 | | φ | 2,903.84 | ò | 364.44 | φ | | Ŷ | 3,348.28 |
| 2 | 230523802000 | kPa, 50 mm | | \$ | 1,481.92 | \$ | 192.22 | \$ | - | \$ | 1,674.14 |
| 4 | 230523802000 | kPa, 50 mm | | \$ | 2,963.84 | \$ | 384.44 | \$ | - | \$ | 3,348.28 |

| Quantity | Line Number | Description | | | Ex | t. Mat. O&P | Ext | . Labour O&P | Ext | Equip. O&P | E | t. Total O&P |
|--------------|------------------|--|-------------------|-----|----|-------------|-----|--------------|-----|------------|----|--------------|
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Values start and flanged 1024 | | | | | | | | | | |
| 4 | 230523802000 | kPa, 50 mm | | | \$ | 2,963.84 | \$ | 384.44 | \$ | - | \$ | 3,348.28 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Valves, steel, cast, gate, flanged, 1034 | | | | | | | | | | |
| 2 | 230523802000 | kPa, 50 mm | | | \$ | 1,481.92 | \$ | 192.22 | \$ | - | \$ | 1,674.14 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| 2 | 222120790100 | Strainer, Y type, iron body, screwed, | | | ¢ | 15 20 | ¢ | 90 E0 | ¢ | | ¢ | 105 70 |
| 2 | 232120780100 | 1724 KFA, 13 min pipe size | | | φ | 43.20 | φ | 60.50 | φ | | φ | 123.70 |
| | | | | | | | | | | | | |
| | | Steam trap, cast iron body, inverted | | | | | | | | | | |
| 2 | 232120700070 | bucket type, threaded, 20 mm pipe size | | | \$ | 637.98 | \$ | 162.02 | \$ | - | \$ | 800.00 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Valves, steel, cast, globe, flanged, | | | | | | | | | | |
| 1 | 230523803760 | 1034 kPa, 100 mm | | | \$ | 2,023.18 | \$ | 463.14 | \$ | - | \$ | 2,486.32 |
| | | | | | \$ | 38,950,21 | \$ | 33,374,15 | \$ | - | \$ | 72,324,36 |
| | | | Sampling | | Ŷ | 00,000.21 | \$ | 19,057.50 | ÷ | | \$ | 19,057.50 |
| | | | Buttweld Q1&QA | 1 | | | \$ | 1,317.44 | | | \$ | 1,317.44 |
| | | | Buttweld P&QA | 2 | | | \$ | 1,727.46 | | | \$ | 1,727.46 |
| | | | subtotal labor | | | | \$ | 55,476.55 | | | \$ | 94,426.76 |
| | | | Labor factor 2.5x | 1.5 | * | 29 050 21 | \$ | 83,214.83 | | | \$ | 83,214.83 |
| G 02 03 H | lot water nining | valves and supports | TOLAI | | Þ | 38,950.21 | Þ | 136,091.36 | | | Þ | 177,041.59 |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| Data Pitoloa | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, steel, black, | | | | | | | | | | |
| | | grooved joint, 25 mm diameter, | | | | | | | | | | |
| 2 | 221113481050 | schedule 40, includes coupling & clevis type hanger 3 m OC | | | \$ | 47.34 | \$ | 82.56 | \$ | | \$ | 129.90 |
| | | ·, · · · · · · · · · · · · · · · · · · | | | - | | - | | Ť | | - | |
| | | Pipe, fittings & valves, steel, black, | | | | | | | | | | |
| | | grooved joint, 50 mm diameter, | | | | | | | | | | |
| 20 | 221113481080 | type hanger 3 m OC | | | \$ | 720.40 | \$ | 1,310.60 | \$ | - | \$ | 2,031.00 |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, steel, black, | | | | | | | | | | |
| | | schedule 40. includes coupling & clevis | | | | | | | | | | |
| 15 | 221113481100 | type hanger 3 m OC | | | \$ | 1,219.35 | \$ | 1,408.65 | \$ | - | \$ | 2,628.00 |
| | | | | | | | | | | | | |
| | | Pipe, fittings & valves, steel, black, grooved joint, 100 mm diameter | | | | | | | | | | |
| | | schedule 40, includes coupling & clevis | | | | | | | | | | |
| 3 | 221113481110 | type hanger 3 m OC | | | \$ | 290.19 | \$ | 312.69 | \$ | - | \$ | 602.88 |
| | | Inculation, since accuration (price accurate | | | | | | | | | | |
| | | tube one size less than I.P.S.). | | | | | | | | | | |
| | | fiberglass with all service jacket, 25 | | | | | | | | | | |
| 7 | 220719106870 | mm wall, 25 mm iron pipe size | | | \$ | 28.70 | \$ | 134.89 | \$ | - | \$ | 163.59 |
| | | Pipe fittings & valves flange black | | | | | | | | | | |
| | | steel, painted, with grooved face for | | | | | | | | | | |
| | | gasket, grooved joint, class 125 and | | | | | | | | | | |
| | | 150, 50 mm pipe size, add 1 coupling (material only) per joint for installed | | | | | | | | | | |
| | | price, incl joint coupling labor, excl joint | | | | | | | | | | |
| 8 | 221113485780 | coupling material | | | \$ | 1,317.12 | \$ | 276.56 | \$ | - | \$ | 1,593.68 |
| | | Ding fittings & voluce flange black | | | | | | | | | | |
| | | steel, painted, with grooved face for | | | | | | | | | | |
| | | gasket, grooved joint, class 125 and | | | | | | | | | | |
| | | 150, 80 mm pipe size, add 1 coupling | | | | | | | | | | |
| | | (material only) per joint for installed | | | | | | | | | | |
| 8 | 221113485800 | coupling material | | | \$ | 1,761.68 | \$ | 371.52 | \$ | - | \$ | 2,133.20 |

| Quantity | Line Number | Description | | | E | xt. Mat. O&P | Ex | t. Labour O&P | Ext | . Equip. O&P | E | kt. Total O&P |
|----------|--------------|---|-------------------------------------|-----|----|--------------|----------|-----------------------------------|-----|--------------|----------------|---|
| 8 | 221113484090 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 703.84 | \$ | 346.72 | \$ | - | \$ | 1,050.56 |
| 4 | 221113484090 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 351.92 | \$ | 173.36 | \$ | - | \$ | 525.28 |
| 8 | 221316301740 | Reducer, cast iron soil, hub and spigot, service weight, 80 mm x 50 mm, includes lead & oakum joints | | | \$ | 205.84 | \$ | 763.68 | \$ | - | \$ | 969.52 |
| 8 | 221113484916 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 80 mm diameter | | | \$ | 518 64 | \$ | 169.28 | \$ | _ | \$ | 687 92 |
| 8 | 221113488030 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 80 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 4,568.80 | \$ | 383.92 | \$ | - | \$ | 4,952.72 |
| 8 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 3 169 36 | s | 210.56 | \$ | | \$ | 3 379 92 |
| 4 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | | \$ | 1,584.68 | \$ | 105.28 | \$ | - | \$ | 1,689.96 |
| | | Flexible metal hose, bronze braided, bronze ends, threaded, 50 mm | | | | | | | | | | |
| 4 | 221119140220 | Flexible metal hose, bronze braided, bronze ends, threaded, 50 mm | | | \$ | 423.96 | \$ | 295.16 | Φ | - | \$ | 719.12 |
| 2 | 221119140220 | diameter x 450 mm Flexible metal hose, bronze braided, bronze ends, threaded, 50 mm | | | \$ | 211.98 | \$ | 147.58 | \$ | - | \$ | 359.56 |
| 2 | 221119140220 | diameter x 450 mm | | | \$ | 211.98 | \$ | 147.58 | \$ | - | \$ | 359.56 |
| | | | Sampling Buttweld Q1&QA | 1 | \$ | 17,335.78 | \$ \$ | 6,640.59 19,057.50 (520.08) | \$ | - | \$ \$ \$ | 23,976.37 19,057.50 (520.08) |
| | | | subtotal labor Labor factor 2.5x | 1.5 | | | \$ \$ | 25,178.01 | | | \$ \$ | 42,513.79 |
| | | | Total | 1.5 | \$ | 17,335.78 | \$ | 62,945.03 | | | \$ | 80,280.81 |
| | | | | | | | | | | | | |
| | | | Total | | \$ | 538,700.26 | \$ | 204,427.02 | \$ | - | \$ | 743,127.28 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | | Ext. Labour O&P | | Ext. Equip. O&P | | E | xt. Total O&P |
|--------------|-----------------------------|---|--|---------------|--------------|-----------------|----------|-----------------|---|----|---------------|
| 0 00 04 104 | | | | | | | | | | | |
| G_03_01 HV | AC Equipment | Unit Coot Estimate | | | | | | | | | |
| Data Release | e. real 2020 | onit Cost Estimate | | | | | | | | | |
| 6 | 628411-K73690- 52BX-0004 | Manufacturing and Delivery Filter Unit 0-73690-FR21/FR22 | | \$ | 1,778,225.00 | \$ | 6,179.42 | | | \$ | 1,784,404.42 |
| G 03 02 Vor | tilation and Exhau | st Ductwork and Dovicos | | \$ | 1,778,225.00 | \$ | 6,179.42 | \$ | - | \$ | 1,784,404.42 |
| Data Release | · Year 2020 | Unit Cost Estimate | | | | | | | | | |
| Data Holodoo | . 10012020 | | | | | | | | | | |
| | | Register, floor, enameled steel, 350 mm x 500 mm, includes toe operated | | | | | | | | | |
| 3 | 233713604240 | damper | | \$ | 199.41 | \$ | 150.15 | \$ | - | \$ | 349.56 |
| 24 | 233713604240 | Register, floor, enameled steel, 350 mm x 500 mm, includes toe operated damper | | \$ | 1,595.28 | \$ | 1,201.20 | \$ | - | \$ | 2,796.48 |
| 20 | 233713604240 | Register, floor, enameled steel, 350 mm x 500 mm, includes toe operated damper | | \$ | 1,329.40 | \$ | 1,001.00 | \$ | - | \$ | 2,330.40 |
| 1 | 233713604240 | Register, floor, enameled steel, 350 mm x 500 mm, includes toe operated damper | | \$ | 66.47 | \$ | 50.05 | \$ | - | \$ | 116.52 |
| 7 | 233713604240 | Register, floor, enameled steel, 350 mm x 500 mm, includes toe operated damper | | \$ | 465 29 | \$ | 350 35 | \$ | _ | \$ | 815 64 |
| 5 | 233713604240 | Register, floor, enameled steel, 350 mm x 500 mm, includes toe operated damper | | \$ | 332.35 | \$ | 250.25 | \$ | - | \$ | 582.60 |
| 23 | 233713604240 | Register, floor, enameled steel, 350 mm x 500 mm, includes toe operated | | ¢ | 1 528 81 | ¢ | 1 151 15 | ¢ | | ¢ | 2 679 96 |
| 10 | 233713604240 | Register, floor, enameled steel, 350 mm x 500 mm, includes toe operated damper | | \$ | 664.70 | \$ | 500.50 | \$ | - | \$ | 1,165.20 |
| 18 | 233713604240 | Register, floor, enameled steel, 350 mm x 500 mm, includes toe operated damper | | \$ | 1,196.46 | \$ | 900.90 | \$ | - | \$ | 2,097.36 |
| 2 | 233713604240 | Register, floor, enameled steel, 350 mm x 500 mm, includes toe operated damper | | \$ | 132.94 | \$ | 100.10 | \$ | - | \$ | 233.04 |
| 27 | 233713604240 | Register, floor, enameled steel, 350 mm x 500 mm, includes toe operated damper | | \$ | 1,794.69 | \$ | 1,351.35 | \$ | - | \$ | 3,146.04 |
| 4 | 233713604240 | Register, floor, enameled steel, 350 mm x 500 mm, includes toe operated damper | | \$ | 265.88 | \$ | 200.20 | \$ | - | \$ | 466.08 |
| 2 | 233713604240 | Register, floor, enameled steel, 350 mm x 500 mm, includes toe operated damper | | \$ | 132.94 | \$ | 100.10 | \$ | - | \$ | 233.04 |
| 2 | 233713604240 | Register, floor, enameled steel, 350 mm x 500 mm, includes toe operated damper | | \$ | 132.94 | \$ | 100.10 | \$ | _ | \$ | 233.04 |
| 2 | 233713604240 | Register, floor, enameled steel, 350 mm x 500 mm, includes toe operated damper | | \$ | 132.94 | \$ | 100.10 | \$ | - | \$ | 233.04 |
| 3 | 233713101074 | Diffuser, aluminum, ceiling, rectangular, 1 to 4 way blow, 350 mm x 350 mm, includes opposed blade damper | | \$ | 505.38 | \$ | 187.29 | \$ | - | \$ | 692.67 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
|----------|--------------|--|--|---------------|-----------------|-----------------|----------------|
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.0 | \$ 93.65 | \$- | \$ 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.0 | 93.65 | \$ - | \$ 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.0 | \$ 93.65 | \$ - | \$ 176.74 |
| 3 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 249.2 | · \$ 280.95 | \$ - | \$ 530.22 |
| 3 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 249.2 | \$ 280.95 | \$- | \$ 530.22 |
| 3 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 249.2 | \$ 280.95 | \$- | \$ 530.22 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.0 | \$ 93.65 | \$ - | \$ 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.0 | \$ 93.65 | \$- | \$ 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.0 | \$ 93.65 | \$- | \$ 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.0 | \$ 93.65 | \$- | \$ 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.0 | \$ 93.65 | \$ - | \$ 176.74 |
| 2 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 166.1 | \$ 187.30 | \$- | \$ 353.48 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.0 | \$ 93.65 | \$ - | \$ 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.0 | \$ 93.65 | \$ - | \$ 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.0 | \$ 93.65 | \$- | \$ 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.0 | \$ 93.65 | \$ - | \$ 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label 1-1/2 bour rated | | \$ 83.0 | \$ 93.65 | \$ - | \$ 176.74 |
| 2 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label 1-1/2 hour rated | | \$ 166.1 | \$ 187.30 | \$ | \$ 353.48 |
| 2 | 233313163/00 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label 1-1/2 hour rated | | \$ 166.1 | \$ 197.00 | \$ | \$ 252.40 |
| 2 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 166.1 | \$ 187.30 | \$ | \$ 353.48 |
| | | | | | | | |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
|----------|--------------|--|--|---------------|-----------------|-----------------|----------------|
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.09 | \$ 93.65 | \$- | \$ 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.09 | \$ 93.65 | \$ - | \$ 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.09 | \$ 93.65 | \$ - | \$ 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.09 | \$ 93.65 | \$ - | \$ 176.74 |
| 2 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 166.18 | \$ 187.30 | \$ - | \$ 353.48 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.09 | \$ 93.65 | \$- | \$ 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.09 | \$ 93.65 | \$ - | \$ 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.09 | \$ 93.65 | \$- | \$ 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.09 | \$ 93.65 | \$ - | \$ 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.09 | \$ 93.65 | \$ - | \$ 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.09 | \$ 93.65 | \$ - | \$ 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.09 | \$ 93.65 | \$ - | \$ 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.09 | \$ 93.65 | \$ - | \$ 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.09 | \$ 93.65 | \$ - | \$ 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.09 | \$ 93.65 | \$ - | \$ 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.09 | \$ 93.65 | \$ - | \$ 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label 1-1/2 bour rated | | \$ 83.09 | \$ 93.65 | \$ - | \$ 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label 1-1/2 hour rated | | \$ 83.00 | \$ 93.65 | \$ | \$ 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label 1-1/2 hour rated | | \$ 83.00 | \$ 03.65 | \$ | \$ 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ 83.09 | \$ 93.65 | \$ - | \$ 176.74 |
| | | | | | | | |

| Quantity | Line Number | Description | | E | Ext. Mat. O&P | E | xt. Labour O&P | | Ext. Equip. O&P | l | Ext. Total O&P |
|----------|--------------|--|--|----------|---------------|----|----------------|----|-----------------|----|----------------|
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ | 83.09 | \$ | 93.65 | \$ | - | \$ | 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ | 83.09 | \$ | 93.65 | \$ | <u>-</u> | \$ | 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label 1-1/2 bour rated | | \$ | 83.09 | \$ | 93 65 | \$ | - | \$ | 176 74 |
| | 222212122400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL | | ¢ | 00.00 | ¢ | 00.00 | ¢ | | ¢ | 470.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ \$ | 83.09 | \$ | 93.65 | \$ | - | \$ | 176.74 |
| 1 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ | 83.09 | \$ | 93.65 | \$ | - | \$ | 176.74 |
| 18 | 233313163400 | Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated | | \$ | 1,495.62 | \$ | 1,685.70 | \$ | - | \$ | 3,181.32 |
| | | Pipe, stainless steel, threaded, 50 mm | | | | | | | | | |
| 1 | 221113644360 | diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 334.43 | \$ | 82.56 | \$ | - | \$ | 416.99 |
| 1 | 221113644390 | Pipe, stainless steel, threaded, 100 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC | | \$ | 694.58 | \$ | 143.45 | \$ | - | \$ | 838.03 |
| _ | | Duct accessories, multi-blade dampers, | | | | | | | | | |
| 2 | 233313136180 | opposed blade, 1200 mm x 900 mm | | \$ | 1,008.48 | \$ | 481.62 | \$ | - | \$ | 1,490.10 |
| 6300 | 230713103180 | Duct thermal insulation, blanket type, fiberglass, flexible, FSK vapor barrier wrap, .34 kg density, 50 mm thick | | \$ | 25,704.00 | \$ | 291,753.00 | \$ | - | \$ | 317,457.00 |
| | | Duct thermal insulation, pipe covering (price copper tube one size less than L.P.S.), finishes. 4 mm thick, for | | | | | | | | | |
| 3680 | 230713103940 | aluminum jacket, add | | \$ | 46,993.60 | \$ | 256,569.60 | \$ | - | \$ | 303,563.20 |
| 12700 | 233113130580 | Metal ductwork, fabricated rectangular, galvanized steel, over 2270 kg, incl fittings, joints, supports & allow for a flexible connections field sketches, excludes as-built drawings and insulation | | \$ | 19,558.00 | \$ | 206,375.00 | \$ | - | \$ | 225,933.00 |
| | | Metal ductwork, fabricated rectangular, 4.6 to 6 m high, incl fittings, joints, supports & amp; allow for a flexible connections field sketches, excl as-built drawings & amp; insulation, add to labor for elevated installation of fabricated | | | | | | | | | |
| 1 | 233113130580 | ductwork | | \$ | - | \$ | 24,765.00 | \$ | - | \$ | 24,765.00 |
| 1 | 233113130580 | Metal ductwork, fabricated rectangular, for welded ductwork, add | | \$ | _ | \$ | 175,418.75 | \$ | - | \$ | 175,418.75 |

| Quantity | Line Number | Description | | | I | Ext. Mat. O&P | E | xt. Labour O&P | E | xt. Equip. O&P | I | Ext. Total O&P |
|----------|--------------|--|-------------------|------|----|---------------|----|----------------|----|----------------|----|----------------|
| 10000 | 233113131060 | Metal ductwork, fabricated rectangular, over 2270 kg, stainless steel, type 304, incl fittings, joints, supports & allow for a flexible connections field sketches, excludes as-built drawings and insulation | | | \$ | 74,500.00 | \$ | 196,200.00 | \$ | - | \$ | 270,700.00 |
| 1 | 233113131060 | Metal ductwork, fabricated rectangular, 4.6 to 6 m high, incl fittings, joints, supports & amp; allow for a flexible connections field sketches, excl as-built drawings & amp; insulation, add to labor for elevated installation of fabricated ductwork | | | s | | s | 58,860.00 | \$ | _ | \$ | 58,860.00 |
| 1 | 233113131060 | Metal ductwork, fabricated rectangular, 4.6 to 6 m high, incl fittings, joints, supports & amp; allow for a flexible connections field sketches, excl as-built drawings & amp; insulation, add to labor for elevated installation of fabricated ductwork | | | \$ | | \$ | 23 544 00 | \$ | | \$ | 23 544 00 |
| | 200110101000 | Metal ductwork, fabricated rectangular, | | | Ų | | Ŷ | 20,011.00 | Ŷ | | Ŷ | 20,011.00 |
| 1 | 233113131060 | for high pressure ductwork, add | | | \$ | - | \$ | 166,770.00 | \$ | - | \$ | 166,770.00 |
| 1 | 233113131060 | for high pressure ductwork, add | | | \$ | - | \$ | 416,925.00 | \$ | - | \$ | 416,925.00 |
| 25000 | 233113131060 | Metal ductwork, fabricated rectangular, over 2270 kg, stainless steel, type 304, incl fittings, joints, supports & allow for a flexible connections field sketches, excludes as-built drawings and insulation | | | \$ | 186,250.00 | \$ | 490,500.00 | \$ | - | \$ | 676,750.00 |
| | | | | | \$ | 371,750.72 | \$ | 2,323,106.52 | \$ | - | \$ | 2,694,857.24 |
| | | | Welder Q2 | 0.33 | | . , | \$ | 92,742.67 | | | \$ | 92,742.67 |
| | | | QA inspection | 1 | | | \$ | 92,742.67 | | | \$ | 92,742.67 |
| | | | subtotal labor | | | | \$ | 2,508,591.85 | | | \$ | 2,880,342.57 |
| | | | Labor factor 2.5x | 1.5 | | | \$ | 3,762,887.78 | | | \$ | 3,762,887.78 |
| | | | Total | | \$ | 371,750.72 | \$ | 6,271,479.63 | | | \$ | 6,643,230.35 |
| | | | Total | | \$ | 2,149,975.72 | \$ | 6,277,659.06 | \$ | - | \$ | 8,427,634.78 |

| Quantity | Line Number | Description | | | Ext | t. Mat. O&P | Ext. | Labour O&P | Ext. Equip. O&P | Ex | t. Total O&P |
|------------|----------------|---|-------------------|-----|-----|-------------|------|------------|-----------------|----|--------------|
| G_04_01 E | 20 Leak Detec | tion System | | | | | | | | | |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 2 | 284215500140 | Tank leak detection systems, for hydrocarbons & hazardous liquids/vapors, controller, data acquisition, for use with all probes, 24 channel, incl. printer, modern, RS232 port | | | \$ | 9,045.90 | \$ | 2,420.00 | \$- | \$ | 11,465.90 |
| | | | | | ¢ | 9 045 90 | ¢ | 2 420 00 | e | ¢ | 11 465 90 |
| | | | Labor factor 2.5x | 15 | φ | 5,045.90 | \$ | 3 630 00 | φ - | \$ | 3 630 00 |
| | | | Total | 1.5 | \$ | 9,045.90 | \$ | 6,050.00 | | \$ | 15,095.90 |

| Quantity | Line Number | Description | | Ext | . Mat. O&P | Ext. | Labour O&P | Ext. | Equip. O&P | Ex | t. Total O&P |
|--------------|------------------|---|--|-----|------------|------|------------|------|------------|--------------------|--------------|
| G_07_01 We | st annex fire pr | otection standpipe system | | | | | | | | | |
| Data Release | : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| 10 | 221113481040 | Pipe, fittings & valves, steel, black, grooved joint, 20 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC | | \$ | 241.80 | \$ | 366.40 | \$ | - | \$ | 608.20 |
| 70 | 221113481080 | Pipe, fittings & valves, steel, black, grooved joint, 50 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC | | \$ | 2,521.40 | \$ | 4,587.10 | \$ | - | \$ | 7,108.50 |
| 150 | 221113481110 | Pipe, fittings & valves, steel, black, grooved joint, 100 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC | | \$ | 14,509.50 | \$ | 15,634.50 | \$ | | \$ | 30,144.00 |
| 50 | 221113481130 | Pipe, fittings & valves, steel, black, grooved joint, 150 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC | | \$ | 9,724.00 | \$ | 8,720.50 | \$ | - | \$ | 18,444.50 |
| 10 | 221113481070 | Pipe, fittings & valves, steel, black, grooved joint, 40 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC | | \$ | 313.80 | \$ | 510.80 | \$ | <u>-</u> | \$ | 824.60 |
| 7 | 221112484100 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 100 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, and init coupling material | | ¢ | 660.00 | ¢ | 400.06 | ¢ | | ¢ | 1 070 86 |
| 22 | 221113484100 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 100 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, evcl joint coupling material | | \$ | 2 105 40 | Ş | 1 260 16 | \$ | | у \$ | 3 365 56 |
| 5 | 221113484120 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 150 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 1,337.70 | \$ | 446.35 | \$ | _ | \$ | 1,784.05 |
| 2 | 221113484820 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 150 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 864.36 | \$ | 262.12 | \$ | - | \$ | 1,126.48 |
| 1 | 221113484820 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 150 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 432.18 | \$ | 131.06 | \$ | | \$ | 563.24 |
| 8 | 221113484800 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 100 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 1,284.16 | \$ | 672.88 | \$ | - | \$ | 1,957.04 |
| 3 | 221316301840 | Reducer, cast iron soil, hub and spigot, service weight, 150 mm x 125 mm, includes lead & oakum joints | | \$ | 219.18 | \$ | 390.09 | \$ | _ | \$ | 609.27 |

| Quantity | Line Number | Description | | Ext | . Mat. O&P | Ext. | Labour O&P | Ext. Equip. O&P | E | ct. Total O&P |
|----------|--------------|--|--|-----|------------|----------|------------|-----------------|----|---------------|
| 12 | 221113765414 | Reducer bushing, plastic, PVC, socket joint, 100 mm x 50 mm, type DWV, schedule 40 | | \$ | 235.80 | \$ | 947.40 | \$- | \$ | 1,183.20 |
| 10 | 221113484060 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 40 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor. excl joint coupling material | | \$ | 504.20 | \$ | 242.50 | \$ - | \$ | 746.70 |
| 36 | 221113484070 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 1,815.12 | \$ | 1,151.64 | \$- | \$ | 2,966.76 |
| 11 | 221316301760 | Reducer, cast iron soil, hub and spigot, service weight, 100 mm x 80 mm, includes lead & oakum joints | | \$ | 367.84 | \$ | 1,123.87 | \$- | \$ | 1,491.71 |
| 2 | 221316301810 | Reducer, cast iron soil, hub and spigot, service weight, 150 mm x 80 mm, includes lead & oakum joints | | \$ | 137.88 | \$ | 220.84 | \$ - | \$ | 358.72 |
| 4 | 221113484770 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl isite coupling material | | ¢ | 308 72 | ¢ | 197 94 | ¢ | ¢ | 406 56 |
| 6 | 221113488010 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 40 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 2 377 02 | \$ | 157.92 | \$ - | \$ | 2 534 94 |
| | | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 100 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, | | Ţ | 2,011.02 | Ŷ | .002 | • | Ŷ | 2,00101 |
| 3 | 221113488050 | excl joint coupling material Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 200 mm pipe size, add 1 coupling (material only) per joint for installed price, incl manual gear operator, excl joint coupling material | | \$ | 1,883.07 | \$ | 195.06 | \$ - \$ - | \$ | 2,078.13 |
| | | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 100 mm | | • | ., | Ŷ | .20.01 | | Ŷ | ., |
| 150 | 221113484918 | diameter Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 125 mm | | \$ | 13,506.00 | \$ | 4,335.00 | \$ - | \$ | 17,841.00 |
| 100 | 221113484920 | diameter Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 100 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling lobe, and inst coupling material | | \$ | 11,628.00 | \$ | 3,560.00 | \$ - | \$ | 2 140 38 |
| 10 | 221113465620 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 150 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 3,704.40 | \$ \$ | 970.10 | \$ - | \$ | 4,674.50 |

| Quantity | Line Number | Description | | | Ex | t. Mat. O&P | Ext | Labour O&P | Ex | t. Equip. O&P | E | t. Total O&P |
|--------------|------------------|---|-------------------|-----|----|-------------|----------|------------|----|---------------|----------|-------------------------|
| 1 | 221113484780 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 65 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 77.18 | \$ | 53.15 | \$ | - | \$ | 130.33 |
| 1 | 104413531000 | Fire equipment cabinets, portable extinguisher, single, steel box, recessed, D.S. glass in door, aluminum door & frame, 200 mm x 300 mm x 675 mm, excludes equipment | | | \$ | 204.52 | \$ | 163.13 | \$ | - | \$ | 367.65 |
| 9 | 104413535100 | Fire equipment cabinets, hose rack assembly, steel box, recessed, D.S. glass in door, aluminum door & frame, 762 mm x 1016 mm x 203 mm, 64 mm x 38 mm valve & 30 m hose & extinguisher, excludes equipment | | | \$ | 9,439.20 | \$ | 2,343.96 | \$ | - | \$ | 11,783.16 |
| | | | | | | | | | | | | |
| 6 | 221113484914 | Pressure gauge Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 65 mm diameter | | | \$ | 12,364.91 | \$ | 326.70 | \$ | - | \$ | 12,691.61 |
| | | | | | | | | | | | | |
| | | | Labor factor 2 5v | 1 5 | \$ | 96,245.46 | \$ ¢ | 49,878.42 | \$ | - | \$ ¢ | 146,123.88 74,817,63 |
| | | | Total | 1.5 | \$ | 96,245.46 | .₽ \$ | 124,696.05 | | | .₽ \$ | 220,941.51 |
| | | | | | | | | | | | | |
| G_07_02 Fire | e Protection Spi | rinkler System | | | | | | | | | | |
| Data Nelease | . 10ai 2020 | Shit Gost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| 2 | 221113440813 | Pipe, steel, black, threaded, 15 mm diameter, schedule 40, A-106, grade A/B seamless, includes coupling and clevis hanger assembly sized for covering, 3 m OC | | | \$ | 69.98 | \$ | 82.56 | \$ | | \$ | 152.54 |
| 130 | 221113440816 | Pipe, steel, black, threaded, 32 mm diameter, schedule 40, A-106, grade A/B seamless, includes coupling and clevis hanger assembly sized for covering, 3 m OC | | | \$ | 6.354.40 | \$ | 6.841.90 | \$ | _ | \$ | 13.196.30 |
| 20 | 221113440817 | Pipe, steel, black, threaded, 40 mm diameter, schedule 40, A-106, grade A/B seamless, includes coupling and clevis hanger assembly sized for covering, 3 m OC | | | \$ | 1 450 80 | \$ | 1 176 40 | \$ | _ | \$ | 2 627 20 |
| 750 | 221113440815 | Pipe, steel, black, threaded, 25 mm diameter, schedule 40, A-106, grade A/B seamless, includes coupling and clevis hanger assembly sized for covering, 3 m OC | | | \$ | 31,252.50 | \$ | 37,155.00 | \$ | | \$ | 68,407.50 |
| 75 | 221113440821 | Pipe, steel, black, threaded, 65 mm diameter, schedule 40, A-106, grade A/B seamless, includes coupling and clevis hanger assembly sized for covering, 3 m OC | | | \$ | 5,865.00 | \$ | 7,043.25 | \$ | - | \$ | 12,908.25 |
| 55 | 221113440819 | Pipe, steel, black, threaded, 50 mm diameter, schedule 40, A-106, grade A/B seamless, includes coupling and clevis hanger assembly sized for covering, 3 m OC | | | \$ | 3,197.70 | \$ | 4,029.85 | \$ | _ | \$ | 7,227.55 |

| Quantity | Line Number | Description | | Ext. | Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ex | t. Total O&P |
|----------|--------------|--|--|------|-----------|----------------------|-----------------|----|--------------|
| 50 | 221113440822 | Pipe, steel, black, threaded, 80 mm diameter, schedule 40, A-106, grade A/B seamless, includes coupling and clevis hanger assembly sized for covering, 3 m OC | | \$ | 4,888.00 | \$ 5,469.50 | \$- | \$ | 10,357.50 |
| 200 | 221113440823 | Pipe, steel, black, threaded, 100 mm diameter, schedule 40, A-106, grade A/B seamless, includes coupling and clevis hanger assembly sized for covering, 3 m OC | | \$ | 30,458.00 | \$ 26,212.00 | \$ - | \$ | 56,670.00 |
| 22 | 221113484800 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 100 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 3 531 44 | \$ 1850.42 | \$ - | \$ | 5 381 86 |
| | 221110404000 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 100 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling | | Ŷ | 0,001.11 | ¢ 1,000.42 | | Ŷ | 0,001.00 |
| 35 | 221113484100 | labor, excl joint coupling material Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per isit for inscalled price incl loint coupling | | \$ | 3,349.50 | \$ 2,004.80 | \$ - | \$ | 5,354.30 |
| 14 | 221113484090 | labor, excl joint coupling material | | \$ | 1,231.72 | \$ 606.76 | \$- | \$ | 1,838.48 |
| 8 | 221113485010 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 80 mm diameter | | \$ | 440.40 | \$ 169.28 | \$- | \$ | 609.68 |
| 0 | 001110405000 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, | | ¢ | 200.20 | ¢ 442.00 | • | ¢ | 540.50 |
| 0 | 221113465000 | os min diameter | | φ | 399.20 | \$ 143.20 | \$ <u>-</u> | Þ | 542.50 |
| 8 | 221113485000 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 65 mm diameter | | \$ | 399.28 | \$ 143.28 | \$- | \$ | 542.56 |
| 8 | 221113484990 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter | | \$ | 341.60 | \$ 127.52 | \$- | \$ | 469.12 |
| | | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, | | | | | | | |
| 1 | 221113485030 | 100 mm diameter Pipe, fittings & valves, tee, steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl | | \$ | 79.23 | \$ 28.90 | \$ - | \$ | 108.13 |
| 18 | 221113484790 | point coupling material Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl | | \$ | 1,907.82 | \$ 1,1 <i>1</i> 0.36 | Ş - | \$ | 3,078.18 |
| 8 | 221113484770 | joint coupling material | | \$ | 617.44 | \$ 375.68 | \$ - | \$ | 993.12 |
| 20 | 221113484790 | grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 2,119.80 | \$ 1.300.40 | \$ - | \$ | 3,420.20 |

| Quantity | Line Number | Description | | Ext. | Mat. O&P | Ext. Labour O&P | Ext. Equip. O | ŝР | Ext. Total O&P |
|----------|--------------|---|--|------|----------|-----------------|---------------|----|----------------|
| 2 | 221113484790 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 211 98 | \$ 130.04 | \$ | | \$ 342.02 |
| _ | 004440404700 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 65 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl | | • | 000 70 | 0 040 00 | | | ¢ 504.00 |
| 4 | 221113484780 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 65 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl | | \$ | 308.72 | \$ 212.60 | \$ - | | \$ 521.32 |
| 20 | 221113484780 | joint coupling material Pipe, fittings & valves, tee, steel, painted, grooved joint, 65 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl | | \$ | 1,543.60 | \$ 1,063.00 | \$ - | | \$ 2,606.60 |
| 12 | 221113484780 | joint coupling material Pipe, fittings & valves, tee, steel, painted, grooved joint, 50 mm diameter, add 1 coupling (material only) per joint for installed price, incluing coupling lobgr, avel | | \$ | 926.16 | \$ 637.80 | \$ - | | \$ 1,563.96 |
| 8 | 221113484770 | joint coupling material | | \$ | 617.44 | \$ 375.68 | \$ - | | \$ 993.12 |
| 10 | 221113484780 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 65 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 771.80 | \$ 531.50 | \$ - | | \$ 1,303.30 |
| 22 | 221113484780 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 65 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl isint coupling material | | ¢ | 1 697 96 | \$ 1 160 30 | ¢ | | ¢ 2867.26 |
| 4 | 221112484780 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 65 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl isite coupling material | | ¢ | 308.72 | \$ 212.60 | ¢ | | \$ 501.20 |
| | 221110404700 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 65 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl | | Ų | 500.72 | φ 212.00 | ų - | | ψ σετ.σε |
| 8 | 221113484780 | joint coupling material | | \$ | 617.44 | \$ 425.20 | \$ - | | \$ 1,042.64 |
| 6 | 221113488050 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 100 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, excl joint coupling material | | \$ | 3,766.14 | \$ 390.12 | \$ - | | \$ 4,156.26 |
| | 004440-000 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 100 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, | | | | | | | A 4000 |
| 2 | 221113488050 | exci joint coupling material | | \$ | 1,255.38 | ə 130.04 | р - | | ə 1,385.42 |

| Quantity | Line Number | Description | | Ext. | Mat. O&P | Ext. | Labour O&P | Ext. | Equip. O&P | Ex | t. Total O&P |
|----------|--------------|---|--|------|-----------|------|------------|------|------------|----|--------------|
| 16 | 221113485820 | Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved joint, class 125 and 150, 100 mm pipe size, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 4,708.64 | \$ | 999.04 | \$ | - | \$ | 5,707.68 |
| 1 | 221113484908 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm diameter | | \$ | 535.00 | \$ | 130.00 | \$ | | \$ | 665.00 |
| 1 | 221113484922 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 150 mm diameter | | \$ | 800.00 | \$ | 150.00 | \$ | - | \$ | 950.00 |
| 14 | 221113484922 | Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 150 mm diameter | | \$ | 2,146.48 | \$ | 621.32 | \$ | - | \$ | 2,767.80 |
| 120 | 221113485030 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 100 mm diameter | | \$ | 9,507.60 | \$ | 3,468.00 | \$ | - | \$ | 12,975.60 |
| 72 | 221113485010 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 80 mm diameter | | \$ | 3.963.60 | \$ | 1.523.52 | \$ | | \$ | 5.487.12 |
| 80 | 221113485000 | Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 65 mm diameter | | \$ | 3,992.80 | \$ | 1,432.80 | \$ | - | \$ | 5,425.60 |
| 1 | 221113484780 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 65 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | \$ | 77.18 | \$ | 53.15 | \$ | | \$ | 130.33 |
| 271 | 211313503940 | Sprinkler system components, sprinkler heads, standard spray, pendent or upright, brass, excludes supply piping, for 260 degrees C | | \$ | 33,086.39 | \$ | 11,701.78 | \$ | - | \$ | 44,788.17 |
| 5 | 221119263540 | Pressure regulator, steam valve, iron body, flanged 862 kPa W S P 100 mm diameter | | \$ | 59 167 50 | \$ | 1 460 30 | \$ | | \$ | 60 627 80 |
| | | Pipe, fittings & valves, tee, steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl | | | | | ., | | | - | |
| 2 | 221113484790 | joint coupling material Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 100 mm diameter, add 1 coupling (material only) per joint for installed price. incl joint coupling | | \$ | 211.98 | \$ | 130.04 | \$ | | \$ | 342.02 |
| 6 | 221113484100 | labor, excl joint coupling material | | \$ | 574.20 | \$ | 343.68 | \$ | - | \$ | 917.88 |

| Quantity | Line Number | Description | | | E | xt. Mat. O&P | Ex | t. Labour O&P | Ext. | . Equip. O&P | E | ct. Total O&P |
|----------|--------------|--|-------------------|-----|----|--------------|---------|--------------------------|------|--------------|---------|--------------------------|
| 4 | 221113484080 | Pipe, fittings & valves, elbow, 45 Deg. or 90 Deg., steel, painted, grooved joint, 65 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 201.68 | \$ | 142.40 | \$ | - | \$ | 344.08 |
| 15 | 221113484790 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 1,589.85 | \$ | 975.30 | \$ | - | \$ | 2,565.15 |
| 8 | 221113484800 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 100 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 1,284.16 | \$ | 672.88 | \$ | | \$ | 1,957.04 |
| 14 | 221113484780 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 65 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | \$ | 1,080.52 | \$ | 744.10 | \$ | - | \$ | 1,824.62 |
| 6 | 221113484700 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl joint coupling material | | | ¢ | 635.94 | e | 300 12 | ¢ | | e | 1 026 06 |
| 15 | 221113404730 | Pipe, fittings & valves, tee, steel, painted, grooved joint, 80 mm diameter, add 1 coupling (material only) per joint for installed price, incl joint coupling labor, excl | | | ¢ | 1 590.95 | ¢ | 075 20 | ¢ | | ¢ | 2 565 15 |
| 15 | 221113404790 | Pipe, fittings & valves, valve, butterfly, standard trim, grooved joint, 80 mm pipe size, add 1 coupling (material only) per joint for installed price, incl 2 position handle, | | | • | 0.055.50 | ¢ | 975.30 | Φ | - | • | 2,000.15 |
| 5 | 221113488030 | exci joint coupling material | | | \$ | 2,855.50 | \$ | 239.95 | \$ | - | \$ | 3,095.45 |
| | | | | | \$ | 237,988.10 | \$ | 127,362.70 | \$ | - | \$ | 365,350.80 |
| | | | Labor factor 2.5x | 1.5 | ¢ | 237 988 10 | \$ ¢ | 191,044.05 318 406 75 | | | \$ ¢ | 191,044.05 556 394 85 |
| | | | Total | | Ψ | 237,500.10 | Ţ | 510,400.75 | | | φ | 550,557.05 |
| | | | | | | | | | | | | |
| | | | lotal | | \$ | 334,233.56 | \$ | 443,102.80 | \$ | - | \$ | 777,336.36 |

| Quantity | Line Number | Description | | | Ext | t. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
|------------|---------------------|---|-------------------|-----|-----|-------------|-----------------|-----------------|----------------|
| | | | | | | | | | |
| G_09-01 B | uilding Control Sys | stem | | | | | | | |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| 2 | 233416107300 | Fans, roof exhauster, centrifugal, aluminum housing, bird screen, back draft damper, V belt drive, 6.35 mm S.P., 9700 L/s, 300 mm galvanized curb, 1075 mm sq. damper | | | \$ | 22,518.90 | \$ 3,418.96 | \$- | \$ 25,937.86 |
| | 000010101000 | Pneumatic control system, air supply for pneumatic, tank mounted duplex compressor, starter, alternator, piping, dryer, PRV station & filter control | | | | | • | | |
| 0 | 230943104630 | system, 373 W | | | \$ | - | \$ - | \$ - | \$ - |
| 0 | 238216200100 | Duct heater, electric, finned tubular insert, 480 V, 3Ph., 533 Deg. K, 4.0 kW, 200 mm wide x 150 mm high | | | \$ | - | \$- | \$- | \$- |
| | | Duct heater, electric, finned tubular | | | | | | | |
| 0 | 238216200360 | insert, 480 V, 3Ph., 533 Deg. K, 26.7 kW, 300 mm wide x 600 mm high | | | \$ | - | \$- | \$- | \$- |
| | | | | | | | | | |
| 0 | 233313136180 | Duct accessories, multi-blade dampers, opposed blade, 1200 mm x 900 mm | | | \$ | - | \$- | \$- | \$- |
| 2 | 233414102620 | Fans, ceiling fan, right angle, extra quiet, 2.54 mm S.P., 1400 L/s | | | \$ | 4,182.90 | \$ 311.18 | \$- | \$ 4,494.08 |
| | | Heat transfer package, complete, hot water, 355 Deg. K enter, 366 Deg. K leaving, 103 kPa steam, one pump system, 34.7 L/s, includes controls, | | | | | | | |
| 1 | 223530101100 | expansion tank, converter, air separator | | | \$ | 76,146.00 | \$ 7,559.40 | \$- | \$ 83,705.40 |
| 3 | 238229103250 | Hydronic heating, radiator, cast iron, free standing or wall hung, adjustable brackets, 2 per wall radiator up to 30 sections | | | \$ | 249.27 | \$ 72.84 | \$- | \$ 322.11 |
| | | | | | | | | | |
| | | | | | \$ | 103,097.07 | \$ 11,362.38 | s - | \$ 114,459.45 |
| | | | Labar fastar 2 Fu | 1.5 | | , | + 17.042.F7 | | ¢ 17.042.57 |
| | | | Lador lactor 2.5x | 1.5 | | | \$ 17,045.57 | | \$ 17,045.57 |
| | | | Total | | \$ | 103,097.07 | \$ 28,405.95 | | \$ 131,503.02 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| G 09 02 C | ontrol System per | Spec | | | | | | | |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| 1 | 230943103000 | Pneumatic control system, boiler room combustion air, damper to 0.46m2, controls | | | \$ | 3,494.58 | \$ 1,568.70 | \$- | \$ 5,063.28 |
| | | Pneumatic control system, heating & ventilating, split system, mixed air control, economizer cycle, panel readout, tubing, over 70 kW, including nominal 15m of tubing, add control | | | | | | | |
| 1 | 230943100260 | panelboard if required | | | \$ | 6,200.90 | \$ 3,660.30 | \$- | \$ 9,861.20 |
| 2 | 230043100320 | Pneumatic control system, heating & ventilating, split system, heating coil, hot water, 3 way valve, freezestat, limit control on discharge readout | | | ¢ | 7 882 50 | \$ 4.083.60 | ¢ | \$ 11.066.10 |
| 2 | 200040100020 | control on discharge readout | | | Ψ | 7,002.50 | φ 4,065.00 | Ψ - | φ 11,900.10 |
| | | Pneumatic control system, heating & ventilating, split system, cooling tower, fan cycle, damper control, control system, including water readout in/out | | | | | | | |
| 2 | 230943100620 | at panel | | | \$ | 14,030.86 | \$ 6,374.40 | \$ - | \$ 20,405.26 |

| Quantity | Line Number | Description | | | E | xt. Mat. O&P | Ex | t. Labour O&P | Ext. | . Equip. O&P | E> | t. Total O&P |
|----------|--------------|--|--------------|-----|----|--------------|----|---------------|------|--------------|----|--------------|
| 2 | 230943100520 | Pneumatic control system, heating & ventilating, split system, cooling coil, chilled water, room, thermostat, 3 way valve | | | \$ | 3,415.76 | \$ | 1,404.36 | \$ | - | \$ | 4,820.12 |
| 2 | 230943102100 | Pneumatic control system, compensated hot water from boiler, valve control, readout & reset at panel, up to 3.8 L/s | | | \$ | 14,556.36 | \$ | 7,818.60 | \$ | - | \$ | 22,374.96 |
| 2 | 230943102140 | Pneumatic control system, compensated hot water from boiler, valve control, readout & reset at panel, 15 L/s | | | \$ | 16,290.50 | \$ | 8,764.80 | \$ | - | \$ | 25,055.30 |
| 2 | 230943103000 | Pneumatic control system, boiler room combustion air, damper to 0.46m2, controls | | | \$ | 6,989.16 | \$ | 3,137.40 | \$ | - | \$ | 10,126.56 |
| 2 | 230943103500 | Pneumatic control system, fan coil, heating & cooling valves, 4 pipe control system | | | \$ | 3,153.00 | \$ | 1,424.28 | \$ | - | \$ | 4,577.28 |
| 2 | 230943103600 | Pneumatic control system, heat exchanger system controls | | | \$ | 6,568.76 | \$ | 4,980.00 | \$ | - | \$ | 11,548.76 |
| 2 | 230943104060 | Pneumatic control system, pump control system | | | \$ | 3,100.46 | \$ | 1,424.28 | \$ | - | \$ | 4,524.74 |
| 2 | 230943104000 | Pneumatic control system, pneumatic thermostat, incl. controlling room radiator valve | | | \$ | 2,038.94 | \$ | 1,155.36 | \$ | - | \$ | 3,194.30 |
| | | | | | ¢ | 87 721 79 | ¢ | 45 796 09 | ¢ | | ¢ | 133 517 96 |
| | | | Labor factor | 1.5 | Ψ | 07,721.70 | \$ | 68,694.12 | Ψ | - | \$ | 68,694.12 |
| | | | Total | | \$ | 87,721.78 | \$ | 114,490.20 | \$ | - | \$ | 202,211.98 |
| | | | | | | | | | | | | |
| | | | Total | | \$ | 190,818.85 | \$ | 142,896.15 | \$ | - | \$ | 333,715.00 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 262 of 350

CONFIDENTIAL ATTORNEY WORK PRODUCT

Table D-7: BOQ Section H - Electrical

| | | | Overnight materials costs | Overnight Iabour costs | Overnight equipment costs | Total overnight costs |
|--------|------------------------------|-------|---------------------------------|---------------------------|---------------------------------|-----------------------------|
| Sectio | n H, Electrical | | | | | |
| H_01 | Services & Distribution | | \$13,542,907 | \$8,121,429 | \$0 | \$21,664,336 |
| | | | | | | |
| H_02 | Lighting, Devices, etc. | | \$3,449,617 | \$5,303,593 | \$84 | \$8,753,294 |
| | | | | | | |
| H_03 | Systems & Ancillaries | | \$506,027 | \$1,419,492 | \$0 | \$1,925,519 |
| | | | | | | |
| H_04 | Instrumentation and Controls | | \$17,395,420 | \$20,136,568 | \$145 | \$37,532,133 |
| | | | | | | |
| | | Total | \$34,893,971 | \$34,981,082 | \$229 | \$69,875,282 |

| CONFID | ביאויד אד א | | 1 | | | | | | EB-20 | 20-0 |)290 J3 4 |
|-------------------------|---------------------------------|--|---|----|--------------|-----|--------------|------|-------------|------|--------------|
| CONFID | ENIIAL A | IIORNEI WORK PRODUCI | | | | | | | Attac | hme | ent 1 |
| Quantity | Line Number | Description | | E | xt. Mat. O&P | Ext | . Labour O&P | Ext. | Equipageizo | S OT | BOUFotal O&P |
| H_01_01 L Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | Incorporated in H01.02 and H01.03 (based on invoice 628411-K53300- 52BX-0001). | | | | | | | | | |
| H_01_02 a | ind H_01_03 60 | 0V Power Distribution | | | | | | | | | |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| 4 | K53300-52BX- | Switchgear | | \$ | 1,019,345.00 | \$ | 1,029.90 | | | \$ | 1,020,374.90 |
| 4 | 628411- K53300-52BX- | Motor-control centers (see invoices) | | \$ | 1.057.811.00 | \$ | 1,387.53 | \$ | - | \$ | 1.059.198.53 |
| 1 | 628411- K53300-52BX- 0002 | Generator set, diesel, 3 phase 4 wire, 277/480 V, 600 kW, incl battery, charger, muffler, & day tank, excl conduit, wiring, & concrete (see invoice) | | \$ | 1,306,475.00 | \$ | 3,121.95 | \$ | - | \$ | 1,309,596.95 |
| | | | | \$ | 3,383,631.00 | \$ | 5,539.38 | \$ | - | \$ | 3,389,170.38 |
| H_01_04 T | ransformers an | d Power Distribution | | | | | | | | | |
| 3 | 262213102220 | Transformer, dry-type, nonventilated, single phase 480 V primary 120/240 V secondary, 50 kVA | | \$ | 14,017.50 | \$ | 7,006.50 | \$ | - | \$ | 21,024.00 |
| 2 | 262213101300 | Transformer, dry-type, single phase 240/480 V primary 120/240 V secondary, 15 kVA | | \$ | 4,859.40 | \$ | 2,543.10 | \$ | - | \$ | 7,402.50 |
| 3 | 262416301010 | Panelboards, 3 phase 4 wire, main lugs, 120/208 V, 400 A, 42 circuits, NQOD, incl 20 A 1 pole bolt-on breakers | | \$ | 7,769.70 | \$ | 6,695.10 | \$ | | \$ | 14,464.80 |
| 3 | 262416300300 | Panelboards, 1 phase 3 wire, main lugs, 120/240 V, 100 A, 20 circuits, NQOD, incl 20 A 1 pole bolt-on breakers | | \$ | 4,565.70 | \$ | 3,503.25 | \$ | _ | \$ | 8,068.95 |
| 2 | 262213102220 | Transformer, dry-type, nonventilated, single phase 480 V primary 120/240 V secondary, 50 kVA | | \$ | 9,345.00 | \$ | 4,671.00 | \$ | - | \$ | 14,016.00 |
| 4 | 262213102210 | Transformer, dry-type, nonventilated, single phase 480 V primary 120/240 V secondary, 37 kVA | | \$ | 15,913.20 | \$ | 8,096.40 | \$ | - | \$ | 24,009.60 |
| 4 | 262213103100 | Transformer, dry-type, ventilated, 3 phase 480 V primary 120/208 V secondary, 15 kVA | | \$ | 8,864.40 | \$ | 5,501.40 | \$ | | \$ | 14,365.80 |
| 8 | 262416301300 | Panelboards, 3 phase 4 wire, main lugs, 277/480 V, 100 A, 20 circuits, NEHB, incl 20 A 1 pole bolt-on breakers | | \$ | 20,719.20 | \$ | 10,172.40 | \$ | | \$ | 30,891.60 |
| Total H_01_05 | | | | \$ | 86,054.10 | \$ | 48,189.15 | \$ | - | \$ | 134,243.25 |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| 1 | 628411-K53300 | Power distribution, 3PH, 600V- 208V/120V, 60 kVA PDU | | \$ | 628,837.30 | \$ | 1,373.21 | \$ | - | \$ | 630,210.51 |
| 1 | 263613100150 | Non-automatic transfer switch, enclosed, manual operated, 3 pole, 480 volt, 60 amp | | \$ | 2,376.30 | \$ | 399.63 | \$ | - | \$ | 2,775.93 |
| 4 | 262213101300 | 240/480 V primary 120/240 V secondary, 15 kVA | | \$ | 9,718.80 | \$ | 5,086.20 | \$ | - | \$ | 14,805.00 |

| ONFID | ENTIAL A | TTORNEY WORK PRODUCI | , | | | | | | EB-20 | 21-08)20-0 | 5-17 1290 J3.4 |
|------------|-----------------|---|---|----|-------------|----|---------------|------|------------|----------------|----------------------|
| Quantity | Line Number | Description | | Ex | t. Mat. O&P | Ex | t. Labour O&P | Ext. | EquRage 20 | onme 64 of | S50Total O&P |
| 4 | 260926100130 | Lighting control relay panel, 24 relay, with timeclockwith timeclock | | \$ | 11,427.60 | \$ | 2,013.72 | \$ | - | \$ | 13,441.32 |
| | | | | \$ | 652,360.00 | \$ | 8,872.76 | \$ | - | \$ | 661,232.76 |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| 210 | 260519206900 | Armored cable, aluminum, PVC jacket shielded-grounded, 15 kV, 3 conductor, #2, in cable tray | | \$ | 3,330.60 | \$ | 995.40 | \$ | - | \$ | 4,326.0 |
| 0 | Termination | Tampiani and a kit | | • | 4 500 04 | • | 0 775 00 | • | | • | 4 000 0 |
| 0 | KIIS | remination Kit | | ¢ | 1,000.01 | φ | 2,775.00 | φ | - | φ | 4,306.3 |
| 3 | 260519255800 | Cable connectors, armored, 15 kV, #1 | | \$ | 490.20 | \$ | 569.85 | \$ | - | \$ | 1,060.0 |
| 382 | 260519130100 | Underecarpet, cable flat, w/attached bottom shield, #12, 3 conductor | | \$ | 2,406.60 | \$ | 294.14 | \$ | - | \$ | 2,700.74 |
| 576 | 260519130100 | Underecarpet, cable flat, w/attached bottom shield, #12, 3 conductor | | \$ | 3,628.80 | \$ | 443.52 | \$ | - | \$ | 4,072.32 |
| | | Trench duct, steel with cover, standard adjustable, straight, single compartment dents to 102 mm 229 | | | | | | | | | |
| 16 | 260543100100 | mm wide | | \$ | 17,942.40 | \$ | 1,992.96 | \$ | - | \$ | 19,935.3 |
| 16 | 260543100100 | Trench duct, steel with cover, standard adjustable, straight, single compartment, depths to 4", 9" wide | | \$ | 5.468.16 | \$ | 606.24 | \$ | - | \$ | 6.074.40 |
| | | Bus duct, aluminum, 3 pole 4 wire, | | | ., | | | · | | | |
| 16 | 262513100050 | amp | | \$ | 3,229.60 | \$ | 548.00 | \$ | - | \$ | 3,777.6 |
| 40 | 260533131140 | Aluminum conduit, 4" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 L E | | ¢ | 807 20 | ¢ | 872.00 | ¢ | | ¢ | 1 769 2 |
| 10 | 200000101140 | Rigid galvanized steel conduit, 3" diameter, to 10' H, incl 2 terminations, 2 | | Ψ | 001.20 | Ψ | 072.00 | Ψ | - | Ψ | 1,100.2 |
| 180 | 260533131930 | elbows, 11 beam clamps, and 11 couplings per 100 LF | | \$ | 3,344.40 | \$ | 5,418.00 | \$ | - | \$ | 8,762.4 |
| 00 | 000540000400 | Armored cable, copper, solid, 600 V, 3 | | • | 0.004.00 | | 00.000.00 | | | • | 07 7 10 0 |
| 90 | 260519200100 | conductor, #14, BX, exposed | | \$ | 6,921.00 | \$ | 30,828.60 | \$ | - | \$ | 37,749.60 |
| 15 | 260519200650 | Armored cable, PVC jacket, 600 V, 3 conductor, 2/0, in cable tray | | \$ | 20,025.00 | \$ | 6,695.10 | \$ | - | \$ | 26,720.10 |
| | | Ground wire, copper wire, bare | | | | | | | | | |
| 15 | 260526800750 | stranded, 2/0 | | \$ | 4,469.55 | \$ | 3,160.65 | \$ | - | \$ | 7,630.20 |
| 140 | 260519200450 | Armored cable, PVC jacket, 600 V, 3 conductor, #4, in cable tray | | \$ | 106,906.80 | \$ | 39,382.00 | \$ | - | \$ | 146,288.8 |
| | | Ground wire, copper wire, bare solid, | | | | - | | | | | |
| 140 | 260526800370 | #4 | | \$ | 16,147.60 | \$ | 13,297.20 | \$ | - | \$ | 29,444.8 |
| 25 | 260519200500 | Armored cable, PVC jacket, 600 V, 3 conductor, #2, in cable tray | | \$ | 23,763.00 | \$ | 8,304.00 | \$ | - | \$ | 32,067.00 |
| 07 | 0005000 | Ground wire, copper wire, bare solid, | | • | | | | | | • | |
| 25 | 260526800380 | #2 | | \$ | 3,711.25 | \$ | 3,788.75 | \$ | - | \$ | 7,500.0 |
| 80 | 260519200500 | Armored cable, PVC jacket, 600 V, 3 conductor. #2. in cable trav | | \$ | 76.041.60 | \$ | 26.572.80 | \$ | _ | \$ | 102.614.4 |

| ~ ~ ~ ~ ~ ~ ~ ~ ~ | | | _ | | | | | | EB-20 |)20-0 |)290 12.4 |
|-------------------|----------------|--|---|-----|-------------|----|---------------|--------|-----------|-------|---------------|
| CONFID | ENTIAL A | TTORNEY WORK PRODUCT | 1 | | | | | | Attac | hme | 53.4 ent 1 |
| Quantity | Line Number | Description | | Ext | t. Mat. O&P | Ex | t. Labour O&P | Ext. E | quRage 26 | 65 of | E350Total O&P |
| 80 | 260526800380 | Ground wire, copper wire, bare solid, #2 | | \$ | 11,876.00 | \$ | 12,124.00 | \$ | - | \$ | 24,000.00 |
| 170 | 260519200500 | Armored cable, PVC jacket, 600 V, 3 conductor, #2, in cable tray | | \$ | 161,588.40 | \$ | 56,467.20 | \$ | - | \$ | 218,055.60 |
| 170 | 260526800380 | Ground wire, copper wire, bare solid, #2 | | \$ | 25,236.50 | \$ | 25,763.50 | \$ | - | \$ | 51,000.00 |
| 190 | 260519200500 | Armored cable, PVC jacket, 600 V, 3 conductor, #2, in cable tray | | \$ | 180,598.80 | \$ | 63,110.40 | \$ | - | \$ | 243,709.20 |
| 6 | 260519200380 | Armored cable, copper, stranded, 600 V, 2 conductor, #6, BX, exposed | | \$ | 1,768.62 | \$ | 3,487.68 | \$ | - | \$ | 5,256.30 |
| 6 | 260526800360 | Ground wire, copper wire, bare solid, #6 | | \$ | 278.76 | \$ | 454.62 | \$ | - | \$ | 733.38 |
| 120 | 260519200380 | Armored cable, copper, stranded, 600 V, 2 conductor, #6, BX, exposed | | \$ | 35,372.40 | \$ | 69,753.60 | \$ | - | \$ | 105,126.00 |
| 120 | 260526800360 | Ground wire, copper wire, bare solid, #6 | | \$ | 5,575.20 | \$ | 9,092.40 | \$ | - | \$ | 14,667.60 |
| 170 | 260519200340 | Armored cable, copper, stranded, 600 V, 2 conductor, #8, BX, exposed | | \$ | 51,380.80 | \$ | 85,583.10 | \$ | - | \$ | 136,963.90 |
| 170 | 260526800350 | Ground wire, copper wire, bare solid, #8 | | \$ | 4,992.90 | \$ | 11,735.10 | \$ | - | \$ | 16,728.00 |
| 56 | 260519200250 | Armored cable, copper, solid, 600 V, 2 conductor, #10, BX, exposed | | \$ | 5,353.04 | \$ | 21,216.72 | \$ | - | \$ | 26,569.76 |
| 56 | 260526800340 | Ground wire, copper wire, bare solid, #10 | | \$ | 1,163.12 | \$ | 3,545.92 | \$ | - | \$ | 4,709.04 |
| 92 | 260519350450 | Terminal lugs, solderless, 500 kcmil | | \$ | 844.56 | \$ | 11,650.88 | \$ | - | \$ | 12,495.44 |
| 26 | 260519350350 | Terminal lugs, solderless, 250 kcmil | | \$ | 95.42 | \$ | 2,186.08 | \$ | - | \$ | 2,281.50 |
| 38 | 260519350200 | Terminal lugs, solderless, 1/0 to 2/0 | | \$ | 70.68 | \$ | 1,794.74 | \$ | - | \$ | 1,865.42 |
| 10 | 260519350200 | Terminal lugs, solderless, 1/0 to 2/0 | | \$ | 18.60 | \$ | 472.30 | \$ | - | \$ | 490.90 |
| 130 | 260519350150 | Terminal lugs, solderless, #2 to #1 | | \$ | 120.90 | \$ | 4,452.50 | \$ | - | \$ | 4,573.40 |
| 8 | 260519350150 | Terminal lugs, solderless, #2 to #1 | | \$ | 7.44 | \$ | 274.00 | \$ | - | \$ | 281.44 |
| 3 | 260519350150 | Terminal lugs, solderless, #2 to #1 | | \$ | 2.79 | \$ | 102.75 | \$ | - | \$ | 105.54 |
| 143 | 260519350100 | Terminal lugs, solderless, #8 to #4 | | \$ | 124.41 | \$ | 3,636.49 | \$ | - | \$ | 3,760.90 |
| 36 | 260519350035 | Wire connector, screw type, insulated, #16 to #10 | | \$ | 11.16 | \$ | 118.80 | \$ | - | \$ | 129.96 |
| H 01 07 | | | | \$ | 786,737.57 | \$ | 533,567.05 | \$ | - | \$ | 1,320,304.62 |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| 20 | 260533131050 | Aluminum conduit, 2" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF | | \$ | 170.80 | \$ | 253.20 | \$ | - | \$ | 424.00 |
| 400 | 260519200250 | Armored cable, copper, solid, 600 V, 2 conductor, #10, BX, exposed | | \$ | 38,236.00 | \$ | 151,548.00 | \$ | - | \$ | 189,784.00 |
| 1200 | 260523100030 | Control cable, copper, THHN wire with PVC jacket, 600 V, 3 wires, #14 | | \$ | 73,692.00 | \$ | 113,976.00 | \$ | - | \$ | 187,668.00 |
| | | Cable connectors, nonmetallic, 600 volt, #10-3 wire to #14-4 and #12-4 | | | | | | | | | |
| 20 | 260519250400 | wire | | \$ | 40.20 | \$ | 151.60 | \$ | - | \$ | 191.80 |

| CONFID | ENTIAL A | TTORNEY WORK PRODUCT | | | | | | LD-21 | ,20-0 , | J3.4 |
|------------|-----------------|--|----------|-------------|----|---------------|--------|------------|------------|----------------------|
| Ouantity | | | _ Ex | t Mat O&P | E | vt Labour OPP | Ext E | Atta | chme | nt 1 350Total O&B |
| Quantity | | Description | EX | t. Mat. OaP | E) | | EXI. E | quipageizt | 0.01 | |
| | | Hangers, channel, steel, 16 gauge, 1- | | | | | | | | |
| 36 | 260529204110 | 5/8" x 13/16" | \$ | 240.48 | \$ | 342.00 | \$ | - | \$ | 582.48 |
| H 01 08 | | | \$ | 112,379.48 | \$ | 266,270.80 | \$ | - | \$ | 378,650.28 |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | | | |
| 2 | Port Power | Portable power cart | \$ | 14 230 02 | \$ | 693 77 | \$ | _ | \$ | 14 923 79 |
| _ | | Armored cable, PVC jacket, 600 V, 3 | Ŷ | 11,200.02 | Ŷ | 000.11 | Ų | | Ŷ | 11,020.10 |
| 140 | 260519200450 | conductor, #4, in cable tray | \$ | 106,906.80 | \$ | 39,382.00 | \$ | - | \$ | 146,288.80 |
| 8 | 260519200150 | Armored cable, copper, solid, 600 V, 2 conductor, #12, BX, exposed | \$ | 388.72 | \$ | 2,657.28 | \$ | - | \$ | 3,046.00 |
| 25 | 260519200250 | Armored cable, copper, solid, 600 V, 2 conductor, #10, BX, exposed | \$ | 2,389.75 | \$ | 9,471.75 | \$ | - | \$ | 11,861.50 |
| 8 | 260519252800 | Cable connectors, PVC jacket, 600 volt, #4-3 wire, #4-4 wire | \$ | 56.40 | \$ | 377.84 | \$ | - | \$ | 434.24 |
| 18 | 260519252200 | Cable connectors, armored, 600 volt, #14-4, #12-3 and #10-2 wire | \$ | 16.74 | \$ | 340.92 | \$ | - | \$ | 357.66 |
| 36 | 260529204110 | Hangers, channel, steel, 16 gauge, 1- 5/8" x 13/16" | \$ | 240.48 | \$ | 342.00 | \$ | - | \$ | 582.48 |
| 1 | 260583100600 | Motor connections, flexible conduit and fittings, 3 phase, 230 V, 75 kW motor | \$ | 142.04 | \$ | 503.43 | \$ | - | \$ | 645.47 |
| 35 | 260519350045 | Wire connector, screw type, insulated, #12 to #6 | \$ | 19.60 | \$ | 147.35 | \$ | - | \$ | 166.95 |
| 18 | 260519350040 | Wire connector, screw type, insulated, #14 to #8 | \$ | 6.84 | \$ | 64.98 | \$ | - | \$ | 71.82 |
| | | | \$ | 124,397.39 | \$ | 53,981.32 | \$ | - | \$ | 178,378.71 |
| H_01_09 | Noor 2020 | Unit Cost Estimato | | | | , | | | | |
| Dala Relea | ise : Year 2020 | | | | | | | | | |
| 102 | 262513306450 | pole | \$ | 8,660.82 | \$ | 4,817.46 | \$ | - | \$ | 13,478.28 |
| 36 | 260526800030 | Grounding rod, copper clad, 8' long, 1/2" diameter | \$ | 961.20 | \$ | 4,969.80 | \$ | - | \$ | 5,931.00 |
| 18 | 265633550680 | LED bollard pole, 10" diameter x 49" H, concrete base,W/SCH40 Steel pipe, 8W | \$ | 24,510.60 | \$ | 2,017.80 | \$ | - | \$ | 26,528.40 |
| 23 | 264113134640 | Aluminum bonding plates, I-beam, 8" square | \$ | 459.31 | \$ | 2,482,85 | \$ | _ | \$ | 2.942.16 |
| | | Aluminum bonding plates, I-beam, 8" | | | | , | | | | |
| 32 | 264113134640 | square | \$ | 639.04 | \$ | 3,454.40 | \$ | - | \$ | 4,093.44 |
| 480 | 260526807000 | welding kit, multi vertical | \$ | 404,985.60 | \$ | 45,590.40 | \$ | - | \$ | 450,576.00 |
| 15 | 260583100600 | Motor connections, flexible conduit and fittings, 3 phase, 230 V, 75 kW motor | \$ | 2,130.60 | \$ | 7,551.45 | \$ | - | \$ | 9,682.05 |
| | | Exothermic weld, exothermic welding | | | | | | | | |
| 8 | 260526802500 | vertical | \$ | 3,161.28 | \$ | 759.84 | \$ | - | \$ | 3,921.12 |
| | | Copper electrolytic ground rod system, | | | | | | | | |
| 80 | 260526805195 | long, incl exothermic weld connection | \$ | 288,360.00 | \$ | 60,619.20 | \$ | - | \$ | 348,979.20 |
| 65 | 260526802800 | Grounding connection, brazed, #6 wire | \$ | 1,232.40 | \$ | 4,115.80 | \$ | - | \$ | 5,348.20 |
| 42 | 260526803000 | Grounding connection, brazed, #2 wire | \$ | 1 076 46 | \$ | 3 180 34 | \$ | | \$ | 1 258 80 |
| 72 | _00020000000 | Bonding strap, copper, flexible braided | Ŷ | 1,070.40 | Ψ | 0,102.04 | Ŷ | - | Ψ | +,200.00 |
| 12 | 264113134740 | strap, 3/4" x 9 1/2" | \$ | 157.68 | \$ | 604.08 | \$ | - | \$ | 761.76 |
| 60 | 260519350020 | Wire connector, screw type, #18 to #12 | \$ | 5.40 | \$ | 189.60 | \$ | - | \$ | 195.00 |
| 24 | 260523200500 | Thermostat cable, jacket non-plenum, twisted, #18-2 conductor | \$ | 287.04 | \$ | 2,279.52 | \$ | - | \$ | 2,566.56 |
| | 0005000500 | Wireway, cross, 2-1/2" x 2-1/2", NEMA | • | 10- 11 | ¢ | / | • | | * | |
| 10 | 260533232300 | 1, to 10' high | \$ | 485.90 | \$ | 472.30 | \$ | - | \$ | 958.20 |

| CONTRATO | די איד די איד | | 1 | | | | EB-20 |)20-0290 .13 4 |
|------------|-----------------|---|---|----|--------------|-----------------|-----------------|-------------------|
| CONFID | ENTIAL A | TTORNEY WORK PRODUCT | | | | | Atta | chment 1 |
| Quantity | Line Number | Description | | E | xt. Mat. O&P | Ext. Labour O&P | Ext. EquRage 20 | 7 Of B50Total O&P |
| | | Exothermic weld, exothermic welding reusable mold, cable to cable, | | | | | | |
| 8 | 260526802520 | termination, Tee | | \$ | 3,118.56 | \$ 759.84 | \$- | \$ 3,878.40 |
| 210 | 260519201010 | conductor, 500 kcmil, in cable tray | | \$ | 1,469,034.00 | \$ 176,563.80 | \$- | \$ 1,645,597.80 |
| 460 | 260519200750 | Armored cable, PVC jacket, 600 V, 3 conductor, 4/0, in cable tray | | \$ | 1,142,226.00 | \$ 231,577.80 | \$- | \$ 1,373,803.80 |
| 185 | 260519200750 | Armored cable, PVC jacket, 600 V, 3 conductor, 4/0, in cable tray | | \$ | 459,373.50 | \$ 93,134.55 | \$- | \$ 552,508.05 |
| 10 | 260519200750 | Armored cable, PVC jacket, 600 V, 3 conductor, 4/0, in cable tray | | \$ | 24,831.00 | \$ 5,034.30 | \$- | \$ 29,865.30 |
| 20 | 260519200750 | Armored cable, PVC jacket, 600 V, 3 conductor, 4/0, in cable tray | | \$ | 49,662.00 | \$ 10,068.60 | \$- | \$ 59,730.60 |
| 1600 | 260519200750 | Armored cable, PVC jacket, 600 V, 3 conductor, 4/0, in cable tray | | \$ | 3.972.960.00 | \$ 805.488.00 | s - | \$ 4,778,448.00 |
| 260 | 260510200650 | Armored cable, PVC jacket, 600 V, 3 | | ¢ | 347 100 00 | \$ 116.048.40 | 2 | \$ 463 148 40 |
| 200 | 200510200000 | Armored cable, PVC jacket, 600 V, 3 | | • | 0.010.00 | 0.070.04 | • | ¢ +00,1+0.+0 |
| 6 | 260519200650 | Armored cable, PVC jacket, 600 V, 3 | | \$ | 8,010.00 | \$ 2,678.04 | \$- | \$ 10,688.04 |
| 25 | 260519200650 | conductor, 2/0, in cable tray | | \$ | 33,375.00 | \$ 11,158.50 | \$- | \$ 44,533.50 |
| 8 | 260519200450 | conductor, #4, in cable tray | | \$ | 6,108.96 | \$ 2,250.40 | \$- | \$ 8,359.36 |
| 1 | Ground Test | Ground testing | | | | \$ 693.72 | \$- | \$ 693.72 |
| H 01 10 | | | | \$ | 8,252,912.35 | \$ 1,598,562.79 | \$- | \$ 9,851,475.14 |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | |
| 4 | 260526800030 | Grounding rod, copper clad, 8' long, 1/2" diameter | | \$ | 106.80 | \$ 552.20 | \$- | \$ 659.00 |
| | | | | | | | | |
| 4 | 260526802800 | Grounding connection, brazed, #6 wire | | \$ | 75.84 | \$ 253.28 | \$- | \$ 329.12 |
| 4 | 260526802800 | Grounding connection, brazed, #6 wire | | \$ | 75.84 | \$ 253.28 | \$- | \$ 329.12 |
| 16 | 260526802800 | Grounding connection, brazed, #6 wire | | \$ | 303.36 | \$ 1,013.12 | \$ - | \$ 1,316.48 |
| | | Ground wire, copper wire, bare | | | | | | |
| 42 | 260526801000 | stranded, 4/0 | | \$ | 20,858.04 | \$ 11,160.66 | \$- | \$ 32,018.70 |
| 55 | 260526801240 | Ground wire, copper wire, bare stranded, 500 kcmil | | \$ | 50,810.10 | \$ 24,548.70 | \$- | \$ 75,358.80 |
| 1 | Ground Test | Ground testing | | \$ | - | \$ 693.72 | \$ - | \$ 693.72 |
| | | | | \$ | 72 229 98 | \$ 38 474 96 | \$ | \$ 110 704 94 |
| H_01_11 | | | | Ť | , | • •••• | • | • |
| Data Relea | ase : Year 2020 | Unit Cost Estimate | | | | | | |
| 33 | 264113130520 | Air terminal and base, copper, 1/2" dia x 24", over 75' high | | \$ | 1,550.67 | \$ 3,425.40 | \$- | \$ 4,976.07 |
| 4 | 264113134320 | Aluminum air terminal base, bolted base for aluminum terminal, 1/2" | | \$ | 64.08 | \$ 336.32 | \$- | \$ 400.40 |
| 24 | 264113134370 | Aluminum air terminal base, tee connector base for 1aluminum air terminal, 1/2" | | \$ | 422.88 | \$ 1,395.12 | \$- | \$ 1,818.00 |
| 6 | Down Cond | Down conductor to arounding electrode | | \$ | 1 815 00 | \$ 346.88 | \$ - | \$ 2 161 88 |

| | Filed 2021-08-17 EB-2020-0290 | | | | | | | | | | | | | |
|---------|----------------------------------|--------------------------------------|-------------------|-------|-------|---------------|----|-----------------|----|---------------|----------|---------------|--|--|
| | | | | | | | | | | EB-20 | 20-0 | 290 | | |
| CONFI | DENTIAL A | TTORNEY WORK PRODUCT | [| | | | | | | • · · | . ' | J3.4 | | |
| | | | | | | | | | | Attac | hme | nt 1 | | |
| Quant | ty Line Number | Description | | | | Ext. Mat. O&P | E | Ext. Labour O&P | Ex | t. EquRage 26 | 68 of | 350Total O&P | | |
| | | | | | | | | | | | | | | |
| | | Ground wire, ground have armored #4- | | | | | | | | | | | | |
| 400 | 260526800280 | 1 conductor | | | \$ | 68.352.00 | \$ | 188.916.00 | \$ | - | \$ | 257,268,00 | | |
| | | | | | • | , | Ť | , | | | Ŧ | | | |
| | | | | | | | | | | | | | | |
| | Links Tools | I fail the manufacture to a the m | | | • | | | 000 70 | • | | • | 000 70 | | |
| 1 | Light Test | Lighting protection testing | | | \$-\$ | | \$ | 693.72 | \$ | - | \$ | 693.72 | | |
| | | | | | ¢ | 70 004 62 | • | 405 442 44 | ¢ | | ¢ | 267 249 07 | | |
| | 2 | | | | Þ | 12,204.03 | Þ | 195,115.44 | Þ | - | Þ | 207,310.07 | | |
| | 2 | Unit On at Eatimate | | | | | | | | | | | | |
| Data Re | lease : Year 2020 | Unit Cost Estimate | | | | | • | 500.000.00 | | | <u>^</u> | | | |
| 1 | Study | Short Circuit /Coordination Study | | | | | \$ | 500,000.00 | | | \$ | 500,000.00 | | |
| | | | | | • | | • | | • | | • | | | |
| | | | | | \$ | - | \$ | 500,000.00 | \$ | - | \$ | 500,000.00 | | |
| | | | | | | 12 542 006 50 | | 2 240 574 64 | - | | 1 | 46 704 470 44 | | |
| | | | | 4.5 | \$ | 13,542,906.50 | \$ | 3,248,571.64 | \$ | - | \$ | 16,/91,4/8.14 | | |
| | | | Labor factor 2.5x | 1.5 | | | \$ | 4,8/2,85/.46 | | | \$ | 4,8/2,85/.46 | | |
| | | | | Total | \$ | 13,542,906.50 | \$ | 8,121,429.11 | | | Ş | 21,664,335.61 | | |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 269 of 350

| Quantity | Line Number | Description | | E | xt. Mat. O&P | Ext. | Labour O&P | E | xt. Equip. O&P | E> | tt. Total O&P |
|------------|-----------------|--|--|----|--------------|------|------------|----|-------------------|----|---------------|
| H 02 01 | | | | | | | | | | | |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| 182 | 265113553020 | Interior LED fixtures, linear, suspended mounted, 74 watt, two light bar 4' long, incl lamps, mounting hardware and connections | | \$ | 70,947.24 | \$ | 24,180.52 | \$ | _ | \$ | 95,127.76 |
| 96 | 265113553020 | Interior LED fixtures, linear, suspended mounted, 74 watt, two light bar 4' long, incl lamps, mounting hardware and connections | | \$ | 37,422.72 | \$ | 12,754.56 | \$ | _ | \$ | 50,177.28 |
| 52 | 265113553020 | Interior LED fixtures, linear, suspended mounted, 74 watt, two light bar 4' long, incl lamps, mounting hardware and connections Interior LED fixtures, linear, suspended | | \$ | 20,270.64 | \$ | 6,908.72 | \$ | - | \$ | 27,179.36 |
| 33 | 265113553020 | incl lamps, mounting hardware and connections | | \$ | 12,864.06 | \$ | 4,384.38 | \$ | - | \$ | 17,248.44 |
| 1 | 265636550130 | LED floodlights, pole mounted, 288 watt, incl ballast and lamp, excl pole | | \$ | 2,349.60 | \$ | 189.95 | \$ | - | \$ | 2,539.55 |
| 1 | 265613103000 | Light poles, anchor base, aluminum, 20' high, excl concrete bases | | \$ | 1,281.60 | \$ | 653.94 | \$ | 84.01 | \$ | 2,019.55 |
| 7 | 265113403120 | High pressure sodium fixture, interior, vaporproof, wall, 100 W, incl lamps and mounting hardware | | \$ | 7,849.80 | \$ | 1,772.89 | \$ | - | \$ | 9,622.69 |
| 387 | 260529204650 | Junction boxes, steel channel, 1 channel | | \$ | 16,946.73 | \$ | 18,278.01 | \$ | - | \$ | 35,224.74 |
| 2200 | 260519200400 | Armored cable, PVC jacket, 600 V, 3 conductor, #6, in cable tray | | \$ | 1,374,516.00 | \$ | 538,934.00 | \$ | - | \$ | 1,913,450.00 |
| 810 | 260519252700 | Cable connectors, PVC jacket, 600 volt, #6-3 wire, #6-4 wire | | \$ | 5,710.50 | \$ | 38,256.30 | \$ | - | \$ | 43,966.80 |
| | | | | \$ | 1,550,158.89 | \$ | 646,313.27 | \$ | 84.01 | \$ | 2,196,556.17 |
| H_02_02 | | | | | | | | | | | |
| Data Relea | ise : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| 51 | 265213160200 | Exit lighting, LED standard, single face, ceiling or wall mount | | \$ | 2,968.71 | \$ | 4,843.98 | \$ | - | \$ | 7,812.69 |
| 2 | 265213160220 | Exit lighting, LED standard, double face, ceiling or wall mount | | \$ | 121.76 | \$ | 226.28 | \$ | - | \$ | 348.04 |
| 83 | 265213103060 | Solid state battery charger, 1 phase, 208/240/480V, 18 cell, incl wall bracket | | \$ | 177,288.00 | \$ | 107,692.50 | \$ | - | \$ | 284,980.50 |
| 83 | 262726202460 | Duplex receptacle, grounded, 120 volt, 15 amp | | \$ | 157.70 | \$ | 1,572.02 | \$ | - | \$ | 1,729.72 |
| 420 | 260519900020 | Wire, copper solid, 600 volt, #14, type THW, normal installation conditions in wireway, conduit, cable tray | | \$ | 3,074.40 | \$ | 24,414.60 | \$ | - | \$ | 27,489.00 |
| | | | | \$ | 183,610.57 | \$ | 138,749.38 | \$ | - | \$ | 322,359.95 |
| H_02_03 | | | | | | | | | | | |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| 18 | 262726202460 | Duplex receptacle, grounded, 120 volt, 15 amp | | \$ | 34.20 | \$ | 340.92 | \$ | - | \$ | 375.12 |

| | | | | | | _ | | E | xt. Equip. | | |
|----------|--------------|--|--|-----|------------|-----|--------------|----|------------|----|--------------|
| Quantity | Line Number | Description | | Ext | . Mat. O&P | Ext | . Labour O&P | | O&P | Ex | t. Total O&P |
| 47 | 262726202460 | Duplex receptacle, grounded, 120 volt, 15 amp | | \$ | 89.30 | \$ | 890.18 | \$ | - | \$ | 979.48 |
| 11 | 262726204100 | Receptacle, locking, 20 amp, 125 volt, NEMA L5 | | \$ | 323.07 | \$ | 308.33 | \$ | - | \$ | 631.40 |
| 12 | 262726204100 | Receptacle, locking, 20 amp, 125 volt, NEMA L5 | | \$ | 352.44 | \$ | 336.36 | \$ | - | \$ | 688.80 |
| 1800 | 260519200050 | Armored cable, copper, solid, 600 V, 2 conductor, #14, BX, exposed | | \$ | 82,656.00 | \$ | 569,862.00 | \$ | - | \$ | 652,518.00 |
| 210 | 260519250100 | Cable connectors, nonmetallic, 600 volt, #14-2 wire | | \$ | 422.10 | \$ | 995.40 | \$ | - | \$ | 1,417.50 |
| 6 | 262726204040 | Receptacle, 3 pole, 60 amp, 250 volt, NEMA 15 | | \$ | 775.38 | \$ | 569.88 | \$ | - | \$ | 1,345.26 |
| 2 | 260529204650 | Junction boxes, steel channel, 1 channel | | \$ | 87.58 | \$ | 94.46 | \$ | - | \$ | 182.04 |
| 56 | 260519200650 | Armored cable, PVC jacket, 600 V, 3 conductor, 2/0, in cable tray | | \$ | 74,760.00 | \$ | 24,995.04 | \$ | - | \$ | 99,755.04 |
| 12 | 260519350200 | Terminal lugs, solderless, 1/0 to 2/0 | | \$ | 22.32 | \$ | 566.76 | \$ | - | \$ | 589.08 |
| 4 | 260519350100 | Terminal lugs, solderless, #8 to #4 | | \$ | 3.48 | \$ | 101.72 | \$ | - | \$ | 105.20 |
| 150 | 260519200450 | Armored cable, PVC jacket, 600 V, 3 conductor, #4, in cable tray | | \$ | 114,543.00 | \$ | 42,195.00 | \$ | - | \$ | 156,738.00 |
| 150 | 260526800370 | Ground wire, copper wire, bare solid, #4 | | \$ | 17,301.00 | \$ | 14,247.00 | \$ | - | \$ | 31,548.00 |
| 40 | 260519350100 | Terminal lugs, solderless, #8 to #4 | | \$ | 34.80 | \$ | 1,017.20 | \$ | - | \$ | 1,052.00 |
| 13 | 260519350100 | Terminal lugs, solderless, #8 to #4 | | \$ | 11.31 | \$ | 330.59 | \$ | - | \$ | 341.90 |
| 1 | 262726204040 | Receptacle, 3 pole, 60 amp, 250 volt, NEMA 15 | | \$ | 129.23 | \$ | 94.98 | \$ | - | \$ | 224.21 |
| 1 | 262726204520 | Receptacle, locking, 30 amp, 600 volt, NEMA L9 | | \$ | 47.53 | \$ | 50.34 | \$ | - | \$ | 97.87 |
| 4 | 260583100600 | Motor connections, flexible conduit and fittings, 3 phase, 230 V, 75 kW motor | | \$ | 568.16 | \$ | 2,013.72 | \$ | - | \$ | 2,581.88 |
| 4 | 260583100600 | Motor connections, flexible conduit and fittings, 3 phase, 230 V, 75 kW motor | | \$ | 568.16 | \$ | 2,013.72 | \$ | - | \$ | 2,581.88 |
| 150 | 260519200150 | Armored cable, copper, solid, 600 V, 2 conductor, #12, BX, exposed | | \$ | 7,288.50 | \$ | 49,824.00 | \$ | - | \$ | 57,112.50 |
| 150 | 260526800330 | Ground wire, copper wire, bare solid, #12 | | \$ | 2,266.50 | \$ | 8,719.50 | \$ | - | \$ | 10,986.00 |
| 35 | 260519350020 | Wire connector, screw type, #18 to #12 | | \$ | 3.15 | \$ | 110.60 | \$ | - | \$ | 113.75 |
| 18 | 260519350040 | Wire connector, screw type, insulated, #14 to #8 | | \$ | 6.84 | \$ | 64.98 | \$ | - | \$ | 71.82 |
| 4 | 260583100600 | Motor connections, flexible conduit and fittings, 3 phase, 230 V, 75 kW motor | | \$ | 568.16 | \$ | 2,013.72 | \$ | - | \$ | 2,581.88 |
| 210 | 260519200150 | Armored cable, copper, solid, 600 V, 2 conductor, #12, BX, exposed | | \$ | 10,203.90 | \$ | 69,753.60 | \$ | - | \$ | 79,957.50 |
| 8 | 260519250200 | Cable connectors, nonmetallic, 600 volt, #14-3 wire to #12-2 wire | | \$ | 16.08 | \$ | 45.68 | \$ | _ | \$ | 61.76 |
| | | Rigid galvanized steel conduit, 1-1/2" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 | | | | ÷ | | • | | · | |
| 150 | 260533131850 | couplings per 100 LF | | \$ | 1,642.50 | \$ | 2,071.50 | \$ | - | \$ | 3,714.00 |

| | | | | | | | | - | | | |
|------------|-----------------|--|--|----|-------------|------|------------|----|-------------------|--------|---|
| Quantity | Line Number | Description | | E | t. Mat. O&P | Ext. | Labour O&P | E | xt. Equip. O&P | Ex | t. Total O&P |
| 44 | 260533180200 | Pull boxes, steel, type SC, 8" W x 8" H x 4" D, NEMA 1 | | \$ | 667.48 | \$ | 4,179.12 | \$ | <u>-</u> | \$ | 4,846.60 |
| 5 | 260533180220 | Pull boxes, steel, type SC, 12" W x 12" H x 4" D, NEMA 1 | | \$ | 138.85 | \$ | 581.30 | \$ | - | \$ | 720.15 |
| | | | | \$ | 315.531.02 | \$ | 798.387.60 | \$ | | \$ | 1.113.918.62 |
| H_02_04 | | | | Ċ | , | | | Ċ | | | , |
| Data Relea | ise : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| 150 | 260519200900 | Armored cable, PVC jacket, 600 V, 3 conductor, 500 kcmil, in cable tray | | \$ | 801,000.00 | \$ | 113,661.00 | \$ | - | \$ | 914,661.00 |
| 55 | 260519200150 | Armored cable, copper, solid, 600 V, 2 conductor, #12, BX, exposed | | \$ | 2,672.45 | \$ | 18,268.80 | \$ | - | \$ | 20,941.25 |
| 58 | 260510200150 | Armored cable, copper, solid, 600 V, 2 | | ¢ | 2 818 22 | ¢ | 10 265 28 | ¢ | | ¢ | 22.083.50 |
| | 200319200130 | Armored cable, PVC jacket, 600 V, 3 | | Ŷ | 2,010.22 | φ | 0.504.00 | ¢ | | ф Ф | 45 507 40 |
| 18 | 260519200700 | conductor, 3/0, in cable tray | | \$ | 37,006.20 | \$ | 8,501.22 | \$ | - | \$ | 45,507.42 |
| 165 | 260519200450 | Armored cable, PVC jacket, 600 V, 3 conductor, #4, in cable tray | | \$ | 125,997.30 | \$ | 46,414.50 | \$ | - | \$ | 172,411.80 |
| 94 | 260519200150 | Armored cable, copper, solid, 600 V, 2 conductor, #12, BX, exposed | | \$ | 4,567.46 | \$ | 31,223.04 | \$ | - | \$ | 35,790.50 |
| 65 | 260519200250 | Armored cable, copper, solid, 600 V, 2 conductor, #10, BX, exposed | | \$ | 6,213.35 | \$ | 24,626.55 | \$ | - | \$ | 30,839.90 |
| 160 | 260519200700 | Armored cable, PVC jacket, 600 V, 3 conductor, 3/0, in cable tray | | \$ | 328,944.00 | \$ | 75,566.40 | \$ | _ | \$ | 404,510.40 |
| 100 | 260519200150 | Armored cable, copper, solid, 600 V, 2 conductor, #12, BX, exposed | | \$ | 4,859.00 | \$ | 33,216.00 | \$ | - | \$ | 38,075.00 |
| 210 | 260519200340 | Armored cable, copper, stranded, 600 V, 2 conductor, #8, BX, exposed | | \$ | 63,470.40 | \$ | 105,720.30 | \$ | - | \$ | 169,190.70 |
| 26 | 260519350450 | Terminal lugs solderless 500 kcmil | | \$ | 238.68 | \$ | 3 292 64 | \$ | _ | \$ | 3 531 32 |
| | | | | Ŷ | 200.00 | Ţ | 0,202101 | Ŷ | | Ţ | 0,001102 |
| 14 | 260519350400 | Terminal lugs, solderless, 350 kcmil | | \$ | 70.14 | \$ | 1,511.30 | \$ | - | \$ | 1,581.44 |
| 14 | 260519350350 | Terminal lugs, solderless, 250 kcmil | | \$ | 51.38 | \$ | 1,177.12 | \$ | | \$ | 1,228.50 |
| 40 | 260519350250 | Terminal lugs, solderless, 3/0 | | \$ | 220.00 | \$ | 2,532.80 | \$ | - | \$ | 2,752.80 |
| 29 | 260519350200 | Terminal lugs, solderless, 1/0 to 2/0 | | \$ | 53.94 | \$ | 1,369.67 | \$ | - | \$ | 1,423.61 |
| 10 | 260519350200 | Terminal lugs, solderless, 1/0 to 2/0 | | \$ | 18.60 | \$ | 472.30 | \$ | - | \$ | 490.90 |
| 14 | 260519350150 | Terminal lugs, solderless. #2 to #1 | | \$ | 13.02 | \$ | 479.50 | \$ | _ | \$ | 492.52 |
| | | 0 , | | • | | Ŧ | | - | | Ŧ | |
| 8 | 260519350100 | Terminal lugs, solderless, #8 to #4 | | \$ | 6.96 | \$ | 203.44 | \$ | - | \$ | 210.40 |

| | | | | | | | | | | age <u>_</u> e. e | | |
|------------|----------------|--|-------------------|-------|-------------|--------------|------|--------------|----|-------------------|-----|--------------|
| Quantity | Line Number | Description | | | E | xt. Mat. O&P | Ext | . Labour O&P | E | xt. Equip. | E> | t. Total O&P |
| | | | | | | | | | | Odi | | |
| | | Crimp 1 hole lugs, copper or aluminum. | | | | | | | | | | |
| 14 | 260519352000 | 600 volt, #4 | | | \$ | 66.08 | \$ | 392.42 | \$ | - | \$ | 458.50 |
| | | | | | | | | | | | | |
| | 000540054700 | Crimp 1 hole lugs, copper or aluminum, | | | • | 77.00 | • | 000.00 | • | | • | 4 04 4 00 |
| 44 | 260519351780 | 600 Volt, #8 | | | \$ | //.88 | \$ | 936.32 | \$ | - | \$ | 1,014.20 |
| | | Crimp 1 hole lugs copper or aluminum | | | | | | | | | | |
| 80 | 260519351640 | 600 volt, #10 | | | \$ | 93.60 | \$ | 1,349.60 | \$ | - | \$ | 1,443.20 |
| | | | | | | | | | | | | |
| <u></u> | 000540054000 | Crimp 1 hole lugs, copper or aluminum, | | | ۴ | 70 54 | ¢ | 020.20 | ¢ | | ¢ | 1 014 04 |
| 02 | 200519351030 | 600 Volt, #12 | | | Þ | 72.04 | Ф | 939.30 | Þ | - | Ф | 1,011.84 |
| | | Crimp 1 hole lugs, copper or aluminum. | | | | | | | | | | |
| 14 | 260519351620 | 600 volt, #14 | | | \$ | 9.66 | \$ | 177.24 | \$ | - | \$ | 186.90 |
| | | | | | • | | • | | • | | • | |
| H 02 05 | | | | | \$ | 1,378,540.86 | \$ | 491,296.74 | \$ | - | \$ | 1,869,837.60 |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | Thermostat cable, jacket non-plenum, | | | | | | | | | | |
| 60 | 260523200500 | twisted, #18-2 conductor | | | \$ | 717.60 | \$ | 5,698.80 | \$ | - | \$ | 6,416.40 |
| | | Thermostat cable jacket non-plenum | | | | | | | | | | |
| 20 | 260523200500 | twisted, #18-2 conductor | | | \$ | 239.20 | \$ | 1,899.60 | \$ | - | \$ | 2,138.80 |
| | | Thermostat, residential, hook-up, using | | | | | | | | | | |
| | | low voltage wire, heating only, 25' of | | | | | | | | | | |
| 2 | 260590109520 | #18-3 | | | \$ | 15.92 | \$ | 63.32 | \$ | - | \$ | 79.24 |
| | | | | | | | | | | | | |
| 2 | Light Ind | Heat Tracing Light Indicator | | | \$ | 200.00 | \$ | 173.44 | \$ | - | \$ | 373.44 |
| | | Junction boxes, steel channel, 1 | | | | | | | | | | |
| 2 | 260529204650 | channel | | | \$ | 87.58 | \$ | 94.46 | \$ | - | \$ | 182.04 |
| | | Duplex receptacle, arounded, 120 volt | | | | | | | | | | |
| 2 | 262726202460 | 15 amp | | | \$ | 3.80 | \$ | 37.88 | \$ | - | \$ | 41.68 |
| | | Armorad apple conner colid 600 V/ 2 | | | | | | | | | | |
| 40 | 260519200150 | conductor, #12, BX, exposed | | | \$ | 1,943.60 | \$ | 13,286.40 | \$ | - | \$ | 15,230.00 |
| | | | | | | | | | | | | |
| 50 | 260519200150 | conductor, #12, BX, exposed | | | \$ | 2,429,50 | \$ | 16,608.00 | \$ | - | \$ | 19.037.50 |
| | | , | | | Ŷ | 2,.20.00 | Ť | . 0,000.00 | * | | * | , |
| 20 | 260510200450 | Armored cable, PVC jacket, 600 V, 3 | | | ¢ | 15 272 40 | ¢ | 5 626 00 | ¢ | | ¢ | 20 808 40 |
| 20 | 200010200400 | conductor, <i>m</i>-1 , in cable tray | | | ψ | 10,272.40 | ψ | 0,020.00 | ψ | | ψ | 20,030.40 |
| 40 | | Crimp 1 hole lugs, copper or aluminum, | | | | | | | | | | |
| 12 | 260519351630 | 600 Volt, #12 | | | \$ | 14.04 | \$ | 181.80 | \$ | - | \$ | 195.84 |
| | | Motor connections, flexible conduit and | | | | | | | | | | |
| 6 | 260583100600 | fittings, 3 phase, 230 V, 75 kW motor | | | \$ | 852.24 | \$ | 3,020.58 | \$ | - | \$ | 3,872.82 |
| | | | | | | | | | | | | |
| | | | | | | 04 05 | • | 10 000 00 | • | | | 00 (00 10 |
| | | | | | \$ | 21,775.88 | \$ | 46,690.28 | \$ | - | \$ | 68,466.16 |
| | | | | | \$ | 3,449,617.22 | \$ | 2,121,437.27 | \$ | 84.01 | \$ | 5,571,138.50 |
| | | | Labor factor 2.5x | 1.5 | | | \$ | 3,182,155.91 | æ | | \$ | 3,182,155.91 |
| | | | | Iotal | \$ 3 | 5,449,617.22 | \$ 5 | 0,303,593.18 | \$ | 84.01 | \$8 | ,/53,294.41 |

| Quantity | Line Number | Description | | Ext. | Mat. O&P | Ext | . Labour O&P | Ext. | Equip. O&P | Ext | Total O&P |
|------------|-----------------|--|----|------|-----------|-----|--------------|------|------------|-----|------------|
| H 03 01 | | | | | | | | | | | |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| 1 | 628411-K67870-5 | Detection system, fire alarm control panel, addressable without voice, up to 200 points, excluding wires & conduits | In | \$ | 48,615.92 | \$ | 1,560.97 | \$ | | \$ | 50,176.89 |
| 1 | 284620507800 | Detection system, remote annunciator, 8 zone lamp, excluding wires & conduits | | \$ | 305.46 | \$ | 386.37 | \$ | - | \$ | 691.83 |
| 18 | 284620504800 | Detection system, signal bell for fire alarm, trouble buzzer or manual station, excluding wires & conduits | | \$ | 2 300 76 | \$ | 1 571 22 | \$ | _ | \$ | 3 871 98 |
| | 201020001000 | | | ÷ | 2,000.10 | Ť | 1,011122 | Ť | | Ŷ | 0,01 1100 |
| 33 | 284611275240 | Detection system, smoke detector, addressable type, excl. wires & conduit | | \$ | 10,642.83 | \$ | 3,840.87 | \$ | - | \$ | 14,483.70 |
| 6 | 284611278440 | Fire alarm, fireray 5000, fire alarm beam detector, motorized reflective, infrared optical beam | | \$ | 6,489.48 | \$ | 5,237.46 | \$ | - | \$ | 11,726.94 |
| 1 | 284611275420 | Detection system, smoke detector, duct | | \$ | 753 83 | \$ | 217 51 | \$ | _ | \$ | 971 34 |
| 50 | 284611505010 | Detection system, fire alarm, detector, heat (addressable type), excl. wires & conduit | | \$ | 16,191.00 | \$ | 4,817.50 | \$ | - | \$ | 21,008.50 |
| 3 | 284620505460 | Detection system, remote fire alarm indicator light | | \$ | 108.15 | \$ | 394.95 | \$ | - | \$ | 503.10 |
| 29 | 263623100030 | Automatic transfer switches, enclosed, 2 pole, 120/240 volt, 100 amp | | \$ | 68,912.70 | \$ | 16,255.08 | \$ | - | \$ | 85,167.78 |
| 4 | 281511110950 | Access control equipment, switch, tamper | | \$ | 228.12 | \$ | 1,163.88 | \$ | - | \$ | 1,392.00 |
| 4 | 260583100020 | Motor connections, flexible conduit and fittings, 1 phase, 115 V, up to 0.75 kW motor | | \$ | 27.76 | \$ | 379.92 | \$ | - | \$ | 407.68 |
| 2100 | 260519905390 | Wire, copper, solid, 600 volt, #14, type XLPE-USE (RHW), normal installation conditions in wireway, conduit, cable trav | | \$ | 29.274.00 | \$ | 132.972.00 | \$ | <u>-</u> | \$ | 162.246.00 |
| 300 | 260519905390 | Wire, copper, solid, 600 volt, #14, type XLPE-USE (RHW), normal installation conditions in wireway, conduit, cable trav | | \$ | 4 182 00 | \$ | 18,996.00 | \$ | _ | \$ | 23 178 00 |
| | | Wire, copper, stranded, 600 volt, #12, type THW, normal installation conditions in wireway, conduit, cable | | Ŷ | 1,102.00 | Ŷ | 10,000.00 | Ŷ | | Ŷ | 20,110.00 |
| 150 | 260519900100 | tray | | \$ | 2,427.00 | \$ | 10,354.50 | \$ | - | \$ | 12,781.50 |
| 340 | 260519350020 | Wire connector, screw type, #18 to #12 | | \$ | 30.60 | \$ | 1,074.40 | \$ | - | \$ | 1,105.00 |
| 600 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ | 31,398.00 | \$ | 50,448.00 | \$ | - | \$ | 81,846.00 |
| 600 | 260523200150 | Fixture wire, stranded, 600 volt 90 Deg. C. #16 TEEN | | \$ | 8 712 00 | \$ | 34 878 00 | \$ | _ | \$ | 43 590 00 |
| 000 | | | | Ψ | 0,112.00 | Ŷ | 01,010.00 | Ŷ | | ¥ | 10,000.00 |
| 150 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ | 7,849.50 | \$ | 12,612.00 | \$ | - | \$ | 20,461.50 |

| Quantity | Line Number | Description | | Ex | t. Mat. O&P | Ext | . Labour O&P | Ext | . Equip. O&P | Ext | t. Total O&P |
|-----------------------|----------------|---|--|----|-------------|-----|--------------|-----|--------------|-----|--------------|
| 1800 | 260533135040 | Electric metallic tubing (EMT), 1" diameter, to 10' high, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF | | \$ | 3,798.00 | \$ | 11,862.00 | \$ | | \$ | 15,660.00 |
| 125 | 260533250300 | Conduit fittings for rigid galvanized steel, standard, locknuts, 1" diameter | | \$ | 91.25 | \$ | 1,890.00 | \$ | - | \$ | 1,981.25 |
| 75 | 260519252700 | Cable connectors, PVC jacket, 600 volt, #6-3 wire, #6-4 wire | | \$ | 528.75 | \$ | 3,542.25 | \$ | - | \$ | 4,071.00 |
| 20 | 260533139190 | PVC conduit, schedule 40, 4" diameter, to 10' H, incl terminations, fittings, & support | | \$ | 134.60 | \$ | 337.40 | \$ | - | \$ | 472.00 |
| 1 | Fire Test | Fire Alarm Testing | | \$ | 11,100.00 | \$ | 11,100.00 | \$ | - | \$ | 22,200.00 |
| 11 02 02 | | | | \$ | 254,101.71 | \$ | 325,892.28 | \$ | - | \$ | 579,993.99 |
| H_03_02 Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |
| 18 | 260533161300 | Outlet boxes, pressed steel, concrete, for telephone, pedestal mounted, add | | \$ | 2,383.74 | \$ | 457.74 | \$ | - | \$ | 2,841.48 |
| 2 | 260533161300 | Outlet boxes, pressed steel, concrete, for telephone, pedestal mounted, add | | \$ | 264.86 | \$ | 50.86 | \$ | | \$ | 315.72 |
| 2750 | 260519133040 | Underecarpet, top shield, for 25 pair cable | | \$ | 2,777.50 | \$ | 495.00 | \$ | - | \$ | 3,272.50 |
| 2750 | 260519133720 | Underecarpet, data cable-bulk, dual lead | | \$ | 17,325.00 | \$ | 1,430.00 | \$ | | \$ | 18,755.00 |
| 74 | 101716100300 | Telephone enclosures, shelf type, wall hung, recessed | | \$ | 94,589.02 | \$ | 18,072.28 | \$ | - | \$ | 112,661.30 |
| 1 | 262716107050 | Cabinets, current transformer, single door, 24" H x 24" W x 10" D | | \$ | 201.85 | \$ | 472.29 | \$ | - | \$ | 674.14 |
| 1 | 272129101300 | Switching and routing equipment, network switch, 50/60 HZ, 8 port, multi- platform, analog KVM | | \$ | 1,361.70 | \$ | 111.07 | \$ | - | \$ | 1,472.77 |
| 3 | 271119102960 | Patch panel, jack RJ-45/110 type, 24 ports | | \$ | 647.22 | \$ | 759.81 | \$ | | \$ | 1,407.03 |
| 2 | 271119102960 | Patch panel, jack RJ-45/110 type, 24 ports | | \$ | 431.48 | \$ | 506.54 | \$ | - | \$ | 938.02 |
| 5 | 260543204000 | Underfloor duct, outlet, low tension (telephone, computer, etc) | | \$ | 608.75 | \$ | 474.90 | \$ | - | \$ | 1,083.65 |
| 1120 | 271501191850 | Fire alarm cable, FEP teflon, 150 V, to 200 Deg.C, #18, 1 pair | | \$ | 89,118.40 | \$ | 106,377.60 | \$ | | \$ | 195,496.00 |
| | | Rigid galvanized steel conduit, 3" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 | | | | | | | | | |
| 20 | 260533131930 | couplings per 100 LF | | \$ | 371.60 | \$ | 602.00 | \$ | - | \$ | 973.60 |
| H_03_03 | | | | \$ | 210,081.12 | \$ | 129,810.09 | \$ | - | \$ | 339,891.21 |
| Data Relea | se : Year 2020 | Unit Cost Estimate | | | | | | | | | |
| | | | | | | | | | | | |

| Quantity | Line Number | Description | | | E | xt. Mat. O&P | Ex | t. Labour O&P | Ext | t. Equip. O&P | Ex | t. Total O&P |
|------------|----------------|--|-------------------|-------|----|--------------|---------|---------------|-----|---------------|-----|--------------|
| 20 | 260536100200 | Cable tray, ladder type, galvanized steel, 4" deep, 4" rung spacing, 12" wide, to 15' elevation, incl fittings & supports | | | \$ | 421.80 | \$ | 353.00 | \$ | _ | \$ | 774.80 |
| 18 | 260536100400 | Cable tray, ladder type, galvanized steel, 4" deep, 4" rung spacing, 18" wide, to 15' elevation, incl fittings & supports | | | \$ | 442.08 | \$ | 332.64 | \$ | - | \$ | 774.72 |
| 440 | 260536100400 | Cable tray, ladder type, galvanized steel, 4" deep, 4" rung spacing, 18" wide, to 15' elevation, incl fittings & supports | | | \$ | 10,806.40 | \$ | 8,131.20 | \$ | <u>-</u> | \$ | 18,937.60 |
| 16 | 078413100230 | Firestopping, metallic piping, insulated, through walls, 300mm dia | | | \$ | 687.52 | \$ | 1,261.60 | \$ | | \$ | 1,949.12 |
| | | | | | \$ | 12,357.80 | \$ | 10,078.44 | \$ | - | \$ | 22,436.24 |
| H_03_04 | so : Voar 2020 | Unit Cost Estimate | | | | | | | | | | |
| Data Nelea | Se . Teal 2020 | onit oost Estimate | | | | | | | | | | |
| | | | | | | | | | | | | |
| 31 | 275119100400 | Sound system, speaker, ceiling or wall, excl rough-in wires, cables & conduits | | | \$ | 5,727.56 | \$ | 2,944.38 | \$ | - | \$ | 8,671.94 |
| 2 | 275119100400 | Sound system, speaker, ceiling or wall, excl rough-in wires, cables & conduits | | | \$ | 369.52 | \$ | 189.96 | \$ | - | \$ | 559.48 |
| 1 | 275119100400 | Sound system, speaker, ceiling or wall, excl rough-in wires, cables & conduits | | | \$ | 184.76 | \$ | 94.98 | \$ | - | \$ | 279.74 |
| 4 | 260529204650 | Junction boxes, steel channel, 1 channel | | | \$ | 175.16 | \$ | 188.92 | \$ | - | \$ | 364.08 |
| 18 | 260533180300 | Pull boxes, steel, type SC, 10" W x 12" H x 6" D, NEMA 1 | | | \$ | 644.04 | \$ | 2,578.32 | \$ | - | \$ | 3,222.36 |
| 1470 | 260519905390 | Wire, copper, solid, 600 volt, #14, type XLPE-USE (RHW), normal installation conditions in wireway, conduit, cable tray | | | \$ | 20,491.80 | \$ | 93,080.40 | \$ | <u>-</u> | \$ | 113,572.20 |
| | | | | | | | | | | | | |
| 75 | 260519350040 | #14 to #8 | | | \$ | 28.50 | \$ | 270.75 | \$ | - | \$ | 299.25 |
| | | | | | | | | | | | | |
| 220 | 260529204130 | Channel, steel, 12 gauge, 1-5/8" x 7/8" | | | \$ | 1,480.60 | \$ | 2,387.00 | \$ | - | \$ | 3,867.60 |
| 1 | 275116100200 | Public address system, conventional, industrial | | | \$ | 384.48 | \$ | 281.30 | \$ | - | \$ | 665.78 |
| | | | | | \$ | 29,486.42 | \$ | 102,016.01 | \$ | - | \$ | 131,502.43 |
| | | | | | \$ | 506 027 05 | ¢ | 567 796 82 | \$ | _ | \$ | 1 073 823 87 |
| | | | Labor factor 2.5x | 1.5 | φ | 500,027.05 | φ \$ | 851,695.23 | Ŷ | | \$ | 851,695.23 |
| | | | | Total | \$ | 506,027.05 | \$ | 1,419,492.06 | | | \$1 | ,925,519.11 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | E | ct. Total O&P |
|----------------------------------|--------------|---|--|---------------|-----------------|-----------------|----|---------------|
| H_04_01 | | | | | | | | |
| 2020 | | Unit Cost Estimate | | | | | | |
| 20 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ 1,046.60 | \$ 1,681.60 | \$- | \$ | 2,728.20 |
| 20 | 260526800260 | Ground wire, ground bare armored, #8-1 conductor | | \$ 1,751.60 | \$ 7,577.40 | \$- | \$ | 9,329.00 |
| 150 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ 7,849.50 | \$ 12,612.00 | \$- | \$ | 20,461.50 |
| 150 | 260526800260 | Ground wire, ground bare armored, #8-1 conductor | | \$ 13,137.00 | \$ 56,830.50 | \$- | \$ | 69,967.50 |
| 1500 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ 78,495.00 | \$ 126,120.00 | \$- | \$ | 204,615.00 |
| 1500 | 260526800260 | Ground wire, ground bare armored, #8-1 conductor | | \$ 131,370.00 | \$ 568,305.00 | \$- | \$ | 699,675.00 |
| 350 | 260523100200 | Control cable, copper, THHN wire with PVC jacket, 600 V, 6 wires, #14 | | \$ 41,118.00 | \$ 44,324.00 | \$- | \$ | 85,442.00 |
| 350 | 260526800260 | Ground wire, ground bare armored, #8-1 conductor | | \$ 30,653.00 | \$ 132,604.50 | \$- | \$ | 163,257.50 |
| 250 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ 13,082.50 | \$ 21,020.00 | \$- | \$ | 34,102.50 |
| 250 | 260526800260 | Ground wire, ground bare armored, #8-1 conductor | | \$ 21,895.00 | \$ 94,717.50 | \$- | \$ | 116,612.50 |
| 50 | 260523101000 | Control cable, copper, THHN wire with PVC jacket, 600 V, 22 wires, #14 | | \$ 20,826.00 | \$ 13,546.00 | \$- | \$ | 34,372.00 |
| 50 | 260526800260 | Ground wire, ground bare armored, #8-1 conductor | | \$ 4,379.00 | \$ 18,943.50 | \$- | \$ | 23,322.50 |
| 200 | 260523100900 | Control cable, copper, THHN wire with PVC jacket, 600 V, 20 wires, #14 | | \$ 69,420.00 | \$ 50,654.00 | \$- | \$ | 120,074.00 |
| 200 | 260526800260 | Ground wire, ground bare armored, #8-1 conductor | | \$ 17,516.00 | \$ 75,774.00 | \$- | \$ | 93,290.00 |
| 50 | 260523100100 | Control cable, copper, THHN wire with PVC jacket, 600 V, 4 wires, #14 | | \$ 3,177.50 | \$ 5,397.50 | \$- | \$ | 8,575.00 |
| 50 | 260526800260 | Ground wire, ground bare armored, #8-1 conductor | | \$ 4,379.00 | \$ 18,943.50 | \$- | \$ | 23,322.50 |
| 150 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ 7,849.50 | \$ 12,612.00 | \$- | \$ | 20,461.50 |
| 150 | 260526800260 | Ground wire, ground bare armored, #8-1 conductor | | \$ 13,137.00 | \$ 56,830.50 | \$- | \$ | 69,967.50 |
| 150 | 260523101000 | Control cable, copper, THHN wire with PVC jacket, 600 V, 22 wires, #14 | | \$ 62,478.00 | \$ 40,638.00 | \$- | \$ | 103,116.00 |
| 10 | 260519252700 | Cable connectors, PVC jacket, 600 volt, #6-3 wire, #6-4 wire | | \$ 70.50 | \$ 472.30 | \$- | \$ | 542.80 |
| 30 | 260519252700 | Cable connectors, PVC jacket, 600 volt, #6-3 wire, #6-4 wire | | \$ 211.50 | \$ 1,416.90 | \$- | \$ | 1,628.40 |
| 86 | 260519252700 | Cable connectors, PVC jacket, 600 volt, #6-3 wire, #6-4 wire | | \$ 606.30 | \$ 4,061.78 | \$- | \$ | 4,668.08 |
| | | | | \$ 544,448.50 | \$ 1,365,082.48 | \$- | \$ | 1,909,530.98 |
| H_04_02 Data Release : Year 2 | 020 | Unit Cost Estimate | | | | | | |
| | | | | | | | | |
| 90 | 260523100100 | Control cable, copper, THHN wire with PVC jacket, 600 V 4 wires #14 | | \$ 571950 | \$ 9715.50 | \$ | \$ | 15 435 00 |
| 180 | 260523101000 | Control cable, copper, THHN wire with PVC jacket, 600 V, 22 wires #14 | | \$ 74 973 60 | \$ 48.765.60 | \$ | s | 123 739 20 |
| 90 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V. 2 wires. #14 | | \$ 4.709.70 | \$ 7.567.20 | \$ - | \$ | 12,276.90 |
| 190 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ 9,942.70 | \$ 15,975.20 | \$- | \$ | 25,917.90 |
| 180 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ 9,419.40 | \$ 15,134.40 | \$- | \$ | 24,553.80 |
| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
|----------------------------------|--------------|--|--|---------------|-----------------|-----------------|----------------|
| 190 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ 9,942.70 | \$ 15,975.20 | \$- | \$ 25,917.9 |
| 3 | 260529204110 | Hangers, channel, steel, 16 gauge, 1- 5/8" x 13/16" | | \$ 20.04 | \$ 28.50 | \$- | \$ 48.5 |
| | | | | \$ 114,727.64 | \$ 113,161.60 | \$- | \$ 227,889.2 |
| H_04_03 Data Release : Year 2 | 020 | Unit Cost Estimate | | | | | |
| | | | | | | | |
| 78 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ 4,081.74 | \$ 6,558.24 | \$- | \$ 10,639.9 |
| 120 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ 6,279.60 | \$ 10,089.60 | \$ - | \$ 16,369.2 |
| 120 | 260526800360 | Ground wire, copper wire, bare solid, #6 | | \$ 5 575 20 | \$ 9 092 40 | \$ - | \$ 14 667 6 |
| 60 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ 3.139.80 | \$ 5.044.80 | \$ - | \$ 8.184.6 |
| <u></u> | 000500000000 | Ground wire, copper wire, bare solid, | | ¢ 000.00 | ¢ 0.407.00 | <u>,</u> | ¢ 40044 |
| 60 | 260526800330 | #12 Hangers, channel, steel, 16 gauge, 1- | | \$ 906.60 | \$ 3,487.80 | \$ - | \$ 4,394.4 |
| 12 | 260529204110 | 5/8" x 13/16" | | \$ 80.16 | \$ 114.00 | \$- | \$ 194.1 |
| | | diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 | | | | | |
| 6 | 260533131750 | couplings per 100 LF | | \$ 19.50 | \$ 50.46 | \$- | \$ 69.9 |
| H 04 04 | | | | \$ 20,082.60 | \$ 34,437.30 | \$- | \$ 54,519.9 |
| Data Release : Year 2 | 020 | Unit Cost Estimate | | | | | |
| | | | | | | | |
| 1 | 284620504020 | Detection system, fire alarm control panel, alarm device, excluding wires & conduits | | \$ 331.68 | \$ 87.29 | \$- | \$ 418.9 |
| 1 | 262416205110 | Circuit breakers, enclosure only, 3 pole, 14 k A I.C., panelboard ckt brkr, NEMA 1 enclosure only, 600V, 3 p, 14k AIC 100A NEMA 1 | | \$ 187 97 | \$ 342 54 | \$ - | \$ 530.5 |
| 4 | 211313506165 | Flow switch, (valve supervisory | | \$ 1 174 48 | \$ 172.72 | ¢ | ¢ 1347.2 |
| | 200540252000 | Crimp 1 hole lugs, copper or | | ¢ 1,174.40 | ¢ 112.12 | Ψ - | ¢ 1,047.2 |
| 4 | 260519353800 | Armored cable, copper, solid, 600 V, | | \$ 90.12 | \$ 500.50 | \$ - | \$ 602.6 |
| 310 | 260519200050 | 2 conductor, #14, BX, exposed Armored cable, copper, solid, 600 V, | | \$ 14,235.20 | \$ 98,142.90 | \$ - | \$ 112,378.1 |
| 80 | 260519200150 | 2 conductor, #12, BX, exposed | | \$ 3,887.20 | \$ 26,572.80 | \$- | \$ 30,460.0 |
| 20 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ 1,046.60 | \$ 1,681.60 | \$ - | \$ 2,728.2 |
| 10 | 260526800370 | Ground wire, copper wire, bare solid, #4 | | \$ 1,153,40 | \$ 949.80 | \$ - | \$ 2.103.2 |
| 310 | 260533131800 | Rigid galvanized steel conduit, 1" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF | | \$ 2,814.80 | \$ 3,620.80 | \$ - | \$ 6,435.6 |
| | | | | | | | |
| 8 | 260519250200 | Cable connectors, nonmetallic, 600 volt, #14-3 wire to #12-2 wire | | \$ 16.08 | \$ 45.68 | \$ - | \$ 61.7 |
| 4 | 211313506165 | Flow switch, (valve supervisory switch) | | \$ 1,174.48 | \$ 172.72 | \$ - | \$ 1,347.2 |
| 1 | Head-end | Head-on equipment, programming, software, commissioning | | \$- | \$ 108,900.00 | \$- | \$ 108,900.0 |
| | | | | \$ 26,118.01 | \$ 241,195.41 | \$- | \$ 267,313.4 |
| H_04_05 | 020 | Unit Cost Estimate | | | | | |
| Data Neledse . Tear 2 | 020 | onit oost Louillate | | | | | |
| | | | | | | | |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | E | ct. Total O&P |
|-----------------------|----------------|--|--|---------------------------|-----------------|-----------------|----|---------------|
| | 608411 1/60201 | | | | | | | |
| 1 | 52BX-0001 | Hand, Foot, and Body Monitor | | \$ 162,305.60 | \$ 514.95 | \$- | \$ | 162,820.55 |
| 3 | 262726205550 | Plug, locking, 3 pole, 20 amp, 125/250 volt, NEMA L10 | | \$ 81.69 | \$ 87.18 | \$- | \$ | 168.87 |
| 1 | 260913300100 | Smart metering, in panel, single phase, 120/208 volt, 100 amp | | \$ 448.56 | \$ 86.15 | \$- | \$ | 534.71 |
| 250 | 260519200500 | Armored cable, PVC jacket, 600 V, 3 conductor, #2, in cable tray | | \$ 237,630.00 | \$ 83,040.00 | \$ - | \$ | 320,670.00 |
| 6 | 260519252700 | Cable connectors, PVC jacket, 600 volt, #6-3 wire, #6-4 wire | | \$ 42.30 | \$ 283.38 | \$- | \$ | 325.68 |
| | | | | \$ 400,508.15 | \$ 84,011.66 | \$- | \$ | 484,519.81 |
| H_04_06 | | Unit Coot Estimate | | | | | | |
| Data Release : Year 2 | 020 | Unit Cost Estimate | | | | | | |
| | | | | | | | | |
| 21 | 628411-K75160- | Breathing air station | | \$ 455.679.50 | \$ 10.813.99 | \$ - | \$ | 466 493 49 |
| 21 | 0207 0001 | Junction boxes, steel channel, 4 | | φ 400,010.00 | ¢ 10,010.00 | Ŷ | Ŷ | 400,400.40 |
| 2 | 260529204800 | channel | | \$ 201.86 | \$ 151.54 | \$- | \$ | 353.40 |
| 2 | 250528392000 | Terminal block, DIN mounted, 35MM, medium screw, connector end bracket | | \$ 6.32 | \$ 29.10 | \$- | \$ | 35.42 |
| | | Cabinets & enclosures, enclosures polyester, small, pushbutton, 3 hole, 10-3/16" H x 3-5/16" W x 3-1/16" D, | | | | | | |
| 2 | 262716201640 | NEMA 4X | | \$ 176.22 | \$ 144.28 | \$- | \$ | 320.50 |
| 180 | 260523101000 | Control cable, copper, THHN wire with PVC jacket, 600 V, 22 wires, #14 | | \$ 74,973.60 | \$ 48,765.60 | \$ - | \$ | 123,739.20 |
| 900 | 260523100700 | Control cable, copper, THHN wire with PVC jacket, 600 V, 16 wires, #14 | | \$ 272,979.00 | \$ 195,246.00 | \$- | \$ | 468,225.00 |
| 70 | 260519200150 | Armored cable, copper, solid, 600 V, 2 conductor, #12, BX, exposed | | \$ 3,401.30 | \$ 23,251.20 | \$- | \$ | 26,652.50 |
| 550 | 260533131800 | Rigid galvanized steel conduit, 1" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF | | \$ 4,994.00 | \$ 6,424.00 | \$- | \$ | 11,418.00 |
| 92 | 260533131830 | Rigid galvanized steel conduit, 1-1/4" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 countings per 100 LF | | \$ 575.00 | \$ 1 164 72 | \$ - | \$ | 1 739 72 |
| 1 | 260533250500 | Conduit fittings for rigid galvanized steel, standard, locknuts, 1-1/4" diameter | | \$ 0.93 | ¢ | ¢ | ¢ | 0.93 |
| 75 | 260529204120 | Channel, steel, 14 gauge, 1-5/8" x 1- 5/8" | | \$ 492 75 | \$ 813 75 | \$ - | ş | 1 306 50 |
| 1 | Lump sum | Head-end equipment, programming, software, commissioning | | \$ - | \$ 108.900.00 | \$ - | \$ | 108.900.00 |
| | | | | \$ 813 480 48 | \$ 395 704 18 | s _ | \$ | 1 209 184 66 |
| H_04_07 | | | | ÷ 510,400.40 | | Ť | | .,200,104.00 |
| Data Release : Year 2 | 020 | Unit Cost Estimate | | | | | | |
| | | | | | | | | |
| 100 | 260522400020 | Control cable, copper, THHN wire with | | ¢ 0.042.70 | ¢ 45.075.00 | ¢ | ¢ | 25.047.00 |
| 190 | 260525100020 | Ground wire, copper wire, bare solid, | | \$ 9,942.70 ¢ 2,970.00 | \$ 15,975.20 | | ¢ | 13 015 60 |
| 130 | 200320000330 | Rigid galvanized steel conduit, 2" diameter, to 10' H, incl 2 terminations, 2 elsevie 11 beam elseme and 11 | | ψ 2,070.30 | φ Π,044.70 | ų - | Ų | 13,313.00 |
| 20 | 260533131870 | couplings per 100 LF | | \$ 230.60 | \$ 337.40 | \$- | \$ | 568.00 |
| 20 | 260522121970 | Rigid galvanized steel conduit, 2" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 L 5 | | ¢ 202.04 | ¢ 470.26 | ¢ | ¢ | 705 20 |
| 20 | 200000101070 | Pull boxes, steel, type SC, raintight & | | v 3∠2.84 | φ 412.30 | ψ - | φ | 795.20 |
| 2 | 260533182200 | weatherproof, 8" L x 6" W x 6" D, NEMA 3R | | \$ 58.74 | \$ 189.96 | \$ - | \$ | 248.70 |
| 12 | 260529204110 | Hangers, channel, steel, 16 gauge, 1- 5/8" x 13/16" | | \$ 80.16 | \$ 114.00 | \$ - | \$ | 194.16 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | E | Ext. Total O&P |
|-----------------------|---------------------------------|---|--|---------------|-----------------|-----------------|----------|----------------|
| 12 | 260529300350 | Rooftop channel support, 1-5/8"x 16"H, threaded rod dbl. H block base | | \$ 68.52 | \$ 267.84 | \$ - | \$ | 336.36 |
| 15 | 260526800450 | Ground wire, copper wire, bare stranded, #4 | | \$ 1.505.85 | \$ 1.424.70 | \$ - | \$ | 2.930.55 |
| 15 | 260519350100 | Terminal lugs, solderless, #8 to #4 | | \$ 13.05 | \$ 381.45 | \$ - | s | 394.50 |
| 3 | 260533131870 | Rigid galvanized steel conduit, 2" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF | | \$ 34.59 | \$ 50.61 | \$- | \$ | 85.20 |
| 1 | 260533183250 | Pull boxes, cast iron, water & dust tight, 16" L x 16" W x 6" D, NEMA 4, surface mounting | | \$ 982.56 | \$ 581.28 | \$- | \$ | 1,563.84 |
| 100 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ 5,233.00 | \$ 8,408.00 | \$- | \$ | 13,641.00 |
| 12 | 260519252700 | Cable connectors, PVC jacket, 600 volt, #6-3 wire, #6-4 wire | | \$ 84.60 | \$ 566.76 | \$ - | \$ | 651.36 |
| H 04 08 | | | | \$ 21,428.11 | \$ 39,814.26 | \$- | \$ | 61,242.37 |
| Data Release : Year 2 | 020 | Unit Cost Estimate | | | | | | |
| | | | | | | | | |
| 2 | 260529204800 | Junction boxes, steel channel, 4 channel | | \$ 201.86 | \$ 151.54 | \$- | \$ | 353.40 |
| 24 | Invoice 628411- K63861-52BX- | Tank leak detection systems, for hydrocarbons & hazardous liquids/vapors, controller, data acquisition, for use with all probes, 24 channel, incl. printer, modem, RS232 not | | ¢ 59 904 56 | ¢ 10.912.00 | ¢ | ¢ | 60,619,55 |
| 54 | 0001 | | | \$ 55,604.50 | \$ 10,013.55 | φ - | Ŷ | 09,010.35 |
| 700 | 260519200050 | Armored cable, copper, solid, 600 V, 2 conductor, #14, BX, exposed | | \$ 32,144.00 | \$ 221,613.00 | \$- | \$ | 253,757.00 |
| 1000 | 260523100020 | PVC jacket, 600 V, 2 wires, #14 | | \$ 52,330.00 | \$ 84,080.00 | \$- | \$ | 136,410.00 |
| 700 | 260523100300 | Control cable, copper, THHN wire with PVC jacket, 600 V, 8 wires, #14 | | \$ 114,380.00 | \$ 100,268.00 | \$- | \$ | 214,648.00 |
| 150 | 260523100900 | Control cable, copper, THHN wire with PVC jacket, 600 V, 20 wires, #14 Ground wire, copper wire, bare solid. | | \$ 52,065.00 | \$ 37,990.50 | \$- | \$ | 90,055.50 |
| 70 | 260526800370 | #4 | | \$ 8,073.80 | \$ 6,648.60 | \$- | \$ | 14,722.40 |
| 7 | 260519350100 | Terminal lugs, solderless, #8 to #4 | | \$ 6.09 | \$ 178.01 | \$- | \$ | 184.10 |
| 600 | 260533131770 | Rigid galvanized steel conduit, 3/4" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LE | | \$ 3,618,00 | \$ 5 700 00 | \$ - | \$ | 9.318.00 |
| | 200000101110 | Elevible metallic conduit steel 3/4" | | \$ 0,010.00 | \$ 0,100.00 | ÷ | Ţ | 0,010.00 |
| 60 | 260533350200 | diameter | | \$ 43.20 | \$ 284.40 | \$- | \$ | 327.60 |
| 110 | 000500404050 | Rigid galvanized steel conduit, 1-1/2" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 | | A 004 50 | ¢ 4,540,40 | ¢ | ¢ | 0 700 00 |
| 60 | 260533131830 | Rigid galvanized steel conduit, 2" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF | | \$ 1,204.30 | \$ 1,012.20 | s - | \$ \$ | 1,704.00 |
| | | Channel, steel. 12 gauge. 1-5/8" x 1- | | | | | | |
| 50 | 260529204150 | 5/8" Head-end equipment, programming, | | \$ 406.00 | \$ 757.50 | \$ - | \$ | 1,163.50 |
| 1 | Lump sum | software, commissioning | | \$ - | \$ 108,900.00 | \$ - | \$ | 108,900.00 |
| H_04_09 | | | | \$ 323,968.81 | \$ 579,916.84 | \$ - | \$ | 903,885.65 |
| Data Release : Year 2 | 020 | Unit Cost Estimate | | | | | | |
| | | | | | | | | |
| 14 | 221113605022 | Pipe, stainless steel, tubing, .035 wall, 3/8", type 304, excludes joints and | | \$ 99.40 | \$ 69.58 | \$ - | \$ | 168.98 |
| 10 | 230953102100 | Control component, gauges, pressure or vacuum, 2" diameter dial | | \$ 121.90 | \$ 244.00 | \$ - | \$ | 365.90 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | E | xt. Total O&P |
|-----------------------|-----------------------------|--|--|----------------------|-----------------|-----------------|--------|---------------|
| 2 | 221113618207 | Elbow, 90 Deg., stainless steel, tube fittings, compression type, 3/8", type 316 | | \$ 48.36 | \$ 72.24 | \$- | \$ | 120.60 |
| | | Union tee, stainless steel, tube fittings, compression type, 3/8", type | | | | | | |
| 16 | 221113618224 | 316 Flexible metal hose, molded teflon with staiplass steal flanges, 150 psi | | \$ 568.00 | \$ 850.40 | \$ - | Ş ¢ | 1,418.40 |
| 10 | 221119147000 | Hangers, channel, steel, 16 gauge, 1- | | φ 21,900.00 | φ 0,020.00 | φ - | φ | 34,013.00 |
| 6 | 260529204110 | 5/8" x 13/16" Rooftop channel support, 13/16" L x 1- | | \$ 40.08 | \$ 57.00 | \$- | \$ | 97.08 |
| 6 | 260529300250 | 5/8" W, 14 ga. hot dip galv., sngl. base | | \$ 44.88 | \$ 81.30 | \$- | \$ | 126.18 |
| 6 | 060523606742 | galvanized, adjustable, 6" x 6", 12 gauge | | \$ 24.969.00 | \$ 2.954.70 | \$ - | \$ | 27.923.70 |
| 6 | 260529204800 | Junction boxes, steel channel, 4 channel | | \$ 605.58 | \$ 454.62 | \$ - | \$ | 1,060.20 |
| 20 | 260519200050 | Armored cable, copper, solid, 600 V, 2 conductor, #14, BX, exposed | | \$ 918.40 | \$ 6.331.80 | \$ - | \$ | 7,250,20 |
| 500 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ 26,165.00 | \$ 42,040.00 | \$- | \$ | 68,205.00 |
| 1 | Allowance | Head-end equipment, programming, | | ¢ | \$ 108 900 00 | ¢ | ¢ | 108 900 00 |
| · | Allowanoc | oortware, commissioning | | \$ 81 569 <i>4</i> 0 | \$ 168,082,52 | ¢ ¢ | ¢ | 249 651 92 |
| H_04_10 | | | | ¢ 01,000.40 | ¢ 100,002.02 | Ţ. | Ť | 240,001.02 |
| Data Release : Year 2 | 020 | Unit Cost Estimate | | | | | | |
| 3 | 284620505610 | Detection system, strobe & horn, ADA type, excluding wires & conduits | | \$ 711.87 | \$ 394.95 | \$- | \$ | 1,106.82 |
| 3 | 284620505460 | Detection system, remote fire alarm indicator light | | \$ 108.15 | \$ 394.95 | \$- | \$ | 503.10 |
| 500 | 260523100300 | Control cable, copper, THHN wire with PVC jacket, 600 V, 8 wires, #14 | | \$ 81,700.00 | \$ 71,620.00 | \$- | \$ | 153,320.00 |
| 2000 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ 104,660.00 | \$ 168,160.00 | \$ - | \$ | 272,820.00 |
| 100 | 260523100100 | Control cable, copper, THHN wire with PVC jacket, 600 V, 4 wires, #14 | | \$ 6,355.00 | \$ 10,795.00 | \$- | \$ | 17,150.00 |
| 2500 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ 130,825.00 | \$ 210,200.00 | \$- | \$ | 341,025.00 |
| 30 | 260533350490 | Flexible metallic conduit, steel, connectors, insulated, 1" diameter | | \$ 288.30 | \$ 568.20 | \$- | \$ | 856.50 |
| 900 | 260533350970 | Flexible metallic conduit, couplings, to flexible conduit, 3/4" diameter | | \$ 1,611.00 | \$ 17,046.00 | \$ - | \$ | 18,657.00 |
| 25 | 260519252700 | Cable connectors, PVC jacket, 600 volt, #6-3 wire, #6-4 wire | | \$ 176.25 | \$ 1.180.75 | \$ - | \$ | 1.357.00 |
| | | Rigid galvanized steel conduit, 1" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 | | | | | | |
| 150 | 260533131800 | couplings per 100 LF | | \$ 1,362.00 | \$ 1,752.00 | \$- | \$ | 3,114.00 |
| 60 | 260529204110 | Hangers, channel, steel, 16 gauge, 1- 5/8" x 13/16" | | \$ 400.80 | \$ 570.00 | \$ - | \$ | 970.80 |
| 60 | 260529300270 | Rooftop channel support, 1-5/8" L x 1- 5/8" W, 12 ga. hot dip galv., sngl. base | | \$ 126.00 | \$ 843.60 | \$- | \$ | 969.60 |
| 100 | 260526800370 | Ground wire, copper wire, bare solid, #4 | | \$ 11,534.00 | \$ 9,498.00 | \$ - | \$ | 21,032.00 |
| 100 | 260519350100 | Terminal lugs, solderless, #8 to #4 | | \$ 87.00 | \$ 2,543.00 | \$ - | \$ | 2,630.00 |
| 100 | 260519200050 | Armored cable, copper, solid, 600 V, 2 conductor, #14, BX, exposed | | \$ 4,592.00 | \$ 31,659.00 | \$- | \$ | 36,251.00 |
| 1 | 628411-K62330- 52BX-0001 | Fixed Alarm Gamma Monitors | | \$ 107,339.60 | \$ 514.95 | \$ - | \$ | 107,854.55 |
| 1 | 628411-K62341- 52BX-0001 | Fixed Alarm Tritium Monitors | | \$ 1,019,049.00 | \$ 2,657.04 | \$- | \$ | 1,021,706.04 |
| 10 | 284620505610 | Detection system, strobe & horn, ADA type, excluding wires & conduits | | \$ 2,372.90 | \$ 1,316.50 | \$- | \$ | 3,689.40 |
| 7 | 284620505460 | Detection system, remote fire alarm indicator light | | \$ 252.35 | \$ 921.55 | \$- | \$ | 1,173.90 |
| 1 | 284620508200 | Detection system, annunciator panel, 16 zone lamp, excluding wires & conduits | | \$ 537.51 | \$ 634.41 | \$ | s | 1.171.92 |
| | | | | | | | | |

| Quantity | Line Number | Description | | Ext. | Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | E | xt. Total O&P |
|-----------------------|--------------------------------|--|--|----------|-------------------|----------------------------------|-----------------|----------|----------------------------|
| 2550 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ | 133,441.50 | \$ 214,404.00 | \$- | \$ | 347,845.50 |
| 1000 | 260523100300 | Control cable, copper, THHN wire with PVC jacket, 600 V, 8 wires, #14 | | \$ | 163,400.00 | \$ 143,240.00 | \$- | \$ | 306,640.00 |
| 250 | 260523101000 | Control cable, copper, THHN wire with PVC jacket, 600 V, 22 wires, #14 | | \$ | 104,130.00 | \$ 67,730.00 | \$- | \$ | 171,860.00 |
| 2000 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ | 104,660.00 | \$ 168,160.00 | \$- | \$ | 272,820.00 |
| 100 | 260523100100 | Control cable, copper, THHN wire with PVC jacket, 600 V, 4 wires, #14 | | \$ | 6,355.00 | \$ 10,795.00 | \$- | \$ | 17,150.00 |
| 250 | 260523100300 | Control cable, copper, THHN wire with PVC jacket, 600 V, 8 wires, #14 | | \$ | 40,850.00 | \$ 35,810.00 | \$- | \$ | 76,660.00 |
| 350 | 260523100900 | Control cable, copper, THHN wire with PVC jacket, 600 V, 20 wires, #14 | | \$ | 121,485.00 | \$ 88,644.50 | \$- | \$ | 210,129.50 |
| 107 | 260519251800 | Cable connectors, armored, 600 volt, #14-2 wire | | \$ | 158.36 | \$ 1,016.50 | \$- | \$ | 1,174.86 |
| 380 | 260533131800 | Rigid galvanized steel conduit, 1" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF | | \$ | 3,450.40 | \$ 4,438.40 | \$- | \$ | 7,888.80 |
| 380 | 260533251430 | Conduit fittings for rigid galvanized steel, bushings, steel, 1" diameter | | \$ | 581.40 | \$ 10,256.20 | \$- | \$ | 10,837.60 |
| 60 | 260533350250 | Flexible metallic conduit, steel, 1" diameter | | \$ | 84.60 | \$ 454.80 | \$- | \$ | 539.40 |
| 60 | 260533131830 | Rigid galvanized steel conduit, 1-1/4" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF | | \$ | 375.00 | \$ 759.60 | \$- | \$ | 1,134.60 |
| 15 | 260533350300 | Flexible metallic conduit, steel, 1-1/4" diameter | | \$ | 24.45 | \$ 162.75 | \$- | \$ | 187.20 |
| 150 | 260529204110 | Hangers, channel, steel, 16 gauge, 1- 5/8" x 13/16" | | \$ | 1,002.00 | \$ 1,425.00 | \$- | \$ | 2,427.00 |
| 150 | 260529300270 | Roottop channel support, 1-5/8" L x 1- 5/8" W, 12 ga. hot dip galv., sngl. base | | \$ | 315.00 | \$ 2,109.00 | \$- | \$ | 2,424.00 |
| 300 | 260526800370 | Ground wire, copper wire, bare solid, #4 | | \$ | 34,602.00 | \$ 28,494.00 | \$- | \$ | 63,096.00 |
| 30 | 260519252700 | Cable connectors, PVC jacket, 600 volt, #6-3 wire, #6-4 wire | | \$ | 211.50 | \$ 1,416.90 | \$- | \$ | 1,628.40 |
| 1000 | 260519200340 | Armored cable, copper, stranded, 600 V, 2 conductor, #8, BX, exposed | | \$ | 302,240.00 | \$ 503,430.00 | \$- | \$ | 805,670.00 |
| 150 | 260519200050 Allowance lump | 2 conductor, #14, BX, exposed Head-end, equipment, programming, | | \$ | 6,888.00 | \$ 47,488.50 | \$- | \$ | 54,376.50 |
| 1 H 04 11 | sum | software, commissioning | | \$ \$ | - 2,498,342.94 | \$ 108,900.00 \$ 1,972,405.05 | \$- \$- | \$ \$ | 108,900.00 4,470,747.99 |
| Data Release : Year 2 | 020 | Unit Cost Estimate | | | | | | | |
| | | | | | | | | | |
| 1 | 628411-K63821- 52BX-0001 | Pump Control assembly and items | | \$ | 171,836.90 | \$ 2,059.81 | \$ - | \$ | 173,896.71 |
| 10 | 260523100400 | Control cable, copper, THHN wire with PVC jacket, 600 V, 10 wires, #14 | | \$ | 1,954.40 | \$ 1,577.80 | \$- | \$ | 3,532.20 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
|----------|--------------|--|--|---------------|-----------------|-----------------|----------------|
| 100 | 260523100600 | Control cable, copper, THHN wire with PVC jacket, 600 V, 14 wires, #14 | | \$ 26,593.00 | \$ 19,930.00 | \$ - | \$ 46,523.00 |
| 100 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ 5,233.00 | \$ 8,408.00 | \$- | \$ 13,641.00 |
| 2 | 260519252700 | Cable connectors, PVC jacket, 600 volt, #6-3 wire, #6-4 wire | | \$ 14.10 | \$ 94.46 | \$- | \$ 108.56 |
| 1 | 221429132202 | Pump, pedestal sump, single stage, for general purpose float switch, copper coated float, add | | \$ 121.42 | \$ 286.90 | \$- | \$ 408.32 |
| 3 | 230913609530 | Water level control, water gauges, complete, high pressure, 500 psi at 450Deg.F, 3/4" pipe size, type 316 stainless steel, ASME | | \$ 3,121.47 | \$ 259.95 | \$- | \$ 3,381.42 |
| 30 | 260533131800 | Rigid galvanized steel conduit, 1" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF | | \$ 272.40 | \$ 350.40 | \$- | \$ 622.80 |
| 30 | 260533251430 | Conduit fittings for rigid galvanized steel, bushings, steel, 1" diameter | | \$ 45.90 | \$ 809.70 | \$- | \$ 855.60 |
| 6 | 260529204110 | Hangers, channel, steel, 16 gauge, 1- 5/8" x 13/16" | | \$ 40.08 | \$ 57.00 | \$- | \$ 97.08 |
| 6 | 260529300270 | Roottop channel support, 1-5/8" L x 1- 5/8" W, 12 ga. hot dip galv., sngl. base | | \$ 12.60 | \$ 84.36 | \$- | \$ 96.96 |
| 24 | 221113605042 | Pipe, stainless steel, tubing, .049 wall, 3/8", type 304, excludes joints and hangers | | \$ 287.76 | \$ 119.28 | \$- | \$ 407.04 |
| 8 | 221113618207 | Elbow, 90 Deg., stainless steel, tube fittings, compression type, 3/8", type 316 | | \$ 193.44 | \$ 288.96 | \$ | \$ 482.40 |
| | | Valves, bronze, water heater water & | | | | · | |
| 4 | 220523208814 | gas safety shut off, valve Cabinets & enclosures, enclosures fiberglass, small, pushbutton, 30 hole, | | \$ 908.08 | \$ 191.24 | \$- | \$ 1,099.32 |
| 2 | 262716200990 | 17-1/2" H x 14" W x 8-11/16" D, NEMA 4X | | \$ 2,242.80 | \$ 336.32 | \$- | \$ 2,579.12 |
| 4 | 230913609530 | Water level control, water gauges, complete, high pressure, 500 psi at 450Deg.F, 3/4" pipe size, type 316 stainless steel, ASME | | \$ 4,161.96 | \$ 346.60 | \$- | \$ 4,508.56 |
| | | Control cable, copper, THHN wire with | | | | | |
| 80 | 260523100020 | PVC jacket, 600 V, 2 wires, #14 | | \$ 4,186.40 | \$ 6,726.40 | \$- | \$ 10,912.80 |
| 20 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ 1,046.60 | \$ 1,681.60 | \$- | \$ 2,728.20 |
| 80 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ 4,186.40 | \$ 6,726.40 | \$- | \$ 10,912.80 |
| | | Ground wire, copper wire, bare solid, | | | | | |
| 160 | 260526800330 | #12 | | \$ 2,417.60 | \$ 9,300.80 | \$- | \$ 11,718.40 |
| 2 | 260519252700 | Cable connectors, PVC jacket, 600 volt, #6-3 wire, #6-4 wire | | \$ 14.10 | \$ 94.46 | \$- | \$ 108.56 |
| 60 | 260533131800 | Rigid galvanized steel conduit, 1" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF | | \$ 544.80 | \$ 700.80 | \$- | \$ 1,245.60 |
| | | | | | | | |
| 15 | 260526800370 | Ground wire, copper wire, bare solid, #4 | | \$ 1,730.10 | \$ 1,424.70 | \$ - | \$ 3,154.80 |

| Quantity | Line Number | Description | | Ext | . Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | I | Ext. Total O&P |
|-----------------------|--------------|--|--|---------|------------|---------------------------------------|-----------------|----|----------------|
| | | | | | | | | | |
| 15 | 260510250100 | Terminal luga colderiaco #0 to #4 | | ¢ | 12.05 | ¢ 201.45 | ¢ | ¢ | 304 50 |
| 15 | 260519350100 | reminal lugs, soldeness, #8 to #4 | | ф | 13.05 | \$ 381.45 | ə - | Þ | 394.50 |
| | | Head-end equipment, programming, | | | | | | | |
| 1 | Summary | software, commissioning | | \$ ¢ | - | \$ 108,900.00 \$ 171 137 39 | \$- ¢ | \$ | 108,900.00 |
| H 04 12 | | | | φ | 231,178.30 | φ 1/1,15/.55 | | ş | 402,315.75 |
| Data Release : Year 2 | 020 | Unit Cost Estimate | | | | | | | |
| | | | | | | | | | |
| 240 | 260519200250 | Armored cable, copper, solid, 600 V, 2 conductor, #10, BX, exposed | | \$ | 22,941.60 | \$ 90,928.80 | \$- | Ş | 113,870.40 |
| 50 | 260519200100 | Armored cable, copper, solid, 600 V, 3 conductor, #14, BX, exposed | | \$ | 3,845.00 | \$ 17,127.00 | \$- | \$ | 20,972.00 |
| 340 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ | 17,792.20 | \$ 28,587.20 | \$ - | \$ | 46,379.40 |
| 460 | 260533131770 | Rigid galvanized steel conduit, 3/4" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 L | | ¢ | 2 773 80 | \$ 4 370.00 | ¢ | ¢ | 7 1/3 80 |
| 460 | 200535151770 | Conduit fittings for rigid galvanized | | Φ | 2,773.80 | \$ 4,370.00 | | Ŷ | 7,143.80 |
| 460 | 260533250100 | steel, standard, locknuts, 3/4" diameter | | \$ | 216.20 | \$ 6,957.50 | \$- | \$ | 7,173.70 |
| 400 | 000500404000 | Rigid galvanized steel conduit, 1" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 | | ¢ | 2 022 02 | ¢ 4,070,00 | • | | 0.204.00 |
| 400 | 260533131800 | couplings per 100 LF | | \$ | 3,632.00 | \$ 4,672.00 | \$ - | \$ | 8,304.00 |
| 400 | 260533250300 | Conduit fittings for rigid galvanized steel, standard, locknuts, 1" diameter | | \$ | 292.00 | \$ 6,050.00 | \$- | \$ | 6,342.00 |
| 180 | 260533131850 | Rigid galvanized steel conduit, 1-1/2" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF | | \$ | 1,971,00 | \$ 2,485,80 | \$ - | \$ | 4,456,80 |
| | | Conduit fittings for rigid galvanized | | Ţ | ., | | · | | ., |
| 180 | 260533250700 | diameter | | \$ | 279.00 | \$ 2,722.50 | \$- | \$ | 3,001.50 |
| 25 | 260526800370 | Ground wire, copper wire, bare solid, #4 | | \$ | 2,883.50 | \$ 2,374.50 | \$- | \$ | 5,258.00 |
| | | | | | | | | | |
| 25 | 260519350100 | Terminal lugs, solderless, #8 to #4 | | \$ | 21.75 | \$ 635.75 | \$- | \$ | 657.50 |
| | | Hangers, channel, steel, 16 gauge, 1- | | | | | | | |
| 30 | 260529204110 | 5/8" x 13/16" | | \$ | 200.40 | \$ 285.00 | \$- | \$ | 485.40 |
| 30 | 260529300270 | Rooftop channel support, 1-5/8" L x 1- 5/8" W, 12 ga. hot dip galv., sngl. base | | \$ | 63.00 | \$ 421.80 | \$ - | \$ | 484.80 |
| 190 | 260522424770 | Rigid galvanized steel conduit, 3/4" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings 100 L | | ¢ | 1.005.40 | ¢ 4.740.00 | ¢ | | 0.705.40 |
| 100 | 200333131770 | Conduit fittings for rigid galvanized | | φ | 1,065.40 | φ 1,710.00 | φ - | 2 | 2,795.40 |
| 180 | 260533250100 | steel, standard, locknuts, 3/4" diameter | | \$ | 84.60 | \$ 2 722 50 | \$ | \$ | 2,807.10 |
| | | | | 4 | 54.00 | . 2,122.00 | | Ψ | 2,507.10 |

| Quantity | Line Number | Description | | Ex | t. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | E | xt. Total O&P |
|----------------------------------|---------------------------------|---|--|----|--------------|-----------------|-----------------|----|---------------|
| | | | | | | | | | |
| | | Flexible metallic conduit. steel. 1" | | | | | | | |
| 150 | 260533350250 | diameter | | \$ | 211.50 | \$ 1,137.00 | \$- | \$ | 1,348.50 |
| | 628411-K73870- 52BX-0002 and | | | | | | | | |
| 8 | 628411-K73870- 52BX-0001 | Chiller control system | | \$ | 5,243,301.00 | \$ 10,299.04 | \$- | \$ | 5,253,600.04 |
| | | | | | | | | | |
| 0 | 000500004440 | Hangers, channel, steel, 16 gauge, 1- | | ¢ | 40.00 | ¢ 10.00 | ¢ | ¢ | 20.20 |
| 2 | 260529204110 | 5/8" X 13/16" | | \$ | 13.36 | \$ 19.00 | \$- | \$ | 32.36 |
| | | Rooftop channel support, 1-5/8" L x 1- | | | | | | | |
| 2 | 260529300270 | 5/8 W, 12 ga. not dip gaiv., sngi. base | | \$ | 4.20 | \$ 28.12 | \$- | \$ | 32.32 |
| | | | | | | | | | |
| 1 | Allowance lump sum | Head-end equipment, programming, software, commissioning | | \$ | | \$ 108,900.00 | \$- | \$ | 108,900.00 |
| | | | | \$ | 5,301,611.51 | \$ 292,433.51 | \$- | \$ | 5,594,045.02 |
| H_04_13 Data Release : Year 2 | 020 | Unit Cost Estimate | | | | | | | |
| | | | | | | | | | |
| 405 | 000500400000 | Control cable, copper, THHN wire with | | ¢ | 0.004.45 | ¢ 40.070.00 | ¢ | ¢ | 00 507 65 |
| 165 | 260523100020 | PVC jacket, 600 V, 2 wires, #14 | | \$ | 8,634.45 | \$ 13,873.20 | \$ - | \$ | 22,507.65 |
| | | Ground wire, copper wire, bare solid, | | | | | | | |
| 165 | 260526800340 | #10 Control cable conner THHN wire with | | \$ | 3,427.05 | \$ 10,447.80 | \$ - | \$ | 13,874.85 |
| 100 | 260523100020 | PVC jacket, 600 V, 2 wires, #14 | | \$ | 5,233.00 | \$ 8,408.00 | \$- | \$ | 13,641.00 |
| | | Rigid galvanized steel conduit, 3/4" diameter, to 10' H, incl 2 terminations, | | | | | | | |
| 25 | 260533131770 | 2 elbows, 11 beam clamps, and 11 couplings per 100 LF | | \$ | 150.75 | \$ 237.50 | \$- | \$ | 388.25 |
| | | Conduit fittings for rigid galvanized | | | | | | | |
| 25 | 260533250100 | steel, standard, locknuts, 3/4" diameter | | \$ | 11.75 | \$ 378.00 | \$- | \$ | 389.75 |
| | | | | | | | | | |
| 40 | 260526800370 | Ground wire, copper wire, bare solid, #4 | | \$ | 4,613.60 | \$ 3,799.20 | \$- | \$ | 8,412.80 |
| | | | | | | | | | |
| 4 | 260519252700 | Cable connectors, PVC jacket, 600 volt, #6-3 wire, #6-4 wire | | \$ | 28.20 | \$ 188.92 | \$- | \$ | 217.12 |
| | | | | | | | | | |
| 6 | 260519250100 | Cable connectors, nonmetallic, 600 volt, #14-2 wire | | \$ | 12.06 | \$ 28.44 | \$- | \$ | 40.50 |
| | | | | | | | | | |
| 25 | 260529204110 | Hangers, channel, steel, 16 gauge, 1- 5/8" x 13/16" | | \$ | 167.00 | \$ 237.50 | \$- | \$ | 404.50 |
| | | Rooftop channel support, 1-5/8" L x 1- | | | | | | | |
| 25 | 260529300270 | 5/8" W, 12 ga. hot dip galv., sngl. base | | \$ | 52.50 | \$ 351.50 | \$- | \$ | 404.00 |
| | | | | | | | | | |
| 1 | 628411-K73690- 52BX-0003 | HVAC control panel | | \$ | 2,750,963.00 | \$ 4,162.59 | | \$ | 2,755,125.59 |
| | | | | \$ | 2,773,293.36 | \$ 42,112.65 | \$- | \$ | 2,815,406.01 |
| H_04_14 | | | | | | | | | |
| Data Release : Year 2 | 020 | Unit Cost Estimate | | | | | | | |
| | | | | | | | | | |
| | | Armored cable, copper, stranded, 600 | | | | | | | |
| 90 | 260519200380 | V, 2 conductor, #6, BX, exposed | | \$ | 26,529.30 | \$ 52,315.20 | \$ - | \$ | 78,844.50 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | E | t. Total O&P |
|----------|--------------|--|--|---------------|-----------------|-----------------|----|--------------|
| | | | | | | | | |
| | | Ground wire, copper wire, bare solid, | | | | | | |
| 90 | 260526800360 | #6 | | \$ 4,181.40 | \$ 6,819.30 | \$- | \$ | 11,000.70 |
| | | Control cable, copper, THHN wire with | | | | | | |
| 115 | 260523100100 | PVC jacket, 600 V, 4 wires, #14 | | \$ 7,308.25 | \$ 12,414.25 | \$- | \$ | 19,722.50 |
| 20 | 000500400000 | Control cable, copper, THHN wire with | | ¢ 4 500 00 | ¢ 0.500.40 | ¢ | ¢ | 4 000 00 |
| 30 | 260523100020 | PVC jacket, 600 V, 2 wires, #14 | | \$ 1,569.90 | \$ 2,522.40 | \$ - | Þ | 4,092.30 |
| | | Rigid galvanized steel conduit, 1" diameter, to 10' H, incl 2 terminations, | | | | | | |
| 75 | 260533131800 | 2 elbows, 11 beam clamps, and 11 couplings per 100 LF | | \$ 681.00 | \$ 876.00 | \$- | \$ | 1,557.00 |
| | | | | | | | | |
| 75 | 260533250300 | Conduit fittings for rigid galvanized steel standard locknuts 1" diameter | | \$ 54.75 | \$ - | \$ - | \$ | 54 75 |
| | 20000200000 | Rigid galvanized steel conduit 3/4" | | ¢ 01.10 | ÷ | Ť | Ţ | 00 |
| | | diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 | | | | | | |
| 60 | 260533131770 | couplings per 100 LF | | \$ 361.80 | \$ 570.00 | \$- | \$ | 931.80 |
| | | Conduit fittings for rigid galvanized | | | | | | |
| 60 | 260533250100 | diameter | | \$ 28.20 | \$- | \$- | \$ | 28.20 |
| | | | | | | | | |
| 8 | 260526800370 | Ground wire, copper wire, bare solid, #4 | | \$ 922.72 | \$ 759.84 | \$- | \$ | 1,682.56 |
| | | | | | | | | |
| 8 | 260519350100 | Terminal lugs, solderless, #8 to #4 | | \$ 6.96 | \$ 203.44 | \$- | \$ | 210.40 |
| | | Control component, gauges, | | | | | | |
| 19 | 230953103084 | with air filter kit, 0-2" W.C. | | \$ 1,857.06 | \$ 2,479.12 | \$- | \$ | 4,336.18 |
| | | Pump, pedestal sump, single stage, | | | | | | |
| 6 | 221429132202 | for general purpose float switch, copper coated float, add | | \$ 728.52 | \$ 1,721.40 | \$- | \$ | 2,449.92 |
| | | Water level control, water gauges, | | | | | | |
| 3 | 230913609030 | complete, rough brass, wheel type, 125 psi at 350Deg.F, 3/8" pipe size | | \$ 256.98 | \$ 213.63 | \$- | \$ | 470.61 |
| | | Control component, pressure | | | | | | |
| 8 | 230953109220 | controllers & switches, pressure transmitter | | \$ 2.110.40 | \$ 780.88 | \$ - | \$ | 2.891.28 |
| | | Dust haster, dust haster modifications | | | | - | • | _, |
| 5 | 229216205160 | and accessories, overheat | | ¢ 5,157,00 | ¢ 1 222 00 | ¢ | ¢ | 6 290 00 |
| 5 | 230210205100 | inerniocoupie (removable) | | \$ 5,157.00 | \$ 1,223.90 | - | ð | 0,360.90 |
| | | | | | | | | |
| 16 | vendor | Temperature / Resistancec detector | | \$ 175.69 | \$ 1,387.53 | | \$ | 1,563.22 |
| | | Control component, thermometers, dial type, liquid type, union | | | | | | |
| 7 | 230953104120 | connection, 3-1/2" diameter | | \$ 3,531.36 | \$ 170.80 | \$ - | \$ | 3,702.16 |
| | | Rigid galvanized steel conduit | | | | | | |
| 2 | 260533152780 | locknuts and bushings | | \$ 12.82 | \$ 66.44 | \$- | \$ | 79.26 |
| | | | | | | | | |
| 150 | 260523100020 | PVC jacket, 600 V, 2 wires, #14 | | \$ 7,849.50 | \$ 12,612.00 | \$- | \$ | 20,461.50 |
| | | | | | | | | |
| 160 | 260523100030 | Control cable, copper, THHN wire with PVC jacket, 600 V, 3 wires, #14 | | \$ 9,825.60 | \$ 15,196.80 | \$ - | \$ | 25,022.40 |
| | | | | | | | | |
| 55 | 260523100300 | Control cable, copper, THHN wire with PVC jacket, 600 V, 8 wires #14 | | \$ 8 987 00 | \$ 7 878 20 | \$ | \$ | 16 865 20 |
| | | Rigid galvanized steel conduit, 3/4" | | , 0,001.00 | | · | , | . 3,000.20 |
| | | diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 | | | | | | |
| 72 | 260533131770 | couplings per 100 LF | | \$ 434.16 | \$ 684.00 | \$ - | \$ | 1,118.16 |

| Quantity | Line Number | Description | | E | xt. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | | Ext. Total O&P |
|-----------------------|-------------------------|--|--|----|--------------|-----------------|-----------------|----|----------------|
| 72 | 260533250100 | Conduit fittings for rigid galvanized steel, standard, locknuts, 3/4" diameter | | \$ | 33.84 | \$- | \$ - | \$ | 33.84 |
| 4 | 260526800370 | Ground wire, copper wire, bare solid, #4 | | \$ | 461.36 | \$ 379.92 | \$ - | \$ | 841.28 |
| 4 | 260519350100 | Terminal lugs, solderless, #8 to #4 | | \$ | 3.48 | \$ 101.72 | \$- | \$ | 105.20 |
| 32 | 260529204110 | Hangers, channel, steel, 16 gauge, 1- 5/8" x 13/16" | | \$ | 213.76 | \$ 304.00 | \$- | \$ | 517.76 |
| 32 | 260529300270 | Rooftop channel support, 1-5/8" L x 1- 5/8" W, 12 ga. hot dip galv., sngl. base | | \$ | 67.20 | \$ 449.92 | \$ - | \$ | 517.12 |
| 2 | 221429132202 | Pump, pedestal sump, single stage, for general purpose float switch, copper coated float, add | | \$ | 242.84 | \$ 573.80 | \$- | \$ | 816.64 |
| 6 | 230953103680 | Control component, sensor, electric operated, temperature | | \$ | 838.68 | \$ 436.26 | \$ - | \$ | 1,274.94 |
| 4 | 230953103650 | Control component, sensor, electric operated, pressure | | \$ | 1,513.44 | \$ 364.52 | \$- | \$ | 1,877.96 |
| 2 | 230953109220 | Control component, pressure controllers & switches, pressure transmitter | | \$ | 527.60 | \$ 195.22 | \$- | \$ | 722.82 |
| 3 | 230953103084 | Control component, gauges, pressure, differential, magnehelic, with air filter kit, 0-2" W.C. | | \$ | 293.22 | \$ 391.44 | \$- | \$ | 684.66 |
| 1 | Allowance - lump sum | Head-end equipment, programming, software, commissioning | | \$ | - | \$ 108,900.00 | \$- | \$ | 108,900.00 |
| | | | | \$ | 86,765.79 | \$ 232,991.93 | \$- | \$ | 319,757.72 |
| H_04_15 | | | | | | | | | |
| Data Release : Year 2 | 020 | Unit Cost Estimate | | | | | | | |
| | | | | | | | | | |
| 220 | 260519200380 | Armored cable, copper, stranded, 600 | | \$ | 64 849 40 | \$ 127 881 60 | \$ - | s | 192 731 00 |
| 220 | 260526800360 | Ground wire, copper wire, bare solid, #6 | | \$ | 10,221.20 | \$ 16,669.40 | \$- | \$ | 26,890.60 |
| | | Control cable, copper, THHN wire with | | | | | | | |
| 275 | 260523100020 | PVC jacket, 600 V, 2 wires, #14 | | \$ | 14,390.75 | \$ 23,122.00 | \$ - | \$ | 37,512.75 |
| 1 | 230953109220 | controllers & switches, pressure transmitter | | \$ | 263.80 | \$ 97.61 | \$- | \$ | 361.41 |
| 150 | 260529204110 | Hangers, channel, steel, 16 gauge, 1- 5/8" x 13/16" | | \$ | 1,002.00 | \$ 1,425.00 | \$- | \$ | 2,427.00 |
| 150 | 260529300270 | Rooftop channel support, 1-5/8" L x 1- 5/8" W, 12 ga. hot dip galv., sngl. base | | \$ | 315.00 | \$ 2,109.00 | \$- | \$ | 2,424.00 |
| 90 | 260533131830 | Rigid galvanized steel conduit, 1-1/4" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF | | \$ | 562.50 | \$ 1,139.40 | \$- | \$ | 1,701.90 |
| | | Conduit fittings for rigid galvanized steel, standard, locknuts, 1-1/4" | | | | | | | |
| 90 | 260533250500 | diameter | | \$ | 83.70 | \$ - | \$- | \$ | 83.70 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
|----------|--------------|--|--|---------------|-----------------|-----------------|--------------------|
| 370 | 260533131800 | Rigid galvanized steel conduit, 1" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF | | \$ 3,359.60 | \$ 4,321.60 | \$ - | \$ 7,681.20 |
| 370 | 260533250300 | Conduit fittings for rigid galvanized steel, standard, locknuts, 1" diameter | | \$ 270.10 | \$- | \$- | \$ 270.10 |
| | | Rigid galvanized steel conduit, 3/4" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 | | | | | |
| 45 | 260533131770 | couplings per 100 LF Conduit fittings for rigid galvanized steel, standard, locknuts, 3/4" | | \$ 271.35 | \$ 427.50 | \$- | \$ 698.85 |
| 45 | 260533250100 | diameter | | \$ 21.15 | \$- | \$- | \$ 21.15 |
| 25 | 260526800370 | Ground wire, copper wire, bare solid, #4 | | \$ 2,883.50 | \$ 2,374.50 | \$- | \$ 5,258.00 |
| 25 | 260519350100 | Terminal lugs, solderless, #8 to #4 | | \$ 21.75 | \$ 635.75 | \$- | \$ 657.50 |
| 30 | 260533350200 | Flexible metallic conduit, steel, 3/4" diameter | | \$ 21.60 | \$ 142.20 | \$- | \$ 163.80 |
| 60 | 260519200150 | Armored cable, copper, solid, 600 V, 2 conductor, #12, BX, exposed | | \$ 2,915.40 | \$ 19,929.60 | \$- | \$ 22,845.00 |
| 60 | 260526800330 | Ground wire, copper wire, bare solid, #12 | | \$ 906.60 | \$ 3,487.80 | \$- | \$ 4,394.40 |
| 100 | 260523100300 | Control cable, copper, THHN wire with PVC jacket, 600 V, 8 wires, #14 | | \$ 16,340.00 | \$ 14,324.00 | \$- | \$ 30,664.00 |
| 60 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ 3,139.80 | \$ 5,044.80 | \$- | \$ 8,184.60 |
| 100 | 260519200350 | Armored cable, copper, stranded, 600 V, 3 conductor, #8, BX, exposed | | \$ 30,224.00 | \$ 58,128.00 | \$ - | \$ 88,352.00 |
| 200 | 260523100030 | Control cable, copper, THHN wire with PVC jacket, 600 V, 3 wires, #14 | | \$ 12,282.00 | \$ 18,996.00 | \$ - | \$ 31,278.00 |
| 200 | 260526800340 | Ground wire, copper wire, bare solid, #10 | | \$ 4,154.00 | \$ 12,664.00 | \$- | \$ 16,818.00 |
| 80 | 260523100030 | Control cable, copper, THHN wire with PVC jacket, 600 V, 3 wires, #14 | | \$ 4,912.80 | \$ 7,598.40 | \$- | \$ 12,511.20 |
| 80 | 260526800320 | Ground wire, copper wire, bare solid, #14 | | \$ 666.40 | \$ 4,318.40 | \$ - | \$ 4,984.80 |
| 250 | 260523100300 | Control cable, copper, THHN wire with PVC jacket, 600 V, 8 wires, #14 | | \$ 40,850.00 | \$ 35,810.00 | \$- | \$ 76,660.00 |
| 100 | 260523100100 | Control cable, copper, THHN wire with PVC jacket, 600 V, 4 wires, #14 | | \$ 6,355.00 | \$ 10,795.00 | \$- | \$ 17,150.00 |
| 105 | 000500400000 | Control cable, copper, THHN wire with | | 0 0 5 4 4 0 5 | | | |
| 125 | 260523100020 | PVC jacket, 600 V, 2 wires, #14 | | \$ 6,541.25 | \$ 10,510.00 | \$ - | \$ 17,051.25 |
| 152 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 Cable tray, ladder type, galvanized | | \$ 7,954.16 | \$ 12,780.16 | \$ - | \$ 20,734.32 |
| 60 | 260536100600 | steel, 4" deep, 4" rung spacing, 24" wide, to 15' elevation, incl fittings & supports | | \$ 1,698.00 | \$ 1,167.60 | \$ - | \$ 2,865.60 |
| | | Pipe, stainless steel, tubing, .035 wall, 1", type 304, excludes joints and | | | | | |
| 125 | 221113605027 | hangers | | \$ 2,071.25 | \$ 871.25 | \$- | \$ 2,942.50 |

| Quantity | Line Number | Description | | Ext. | Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | E | xt. Total O&P |
|-----------------------|--------------|--|--|------|------------|-----------------|-----------------|----|---------------|
| | | | | | | | | | |
| | | Pipe, stainless steel, tubing, .035 wall, 1/2", type 304, excludes joints and | | | 17.00 | | | | |
| 4 | 221113605023 | hangers | | \$ | 47.96 | \$ 19.88 | \$ - | \$ | 67.84 |
| | | Pipe, stainless steel, tubing, .035 wall, | | | | | | | |
| 65 | 221113605021 | 1/4", type 304, excludes joints and hangers | | \$ | 494.65 | \$ 323.05 | \$ - | \$ | 817.70 |
| | | Divid a brack and start and the Off | | | | | | | |
| | | diameter, to 10' H, incl 2 terminations, | | | | | | | |
| 16 | 260533131930 | 2 elbows, 11 beam clamps, and 11 couplings per 100 LF | | \$ | 297.28 | \$ 481.60 | \$- | \$ | 778.88 |
| | | | | | | | | | |
| 16 | 260533251050 | Conduit fittings for rigid galvanized steel, standard, locknuts, 3" diameter | | \$ | 121.28 | \$ - | \$- | \$ | 121.28 |
| | | Rigid galvanized steel conduit 1-1///" | | | | | | | |
| | | diameter, to 10' H, incl 2 terminations, | | | | | | | |
| 6 | 260533131830 | couplings per 100 LF | | \$ | 37.50 | \$ 75.96 | \$- | \$ | 113.46 |
| | | | | | | | | | |
| | | Conduit fittings for rigid galvanized steel, standard, locknuts, 1-1/4" | | | | | | | |
| 6 | 260533250500 | diameter | | \$ | 5.58 | \$ - | \$- | \$ | 5.58 |
| | | Rigid galvanized steel conduit, 3/4" | | | | | | | |
| 20 | 000500404770 | 2 elbows, 11 beam clamps, and 11 | | ¢ | 400.00 | ¢ 005.00 | • | | 405.00 |
| 30 | 260533131770 | couplings per 100 LF | | \$ | 180.90 | \$ 285.00 | \$ - | \$ | 465.90 |
| | | Conduit fittings for rigid galvanized | | | | | | | |
| 30 | 260533250100 | steel, standard, locknuts, 3/4" diameter | | \$ | 14.10 | \$ - | \$ - | \$ | 14.10 |
| | | | | | | | | | |
| | | Ground wire, copper wire, bare solid, | | | | | | | |
| 155 | 260526800370 | #4 | | \$ | 17,877.70 | \$ 14,721.90 | \$ - | \$ | 32,599.60 |
| | | | | | | | | | |
| 155 | 260519350100 | l erminal lugs, solderless, #8 to #4 | | \$ | 134.85 | \$ 3,941.65 | \$ - | \$ | 4,076.50 |
| | | Cable connectors, PVC jacket, 600 | | | | | | | |
| 20 | 260519252700 | volt, #6-3 wire, #6-4 wire | | \$ | 141.00 | \$ 944.60 | \$ - | \$ | 1,085.60 |
| 60 | 260519252700 | Cable connectors, PVC jacket, 600 volt, #6-3 wire, #6-4 wire | | \$ | 423.00 | \$ 2,833.80 | \$ - | \$ | 3,256.80 |
| | | Hangers, channel, steel, 16 gauge, 1- | | | | | | | |
| 2 | 260529204110 | 5/8" x 13/16" | | \$ | 13.36 | \$ 19.00 | \$ - | \$ | 32.36 |
| | | Rooftop channel support, 1-5/8" L x 1- 5/8" W, 12 ga. hot dip galv., sngl. | | | | | | | |
| 2 | 260529300270 | base | | \$ | 4.20 | \$ 28.12 | \$ - | \$ | 32.32 |
| 1 | 262726205530 | NEMA L8 | | \$ | 23.50 | \$ 25.43 | \$ - | \$ | 48.93 |
| 11 04 40 | | | | \$ | 259,364.92 | \$ 420,470.56 | \$- | \$ | 679,835.48 |
| Data Release : Year 2 | 020 | Unit Cost Estimate | | | | | | | |
| | | | | | | | | | |
| 100 | 260519200350 | Armored cable, copper, stranded, 600 | | \$ | 30 224 00 | \$ 58 128 00 | \$ | \$ | 88 352 00 |
| 100 | 200010200300 | , o conductor, #0, DA, exposed | | Ψ | 00,224.00 | ÷ 30,120.00 | Ψ - | Ŷ | 00,352.00 |
| 200 | 260523100020 | Control cable, copper, THHN wire with | | \$ | 12 282 00 | \$ 19.006.00 | \$ | ¢ | 31 279 00 |
| 200 | 20020100000 | Ground wire, copper wire, bare solid, | | Ψ | 12,202.00 | φ 10,990.00 | Ψ - | φ | 51,278.00 |
| 200 | 260526800340 | #10 | | \$ | 4,154.00 | \$ 12,664.00 | \$- | \$ | 16,818.00 |
| | | Control cable, copper, THHN wire with | | | | | | | |
| 80 | 260523100030 | PVC jacket, 600 V, 3 wires, #14 | | \$ | 4,912.80 | \$ 7,598.40 | \$ - | \$ | 12,511.20 |
| | | Ground wire, copper wire, bare solid, | | | | | | | |
| 80 | 260526800320 | #14 | | \$ | 666.40 | \$ 4,318.40 | \$- | \$ | 4,984.80 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | E | xt. Total O&P |
|----------|--------------|--|--|---------------|-----------------|-----------------|----|---------------|
| | | | | | | | | |
| 250 | 260523100300 | Control cable, copper, THHN wire with PVC jacket, 600 V, 8 wires, #14 | | \$ 40,850.00 | \$ 35,810.00 | \$- | \$ | 76,660.00 |
| | | Control cable, copper, THHN wire with | | | | | | |
| 100 | 260523100100 | PVC jacket, 600 V, 4 wires, #14 | | \$ 6,355.00 | \$ 10,795.00 | \$- | \$ | 17,150.00 |
| 125 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ 6,541.25 | \$ 10,510.00 | \$- | \$ | 17,051.25 |
| | | Control coble, coppor, THUN wire with | | | | | | |
| 152 | 260523100020 | PVC jacket, 600 V, 2 wires, #14 | | \$ 7,954.16 | \$ 12,780.16 | \$- | \$ | 20,734.32 |
| 60 | 260536100600 | Cable tray, ladder type, galvanized steel, 4" deep, 4" rung spacing, 24" wide, to 15' elevation, incl fittings & supports | | \$ 1,698.00 | \$ 1,167.60 | \$- | \$ | 2,865.60 |
| 125 | 221113605027 | Pipe, stainless steel, tubing, .035 wall, 1", type 304, excludes joints and hangers | | \$ 2,071.25 | \$ 871.25 | \$- | \$ | 2,942.50 |
| 4 | 221113605023 | Pipe, stainless steel, tubing, .035 wall, 1/2", type 304, excludes joints and hangers | | \$ 47.96 | \$ 19.88 | \$- | \$ | 67.84 |
| | | Pipe, stainless steel, tubing, .035 wall, | | | | | | |
| 65 | 221113605021 | hangers | | \$ 494.65 | \$ 323.05 | \$- | \$ | 817.70 |
| 16 | 260533131930 | Rigid galvanized steel conduit, 3" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LE | | \$ 297.25 | \$ 481.60 | \$ | \$ | 778 88 |
| | 200000101000 | oodpinigo poi 100 zi | | φ 201.20 | • 101.00 | Ť | Ŷ | 110.00 |
| 16 | 260533251050 | Conduit fittings for rigid galvanized steel, standard, locknuts, 3" diameter | | \$ 121.28 | \$ | \$- | \$ | 121.28 |
| 6 | 260533131830 | Rigid galvanized steel conduit, 1-1/4" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF | | \$ 37.50 | \$ 75.96 | \$- | \$ | 113.46 |
| 6 | 260533250500 | Conduit fittings for rigid galvanized steel, standard, locknuts, 1-1/4" diameter | | \$ 5.58 | s - | · \$ - | \$ | 5.58 |
| | | Rigid galvanized steel conduit, 3/4" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 | | | | | | |
| 30 | 260533131770 | couplings per 100 LF Conduit fittings for rigid galvanized steel, standard, locknuts, 3/4" | | \$ 180.90 | \$ 285.00 | \$ - | Ş | 465.90 |
| 30 | 260533250100 | diameter Ground wire, copper wire, bare solid, | | \$ 14.10 | \$ | | \$ | 14.10 |
| 155 | 260526800370 | #4 | | \$ 17,877.70 | \$ 14,721.90 | \$ - | \$ | 32,599.60 |
| 155 | 260519350100 | Terminal lugs, solderless, #8 to #4 | | \$ 134.85 | \$ 3,941.65 | \$- | \$ | 4,076.50 |
| 20 | 260519252700 | Cable connectors, PVC jacket, 600 volt, #6-3 wire, #6-4 wire | | \$ 141.00 | \$ 944.60 | \$- | \$ | 1,085.60 |
| 60 | 260519252700 | Cable connectors, PVC jacket, 600 volt, #6-3 wire, #6-4 wire | | \$ 423.00 | \$ 2,833.80 | \$- | \$ | 3,256.80 |
| 2 | 260529204110 | Hangers, channel, steel, 16 gauge, 1- 5/8" x 13/16" | | \$ 13.36 | i \$ 19.00 | \$- | \$ | 32.36 |
| 2 | 260529300270 | Rooftop channel support, 1-5/8" L x 1- 5/8" W, 12 ga. hot dip galv., sngl. base | | \$ 4.20 | \$ 28.12 | \$. | ¢ | 32 32 |
| _ | 000700005500 | Plug, locking, 20 amp, 480 volt, | | | | | ÷ | 10.02 |
| 1 | 262726205530 | Duplex receptacle, duplex | | ə 23.50 | ¢ 25.43 | \$- | \$ | 48.93 |
| 1 | 262726205000 | receptacle,combo 15A/125V, 3 wire w/2-5V 0.7A, port USB, AL | | \$ 22.43 | \$ 28.03 | \$- | \$ | 50.46 |
| | | Receptacle devices, residential, weather-proof cover or above | | | | | | |
| 1 | 260590104500 | receptacles, add | | \$ 2.37 | \$ 23.87 | \$ - | \$ | 26.24 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | E | xt. Total O&P |
|-----------------------|----------------|--|--|----------------------------|-----------------|-----------------|----------|---------------|
| 1 | 262726200200 | Toggle switch, quiet type, single pole, 15 amp | | \$ 0.61 | \$ 18.94 | \$- | \$ | 19.55 |
| 25 | 004440040040 | Elbow, 90 Deg., stainless steel, tube fittings, compression type, 1", type | | ¢ 0.044.05 | ¢ 000.05 | <u>^</u> | ¢ | 4 227 50 |
| 110 | 220533200150 | Temperature maintenance cable, components, heating cable, 208 V, 140 Deg F | | \$ 3,344.25 \$ 1,294.70 | \$ 993.25 | \$ - \$ - | \$ \$ | 4,337.50 |
| 1 | Allowance | Head-end equipment, programming, software, commissioning | | \$ - | \$ 108,900.00 | \$- | \$ | 108,900.00 |
| | | | | \$ 142,190.08 | \$ 307,445.89 | \$- | \$ | 449,635.97 |
| H 04 17 | | | | | | | | |
| Data Release : Year 2 | 020 | Unit Cost Estimate | | | | | | |
| | | | | | | | | |
| 1 | Panel Assem | Intermediate Control panel assembly | | \$ 1,036,450.00 | \$ 6,937.66 | \$- | \$ | 1,043,387.66 |
| 2 | 52BX-0001 | Control Panels | | \$ 1,075.02 | \$ 1,268.82 | \$- | \$ | 2,343.84 |
| 54 | 220523403570 | Valves, cast iron, lined, corrosion resistant, high purity, check lift, horizontal, PPL or SL lined, flanged, 125 lb., 3" | | \$ 95,063.22 | \$ 16,673.04 | \$ - | \$ | 111,736.26 |
| | | Valves, cast iron body, multipurpose, functions as a shut off, balancing, check and metering valve, threaded, | | | | | | |
| 44 | 230523501040 | 2-1/2" size | | \$ 31,445.92 | \$ 12,402.28 | \$- | \$ | 43,848.20 |
| | | Individual steel bearing plate, 6" x 6" x | | | | | | |
| 9 | 052119106400 | 1/4", with J-hook | | \$ 128.88 | \$ 39.06 | \$- | \$ | 167.94 |
| 10 | 628411-K60431- | | | ¢ 969 290 10 | ¢ 40.425.27 | | ¢ | 017 915 47 |
| 19 | 52BX-0001 | | | \$ 868,380.10 | \$ 49,435.37 | | Þ | 917,815.47 |
| 1 | 220052100220 | controllers & switches, pressure | | ¢ | ¢ 07.64 | ¢ | ¢ | 261.41 |
| | 230953109220 | Water level control, water gauges, complete, high pressure, 500 psi at 450Deg.F, 3/4" pipe size, type 316 | | \$ 203.00 | 5 97.01 | р - | \$ | 301.41 |
| 13 | 230913609530 | stainless steel, ASME | | \$ 13,526.37 | \$ 1,126.45 | \$ - | \$ | 14,652.82 |
| 675 | 221113605025 | Pipe, stainless steel, tubing, .035 wall, 3/4", type 304, excludes joints and hangers | | \$ 8,228.25 | \$ 4,043.25 | \$- | \$ | 12,271.50 |
| 675 | 221113618210 | Elbow, 90 Deg., stainless steel, tube fittings, compression type, 3/4", type 316 | | \$ 47,229.75 | \$ 25,427.25 | \$- | \$ | 72,657.00 |
| | | Medium-cable single cable, copper, XLP shielding, grounded neutral, 35 | | | | | | |
| 59 | 260513165000 | & terminations | | \$ 3,591.92 | \$ 1,469.69 | \$- | \$ | 5,061.61 |
| | | Hangers, channel, steel, 16 gauge, 1- | | | | | | |
| 304 | 260529204110 | 5/8" x 13/16" Reafton channel support 1 5/8" L x 1 | | \$ 2,030.72 | \$ 2,888.00 | \$ - | \$ | 4,918.72 |
| 304 | 260520300270 | 5/8" W, 12 ga. hot dip galv., sngl. | | \$ 638.40 | \$ 1 274 24 | ¢ | ¢ | 4 912 64 |
| 504 | 200323300270 | base | | φ 000.40 | Ψ ,214.24 | ų - | Ų | 4,912.04 |
| 5 | Telestrut | I Initstrut / telestrut carbon steel | | \$ 493.69 | \$ 520.32 | \$ - | \$ | 1 014 02 |
| Ť | | | | | | | ¥ | .,014.02 |
| 110 | 260526800370 | Ground wire, copper wire, bare solid, #4 | | \$ 12,687.40 | \$ 10,447.80 | \$- | \$ | 23,135.20 |
| | | | | | | | | |
| 110 | 260519350100 | Terminal lugs, solderless, #8 to #4 | | \$ 95.70 | \$ 2,797.30 | \$- | \$ | 2,893.00 |
| | | Control cable, copper, THHN wire with | | | | | | |
| 400 | 260523101000 | PVC jacket, 600 V, 22 wires, #14 | | \$ 166,608.00 | \$ 108,368.00 | \$- | \$ | 274,976.00 |
| 100 | 260523101000 | Control cable, copper, THHN wire with | | \$ 41,652,00 | \$ 27.002.00 | \$ | ¢ | 68 744 00 |
| 100 | 200323101000 | 1 10 Jacket, 000 V, 22 WIIES, #14 | | | | ψ - | φ | 00,744.00 |

| Quantity | Line Number | Description | | E> | ct. Mat. O&P | Ext. Labour O&P | E | ct. Equip. O&P | E | xt. Total O&P |
|----------------------------------|--------------|--|--|----|--------------|-----------------|-------|----------------|----|---------------|
| 720 | 260523101000 | Control cable, copper, THHN wire with PVC jacket, 600 V, 22 wires, #14 | | \$ | 299,894.40 | \$ 195,062 | 40 \$ | - | \$ | 494,956.80 |
| 1100 | 260523100300 | Control cable, copper, THHN wire with PVC jacket, 600 V, 8 wires, #14 | | \$ | 179,740.00 | \$ 157,564 | 00 \$ | - | \$ | 337,304.00 |
| 500 | 260523101000 | Control cable, copper, THHN wire with PVC jacket, 600 V, 22 wires, #14 | | \$ | 208,260.00 | \$ 135,460 | 00 \$ | | \$ | 343,720.00 |
| 20 | 260523101000 | Control cable, copper, THHN wire with PVC jacket, 600 V, 22 wires, #14 | | \$ | 8,330.40 | \$ 5,418 | 40 \$ | | \$ | 13,748.80 |
| 100 | 260523100400 | Control cable, copper, THHN wire with PVC jacket, 600 V, 10 wires, #14 | | \$ | 19,544.00 | \$ 15,778 | 00 \$ | - | \$ | 35,322.00 |
| 100 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ | 5,233.00 | \$ 8,408 | 00 \$ | | \$ | 13,641.00 |
| 1000 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ | 52,330.00 | \$ 84,080 | 00 \$ | _ | \$ | 136,410.00 |
| 30 | 260533131850 | Rigid galvanized steel conduit, 1-1/2" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LE | | ¢ | 328 50 | \$ 414 | 30 ¢ | | ¢ | 742.80 |
| | 20000101000 | Conduit fittings for rigid galvanized | | Ŷ | 020.00 | ¥ | UU V | | Ŷ | 742.00 |
| 30 | 260533250700 | diameter | | \$ | 46.50 | \$ | - \$ | | \$ | 46.50 |
| 60 | 260533131930 | Rigid galvanized steel conduit, 3" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF | | \$ | 1,114.80 | \$ 1,806 | 00 \$ | - | \$ | 2,920.80 |
| 60 | 260533251050 | Conduit fittings for rigid galvanized steel, standard, locknuts, 3" diameter | | \$ | 454.80 | \$ | - \$ | - | \$ | 454.80 |
| 630 | 260533131800 | Rigid galvanized steel conduit, 1" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF | | \$ | 5,720.40 | \$ 7,358 | 40 \$ | - | \$ | 13,078.80 |
| 630 | 260533250300 | Conduit fittings for rigid galvanized steel, standard, locknuts, 1" diameter | | \$ | 459.90 | \$ | - \$ | - | \$ | 459.90 |
| | | Rigid galvanized steel conduit, 1/2" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 | | | | | | | | |
| 500 | 260533131750 | couplings per 100 LF Conduit fittings for rigid galvanized | | \$ | 1,625.00 | \$ 4,205 | 00 \$ | | \$ | 5,830.00 |
| 500 | 260533250050 | steel, standard, locknuts, 1/2" diameter | | \$ | 115.00 | \$ | - \$ | - | \$ | 115.00 |
| 1 | 260533180100 | Pull boxes, steel, type SC, 6" W x 6" H x 4" D, NEMA 1 | | \$ | 11.59 | \$ 94 | 98 \$ | _ | \$ | 106.57 |
| 30 | 260533350100 | Flexible metallic conduit, steel, 1/2" diameter | | \$ | 15.90 | \$ 113 | 70 \$ | | \$ | 129.60 |
| 35 | 260519200050 | Armored cable, copper, solid, 600 V, 2 conductor, #14, BX, exposed | | \$ | 1,607.20 | \$ 11,080 | 65 \$ | - | \$ | 12,687.85 |
| 1 | Allowance | Head-end equipment, programming, software, commissioning | | \$ | - | \$ 108,900 | 00 \$ | _ | \$ | 108,900.00 |
| | | | | \$ | 3,114,420.53 | ə 1,011,051 | ษ/ \$ | | \$ | 4,125,472.50 |
| H_04_18 Data Release - Veor 2 | 020 | Unit Cost Estimate | | | | | | | | |
| Data Nelease . Teal 2 | 020 | | | | | | | | | |
| | | | | | | | | | | |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | E | kt. Total O&P |
|----------|--------------|---|--|---|-----------------|-----------------|----------|---------------|
| 1 | 262726205020 | Duplex receptacle, duplex receptacle,combo 20A/125V, 3 wire w/2-5V 2.1A, port USB, AL | | \$ 60.34 | \$ 28.03 | \$ - | \$ | 88.37 |
| 1 | 284620508200 | Detection system, annunciator panel, 16 zone lamp, excluding wires & conduits | | \$ 537.51 | \$ 634.41 | \$- | \$ | 1,171.92 |
| 40 | 221113605025 | Pipe, stainless steel, tubing, .035 wall, 3/4", type 304, excludes joints and hangers | | \$ 487.60 | \$ 239.60 | \$- | \$ | 727.20 |
| 6 | 220523403570 | Valves, cast iron, lined, corrosion resistant, high purity, check lift, horizontal, PPL or SL lined, flanged, 125 lb., 3" | | \$ 10,562.58 | \$ 1,852.56 | \$- | \$ | 12,415.14 |
| 6 | 230523501040 | Valves, cast iron body, multipurpose, functions as a shut off, balancing, check and metering valve, threaded, 2-1/2" size | | \$ 4,288.08 | \$ 1,691.22 | \$- | \$ | 5,979.30 |
| | | | | | | | | |
| 500 | 260523101000 | Control cable, copper, THHN wire with PVC jacket, 600 V, 22 wires, #14 | | \$ 208,260.00 | \$ 135,460.00 | \$- | \$ | 343,720.00 |
| 500 | 260523100300 | Control cable, copper, THHN wire with | | \$ 81 700 00 | \$ 71.620.00 | \$ _ | s | 153 320 00 |
| | | | | • | ¢ 1,020.00 | Ţ | Ţ | 100,020.00 |
| 500 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ 26,165.00 | \$ 42,040.00 | \$ - | \$ | 68,205.00 |
| 240 | 260533131800 | Rigid galvanized steel conduit, 1" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF | | \$ 2,179.20 | \$ 2,803.20 | \$ - | s | 4,982.40 |
| 240 | 260533250300 | Conduit fittings for rigid galvanized | | \$ 175.20 | ¢ | ¢ | ¢ | 175 20 |
| 240 | 20033230300 | Rigid galvanized steel conduit, 1/2" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 | | φ 113.20 | Ψ | | Ŷ | 110.20 |
| 70 | 260533131750 | couplings per 100 LF | | \$ 227.50 | \$ 588.70 | \$- | \$ | 816.20 |
| 70 | 260533250050 | Conduit fittings for rigid galvanized steel, standard, locknuts, 1/2" diameter | | \$ 16.10 | \$ - | \$ - | \$ | 16.10 |
| 10 | 200522424850 | Rigid galvanized steel conduit, 1-1/2" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 exurging a 100 LF | | ¢ 121.40 | ¢ 465.72 | ¢ | ¢ | 207.42 |
| 12 | 260533250700 | Conduit fittings for rigid galvanized steel, standard, locknuts, 1-1/2" diameter | | \$ 18.60 | \$ 103.72 | \$ - | \$ \$ | 18.60 |
| 30 | 260533350100 | Flexible metallic conduit, steel, 1/2" diameter | | \$ 15.90 | \$ 113.70 | \$- | \$ | 129.60 |
| 15 | 260523202480 | Tray cable, type TC, copper, 600 V, #16-9 conductor | | \$ 1,289.55 | \$ 2,273.25 | \$- | \$ | 3,562.80 |
| 250 | 260523202496 | Tray cable, type TC, copper, 600 V, #16-25 conductor | | \$ 64,880.00 | \$ 59,165.00 | \$- | \$ | 124,045.00 |
| 200 | 260523101000 | Control cable, copper, THHN wire with PVC jacket, 600 V, 22 wires, #14 | | \$ 83,304.00 | \$ 54,184.00 | \$- | \$ | 137,488.00 |
| 75 | 260526800370 | Ground wire, copper wire, bare solid, #4 | | \$ 8,650.50 | \$ 7,123.50 | \$- | \$ | 15,774.00 |

| Quantity | Line Number | Description | | Ext. Mat. O&P | Ext. Labour O&P | Ext. Equip. O&P | Ext. Total O&P |
|-----------------------|--------------|---|--|---------------|-----------------|-----------------|----------------|
| | | | | | | | |
| 75 | 260519350100 | Terminal lugs, solderless, #8 to #4 | | \$ 65.25 | \$ 1,907.25 | \$- | \$ 1,972.50 |
| 30 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ 1,569.90 | \$ 2,522.40 | \$- | \$ 4,092.30 |
| 250 | 260533131930 | Rigid galvanized steel conduit, 3" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF | | \$ 4,645.00 | \$ 7,525.00 | \$ - | \$ 12,170.00 |
| 250 | 260533251050 | Conduit fittings for rigid galvanized steel, standard, locknuts, 3" diameter | | \$ 1,895.00 | \$- | \$- | \$ 1,895.00 |
| 7 | 250528393020 | Terminal block, fuse holder, LED indicator, DIN mounted, 110V, 6A | | \$ 95.90 | \$ 101.85 | \$- | \$ 197.75 |
| | | | | \$ 501,220.11 | \$ 392,039.39 | \$- | \$ 893,259.50 |
| H 04 19 | | | | | | | |
| Data Release : Year 2 | 020 | Unit Cost Estimate | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | Pipe, stainless steel, tubing, .035 wall, 3/8", type 304, excludes joints and | | | | | |
| 350 | 221113605022 | hangers | | \$ 2,485.00 | \$ 1,739.50 | \$ - | \$ 4,224.50 |
| | | Valves, bronze, reducing, water pressure, high capacity, iron body, | | | | | |
| 2 | 220523207860 | flanged, 250 psi to 25-75 psi, 4" | | \$ 19,548.60 | \$ 346.60 | \$- | \$ 19,895.20 |
| 2 | 230913609530 | Water level control, water gauges, complete, high pressure, 500 psi at 450Deg.F, 3/4" pipe size, type 316 stainless steel, ASME | | \$ 2,080.98 | \$ 173.30 | \$- | \$ 2,254.28 |
| | | Floor plate, steel checkered plate, 6.& | | | | | |
| | | 9 mm T, 185 to 465 m2, field | | | | | |
| 445 | 055413200020 | Valves, cast iron, lined, corrosion resistant, high purity, check lift, horizontal, PPL or SL lined, flanged, doc line 27 | | \$ 26 406 45 | \$ 938.95 | \$ 62.30 | \$ 1,864.55 |
| 15 | 220523403370 | Valves, cast iron body, multipurpose, functions as a shut off, balancing, check and metering valve, threaded, d (0) is inc. | | ¢ 11 424 99 | ¢ 4,001.40 | φ - | ¢ 45.044.90 |
| 10 | 230323301040 | Pressure & temperature safety plug, 3/4" external thread, 3/8" diameter element 7-1/2" insertion, 316 | | | \$ 4,509.92 | р - | \$ 15,944.60 |
| 6 | 221119301250 | stainless steel Control component, pressure | | \$ 395.16 | \$ 151.68 | \$- | \$ 546.84 |
| 2 | 230953109220 | controllers & switches, pressure transmitter | | \$ 527.60 | \$ 195.22 | \$- | \$ 722.82 |
| | | | | \$ 63,741.97 | \$ 12,686.57 | \$ 62.30 | \$ 76,490.84 |
| H 04 20 | | | | | | | |
| Data Release : Year 2 | 020 | Unit Cost Estimate | | | | | |
| | | | | | | | |
| 100 | 260523100300 | Control cable, copper, THHN wire with PVC jacket, 600 V, 8 wires, #14 | | \$ 16,340.00 | \$ 14,324.00 | \$- | \$ 30,664.00 |
| 100 | 260523100020 | Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14 | | \$ 5,233.00 | \$ 8,408.00 | \$ - | \$ 13,641.00 |
| 250 | 260523100300 | Control cable, copper, THHN wire with PVC jacket, 600 V, 8 wires, #14 | | \$ 40,850.00 | \$ 35,810.00 | \$- | \$ 76,660.00 |
| 200 | 000500404000 | Rigid galvanized steel conduit, 1" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 sourcling a per 100 L | | ¢ 4.040.00 | ¢ 0.000.00 | ¢ | ¢ 450.00 |
| 200 | 200000131800 | Coupilitigs per 100 LF | | φ 1,810.00 | φ 2,336.00 | ۍ - | φ 4,152.00 |
| 200 | 260533250300 | Conduit fittings for rigid galvanized steel, standard, locknuts, 1" diameter | | \$ 146.00 | \$ - | \$ - | \$ 146.00 |

| Quantity | Line Number | Description | | | E | Ext. Mat. O&P | E | Ext. Labour O&P | Ex | t. Equip. O&P | l | Ext. Total O&P |
|----------|--------------|--|-------------------|-------|----|---------------|---------|-----------------|----|---------------|----------|----------------|
| 2 | 260533180100 | Pull boxes, steel, type SC, 6" W x 6" H x 4" D, NEMA 1 | | | \$ | 23.18 | \$ | 189.96 | \$ | - | \$ | 213.14 |
| 140 | 221113605022 | Pipe, stainless steel, tubing, .035 wall, 3/8", type 304, excludes joints and hangers | | | \$ | 994.00 | \$ | 695.80 | \$ | | \$ | 1,689.80 |
| 140 | 221113618207 | Elbow, 90 Deg., stainless steel, tube fittings, compression type, 3/8", type 316 | | | \$ | 3,385.20 | \$ | 5,056.80 | \$ | - | \$ | 8,442.00 |
| 4 | 230523501040 | Valves, cast iron body, multipurpose, functions as a shut off, balancing, check and metering valve, threaded, 2-1/2" size | | | \$ | 2 858 72 | \$ | 1 127 48 | \$ | _ | \$ | 3 986 20 |
| 4 | 230913609530 | Water level control, water gauges, complete, high pressure, 500 psi at 450Deg.F, 3/4" pipe size, type 316 stainless steel. ASME | | | \$ | 4,161.96 | \$ | 346.60 | \$ | _ | s | 4,508.56 |
| 593 | 055413200020 | Floor plate, steel checkered plate, 6 & 9 mm T, 185 to 465 m2, field fabricated, bolted | | | \$ | 1,150.42 | \$ | 1,251.23 | \$ | 83.02 | \$ | 2,484.67 |
| 1 | Allowance | Head-end equipment, programming software, commissioning | | | \$ | - | \$ | 108,900.00 | \$ | - | \$ | 108,900.00 |
| | | | | | \$ | 76,958.48 | \$ | 178,445.87 | \$ | 83.02 | \$ | 255,487.37 |
| | | | Labor factor 2.5v | 15 | \$ | 17,395,419.76 | \$ ¢ | 8,054,627.03 | \$ | 145.32 | \$ \$ | 25,450,192.11 |
| | | | | Total | \$ | 17,395,419.76 | ₽ \$ | 20,136,567.58 | \$ | 145.32 | φ \$ | 37,532,132.66 |

Appendix E. Backup Detail on EPC Contractor's Indirect Costs

This appendix presents the worksheets we used in developing our estimate of the EPC contractor's indirect costs. These worksheets show the staffing level and associated costs by staff position for 8 specialty sections for each year of construction, Years 1 through Year 6. Thus, there are 48 spreadsheets.

The specialty sections are arranged in the following order:

- Civil
- Electrical
- Engineering support
- Mechanical
- Nuclear mechanical
- Nuclear structure
- Procurement
- Project management

We arranged each spreadsheet in a consistent format. In the first column, we specify the staff position of the individual. We used the second column (portion of a year) and third column (allocation of effort to the project) to develop scaling factors for the proportion of time that the staff person would devote to the D2O Storage Project. The product of the second and third column in each row reflects the proportion of time per year that the staff person would be assigned to the D2O Storage Project. In the fourth column, we specify the price deflation factor we applied to the 2019 annual wage (in sixth column) to reflect the then-year annual cost of the staff person. In the fifth column, we identify the number of staff people (denoted in full-time equivalents) that would be assigned to the staff position. In the sixth column, we placed our estimated average annual salary (scaled in thousands of dollars) for each staff position. The sum of the product of each row in columns 2 through 6 yield the annual wage cost (scaled in thousands of dollars) for the staff people assigned to that specialty section.

We then applied a "burden" factor of 1.9 to the raw wages amount to reflect the EPC contractor's full cost for the section. The burden factor accounts for the costs of the employees' fringe benefit and the EPC contractor's overhead costs and profit. In our experience, a burden factor of 1.9 (or a burden of 90% of base labour costs) is appropriate for EPC contractor staffing. Finally, we rescaled the costs to reflect costs in dollars.

Table E-1: EPC Civil Engineering Spend Profile Details

| Year 1—EPC Civil | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|----------------------------------|-----------|------------|----------|---------|--------------------|
| Civil engr | 1 | 0.667 | 0.848 | 3 | \$81 |
| Civil engr spec | 1 | 0.667 | 0.848 | 1 | \$94 |
| Director | 1 | 0.667 | 0.848 | 0.25 | \$180 |
| Document controller | 1 | 0.667 | 0.848 | 0.33 | \$46 |
| Engr EIT | 1 | 0.667 | 0.848 | 1 | \$65 |
| Engr mngr | 1 | 0.667 | 0.848 | 1 | \$127 |
| Intermed piping designer (civil) | 1 | 0.667 | 0.848 | 1 | \$65 |
| Senior director | 1 | 0.667 | 0.848 | 0.125 | \$173 |
| Senior engr | 1 | 0.667 | 0.848 | 0.5 | \$125 |
| Senior engr | 1 | 0.667 | 0.848 | 0.5 | \$105 |
| Structural engr | 1 | 0.667 | 0.848 | 2 | \$72 |
| | | | Sum | 10.7 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$1,002,550 |

| Year 2—EPC Civil | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|----------------------------------|-----------|------------|----------|---------|--------------------|
| Civil engr | 1 | 0.667 | 0.855 | 3 | \$81 |
| Civil engr spec | 1 | 0.667 | 0.855 | 1 | \$94 |
| Director | 1 | 0.667 | 0.855 | 0.25 | \$180 |
| Document controller | 1 | 0.667 | 0.855 | 0.33 | \$46 |
| Engr EIT | 1 | 0.667 | 0.855 | 1 | \$65 |
| Engr mngr | 1 | 0.667 | 0.855 | 1 | \$127 |
| Intermed piping designer (civil) | 1 | 0.667 | 0.855 | 1 | \$65 |
| Senior director | 1 | 0.667 | 0.855 | 0.125 | \$173 |
| Senior engr | 1 | 0.667 | 0.855 | 0.5 | \$125 |
| Senior engr | 1 | 0.667 | 0.855 | 0.5 | \$105 |
| Structural engr | 1 | 0.667 | 0.855 | 2 | \$72 |
| | | | Sum | 10.7 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$1,010,954 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 297 of 350

| Year 3—EPC Civil | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|----------------------------------|-----------|------------|----------|---------|--------------------|
| Civil engr | 0.75 | 0.667 | 0.857 | 3 | \$81 |
| Civil engr spec | 0.75 | 0.667 | 0.857 | 1 | \$94 |
| Director | 0.75 | 0.667 | 0.857 | 0.25 | \$180 |
| Document controller | 0.75 | 0.667 | 0.857 | 0.33 | \$46 |
| Engr EIT | 0.75 | 0.667 | 0.857 | 1 | \$65 |
| Engr mngr | 0.75 | 0.667 | 0.857 | 1 | \$127 |
| Intermed piping designer (civil) | 0.75 | 0.667 | 0.857 | 1 | \$65 |
| Senior director | 0.75 | 0.667 | 0.857 | 0.125 | \$173 |
| Senior engr | 0.75 | 0.667 | 0.857 | 0.5 | \$125 |
| Senior engr | 0.75 | 0.667 | 0.857 | 0.5 | \$105 |
| Structural engr | 0.75 | 0.667 | 0.857 | 2 | \$72 |
| | | | Sum | 10.7 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$759,896 |

| Year 4–EPC Civil | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|----------------------------------|-----------|------------|----------|---------|--------------------|
| Civil engr | 0.5 | 0.667 | 0.913 | 3 | \$81 |
| Civil engr spec | 0.5 | 0.667 | 0.913 | 1 | \$94 |
| Director | 0.5 | 0.667 | 0.913 | 0.25 | \$180 |
| Document controller | 0.5 | 0.667 | 0.913 | 0.33 | \$46 |
| Engr EIT | 0.5 | 0.667 | 0.913 | 1 | \$65 |
| Engr mngr | 0.5 | 0.667 | 0.913 | 1 | \$127 |
| Intermed piping designer (civil) | 0.5 | 0.667 | 0.913 | 1 | \$65 |
| Senior director | 0.5 | 0.667 | 0.913 | 0.125 | \$173 |
| Senior engr | 0.5 | 0.667 | 0.913 | 0.5 | \$125 |
| Senior engr | 0.5 | 0.667 | 0.913 | 0.5 | \$105 |
| Structural engr | 0.5 | 0.667 | 0.913 | 2 | \$72 |
| | | | Sum | 10.7 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$540,072 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 298 of 350

| Year 5—EPC Civil | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|----------------------------------|-----------|------------|----------|---------|--------------------|
| Civil engr | 0.5 | 0.667 | 0.948 | 3 | \$81 |
| Civil engr spec | 0.5 | 0.667 | 0.948 | 1 | \$94 |
| Director | 0.5 | 0.667 | 0.948 | 0.25 | \$180 |
| Document controller | 0.5 | 0.667 | 0.948 | 0.33 | \$46 |
| Engr EIT | 0.5 | 0.667 | 0.948 | 1 | \$65 |
| Engr mngr | 0.5 | 0.667 | 0.948 | 1 | \$127 |
| Intermed piping designer (civil) | 0.5 | 0.667 | 0.948 | 1 | \$65 |
| Senior director | 0.5 | 0.667 | 0.948 | 0.125 | \$173 |
| Senior engr | 0.5 | 0.667 | 0.948 | 0.5 | \$125 |
| Senior engr | 0.5 | 0.667 | 0.948 | 0.5 | \$105 |
| Structural engr | 0.5 | 0.667 | 0.948 | 2 | \$72 |
| | | | Sum | 10.7 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$560,240 |

| Year 6—EPC Civil | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|----------------------------------|-----------|------------|----------|---------|--------------------|
| Civil engr | 0.25 | 0.667 | 0.991 | 3 | \$81.00 |
| Civil engr spec | 0.25 | 0.667 | 0.991 | 1 | \$94.00 |
| Director | 0.25 | 0.667 | 0.991 | 0.25 | \$180.23 |
| Document controller | 0.25 | 0.667 | 0.991 | 0.33 | \$46.00 |
| Engr EIT | 0.25 | 0.667 | 0.991 | 1 | \$65.00 |
| Engr mngr | 0.25 | 0.667 | 0.991 | 1 | \$126.52 |
| Intermed piping designer (civil) | 0.25 | 0.667 | 0.991 | 1 | \$64.50 |
| Senior director | 0.25 | 0.667 | 0.991 | 0.125 | \$173.00 |
| Senior engr | 0.25 | 0.667 | 0.991 | 0.5 | \$124.50 |
| Senior engr | 0.25 | 0.667 | 0.991 | 0.5 | \$104.50 |
| Structural engr | 0.25 | 0.667 | 0.991 | 2 | \$72.00 |
| | | | Sum | 10.7 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$293,075.71 |

Table E-2: EPC Electrical Engineering Spend Profile Details

| Year 1—EPC Electrical | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-----------------------|-----------|------------|----------|---------|--------------------|
| Director | 0.5 | 0.667 | 0.848 | 0.25 | \$180 |
| Document controller | 0.5 | 0.667 | 0.848 | 0.33 | \$46 |
| Electrical EIT | 0.5 | 0.667 | 0.848 | 1 | \$64 |
| Electrical engr | 0.5 | 0.667 | 0.848 | 2 | \$83 |
| Engr mngr | 0.5 | 0.667 | 0.848 | 1 | \$127 |
| Engr sys spec | 0.5 | 0.667 | 0.848 | 1 | \$141 |
| I&C engr | 0.5 | 0.667 | 0.848 | 2 | \$130 |
| Intermed elec engr | 0.5 | 0.667 | 0.848 | 1 | \$67 |
| Senior director | 0.5 | 0.667 | 0.848 | 0.125 | \$173 |
| Senior elec engr | 0.5 | 0.667 | 0.848 | 1 | \$160 |
| Senior systems engr | 0.5 | 0.667 | 0.848 | 1 | \$118 |
| Systems engr | 0.5 | 0.667 | 0.848 | 1 | \$100 |
| | | | Sum | 11.71 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$688,675 |

| Year 2—EPC Electrical | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-----------------------|-----------|------------|----------|---------|--------------------|
| Director | 0.5 | 0.667 | 0.855 | 0.25 | \$180 |
| Document controller | 0.5 | 0.667 | 0.855 | 0.33 | \$46 |
| Electrical EIT | 0.5 | 0.667 | 0.855 | 1 | \$64 |
| Electrical engr | 0.5 | 0.667 | 0.855 | 2 | \$83 |
| Engr mngr | 0.5 | 0.667 | 0.855 | 1 | \$127 |
| Engr sys spec | 0.5 | 0.667 | 0.855 | 1 | \$141 |
| I&C engr | 0.5 | 0.667 | 0.855 | 2 | \$130 |
| Intemed elec engr | 0.5 | 0.667 | 0.855 | 1 | \$67 |
| Senior director | 0.5 | 0.667 | 0.855 | 0.125 | \$173 |
| Senior elec engr | 0.5 | 0.667 | 0.855 | 1 | \$160 |
| Senior systems engr | 0.5 | 0.667 | 0.855 | 1 | \$118 |
| Systems engr | 0.5 | 0.667 | 0.855 | 1 | \$100 |
| | | | Sum | 11.7 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$694,448 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 300 of 350

| Year 3—EPC Electrical | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-----------------------|-----------|------------|----------|---------|--------------------|
| Director | 0.75 | 0.667 | 0.857 | 0.25 | \$180 |
| Document controller | 0.75 | 0.667 | 0.857 | 0.33 | \$46 |
| Electrical EIT | 0.75 | 0.667 | 0.857 | 1 | \$64 |
| Electrical engr | 0.75 | 0.667 | 0.857 | 2 | \$83 |
| Engr mngr | 0.75 | 0.667 | 0.857 | 1 | \$127 |
| Engr sys spec | 0.75 | 0.667 | 0.857 | 1 | \$141 |
| I&C engr | 0.75 | 0.667 | 0.857 | 2 | \$130 |
| Intemed elec engr | 0.75 | 0.667 | 0.857 | 1 | \$67 |
| Senior director | 0.75 | 0.667 | 0.857 | 0.125 | \$173 |
| Senior elec engr | 0.75 | 0.667 | 0.857 | 1 | \$160 |
| Senior systems engr | 0.75 | 0.667 | 0.857 | 1 | \$118 |
| Systems engr | 0.75 | 0.667 | 0.857 | 1 | \$100 |
| | | | Sum | 11.7 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$1,043,981 |

| Year 4—EPC Electrical | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-----------------------|-----------|------------|----------|---------|--------------------|
| Director | 1 | 0.667 | 0.913 | 0.25 | \$180 |
| Document controller | 1 | 0.667 | 0.913 | 0.33 | \$46 |
| Electrical EIT | 1 | 0.667 | 0.913 | 1 | \$64 |
| Electrical engr | 1 | 0.667 | 0.913 | 2 | \$83 |
| Engr mngr | 1 | 0.667 | 0.913 | 1 | \$127 |
| Engr sys spec | 1 | 0.667 | 0.913 | 1 | \$141 |
| I&C engr | 1 | 0.667 | 0.913 | 2 | \$130 |
| Intemed elec engr | 1 | 0.667 | 0.913 | 1 | \$67 |
| Senior director | 1 | 0.667 | 0.913 | 0.125 | \$173 |
| Senior elec engr | 1 | 0.667 | 0.913 | 1 | \$160 |
| Senior systems engr | 1 | 0.667 | 0.913 | 1 | \$118 |
| Systems engr | 1 | 0.667 | 0.913 | 1 | \$100 |
| | | | Sum | 11.7 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$1,483,952 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 301 of 350

| Year 5—EPC Electrical | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-----------------------|-----------|------------|----------|---------|--------------------|
| Director | 1 | 0.667 | 0.948 | 0.25 | \$180 |
| Document controller | 1 | 0.667 | 0.948 | 0.33 | \$46 |
| Electrical EIT | 1 | 0.667 | 0.948 | 1 | \$64 |
| Electrical engr | 1 | 0.667 | 0.948 | 2 | \$83 |
| Engr mngr | 1 | 0.667 | 0.948 | 1 | \$127 |
| Engr sys spec | 1 | 0.667 | 0.948 | 1 | \$141 |
| I&C engr | 1 | 0.667 | 0.948 | 2 | \$130 |
| Intemed elec engr | 1 | 0.667 | 0.948 | 1 | \$67 |
| Senior director | 1 | 0.667 | 0.948 | 0.125 | \$173 |
| Senior elec engr | 1 | 0.667 | 0.948 | 1 | \$160 |
| Senior systems engr | 1 | 0.667 | 0.948 | 1 | \$118 |
| Systems engr | 1 | 0.667 | 0.948 | 1 | \$100 |
| | | | Sum | 11.7 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$1,539,369 |

| Year 6—EPC Electrical | PropPerYr | Allocation | Deflator # staff | | Wage/yr (\$000) |
|-----------------------|-----------|------------|------------------|-------|--------------------|
| Director | 0.75 | 0.667 | 0.991 | 0.25 | \$180 |
| Document controller | 0.75 | 0.667 | 0.991 | 0.33 | \$46 |
| Electrical EIT | 0.75 | 0.667 | 0.991 | 1 | \$64 |
| Electrical engr | 0.75 | 0.667 | 0.991 | 2 | \$83 |
| Engr mngr | 0.75 | 0.667 | 0.991 | 1 | \$127 |
| Engr sys spec | 0.75 | 0.667 | 0.991 | 1 | \$141 |
| I&C engr | 0.75 | 0.667 | 0.991 | 2 | \$130 |
| Intemed elec engr | 0.75 | 0.667 | 0.991 | 1 | \$67 |
| Senior director | 0.75 | 0.667 | 0.991 | 0.125 | \$173 |
| Senior elec engr | 0.75 | 0.667 | 0.991 | 1 | \$160 |
| Senior systems engr | 0.75 | 0.667 | 0.991 | 1 | \$118 |
| Systems engr | 0.75 | 0.667 | 0.991 | 1 | \$100 |
| | | | Sum | 11.7 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$1,207,924 |

| Table E-3: EPC | Engineering | Support | Spend | Profile Deta | ails |
|----------------|-------------|---------|-------|--------------|------|
| | | | | | |

| Year 1—EPC EngrSpt | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-----------------------------|-----------|------------|----------|---------|--------------------|
| Civil engr spec | 0.5 | 0.667 | 0.848 | 1 | \$94 |
| Director | 0.5 | 0.667 | 0.848 | 0.25 | \$180 |
| Document controller | 0.5 | 0.667 | 0.848 | 1 | \$46 |
| Electrical proj engr | 0.5 | 0.667 | 0.848 | 1 | \$110 |
| Engr EIT | 0.5 | 0.667 | 0.848 | 1 | \$65 |
| Engr mngr | 0.5 | 0.667 | 0.848 | 2 | \$127 |
| Engr sys spec | 0.5 | 0.667 | 0.848 | 1 | \$141 |
| Environ Spec | 0.5 | 0.667 | 0.848 | 1 | \$164 |
| Environ Tech | 0.5 | 0.667 | 0.848 | 1 | \$57 |
| HSE Mngr | 0.5 | 0.667 | 0.848 | 2 | \$146 |
| Intermed piping designer | 0.5 | 0.667 | 0.848 | 1 | \$65 |
| Mech spec | 0.5 | 0.667 | 0.848 | 1 | \$75 |
| Mech/piping designer | 0.5 | 0.667 | 0.848 | 1 | \$96 |
| Mechanical designer | 0.5 | 0.667 | 0.848 | 1 | \$72 |
| Process specialist | 0.5 | 0.667 | 0.848 | 1 | \$59 |
| Proj coord | 0.5 | 0.667 | 0.848 | 1 | \$53 |
| Proj engr | 0.5 | 0.667 | 0.848 | 1 | \$103 |
| Proj planner | 0.5 | 0.667 | 0.848 | 1 | \$63 |
| Proj QM | 0.5 | 0.667 | 0.848 | 4 | \$104 |
| Senior director | 0.5 | 0.667 | 0.848 | 0.125 | \$173 |
| Senior Environ Engr | 0.5 | 0.667 | 0.848 | 1 | \$139 |
| Structural engr | 0.5 | 0.667 | 0.848 | 1 | \$72 |
| Systems engr | 0.5 | 0.667 | 0.848 | 1 | \$100 |
| | | | Sum | 26.375 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$1,394,940 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 303 of 350

| Year 2—EPC EngrSpt | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-----------------------------|-----------|------------|----------|---------|--------------------|
| Civil engr spec | 0.75 | 0.667 | 0.855 | 1 | \$94 |
| Director | 0.75 | 0.667 | 0.855 | 0.25 | \$180 |
| Document controller | 0.75 | 0.667 | 0.855 | 1 | \$46 |
| Electrical proj engr | 0.75 | 0.667 | 0.855 | 1 | \$110 |
| Engr EIT | 0.75 | 0.667 | 0.855 | 1 | \$65 |
| Engr mngr | 0.75 | 0.667 | 0.855 | 2 | \$127 |
| Engr sys spec | 0.75 | 0.667 | 0.855 | 1 | \$141 |
| Environ Spec | 0.75 | 0.667 | 0.855 | 1 | \$164 |
| Environ Tech | 0.75 | 0.667 | 0.855 | 1 | \$57 |
| HSE Mngr | 0.75 | 0.667 | 0.855 | 2 | \$146 |
| Intermed piping designer | 0.75 | 0.667 | 0.855 | 1 | \$65 |
| Mech spec | 0.75 | 0.667 | 0.855 | 1 | \$75 |
| Mech/piping designer | 0.75 | 0.667 | 0.855 | 1 | \$96 |
| Mechanical designer | 0.75 | 0.667 | 0.855 | 1 | \$72 |
| Process specialist | 0.75 | 0.667 | 0.855 | 1 | \$59 |
| Proj coord | 0.75 | 0.667 | 0.855 | 1 | \$53 |
| Proj engr | 0.75 | 0.667 | 0.855 | 1 | \$103 |
| Proj planner | 0.75 | 0.667 | 0.855 | 1 | \$63 |
| Proj QM | 0.75 | 0.667 | 0.855 | 4 | \$104 |
| Senior director | 0.75 | 0.667 | 0.855 | 0.125 | \$173 |
| Senior Environ Engr | 0.75 | 0.667 | 0.855 | 1 | \$139 |
| Structural engr | 0.75 | 0.667 | 0.855 | 1 | \$72 |
| Systems engr | 0.75 | 0.667 | 0.855 | 1 | \$100 |
| | | | Sum | 26.375 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$2,109,949 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 304 of 350

| Year 3—EPC EngrSpt | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-----------------------------|-----------|------------|----------|---------|--------------------|
| Civil engr spec | 1 | 0.667 | 0.857 | 1 | \$94 |
| Director | 1 | 0.667 | 0.857 | 0.25 | \$180 |
| Document controller | 1 | 0.667 | 0.857 | 1 | \$46 |
| Electrical proj engr | 1 | 0.667 | 0.857 | 1 | \$110 |
| Engr EIT | 1 | 0.667 | 0.857 | 1 | \$65 |
| Engr mngr | 1 | 0.667 | 0.857 | 2 | \$127 |
| Engr sys spec | 1 | 0.667 | 0.857 | 1 | \$141 |
| Environ Spec | 1 | 0.667 | 0.857 | 1 | \$164 |
| Environ Tech | 1 | 0.667 | 0.857 | 1 | \$57 |
| HSE Mngr | 1 | 0.667 | 0.857 | 2 | \$146 |
| Intermed piping designer | 1 | 0.667 | 0.857 | 1 | \$65 |
| Mech spec | 1 | 0.667 | 0.857 | 1 | \$75 |
| Mech/piping designer | 1 | 0.667 | 0.857 | 1 | \$96 |
| Mechanical designer | 1 | 0.667 | 0.857 | 1 | \$72 |
| Process specialist | 1 | 0.667 | 0.857 | 1 | \$59 |
| Proj coord | 1 | 0.667 | 0.857 | 1 | \$53 |
| Proj engr | 1 | 0.667 | 0.857 | 1 | \$103 |
| Proj planner | 1 | 0.667 | 0.857 | 1 | \$63 |
| Proj QM | 1 | 0.667 | 0.857 | 4 | \$104 |
| Senior director | 1 | 0.667 | 0.857 | 0.125 | \$173 |
| Senior Environ Engr | 1 | 0.667 | 0.857 | 1 | \$139 |
| Structural engr | 1 | 0.667 | 0.857 | 1 | \$72 |
| Systems engr | 1 | 0.667 | 0.857 | 1 | \$100 |
| | | | Sum | 26.375 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$2,819,502 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 305 of 350

| Year 4—EPC Engr Spt | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-----------------------------|-----------|------------|----------|---------|--------------------|
| Civil engr spec | 1 | 0.667 | 0.913 | 1 | \$94 |
| Director | 1 | 0.667 | 0.913 | 0.25 | \$180 |
| Document controller | 1 | 0.667 | 0.913 | 1 | \$46 |
| Electrical proj engr | 1 | 0.667 | 0.913 | 1 | \$110 |
| Engr EIT | 1 | 0.667 | 0.913 | 1 | \$65 |
| Engr mngr | 1 | 0.667 | 0.913 | 2 | \$127 |
| Engr sys spec | 1 | 0.667 | 0.913 | 1 | \$141 |
| Environ Spec | 1 | 0.667 | 0.913 | 1 | \$164 |
| Environ Tech | 1 | 0.667 | 0.913 | 1 | \$57 |
| HSE Mngr | 1 | 0.667 | 0.913 | 2 | \$146 |
| Intermed piping designer | 1 | 0.667 | 0.913 | 1 | \$65 |
| Mech spec | 1 | 0.667 | 0.913 | 1 | \$75 |
| Mech/piping designer | 1 | 0.667 | 0.913 | 1 | \$96 |
| Mechanical designer | 1 | 0.667 | 0.913 | 1 | \$72 |
| Process specialist | 1 | 0.667 | 0.913 | 1 | \$59 |
| Proj coord | 1 | 0.667 | 0.913 | 1 | \$53 |
| Proj engr | 1 | 0.667 | 0.913 | 1 | \$103 |
| Proj planner | 1 | 0.667 | 0.913 | 1 | \$63 |
| Proj QM | 1 | 0.667 | 0.913 | 4 | \$104 |
| Senior director | 1 | 0.667 | 0.913 | 0.125 | \$173 |
| Senior Environ Engr | 1 | 0.667 | 0.913 | 1 | \$139 |
| Structural engr | 1 | 0.667 | 0.913 | 1 | \$72 |
| Systems engr | 1 | 0.667 | 0.913 | 1 | \$100 |
| | | | Sum | 26.375 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$3,005,806 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 306 of 350

| Year 5—EPC EngrSpt | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-----------------------------|-----------|------------|----------|---------|--------------------|
| Civil engr spec | 1 | 0.667 | 0.948 | 1 | \$94 |
| Director | 1 | 0.667 | 0.948 | 0.25 | \$180 |
| Document controller | 1 | 0.667 | 0.948 | 1 | \$46 |
| Electrical proj engr | 1 | 0.667 | 0.948 | 1 | \$110 |
| Engr EIT | 1 | 0.667 | 0.948 | 1 | \$65 |
| Engr mngr | 1 | 0.667 | 0.948 | 2 | \$127 |
| Engr sys spec | 1 | 0.667 | 0.948 | 1 | \$141 |
| Environ Spec | 1 | 0.667 | 0.948 | 1 | \$164 |
| Environ Tech | 1 | 0.667 | 0.948 | 1 | \$57 |
| HSE Mngr | 1 | 0.667 | 0.948 | 2 | \$146 |
| Intermed piping designer | 1 | 0.667 | 0.948 | 1 | \$65 |
| Mech spec | 1 | 0.667 | 0.948 | 1 | \$75 |
| Mech/piping designer | 1 | 0.667 | 0.948 | 1 | \$96 |
| Mechanical designer | 1 | 0.667 | 0.948 | 1 | \$72 |
| Process specialist | 1 | 0.667 | 0.948 | 1 | \$59 |
| Proj coord | 1 | 0.667 | 0.948 | 1 | \$53 |
| Proj engr | 1 | 0.667 | 0.948 | 1 | \$103 |
| Proj planner | 1 | 0.667 | 0.948 | 1 | \$63 |
| Proj QM | 1 | 0.667 | 0.948 | 4 | \$104 |
| Senior director | 1 | 0.667 | 0.948 | 0.125 | \$173 |
| Senior Environ Engr | 1 | 0.667 | 0.948 | 1 | \$139 |
| Structural engr | 1 | 0.667 | 0.948 | 1 | \$72 |
| Systems engr | 1 | 0.667 | 0.948 | 1 | \$100 |
| | | | Sum | 26.375 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$3,118,056 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 307 of 350

| Year 6—EPC EngrSpt | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-----------------------------|-----------|------------|----------|---------|--------------------|
| Civil engr spec | 0.5 | 0.667 | 0.991 | \$1 | \$94 |
| Director | 0.5 | 0.667 | 0.991 | \$0 | \$180 |
| Document controller | 0.5 | 0.667 | 0.991 | \$1 | \$46 |
| Electrical proj engr | 0.5 | 0.667 | 0.991 | \$1 | \$110 |
| Engr EIT | 0.5 | 0.667 | 0.991 | \$1 | \$65 |
| Engr mngr | 0.5 | 0.667 | 0.991 | \$2 | \$127 |
| Engr sys spec | 0.5 | 0.667 | 0.991 | \$1 | \$141 |
| Environ Spec | 0.5 | 0.667 | 0.991 | \$1 | \$164 |
| Environ Tech | 0.5 | 0.667 | 0.991 | \$1 | \$57 |
| HSE Mngr | 0.5 | 0.667 | 0.991 | \$2 | \$146 |
| Intermed piping designer | 0.5 | 0.667 | 0.991 | \$1 | \$65 |
| Mech spec | 0.5 | 0.667 | 0.991 | \$1 | \$75 |
| Mech/piping designer | 0.5 | 0.667 | 0.991 | \$1 | \$96 |
| Mechanical designer | 0.5 | 0.667 | 0.991 | \$1 | \$72 |
| Process specialist | 0.5 | 0.667 | 0.991 | \$1 | \$59 |
| Proj coord | 0.5 | 0.667 | 0.991 | \$1 | \$53 |
| Proj engr | 0.5 | 0.667 | 0.991 | \$1 | \$103 |
| Proj planner | 0.5 | 0.667 | 0.991 | \$1 | \$63 |
| Proj QM | 0.5 | 0.667 | 0.991 | \$4 | \$104 |
| Senior director | 0.5 | 0.667 | 0.991 | \$0 | \$173 |
| Senior Environ Engr | 0.5 | 0.667 | 0.991 | \$1 | \$139 |
| Structural engr | 0.5 | 0.667 | 0.991 | \$1 | \$72 |
| Systems engr | 0.5 | 0.667 | 0.991 | \$1 | \$100 |
| | | | Sum | \$26 | |
| | | | Burden | \$2 | |
| | | | Total | | \$1,631,133 |

Table E-4: EPC Mechanical Engineering Spend Profile Details

| Year 1—EPC Mechanical | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-----------------------|-----------|------------|----------|------------|--------------------|
| Director | 0.5 | 0.6667 | 0.8478 | 0.25 | \$180 |
| Document controller | 0.5 | 0.6667 | 0.8478 | 1 | \$46 |
| Engr mngr | 0.5 | 0.6667 | 0.8478 | 1 | \$127 |
| Mech/piping designer | 0.5 | 0.6667 | 0.8478 | 0.5 | \$96 |
| Mechanical designer | 0.5 | 0.6667 | 0.8478 | 0.5 | \$72 |
| Mechanical engineer | 0.5 | 0.6667 | 0.8478 | 2 | \$80 |
| Mechanical EIT | 0.5 | 0.6667 | 0.8478 | 1 | \$64 |
| Process engr | 0.5 | 0.6667 | 0.8478 | 1 | \$103 |
| Senior director | 0.5 | 0.6667 | 0.8478 | 0.125 | \$173 |
| Senior engr | 0.5 | 0.6667 | 0.8478 | 1 | \$125 |
| Senior engr | 0.5 | 0.6667 | 0.8478 | 1 | \$105 |
| Senior process engr | 0.5 | 0.6667 | 0.8478 | 1 | \$90 |
| | | | Sum | 10.38 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$520,906 |

| Year 2—EPC Mechanical | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-----------------------|-----------|------------|----------|------------|--------------------|
| Director | 0.75 | 0.667 | 0.855 | 0.25 | \$180 |
| Document controller | 0.75 | 0.667 | 0.855 | 1 | \$46 |
| Engr mngr | 0.75 | 0.667 | 0.855 | 1 | \$127 |
| Mech/piping designer | 0.75 | 0.667 | 0.855 | 0.5 | \$96 |
| Mechanical designer | 0.75 | 0.667 | 0.855 | 0.5 | \$72 |
| Mechanical engineer | 0.75 | 0.667 | 0.855 | 2 | \$80 |
| Mechanical EIT | 0.75 | 0.667 | 0.855 | 1 | \$64 |
| Process engr | 0.75 | 0.667 | 0.855 | 1 | \$103 |
| Senior director | 0.75 | 0.667 | 0.855 | 0.125 | \$173 |
| Senior engr | 0.75 | 0.667 | 0.855 | 1 | \$125 |
| Senior engr | 0.75 | 0.667 | 0.855 | 1 | \$105 |
| Senior process engr | 0.75 | 0.667 | 0.855 | 1 | \$90 |
| | | | Sum | 10.38 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$787,909 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 309 of 350

| Year 3—EPC Mechanical | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-----------------------|-----------|------------|----------|------------|--------------------|
| Director | 1 | 0.667 | 0.857 | 0.25 | \$180 |
| Document controller | 1 | 0.667 | 0.857 | 1 | \$46 |
| Engr mngr | 1 | 0.667 | 0.857 | 1 | \$127 |
| Mech/piping designer | 1 | 0.667 | 0.857 | 0.5 | \$96 |
| Mechanical designer | 1 | 0.667 | 0.857 | 0.5 | \$72 |
| Mechanical engineer | 1 | 0.667 | 0.857 | 2 | \$80 |
| Mechanical EIT | 1 | 0.667 | 0.857 | 1 | \$64 |
| Process engr | 1 | 0.667 | 0.857 | 1 | \$103 |
| Senior director | 1 | 0.667 | 0.857 | 0.125 | \$173 |
| Senior engr | 1 | 0.667 | 0.857 | 1 | \$125 |
| Senior engr | 1 | 0.667 | 0.857 | 1 | \$105 |
| Senior process engr | 1 | 0.667 | 0.857 | 1 | \$90 |
| | | | Sum | 10.38 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$1,052,874 |

| Year 4—EPC Mechanical | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-----------------------|-----------|------------|----------|------------|--------------------|
| Director | 1 | 67% | 91% | 0.25 | \$180 |
| Document controller | 1 | 67% | 91% | 1 | \$46 |
| Engr mngr | 1 | 67% | 91% | 1 | \$127 |
| Mech/piping designer | 1 | 67% | 91% | 0.5 | \$96 |
| Mechanical designer | 1 | 67% | 91% | 0.5 | \$72 |
| Mechanical engineer | 1 | 67% | 91% | 2 | \$80 |
| Mechanical EIT | 1 | 67% | 91% | 1 | \$64 |
| Process engr | 1 | 67% | 91% | 1 | \$103 |
| Senior director | 1 | 67% | 91% | 0.125 | \$173 |
| Senior engr | 1 | 67% | 91% | 1 | \$125 |
| Senior engr | 1 | 67% | 91% | 1 | \$105 |
| Senior process engr | 1 | 67% | 91% | 1 | \$90 |
| | | | Sum | 10.38 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$1,122,445 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 310 of 350

| Year 5—EPC Mechanical | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-----------------------|-----------|------------|----------|------------|--------------------|
| Director | 1 | 0.667 | 0.948 | 0.25 | \$180 |
| Document controller | 1 | 0.667 | 0.948 | 1 | \$46 |
| Engr mngr | 1 | 0.667 | 0.948 | 1 | \$127 |
| Mech/piping designer | 1 | 0.667 | 0.948 | 0.5 | \$96 |
| Mechanical designer | 1 | 0.667 | 0.948 | 0.5 | \$72 |
| Mechanical engineer | 1 | 0.667 | 0.948 | 2 | \$80 |
| Mechanical EIT | 1 | 0.667 | 0.948 | 1 | \$64 |
| Process engr | 1 | 0.667 | 0.948 | 1 | \$103 |
| Senior director | 1 | 0.667 | 0.948 | 0.125 | \$173 |
| Senior engr | 1 | 0.667 | 0.948 | 1 | \$125 |
| Senior engr | 1 | 0.667 | 0.948 | 1 | \$105 |
| Senior process engr | 1 | 0.667 | 0.948 | 1 | \$90 |
| | | | Sum | 10.38 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$1,164,362 |

| Year 6—EPC Mechanical | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-----------------------|-----------|------------|----------|------------|--------------------|
| Director | 0.5 | 0.667 | 0.991 | 0.25 | \$180 |
| Document controller | 0.5 | 0.667 | 0.991 | 1 | \$46 |
| Engr mngr | 0.5 | 0.667 | 0.991 | 1 | \$127 |
| Mech/piping designer | 0.5 | 0.667 | 0.991 | 0.5 | \$96 |
| Mechanical designer | 0.5 | 0.667 | 0.991 | 0.5 | \$72 |
| Mechanical engineer | 0.5 | 0.667 | 0.991 | 2 | \$80 |
| Mechanical EIT | 0.5 | 0.667 | 0.991 | 1 | \$64 |
| Process engr | 0.5 | 0.667 | 0.991 | 1 | \$103 |
| Senior director | 0.5 | 0.667 | 0.991 | 0.125 | \$173 |
| Senior engr | 0.5 | 0.667 | 0.991 | 1 | \$125 |
| Senior engr | 0.5 | 0.667 | 0.991 | 1 | \$105 |
| Senior process engr | 0.5 | 0.667 | 0.991 | 1 | \$90 |
| | | | Sum | 10.38 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$609,107 |

| Year 6—EPC Mechanical Commissioning Support | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|--|-----------|------------|----------|------------|--------------------|
| Director | 0.5 | 1.000 | 0.991 | 0.5 | \$180 |
| Document controller | 0.5 | 1.000 | 0.991 | 2 | \$46 |
| Mechanical engineer | 0.5 | 1.000 | 0.991 | 4 | \$80 |
| Senior engr | 0.5 | 1.000 | 0.991 | 4 | \$125 |
| | | | Sum | 10.5 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$943,437 |

| Year 7—EPC Mechanical | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-----------------------|-----------|------------|----------|------------|--------------------|
| Director | 0.333 | 1.000 | 1.000 | 0.5 | \$180 |
| Document controller | 0.333 | 1.000 | 1.000 | 2 | \$46 |
| Mechanical engineer | 0.333 | 1.000 | 1.000 | 4 | \$80 |
| Senior engr | 0.333 | 1.000 | 1.000 | 4 | \$125 |
| | | | Sum | 10.5 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$634,418 |

| Year 1—EPC NucMech | PropPerYr | Allocation | Deflator | Staffing | Wage/yr (\$000) |
|----------------------|-----------|------------|----------|----------|--------------------|
| Director | 0.75 | 0.667 | 0.848 | 0.25 | \$180 |
| Document controller | 0.75 | 0.667 | 0.848 | 2 | \$46 |
| Engr mngr | 0.75 | 0.667 | 0.848 | 2 | \$127 |
| Engr sys spec | 0.75 | 0.667 | 0.848 | 1 | \$141 |
| Environ Spec | 0.75 | 0.667 | 0.848 | 1 | \$164 |
| I&C engr | 0.75 | 0.667 | 0.848 | 1 | \$130 |
| Mech/piping designer | 0.75 | 0.667 | 0.848 | 1 | \$96 |
| Mechanical designer | 0.75 | 0.667 | 0.848 | 1 | \$72 |
| Mechanical engineer | 0.75 | 0.667 | 0.848 | 3 | \$80 |
| Mechanical EIT | 0.75 | 0.667 | 0.848 | 1 | \$64 |
| Process engr | 0.75 | 0.667 | 0.848 | 1 | \$103 |
| Proj QM | 0.75 | 0.667 | 0.848 | 1 | \$104 |
| Senior director | 0.75 | 0.667 | 0.848 | 0.125 | \$173 |
| Senior Environ Engr | 0.75 | 0.667 | 0.848 | 1 | \$139 |
| Senior process engr | 0.75 | 0.667 | 0.848 | 1 | \$90 |
| Systems engr | 0.75 | 0.667 | 0.848 | 1 | \$100 |
| | | | Sum | 18.375 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$1,493,742 |

Table E-5: EPC Nuclear Mechanical Engineering Spend Profile Details
| Year 2—EPC NucMech | PropPerYr | Allocation | Deflator | Staffing | Wage/yr (\$000) |
|----------------------|-----------|------------|----------|----------|--------------------|
| Director | 1 | 0.667 | 0.855 | 0.25 | \$180 |
| Document controller | 1 | 0.667 | 0.855 | 2 | \$46 |
| Engr mngr | 1 | 0.667 | 0.855 | 2 | \$127 |
| Engr sys spec | 1 | 0.667 | 0.855 | 1 | \$141 |
| Environ Spec | 1 | 0.667 | 0.855 | 1 | \$164 |
| I&C engr | 1 | 0.667 | 0.855 | 1 | \$130 |
| Mech/piping designer | 1 | 0.667 | 0.855 | 1 | \$96 |
| Mechanical designer | 1 | 0.667 | 0.855 | 1 | \$72 |
| Mechanical engineer | 1 | 0.667 | 0.855 | 3 | \$80 |
| Mechanical EIT | 1 | 0.667 | 0.855 | 1 | \$64 |
| Process engr | 1 | 0.667 | 0.855 | 1 | \$103 |
| Proj QM | 1 | 0.667 | 0.855 | 1 | \$104 |
| Senior director | 1 | 0.667 | 0.855 | 0.125 | \$173 |
| Senior Environ Engr | 1 | 0.667 | 0.855 | 1 | \$139 |
| Senior process engr | 1 | 0.667 | 0.855 | 1 | \$90 |
| Systems engr | 1 | 0.667 | 0.855 | 1 | \$100 |
| | | | Sum | 18.375 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$2,008,351 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 314 of 350

| Year 3—EPC NucMech | PropPerYr | Allocation | Deflator | Staffing | Wage/yr (\$000) |
|----------------------|-----------|------------|----------|----------|--------------------|
| Director | 1 | 0.667 | 0.857 | 0.25 | \$180 |
| Document controller | 1 | 0.667 | 0.857 | 2 | \$46 |
| Engr mngr | 1 | 0.667 | 0.857 | 2 | \$127 |
| Engr sys spec | 1 | 0.667 | 0.857 | 1 | \$141 |
| Environ Spec | 1 | 0.667 | 0.857 | 1 | \$164 |
| I&C engr | 1 | 0.667 | 0.857 | 1 | \$130 |
| Mech/piping designer | 1 | 0.667 | 0.857 | 1 | \$96 |
| Mechanical designer | 1 | 0.667 | 0.857 | 1 | \$72 |
| Mechanical engineer | 1 | 0.667 | 0.857 | 3 | \$80 |
| Mechanical EIT | 1 | 0.667 | 0.857 | 1 | \$64 |
| Process engr | 1 | 0.667 | 0.857 | 1 | \$103 |
| Proj QM | 1 | 0.667 | 0.857 | 1 | \$104 |
| Senior director | 1 | 0.667 | 0.857 | 0.125 | \$173 |
| Senior Environ Engr | 1 | 0.667 | 0.857 | 1 | \$139 |
| Senior process engr | 1 | 0.667 | 0.857 | 1 | \$90 |
| Systems engr | 1 | 0.667 | 0.857 | 1 | \$100 |
| | | | Sum | 18.375 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$2,012,803 |

| Year 4—EPC NucMech | PropPerYr | Allocation | Deflator | Staffing | Wage/yr (\$000) |
|----------------------|-----------|------------|----------|----------|--------------------|
| Director | 1 | 0.667 | 0.913 | 0.25 | \$180 |
| Document controller | 1 | 0.667 | 0.913 | 2 | \$46 |
| Engr mngr | 1 | 0.667 | 0.913 | 2 | \$127 |
| Engr sys spec | 1 | 0.667 | 0.913 | 1 | \$141 |
| Environ Spec | 1 | 0.667 | 0.913 | 1 | \$164 |
| I&C engr | 1 | 0.667 | 0.913 | 1 | \$130 |
| Mech/piping designer | 1 | 0.667 | 0.913 | 1 | \$96 |
| Mechanical designer | 1 | 0.667 | 0.913 | 1 | \$72 |
| Mechanical engineer | 1 | 0.667 | 0.913 | 3 | \$80 |
| Mechanical EIT | 1 | 0.667 | 0.913 | 1 | \$64 |
| Process engr | 1 | 0.667 | 0.913 | 1 | \$103 |
| Proj QM | 1 | 0.667 | 0.913 | 1 | \$104 |
| Senior director | 1 | 0.667 | 0.913 | 0.125 | \$173 |
| Senior Environ Engr | 1 | 0.667 | 0.913 | 1 | \$139 |
| Senior process engr | 1 | 0.667 | 0.913 | 1 | \$90 |
| Systems engr | 1 | 0.667 | 0.913 | 1 | \$100 |
| | | | Sum | 18.375 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$2,145,802 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 316 of 350

| Year 5—NucMech | PropPerYr | Allocation | Deflator | Staffing | Wage/yr (\$000) |
|----------------------|-----------|------------|----------|----------|--------------------|
| Director | 0.75 | 0.667 | 0.948 | 0.25 | \$180 |
| Document controller | 0.75 | 0.667 | 0.948 | 2 | \$46 |
| Engr mngr | 0.75 | 0.667 | 0.948 | 2 | \$127 |
| Engr sys spec | 0.75 | 0.667 | 0.948 | 1 | \$141 |
| Environ Spec | 0.75 | 0.667 | 0.948 | 1 | \$164 |
| I&C engr | 0.75 | 0.667 | 0.948 | 1 | \$130 |
| Mech/piping designer | 0.75 | 0.667 | 0.948 | 1 | \$96 |
| Mechanical designer | 0.75 | 0.667 | 0.948 | 1 | \$72 |
| Mechanical engineer | 0.75 | 0.667 | 0.948 | 3 | \$80 |
| Mechanical EIT | 0.75 | 0.667 | 0.948 | 1 | \$64 |
| Process engr | 0.75 | 0.667 | 0.948 | 1 | \$103 |
| Proj QM | 0.75 | 0.667 | 0.948 | 1 | \$104 |
| Senior director | 0.75 | 0.667 | 0.948 | 0.125 | \$173 |
| Senior Environ Engr | 0.75 | 0.667 | 0.948 | 1 | \$139 |
| Senior process engr | 0.75 | 0.667 | 0.948 | 1 | \$90 |
| Systems engr | 0.75 | 0.667 | 0.948 | 1 | \$100 |
| | | | Sum | 18.375 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$1,669,452 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 317 of 350

| Year 6—EPC NucMech | PropPerYr | Allocation | Deflator | Staffing | Wage/yr (\$000) |
|----------------------|-----------|------------|----------|----------|--------------------|
| Director | 0.5 | 0.667 | 0.991 | 0.25 | \$180 |
| Document controller | 0.5 | 0.667 | 0.991 | 2 | \$46 |
| Engr mngr | 0.5 | 0.667 | 0.991 | 2 | \$127 |
| Engr sys spec | 0.5 | 0.667 | 0.991 | 1 | \$141 |
| Environ Spec | 0.5 | 0.667 | 0.991 | 1 | \$164 |
| I&C engr | 0.5 | 0.667 | 0.991 | 1 | \$130 |
| Mech/piping designer | 0.5 | 0.667 | 0.991 | 1 | \$96 |
| Mechanical designer | 0.5 | 0.667 | 0.991 | 1 | \$72 |
| Mechanical engineer | 0.5 | 0.667 | 0.991 | 3 | \$80 |
| Mechanical EIT | 0.5 | 0.667 | 0.991 | 1 | \$64 |
| Process engr | 0.5 | 0.667 | 0.991 | 1 | \$103 |
| Proj QM | 0.5 | 0.667 | 0.991 | 1 | \$104 |
| Senior director | 0.5 | 0.667 | 0.991 | 0.125 | \$173 |
| Senior Environ Engr | 0.5 | 0.667 | 0.991 | 1 | \$139 |
| Senior process engr | 0.5 | 0.667 | 0.991 | 1 | \$90 |
| Systems engr | 0.5 | 0.667 | 0.991 | 1 | \$100 |
| | | | Sum | 18.375 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$1,164,443 |

| Table E-0. El O Nuclear otructural Engineering opend i fone Details |
|---|
|---|

| Year 1—EPC NucStruc | PropPerYr | Allocation | Deflator | Staffing | Wage/yr (\$000) |
|------------------------|-----------|------------|----------|----------|-----------------|
| Director | 1 | 0.667 | 0.848 | 0.25 | \$180 |
| Document controller | 1 | 0.667 | 0.848 | 1 | \$46 |
| Engr mngr | 1 | 0.667 | 0.848 | 1 | \$127 |
| Environ Spec | 1 | 0.667 | 0.848 | 1 | \$164 |
| Mech/piping designer | 1 | 0.667 | 0.848 | 1 | \$96 |
| Mechanical designer | 1 | 0.667 | 0.848 | 1 | \$72 |
| Mechanical engineer | 1 | 0.667 | 0.848 | 1 | \$80 |
| PM II | 1 | 0.667 | 0.848 | 0.5 | \$98 |
| Procurement specialist | 1 | 0.667 | 0.848 | 0.5 | \$80 |
| Proj QM | 1 | 0.667 | 0.848 | 1 | \$104 |
| Senior Environ Engr | 1 | 0.667 | 0.848 | 1 | \$139 |
| Structural engr | 1 | 0.667 | 0.848 | 4 | \$72 |
| | | | Sum | 13.25 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$1,340,319 |

| Year 2—EPC NucStruc | PropPerYr | Allocation | Deflator | Staffing | Wage/yr (\$000) |
|------------------------|-----------|------------|----------|----------|-----------------|
| Director | 1 | 0.667 | 0.855 | 0.25 | \$180 |
| Document controller | 1 | 0.667 | 0.855 | 1 | \$46 |
| Engr mngr | 1 | 0.667 | 0.855 | 1 | \$127 |
| Environ Spec | 1 | 0.667 | 0.855 | 1 | \$164 |
| Mech/piping designer | 1 | 0.667 | 0.855 | 1 | \$96 |
| Mechanical designer | 1 | 0.667 | 0.855 | 1 | \$72 |
| Mechanical engineer | 1 | 0.667 | 0.855 | 1 | \$80 |
| PM II | 1 | 0.667 | 0.855 | 0.5 | \$98 |
| Procurement specialist | 1 | 0.667 | 0.855 | 0.5 | \$80 |
| Proj QM | 1 | 0.667 | 0.855 | 1 | \$104 |
| Senior Environ Engr | 1 | 0.667 | 0.855 | 1 | \$139 |
| Structural engr | 1 | 0.667 | 0.855 | 4 | \$72 |
| | | | Sum | 13.25 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$1,351,554 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 319 of 350

| Year 3—EPC NucStruc | PropPerYr | Allocation | Deflator | Staffing | Wage/yr (\$000) |
|------------------------|-----------|------------|----------|----------|--------------------|
| Director | 0.75 | 0.6667 | 0.857 | 0.25 | \$180 |
| Document controller | 0.75 | 0.6667 | 0.857 | 1 | \$46 |
| Engr mngr | 0.75 | 0.6667 | 0.857 | 1 | \$127 |
| Environ Spec | 0.75 | 0.6667 | 0.857 | 1 | \$164 |
| Mech/piping designer | 0.75 | 0.6667 | 0.857 | 1 | \$96 |
| Mechanical designer | 0.75 | 0.6667 | 0.857 | 1 | \$72 |
| Mechanical engineer | 0.75 | 0.6667 | 0.857 | 1 | \$80 |
| PM II | 0.75 | 0.6667 | 0.857 | 0.5 | \$98 |
| Procurement specialist | 0.75 | 0.6667 | 0.857 | 0.5 | \$80 |
| Proj QM | 0.75 | 0.6667 | 0.857 | 1 | \$104 |
| Senior Environ Engr | 0.75 | 0.6667 | 0.857 | 1 | \$139 |
| Structural engr | 0.75 | 0.6667 | 0.857 | 4 | \$72 |
| | | | Sum | 13.25 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$1,015,913 |

| Year 4—EPC NucStruc | PropPerYr | Allocation | Deflator | Staffing | Wage/yr (\$000) |
|------------------------|-----------|------------|----------|----------|--------------------|
| Director | 0.5 | 0.666667 | 0.913 | 0.25 | \$180 |
| Document controller | 0.5 | 0.666667 | 0.913 | 1 | \$46 |
| Engr mngr | 0.5 | 0.666667 | 0.913 | 1 | \$127 |
| Environ Spec | 0.5 | 0.666667 | 0.913 | 1 | \$164 |
| Mech/piping designer | 0.5 | 0.666667 | 0.913 | 1 | \$96 |
| Mechanical designer | 0.5 | 0.666667 | 0.913 | 1 | \$72 |
| Mechanical engineer | 0.5 | 0.666667 | 0.913 | 1 | \$80 |
| PM II | 0.5 | 0.666667 | 0.913 | 0.5 | \$98 |
| Procurement specialist | 0.5 | 0.666667 | 0.913 | 0.5 | \$80 |
| Proj QM | 0.5 | 0.666667 | 0.913 | 1 | \$104 |
| Senior Environ Engr | 0.5 | 0.666667 | 0.913 | 1 | \$139 |
| Structural engr | 0.5 | 0.666667 | 0.913 | 4 | \$72 |
| | | | Sum | 13.25 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$722,027 |

| Year 5—EPC NucStruc | PropPerYr | Allocation | Deflator | Staffing | Wage/yr (\$000) |
|------------------------|-----------|------------|----------|----------|--------------------|
| Director | 0.25 | 0.667 | 0.948 | 0.25 | \$180 |
| Document controller | 0.25 | 0.667 | 0.948 | 1 | \$46 |
| Engr mngr | 0.25 | 0.667 | 0.948 | 1 | \$127 |
| Environ Spec | 0.25 | 0.667 | 0.948 | 1 | \$164 |
| Mech/piping designer | 0.25 | 0.667 | 0.948 | 1 | \$96 |
| Mechanical designer | 0.25 | 0.667 | 0.948 | 1 | \$72 |
| Mechanical engineer | 0.25 | 0.667 | 0.948 | 1 | \$80 |
| PM II | 0.25 | 0.667 | 0.948 | 0.5 | \$98 |
| Procurement specialist | 0.25 | 0.667 | 0.948 | 0.5 | \$80 |
| Proj QM | 0.25 | 0.667 | 0.948 | 1 | \$104 |
| Senior Environ Engr | 0.25 | 0.667 | 0.948 | 1 | \$139 |
| Structural engr | 0.25 | 0.667 | 0.948 | 4 | \$72 |
| | | | Sum | 13.25 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$374,495 |

| Year 6—EPC NucStruc | PropPerYr | Allocation | Deflator | Staffing | Wage/yr (\$000) |
|------------------------|-----------|------------|----------|----------|--------------------|
| Director | 0.25 | 0.667 | 0.991 | 0.25 | \$180 |
| Document controller | 0.25 | 0.667 | 0.991 | 1 | \$46 |
| Engr mngr | 0.25 | 0.667 | 0.991 | 1 | \$127 |
| Environ Spec | 0.25 | 0.667 | 0.991 | 1 | \$164 |
| Mech/piping designer | 0.25 | 0.667 | 0.991 | 1 | \$96 |
| Mechanical designer | 0.25 | 0.667 | 0.991 | 1 | \$72 |
| Mechanical engineer | 0.25 | 0.667 | 0.991 | 1 | \$80 |
| PM II | 0.25 | 0.667 | 0.991 | 0.5 | \$98 |
| Procurement specialist | 0.25 | 0.667 | 0.991 | 0.5 | \$80 |
| Proj QM | 0.25 | 0.667 | 0.991 | 1 | \$104 |
| Senior Environ Engr | 0.25 | 0.667 | 0.991 | 1 | \$139 |
| Structural engr | 0.25 | 0.667 | 0.991 | 4 | \$72 |
| | | | Sum | 13.25 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$391,816 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 321 of 350

CONFIDENTIAL ATTORNEY WORK PRODUCT

Table E-7: EPC Procurement Spend Profile Details

| Year 1—EPC Procurement | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-------------------------|-----------|------------|----------|---------|--------------------|
| Buyer | 0.5 | 0.667 | 0.848 | 3 | \$92 |
| Contracts admin | 0.5 | 0.667 | 0.848 | 3 | \$84 |
| Cost controller | 0.5 | 0.667 | 0.848 | 1 | \$78 |
| Director | 0.5 | 0.667 | 0.848 | 0.25 | \$180 |
| Document controller | 0.5 | 0.667 | 0.848 | 2 | \$46 |
| mngr | 0.5 | 0.667 | 0.848 | 3 | \$127 |
| Engr sys spec | 0.5 | 0.667 | 0.848 | 1 | \$141 |
| Environ Spec | 0.5 | 0.667 | 0.848 | 1 | \$164 |
| Estimator | 0.5 | 0.667 | 0.848 | 2 | \$71 |
| Financial analyst | 0.5 | 0.667 | 0.848 | 2 | \$64 |
| Mech spec | 0.5 | 0.667 | 0.848 | 1 | \$75 |
| Planner | 0.5 | 0.667 | 0.848 | 1 | \$111 |
| PM II | 0.5 | 0.667 | 0.848 | 1 | \$98 |
| Process specialist | 0.5 | 0.667 | 0.848 | 1 | \$59 |
| Procurement specialist | 0.5 | 0.667 | 0.848 | 3 | \$80 |
| Proj coord | 0.5 | 0.667 | 0.848 | 0.5 | \$53 |
| Proj planner | 0.5 | 0.667 | 0.848 | 0.5 | \$63 |
| Project coordinator | 0.5 | 0.667 | 0.848 | 0.5 | \$68 |
| Scheduler | 0.5 | 0.667 | 0.848 | 1 | \$86 |
| Senior director | 0.5 | 0.667 | 0.848 | 0.125 | \$173 |
| Senior estimator | 0.5 | 0.667 | 0.848 | 1 | \$89 |
| Senior procurement spec | 0.5 | 0.667 | 0.848 | 1 | \$77 |
| Structural engr | 0.5 | 0.667 | 0.848 | 1 | \$72 |
| Systems engr | 0.5 | 0.667 | 0.848 | 1 | \$100 |
| | | | Sum | 31.875 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$1,509,944 |

| Year 2—EPC Procurement | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-------------------------|-----------|------------|----------|---------|--------------------|
| Buyer | 1 | 0.667 | 0.855 | 3 | \$92 |
| Contracts admin | 1 | 0.667 | 0.855 | 3 | \$84 |
| Cost controller | 1 | 0.667 | 0.855 | 1 | \$78 |
| Director | 1 | 0.667 | 0.855 | 0.25 | \$180 |
| Document controller | 1 | 0.667 | 0.855 | 2 | \$46 |
| mngr | 1 | 0.667 | 0.855 | 3 | \$127 |
| Engr sys spec | 1 | 0.667 | 0.855 | 1 | \$141 |
| Environ Spec | 1 | 0.667 | 0.855 | 1 | \$164 |
| Estimator | 1 | 0.667 | 0.855 | 2 | \$71 |
| Financial analyst | 1 | 0.667 | 0.855 | 2 | \$64 |
| Mech spec | 1 | 0.667 | 0.855 | 1 | \$75 |
| Planner | 1 | 0.667 | 0.855 | 1 | \$111 |
| PM II | 1 | 0.667 | 0.855 | 1 | \$98 |
| Process specialist | 1 | 0.667 | 0.855 | 1 | \$59 |
| Procurement specialist | 1 | 0.667 | 0.855 | 3 | \$80 |
| Proj coord | 1 | 0.667 | 0.855 | 0.5 | \$53 |
| Proj planner | 1 | 0.667 | 0.855 | 0.5 | \$63 |
| Project coordinator | 1 | 0.667 | 0.855 | 0.5 | \$68 |
| Scheduler | 1 | 0.667 | 0.855 | 1 | \$86 |
| Senior director | 1 | 0.667 | 0.855 | 0.125 | \$173 |
| Senior estimator | 1 | 0.667 | 0.855 | 1 | \$89 |
| Senior procurement spec | 1 | 0.667 | 0.855 | 1 | \$77 |
| Structural engr | 1 | 0.667 | 0.855 | 1 | \$72 |
| Systems engr | 1 | 0.667 | 0.855 | 1 | \$100 |
| | | | Sum | 31.875 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$3,045,201 |

| Year 3—EPC Procurement | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-------------------------|-----------|------------|----------|---------|--------------------|
| Buyer | 1 | 0.667 | 0.857 | 3 | \$92 |
| Contracts admin | 1 | 0.667 | 0.857 | 3 | \$84 |
| Cost controller | 1 | 0.667 | 0.857 | 1 | \$78 |
| Director | 1 | 0.667 | 0.857 | 0.25 | \$180 |
| Document controller | 1 | 0.667 | 0.857 | 2 | \$46 |
| mngr | 1 | 0.667 | 0.857 | 3 | \$127 |
| Engr sys spec | 1 | 0.667 | 0.857 | 1 | \$141 |
| Environ Spec | 1 | 0.667 | 0.857 | 1 | \$164 |
| Estimator | 1 | 0.667 | 0.857 | 2 | \$71 |
| Financial analyst | 1 | 0.667 | 0.857 | 2 | \$64 |
| Mech spec | 1 | 0.667 | 0.857 | 1 | \$75 |
| Planner | 1 | 0.667 | 0.857 | 1 | \$111 |
| PM II | 1 | 0.667 | 0.857 | 1 | \$98 |
| Process specialist | 1 | 0.667 | 0.857 | 1 | \$59 |
| Procurement specialist | 1 | 0.667 | 0.857 | 3 | \$80 |
| Proj coord | 1 | 0.667 | 0.857 | 0.5 | \$53 |
| Proj planner | 1 | 0.667 | 0.857 | 0.5 | \$63 |
| Project coordinator | 1 | 0.667 | 0.857 | 0.5 | \$68 |
| Scheduler | 1 | 0.667 | 0.857 | 1 | \$86 |
| Senior director | 1 | 0.667 | 0.857 | 0.125 | \$173 |
| Senior estimator | 1 | 0.667 | 0.857 | 1 | \$89 |
| Senior procurement spec | 1 | 0.667 | 0.857 | 1 | \$77 |
| Structural engr | 1 | 0.667 | 0.857 | 1 | \$72 |
| Systems engr | 1 | 0.667 | 0.857 | 1 | \$100 |
| | | | Sum | 31.875 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$3,051,952 |

| Year 4—EPC Procurement | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-------------------------|-----------|------------|----------|---------|--------------------|
| Buyer | 0.5 | 0.667 | 0.913 | 3 | \$92 |
| Contracts admin | 0.5 | 0.667 | 0.913 | 3 | \$84 |
| Cost controller | 0.5 | 0.667 | 0.913 | 1 | \$78 |
| Director | 0.5 | 0.667 | 0.913 | 0.25 | \$180 |
| Document controller | 0.5 | 0.667 | 0.913 | 2 | \$46 |
| mngr | 0.5 | 0.667 | 0.913 | 3 | \$127 |
| Engr sys spec | 0.5 | 0.667 | 0.913 | 1 | \$141 |
| Environ Spec | 0.5 | 0.667 | 0.913 | 1 | \$164 |
| Estimator | 0.5 | 0.667 | 0.913 | 2 | \$71 |
| Financial analyst | 0.5 | 0.667 | 0.913 | 2 | \$64 |
| Mech spec | 0.5 | 0.667 | 0.913 | 1 | \$75 |
| Planner | 0.5 | 0.667 | 0.913 | 1 | \$111 |
| PM II | 0.5 | 0.667 | 0.913 | 1 | \$98 |
| Process specialist | 0.5 | 0.667 | 0.913 | 1 | \$59 |
| Procurement specialist | 0.5 | 0.667 | 0.913 | 3 | \$80 |
| Proj coord | 0.5 | 0.667 | 0.913 | 0.5 | \$53 |
| Proj planner | 0.5 | 0.667 | 0.913 | 0.5 | \$63 |
| Project coordinator | 0.5 | 0.667 | 0.913 | 0.5 | \$68 |
| Scheduler | 0.5 | 0.667 | 0.913 | 1 | \$86 |
| Senior director | 0.5 | 0.667 | 0.913 | 0.125 | \$173 |
| Senior estimator | 0.5 | 0.667 | 0.913 | 1 | \$89 |
| Senior procurement spec | 0.5 | 0.667 | 0.913 | 1 | \$77 |
| Structural engr | 0.5 | 0.667 | 0.913 | 1 | \$72 |
| Systems engr | 0.5 | 0.667 | 0.913 | 1 | \$100 |
| | | | Sum | 31.875 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$1,626,807 |

| Year 5—EPC Procurement | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-------------------------|-----------|------------|----------|---------|--------------------|
| Buyer | 0.25 | 0.667 | 0.948 | \$3 | \$92 |
| Contracts admin | 0.25 | 0.667 | 0.948 | \$3 | \$84 |
| Cost controller | 0.25 | 0.667 | 0.948 | \$1 | \$78 |
| Director | 0.25 | 0.667 | 0.948 | \$0 | \$180 |
| Document controller | 0.25 | 0.667 | 0.948 | \$2 | \$46 |
| mngr | 0.25 | 0.667 | 0.948 | \$3 | \$127 |
| Engr sys spec | 0.25 | 0.667 | 0.948 | \$1 | \$141 |
| Environ Spec | 0.25 | 0.667 | 0.948 | \$1 | \$164 |
| Estimator | 0.25 | 0.667 | 0.948 | \$2 | \$71 |
| Financial analyst | 0.25 | 0.667 | 0.948 | \$2 | \$64 |
| Mech spec | 0.25 | 0.667 | 0.948 | \$1 | \$75 |
| Planner | 0.25 | 0.667 | 0.948 | \$1 | \$111 |
| PM II | 0.25 | 0.667 | 0.948 | \$1 | \$98 |
| Process specialist | 0.25 | 0.667 | 0.948 | \$1 | \$59 |
| Procurement specialist | 0.25 | 0.667 | 0.948 | \$3 | \$80 |
| Proj coord | 0.25 | 0.667 | 0.948 | \$1 | \$53 |
| Proj planner | 0.25 | 0.667 | 0.948 | \$1 | \$63 |
| Project coordinator | 0.25 | 0.667 | 0.948 | \$1 | \$68 |
| Scheduler | 0.25 | 0.667 | 0.948 | \$1 | \$86 |
| Senior director | 0.25 | 0.667 | 0.948 | \$0 | \$173 |
| Senior estimator | 0.25 | 0.667 | 0.948 | \$1 | \$89 |
| Senior procurement spec | 0.25 | 0.667 | 0.948 | \$1 | \$77 |
| Structural engr | 0.25 | 0.667 | 0.948 | \$1 | \$72 |
| Systems engr | 0.25 | 0.667 | 0.948 | \$1 | \$100 |
| | | | Sum | \$32 | |
| | | | Burden | \$2 | |
| | | | Total | | \$843,780 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 326 of 350

| Year 6—EPC Procurement | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-------------------------|-----------|------------|----------|---------|--------------------|
| Buyer | 0.25 | 0.667 | 0.991 | \$3 | \$92 |
| Contracts admin | 0.25 | 0.667 | 0.991 | \$3 | \$84 |
| Cost controller | 0.25 | 0.667 | 0.991 | \$1 | \$78 |
| Director | 0.25 | 0.667 | 0.991 | \$0 | \$180 |
| Document controller | 0.25 | 0.667 | 0.991 | \$2 | \$46 |
| mngr | 0.25 | 0.667 | 0.991 | \$3 | \$127 |
| Engr sys spec | 0.25 | 0.667 | 0.991 | \$1 | \$141 |
| Environ Spec | 0.25 | 0.667 | 0.991 | \$1 | \$164 |
| Estimator | 0.25 | 0.667 | 0.991 | \$2 | \$71 |
| Financial analyst | 0.25 | 0.667 | 0.991 | \$2 | \$64 |
| Mech spec | 0.25 | 0.667 | 0.991 | \$1 | \$75 |
| Planner | 0.25 | 0.667 | 0.991 | \$1 | \$111 |
| PM II | 0.25 | 0.667 | 0.991 | \$1 | \$98 |
| Process specialist | 0.25 | 0.667 | 0.991 | \$1 | \$59 |
| Procurement specialist | 0.25 | 0.667 | 0.991 | \$3 | \$80 |
| Proj coord | 0.25 | 0.667 | 0.991 | \$1 | \$53 |
| Proj planner | 0.25 | 0.667 | 0.991 | \$1 | \$63 |
| Project coordinator | 0.25 | 0.667 | 0.991 | \$1 | \$68 |
| Scheduler | 0.25 | 0.667 | 0.991 | \$1 | \$86 |
| Senior director | 0.25 | 0.667 | 0.991 | \$0 | \$173 |
| Senior estimator | 0.25 | 0.667 | 0.991 | \$1 | \$89 |
| Senior procurement spec | 0.25 | 0.667 | 0.991 | \$1 | \$77 |
| Structural engr | 0.25 | 0.667 | 0.991 | \$1 | \$72 |
| Systems engr | 0.25 | 0.667 | 0.991 | \$1 | \$100 |
| | | | Sum | \$32 | |
| | | | Burden | \$2 | |
| | | | Total | | \$882,805 |

Table E-8: EPC Project Management Spend Profile Details

| Year 1—EPC PM | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-----------------------|-----------|------------|----------|---------|--------------------|
| Director | 0.75 | 0.667 | 0.848 | 0.25 | \$180 |
| Document controller | 0.75 | 0.667 | 0.848 | 2 | \$46 |
| mngr | 0.75 | 0.667 | 0.848 | 1 | \$127 |
| Planner | 0.75 | 0.667 | 0.848 | 2 | \$111 |
| PM II | 0.75 | 0.667 | 0.848 | 0.5 | \$98 |
| Process engr | 0.75 | 0.667 | 0.848 | 1 | \$103 |
| Proj control dir | 0.75 | 0.667 | 0.848 | 1 | \$234 |
| Proj coord | 0.75 | 0.667 | 0.848 | 1 | \$53 |
| Proj engr | 0.75 | 0.667 | 0.848 | 3 | \$103 |
| Proj planner | 0.75 | 0.667 | 0.848 | 3 | \$63 |
| Project control spec | 0.75 | 0.667 | 0.848 | 1 | \$116 |
| Project controls engr | 0.75 | 0.667 | 0.848 | 1 | \$90 |
| Project coordinator | 0.75 | 0.667 | 0.848 | 1 | \$68 |
| Project mngr | 0.75 | 0.667 | 0.848 | 1 | \$139 |
| Scheduler | 0.75 | 0.667 | 0.848 | 3 | \$86 |
| Senior director | 0.75 | 0.667 | 0.848 | 0.125 | \$173 |
| Senior estimator | 0.75 | 0.667 | 0.848 | 1 | \$89 |
| Senior planner | 0.75 | 0.667 | 0.848 | 1 | \$153 |
| Senior process engr | 0.75 | 0.667 | 0.848 | 1 | \$90 |
| Systems engr | 0.75 | 0.667 | 0.848 | 1 | \$100 |
| | | | Sum | 25.875 | \$1,079 |
| | | | Burden | 1.9 | |
| | | | Total | | \$2,049,291 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 328 of 350

| Year 2—EPC PM | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-----------------------|-----------|------------|----------|---------|--------------------|
| Director | 1 | 0.667 | 0.855 | 0.25 | \$180 |
| Document controller | 1 | 0.667 | 0.855 | 2 | \$46 |
| mngr | 1 | 0.667 | 0.855 | 1 | \$127 |
| Planner | 1 | 0.667 | 0.855 | 2 | \$111 |
| PM II | 1 | 0.667 | 0.855 | 0.5 | \$98 |
| Process engr | 1 | 0.667 | 0.855 | 1 | \$103 |
| Proj control dir | 1 | 0.667 | 0.855 | 1 | \$234 |
| Proj coord | 1 | 0.667 | 0.855 | 1 | \$53 |
| Proj engr | 1 | 0.667 | 0.855 | 3 | \$103 |
| Proj planner | 1 | 0.667 | 0.855 | 3 | \$63 |
| Project control spec | 1 | 0.667 | 0.855 | 1 | \$116 |
| Project controls engr | 1 | 0.667 | 0.855 | 1 | \$90 |
| Project coordinator | 1 | 0.667 | 0.855 | 1 | \$68 |
| Project mngr | 1 | 0.667 | 0.855 | 1 | \$139 |
| Scheduler | 1 | 0.667 | 0.855 | 3 | \$86 |
| Senior director | 1 | 0.667 | 0.855 | 0.125 | \$173 |
| Senior estimator | 1 | 0.667 | 0.855 | 1 | \$89 |
| Senior planner | 1 | 0.667 | 0.855 | 1 | \$153 |
| Senior process engr | 1 | 0.667 | 0.855 | 1 | \$90 |
| Systems engr | 1 | 0.667 | 0.855 | 1 | \$100 |
| | | | Sum | 25.875 | \$1,450 |
| | | | Burden | 1.9 | |
| | | | Total | | \$2,755,291 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 329 of 350

| Year 3—EPC PM | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-----------------------|-----------|------------|----------|---------|--------------------|
| Director | 1 | 0.667 | 0.857 | 0.25 | \$180 |
| Document controller | 1 | 0.667 | 0.857 | 2 | \$46 |
| mngr | 1 | 0.667 | 0.857 | 1 | \$127 |
| Planner | 1 | 0.667 | 0.857 | 2 | \$111 |
| PM II | 1 | 0.667 | 0.857 | 0.5 | \$98 |
| Process engr | 1 | 0.667 | 0.857 | 1 | \$103 |
| Proj control dir | 1 | 0.667 | 0.857 | 1 | \$234 |
| Proj coord | 1 | 0.667 | 0.857 | 1 | \$53 |
| Proj engr | 1 | 0.667 | 0.857 | 3 | \$103 |
| Proj planner | 1 | 0.667 | 0.857 | 3 | \$63 |
| Project control spec | 1 | 0.667 | 0.857 | 1 | \$116 |
| Project controls engr | 1 | 0.667 | 0.857 | 1 | \$90 |
| Project coordinator | 1 | 0.667 | 0.857 | 1 | \$68 |
| Project mngr | 1 | 0.667 | 0.857 | 1 | \$139 |
| Scheduler | 1 | 0.667 | 0.857 | 3 | \$86 |
| Senior director | 1 | 0.667 | 0.857 | 0.125 | \$173 |
| Senior estimator | 1 | 0.667 | 0.857 | 1 | \$89 |
| Senior planner | 1 | 0.667 | 0.857 | 1 | \$153 |
| Senior process engr | 1 | 0.667 | 0.857 | 1 | \$90 |
| Systems engr | 1 | 0.667 | 0.857 | 1 | \$100 |
| | | | Sum | 25.875 | \$1,453 |
| | | | Burden | 1.9 | |
| | | | Total | | \$2,761,399 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 330 of 350

| Year 4—EPC PM | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-----------------------|-----------|------------|----------|---------|--------------------|
| Director | 1 | 0.667 | 0.913 | 0.25 | \$180 |
| Document controller | 1 | 0.667 | 0.913 | 2 | \$46 |
| mngr | 1 | 0.667 | 0.913 | 1 | \$127 |
| Planner | 1 | 0.667 | 0.913 | 2 | \$111 |
| PM II | 1 | 0.667 | 0.913 | 0.5 | \$98 |
| Process engr | 1 | 0.667 | 0.913 | 1 | \$103 |
| Proj control dir | 1 | 0.667 | 0.913 | 1 | \$234 |
| Proj coord | 1 | 0.667 | 0.913 | 1 | \$53 |
| Proj engr | 1 | 0.667 | 0.913 | 3 | \$103 |
| Proj planner | 1 | 0.667 | 0.913 | 3 | \$63 |
| Project control spec | 1 | 0.667 | 0.913 | 1 | \$116 |
| Project controls engr | 1 | 0.667 | 0.913 | 1 | \$90 |
| Project coordinator | 1 | 0.667 | 0.913 | 1 | \$68 |
| Project mngr | 1 | 0.667 | 0.913 | 1 | \$139 |
| Scheduler | 1 | 0.667 | 0.913 | 3 | \$86 |
| Senior director | 1 | 0.667 | 0.913 | 0.125 | \$173 |
| Senior estimator | 1 | 0.667 | 0.913 | 1 | \$89 |
| Senior planner | 1 | 0.667 | 0.913 | 1 | \$153 |
| Senior process engr | 1 | 0.667 | 0.913 | 1 | \$90 |
| Systems engr | 1 | 0.667 | 0.913 | 1 | \$100 |
| | | | Sum | 25.875 | \$1,549 |
| | | | Burden | 1.9 | |
| | | | Total | | \$2,943,863 |

| Year 5—EPC PM | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-----------------------|-----------|------------|----------|---------|--------------------|
| Director | 0.5 | 0.667 | 0.948 | 0.25 | \$180 |
| Document controller | 0.5 | 0.667 | 0.948 | 2 | \$46 |
| mngr | 0.5 | 0.667 | 0.948 | 1 | \$127 |
| Planner | 0.5 | 0.667 | 0.948 | 2 | \$111 |
| PM II | 0.5 | 0.667 | 0.948 | 0.5 | \$98 |
| Process engr | 0.5 | 0.667 | 0.948 | 1 | \$103 |
| Proj control dir | 0.5 | 0.667 | 0.948 | 1 | \$234 |
| Proj coord | 0.5 | 0.667 | 0.948 | 1 | \$53 |
| Proj engr | 0.5 | 0.667 | 0.948 | 3 | \$103 |
| Proj planner | 0.5 | 0.667 | 0.948 | 3 | \$63 |
| Project control spec | 0.5 | 0.667 | 0.948 | 1 | \$116 |
| Project controls engr | 0.5 | 0.667 | 0.948 | 1 | \$90 |
| Project coordinator | 0.5 | 0.667 | 0.948 | 1 | \$68 |
| Project mngr | 0.5 | 0.667 | 0.948 | 1 | \$139 |
| Scheduler | 0.5 | 0.667 | 0.948 | 3 | \$86 |
| Senior director | 0.5 | 0.667 | 0.948 | 0.125 | \$173 |
| Senior estimator | 0.5 | 0.667 | 0.948 | 1 | \$89 |
| Senior planner | 0.5 | 0.667 | 0.948 | 1 | \$153 |
| Senior process engr | 0.5 | 0.667 | 0.948 | 1 | \$90 |
| Systems engr | 0.5 | 0.667 | 0.948 | 1 | \$100 |
| | | | Sum | 25.875 | \$804 |
| | | | Burden | 1.9 | |
| | | | Total | | \$1,526,900 |

| Year 6—EPC PM | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|-----------------------|-----------|------------|----------|---------|--------------------|
| Director | 0.333 | 0.667 | 0.991 | 0.25 | \$180 |
| Document controller | 0.333 | 0.667 | 0.991 | 2 | \$46 |
| mngr | 0.333 | 0.667 | 0.991 | 1 | \$127 |
| Planner | 0.333 | 0.667 | 0.991 | 2 | \$111 |
| PM II | 0.333 | 0.667 | 0.991 | 0.5 | \$98 |
| Process engr | 0.333 | 0.667 | 0.991 | 1 | \$103 |
| Proj control dir | 0.333 | 0.667 | 0.991 | 1 | \$234 |
| Proj coord | 0.333 | 0.667 | 0.991 | 1 | \$53 |
| Proj engr | 0.333 | 0.667 | 0.991 | 3 | \$103 |
| Proj planner | 0.333 | 0.667 | 0.991 | 3 | \$63 |
| Project control spec | 0.333 | 0.667 | 0.991 | 1 | \$116 |
| Project controls engr | 0.333 | 0.667 | 0.991 | 1 | \$90 |
| Project coordinator | 0.333 | 0.667 | 0.991 | 1 | \$68 |
| Project mngr | 0.333 | 0.667 | 0.991 | 1 | \$139 |
| Scheduler | 0.333 | 0.667 | 0.991 | 3 | \$86 |
| Senior director | 0.333 | 0.667 | 0.991 | 0.125 | \$173 |
| Senior estimator | 0.333 | 0.667 | 0.991 | 1 | \$89 |
| Senior planner | 0.333 | 0.667 | 0.991 | 1 | \$153 |
| Senior process engr | 0.333 | 0.667 | 0.991 | 1 | \$90 |
| Systems engr | 0.333 | 0.667 | 0.991 | 1 | \$100 |
| | | | Sum | 25.875 | \$561 |
| | | | Burden | 1.9 | |
| | | | Total | | \$1,065,013 |

Appendix F. Backup Detail on EPC and Owner's Commissioning and **Close-Out Costs**

Commissioning is an evolution at the end of construction intended to verify that a new facility meets the owner's requirements and expectations. We adopt the following definition, which is typical in the construction sector:⁶⁴

The process of achieving, verifying, and documenting the performance of building systems to meet the design intent and client's functional and operational needs. It is the advancement of systems from static completion to full dynamic working order...

Consistent with nuclear industry practice, in our view, commissioning also includes "training and preparation of operator personnel" as well as conduct of O&M.65 Notably, consistent with CNSC requirements, 66 we consider introduction of radioactive material into the system as a separate evolution that occurs only after the facility is fully turned over to the owner, *i.e.*, post-commissioning.⁶⁷

Commissioning costs therefore include three main elements:

- **Training of operators**. Owner's operations personnel are intimately involved in test procedure development, testing workup, and ultimate systems operations. This represents a part-time commitment during preparations for commissioning and a full-time commitment during actual commissioning. Required staff include operators and an operator supervisor, all from the owner.
- Development/Verification of operating procedures. These are modifications of previously developed operating procedures, typically drafted by EPC engineering staff as part of preparations for commissioning. Required staff includes EPC and owner engineering and engineering support staff, all part time.
- **Testing**. Testing falls into several stages, which in practice may overlap: factory acceptance testing, installation testing, component testing, system testing (including ventilation balancing and safety system testing), and integrated system testing, all of which involve some degree of vendor support.⁶⁸ Our cost estimate already includes factory acceptance testing, by review of purchase orders and invoices; installation and component testing as part of RSMeans bottom-up estimates; and system testing of electrical and Instrumentation and Control ("I&C") systems and hydrostatic testing of mechanical systems, on a system-bysystem basis, as part of an adjustment to the RSMeans materials estimate. Within commissioning, we include only integrated system testing. Required staff includes owner operations staff, and owner and EPC engineering and engineering support staff, all full-time.

In terms of duration, we believe preparations for commissioning a facility of this kind would typically last approximately six months, which would largely occur in the run-up to completion of construction. Moreover, based on our experience with similar facilities, we believe the execution of commissioning itself-dominated by commissioning testing—would last approximately four months beyond the end of construction. This is consistent with the literature.69

⁶⁴ D. Chu, "Everything You Always Wanted to Know About Commissioning, But Didn't Know to Ask" (US Army Research and Development Center White Paper, September 2015). ⁶⁵ DOE-G-413.3-23, *Nuclear Facilities Commissioning Guide*, August 2019 ("NFCG").

⁶⁶ CNSC, Regulatory Document (REGDOC) 2.3.1, "Conduct of Licensed Activities: Construction and Commissioning Programs," accessed April 26, 2020, https://nuclearsafety.gc.ca/eng/acts-and-regulations/regulatory-documents/published/html/regdoc2-3-1/index.cfm

⁶⁷ In US DOE nuclear facilities, this evolution is termed "hot commissioning," requires completion of a DOE Operational Readiness Review (ORR, in accordance with DOE Order 425.1B, Planning and Conduct of Operational Readiness Reviews), and involves ramp-up to full production capacity. 68 See NFCG discussion in Section 3.5.1.7 (pp. 18-19).

⁶⁹ A report by the DOE Chief of Nuclear Safety, "Design and Commissioning Report" (Rev. 1, July 2017), gives a median duration of 4.5 months, based on five nuclear process chemical facilities. RAND gives median estimates of 2.2 months (with a range of 1-6 months) for "First in North America" builds for a particular EPC contractor, and 4.5 months (with a range of 1-15 months) for startup efforts that encountered some equipment failures but did not require a major redesign. C. Myers, R. Shangraw, M. Devey, and T. Hayashi, "Understanding Process Plant Schedule Slippage and Startup Costs" (RAND Report R-3215-PSSP/RC, June 1986). See also E. Merrow, K. Phillips, and C. Myers, "Understanding Cost Growth and Performance Shortfalls in Pioneer Process Plants" (RAND Report R-2569-DOE, September 1981).

Using this duration as a basis, we estimated the owner and EPC contractor crew sizes during the preparation stage and the execution of commissioning—as shown in the attached spreadsheets.

Subsequent to commissioning, contract close-out takes place. Close-out is an administrative process that involves mostly contract management, legal, and administrative staff. We conceptualize it as a phased process, encompassing the following elements: close-out planning, contract negotiations (regarding contract close-out), disposal of any leftover materials, staff planning, archiving of data, and contract/financial administration.⁷⁰

For the EPC contractor, based on our experience, we include close-out cost within the contractor's fee; *i.e.*, we do not calculate it separately. This approach is consistent with that typical of fixed-price EPC contracts for nuclear construction.

For the owner, we developed a staffing model from the elements included in the phased process described immediately above. We assumed a notional duration of six months, beginning after the completion of commissioning. This duration is consistent with our experience with fixed-price EPC contracts for nuclear construction.

As shown below, we calculate EPC contractor's commissioning support cost of **\$4.5 million**, and owner's commissioning and close-out cost of **\$6.8 million**. As a percentage of total construction cost, these commissioning and close-out costs fall within the range described in the literature.⁷¹

EPC Contractor's Commissioning Support Cost

Table F-1: EPC Contractor's Commissioning Support Cost

| Commissioning | | | | |
|---------------|---------|--|--|--|
| | support | | | |
| 2018 | \$3.0 | | | |
| 2019 | \$1.5 | | | |
| Total | \$4.5 | | | |

Figure F-1: Probability Distribution of EPC Contractor's Commissioning Support Cost



EPC Commissioning

⁷⁰ E. Chatterton, "The End of Acquisition Reform: Creating Guidelines to Reduce the Cost of the Weapons Systems Program Close-out Process" (MS Thesis, US Air University, Maxwell Air Force Base, April 2012).

⁷¹ The US Army Research and Development Center estimates commissioning cost in the range of 1%-3% of total construction cost. D. Chu,

[&]quot;Everything You Always Wanted to Know About Commissioning, But Didn't Know to Ask" (US Army Research and Development Center White Paper, September 2015). RAND estimates commissioning cost in the range of 1%-6% of total construction cost. C. Myers, R. Shangraw, M. Devey, and T. Hayashi, "Understanding Process Plant Slippage and Startup Costs" (RAND Report R-3215-PSSP/RC, June 1986).

Table F-2: EPC Commissioning Support Spend Profile Details

| Year 6—EPC electrical engineering commissioning support | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|--|-----------|------------|----------|---------|--------------------|
| Director | 0.5 | 1.000 | 0.991 | 0.5 | \$180 |
| Document controller | 0.5 | 1.000 | 0.991 | 2.00 | \$46 |
| I&C engr | 0.5 | 1.000 | 0.991 | 4 | \$130 |
| Senior elec engr | 0.5 | 1.000 | 0.991 | 4 | \$160 |
| | | | Sum | 10.5 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$1,260,269 |

| Year 6—EPC Engineering support procedures | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|---|-----------|------------|----------|---------|--------------------|
| Document controller | 0.5 | 0.667 | 0.991 | 4 | \$46 |
| Electrical proj engr | 0.5 | 0.667 | 0.991 | 1 | \$110 |
| Engr mngr | 0.5 | 0.667 | 0.991 | 1 | \$127 |
| Environ Spec | 0.5 | 0.667 | 0.991 | 2 | \$164 |
| Environ Tech | 0.5 | 0.667 | 0.991 | 1 | \$57 |
| HSE Mngr | 0.5 | 0.667 | 0.991 | 0.5 | \$146 |
| Mech spec | 0.5 | 0.667 | 0.991 | 1 | \$75 |
| Proj engr | 0.5 | 0.667 | 0.991 | 1 | \$103 |
| Proj planner | 0.5 | 0.667 | 0.991 | 1 | \$63 |
| Proj QM | 0.5 | 0.667 | 0.991 | 1 | \$104 |
| Systems engr | 0.5 | 0.667 | 0.991 | 1 | \$100 |
| | | | Sum | 14.5 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$830,406 |

| Year 7—EPC electrical engineering commissioning support | PropPerYr | Allocation | Deflator | # staff | Wage/yr (\$000) |
|--|-----------|------------|----------|---------|--------------------|
| Director | 0.333 | 1.000 | 1.000 | 0.5 | \$180 |
| Document controller | 0.333 | 1.000 | 1.000 | 2.00 | \$46 |
| I&C engr | 0.333 | 1.000 | 1.000 | 4 | \$130 |
| Senior elec engr | 0.333 | 1.000 | 1.000 | 4 | \$160 |
| | | | Sum | 10.5 | |
| | | | Burden | 1.9 | |
| | | | Total | | \$847,474 |

Owner's Commissioning and Close-Out Cost

Table F-3: Owner's Commissioning and Close-Out Costs

| | Commissioning | Procedures | Close-out | Total |
|-------|---------------|------------|-----------|-------|
| 2018 | \$1.9 | \$2,9 | N/A | \$4.8 |
| 2019 | \$1.3 | N/A | \$0.7 | \$2.0 |
| Total | | | | \$6.8 |

Figure F-2: Probability Distribution of Owner's Commissioning and Close-Out Cost



Table F-4: Owner's Commissioning and Close-Out Cost Spend Profile Details

| Category | Year 6—Owner Commissioning | PropPerYr | Deflator | Staff | Wage/yr (\$000) |
|----------|-------------------------------|-----------|----------|-------|--------------------|
| Engrg | Authorized Nuclear Operator | 0.5 | 0.991 | 4 | \$155 |
| Engrg | Electrical Control Technician | 0.5 | 0.991 | 2 | \$154 |
| Engrg | Envir Spec | 0.5 | 0.991 | 2 | \$164 |
| Engrg | HSE Mngr | 0.5 | 0.991 | 0.5 | \$146 |
| Engrg | First Line Mngr/Control/Mech | 0.5 | 0.991 | 0.5 | \$192 |
| Engrg | Mechanical Engr | 0.5 | 0.991 | 1 | \$137 |
| Engrg | Nuclear Operator | 0.5 | 0.991 | 4 | \$147 |
| Engrg | Responsible Systems Engr | 0.5 | 0.991 | 1 | \$106 |
| Engrg | Section Manager | 0.5 | 0.991 | 2 | \$167 |
| Engrg | Senior Engineer | 0.5 | 0.991 | 1 | \$125 |
| Engrg | Senior Technical Engr/Officer | 0.5 | 0.991 | 1 | \$158 |
| | | | Sum | 19 | \$1,422 |
| | | | Fringe | 1.35 | |
| | | | Total | | \$1,920,295 |

| Category | Year 6—Owner Procedures Team | PropPerYr | Deflator | Staff | Wage/yr (\$000) |
|------------|-------------------------------|-----------|----------|-------|--------------------|
| Engrg | Authorized Nuclear Operator | 0.5 | 0.991 | 1 | \$155 |
| Engrg | Electrical Control Technician | 0.5 | 0.991 | 2 | \$154 |
| Engrg | Envir Spec | 0.5 | 0.991 | 3 | \$164 |
| Engrg | HSE Mngr | 0.5 | 0.991 | 1 | \$146 |
| Engrg | First Line Mngr/Control/Mech | 0.5 | 0.991 | 2 | \$192 |
| Engrg | Inspection Maint Tech | 0.5 | 0.991 | 2 | \$159 |
| Engrg | Mechanical Engr | 0.5 | 0.991 | 4 | \$137 |
| Engrg | Nuclear Operator | 0.5 | 0.991 | 4 | \$147 |
| Engrg | Responsible Systems Engr | 0.5 | 0.991 | 2 | \$106 |
| Engrg | Section Manager | 0.5 | 0.991 | 1 | \$167 |
| Engrg | Senior Engineer | 0.5 | 0.991 | 4 | \$125 |
| Engrg | Senior Technical Engr/Officer | 0.5 | 0.991 | 2 | \$158 |
| Legal/Proc | Support Staff | 0.5 | 0.991 | 4 | \$53 |
| | | | Sum | 32 | \$2,151 |
| | | | Fringe | 1.35 | |
| | | | Total | | \$2,903,353 |

| Year 7 —Owner Commissioning | PropPerYr | Deflator | Staff | Wage/yr (\$000) |
|-------------------------------|-----------|----------|-------|--------------------|
| Authorized Nuclear Operator | 0.333 | 1.000 | 4 | \$155 |
| Electrical Control Technician | 0.333 | 1.000 | 2 | \$154 |
| Envir Spec | 0.333 | 1.000 | 2 | \$164 |
| HSE Mngr | 0.333 | 1.000 | 0.5 | \$146 |
| First Line Mngr/Control/Mech | 0.333 | 1.000 | 0.5 | \$192 |
| Mechanical Engr | 0.333 | 1.000 | 1 | \$137 |
| Nuclear Operator | 0.333 | 1.000 | 4 | \$147 |
| Responsible Systems Engr | 0.333 | 1.000 | 1 | \$106 |
| Section Manager | 0.333 | 1.000 | 2 | \$167 |
| Senior Engineer | 0.333 | 1.000 | 1 | \$125 |
| Senior Technical Engr/Officer | 0.333 | 1.000 | 1 | \$158 |
| | | Sum | 19 | \$957 |
| | | Fringe | 1.35 | |
| | | Total | | \$1,291,311 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 338 of 350

| Year 7—Owner Close-out | PropPerYr | Deflator | Staff | Wage/yr (\$000) |
|------------------------------|-----------|----------|-------|--------------------|
| Business Specialist | 0.5 | 1 | 1 | \$100 |
| First Line Mngr/Control/Mech | 0.5 | 1 | 0.25 | \$192 |
| Senior Engineer | 0.5 | 1 | 1 | \$125 |
| Legal Team Mngr | 0.5 | 1 | 0.5 | \$165 |
| Senior Legal | 0.5 | 1 | 2 | \$130 |
| Senior Legal Staff | 0.5 | 1 | 2 | \$105 |
| Contract Admin Staff | 0.5 | 1 | 2 | \$65 |
| Support Staff | 0.5 | 1 | 2 | \$53 |
| | | Sum | 10.75 | \$530 |
| | | Fringe | 1.35 | |
| | | Total | | \$715,768 |

Appendix G. Backup Detail on Owner's Cost Excluding Commissioning and Close-Out Cost and Financing

This appendix presents the worksheets we used in developing our estimate of the owner's cost. Owner's cost encompasses three elements: project management; facility commissioning; and management reserve. Each is discussed in turn

Project Management

These worksheets show the staffing level and associated costs by staff position for the owner's staff for seven years: one year before construction and the six construction years. Thus, there are seven spreadsheets.

Each spreadsheet depicts two sections: engineering and legal/procurement.

The year before construction is devoted to preliminary design, developing the contract specifications, and letting the contract. The remaining six years are devoted to design reviews and construction oversight by the engineering team and procurement management and contract management by the legal/procurement staff.

We arranged each spreadsheet in a consistent format. In the first column, we identified the section of the employees. In the second column, we identified the staff position. In the third column, we specified the proportion of a year the employees would be devoted to the project. In the fourth column, we record the price deflation factor we applied to the 2019 annual wage in the sixth column. In the fifth column, we show the staffing levels (denoted as full-time equivalents) for each position. In the sixth column, we show our estimate of the average annual salary (scaled in thousands of dollars) for each position. The sum of the products of columns 3 through 6 yield the owner's annual cost for salaries.

We then applied a "burden" factor of 1.35 on the salaries to reflect the owner's full costs. The burden factor accounts for the costs of the employees' fringe benefits and owner's overhead costs. Based on our experience, we believe a burden factor of 1.35 (or 35% of base labour cost) is appropriate for staffing of this sort. We then rescale the fully burdened costs to reflect costs in dollars.

Management Reserve

The management reserve is calculated as 2% of the EPC contractor total project cost of \$424.3 million.

| Category | Year 0—Labor Category | PropPerYr | Deflator | Staff | Wage/yr (\$000) |
|------------|-------------------------------|-----------|----------|-------|-----------------|
| Engrg | Authorized Nuclear Operator | 0 | 0.859425 | 0.5 | \$154.63 |
| Engrg | Electrical Control Technician | 0 | 0.859425 | 1 | \$153.82 |
| Engrg | Engineer | 1 | 0.859425 | 5 | \$89.50 |
| Engrg | Envir Spec | 1 | 0.859 | 2 | \$164.00 |
| Engrg | Business Specialist | 0 | 0.859 | 2 | \$100 |
| Engrg | HSE Mngr | 0 | 0.859 | 0.5 | \$146 |
| Engrg | First Line Mngr/Control/Mech | 0 | 0.859 | 0.25 | \$192 |
| Engrg | Inspection Maint Tech | 0 | 0.859 | 1 | \$159 |
| Engrg | Mechanical Engr | 1 | 0.859 | 4 | \$137 |
| Engrg | Nuclear Operator | 0 | 0.859 | 1 | \$147 |
| Engrg | Nuclear Security Officer | 0 | 0.859 | 0.5 | \$135 |
| Engrg | Responsible Systems Engr | 0 | 0.859 | 1 | \$106 |
| Engrg | Section Manager | 1 | 0.859 | 1 | \$167 |
| Engrg | Senior Engineer | 1 | 0.859 | 2 | \$125 |
| Engrg | Senior Technical Engr/Officer | 0 | 0.859 | 1 | \$158 |
| Legal/Proc | Legal Team Mngr | 1 | 0.859 | 1 | \$165 |
| Legal/Proc | Senior Legal | 1 | 0.859 | 2 | \$130 |
| Legal/Proc | Senior Legal Staff | 1 | 0.859 | 2 | \$105 |
| Legal/Proc | Contract Admin Staff | 1 | 0.859 | 5 | \$65 |
| Legal/Proc | Support Staff | 1 | 0.859 | 3 | \$53 |
| | | | Sum | 35.75 | \$2,455 |
| | | | Fringe | 1.35 | |
| | | | Total | | \$3.313.613 |

Table G-1: Owner's Costs Spend Profile Details

| Category | Year 1—Labor Category | PropPerYr | Deflator | Staff | Wage/yr (\$000) |
|------------|-------------------------------|-----------|----------|-------|--------------------|
| Engrg | Authorized Nuclear Operator | 0.5 | 0.848 | 0.5 | \$155 |
| Engrg | Electrical Control Technician | 0 | 0.848 | 1 | \$154 |
| Engrg | Engineer | 1 | 0.848 | 3 | \$90 |
| Engrg | Envir Spec | 1 | 0.848 | 2 | \$164 |
| Engrg | Business Specialist | 0.25 | 0.848 | 2 | \$100 |
| Engrg | HSE Mngr | 0.25 | 0.848 | 0.5 | \$146 |
| Engrg | First Line Mngr/Control/Mech | 0.25 | 0.848 | 0.25 | \$192 |
| Engrg | Inspection Maint Tech | 0 | 0.848 | 1 | \$159 |
| Engrg | Mechanical Engr | 0 | 0.848 | 4 | \$137 |
| Engrg | Nuclear Operator | 0 | 0.848 | 1 | \$147 |
| Engrg | Nuclear Security Officer | 0.5 | 0.848 | 0.5 | \$135 |
| Engrg | Responsible Systems Engr | 0.25 | 0.848 | 1 | \$106 |
| Engrg | Section Manager | 1 | 0.848 | 1 | \$167 |
| Engrg | Senior Engineer | 1 | 0.848 | 2 | \$125 |
| Engrg | Senior Technical Engr/Officer | 1 | 0.848 | 1 | \$158 |
| Legal/Proc | Legal Team Mngr | 1 | 0.848 | 1 | \$165 |
| Legal/Proc | Senior Legal | 1 | 0.848 | 2 | \$130 |
| Legal/Proc | Senior Legal Staff | 1 | 0.848 | 2 | \$105 |
| Legal/Proc | Contract Admin Staff | 1 | 0.848 | 5 | \$65 |
| Legal/Proc | Support Staff | 1 | 0.848 | 3 | \$53 |
| | | | Sum | 33.75 | \$2,093 |
| | | | Fringe | 1.35 | |
| | | | Total | | \$2,825,076 |

| Category | Year 2—Labor Category | PropPerYr | Deflator | Staff | Wage/yr (\$000) |
|------------|-------------------------------|-----------|----------|-------|--------------------|
| Engrg | Authorized Nuclear Operator | 0.5 | 0.855 | 0.5 | \$155 |
| Engrg | Electrical Control Technician | 0 | 0.855 | 1 | \$154 |
| Engrg | Engineer | 1 | 0.855 | 2 | \$90 |
| Engrg | Envir Spec | 1 | 0.855 | 2 | \$164 |
| Engrg | Business Specialist | 0.25 | 0.855 | 2 | \$100 |
| Engrg | HSE Mngr | 0.25 | 0.855 | 0.5 | \$146 |
| Engrg | First Line Mngr/Control/Mech | 0.25 | 0.855 | 0.25 | \$192 |
| Engrg | Inspection Maint Tech | 1 | 0.855 | 1 | \$159 |
| Engrg | Mechanical Engr | 1 | 0.855 | 4 | \$137 |
| Engrg | Nuclear Operator | 0 | 0.855 | 1 | \$147 |
| Engrg | Nuclear Security Officer | 0.5 | 0.855 | 0.5 | \$135 |
| Engrg | Responsible Systems Engr | 0.5 | 0.855 | 1 | \$106 |
| Engrg | Section Manager | 1 | 0.855 | 1 | \$167 |
| Engrg | Senior Engineer | 1 | 0.855 | 2 | \$125 |
| Engrg | Senior Technical Engr/Officer | 1 | 0.855 | 1 | \$158 |
| Legal/Proc | Legal Team Mngr | 1 | 0.855 | 1 | \$165 |
| Legal/Proc | Senior Legal | 1 | 0.855 | 2 | \$130 |
| Legal/Proc | Senior Legal Staff | 1 | 0.855 | 2 | \$105 |
| Legal/Proc | Contract Admin Staff | 1 | 0.855 | 5 | \$65 |
| Legal/Proc | Support Staff | 1 | 0.855 | 3 | \$53 |
| | | | Sum | 32.75 | \$2,659 |
| | | | Fringe | 1.35 | |
| | | | Total | | \$3,589,220 |

| Category | Year 3—Labor Category | PropPerYr | Deflator | Staff | Wage/yr (\$000) |
|-------------|-------------------------------|-----------|----------|-------|--------------------|
| EngrgA2:I24 | Authorized Nuclear Operator | 0.5 | 0.857 | 0.5 | \$155 |
| Engrg | Electrical Control Technician | 0 | 0.857 | 1 | \$154 |
| Engrg | Engineer | 1 | 0.857 | 2 | \$90 |
| Engrg | Envir Spec | 1 | 0.857 | 2 | \$164 |
| Engrg | Business Specialist | 0.75 | 0.857 | 2 | \$100 |
| Engrg | HSE Mngr | 0.5 | 0.857 | 0.5 | \$146 |
| Engrg | First Line Mngr/Control/Mech | 1 | 0.857 | 0.25 | \$192 |
| Engrg | Inspection Maint Tech | 1 | 0.857 | 1 | \$159 |
| Engrg | Mechanical Engr | 1 | 0.857 | 2 | \$137 |
| Engrg | Nuclear Operator | 1 | 0.857 | 1 | \$147 |
| Engrg | Nuclear Security Officer | 1 | 0.857 | 0.5 | \$135 |
| Engrg | Responsible Systems Engr | 1 | 0.857 | 1 | \$106 |
| Engrg | Section Manager | 1 | 0.857 | 2 | \$167 |
| Engrg | Senior Engineer | 1 | 0.857 | 1 | \$125 |
| Engrg | Senior Technical Engr/Officer | 1 | 0.857 | 1 | \$158 |
| Legal/Proc | Legal Team Mngr | 1 | 0.857 | 1 | \$165 |
| Legal/Proc | Senior Legal | 1 | 0.857 | 2 | \$130 |
| Legal/Proc | Senior Legal Staff | 1 | 0.857 | 2 | \$105 |
| Legal/Proc | Contract Admin Staff | 1 | 0.857 | 5 | \$65 |
| Legal/Proc | Support Staff | 1 | 0.857 | 3 | \$53 |
| | | | Sum | 30.75 | \$2,799 |
| | | | Fringe | 1.35 | |
| | | | Total | | \$3,778,249 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 344 of 350

| Category | Year 4—Labor Category | PropPerYr | Deflator | Staff | Wage/yr (\$000) |
|------------|-------------------------------|-----------|----------|-------|--------------------|
| Engrg | Authorized Nuclear Operator | 1 | 0.913 | 0.5 | \$155 |
| Engrg | Electrical Control Technician | 1 | 0.913 | 1 | \$154 |
| Engrg | Engineer | 1 | 0.913 | 1 | \$90 |
| Engrg | Envir Spec | 1 | 0.913 | 2 | \$164 |
| Engrg | Business Specialist | 1 | 0.913 | 2 | \$100 |
| Engrg | HSE Mngr | 1 | 0.913 | 0.5 | \$146 |
| Engrg | First Line Mngr/Control/Mech | 1 | 0.913 | 0.25 | \$192 |
| Engrg | Inspection Maint Tech | 1 | 0.913 | 1 | \$159 |
| Engrg | Mechanical Engr | 1 | 0.913 | 2 | \$137 |
| Engrg | Nuclear Operator | 1 | 0.913 | 1 | \$147 |
| Engrg | Nuclear Security Officer | 1 | 0.913 | 0.5 | \$135 |
| Engrg | Responsible Systems Engr | 1 | 0.913 | 1 | \$106 |
| Engrg | Section Manager | 1 | 0.913 | 2 | \$167 |
| Engrg | Senior Engineer | 1 | 0.913 | 1 | \$125 |
| Engrg | Senior Technical Engr/Officer | 1 | 0.913 | 1 | \$158 |
| Legal/Proc | Legal Team Mngr | 1 | 0.913 | 1 | \$165 |
| Legal/Proc | Senior Legal | 1 | 0.913 | 2 | \$130 |
| Legal/Proc | Senior Legal Staff | 1 | 0.913 | 2 | \$105 |
| Legal/Proc | Contract Admin Staff | 1 | 0.913 | 5 | \$65 |
| Legal/Proc | Support Staff | 1 | 0.913 | 3 | \$53 |
| | | | Sum | 16.75 | \$3,157 |
| | | | Fringe | 1.35 | |
| | | | Total | | \$4,261,560 |

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 345 of 350

| Category | Year 5—Labor Category | PropPerYr | Deflator | Staff | Wage/yr (\$000) |
|------------|-------------------------------|-----------|----------|-------|--------------------|
| Engrg | Authorized Nuclear Operator | 1 | 0.948 | 0.5 | \$155 |
| Engrg | Electrical Control Technician | 1 | 0.948 | 1 | \$154 |
| Engrg | Engineer | 1 | 0.948 | 1 | \$90 |
| Engrg | Envir Spec | 1 | 0.948 | 2 | \$164 |
| Engrg | Business Specialist | 1 | 0.948 | 2 | \$100 |
| Engrg | HSE Mngr | 1 | 0.948 | 0.5 | \$146 |
| Engrg | First Line Mngr/Control/Mech | 1 | 0.948 | 0.25 | \$192 |
| Engrg | Inspection Maint Tech | 1 | 0.948 | 1 | \$159 |
| Engrg | Mechanical Engr | 1 | 0.948 | 2 | \$137 |
| Engrg | Nuclear Operator | 1 | 0.948 | 1 | \$147 |
| Engrg | Nuclear Security Officer | 1 | 0.948 | 0.5 | \$135 |
| Engrg | Responsible Systems Engr | 1 | 0.948 | 1 | \$106 |
| Engrg | Section Manager | 1 | 0.948 | 2 | \$167 |
| Engrg | Senior Engineer | 1 | 0.948 | 1 | \$125 |
| Engrg | Senior Technical Engr/Officer | 1 | 0.948 | 1 | \$158 |
| Legal/Proc | Legal Team Mngr | 1 | 0.948 | 1 | \$165 |
| Legal/Proc | Senior Legal | 1 | 0.948 | 2 | \$130 |
| Legal/Proc | Senior Legal Staff | 1 | 0.948 | 2 | \$105 |
| Legal/Proc | Contract Admin Staff | 1 | 0.948 | 5 | \$65 |
| Legal/Proc | Support Staff | 1 | 0.948 | 3 | \$53 |
| | | | Sum | 29.75 | \$3,275 |
| | | | Fringe | 1.35 | |
| | | | Total | | \$4,420,706 |

| Year 6—Labor Category | PropPerYr | Deflator | Staff | Wage/yr (\$000) | |
|-------------------------------|-----------|----------|-------|--------------------|--|
| Authorized Nuclear Operator | 1 | 0.991 | 0.5 | \$155 | |
| Electrical Control Technician | 1 | 0.991 | 1 | \$154 | |
| Engineer | 1 | 0.991 | 1 | \$90 | |
| Envir Spec | 1 | 0.991 | 2 | \$164 | |
| Business Specialist | 1 | 0.991 | 2 | \$100 | |
| HSE Mngr | 1 | 0.991 | 0.5 | \$146 | |
| First Line Mngr/Control/Mech | 1 | 0.991 | 0.25 | \$192 | |
| Inspection Maint Tech | 1 | 0.991 | 1 | \$159 | |
| Mechanical Engr | 1 | 0.991 | 2 | \$137 | |
| Nuclear Operator | 1 | 0.991 | 1 | \$147 | |
| Nuclear Security Officer | 1 | 0.991 | 0.5 | \$135 | |
| Responsible Systems Engr | 1 | 0.991 | 1 | \$106 | |
| Section Manager | 1 | 0.991 | 2 | \$167 | |
| Senior Engineer | 1 | 0.991 | 1 | \$125 | |
| Senior Technical Engr/Officer | 1 | 0.991 | 1 | \$158 | |
| Legal Team Mngr | 1 | 0.991 | 1 | \$165 | |
| Senior Legal | 1 | 0.991 | 2 | \$130 | |
| Senior Legal Staff | 1 | 0.991 | 2 | \$105 | |
| Contract Admin Staff | 1 | 0.991 | 5 | \$65 | |
| Support Staff | 1 | 0.991 | 3 | \$53 | |
| | | Sum | 29.75 | \$3,426 | |
| | | Fringe | 1.35 | | |
| | | Total | | \$4,625,163 | |

Appendix H. Backup Detail on Financing Cost

The table below presents the spend profile of "then-year" dollars for each of the major cost categories underlying the estimate of direct costs with fee and contingency, the indirect costs, and the owner's cost. The sum of these items is the total project cost, less financing. To these annual amounts we applied OPG's end-of-year project financing (simple interest) rate for the current and following year (corresponding to our assumption that costs sit in CWIP for an average of two years before corresponding elements of the project are declared in-service).⁷² The numbers in bold tie directly to our summary of project costs as set forth in Table 5. The sum of the annual financing cost is the total financing cost.

Table H-1: Development of Financing Costs (Dollars Million)

| EPC contractor costs | | | | | | | Owner's costs | | | | | |
|----------------------|-------------------------------|--------|-------------------------------|---------|---------------------------------------|--------------------------|---------------------------|--|-----------------------------|-----------------------------------|-----------|--------|
| | Construc | ction | Process sy | ystems | Total EPC | 500 | 550 | Excluding | Commis- | Total | Financing | |
| | Materials and equipment | Labour | Materials and equipment | Labour | direct with fee and contingency | EPC indirect costs | EPC commis- sioning | commissioning, close-out and financing | sioning and close-out | project cost less financing | Rate | Cost |
| 2012 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | \$3.3 | N/A | \$3.3 | 5.03% | \$0.2 |
| 2013 | \$8.2 | \$13.5 | \$12.6 | \$18.9 | \$53.1 | \$10.0 | N/A | \$2.8 | N/A | \$65.9 | 5.03% | \$3.5 |
| 2014 | \$8.3 | \$13.6 | \$19.0 | \$19.0 | \$59.9 | \$13.8 | N/A | \$3.6 | N/A | \$77.2 | 5.03% | \$7.2 |
| 2015 | \$6.8 | \$11.1 | \$15.9 | \$28.6 | \$62.4 | \$14.5 | N/A | \$3.8 | N/A | \$80.7 | 5.26% | \$8.3 |
| 2016 | \$4.8 | \$7.9 | \$10.2 | \$40.7 | \$63.6 | \$13.6 | N/A | \$4.3 | N/A | \$81.4 | 5.23% | \$8.5 |
| 2017 | \$1.7 | \$2.7 | \$5.3 | \$47.5 | \$57.1 | \$10.8 | N/A | \$4.4 | N/A | \$72.3 | 4.89% | \$7.5 |
| 2018 | \$0.9 | \$1.4 | \$1.8 | \$49.7 | \$53.8 | \$7.2 | \$3.0 | \$13.1 | \$4.8 | \$82.0 | 4.40% | \$6.8 |
| 2019 | N/A | N/A | N/A | N/A | N/A | N/A | \$1.5 | N/A | \$2.0 | \$3.5 | 4.30% | \$3.6 |
| Total | \$30.7 | \$50.2 | \$64.7 | \$204.3 | \$349.9 | \$69.9 | \$4.5 | \$35.3 | \$6.8 | \$466.5 | | \$45.6 |

⁷² For 2019, a rate interpolated between the end-of-year rates for 2018 and 2019 was used to reflect the fact that the costs were incurred in the first four months of 2019.

Appendix I. Backup Detail on Comparables Analyses

Salt Waste Treatment Facility

SWPF is a nuclear waste treatment facility at the DOE's Savannah River Site ("SRS") in Aiken, South Carolina. SRS contains legacy nuclear waste from the production of nuclear materials between 1951 and 2002. The nuclear waste is stored in large (typically 1 million US gallons [3,800 m³] nominal capacity) underground doublewalled storage tanks.

Recently completed,⁷³ SWPF is the cornerstone of the SRS salt-processing strategy. It is designed to be capable of processing 6 million US gallons (23,000 m³) of salt solution per year. The waste currently in storage at SRS presently includes approximately 84 million US gallons (320,000 m³) of salt solution that must be processed, of which 75 million US gallons (280,000 m³) are projected to be processed through SWPF.⁷⁴

The data on linear feet of installed piping, storage capacity, and building size for the SWPF are presented in the table below.⁷⁵ Because of the central role that it plays in the processing of high-level radioactive waste at SRS, the SWPF is optimized for a much larger volume of storage (more than150 times larger) than the D2O Storage Project-to provide for substantial amounts of lag storage in the event of process upsets. We therefore based our estimate on the relative values of the length of process piping and facility square footage, which we judged to be better comparators.

Table I-1: SWPF Project Details

| | SWPF Project |
|---|--------------|
| Linear feet of process piping | 111,341 |
| Liquid storage capacity (m ³) | 320,000 |
| Size (ft ²) | 140,000 |

Total construction cost for the SWPF is approximately USD2.3 billion or CAD3.05 billion at the average 2019 exchange rate.

Integrated Waste Treatment Unit

IWTU is a FOAK, 53,000-square-foot facility located near the Idaho Nuclear Technology and Engineering Center ("INTEC") in Idaho Falls, Idaho.⁷⁶ IWTU will treat 900,000 gallons of liquid radioactive and hazardous waste currently stored in underground storage tanks. The sodium-bearing waste was generated from operations at INTEC and is stored in three stainless steel 300,000-gallon storage tanks that are part of a tank farm of 15 tanks.

IWTU will use a steam-reforming technology to convert the liquid to a solid, granular material; package it in stainless steel canisters; and store the containers in concrete vaults at the site. Any emissions generated during the treatment campaign will be filtered through high-efficiency particulate air ("HEPA") and Granulated Activated Charcoal filters and sampled to ensure regulatory requirements are met. Treatment of sodium-bearing waste supports the regulatory agreements between the DOE and state of Idaho. Once the three underground storage

⁷³ SWPF started operations with radioactive material in October 2020, https://www.energy.gov/em/articles/srs-salt-waste-processing-facility-begins-hot-

commissioning. ⁷⁴ Savannah River Site, "Fact Sheets," accessed April 26, 2020, <u>https://www.srs.gov/general/news/facts.htm</u> and Flickr, "Salt Waste Processing Facility (SWPF) at the Savannah River Site," accessed April 26, 2020, https://www.flickr.com/photos/51009184@N06/albums/72157630135719526.

⁷⁵ US Department of Energy, "Construction of Salt Waste Processing Facility (SWPF): Charting the Course for Major EM Successes in 2016–2017," September 29, 2015, https://www.energy.gov/sites/prod/files/2015/10/f27/SheppardEMSuccessPanel%20FINAL%20FINAL.pdf. Data estimated based on percentage complete as reported. ⁷⁶ Fluor Idaho, "Integrated Waste Treatment Unit," video, accessed April 26, 2020, <u>https://fluor-idaho.com/projects/Projects_IWTU.aspx.</u>
CONFIDENTIAL ATTORNEY WORK PRODUCT

tanks containing the waste have been emptied, they—like the previous tanks—will be thoroughly washed and filled with a concrete grout mixture. The entire tank farm will eventually be capped.

The figure below illustrates the IWTU process flow:

Figure I-1: IWTU Simplified Process Flow77



The data on storage and size for the IWTU are presented in the table below.⁷⁸ We were unable to obtain information on the linear feet of process piping at the IWTU project.

| Table I-2: IWTU Project Details | |
|---------------------------------|----|
| | IW |

| | IWTU Project |
|---|--------------|
| Liquid storage capacity (m ³) | 517.44 |
| Size (ft ²) | 53,000 |

Total construction cost for the IWTU project is approximately USD987 million or CAD1.31 billion at the average 2019 exchange rate. However, given that the IWTU failed commission testing and required extensive redesign and retesting, the "construction complete" cost of \$512 million in 2012 may be more appropriate. This equates to approximately \$635 million dollars in 2019, when accounting for inflation of 11.35% over the period.

 ⁷⁷ Fluor Idaho, "Integrated Waste Treatment Unit," October 2017, available at https://fluor-idaho.com/Documents/ProjectFiles/iwtu/IWTU_100417.pdf.
 ⁷⁸ Fluor Idaho, "Integrated Waste Treatment Unit," video, accessed April 26, 2020, https://fluor-idaho.com/projects/ProjectFiles/iwtu/IWTU_100417.pdf.

CONFIDENTIAL ATTORNEY WORK PRODUCT

Filed 2021-08-17 EB-2020-0290 J3.4 Attachment 1 Page 350 of 350



2001 K Street, NW North Building, Suite 500 Washington, DC 20006 USA

BATESWHITE.COM

UNDERTAKING J3.5

2 3 <u>Undertaking</u>

5 TO DESCRIBE THE COST ESTIMATE FOR GETTING THE TANKS, PURCHASING 6 THE TANKS, BRINGING THE TANKS, PUTTING THEM ON-SITE, AND HAVING 7 THEM READY TO CONNECT EVERYTHING ELSE, WITHOUT CONNECTING TO 8 EVERYTHING ELSE, SO BEFORE CONNECTING INTO ALL THE SUBSYSTEMS

9 10

1

4

11 **Response**

12

14

13 The following response was prepared by Bates White:

The estimate in item D01.01, Equipment tanks and pumps, on page D-59 of the Bates White report, presents the cost estimate for "getting the tanks, purchasing the tanks, putting them on site, and having them ready to connect without connecting to everything else."

19

20 Bates White developed the material portion of the estimate from data in OPG Purchase 21 Order #00246115, referenced in Appendix C. Bates White then estimated the labour 22 costs associated with bringing the tanks on site (i.e., to the D2O Storage Project 23 Facility) and landing them in the facility. This portion of the estimate was based on 24 Bates White's professional experience with nuclear lifts and expert judgment in 25 identifying the requisite crew sizes (including oversight/quality assurance personnel 26 separately identified for each major lift) and average OPG contractor union labour rates 27 for the crew members.

UNDERTAKING J3.6

3 <u>Undertaking</u>

TO PREPARE A TABLE SHOWING BOQ BREAKING DOWN THE PIPE BY CATEGORY, AND SHOWING ESTIMATES FOR THAT PIPE; TO FILE A COPY OF THE BOQ

7 8 9

1

2

4 5

6

10 **Response**

11

12 The following response was prepared by Bates White:

13 14 To develop this estimate, Bates White reviewed the Bill of Quantities ("BOQ") provided 15 as Attachment 1 and identified the line items (just over 300) that addressed piping. This information was used in two separate analyses. First, it was used to identify the 16 17 line items in Appendix D of the Bates White Report that involved piping. Bates White 18 extracted from the Appendix D line items the material cost of the piping and reported 19 this value by major system (Sections B through H of the BOQ). Second, Bates White performed a separate assessment that summed the same 300-plus piping line items 20 21 by material type, grade, and size, and then reported this information by major BOQ 22 system.

23

The Charts that follow present a breakdown by BOQ section of the overnight material costs of piping, and a summary analysis of the length of piping by type.

- 26
- 27 28

Chart 1: Overnight Material Costs, Piping, CAD\$

| | Overnight Material Costs |
|---|-----------------------------|
| Section B, Architectural/Structural (Civil) | \$3,519,057 |
| Section C, Process Systems Tie-in | \$25,995 |
| Section D, Process Systems | \$2,897,193 |
| Section E, Process Support Systems | \$687,780 |
| Section F, Building Support Systems Tie-in | \$16,484 |
| Section G, Building Support Systems | \$258,792 |
| Section H, Electrical | \$15,196 |
| | \$7,420,496 |

29

1 Chart 2: Summary Analysis of Piping by Type and BOQ Section (length of piping given in metres, m)

| Stainless Steel Piping | | | | | | | | | | | | | |
|------------------------------------|-------------|----------------|-----------|-------------------------|----------|--------|---------|--------------------|---------|--------------------|------------|-----|---------------|
| BOQ Section | Less thar | 2-inches | | 2-inches | to 3.99- | inches | 4-inche | hes to 5.99-inches | | More than 6-inches | | | Section Total |
| | NC3 | NC6 | NS | NC3 | NC6 | NS | NC3 | NC6 | NS | NC3 | NC6 | NS | |
| B-Architectural/Structural | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| C-Process Systems Tie-in | 5 | 18 | 0 | 5 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 37 |
| D-Process Systems | 1,464 | 1,015 | 512 | 2,210 | 525 | 759 | 0 | 38 | 25 | 0 | 0 | 0 | 6,548 |
| E-Process Support Systems | 0 | 0 | 610 | 0 | 0 | 1 | 0 | 0 | 5 | 0 | 125 | 0 | 741 |
| F-Building Support Systems Tie-in | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| G-Building Support Systems | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| H-Electrical Systems | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 1,469 | 1,033 | 1,122 | 2,215 | 534 | 762 | 0 | 38 | 30 | 0 | 125 | 0 | 7,328 |
| Note: Section H contains 1,437 m o | f SS tubing | , all less tha | an 1-inch | 1 | • | | | | | | | | |
| Carbon Steel Piping | | | | | | | | | | | | | |
| BOQ Section | Less thar | 2-inches | | 2-inches to 3.99-inches | | | 4-inche | s to 5.99 | -inches | More that | n 6-inches | | Section Total |
| | NC3 | NC6 | NS | NC3 | NC6 | NS | NC3 | NC6 | NS | NC3 | NC6 | NS | |
| B-Architectural/Structural | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 0 | 0 | 0 | 13 |
| C-Process Systems Tie-in | 0 | 0 | 29 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 60 | 0 | 94 |
| D-Process Systems | 0 | 0 | 150 | 5 | 0 | 470 | 0 | 0 | 72 | 0 | 0 | 12 | 709 |
| E-Process Support Systems | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 15 |
| F-Building Support Systems Tie-in | 0 | 0 | 5 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 4 | 56 | 70 |
| G-Building Support Systems | 0 | 0 | 938 | 0 | 77 | 285 | 0 | 0 | 449 | 0 | 0 | 50 | 1,799 |
| H-Electrical Systems | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 0 | 0 | 1,122 | 5 | 77 | 765 | 0 | 0 | 534 | 0 | 64 | 133 | 2,700 |

2

Filed: 2021-08-17 EB-2020-0290 J3.6 Page 3 of 3

| Copper Piping | | | | | | | | | | | | | |
|-----------------------------------|--------------------|---|-----------|-------------------------|-----|-------------------------|-----|--------------------|-----|-----|---------------|-----|--------|
| BOQ Section | Less than 2-inches | | | 2-inches to 3.99-inches | | 4-inches to 5.99-inches | | More than 6-inches | | | Section Total | | |
| | NC3 | NC6 | NS | NC3 | NC6 | NS | NC3 | NC6 | NS | NC3 | NC6 | NS | |
| B-Architectural/Structural | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| C-Process Systems Tie-in | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| D-Process Systems | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| E-Process Support Systems | 0 | 378 | 420 | 0 | 78 | 257 | 0 | 0 | 0 | 0 | 0 | 0 | 1,133 |
| F-Building Support Systems Tie-in | 0 | 0 | 0 | 0 | 0 | 85 | 0 | 0 | 0 | 0 | 0 | 0 | 85 |
| G-Building Support Systems | 0 | 0 | 70 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 170 |
| H-Electrical Systems | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 0 | 388 | 490 | 0 | 78 | 442 | 0 | 0 | 0 | 0 | 0 | 0 | 1,398 |
| | | | | | | | | | | | | | |
| Overall Totals | 1,469 | 1,421 | 2,734 | 2,220 | 689 | 1,969 | 0 | 38 | 564 | 0 | 189 | 133 | 11,426 |
| | | | | | | | | | | | | | |
| "Process Piping"(BOQ C+D+E) | 1,469 | 1,421 | 1,721 | 2,220 | 612 | 1,492 | 0 | 38 | 102 | 0 | 185 | 27 | 9,287 |
| | | | | | | | | | | | | | |
| Piping Other than SS, CS and Cu | | | | | | | | | | | | | |
| Cast Iron | 191 m; 70 | 191 m; 70, 4-in, 121, 6-in or larger, all NS, non-process | | | | | | | | | | | |
| PVC | 275 m, all | 6-in or mor | e, all NS | S, non-proce | ess | | | | | | | | |

1

Filed: 2021-08-17 EB-2020-0290 J3.6 Attachment 1 Page 1 of 151

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

BILL OF QUANTITIES

OCTOBER 25, 2019

| Table of Contents 1.0 Introduction | Page No. 1 |
|--|----------------------|
| 2.0 Gross Floor Areas | 2 |
| BILL OF QUANTITIES | |
| A - Project Key Quantities | A1 - A2 |
| B - Architectural/ Structural (CIVII) | B1 - B39 C1 C6 |
| D - Process Systems | D1 - D40 |
| E - Process Support Systems | E1 - E8 |
| F - Building Support Systems tie-in (Mechanical) | F1 - F3 |
| G - Building Support Systems (Mechanical) | G1 - G17 |
| H - Electrical | H1 - H24 |

October 25, 2019

1.0 Introduction

Page 1

1.1 General

This Bill of Quantities are intended to provide a realistic assessment of the quantities as per Documents provided to via USP key on August 30th 2019 by OPG for the Heavy Water Management Building - West Annex.

Accordingly, this Bill of Quantities should only be considered within the full context of the above noted documentation.

1.2 Methodology

Generally, quantities are measured in accordance with acceptable industry standards.

October 25, 2019

| 2.0 Gross Floor Areas | | | | Page 2 |
|---|----------|----------|-------------|--------|
| | | | | |
| Gross Floor Areas: | | | m2 | |
| Basement (Elevation 87.000) | | | 1,034 | |
| First Floor (elevation 100.000) | | | 1,034 | |
| Condensate Platform (elevation 104.32) | | | 33 | |
| Second Floor (elevation 107.800) | | | 1,034 | |
| Mezzanine Floor (elevation 111.600) | | | 69 | |
| Stairwell # 1 at roof level (elevation 115.000) | | | 22 | |
| | | | | |
| Total Gross Floor Area | | | 3,226 | |
| | | | | |
| Volume | GFA (m2) | Height | Volume (m3) | |
| Basement (elevation 87.000) | 1,034 | 14.45 | 14,941 | |
| First Floor (elevation 100.000) | 1,034 | 7.80 | 8,065 | |
| Condensate Platform (elevation 104.32) | 33 | included | | |
| Second Floor (elevation 107.800) | 1,034 | 7.20 | 7,445 | |
| Mezzanine Floor (elevation 111.600) | 69 | included | | |
| Stairwell # 1 (elevation 115.000) | 22 | 3.10 | 68 | |
| Total Gross Volume | | | 30,519 | |

OCTOBER 25, 2019

A - Project Key Quantities

File Name: Path]T5257 HWMB-WA BOQ_Oct. 25, 2019T5257 HWMB-WA BOQ_Oct. 25, 2019A Print Date: 25/10/20199:42 AM

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

KEY QUANTITIES

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------------------------------|-------------------|
| | The following are project key quantities | | |
| 1. | Excavation total volume | 14,041 | m3 |
| 2. | Secant piles - support of excavation | 3,045 | m2 |
| 3. | Concrete total volume | 4,593 | m3 |
| 4. | Re-bar total weight | 871,874 | kg |
| 5. | Masonry - blockwalls total No. - 200X200X400mm - 300X200X400mm | 26,986 538 | No. No. |
| 6. | Structural steel total weght | 589,043 | kg |
| 7. | Process piping - 2 1/2" dia and smaller - 3" - 4" dia. - 10" dia. - 14" dia. - 30" dia. | 8,206 1,230 60 60 60 | m m m m |
| 8. | Process pipe valves - 2 1/2" dia and smaller - 3 - 4" dia. - 10 to 14" dia. | 998 29 12 | No. No. No. |
| 9. | Process pipe fittings - 2 1/2" dia and smaller - 3 - 4" dia. - 10 to 14" dia. - 30" dia. | 4,072 591 41 5 | No. No. No. |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

KEY QUANTITIES

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| | | | |
| 10. | Process tanks | | |
| | - 100m3 tanks, class 6 | 15 | No. |
| | - 100m3 tanks, class 3 | 4 | No. |
| | - 50m3 tanks, class 3 | 2 | No. |
| | - 25m3 tanks, class 3 | 4 | No. |
| | - 22m3 tanks, class 3 | 1 | No. |
| | - 3.8m3 stanless steel tank for drainage | 2 | No. |
| 11. | Process pumps | | |
| | - Pumps 10.5 l/s @ 155.5 head, class 6 | 2 | No. |
| | - Pumps 3.8 l/s @ 96 head, class 6 | 2 | No. |
| | - Pumps 5 I/s @ 30m head | 2 | No. |
| | - Pumps 5 I/s @ 38m head | 2 | No. |
| | - Pumps 3.8 l/s @ 1,035kPa head | 2 | No. |
| | - Pumps 3.8 l/s @ 25 head | 2 | No. |
| | - Pumps 85GPM @ 140' head - drainage | 4 | No. |
| | - Pump 83 l/s @ 23m head - drainage | 1 | No. |
| 12. | Electrical feeders | | |
| | - Main feeder length | 19,100 | m |
| | - Termination | 1,000 | No. |
| | - Branch wiring | 12,000 | m |
| | - Cable connector/ termination | 1,500 | No. |
| 13. | Cable tray total length | 494 | m |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

OCTOBER 25, 2019

B - Architectural/ Structural (Civil)

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|----------------|--|------------|---------|
| 02 | Existing conditions | | |
| 02.01 02.02 | Cut and remove roadway Cut and remove existing curb | 638 167 | m2 m |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 03 | Concrete and Formwork | | |
| | At Basement (Elevation 87+000) level | | |
| 03.01 | Drainage sub-slab 250mm thick | 966 | m2 |
| | - Concrete 35MPa supply and place | 242 | m3 |
| | - Edge formwork | 35 | m2 |
| | - Pre applied sheet membrane waterproofing - note 2 of 23840-10008 | 966 | m2 |
| 03.02 | Basement slab on sub-slab 1000mm thick | 966 | m2 |
| | - Concrete 35MPa supply and place | 966 | m3 |
| | - Edge formwork | 140 | m2 |
| | - Re-bar | 188,929 | kg |
| | - Form key | 134 | m |
| | - Water stop | 134 | m |
| 03.03 | Topping slab 200mm thick | 798 | m2 |
| | - Concrete 35MPa supply and place | 160 | m3 |
| | - Edge formwork | 26 | m2 |
| 03.04 | Wall below grade / Basement wall 1220mm thick | 1,680 | m2 |
| | - Concrete 35MPa supply and place | 2,050 | m3 |
| | - Form work to sides (allowed to both sides - to be confirmed) | 3,368 | m2 |
| | - Re-bar | 293,599 | kg |
| | - Form key | 269 | m |
| | - Water stop | 269 | m |
| 03.05 | Reinforced concrete partition wall 305mm thick | 248 | m2 |
| | - Concrete 35MPa supply and place | 76 | m3 |
| | - Form work to sides | 496 | m2 |
| | - Re-bar | 9,880 | kg |
| 03.06 | Reinforced concrete partition wall 200mm thick | 54 | m2 |
| | - Concrete 35MPa supply and place | 11 | m3 |
| | - Form work to sides | 107 | m2 |
| | - Re-bar | 2,145 | kg |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|-------------|------|
| 03 | Concrete and Formwork (Cont'd) | | |
| | At Basement (Elevation 87+000) level | | |
| 03.07 | Reinforced concrete partition wall 200mm thick w/ radiation shielding design & 2 hr fire rated | 283 | m2 |
| | - Concrete 35MPa supply and place | 57 | m3 |
| | - Form work to sides | 566 | m2 |
| | - Re-bar | 11,115 | kg |
| 03.08 | Reinforced concrete suspended slab 200mm thk | 6 | m2 |
| | - Concrete 35MPa supply and place | 1 | m3 |
| | - Formwork to soffit | 6 | m2 |
| | - Re-bar | 228 | kg |
| | At First Floor (Elevation 100+000) level | | |
| 03.09 | Reinforced concrete composite slab 700mm thick on 76mm corrugated deck (deck measured elsewhere) | 918 | m2 |
| | - Concrete 35MPa supply and place | 677 | m3 |
| | - Edge formwork | 148 | m2 |
| | - Re-bar | 286,371 | kg |
| 03 10 | Reinforced concrete curb 300x300 | 127 | m |
| 00110 | - Concrete 35MPa supply and place | | m3 |
| | - Edge formwork | 76 | m2 |
| | - Re-bar | incl. above | kg |
| | At Second Floor (Elevation 107+800) level | | |
| 03.11 | Reinforced concrete composite slab 114mm thick on 38mm corrugated deck (deck measured elsewhere) | 884 | m2 |
| | - Concrete 35MPa supply and place | 118 | m3 |
| | - Edge formwork | 23 | m2 |
| | - Re-bar | 33,881 | kg |
| | | | |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|-------------|------|
| 03 | Concrete and Formwork (Cont'd) | | |
| 03.12 | Reinforced concrete pad 102mm on composite slab deck (composite deck meas elsewhere) | 71 | m2 |
| | - Concrete 35MPa supply and place | 7 | m3 |
| | - Edge formwork | 5 | m2 |
| | - Re-bar | Incl. above | кд |
| 03.13 | Roughen surface level channel 300W x 75D (det S8/S9 dwg 23840-10013) apply bonding agent and filled w/ 35Mpa non-shrink grout | 56 | m |
| | At Roof (Elevation 115+000) level | | |
| 03.14 | Reinforced concrete composite slab 83mm thick on 38mm corrugated deck (deck measured elsewhere) | 896 | m2 |
| | - Concrete 35MPa supply and place | 91 | m3 |
| | - Edge formwork | 14 | m2 |
| | - Re-bar | 22,531 | kg |
| 03 15 | Reinforced concrete bulkhead curb 420mm beight | 15 | m |
| 00.10 | - Concrete 35MPa supply and place | 2 | m3 |
| | - Formwork | 13 | m2 |
| | - Re-bar | incl. above | kg |
| 03 16 | Reinforced concrete bulkhead beam 440mm width x 330mm deen | 4 | m |
| 00.10 | | - | |
| | - Concrete 35MPa supply and place | 1 | m3 |
| | - Formwork | incl. chovo | m2 |
| | - Re-Dar | Inci. above | ку |
| | Plant Drainage Platform | | |
| 03.17 | Reinforced concrete suspended slab 200mm thk | 23 | m2 |
| | - Concrete 35MPa supply and place | 7 | m3 |
| | - Formwork to soffit | 23 | m2 |
| | - Re-bar | 1,596 | kg |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|-------------|------|
| 03 | Concrete and Formwork (Cont'd) | | |
| | Pipe Chase | | |
| 03.18 | Slab on grade 600mm thick | 41 | m2 |
| | - 2 layers of 150mm thick compacted granular A fill | 12 | m3 |
| | - 100mm lean concrete pad | 41 | m2 |
| | - Concrete 35MPa supply and place | 25 | m3 |
| | - Edge formwork | 13 | m2 |
| | - Re-bar (floor, wall & roof all inclusive) | 16,843 | kg |
| | - Form key | 24 | m |
| | - Water stop | 24 | m |
| 03.19 | Wall below grade 600mm thick | 41 | m2 |
| | - Concrete 35MPa supply and place | 25 | m3 |
| | - Form work to sides (allowed to both sides - to be confirmed) | 83 | m2 |
| | - Re-bar | incl. above | kg |
| | - Form key | 24 | m |
| | - Water stop | 24 | m |
| | - Wall waterproofing | 42 | m2 |
| | Reinforced concrete composite slab 600mm thick on 38mm | | |
| 03.20 | corrugated deck (deck measured elsewhere) | 41 | m2 |
| | - Concrete 35MPa supply and place | 26 | m3 |
| | - Edge formwork | 13 | m2 |
| | - Re-bar | incl. above | kg |
| | - Roof waterproofing | 41 | m2 |
| | - Edge waterproofing | 13 | m2 |
| 03.21 | Low strength concrete fill (U-fill) to 1.70m depth from 96.300 to 98.000 (ref: note 52 on dwg 23840-10051) | 70 | m3 |
| | Loading Dock Extension/Causeway | | |
| 03.22 | Strip footing 900mm width x 400mm height | 11 | m |
| | - Concrete 35MPa supply and place | 4 | m3 |
| | - Edge formwork | 9 | m2 |
| | - Re-bar | 345 | kg |
| | - Form key | 11 | m |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|--------------------------|----------------------------|
| 03 | Concrete and Formwork (Cont'd) | | |
| 03.23 | Loading Dock Extension/Causeway Foundation wall 300mm thick - Concrete 35MPa supply and place - Form work to sides - Re-bar - Wall waterproofing | 9 3 17 691 9 | m2 m3 m2 kg m2 |
| 03.24 | Reinforced concrete slab on grade 250mm thick w/ edge thickening - Concrete 35MPa supply and place - Edge formwork - Re-bar | 28 8 - 1,905 | m2 m3 m2 kg |
| 03.25 | Stub column 550mm x 550mm width x 890mm height - Concrete 35MPa supply and place - Form work to sides - Re-bar | 2 1 4 238 | No. m3 m2 kg |
| 03.26 | Reinforced concrete partition wall 300mm thick - Concrete 35MPa supply and place - Form work to sides - Re-bar | 15 4 29 696 | m2 m3 m2 kg |
| 03.27 | Condensate Platform Reinforced concrete composite slab 114mm thick on 38mm corrugated deck (deck measured elsewhere) - Concrete 35MPa supply and place - Edge formwork - Re-bar - Re-bar (welded wire mesh) | 41 6 3 35 41 | m2 m3 m2 kg m2 |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|--------------------------|----------------------------|
| 03 | Concrete and Formwork (Cont'd) | | |
| 03.28 | Mezzanine level at elevation 111+600 Reinforced concrete composite slab 114mm thick on 38mm corrugated deck (deck measured elsewhere) - Concrete 35MPa supply and place - Edge formwork - Re-bar - Re-bar (welded wire mesh) | 69 9 5 60 69 | m2 m3 m2 kg m2 |
| 03.29 | Precast Concrete At First Floor (Elevation 100+000) level Walls above grade - Precast wall panel 300mm thick w/ 2 hr fire rating | 984 | m2 |
| 03.30 | At Second Floor (Elevation 107+800) level (including parapet) Walls above grade - Precast wall panel 300mm thick w/ 2 hr fire rating | 1,165 | m2 |
| 03.31 | At Stair # 1 (Elevation 115+000) level (including parapet) Walls above grade - Precast wall panel 300mm thick w/ 2 hr fire rating | 61 | m2 |
| 03.32 | Loading Dock Extension/Causeway Walls above grade - Precast wall panel 300mm thick w/ 2 hr fire rating | 151 | m2 |
| | | | |
| | | | |
| | | | |
| | | | |

Filed: 2021-08-17 EB-2020-0290 J3.6 Attachment 1 Report Date: Oct 25, 2019 Page No.: B - 8

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|-----------|-----------|
| 04 | Masonry At First Floor (Elevation 100+000) level | | |
| 04.01 | Type 3: CMU wall 190mm deep nominal load bearing concrete masonry units w/ galvanized welded wire horizontal joint reinforcement in evry other course (400mm O.C.); 2 hour (min) fire rating - CMU block nominal size 200mm x 200mm x 400mm w/ 5% wastage | 20 263 | m2 No. |
| 04.00 | | | |
| 04.02 | Type 4: CMU wall 190mm deep nominal load bearing concrete masonry units w/ galvanized welded wire horizontal joint reinforcement in evry other course (400mm O.C.) | 312 | m2 |
| | - CMU block nominal size 200mm x 200mm x 400mm w/ 5% wastage | 4,095 | No. |
| 04.03 | Type 5: CMU wall 190mm deep nominal load bearing concrete masonry units w/ galvanized welded wire horizontal joint reinforcement in evry other course (400mm O.C.); 2 hour (min) fire rating | 449 | m2 |
| | - CMU block nominal size 200mm x 200mm x 400mm w/ 5% wastage | 5,893 | No. |
| 04.04 | Type 7: CMU wall 190mm deep nominal load bearing concrete masonry units w/ galvanized welded wire horizontal joint reinforcement in evry other course (400mm O.C.); fill all CMU cells with grout | 249 | m2 |
| | - CMU block nominal size 200mm x 200mm x 400mm w/ 5% wastage | 3,268 | No. |
| 04.05 | Type 12: CMU wall 190mm deep nominal load bearing concrete masonry units w/ 100mm solid cap block and galvanized welded wire horizontal joint reinforcement in evry other course (400mm O.C.) | 13 | m2 |
| | - CMU block nominal size 200mm x 200mm x 400mm w/ 5% wastage | 171 | No. |
| 04.06 | Type 13: CMU wall 190mm deep nominal load bearing concrete masonry units w/ 100mm solid cap block and galvanized welded wire horizontal joint reinforcement in evry other course (400mm O.C.); fill all CMU cells with grout | 20 | m2 |
| | - CMU block nominal size 200mm x 200mm x 400mm w/ 5% wastage | 263 | No. |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-------------------------|---|------------------|-------------|
| 04 | Masonry | | |
| 04.07 | Type 13A: CMU wall 190mm thick - CMU block nominal size 200mm x 200mm x 400mm w/ 5% wastage | 151 1,982 | m2 No. |
| 04.08 | Exterior 300mm thick single whythe CMU wall - CMU block nominal size 300mm x 200mm x 400mm w/ 5% wastage | 41 538 | m2 No. |
| 04.09 | At Second Floor (Elevation 107+800) level Type 4: CMU wall 190mm deep nominal load bearing concrete masonry units w/ galvanized welded wire horizontal joint reinforcement in evry other course (400mm O.C.) | 274 | m2 |
| | - CMU block nominal size 200mm x 200mm x 400mm w/ 5% wastage | 3,596 | No. |
| 04.10 | Type 5: CMU wall 190mm deep nominal load bearing concrete masonry units w/ galvanized welded wire horizontal joint reinforcement in evry other course (400mm O.C.); 2 hour (min) fire rating - CMU block nominal size 200mm x 200mm x 400mm w/ 5% wastage | 568 7,455 | m2 No. |
| 04.11 04.12 04.13 | Masonry accessories <u>At Basement (Elevation 87+000) level</u> Control joint - saw cut groove 3mm min and fill w/ premolded joint filler Expasion joint - 12mm premolded joint filler & sealer Construction joint - w/ 15M 760mm long dowel @ 600 c/c | 103 257 19 | m m m |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 05 | Motals | | |
| 05 | Structural Stool Framing | | |
| | At First Floor (Flovation 100+000) level | | |
| 05.01 | Reams | | |
| 00.01 | - 2 x 1 102x102x6 4 | 65 | ka |
| | - HSS203x203x9 5 | 1 026 | kg |
| | - HSS254x254x13 | 15 422 | ka |
| | - W200x22 | 687 | ka |
| | - W310x33 | 216 | ka |
| | - W310x74 | 714 | ka |
| | - W360x45 | 8.703 | ka |
| | - W530x92 | 16.456 | ka |
| | - W610x101 | 811 | kq |
| | - W610x174 | 27,897 | kg |
| | - W690x350 | 8,680 | kg |
| | - W760x134 | 1,264 | kg |
| | - W760x350 | 2,132 | kg |
| | - W760x484 | 7,880 | kg |
| | - W760x531 | 31,833 | kg |
| | At Second Floor (Elevation 107+800) level | | |
| 05.02 | Beams | | |
| | - 2 x L102x102x6.4 | 3 | kg |
| | - 2 x L152x102x11 | 1,254 | kg |
| | - 2 x L203x152x13 | 3,945 | kg |
| | - C130x13 at surface level channel (detail S8/S9 of dwg 23840-10013) | 696 | kg |
| | - C150x12 | 30 | kg |
| | - C230x20 | 347 | kg |
| | - HSS203x203x9.5 | 11,044 | kg |
| | - MC250x42.4 | 157 | kg |
| | - PL12 x 278mm height | 502 | kg |
| | - PL9.5 x 200 height x 4000mm long | 60 | kg |
| | - W310x45 | 218 | kg |
| | - W310x60 | 3,766 | kg |
| | - W310x74 | 19,549 | kg |
| | | | |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 05 | Metals (Cont'd) | | |
| | Structural Steel Framing | | |
| | At Second Floor (Elevation 107+800) level | | |
| 05.03 | Beams | | |
| | - W360x57 | 1,444 | kg |
| | - W460x74 | 2,258 | kg |
| | - W610x82 | 1,961 | kg |
| | - W610x101 | 7,620 | kg |
| | - W610x125 | 2,208 | kg |
| | - W610x140 | 5,919 | kg |
| | - W610x155 | 6,609 | kg |
| | - W610x285 | 2,269 | kg |
| | - W610x372 | 3,616 | kg |
| | - W690x125 | 20,571 | kg |
| | - W690x192 | 5,282 | kg |
| | - W690x217 | 11,900 | kg |
| | - W690x240 | 4,284 | kg |
| | - W690x289 | 2,757 | kg |
| | - W690x323 | 3,098 | kg |
| | At Roof (Elevation 115+000) level | | |
| 05.04 | Beams | | |
| | - 2 x L152x102x11 | 1,551 | kg |
| | - 2 x L203x152x13 | 3,993 | kg |
| | - L102x102x10 | 148 | kg |
| | - L102x102x10 | 28 | kg |
| | - L102x102x10 | 25 | kg |
| | - MC250x42.4 | 1,765 | kg |
| | - W310x60 | 287 | kg |
| | - W310x74 | 2,860 | kg |
| | - W360x57 | 1,552 | kg |
| | - W360x72 | 1,014 | kg |
| | - W460x74 | 3,559 | kg |
| | - W610x101 | 9,553 | kg |
| | - W610x125 | 3,403 | kg |
| | - W610x140 | 2,351 | kg |
| | | | |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 05 | Metals (Cont'd) | | |
| | Structural Steel Framing | | |
| | At Roof (Elevation 115+000) level | | |
| 05.05 | Beams | | |
| | - W610x82 | 19.791 | ka |
| | - W610x155 | 6.815 | ka |
| | - W610x174 | 3,351 | kg |
| | At Condensate Platform (Elevation 104+320) level | | |
| 05.06 | Beams | | |
| | - L102x102x6.4 | 175 | kg |
| | - L76x76x6.4 | 53 | kg |
| | - W310x39 | 1,639 | kg |
| | - W310x74 | 365 | kg |
| | - W610x155 | 533 | kg |
| | At Mezzanine (Elevation 111+600) level | | |
| 05.07 | Beams | | |
| | - 2 x L102x102x6.4 | 288 | kg |
| | - C250x23 | 354 | kg |
| | - L102x102x6.4 | 60 | kg |
| | - W310x37 | 394 | kg |
| | - W310x74 | 830 | kg |
| | - W360x33 | 683 | kg |
| | - W610x82 | 2,736 | kg |
| | - W610x113 | 1,093 | kg |
| | At Stair#1 Roof (Elevation 118+100) level | | |
| 05.08 | Beams | | |
| | - HSS127x127x6.4 | 680 | kg |
| | - W150x30 | 268 | kg |
| | - W360x33 | 1,003 | kg |
| | Hoist at elevation 107+800) level | | |
| 05.09 | Beams | | |
| | S250x52 | 289 | kg |
| | W200x31 | 297 | kg |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Description | Quantity | Unit |
|--|---|--|
| <u>Metals (Cont'd)</u> <u>Structural Steel Framing</u> Hoist at elevation 115+000) level | | |
| Beams - HSS102x102x13 - S250x52 - W200x31 | 30 628 596 | kg kg kg |
| Pipe Rack at elevation 110+300 Beams & Bracing - 2 x L76x76x6.4 - L76x76x6.4 - W150x37 - W200x27 | 146 894 365 5,750 | kg kg kg kg |
| Column - W150x37 | 2,394 | kg |
| Base Plate - PL13x250x250mm w/ 4 no. 1/2" HILTI KWIK bolt 60mm dia anchor bolt | 23 | No. |
| Monorail at elevation 115+000 Beams - S250x52 - W200x46 | 958 513 | kg kg |
| Vent Stack at elevation 115+100 Beams & Bracing - 2 x L102x102x6.4 - C200x21 - W150x30 - W360x45 - W460x68 | 68 151 96 306 441 | kg kg kg kg |
| | Item Description Metals (Cont'd) Structural Steel Framing Hoist at elevation 115+000) level Beams - HSS102x102x13 - S250x52 - W200x31 Pipe Rack at elevation 110+300 Beams & Bracing - 2 x L76x76x6.4 - L76x76x6.4 - U750x37 Column - W150x37 Base Plate - PL13x250x250mm w/ 4 no. 1/2" HILTI KWIK bolt 60mm dia anchor bolt Monorail at elevation 115+000 Beams - S250x52 - W200x46 Vent Stack at elevation 115+100 Beams - 2 x L102x102x6.4 - 2 (200x46) Vent Stack at elevation 115+100 Beams - 2 x L102x102x6.4 - (200x21 - W150x30 - W150x30 - W150x30 - W150x30 - W150x30 - W160x68 | Item Description Quantity Metals (Cont'd) Structural Steel Framing Hoist at elevation 115+000) level Beams - HSS102x102x13 30 -2550x52 628 -W200x31 596 Pipe Rack at elevation 110+300 Beams & Bracing - 2 x L76x76x6.4 146 -176x76x6.4 146 -176x76x6.4 365 -W200x27 5,750 Column - W150x37 2,394 Base Plate - PL13x250x250mm w/ 4 no. 1/2" HILTI KWIK bolt 60mm dia anchor bolt 23 Monorail at elevation 115+000 Beams - 3250x52 958 W200x46 513 Vent Stack at elevation 115+100 Beams - 2 x L102x102x6.4 68 - C200x21 151 - W150x30 96 - W360x45 306 |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 05 | Metals (Cont'd) | | |
| 00 | Structural Steel Framing | | |
| | Basement level to Ground level | | |
| 05 16 | Columns | | |
| 00.10 | - W360x262 | 3.458 | ka |
| | - W360x314 | 4,145 | ka |
| | - W360x382 | 5,042 | kg |
| | - W360x463 | 6,112 | kg |
| | - W360x592 | 7,814 | kg |
| 05.17 | Base Plate | | |
| | - Type A - 45x600x600mm w/ 4 no. 25 dia anchor bolt | 2 | No. |
| | - Type A - 50x600x600mm w/ 4 no. 25 dia anchor bolt | 2 | No. |
| | - Type A - 70x650x650mm w/ 4 no. 25 dia anchor bolt | 1 | No. |
| | Ground level to Upper level | | |
| 05.18 | Columns | | |
| | - W150x30 | 279 | kg |
| | - W310x143 | 26,560 | kg |
| | - W310x226 | 6,725 | kg |
| | - W310x283 | 12,632 | kg |
| | - W310x342 | 5,089 | kg |
| 05.19 | Base Plate | | |
| | - Type A - 45x550x550mm w/ 4 no. M30 anchor bolt; HSS254x254x13 shear key, grout in 305x305x235 shear pocket | 4 | No. |
| | - Type B - 35x550x550mm w/ 4 no. M25 anchor bolt; HSS203x203x13 shear key, grout in 255x255x205 shear pocket | 2 | No. |
| | - Type C - 35x500x500mm w/ 4 no. M25 anchor bolt; PL50x350x130 shear key, grout in 100x440x155 shear pocket | 3 | No. |
| | - Type D - 50x550x550mm w/ 4 no. M25 anchor bolt | 4 | No. |
| | - Type E - 35x500x500mm w/ 4 no. M25 anchor bolt | 5 | No. |
| | - Type F - 19x360x175mm w/ 4 no. 19 dia bolt and PL12 stiffener | 2 | No. |
| | - Type F - 19x360x216mm w/ 4 no. 19 dia bolt and PL12 stiffener | 1 | No. |
| | At First Floor (Elevation 100+000) level | | |
| 05.20 | Metal Decking | | |
| | - 76mm x 1.52mm Vicwest RD306 deck or approved equal | 751 | m2 |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

ARCHITECTURAL/ STRUCTURAL

| Item Ref. | Item Description | Quantity | Unit |
|----------------------------------|---|--------------------|-------------------------|
| 05 | <u>Metals (Cont'd)</u> | | |
| 05.21 | At Second Floor (Elevation 107+800) level Metal Decking - 38mm galvanized metal deck - 6.4mm bent plate, approx 320mm width along the perimeter | 883 3,314 | m2 kg |
| 05.22 | At Roof (Elevation 115+000) level Metal Decking - 38mm galvanized metal deck - 6.4mm bent plate, approx 290mm width along the perimeter | 917 2,423 | m2 kg |
| 05.23 | Pipe Chase Metal Decking - 76mm x 1.52mm Vicwest RD306 deck or approved equal | 27 | m2 |
| 05.24 05.25 05.26 | Platforms at elevation 87+540 & 88+400 1-1/4" x 3/16" (32mm x 5mm) Steel Grating Platform stair 1100mm width and 7x305mm depth treads; 8 eq. risers = 1440mm w/ handrail, 915mm height Platform stair 1100mm width and 2x305mm depth treads; 3 eq. risers = 540mm w/ handrail, 915mm height | 19 1 2 | m2 No. No. |
| 05.27 | Platform handrail 1100mm height w/ handrail, 915mm height | 22 | m |
| 05.28 | Access ladder type D3, from 88.4 to 87.0 (D3 on dwg 23860- 10030) w/ handrail, 915mm height | 3 | No. |
| 05.29 05.30 05.31 05.32 | Platforms at elevation 91+370, 93+000, 94+000, 94+870, 96+400 & 96+500 1-1/4" x 3/16" (32mm x 5mm) Steel Grating Platform stair 1100mm width and 8x305mm depth treads; 9 eq. risers = 1500mm w/ handrail, 915mm height Platform stair 1100mm width and 7x305mm depth treads; 8 eq. risers = 1440mm w/ handrail, 915mm height Platform stair 1100mm width and 5x305mm depth treads; 6 eq. | 189 1 1 1 | m2 No. No. No. |
| 05.33 | risers = 1000mm w/ handrail, 915mm height Platform stair 1100mm width and 2x305mm depth treads; 3 eq. risers = 440mm w/ handrail, 915mm height | 1 | No. |

-

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 05 | <u>Metals (Cont'd)</u> <u>Platforms at elevation 91+370, 93+000, 94+000, 94+870, 96+400</u> & 96+500 | | |
| 05.34 | Platform handrail 1100mm height | 283 | m |
| 05.35 | Platform self closing gate | 200 | No. |
| 05.36 | PL5x125 Kick plate (at edge of grating against tank wall) | 58 | m |
| 05.37 | Access ladder w/ safety cage from 94.000 to 96.500 w/ handrail, 915mm height | 17 | No. |
| 05.38 | Access ladder w/ safety cage from 94.000 to 96.400 w/ handrail, 915mm height | 2 | No. |
| 05.39 | Access ladder w/ safety cage from 94.440 to 94.870 w/ handrail, 915mm height | 1 | No. |
| 05.40 | Platforms - beams and bracing | | |
| | - C200x17 | 55 | kg |
| | - C200x21 | 1,304 | kg |
| | - C250x23 | 7,991 | kg |
| | - HSS254x254x13 | 7,161 | kg |
| | - L76x76x6.4 | 4,625 | kg |
| | - L152x102x9.5 | 132 | kg |
| | - L203x102x13 | 343 | kg |
| | - MC460x63.5 | 324 | kg |
| 05.41 | <u>Platforms - hanger</u> - L102x102x9.5 | 9.734 | ka |
| | | -, | |
| 05.42 | Platforms - Support post | | |
| | - L76x76x9.5 | 60 | kg |
| | - HSS152x152x9.5 | 223 | kg |
| | - Pipe support column baseplate PL50 - 460x460 (ref det 9 of dwg 23850-10013) | 11 | No. |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|----------------|--|----------|------------|
| 05 | <u>Metals (Cont'd)</u> | | |
| 05.43 05.44 | Metal fabrications 6mm checker plate cover 250mm x 600mm c/w 3pc HSS50x50x6 accros the width 6mm checker plate cover 300mm x 800mm c/w 3pc HSS50x50x6 | 1 | No. No. |
| | Stair #1: hot dipped galvanised steel staircase 1100mm wide. | | |
| 05.45 | from elevation 87+000 to elevation 115+420, c/w metal hand rail; | | |
| | steel prefabricated bar grating tread w/ integral abrasive nosing and 100mmx5mm toe kick welded to trads 1100mm x 280mm | 145 | No. |
| | - C250x22.8 stair stringers | 53 | m |
| | - C200x17.1 header (each 1030mm long) | 35 | m |
| | - C250x22.8 landing stringer (each 2400mm long) | 41 | m |
| | - C200x 17.1 at sides of failing (4 no. at each) - landing - steel welded or pressure locked bar grating w/ 32mm heigh x 5mm bearing bars @ 30mm O.C. | 55 | m2 |
| | - L152x152x7.9 steel L expansion at landing | 41 | m |
| | - 35mm dia handrail & guard rail w/ 20mm dia vertival balusters at 100mm O.C. | 59 | m |
| 05.46 | Stair #2: hot dipped galvanised steel staircase 1100mm wide, from elevation 87+000 to elevation 111+600, c/w metal hand rail; | | |
| | steel prefabricated bar grating tread w/ integral abrasive nosing and 100mmx5mm toe kick welded to trads 1100mm x 280mm | 128 | No. |
| | - C250x22.8 stair stringers | 46 | m |
| | - C200x17.1 header (each 1030mm long) | 29 | m |
| | - C250x22.8 landing stringer (each 2400mm long) | 34 | m |
| | - C200X17.1 at sides of landing (4 no. at each) | 73 | m |
| | bearing bars @ 30mm O.C. - I 152x152x7.9 steel L expansion at landing | 44 34 | m2 m |
| | | 40 | |
| | - somm dia nandrali & guard rali w/ 20mm dia vertival balusters at 100mm O.C. | 48 | m |
| 05.47 | Sum Pit 100x100x12.5 stainless steel angle fixed w/ nelson studs | 6 | m |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 05 | <u>Metals (Cont'd)</u> | | |
| 05.48 | Loading Dock Extension/Causeway Roof at elevation 107+100 and floor at elevation 104+500 Beams and bracing | | |
| | - 2-L152x152x9.5 | 504 | kg |
| | - C200x21 | 28 | kg |
| | - C310x39 | 2,374 | kg |
| | - C310x45 | 1,844 | kg |
| | - W310x39 | 964 | kg |
| | - W360x33 | 99 | kg |
| | - W360x51 | 1,120 | kg |
| | - W530x92 | 224 | kg |
| 05.40 | | | |
| 05.49 | Columns | | |
| | - C200x86 | 2,412 | kg |
| 05 50 | Base Plate | | |
| 00.00 | - 300x250x25mm | 2 | No |
| | - 300x300x25mm | 2 | No. |
| | | _ | |
| 05.51 | 1-1/4" x 3/16" (32mm x 5mm) steel grating at elevation 104+500 | 30 | m2 |
| 05.52 | 38mm galvanized metal deck at elevation 107+100 | 72 | m2 |
| 05.53 | Access ladder w/ safety cage from 100+000 to 104+500 | 1 | No. |
| | Condensate Platform | | |
| 05.54 | 35mm dia guardrail 1070mm H assembly w/ top, intermed & bottom horizontal | 6 | m |
| 05.55 | 35mm dia guardrail 1070mm H assembly w/ top, inter & bottom hori - removable | 5 | m |
| | For board of the structure line is the | | |
| 05.56 | Embaded Steel Wall plate | 70 | No |
| | - FP57007, width 300mm x length 700mm; 33kg per plate | 23 | No |
| | - FP57008, width 300mm x length 1000mm 47kg per plate | 25 | No |
| | - FP57009, width 300mm x length 1300mm; 61kg per plate | 10 | No |
| | - EP57010. width 300mm x length 1600mm: 75kg per plate | 9 | No. |
| | | Ū | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 05 | <u>Metals (Cont'd)</u> | | |
| | - EP57011, width 300mm x length 1900mm; 89kg per plate | 2 | No. |
| | - EP57012, width 300mm x length 2200mm; 104kg per plate | 5 | No. |
| | - EP57013, width 300mm x length 2500mm; 118kg per plate | 1 | No. |
| | - EP57014, width 300mm x length 2800mm; 132kg per plate | 9 | No. |
| | - EP57015, width 300mm x length 3100mm; 146kg per plate | 3 | No. |
| | - EP57016, width 300mm x length 3400mm; 160kg per plate | 9 | No. |
| | - EP57017, width 300mm x length 3700mm; 174kg per plate | 6 | No. |
| | - EP57018, width 300mm x length 4000mm; 188kg per plate | 1 | No. |
| 05.57 | Pipe Chase | | |
| | - Embaded steel wall plate PL19, width 300mm x height 1350mm | 10 | No. |
| | - L76x51x13; each 630mm long | 48 | No. |
| | - 2L76x51x13; each 630mm long | 24 | No. |
| 05.58 | Base Ring (at elevation 87+000) | | |
| | Base ring 4190mm dia x 25.4mm steel plate w/ 18-M20/30 HSL-3, 183mm long anchorage | 19 | No. |
| | - Base ring 3380m dia x 12.7mm steel plate w/ 18-M16/25 HSL-3, 153mm long anchorage | 2 | No. |
| | - Base ring 2745m dia x 12.7mm steel plate w/ 18-M12/25 HSL-3, 153mm long anchorage | 4 | No. |
| | - Base ring 1830m dia x 12.7mm steel plate w/ 18-M12/25 HSL-3, 153mm long anchorage | 1 | No. |
| 05.59 | Embedment at 1st Floor (at elevation 100+000) | | |
| | - PL20x650x350 plate for fire protection support stanchion | 1 | No. |
| | - PL20x500x500 plate for emergency eye wash station | 1 | No. |
| | - PL20x200x200 plate for cable riser support | 8 | No. |
| | - PL20x2642x1143 plate for weigh scales WS3 & WS4 | 1 | No. |
| | - PL20x600x600 plate for HG1470 frame pipe support | 2 | No. |
| | - PL20x600x600 plate for HG1469 frame pipe support | 2 | No. |
| | - PL20x1143x1321 plate for weigh scales WS2 | 1 | No. |
| | - PL20x600x600 plate for HG1468 frame pipe support | 1 | No. |
| | - PL20x1000x1000 plate for tooling cabinet | 1 | No. |
| | - PL20x1143x1321 plate for weigh scales WS1 | 1 | No. |
| | - PL20x1100x750 plate for emergency eye wash stn and hot water tank | 1 | No. |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 05 | Metals (Cont'd) | | |
| | - PL20x600x600 plate for HG1467 frame pipe support | 2 | No. |
| | - PL20x350x350 plate for pipe support | 1 | No. |
| | - PL20x950x200 plate for sampling panel | 2 | No. |
| | - PL20x600x300 plate for telecom rack | 1 | No. |
| | - PL20x450x450 plate for pipe support | 1 | No. |
| | - PL20x550x550 plate for pipe support | 1 | No. |
| | - PL20x300x1000 plate for pipe support | 1 | No. |
| 05.60 | Embedment at 1st Floor (at elevation 107+800) | | |
| | - PL25x250x675 plate for battery bank | 7 | No. |
| | - PL20x200x200 plate for cable riser support | 4 | No. |
| | - PL20x300x500 plate for backup diesel generator panel | 2 | No. |
| | - PL20x500x300 plate for electrical | 4 | No. |
| | - PL20x300x300 plate for chill water skid | 12 | No. |
| | - PL20x300x500 plate for electrical | 4 | No. |
| | - PL20x500x300 plate for chiller | 8 | No. |
| | - PL20x200x200 plate for cable riser support | 4 | No. |
| | - PL20x300x300 plate for condensor water skid | 12 | No. |
| | - PL25x300x500 plate for transformers | 2 | No. |
| | - PL20x300x300 plate for compressor | 8 | No. |
| | - PL16x250x250 plate | 1 | No. |
| | - PL20x500x500 plate | 2 | No. |
| | - PL20x300x500 plate | 6 | No. |
| | - PL20x350x350 plate for pipe support | 8 | No. |
| | - PL20x700x350 plate for pipe support | 1 | No. |
| | - PL20x300x300 plate for mechanical | 12 | No. |
| | - PL9.5x200x4000 plate for exterior wall opening | 1 | No. |
| | - PL20x400x400 plate | 1 | No. |
| | - C130x13x5000 long base support for elect. Equipment | 8 | No. |
| | - C130x13x1825 long base support for elect. Equipment | 1 | No. |
| | - C130x13x6600 long base support for elect. Equipment | 1 | No. |
| | - C130x13x8430 long base support for elect. Equipment | 1 | No. |
| 05.61 | Embedment at Roof (at elevation 115+000) | | |
| | - PL20x300x300 plate for mechanical | 6 | No. |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 05 | Metals (Cont'd) | | |
| | Miscellaneous structural steels and ancillary connections | | |
| 05.62 | Ancillary connections allowance @ 10% | 53,549 | kg |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|----------------|---|------------|----------|
| 07 | Thermal and Moisture Protection | | |
| 07.01 | Preprufe 300R waterproofing membrane - underneath the basement slab - vertical lap over wall membrane | 966 278 | m2 m2 |
| 07.02 | Preprufe 160R waterproofing membrane backed by plywood infill | 1,735 | m2 |
| 07.03 07.04 | Wall insulation Metal flashing w/ hydrolic waterstop | 361 139 | m2 m |
| 07.05 | Roof Covering at elevation 115.000 and 118.100 (refer detail S2 of drawing NK38-DRAW-23860-10065) | 902 | m2 |
| | - Single ply TPO membrane (60mil reinforced) | 902 | m2 |
| | Polyisocyanurate/ Polyurethane Insulation board (RSI 5.64) min 90mm thickness | 902 | m2 |
| | - Air/Vapour retarder | 902 | m2 |
| | - Dens deck thermal barrier mechanically fastened to steel deck | 902 | m2 |
| 07.06 | Insulated stack curb (refer detail S3 of dwg NK38-DRAW-23860-10021) | 1 | No. |
| 07.07 | Pedestrian roof protection mats | 28 | m2 |
| 07.08 | Parapet flashing | 153 | m |
| | Loading Dock Extension/Causeway | | |
| 07.09 | Roof covering (refer detail S2 of drawing NK38-DRAW-23860-10065) | 64 | m2 |
| | - Single ply TPO membrane (60mil reinforced) | 64 | m2 |
| | Polyisocyanurate/ Polyurethane Insulation board (RSI 5.64) min 90mm thickness | 64 | m2 |
| | - Air/Vapour retarder | 64 | m2 |
| | - Dens deck thermal barrier mechanically fastened to steel deck | 64 | m2 |
| 07.10 | Parapet and flashing assembly (detail S1 of 23860-10065) | 6 | m |
| 07.11 | Parapet and flashing assembly (detail S2 of 23860-10065) | 22 | m |
| 07.12 | Flashing assembly (detail S3 of 23860-10065) | 6 | m |
| 07.13 | Root drain w/ cast aluminum dome strainer w/ acc (detail S4 of 23860-10065) | 1 | No. |
| | | | |
Filed: 2021-08-17 EB-2020-0290 J3.6 Attachment 1 Report Date: Oct 25, 2019 Page No.: B - 23

| Item Description | Quantity | Unit |
|--|--|--|
| Thermal and Moisture Protection (Cont'd) | | |
| Fireproofing Carboline "A/D Firefilm III" thin film intumescent fire resistive material or approved equal to structural steel members and floor slabs - First Floor (elevation 100.000) - Condensate Platform (elevation 104.32) - Second Floor (elevation 107.800) - Mezzanine Floor (elevation 111.600) | 1,034 33 1,034 69 | m2 m2 m2 m2 |
| - Roof (elevation 115.000) | 1,034 | m2 |
| <u>Firestops</u> Stainwell #2- Hilti CPS-S-SIL GG sealant to HSS 203y203y13mm structural steel- | 22 | 1112 |
| columns penetration through 200mm thick concrete block wall stair 2 North wall; FTH 0.75hr | 3 | No. |
| Stairwell #2- Hilti CPS-S-SIL GG sealant to HSS 203x203x13mm structural steel- columns penetration through 200mm thick concrete block wall stair 2 South wall; FTH 0.75hr | 3 | No. |
| Stairwell #2- Hilti CPS-S-SIL GG sealant to W610x140mm structural steel penetration through 200mm thick concrete block wall stair 2 North wall; FH 0.75hr | 2 | No. |
| Stairwell #2- Hilti CPS-S-SIL GG sealant to W610x140mm structural steel penetration through 200mm thick concrete block wall stair 2 South wall; FH 0.75hr | 2 | No. |
| Stairwell #2- Hilti CPS-S-SIL GG sealant to W360x57mm structural steel penetration through 200mm thick concrete block wall stair 2 North wall; FH 0.75hr | 1 | No. |
| Stairwell #2- Hilti CPS-S-SIL GG sealant to W360x57mm structural steel penetration through 200mm thick concrete block wall stair 2 South wall; FH 0.75hr | 1 | No. |
| Stairwell #2- Hilti CPS-S-SIL GG sealant to W610x113mm structural steel penetration through 200mm thick concrete block wall stair 2 North wall; FH 0.75hr | 1 | No. |
| Stairwell #2- Hilti CPS-S-SIL GG sealant to W610x113mm structural steel penetration through 200mm thick concrete block wall stair 2 South wall; FH 0.75hr | 1 | No. |
| Stairwell #2- Hilti CPS-S-SIL GG sealant to W610x82mm structural steel penetration through 200mm thick concrete block wall stair 2 North wall; FH 0.75hr | 3 | No. |
| | Item Description Thermal and Moisture Protection (Cont'd) Fireproofing Carboline "A/D Firefilm III" thin film intumescent fire resistive material or approved equal to structural steel members and floor slabs First Floor (elevation 100.000) Condensate Platform (elevation 104.32) Second Floor (elevation 107.800) Mezzanine Floor (elevation 111.600) Rod (elevation 115.000) Stainwell #1 at roof level (elevation 118.100) Firestops Stainwell #2- Hilti CPS-S-SIL GG sealant to HSS 203x203x13mm structural steel- columns penetration through 200mm thick concrete block wall stair 2 North wall; FTH 0.75hr Stainwell #2- Hilti CPS-S-SIL GG sealant to HSS 203x203x13mm structural steel- columns penetration through 200mm thick concrete block wall stair 2 South wall; FH 0.75hr Stainwell #2- Hilti CPS-S-SIL GG sealant to W610x140mm structural steel penetration through 200mm thick concrete block wall stair 2 South wall; FH 0.75hr Stainwell #2- Hilti CPS-S-SIL GG sealant to W610x140mm structural steel penetration through 200mm thick concrete block wall stair 2 South wall; FH 0.75hr Stainwell #2- Hilti CPS-S-SIL GG sealant to W610x140mm structural steel penetration through 200mm thick concrete block wall stair 2 North wall; FH 0.75hr Stainwell #2- Hilti CPS-S-SIL GG sealant to W610x140mm structural steel penetration through 200mm thick concrete block wall stair 2 North wall; FH 0.75hr Stainwell #2- Hilti CPS-S-SIL GG sealant to W360x57mm structural steel penetration through 200mm thick concrete block wall stair 2 North wall; FH 0.75hr Stainwell #2- Hilti CPS-S-SIL GG sealant to W610x113mm structural steel penetration through 200mm thick concrete block wall stair 2 North wall; FH 0.75hr Stainwell #2- Hilti CPS-S-SIL GG sealant to W610x113mm structural steel penetration through 200mm thick concrete block wall stair 2 North wall; FH 0.75hr Stainwell #2- Hilti CPS-S-SIL GG sealant to W610x113mm structural steel penetration through 200mm thick concrete block wall stair 2 North wall; FH 0.75hr Stainwell #2- Hilti CPS-S-SIL GG sealant to | Item DescriptionQuantityThermal and Moisture Protection (Cont'd)Fireproofing Carboline "A/D Firefilm III" thin film inturescent fire resistive material or approved equal to structural steel members and floor slabs- First Floor (elevation 100.000)1.034- First Floor (elevation 107.800)1.034- Roof (elevation 111.600)69- Roof (elevation 115.000)1.034- Stairwell #1 at roof level (elevation 118.100)22FirestOps Stairwell #2- Hilti CPS-S-SIL GG sealant to HSS 203x203x13mm structural steel- columns penetration through 200mm thick concrete block wall stair 2 North wall; FTH 0.75hr3Stairwell #2- Hilti CPS-S-SIL GG sealant to WS10x140mm structural steel penetration through 200mm thick concrete block wall stair 2 South wall; FTH 0.75hr3Stairwell #2- Hilti CPS-S-SIL GG sealant to W300x57mm structural steel penetration through 200mm thick concrete block wall stair 2 North wall; FH 0.75hr2Stairwell #2- Hilti CPS-S-SIL GG sealant to W300x57mm structural steel penetration through 200mm thick concrete block wall stair 2 North wall; FH 0.75hr1Stairwell #2- Hilti CPS-S-SIL GG sealant to W300x57mm structural steel penetration through 200mm thick concrete block wall stair 2 North wall; FH 0.75hr1Stairwell #2- Hilti CPS-S-SIL GG sealant to W300x57mm structural steel penetration through 200mm thick concrete block wall stair 2 North wall; FH 0.75hr1Stairwell #2- Hilti CPS-S-SIL GG sealant to W300x57mm structural steel penetration through 200mm thick concrete block wall stair 2 North wall; FH 0.75hr1Stairwell #2- Hilti CPS-S-SIL GG sealant to W300x57mm |

Filed: 2021-08-17 EB-2020-0290 J3.6 Attachment 1 Report Date: Oct 25, 2019 Page No.: B - 24

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 07 | Thermal and Moisture Protection (Cont'd) | | |
| 07.15 | Firestops (cont'd) | | |
| | Stairwell #2- Hilti CPS-S-SIL GG sealant to W610x82mm structural steel penetration through 200mm thick concrete block wall stair 2 South wall; FH 0.75hr | 3 | No. |
| | Stairwell #2- Hilti CPS-S-SIL GG sealant to W360x57mm structural steel-wall header penetration through 200mm thick concrete block wall stair 2 North wall; FTH 0.75hr | 2 | No. |
| | Stairwell #2- Hilti CPS-S-SIL GG sealant to W360x57mm structural steel-wall header penetration through 200mm thick concrete block wall stair 2 South wall; FTH 0.75hr | 2 | No. |
| | Stairwell #1- Hilti CPS-S-SIL GG sealant to HSS 203x203x13mm structural steel- columns penetration through 200mm thick concrete block wall stair 1 North wall; FTH 0.75hr | 3 | No. |
| | Stairwell #1- Hilti CPS-S-SIL GG sealant to HSS 203x203x13mm structural steel- columns penetration through 200mm thick concrete block wall stair 1 South wall; FTH 0.75hr | 3 | No. |
| | Stairwell #1- Hilti CPS-S-SIL GG sealant to W610x101mm structural steel penetration through 200mm thick concrete block wall stair 1 North wall; FH 0.75hr | 2 | No. |
| | Stairwell #1- Hilti CPS-S-SIL GG sealant to W610x101mm structural steel penetration through 200mm thick concrete block wall stair 1 South wall; FH 0.75hr | 2 | No. |
| | Pipe Chase - 3M sealant to 60mm pipe penetration through 1200mm thick reinforced concrete East wall; FHT 2hr | 6 | No. |
| | Pipe Chase - 3M sealant to 33mm pipe penetration through 1200mm thick | 2 | No. |
| | Pipe Chase - 3M sealant to 48mm pipe penetration through 1200mm thick reinforced concrete East wall; EHT 2hr | 6 | No. |
| | Pipe Chase - 3M sealant to 89mm pipe penetration through 1200mm thick reinforced concrete East wall; FHT 2hr | 6 | No. |
| | Pipe Chase - FS-ONE sealant to penetration through 1200mm thick reinforced concrete East wall; FHT 2hr | 3 | No. |
| | Loading area- 3M fire dam spray 200 or 3M fire barrier 1000/1003 to 76 (h) x610 (w)mm cable tray with cables penetration through 200mm thick block wall East wall; F/FH 0.75hr | 1 | No. |
| | Stairwell #1- 3M CP 25 WB+ to 25mm teck cable penetration through 200mm thick block wall South wall: EH 0.75hr | 2 | No. |
| | Stairwell #1- 3M firedam spray 200 to teck cable penetration through 200mm thick block wall North wall; FH 0.75hr | 2 | No. |
| | | | |

Filed: 2021-08-17 EB-2020-0290 J3.6 Attachment 1 Report Date: Oct 25, 2019 Page No.: B - 25

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 07 | Thermal and Moisture Protection (Cont'd) | | |
| 07.15 | Firestops (cont'd) Stairwell #1- Hilti-CP637 firestop mortar to 6 x 4/C12 AWG teck cable | 1 | No |
| | penetration through 200mm thick block wall North wall; FH 0.75hr Stairwell #1- 3M firedam spray 200 to teck cable penetration through 200mm | I | NO. |
| | thick block wall South wall; FH 0.75hr | 3 | No. |
| | Stairwell #2- 3M CP 25 WB+ to 25mm teck cable penetration through 200mm thick block wall North wall; FH 0.75hr | 1 | No. |
| | Stairwell #2- 3M CP 25 WB+ to 25mm teck cable penetration through 200mm thick block wall South wall: FH 0.75hr | 1 | No. |
| | Stairwell #2- Hilti-CP637 firestop mortar to 6 x 4/C12 AWG teck cable penetration through 200mm thick block wall North wall; FH 0.75hr | 1 | No. |
| | Stairwell #2- 3M firedam spray 200 to teck cable penetration through 200mm thick block wall North wall; FH 0.75hr | 6 | No. |
| | Stairwell #2- 3M firedam spray 200 to teck cable penetration through 200mm thick block wall South wall; FH 0.75hr | 1 | No. |
| | Loading area- 3M CP 25 WB+ to 20mm teck cable penetration through 190mm thick block wall West block wall: F/FH 0.75hr | 1 | No. |
| | Loading area- 3M CP 25 WB+ to 43mm teck cable penetration through 190mm thick block wall East wall; F/FH 0.75hr | 1 | No. |
| | Gamma room- 3M fire dam spray 200 or 3M fire barrier 1000/1003 to 76.2x609.6mm cable tray with cables penetration through 700mm thick reinforced concrete floor; F/FH 0.75hr loading area- 3M fire dam spray 200 or 3M fire barrier 1000/1003 to | 1 | No. |
| | 76.2x609.6mm cable tray with cables penetration through 700mm thick reinforced concrete floor; F/FH 0.75hr | 1 | No. |
| | Loading area- 3M moldable putty 101.6 pvc pipe to 101.6mm teck cable in pvc sleeve penetration through 700mm thick reinforced concrete floor; F/FH 0.75hr | 2 | No. |
| | Stairwell #1- 3M CP 25 WB+ to 19mm conduit penetration through 200mm thick reinforced concrete East wall; F/FH 0.75hr | 1 | No. |
| | Stairwell #1- 3M CP 25 WB+ to 19mm conduit penetration through 200mm thick reinforced concrete North wall; F/FH 0.75hr | 1 | No. |
| | Stairwell #1- 3M CP 25 WB+ to 20mm armored cable penetration through 200mm thick reinforced concrete East wall; F/FH 0.75hr | 1 | No. |
| | Stairwell #1- 3M CP 25 WB+ to 25.4mm condu it penetration through 200mm thick reinforced concrete South wall; FH 0.75hr | 1 | No. |
| | Stairwell #1 W003- 3M CP 25 WB+ to 25.4mm teck cable penetration through 200mm thick reinforced concrete East wall; FH 0.75hr | 1 | No. |
| | Stairwell #2- 3M CP 25 WB+ to 19mm conduit penetration through 200mm thick reinforced concrete West wall; F/FH 0.75hr | 1 | No. |
| | Stairwell #2- 3M CP 25 WB+ to 20mm armored cable penetration through 200mm thick reinforced concrete West wall; F/FH 0.75hr | 1 | No. |

Filed: 2021-08-17 EB-2020-0290 J3.6 Attachment 1 Report Date: Oct 25, 2019 Page No.: B - 26

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 07 | Thermal and Moisture Protection (Cont'd) | | |
| 07.15 | Firestops (cont'd) Stairwell #2- 3M CP 25 WB+ to 25.4mm teck cable penetration through 200mm | 2 | No |
| | thick block wall West wall; FH 0.75hr Stairwell #2- 3M CP 25 WB+ to 25.4mm teck cable penetration through 200mm thick reinforced concrete North wall; EH 0.75hr | 2 | No. |
| | Stairwell #2- 3M fire dam spray 200 or 3M fire barrier 1000/1003 to 25.4mm teck cable penetration through 200mm thick reinforced concrete North wall; FH 0.75hr | 1 | No. |
| | Un-assigned w100- 3M moldable putty 101.6 pvc pipe to 101.6mm teck cable in pvc sleeve penetration through 700mm thick block wall floor; F/FH 0.75hr | 2 | No. |
| | Un-assigned w100- 3M moldable putty 101.6 pvc pipe to 101.6mm teck cable in pvc sleeve penetration through 700mm thick reinforced concrete floor; F/FH 0.75hr | 3 | No. |
| | HVAC shaft (stairwell #1)- 1041x432mm duct penetration through 200mm thick block wall North wall; F/FH 0.75hr | 1 | No. |
| | HVAC shaft (stairwell #1)- 1372 x762mm duct penetration through 200mm thick block wall South wall; F/FH 0.75hr | 1 | No. |
| | HVAC shaft (stairwell #2)- 1118x737mm duct penetration through 200mm thick block wall West wall; F/FH 0.75hr | 1 | No. |
| | HVAC shaft (stairwell #2)- 762 x381mm duct penetration through 200mm thick block wall North wall; F/FH 0.75hr | 1 | No. |
| | HVAC shaft (stairwell #2)- 990x406mm duct penetration through 200mm thick block wall North wall; F/FH 0.75hr | 1 | No. |
| | Loading area- 3M-FB-3000 WT to 114mm insulated pipe penetration through 300mm thick block wall East wall; F/FH 0.75hr | 1 | No. |
| | Loading area- 3M-FB-3000 WT to 168mm pipe penetration through 300mm thick block wall East wall; F/FH 0.75hr | 1 | No. |
| | Loading area- 3M-FB-3000 WT to 48mm pipe penetration through 300mm thick block wall East wall; F/FH 0.75hr | 1 | No. |
| | Loading area- 3M-FB-3000 WT to 60mm insulated pipe penetration through 300mm thick block wall East wall; F/FH 0.75hr | 2 | No. |
| | Loading area- 3M-FB-3000 WT to 60mm pipe penetration through 300mm thick block wall East wall; F/FH 0.75hr | 3 | No. |
| | Pipe shaft- FB-3000 WT to 33mm pipe penetration through 200mm thick block wall tbd; F/FH 0.75hr | 1 | No. |
| | Pipe shaft- FB-3000 WT to 60mm pipe penetration through 200mm thick block wall tbd; F/FH 0.75hr | 2 | No. |
| | Stairwell #1- FB-3000 WT to 114mm pipe penetration through 200mm thick block wall South wall; F/FH 0.75hr | 1 | No. |
| | Stairwell #2- FB-3000 WT to 114mm pipe penetration through 200mm thick block wall North wall; F/FH 0.75hr | 1 | No. |

Filed: 2021-08-17 EB-2020-0290 J3.6 Attachment 1 Report Date: Oct 25, 2019 Page No.: B - 27

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 07 | Thermal and Moisture Protection (Cont'd) | | |
| 07.15 | Firestops (cont'd) | | |
| | Causeway- 3M CP 25 WB+ to 19mm conduit penetration through 156mm thick dry wall East wall; F/FH 0.75hr | 5 | No. |
| | Causeway- 3M CP 25 WB+ to 25mm teck cable penetration through 156mm thick dry wall East wall; F/FH 0.75hr | 1 | No. |
| | Causeway- 3M CP 25 WB+ to 25mm teck cable penetration through 300mm thick reinforced concrete East wall; F/FH 0.75hr | 2 | No. |
| | Causeway- 3M CP 25 WB+ to 43mm teck cable penetration through 300mm thick reinforced concrete East wall; F/FH 0.75hr | 1 | No. |
| | Causeway- 3M CP-25 WB+ caulking to 60mm insulated pipe penetration through 156mm thick drywall East wall; F/FH 0.75hr | 2 | No. |
| | Causeway- 3M fire barrier rated foam FIP 1-step to 76(h)x610(w)mm cable tray with cables penetration through 156mm thick dry wall East wall; F/FH 0.75hr | 1 | No. |
| | Causeway- 3M-FB-3000 WT to 114mm insulated pipe penetration through 156mm thick drywall East wall; F/FH 0.75hr | 1 | No. |
| | Causeway- 3M-FB-3000 WT to 114mm pipe penetration through 300mm thick reinforced concrete East wall; F/FH 0.75hr | 1 | No. |
| | Causeway- 3M-FB-3000 WT to 168mm pipe penetration through 156mm thick drywall East wall; F/FH 0.75hr | 1 | No. |
| | Causeway- 3M-FB-3000 WT to 48mm pipe penetration through 156mm thick drywall East wall; F/FH 0.75hr | 1 | No. |
| | Causeway- 3M-FB-3000 WT to 60mm pipe penetration through 156mm thick drywall East wall; F/FH 0.75hr | 3 | No. |
| | Stairwell #1- Hilti CPS-S-SIL GG sealant to W360x57mm structural steel penetration through 200mm thick concrete block wall stair 1 North wall; FH 0.75hr | 2 | No. |
| | Stairwell #1- Hilti CPS-S-SIL GG sealant to W360x57mm structural steel penetration through 200mm thick concrete block wall stair 1 South wall; FH 0.75hr | 2 | No. |
| | Stairwell #1- Hilti CPS-S-SIL GG sealant to W360x57mm structural steel-wall header penetration through 200mm thick concrete block wall stair 1 East wall; FH 0.75hr | 1 | No. |
| | Stairwell #1- Hilti CPS-S-SIL GG sealant to W360x57mm structural steel-wall header penetration through 200mm thick concrete block wall stair 1 North wall; FH 0.75hr | 1 | No. |
| | Stairwell #1- Hilti CPS-S-SIL GG sealant to W360x57mm structural steel-wall header penetration through 200mm thick concrete block wall stair 1 South wall; FH 0.75hr | 1 | No. |
| | Stairwell #1- Hilti CPS-S-SIL GG sealant to W610x101mm structural steel penetration through 200mm thick concrete block wall stair 1 North wall; FH 0.75hr | 1 | No. |

Filed: 2021-08-17 EB-2020-0290 J3.6 Attachment 1 Report Date: Oct 25, 2019 Page No.: B - 28

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 07 | Thermal and Moisture Protection (Cont'd) | | |
| 07 15 | Firestops (cont'd) | | |
| 07.15 | Stairwell #1- Hilti CPS-S-SIL GG sealant to W610x101mm structural steel penetration through 200mm thick concrete block wall stair 1 South wall; FH 0.75hr | 1 | No. |
| | Stairwell #1- Hilti CPS-S-SIL GG sealant to W610x125mm structural steel penetration through 200mm thick concrete block wall stair 1 North wall; FH 0.75hr | 1 | No. |
| | Stairwell #1- Hilti CPS-S-SIL GG sealant to W610x125mm structural steel penetration through 200mm thick concrete block wall stair 1 South wall; FH 0.75hr | 1 | No. |
| | Pipe shaft- 3M-FB-3000 WT to 114mm insulated pipe penetration through 200mm thick block wall North wall; F/FH 0.75hr | 1 | No. |
| | Pipe shaft- 3M-FB-3000 WT to 114mm insulated pipe penetration through 200mm thick block wall South wall: F/FH 0.75br | 1 | No. |
| | Pipe shaft- 3M-FB-3000 WT to 33mm insulated pipe penetration through 200mm thick block wall North wall; F/FH 0.75hr | 1 | No. |
| | Pipe shaft- 3M-FB-3000 WT to 48mm pipe penetration through 200mm thick block wall North wall: F/FH 0.75hr | 2 | No. |
| | Pipe shaft- 3M-FB-3000 WT to 48mm pipe penetration through 200mm thick block wall South wall; F/FH 0.75hr | 3 | No. |
| | Pipe shaft- 3M-FB-3000 WT to 60mm insulated pipe penetration through 200mm thick block wall North wall: E/EH 0 75br | 2 | No. |
| | Pipe shaft- 3M-FB-3000 WT to 60mm insulated pipe penetration through 200mm thick block wall South wall; F/FH 0.75hr | 1 | No. |
| | Pipe shaft- 3M-FB-3000 WT to 60mm insulated pipe penetration through 200mm thick block wall West wall: F/FH 0 75hr | 1 | No. |
| | Pipe shaft- 3M-FB-3000 WT to 60mm pipe penetration through 200mm thick block wall North wall; F/FH 0.75hr | 2 | No. |
| | Pipe shaft- 3M-FB-3000 WT to 60mm pipe penetration through 200mm thick block wall West wall; F/FH 0.75hr | 1 | No. |
| | Stairwell #1- 3M-FB-3000 WT to 60mm pipe penetration through 200mm thick block wall North wall: F/FH 0.75hr | 1 | No. |
| | Stairwell #1- 3M-FB-3000 WT to 60mm pipe penetration through 200mm thick block wall South wall; F/FH 0.75hr | 1 | No. |
| | Stairwell #2- 3M-FB-3000 WT to 60mm pipe penetration through 200mm thick block wall North wall: F/FH 0.75hr | 2 | No. |
| | Stairwell #2- 3M-FB-3000 WT to 60mm pipe penetration through 200mm thick block wall South wall; F/FH 0.75hr | 2 | No. |
| | | | |
| | | | |

Filed: 2021-08-17 EB-2020-0290 J3.6 Attachment 1 Report Date: Oct 25, 2019 Page No.: B - 29

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 07 | Thermal and Moisture Protection (Cont'd) | | |
| 07.15 | Firestops (cont'd) | | |
| | Loading area- 3M CP 25 WB+ to 19mm conduit penetration through 200mm thick block wall East wall; F/FH 0.75hr | 5 | No. |
| | Stairwell #1- 3M CP 25 WB+ to 19mm conduit penetration through 200mm thick block wall North wall; F/FH 0.75hr | 4 | No. |
| | Stairwell #1- 3M CP 25 WB+ to 19mm conduit penetration through 200mm thick block wall South wall; F/FH 0.75hr | 1 | No. |
| | Stairwell #1- 3M CP 25 WB+ to 20mm armored cable penetration through 200mm thick block wall North wall; F/FH 0.75hr | 2 | No. |
| | Stairwell #2- 3M CP 25 WB+ to 19mm conduit penetration through 200mm thick block wall North wall; F/FH 0.75hr | 4 | No. |
| | Stairwell #2- 3M CP 25 WB+ to 19mm conduit penetration through 200mm thick block wall South wall; F/FH 0.75hr | 1 | No. |
| | Stairwell #2- 3M CP 25 WB+ to 19mm conduit penetration through 200mm thick concrete floor; F/FH 0.75hr | 1 | No. |
| | Stairwell #2- 3M CP 25 WB+ to 20mm armored cable penetration through 200mm thick block wall North wall; F/FH 0.75hr | 2 | No. |
| | Drum handling- 3M-FB-3000 wt to 33Mm pipe penetration through 700mm thick reinforced concrete floor; F/FH 0.75hr | 1 | No. |
| | Drum wash area- 3M-FB-3000 wt to 33Mm pipe penetration through 700mm thick reinforced concrete floor; F/FH 0.75hr | 1 | No. |
| | Drum wash area- 3M silicone sealant to 60mm pipe penetration through 700mm thick reinforced concrete floor; F/FH 0.75hr | 1 | No. |
| | HVAC shaft (stairwell #1)- 1422x965mm duct penetration through 700mm thick reinforced concrete floor; F/FH 0.75hr | 1 | No. |
| | HVAC shaft (stairwell #2)- 1219x1016mm duct penetration through 700mm thick reinforced concrete floor; F/FH 0.75hr | 1 | No. |
| | Loading area- 3M silicone sealant to 26mm pipe penetration through 700mm thick reinforced concrete floor; F/FH 0.75hr | 1 | No. |
| | Loading area- 3M silicone sealant to 89mm pipe penetration through 700mm thick reinforced concrete floor; F/FH 0.75hr | 1 | No. |
| | North of stairwell #2- 3M-FB-3000 wt to 114mm pipe penetration through 700mm thick reinforced concrete floor; F/FH 0.75hr | 1 | No. |
| | North of stairwell #2- 3M-FB-3000 wt to 60mm pipe penetration through 700mm thick reinforced concrete floor; F/FH 0.75hr | 1 | No. |
| | Pipe shaft- 33mm pipe penetration through 115mm thick mortar floor; F/FH 0.75hr | 1 | No. |
| | Pipe shaft- 48mm pipe penetration through 115mm thick mortar floor; F/FH 0.75hr | 3 | No. |
| | Pipe shaft- 60mm pipe penetration through 115mm thick mortar floor; F/FH 0.75hr | 5 | No. |
| | | | |

Filed: 2021-08-17 EB-2020-0290 J3.6 Attachment 1 Report Date: Oct 25, 2019 Page No.: B - 30

| Item Ref. | Item Description | Quantity | Unit |
|--------------------|---|-------------|-------------------|
| 07 | Thermal and Moisture Protection (Cont'd) | | |
| 07 07.15 | Definition of Control Stainwell #2- 3M-FB-3000 wt to 114mm pipe penetration through 70mm thick reinforced concrete floor; F/FH 0.75hr Stainwell #1- 3M-FB-3000 wt to 60mm pipe penetration through 200mm thick reinforced concrete North wall; F/FH 0.75hr Stainwell #2- 3M-FB-3000 wt to 60mm pipe penetration through 100mm thick reinforced concrete North wall; F/FH 0.75hr Stainwell #2- 3M-FB-3000 wt to 60mm pipe penetration through 100mm thick reinforced concrete North wall; F/FH 0.75hr Stainwell #2- 3M-FB-3000 wt to 60mm pipe penetration through 100mm thick reinforced concrete North wall; F/FH 0.75hr Stainwell #2- 3M-FB-3000 wt to 60mm pipe penetration through 100mm thick reinforced concrete West wall; F/FH 0.75hr | 2 1 1 | No. No. No. |
| | | | |
| | | | |

Filed: 2021-08-17 EB-2020-0290 J3.6 Attachment 1 Report Date: Oct 25, 2019 Page No.: B - 31

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 08 | Doors, Entrances and Windows | | |
| 08.01 | At Basement (Elevation 87+000) level Smooth painted hollow metal door with hollow metal frame; frame secured to concrete with conceled expansion anchors; shim and caulk both sides - 900mmX2150mmx45mm with 100x600mm 1/4" thick wired glass insert; 1.5 hr fire proof self closing single door | 4 | leaf |
| | - 900mmX2150mmx45mm with 100x600mm 1/4" thick wired glass insert | 2 | leaf |
| 08.02 | <u>At Platform (Elevation 91+370) level</u> Smooth painted hollow metal door with hollow metal frame; frame secured to concrete with conceled expansion anchors; shim and caulk both sides - 900mmX2150mmx45mm with 100x600mm 1/4" thick wired glass insert; 1.5 hr fire proof self closing single door | 1 | leaf |
| 08.03 | <u>At Platform (Elevation 94+000) level</u> Smooth painted hollow metal door with hollow metal frame; frame secured to concrete with conceled expansion anchors; shim and caulk both sides - 900mmX2150mmx45mm with 100x600mm 1/4" thick wired glass insert; 1.5 hr fire proof self closing single door | 2 | leaf |
| | - 900mmX2150mmx45mm single door | 2 | leaf |
| 08.04 | At First Floor (Elevation 100+000) level Smooth painted hollow metal door with hollow metal frame drill opened, filled solid w/ grout and capped; frame secured to concrete with conceled expansion anchors; shim and caulk both sides - 900mmX2150mmx45mm single door, insulated core to provide U metric of 2.2 or better: with Aluminum ail | 2 | leaf |
| | - 900mmX2150mmx45mm single door, insulated core to provide U metric of 2.2 or better; with Aluminum sill: shall accommodate 25mm raised floor | 1 | leaf |
| | - 900mmX2150mmx45mm, insulated core to provide U metric of 2.2 or better; with Aluminum sill; shall accommodate 25mm raised floor; 1.5 hr fire proof self closing single door | 1 | leaf |
| | | | |

Filed: 2021-08-17 EB-2020-0290 J3.6 Attachment 1 Report Date: Oct 25, 2019 Page No.: B - 32

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|--------------|
| 08 | Doors, Entrances and Windows (Cont'd) | | |
| 08.05 | Smooth painted hollow metal door with hollow metal frame drill opened, filled solid w/ grout and capped; frame secured to concrete with conceled expansion anchors; shim and caulk both sides | | |
| | - 900mmX2150mmx45mm, insulated core to provide U metric of 2.2 or better; with Aluminum sill; shall accommodate 25mm raised floor; 1.5 hr fire proof self closing single door; door to provide max. temp. rise of 250° C in 30 min | 1 | leaf |
| 08.06 | Smooth painted hollow metal door with hollow metal frame; jamb filled solid w/ grout; shim and caulk both sides | | |
| | - 1210mmX2150mmx45mm with 100x600mm 1/4" thick wired glass insert | 1 | leaf |
| | - 900mmX2150mmx45mm with 100x600mm 1/4" thick wired glass insert; 1.5 hr fire proof self closing single door; shall accommodate 25mm raised floor | 4 | leaf |
| | 800mmX2150mmx45mm; shall accommodate 25mm raised floor 1210mmX2150mmx45mm; with Aluminum sill; 1.5 hr fire proof self closing single door; shall accommodate 25mm raised floor | 1 | leaf leaf |
| | - 900mmX2150mmx45mm; 1.5 hr fire proof single door; shall accommodate 25mm raised floor; door to provide max. temp. rise of 250° C in 30 min | 1 | leaf |
| | - 900mmX2150mmx45mm single door | 2 | leaf |
| 08.07 | Motorised steel overhead door, galvanized coiling steel slats; w/ door track | | |
| | - 2500mmX2500mm; 1.5 hr fire proof door | 2 | No. |
| 08.08 | Steel sliding door w/ glass viewing panel insert and overhead sliding track | | |
| | - 2X(1600mmX2500mm) | 1 | pair |
| 08.09 | Smooth painted hollow metal door with hollow metal frame; shim and caulk both sides | | |
| | - 900mmX2150mmx45mm with approx 600x600mm 1/4" thick wired glass insert, 1.5 hr fire proof single door; door to provide max. temp. rise of 250° C in 30 min | 1 | leaf |
| | | | |
| | | | |

Filed: 2021-08-17 EB-2020-0290 J3.6 Attachment 1 Report Date: Oct 25, 2019 Page No.: B - 33

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|-------------|----------------------|
| 08 | Doors, Entrances and Windows (Cont'd) | | |
| 08.10 | Stainless steel access door; MIFAB insulated fire rated access door or equivalent - 810mmX810mm - 405mmX405mm - 760mmX560mm | 1 1 1 | leaf leaf leaf |
| 08.11 | At Condensate Platform (Elevation 104+320) level Smooth painted hollow metal door with hollow metal frame; jamb filled solid w/ grout; shim and caulk both sides - 900mmX2150mmx45mm with 100x600mm 1/4" thick wired glass insert; 1.5 hr fire proof self closing single door | 1 | leaf |
| 08.12 | At Second Floor (Elevation 107+800) level Smooth painted hollow metal door with hollow metal frame; jamb filled solid w/ grout; shim and caulk both sides - 900mmX2150mmx45mm with 100x600mm 1/4" thick wired glass insert; 1.5 hr fire proof self closing single door - 900mmX2150mmx45mm; 1.5 hr fire proof self closing single door - 900mmX2150mmx45mm | 5 3 2 | leaf leaf leaf |
| | - 2X(900mmX2150mmx45mm); 1.5 hr fire proof self closing double door | 1 | pair |
| | - 2X(900mmX2700mmx45mm); 1.5 hr fire proof self closing double door | 1 | pair |
| 08.13 | Steel sliding door w/ overhead sliding track - 2750mmX2500mm - 2750mmX2500mmx45mm; 1.5 hr fire proof self closing double door; insulated core to provide U metric of 2.2 or better | 1 | No. No. |
| 08.14 | Smooth painted hollow metal door with double egress hollow metal frame - 2X(900mmX2150mmx45mm) double door | 1 | pair |
| | | | |

Filed: 2021-08-17 EB-2020-0290 J3.6 Attachment 1 Report Date: Oct 25, 2019 Page No.: B - 34

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 08 | Doors, Entrances and Windows (Cont'd) | | |
| 08.15 | At Roof (Elevation 115+000) level Smooth painted hollow metal door with hollow metal frame drill opened, filled solid w/ grout and capped; frame secured to concrete with conceled expansion anchors; shim and caulk both sides | | |
| | - 900mmX2150mmx45mm, insulated core to provide U metric of 2.2 or better; with Aluminum sill; shall accommodate 25mm raised floor; 1.5 hr fire proof self closing single door; door to provide max. temp. rise of 250° C in 30 min | 1 | leaf |
| | Louvers and Vents At Second Floor (Elevation 107+800) level | | |
| 08.16 | Louver 4847mm width x 5375mm height | 1 | No. |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 00 | Finishings | | |
| 09 01 | <u>Ceiling finish (none as per finish schedule)</u> | | |
| 00.01 | - ceiling to basement | 778 | m2 |
| | - ceiling to mezzanine | 20 | m2 |
| | - ceiling to 1st floor | 853 | m2 |
| | - ceiling to 2nd floor | 876 | m2 |
| | - ceiling to stair#1 lower roof | 22 | m2 |
| | - ceiling to condensation plate | 33 | m2 |
| 09.02 | Floor finish (none as per finish schedule) | | |
| | - basement floor, Sikacan Fastflor CR epoxy floor coating | 778 | m2 |
| | - mezzanine floor | 20 | m2 |
| | - 1st floor | 853 | m2 |
| | - 2nd floor | 876 | m2 |
| | - stair#1 lower roof level floor(covered under staircase measurement) | - | m2 |
| | - condensation plate | 33 | m2 |
| 09.03 | Wall finish (none as per finish schedule) | | |
| | - at basement | 3,025 | m2 |
| | - at 1st floor | 760 | m2 |
| | - at 2nd floor | 2,359 | m2 |
| 09.04 | Wall finish (Paint on concrete and CMU) | | |
| | - floor to 1st floor | 2,329 | m2 |
| | - floor to 2nd floor | 239 | m2 |
| | - floor to stair#1 lower roof | 58 | m2 |
| | Loading Dock Extension/Causeway | | |
| 09.05 | 45min fire rated 16mm type 'X' gyp board wall w/ steel studs @ | 12 | m2 |
| 00.00 | 400mm o/c | 10 | 0 |
| 09.06 | Paint finish to gypsum wall | 12 | m2 |
| 09.07 | Buiknead: 45min life rated Tomm type X gyp board w/ steel studs \bigcirc 400mm e/e (rate D0 & D0 of N)(20 DEA 00000 0014 Dec 04 of DE0 | 12 | m |
| | (@ 400mm 0/C (ret: D2 & D3 of NK38-D5A-23860-0014 Rev 01 of DEC 120906 Rev 002) | 12 | 111 |
| | | | |
| | | | |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|----------------|---|-----------------|----------|
| 31 | Earthwork | | |
| 31.01 31.02 | Clearing and grubbing Basement excavtion and disposal; 50.415x19.000x14.300 | 2,576 13,698 | m2 m3 |
| 31.03 31.04 | Support of excavation - secant piles Secant piles head 1.5m depth removal | 2,826 208 | m2 m2 |
| 31.05 | Rock Anchor (ref: detail S1 of NK38-DRAW-23840-10004 of EC# 120471 rev 003 & D3 of NK38-DRAW-23840-10010 of EC# 120471 rev 004) | 223 | No. |
| 31.06 | Rock Anchor (SC) | 3 | No. |
| | Pipe Chase | | |
| 31.07 | Excavtion and disposal | 288 | m3 |
| 31.08 | (ref: note 52 on dwg 23840-10051) | 53 | m3 |
| 31.09 | Support of excavation - secant piles (tbc) | 219 | m2 |
| 31.10 | Pipe chase pile (ref detail D1 of dwg 23840-10017) | 16 | No. |
| 31.11 31.12 | Loading Dock Extension/Causeway Excavtion and disposal Back fill w/ imported material | 55 45 | m3 m3 |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 30 | Site Improvements | | |
| 32 01 | New curb | 02 | m |
| 32.01 | Barrier free access (refer NK38-DRAW-15100-10011) | 92 35 | m2 |
| 02.02 | Extra over for Barrier free access ramp (refer NK38-DRAW-15100- | 00 | 1112 |
| 32.03 | 10011) | 1 | No. |
| 32.04 | Barrier free access (refer NK38-DRAW-15100-10011): Expansion joint | 25 | m |
| 32.05 | Barrier free access (refer NK38-DRAW-15100-10011): Dummy joints (refer dwg) | 23 | m |
| 32.06 | New asphalt paving | Nil | m2 |
| 32.07 | Reinstate asphalt paving | 111 | m2 |
| 32.08 | Reinforced concrete Entry Pad 1.5m wide x 2.5m long w/ W.W.F & broom finis | 3 | No. |
| 32.09 | Bollards (refer NK38-DRAW-15100-10011) | 6 | No. |
| 32.10 | Turf and grasses | 1,082 | m2 |
| | | | |
| 00.44 | Argon Tank Pad | 10 | 0 |
| 32.11 | Slab on grade 300mm thick | 16 | m2 |
| | - 300mm thick crushed stone | 23 | m3 |
| | - 25mm sand levelling bed | 57 | m2 |
| | - Toomm styrotoam SM Insulation | 57 | m2 |
| | - Concrete SomPa supply and place | 5 | m3 |
| | - Edge formwork | 5 | m2 |
| | - Re-bar (floor, wall & root all inclusive) | 676 | кд |
| 32.12 | Bollard post 915mm height above ground + 1220mm in concrete | 7 | No. |
| 00.40 | footing; filled w/ concrete and painted Yellow | | |
| 32.13 | Galvanized steel wire mesh chain link fence | 11 | m |
| 32.14 | Galvanized steel gate 4' width x 8' height | 2 | No. |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 33 | Site Utilities | | |
| 33.01 | Underground inactive drainage line 79110-wgapab | | |
| | - 4" ø. Pipe, c.s., sch.40 | 13 | m |
| | - Flange, pipe, slip on, 4" ø, c.s., 150 lb | 1 | EA |
| | - Flange, weld neck flat face, 4" ø, c.s., 150 lb | 1 | EA |
| | - Elbow, 6" ø., buttweld ,c.s. ,45 deg, long radius | 2 | EA |
| | - Structural support, allow | 1 | EA |
| | - Reducer, 6" x 4", pipe, concentric, c.s. | 1 | EA |
| | - Elbow, 4" ø., c.s., 45 deg, long radius, sch. 40 | 6 | EA |
| | - 6" ø. pipe, c.s. sch. 40 | 6 | m |
| | - Tee, 4" ø., buttweld, c.s.,standard | 1 | EA |
| | - Metal support, allow | 1 | LS |
| | | | |
| 33.02 | Sub drain | | |
| | - 150mm ø. perforated PVC pipe, outer ø 159.385mm, min wall thickness | 270 | m |
| | 2.54mm, 12.7mm holes at 125mm enters with two rows parallel to the axis of the pipe | 270 | m |
| | - 150mm ø solid pvc pipe, outer ø 159.385mm, min wall thickness 2.54mm c/w | 45 | |
| | filter fabric | 15 | m |
| | - Elbow, 150mm ø PVC 90 degrees, solvent weld, SDR 35, color white | 7 | EA |
| | - Tee, 150mm ø. solvent weld, schedule SDR 35, color white | 11 | EA |
| | - Cross, 150mm ø. PVC SDR 35 cross | 4 | EA |
| | - Allow for excavation | 22 | m3 |
| | - Back fill with clear stone, type 1 or type 2, as per OPSS 1004 | 20 | m3 |
| | - Coupling, 150mm ø, PVC coupling, solvent weld, sir 35 with all accessories | 95 | EA |
| 33.03 | Cut & cap of underground 6" air line | | |
| | - Cap, 4" ø., buttweld, carbon steel | 1 | EA |
| | - Cap, 6" ø., buttweld, carbon steel | 2 | EA |
| | - Allow for excavation& back fill | 1 | LS |
| | - Cap, 4" ø., buttweld, carbon steel | 2 | EA |
| 33.04 | Cut & cap of underground construction 12" steam & 3" | | |
| | condensate return lines | | |
| | - Cap, 3" ø., buttweld, carbon steel | 2 | EA |
| | - Cap, 6" ø., buttweld, carbon steel | 1 | EA |
| | - Cap, 12" ø., buttweld, carbon steel | 1 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|--------------------|--|---|---|
| 33 | Site Utilities (Cont'd) | | |
| 33 33.05 | Site Utilities (Cont'd) Yard drainage temporary provision (civil) Priming pump (diesel engine set), 1450 GPM @ 8m head c/w level control switch with valves, etc. 6" ø PVC pressure pipe 150mm ø solid pvc pipe, outer ø 159.385mm, min wall thickness 2.54mm c/w filter fabric Reducer, 250 mm X 150mm ø PVC, sch 80. Coupling, 6" ø PVC 45 degrees, sch 80 Elbow, 6" ø PVC 90 degrees, sch 80 Elbow, 6" ø , 90 degrees, type B Flanch, 6" ø, sch 80 PVC c/w gasket, bolt / connection Hose, blue line, 6" ø Suction hose, 6" x 10" ø Suction Basket low profile, 6" ø Cherne pneumatic plug Heat tracing, allow Repair existing corrugated, galvanized steel connection | 2 61 3 3 6 6 3 3 61 3 12 3 4 61 1 | EA m EA EA EA EA EA EA EA EA EA EA EA EA EA |
| | | | |

OCTOBER 25, 2019

C - Process Systems Tie-in

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|-----------------------|----------------------------|
| 01 | PHT and Moderator D2O Systems | | |
| 01.01 | Tie into mod. D2O supply system for HWMB West annex - Tee, pipe, 2", buttweld, stainless steel 304L, schedule 40, class 3 - Elbow, pipe, 2", buttweld, stainless steel 304L, 90 deg. schedule 40 | 1 1 | EA EA |
| | - 2" stainless steel pipe, schedule 40, plain ends, spool piece 1 m long, class 3 | 1 | EA |
| | Diaphragm valve, 2" ø, stainless steel Cap, 2" ø stainless steel, class 3 Cap, 1/2" ø stainless steel, class 6 1/2" ø branch spool pipe, stainless steel, allow , class 3 Nipple, 1/2" stainless steel, class 6 Tie into existing system | 1 1 1 1 1 | EA EA EA EA EA |
| 01.02 | Tie into PHT D2O supply system for HWMB West annex | | |
| | - 2" ø stainless pipe schedule 40, plain ends, spool piece 3 m long, class 6 | 1 | EA |
| | - 2 1/2" ø stainless steel pipe, schedule 40, plain ends, spool piece 1 m long, class 6 | 1 | EA |
| | - Cap, 2" ø stainless steel, class 6 | 1 | EA |
| | - Cap, 2 1/2" ø stainless steel, class 6 | 1 | EA |
| | - Elbow, 2-112" ø stainless sch. 41, class 6 | 1 | EA |
| | - Globe valve, 2 1/2" ø, stainless steel | 1 | EA |
| | - Tee, 2-112" ø stainless sch. 40, class 6 -Diaphragm valve, 2" ø, stainless steel, class 6 | 1 | EA |
| 01.03 | Relocation of 30" LPSW discharge line - 30" ø, pipe, sch 40, seamless pipe, plain ends., class 6 - Elbow, 30" ø, long radius, class 6 | 60 5 | m EA |
| | - Magnesium anodes delivering 26 ma on the coated pipe for a period of 40a | 11 | FA |
| | - Enoxy coating for 30" dia nine bitumastic 300m part a & b | 60 | m |
| | - Excavation allow 6m deep 3m wide | 1 080 | m3 |
| | - Trench box, allow, quantity for both sides | 720 | m2 |
| | - Granular a bedding backfilling balance of trench from min. 300mm above the top of pipe, conforming to OPSS1010 | 687 | m3 |
| | - Screened sand backfill material | 334 | m3 |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 01 | PHT and Moderator D2O Systems (Cont'd) | | |
| 01.03 | Relocation of 30" LPSW discharge line (cont'd) | | |
| | - Un shrinkable fill per OPSS 1359 | 70 | m3 |
| | - Cad weld mold for connecting #12 awg (stranded) to carbon steel lug (Erica part number CAHHA-1G) | 1 | EA |
| | - Welding metal for making cad welds (Erica part number CA 15) | 20 | EA |
| | - 1/4" x 3" carbon steel bar to connect anode to pipe | 1 | EA |
| | - Elbow, NPS 30", 90 deg. long radius, class 6 | 1 | EA |
| | - Sleeve for making cad weld (Erica part no. CAB-133-1H) | 20 | EA |
| 01.04 | Tie into upgrader system for HWMB West annex | | |
| | - Tee, pipe, 1 1/2", buttweld, stainless steel 304L, schedule 40, class 3 | 1 | EA |
| | - Tee, pipe, 2", buttweld, stainless steel 304L, schedule 40, class 3 | 1 | EA |
| | - Elbow, pipe, 1 1/2", buttweld, stainless steel 304L, 90 deg. schedule 40, class 3 | 1 | EA |
| | - Elbow, pipe, 2", buttweld, stainless steel 304L, 90 deg. schedule 40, class 3 | 1 | EA |
| | - 1 1/2" stainless steel pipe, schedule 40, plain ends, spool piece up to 2 m long, class 3 | 2 | EA |
| | - Diaphragm valve, 1 1/2" ø, stainless steel, class 3 | 2 | EA |
| | - Cap, 1 1/2" ø stainless steel, class 3 | 1 | EA |
| | - Weldolet, 1 1/2" to 1/2" ø stainless steel, class 3 | 1 | EA |
| | - Weldolet, 2" to 1/2" ø stainless steel, class 3 | 1 | EA |
| | - 1/2" ø branch spool pipe, stainless steel, allow 1 m, class 6 | 2 | EA |
| | - Cap, 1/2" stainless steel, class 3 | 1 | EA |
| | - Cap, 1/2" stainless steel, class 6 | 2 | EA |
| | - Tie into existing system | 1 | EA |
| 01.05 | D2O tanks, piping & equipment for D2O supply (PHT/ Moderator) in HWMB West annex | | |
| | - Fire barrier. | 10 | EA |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|-----------------------------|---------------------------|
| 02 | TRF feed product system | | |
| 02.01 | Tie into TRF incoming and outgoing system for HWMB West | | |
| | Tee, pipe, 2" ø, buttweld, stainless steel 304L, schedule 40, class 3 Tee, pipe, 2" ø, buttweld, stainless steel 304L, schedule 40, class 6 2" ø stainless steel pipe, schedule 40, plain ends, spool piece 4 m long, class 3 2" ø stainless steel pipe, schedule 40, plain ends, spool piece 5 m long, class 6 | 1 1 1 1 | EA EA EA EA |
| | - Cap, 2 Ø stallless steel, class 5 | 5 | EA |
| | - Diaphragm valve, 2" ø, stainless steel, class 3 | 2 | EA |
| | - Elbow, pipe, 2" ø, buttweld, stainless steel 304L, 90 deg. schedule 40, class 3 | 1 | EA |
| | - Elbow, pipe, 2" ø, buttweld, stainless steel 304L, 90 deg. schedule 40, class 6 | 3 | EA |
| | - Tie into existing system | 2 | EA |
| 02.02 | Tie into TRF feed and product system for HWMB West annex | | |
| | Tee, pipe, 1" ø, buttweld, stainless steel 304L, schedule 40, class 6 1" ø stainless steel pipe, schedule 40, plain ends, class 6 Cap, 1" ø stainless steel, class 6 globe valve, 1" ø, stainless steel, class 6 Elbow, pipe, 1", buttweld, stainless steel 304L, 90 deg. schedule 40, class 6 Tie into tank | 1 18 1 1 9 2 | EA m EA EA EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|--------------------|--|--|--|
| 03 | D2O Clean-up System | | |
| 03 03.01 | D2O Clean-up System for HWMB West annex 1 1/2" ø stainless steel pipe, schedule 40, plain ends, spool piece 3 m long, class 3 Branch, pipe, 1-1/2" to ½" ø stainless weldolet stainless steel, class 3 Cap, 1 1/2" ø stainless steel, class 3 Cap, 1/2" ø stainless steel, class 6 Elbow, pipe, 1/12" ø, buttweld, stainless steel 304L, 90 deg. schedule 40, class 3 Nipple, 1/2" ø stainless steel, class 6 Tee, pipe, 1 1/2" ø, buttweld, stainless steel 304L, schedule 40, class 3 Check valve, 1 1/2" ø, stainless steel Diaphragm valve, 1 1/2" ø, stainless steel Tie into existing system | 3 3 3 3 3 3 3 3 3 3 3 3 | EA EA EA EA EA EA EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|---|--|
| 04 | Active Drain System | | |
| 04.01 | Mechanical modifications to the loading bay - 1" ø, piping, carbon steel, sch 80 - 11/2" ø, piping, carbon steel, sch 81 - Coupling, 1-1/2" x 1" ø, socket weld, carbon steel - Union, pipe, 1" ø, socket weld carbon steel - Elbow, 1" ø, socket weld, carbon steel, 90 deg - Elbow, 1" ø, socket weld, carbon steel - Cap, 1" ø, socket weld, carbon steel - Cap, 1" ø, socket weld, carbon - Trap, steam, thermostatic, 1" ø, 125 psi, bronze/semi-steel - Strainer, y, 1" ø, socket weld, 20 mesh type 304 ss screen, 1/2npt blowdown connection - Valve, gate, 1" ø, 600/800 lb socket weld, carbon steel - Hi temperature insulation for up to 1 1/2" ø condensate pipe | 28 1 2 4 1 1 2 1 1 1 29 | m EA EA EA EA EA EA M |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|------------------|----------------------|
| 05 | Inactive Drain System | | |
| 05.01 | Tie-in to inactive plant drainage (roof/condensate) 2" ø pipe, C.S, spool piece5 m length c/w support & fittings Gate valve, 2" ø, C.S Cap, 2" ø, CS Elbow, 2" ø, CS Tie into existing | 1 1 3 1 | EA EA EA LS |
| | | | |

OCTOBER 25, 2019

D - Process Systems

File Name: Path]T5257 HWMB-WA BOQ _Oct. 25, 2019T5257 HWMB-WA BOQ _Oct. 25, 2019D Print Date: 25/10/20199:42 AM

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|----------|
| 01 | PHT and Moderator D2O Systems | | |
| 01.01 | Equipment, tanks and pumps | | |
| | - Pumps P11/12, pump, D2O collection, 10.5 l/s @ 155.5 m head, class 6 | 2 | EA |
| | - Tank skid TK-14 to 21, D2O collection, 100 m3, stainless steel head, Class 6 | 8 | EA |
| | - Pumps P17/18, pump, D2O collection, 3.8 l/s @ 96 m head | 2 | EA |
| | - Tank skid TK22 to 28, D2O collection, 100 m3, stainless steel head, class 6 | 7 | EA |
| | - HX-6/7, heat exchanger, vertical, D2O recovery, stainless steel, 145kpa tube side, 1035kpa{g) shell side | 2 | EA |
| 01.02 | Pipe supports and miscellaneous fittings - Pipe supports as per detail on drg. NK38-DRAW-38008-10001-0001 to 0231, drg. NK38-DRAW-38008-10088 | 386 | EA |
| | - 1" carbon steel pipe, schedule 80, bevelled ends, up to 2 m spool piece | 3 | EA |
| | - 1 1/2" carbon steel pipe, schedule 80, bevelled ends, 2 m spool feeder pipe | 5 | EA |
| | - 1 1/2" carbon steel pipe, schedule 80, bevelled ends, 5 m spool feeder pipe | 1 | EA |
| | - 2" carbon steel pipe, schedule 80, bevelled ends, 2 m spool piece - 2" carbon steel pipe, schedule 80, bevelled ends, 5 m spool piece | 2 1 | EA EA |
| | - 2 1/2" carbon steel pipe, schedule 80, bevelled ends, 2 m spool feeder pipe | 1 | EA |
| | - 2 1/2" carbon steel pipe, schedule 80, bevelled ends, 5 m spool feeder pipe | 1 | EA |
| | - 3" carbon steel pipe, schedule 80, bevelled ends, 2 m spool piece | 3 | EA |
| | - 3" carbon steel pipe, schedule 80, bevelled ends, | 22 | m |
| | - 4" carbon steel pipe, schedule 80, 2 m spool feeder pipe | 1 | EA |
| 01.03 | West annex PHT pump suction piping | 2 | FΔ |
| | - 1/2" ø stainless steel pipe, schedule 40, up to 4 m spool, class 6 | 1 | EA |
| | - 1" ø stainless steel pipe, schedule 40, 1 m spool, class 6 | 1 | EA |
| | - 1 1/2" ø stainless steel pipe, schedule 40, 4 m spool, class 6 | 1 | EA |
| | - 2" to 3/4" ø stainless steel weldolet pipe, schedule 40, allow 2 m spool | 1 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|--------------------------|---|--|---|
| 01 | PHT and Moderator D2O Systems (Cont'd) | | |
| Item Ref. 01 01.03 | Item Description PHT and Moderator D2O Systems (Cont'd) Stainless steel pipe, schedule 40, class 6 3 1/2" ø, stainless steel pipe, schedule 40, class 6 4" ø stainless steel pipe, schedule 40, class 6 Adapter, tube to pipe, 3/4" ø to 3/8" tube, class 6 Adapter, tube to pipe, 3/4" ø to 3/8" tube, class 6 Cap, 1/2" ø stainless steel Elbow, 1" ø stainless steel, 90 deg., class 6 Elbow, 1" ø stainless steel, 90 deg., class 6 Elbow, 3 1/2" ø stainless steel, 90 deg., class 6 Elbow, 3 1/2" ø stainless steel, 90 deg., class 6 Elbow, 3 1/2" ø stainless steel, 90 deg., class 6 Elbow, 3 1/2" ø stainless steel, 90 deg., class 6 Elbow, 3 1/2" ø stainless steel, 90 deg., class 6 Elbow, 3 1/2" ø stainless steel, 90 deg., class 6 Elbow, 31/2" ø stainless steel, concentric, class 6 Flange c/w gasket & studs, 4" stainless steel, weld neck, class 6 Flange c/w gasket & studs, 4" stainless steel, class 6 Reducer, 4" to 3 1/2" to 3" stainless steel, class 6 Reducer, 4" to 3 1/2" ø stainless steel, class 6 Tee, reducing 4" to 31/2" stainless st | Quantity 12 38 8 1 1 8 1 5 10 26 9 2 4 8 2 7 1 2 1 2 1 1 1 1 1 8 8 2 2 7 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 2 1 1 2 1 2 1 2 1 2 1 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 1 2 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 1 2 1 1 1 1 1 8 8 2 8 2 8 8 2 8 8 8 8 2 8 8 8 8 8 8 8 8 8 8 8 8 8 | Unit m m EA EA EA EA EA EA EA EA EA EA EA EA EA E |
| | Globe valve, 4" ø, stainless steel, class 6 Strainer valve, 4" ø, stainless steel, class 6 Connection to pump, class 6 Connection to tank, class 6 | 2 1 2 8 | EA EA EA |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 01 | PHT and Moderator D2O Systems (Cont'd) | | |
| 01.04 | West annex PHT pump discharge piping | | |
| | - 3/8" ø stainless steel, schedule 40, class 6 | - | m |
| | - 1/2" ø stainless steel, schedule 40, class 6 | 65 | m |
| | - 2" ø stainless steel, schedule 40, 3 m spool, class 3 | 1 | EA |
| | - 3/4" ø stainless steel, schedule 40, class 6 | 143 | m |
| | - 1" ø stainless steel, schedule 40, class 6 | 116 | m |
| | - 1 1/2" ø stainless steel, schedule 40, 5 m spool, class 6 | 1 | EA |
| | - 2" ø stainless steel, schedule 40, 2 m spool, class 6 | 2 | EA |
| | - 2" ø, stainless steel pipe, schedule 40, class 6 | 72 | m |
| | - 3" ø, stainless steel pipe, schedule 40, class 6 | 54 | m |
| | - adopter, 1/2" to 3/8" stainless steel, class 6 | 6 | EA |
| | - adopter, 3/4" to 3/8" stainless steel, class 6 | 2 | EA |
| | - Cap, 1/2" stainless steel, class 6 | 4 | EA |
| | - Cap, 3/4" stainless steel, class 6 | 6 | EA |
| | - Elbow, 1/2" ø stainless steel, 90 deg., class 6 | 3 | EA |
| | - Elbow, 3/4" ø stainless steel, 45 deg., class 6 | 8 | EA |
| | - Elbow, 3/4" ø stainless steel, 90 deg., class 6 | 41 | EA |
| | - Elbow, 1" ø stainless steel, 90 deg., class 6 | 23 | EA |
| | - Elbow, 2" ø stainless steel, 45 deg., class 6 | 2 | EA |
| | - Elbow, 2" ø stainless steel, 90 deg., class 6 | 25 | EA |
| | - Elbow, 3" ø stainless steel, 90 deg., class 6 | 13 | EA |
| | - Flange c/w gasket & studs, 1" stainless steel, weld neck, class 6 | 2 | EA |
| | - Flange c/w gasket & studs, 3/4" stainless steel, weld neck, class 6 | 2 | EA |
| | - Flange c/w gasket & studs, 1 1/2" stainless steel, weld neck, class 6 | 1 | EA |
| | - Flange c/w gasket & studs, 2" stainless steel, weld neck, class 3 | 2 | EA |
| | - Flange c/w gasket & studs, 2" stainless steel, weld neck, class 6 | 12 | EA |
| | - Flange c/w gasket & studs, 3" stainless steel, weld neck, class 6 | 4 | EA |
| | - orifice 2" stainless steel, class 6 | 2 | EA |
| | - Reducer, 3/4" to 1/2" ø stainless steel, concentric, class 6 | 4 | EA |
| | - Reducer, 1" to 3/4" ø stainless steel, concentric, class 6 | 3 | EA |
| | - Reducer, 2" to 1" ø stainless steel, concentric, class 6 | 1 | EA |
| | - Reducer, 3" to 2" ø stainless steel, concentric, class 6 | 3 | EA |
| | - Tee, 3/4" ø stainless steel, class 6 | 1 | EA |
| | - Tee, 3/4"x 3/4" x 1/2" ø stainless steel, class 6 | 4 | EA |
| | | | |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 01 | PHT and Moderator D2O Systems (Cont'd) | | |
| 01.04 | West annex PHT pump discharge piping (cont'd) | | |
| | - Tee, 1" ø stainless steel, class 6 | 5 | EA |
| | - Tee, 2 x 2 x 1" ø stainless steel, class 6 | 4 | EA |
| | - Tee, 2 x 2 x 1 1/2" ø stainless steel, class 6 | 2 | EA |
| | - Tee, 2" ø stainless steel, class 6 | 10 | EA |
| | - Tee, 3" ø stainless steel, class 6 | 2 | EA |
| | - Weldolet, 2" to 1/2" stainless steel, class 6 | 3 | EA |
| | - Weldolet, 2" to 3/4" stainless steel, class 6 | 5 | EA |
| | - Weldolet, 3" to 1/2" stainless steel, class 6 | 6 | EA |
| | - Weldolet, 2 1/" to 1/2" stainless steel, class 6 | 1 | EA |
| | - Weldolet, 3" to 3/4" stainless steel, class 6 | 3 | EA |
| | - Weldolet, 4" to 1/2" stainless steel, class 6 | - | EA |
| | - adopters, unions, nipples, orifices etc. up to 1 1/2" ø, allow as required, class 3 & 6 | 1 | LS |
| | - Ball valve, 1/2" ø, stainless steel, class 6 | 7 | EA |
| | - Ball valve, 3/4" ø, stainless steel, class 6 | 11 | EA |
| | - Check valve, 1" ø, stainless steel, class 6 | 1 | EA |
| | - Check valve, 2" ø, stainless steel, class 3 | 2 | EA |
| | - Check valve, 2" ø, stainless steel, class 6 | 4 | EA |
| | - Check valve, 3" ø, stainless steel, class 6 | 3 | EA |
| | - Diaphragm valve, 3/4" ø, stainless steel, class 6 | 2 | EA |
| | - Diaphragm valve, 1" ø, stainless steel, class 6 | 2 | EA |
| | - Diaphragm valve, 2" ø, pneumatic, stainless steel, class 6 | 2 | EA |
| | - Diaphragm valve, 2" ø, stainless steel, class 3 | 2 | EA |
| | - Diaphragm valve, 2" ø, stainless steel, class 6 | 1 | EA |
| | - Globe valve, 1/2" ø, stainless steel, class 6 | 3 | EA |
| | - Globe valve, 3/4" ø, stainless steel, class 6 | 2 | EA |
| | - Globe valve, 2" ø, stainless steel, class 6 | 1 | EA |
| | - Globe valve, 3" ø | 2 | EA |
| | - Globe valve, 3" ø, pneumatic actuator, stainless steel, class 6 | 1 | EA |
| | - Relive valve, 3/4" ø, stainless steel, class 6 | 1 | EA |
| | - Relive valve, 1 1/2" ø, stainless steel, class 6 | 1 | EA |
| | - Needle valve, 3/8" ø, stainless steel, class 6 | - | EA |
| | - Flow indicator gauge, 3/4" ø, stainless steel, class 6 | 1 | EA |
| | - Connection to pump, class 6 | 2 | EA |
| | | | |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|--------------------|--|--|---|
| 01 | PHT and Moderator D2O Systems (Cont'd) | | |
| 01 01.05 | PHT and Moderator D2O Systems (Cont'd) West annex PHT tank inlet and vent piping 1/2" ø stainless steel, schedule 40, 1 m spool, class 6 1/2" ø stainless steel, schedule 40, 2 m spool, class 6 3/4" ø stainless steel, schedule 40, 2 m spool, class 6 2" ø, stainless steel pipe, schedule 40, class 3 2" ø, stainless steel, pipe, schedule 40, class 6 3" ø, stainless steel, pipe, schedule 40, class 6 2 Cap, 1/2" ø stainless steel, class 6 Cap, 1/2" ø stainless steel, class 6 Elbow, 1/2" ø stainless steel, class 6 Elbow, 1/2" ø stainless steel, old se Elbow, 2" ø stainless steel, 90 deg., class 6 Elbow, 2" ø stainless steel, 90 deg., class 6 Elbow, 3/4" ø stainless steel, 90 deg., class 6 Elbow, 3/4" ø stainless steel, 90 deg., class 3 Elbow, 3" ø stainless steel, 90 deg., class 3 Flange c/w gasket & studs, 2" stainless steel, weld neck, class 6 Flange c/w gasket & studs, 3" stainless steel, weld neck, class 3 Tee, 2" ø stainless steel, class 6 Weldolet, 2" to 1/2" ø stainless steel, class 6 Weldolet, 2" to 1/2" ø stainless steel, class 6 adopters, unions, nipples, orifices' etc. up to 1 1/2" ø, allow as required, class 6 Ball valve, 1/2" ø, stainless steel, class 6 Globe valve, 1/2" ø, stainless steel, class 6 Globe valve, 1/2" ø, stainless steel, class 6 Globe valve, 1/2" ø, stainless steel, class 6 Relive valve, 2" ø, stainless steel, class 6 Clobe valve, 2" ø, stainless steel, class 6 Clobe valve, 2" ø, stainless steel, class 6 Relive valve, 2" ø, stainless steel, class 6 Clobe valve, 2" ø, stainless steel, class 6 Clobe valve, 2" ø, stainless steel, class 6 Clobe valve, 2" ø, stainless steel, class 6 | $ \begin{array}{c} 1\\ 1\\ 1\\ 1\\ 1\\ 52\\ 114\\ 40\\ 1\\ 1\\ 10\\ 1\\ 8\\ 20\\ 15\\ 31\\ 2\\ 7\\ 3\\ 1\\ 16\\ 4\\ 2\\ 1\\ 1\\ 16\\ 4\\ 2\\ 1\\ 1\\ 2\\ 8\\ 1\\ 8\\ 1\\ 2 \end{array} $ | EA EA M M M M A A A A A A A A A A A A A |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|---|---|
| 01 | PHT and Moderator D2O Systems (Cont'd) | | |
| 01.06 | West annex mod pump suction piping - 3/4" ø stainless steel, schedule 40, 3 m spool, class 6 - 2 1/2" ø, stainless steel pipe, schedule 40, class 3 - adopter, 1/2" to 3/8" ø, stainless steel, class 3 - Elbow, 3/4" ø stainless steel, 90 deg., class 6 - Elbow, 2 1/2" ø stainless steel, 45 deg., class 3 - Elbow, 2 1/2" ø stainless steel, 90 deg., class 3 - Tee, 21/2x 2" ø stainless steel, class 3 - Tee, 21/2x 0 ø stainless steel, class 3 - Tee, 21/2" ø stainless steel, class 3 - Flange c/w gasket & studs, 2 1/2" stainless steel, weld neck, class 3 - Flange c/w gasket & studs, 2 1/2" stainless steel, weld neck, class 3 - Reducer, 2 1/2" to 2" stainless steel, concentric, class 3 - Reducer, 3" to 2 1/2" stainless steel, class 6 - Threaded cap, 1" ø stainless steel, class 3 - Weldolet 2 1/2" to 3/4" ø, stainless steel, class 3 - Weldolet 2 1/2" to 1/2" stainless steel, class 3 - Weldolet 2 1/2" to 1/2" stainless steel, class 3 - Weldolet 2 1/2" to 1/2" stainless steel, class 3 - Weldolet 2 1/2" to 1/2" stainless steel, class 3 - Weldolet 2 1/2" to 1/2" stainless steel, class 3 - Weldolet 2 1/2" to 1/2" stainless steel, class 3 - Weldolet 2 1/2" to 1/2" stainless steel, class 3 - Weldolet 2 1/2" to 1/2" stainless steel, class 3 - Weldolet 2 1/2" to 1/2" stainless steel, class 3 - Weldolet 2 1/2" to 1/2" stainless steel, class 3 - Weldolet 2 1/2" to 1/2" stainless steel, class 3 - Weldolet 2 1/2" to 1/2" stainless steel, class 3 - Weldolet 2 1/2" to 1/2" stainless steel, class 3 - Weldolet 2 1/2" to 1/2" stainless steel, class 3 - Weldolet 2 1/2" to 1/2" stainless steel, class 3 - Weldolet 2 1/2" to 1/2" stainless steel, class 3 - Weldolet 2 1/2" to 1/2" stainless steel, class 3 - Weldolet 2 1/2" to 1/2" stainless steel, class 6 | 2 37 1 8 13 19 1 7 4 2 2 7 1 1 1 1 1 1 | EA M EA EA EA EA EA EA EA EA EA EA EA |
| | Adopters, unions, nipples, orifices etc. up to 1 1/2" ø, allow as required, class 3 Ball valve, 3/4" ø, stainless steel, class 6 Ball valve, 1" ø, stainless steel, class 6 Diaphragm valve, 2 1/2" ø, stainless steel, class 3 Globe valve, 3/4" ø, stainless steel, class 6 Connection to pump, class 3 Connection to tank | 1 7 1 9 7 2 7 | LS EA EA EA EA EA |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 01 | PHT and Moderator D2O Systems (Cont'd) | | |
| 01 07 | West annex mod pump discharge piping | | |
| 01107 | - 1/2" ø stainless steel, schedule 40, up to 5 m spool, class 6 | 5 | EA |
| | - 1/2" ø, stainless steel pipe, schedule 40, class 6 | 33 | m |
| | - 3/4" ø stainless steel, schedule 40, up to 5 m spool, class 6 | 1 | EA |
| | - 3/4" ø. stainless steel pipe, schedule 40. class 6 | 129 | m |
| | - 1" ø, stainless steel pipe, schedule 40, class 3 | 78 | m |
| | - 1" ø, stainless steel pipe, schedule 40, class 6 | 48 | m |
| | - 1 1/2" ø. stainless steel pipe, schedule 40, class 3 | 72 | m |
| | - 2" ø stainless steel, schedule 40, 5 m spool, class 6 | 1 | EA |
| | - 2" ø, stainless steel pipe, schedule 40, class 3 | 196 | m |
| | - 2" ø, stainless steel pipe, schedule 40, class 6 | 12 | m |
| | - Cap. 1/2" ø stainless steel, class 6 | 9 | EA |
| | - Cap, 3/4" ø stainless steel, class 6 | 9 | EA |
| | - Elbow, 1/2" ø stainless steel, 90 deg., class 6 | 21 | EA |
| | - Elbow, 3/4" ø stainless steel, 45 deg., class 6 | 8 | EA |
| | - Elbow, 3/4" ø stainless steel, 90 deg., class 6 | 43 | EA |
| | - Elbow,1" ø stainless steel, 90 deg., class 3 | 17 | EA |
| | - Elbow,1" ø stainless steel, 90 deg., class 6 | 11 | EA |
| | - Elbow, 1 1/2" ø stainless steel, 90 deg., class 3 | 16 | EA |
| | - Elbow, 2" ø stainless steel, 45 deg., class 3 | 1 | EA |
| | - Elbow, 2" ø stainless steel, 45 deg., class 6 | 1 | EA |
| | - Elbow, 2" ø stainless steel, 90 deg., class 3 | 16 | EA |
| | - Elbow, 2" ø stainless steel, 90 deg., class 6 | 44 | EA |
| | - Flange c/w gasket & studs, 1" stainless steel, weld neck, class 6 | 2 | EA |
| | - Flange c/w gasket & studs, 3/4" stainless steel, weld neck, class 6 | 2 | EA |
| | - Flange c/w gasket & studs, 1 1/2" stainless steel, weld neck, class 3 | 3 | EA |
| | - Flange c/w gasket & studs, 2" stainless steel, weld neck, class 3 | 14 | EA |
| | - Flange c/w gasket & studs, 2" stainless steel, weld neck, class 6 | 1 | EA |
| | - Flange c/w gasket & studs, 2" stainless steel, spectacle, class 3 | 1 | EA |
| | - Orifice. 2" ø. stainless steel. class 6 | 1 | EA |
| | - Reducer, 3/4 " to 1/2" ø, stainless steel, concentric, class 6 | 6 | EA |
| | - Reducer, 1 " to 3/4" ø, stainless steel, concentric, class 6 | 2 | EA |
| | - Reducer, 1 1/2 " to 1" ø, stainless steel, concentric, class 6 | 1 | EA |
| | - Reducer, 2 " to 1" ø, stainless steel, concentric. class 6 | 1 | EA |
| | , | | |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|----------|
| 01 | PHT and Moderator D2O Systems (Cont'd) | | |
| 01.07 | West annex mod pump discharge piping (cont'd) | 0 | |
| | - Reducer, 2 to 1 1/2 Ø stallless steel, concentric, class 5 | 2 | |
| | - Tee, $3/4$ x1/2 \emptyset , statiliess steel, class o | 1 | |
| | -1ec, $3/4$ b , stainless steel, class 0 | 3 | |
| | - Tee, $1 \neq 3$ called steel, class 0 | 3 | EA |
| | - Tee, $1 \times 1/2$ " stainless steel, class 3 | 1 | ΕA |
| | - Tee, $1 \frac{1}{2} \times 1 \frac{1}{2} \times \frac{3}{4}$ estainless steel class 6 | 1 | ΕΔ |
| | - Tee, 2 x 2 x 1" a stainless steel, class 6 | 2 | ΕA |
| | $-$ Tee, 2 x 2 x 1 $\frac{1}{2}$ a stainless steel, class 3 | 2 | ΕA |
| | - Tee, $2 \times 2 \times 1 \times 1/2^{\circ}$ ø stainless steel, class 6 | 2 | ΕA |
| | - Tee 2" a stainless steel class 3 | 10 | ΕΛ ΕΔ |
| | - Tee 2" ø stainless steel, class 6 | 10 | ΕΛ ΕΔ |
| | - Weldolet 1" to 3/4" stainless steel, class 1 | 1 | EA |
| | - Weldolet 1 1/2" to 1/2" stainless steel class 3 | 1 | FA |
| | - Weldolet 2" to 3/4" stainless steel, class 3 | 11 | FA |
| | - Weldolet 2" to 1/2" stainless steel, class 3 | 7 | FA |
| | - Weldolet 2" to 1/2" stainless steel, class 6 | 3 | FA |
| | - Weldolet 2 1/2" to 1/2" stainless steel, class 3 | 1 | EA |
| | - Adopters, unions, nipples, orifices etc. up to 1 1/2" ø, allow as required, class 6 | 1 | LS |
| | - Ball valve, 1/2" ø, stainless steel, class 6 | 6 | EA |
| | - Ball valve, 3/4" ø, stainless steel, class 6 | 12 | EA |
| | - Relief valve, 3/4" ø, stainless steel, class 6 | 1 | EA |
| | - Relief valve, 1 1/2" ø, stainless steel, class 3 | 1 | EA |
| | - Check valve, 1" ø, stainless steel, class 3 | 1 | EA |
| | - Check valve, 1 1/2" ø, stainless steel, class 3 | 1 | EA |
| | - Check valve, 2" ø, stainless steel, class 3 | 10 | EA |
| | - Diaphragm valve, 3/4" ø, stainless steel, class 6 | 2 | EA |
| | - Diaphragm valve, 1" ø, stainless steel, class 6 | 1 | EA |
| | - Diaphragm valve, 1 /2" ø, stainless steel, class 3 | 1 | EA |
| | - Diaphragm valve, 2" ø, stainless steel, class 3 | 8 | EA |
| | - Diaphragm (pneumatic) valve, 2" ø, stainless steel, class 3 | 4 | EA |
| | - Globe valve, 1/2" ø, stainless steel, class 6 | 3 | EA |
| | - Globe valve, 3/4" ø, stainless steel, class 6 | 2 | EA |
| | - Flow indicator gauge, 3/4" ø, stainless steel, class 6 | 1 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 01 | PHT and Moderator D2O Systems (Cont'd) | | |
| 01 08 | west annex mod tank inlet and vent piping | | |
| 01.00 | - 1/2" ø stainless steel, schedule 40, up to 5 m spool, class 6 | 1 | EA |
| | - 1/2" ø stainless steel, schedule 40, up to 5 m spool, class 6 | 1 | EA |
| | - 3/4" ø stainless steel, schedule 40, up to 5 m spool, class 6 | 1 | EA |
| | - 3/4" ø, stainless steel pipe, schedule 40, class 6 | 10 | m |
| | - 1 1/2" ø, stainless steel pipe, schedule 40, class 3 | 62 | m |
| | - 2" ø, stainless steel pipe, schedule 40, class 3 | 160 | m |
| | - 3" ø, stainless steel pipe, schedule 40, class 3 | 22 | m |
| | - Cap, 1/2" ø stainless steel, class 3 | 2 | EA |
| | - Cap, 3/4" ø stainless steel, class 6 | 1 | EA |
| | - Cap, 2" ø stainless steel, class 3 | 8 | EA |
| | - Elbow, 1/2" ø stainless steel, 90 deg., class 6 | 1 | EA |
| | - Elbow, 3/4" ø stainless steel, 90 deg., class 6 | 8 | EA |
| | - Elbow, 1 1/2" ø stainless steel, 45 deg., class 3 | 27 | EA |
| | - Elbow, 1 1/2" ø stainless steel, 90 deg., class 3 | 3 | EA |
| | - Elbow, 2" ø stainless steel, 45 deg., class 3 | 32 | EA |
| | - Elbow, 2" ø stainless steel, 90 deg., class 3 | 36 | EA |
| | - Elbow, 3" ø stainless steel, 45 deg., class 3 | 1 | EA |
| | - Elbow, 3" ø stainless steel, 90 deg., class 3 | 6 | EA |
| | - Flange c/w gasket & studs, 2" stainless steel, weld neck, class 3 | 2 | EA |
| | - Flange c/w gasket & studs, 3" stainless steel, weld neck, class 3 | 1 | EA |
| | - Adopters, unions, nipples, orifices etc. up to 1 1/2" ø, allow as required, class 3 | 1 | LS |
| 01.09 | west annex vapour recovery piping | | |
| | - 1/2" ø stainless steel, schedule 40, up to 5 m spool, class 6 | 3 | EA |
| | - 3/4" ø stainless steel, schedule 40, up to 5 m spool, class 6 | 1 | EA |
| | - 2" ø stainless steel, schedule 40, class 3 | 60 | m |
| | - 2" ø, stainless steel pipe, schedule 40, class 6 | 80 | m |
| | - Cap, 3/4" ø stainless steel, class 6 | 1 | EA |
| | - Elbow, 3/4" ø stainless steel, 45 deg., class 6 | 1 | EA |
| | - Elbow, 2" ø stainless steel, 90 deg., class 3 | 19 | EA |
| | - Elbow, 2" ø stainless steel, 90 deg., class 6 | 53 | EA |
| | - Flange c/w gasket & studs, 1" stainless steel, weld neck, class 6 | 4 | EA |
| | - Flange c/w gasket & studs, 1 1/2" stainless steel, weld neck, class 6 | 4 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 01 | PHT and Moderator D2O Systems (Cont'd) | | |
| 01.09 | west annex vapour recovery piping (cont'd) - Flange, c/w gasket & studs, 2" stainless steel, weld neck, class 6 | 47 | FA |
| | - Flange c/w gasket & studs, 2" stainless steel, weld neck, class 3 | 4 | FA |
| | - Reducer, 2 " to 1" stainless steel, concentric, class 6 | 12 | EA |
| | - Tee, 2 x 2 x 1 1/2" ø stainless steel, class 6 | 4 | EA |
| | - Tee, 2" ø stainless steel, class 3 | 4 | EA |
| | - Tee, 2" ø stainless steel, class 6 | 16 | EA |
| | - Weldolet 2" to 1/2" stainless steel, class 6 | 4 | EA |
| | - Weldolet 2" to 3/4" stainless steel, class 6 | 1 | EA |
| | - Ball valve, 3/4" ø, stainless steel, class 6 | 1 | EA |
| | - Air release valve, 2" ø, stainless steel, class 6 | 1 | EA |
| | - Relief valve, 2" ø, stainless steel, class 3 | 3 | EA |
| | - Relief valve, 2" ø, stainless steel, class 6 | 4 | EA |
| | - regulating valve, 3/4" ø, stainless steel, class 6 | 4 | EA |
| | - regulating valve, 1" ø, stainless steel, class 6 | 2 | EA |
| | - Check valve, 2" ø, stainless steel, class 3 | 3 | EA |
| | - Check valve, 2" ø, stainless steel, class 6 | 3 | EA |
| | - Diaphragm valve, 2" ø, stainless steel, class 3 | 6 | EA |
| | - Diaphragm valve, 2" ø, stainless steel, class 6 | 20 | EA |
| | - Globe valve, 1/2" ø, stainless steel, class 6 | 4 | EA |
| 01.10 | west annex vapour recovery drain piping | | |
| | - 3/4" ø, stainless steel pipe, schedule 40, class 6 | 45 | m |
| | - 1" ø, stainless steel pipe, schedule 40, class 3 | 37 | m |
| | - 1 1/2" ø, stainless steel pipe, schedule 40 | | m |
| | - Elbow, 3/4" ø stainless steel, 45 deg., class 6 | 2 | EA |
| | - Elbow, 3/4" ø stainless steel, 90 deg., class 6 | 13 | EA |
| | - Elbow,1" ø stainless steel, 90 deg., class 3 | 17 | EA |
| | - Flange c/w gasket & studs, 1" stainless steel, weld neck, class 3 | 2 | EA |
| | - Reducer, 1 " to 3/4" stainless steel, concentric, class 3 | 2 | EA |
| | - Tee,1" ø stainless steel, class 3 | 2 | EA |
| | - Tee, 1 x 1 x 3/4" ø stainless steel, class 3 | 1 | EA |
| | - adopters, unions, nipples, orifices etc. up to 1 1/2" ø, allow as required | 1 | LS |
| | - Diaphragm valve, 1" ø, stainless steel, class 3 | 3 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Description | Quantity | Unit |
|--|--|---|
| PHT and Moderator D2O Systems (Cont'd) | | |
| <pre>west annex 87 m el. tie in piping - 1/2" ø, stainless steel pipe, schedule 40, class 6 - 3/4" ø stainless steel, schedule 40, up to 5 m spool, class 6 - 2" ø stainless steel, schedule 40, class 3 - 2" ø, stainless steel pipe, schedule 40, class 6 - 3" ø, stainless steel pipe, schedule 40, class 6 - Cap, 1/2" ø stainless steel, class 6 - Cap, 3/4" ø stainless steel, class 6 - Cap, 3/4" ø stainless steel, class 6 - Elbow, 1/2" ø stainless steel, 90 deg., class 6 - Elbow, 1 1/2" ø stainless steel, 90 deg., class 6 - Elbow, 2" ø stainless steel, 90 deg., class 3 - Elbow, 2" ø stainless steel, 90 deg., class 3 - Elbow, 2" ø stainless steel, 90 deg., class 6 - Elbow, 3" ø stainless steel, 90 deg., class 6 - Elbow, 3" ø stainless steel, 90 deg., class 6 - Elbow, 3" ø stainless steel, 90 deg., class 3 - Elbow, 3" ø stainless steel, 90 deg., class 3 - Elbow, 3" ø stainless steel, 90 deg., class 3 - Elbow, 3" ø stainless steel, 90 deg., class 3 - Weldolet 2" to 1/2" stainless steel, concentric, class 6 - Weldolet 2" to 1/2" stainless steel, class 3 - Weldolet 3" to 1/2" stainless steel, class 3 - Weldolet 3" to 1/2" stainless steel, class 3 - Weldolet 3" to 3/4" stainless steel, class 3 - Weldolet 3" to 3/4" stainless steel, class 3 - Tee, 2" ø stainless steel, class 3 - Tee, 2" ø stainless steel, class 3 - adopters, unions, nipples, orifices etc. up to 1 1/2" ø, allow as required</pre> | 20 1 73 37 34 8 4 20 41 2 25 10 2 10 2 10 1 6 3 2 10 1 1 1 1 | m EA m m EA EA EA EA EA EA EA EA EA EA EA EA EA |
| - Ball valve, 1/2" ø, stainless steel, class 6 - Ball valve, 3/4" ø, stainless steel, class 6 | 8 4 | EA EA |
| west annex tunnel and 94 m el. tie in piping 1/2" ø, stainless steel pipe, schedule 40, class 6 3/4" ø stainless steel, schedule 40, up to 5 m spool, class 6 1" ø, stainless steel pipe, schedule 40, class 3 1" ø, stainless steel pipe, schedule 40, class 6 1 1/2" ø, stainless steel pipe, schedule 40, class 3 2" ø stainless steel, schedule 40, class 3 3" ø, stainless steel pipe, schedule 40, class 6 3" ø, stainless steel pipe, schedule 40, class 3 | 49 1 37 35 163 278 20 287 | m EA m m m m m |
| | Item Description Prove the series of the se | Item DescriptionQuantityPHT and Moderator D2O Systems (Cont'd)west annex 87 m el. tie in piping-1/2" ø, stainless steel pipe, schedule 40, class 63/4" ø stainless steel pipe, schedule 40, class 62" ø, stainless steel pipe, schedule 40, class 63" ø, stainless steel pipe, schedule 40, class 63" ø, stainless steel pipe, schedule 40, class 63" ø, stainless steel pipe, schedule 40, class 62" ø, stainless steel, pipe, schedule 40, class 62" ø, stainless steel, pipe, schedule 40, class 62" ø, stainless steel, pipe, schedule 40, class 62" ø, stainless steel, pipe, schedule 40, class 62" ø, stainless steel, pipe, schedule 40, class 62" ø stainless steel, oldeg, class 6Elbow, 1/2" ø stainless steel, 90 deg, class 6Elbow, 2" ø stainless steel, 90 deg, class 6Elbow, 2" ø stainless steel, 90 deg, class 6Elbow, 3" ø stainless steel, 90 deg, class 610Elbow, 3" ø stainless steel, 90 deg, class 611Weldolet 2" to 1/2" stainless steel, class 32Weldolet 2" to 1/2" stainless steel, class 32Weldolet 2" to 1/2" stainless steel, class 33Weldolet 3" to 1/2" ø, stainless steel, class 634Weldolet 3" to 1/2" ø, stainless steel, class 634Weldolet 3" to 1/2" ø, stainless steel, class 641Ball valve, 1/2" ø, stainless steel, class 6334412" ø, stainless steel pipe, schedule 40, |
ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 01 | PHT and Moderator D2O Systems (Cont'd) | | |
| 01.12 | west annex tunnel and 94 m el. tie in piping (cont'd) | | |
| | - 3" ø, stainless steel pipe, schedule 40, class 6 | 21 | m |
| | - Cap, 1/2" ø stainless steel, class 6 | 24 | EA |
| | - Cap, 3/4" ø stainless steel, class 6 | 1 | EA |
| | - Elbow, 1/2" ø stainless steel, 45 deg., class 6 | 19 | EA |
| | - Elbow, 1/2" ø stainless steel, 90 deg., class 6 | 42 | EA |
| | - Elbow, 3/4" ø stainless steel, 90 deg., class 6 | 5 | EA |
| | - Elbow,1" ø stainless steel, 45 deg., class 3 | 3 | EA |
| | - Elbow,1" ø stainless steel, 45 deg., class 6 | 4 | EA |
| | - Elbow,1" ø stainless steel, 90 deg., class 3 | 11 | EA |
| | - Elbow,1" ø stainless steel, 90 deg., class 6 | 9 | EA |
| | - Elbow, 1 1/2" ø stainless steel, 45 deg., class 3 | 25 | EA |
| | - Elbow, 1 1/2" ø stainless steel, 90 deg. class 3 | 60 | EA |
| | - Elbow, 2" ø stainless steel, 45 deg., class 3 | 23 | EA |
| | - Elbow, 2" ø stainless steel, 45 deg., class 6 | 3 | EA |
| | - Elbow, 2" ø stainless steel, 90 deg., class 3 | 96 | EA |
| | - Elbow, 2" ø stainless steel, 90 deg., class 6 | 4 | EA |
| | - Elbow, 3" ø stainless steel, 45 deg., class 6 | 3 | EA |
| | - Elbow, 3" ø stainless steel, 45 deg., class 3 | 28 | EA |
| | - Elbow, 3" ø stainless steel, 90 deg., class 3 | 93 | EA |
| | - Elbow, 3" ø stainless steel, 90 deg., class 6 | 6 | EA |
| | - Reducer, 1" to 1/2" ø stainless steel, concentric, class 3 | 1 | EA |
| | - Reducer, 1 " to 1/2" ø stainless steel, concentric, class 6 | 1 | EA |
| | - Reducer, 1 1/2 " to 1" ø stainless steel, concentric, class 3 | 1 | EA |
| | - Reducer, 3 " to 1 1/2" ø stainless steel, concentric, class 3 | 1 | EA |
| | - Reducer, 3" to 2"ø stainless steel, concentric, class 3 | 2 | EA |
| | - Tee,1" ø stainless steel, class 3 | 1 | EA |
| | - Tee,1" ø stainless steel, class 6 | 1 | EA |
| | - Tee, 1 1/2 " ø stainless steel, class 3 | 6 | EA |
| | - Tee, 2" ø stainless steel, class 3 | 1 | EA |
| | - Tee, 3"x1" ø stainless steel, class 3 | 1 | EA |
| | - Weldolet, 1 1/2" to 1/2" stainless steel, class 3 | 12 | EA |
| | - Weldolet, 1 1/2" to 3/4" stainless steel, class 3 | 3 | EA |
| | - Weldolet, 2" to 1/2" stainless steel, class 3 | 5 | EA |
| | - Weldolet, 2" to 1/2" stainless steel, class 6 | 1 | EA |
| | - Weldolet, 2" to 1/2" stainless steel, class 3 | 2 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 01 | PHT and Moderator D2O Systems (Cont'd) | | |
| 01.12 | west annex tunnel and 94 m el. tie in piping (cont'd) | | |
| | - Weldolet, 2" to 3/4" stainless steel, class 3 | 1 | EA |
| | - Weldolet, 3" to 1/2" stainless steel, class 3 | 9 | EA |
| | - Weldolet, 3" to 1/2" stainless steel, class 6 | 1 | EA |
| | - Weldolet, 3" to 3/4" stainless steel, class 3 | 1 | EA |
| | - Adopters, unions, nipples, orifices etc. up to 1 1/2" ø, allow as required | 1 | LS |
| | - Ball valve, 1/2" ø, stainless steel, class 6 | 6 | EA |
| | - Ball valve, 3/4" ø, stainless steel, class 6 | 1 | EA |
| | - Diaphragm valve, 1 1 /2" dia, stainless steel | 1 | EA |
| 01.13 | west annex 100m el. tie in piping | | |
| | - 1/2" ø, stainless steel pipe, schedule 40, class 6 | 35 | m |
| | - 1" ø, stainless steel pipe, schedule 40, class 3 | 70 | m |
| | - 1" ø, stainless steel pipe, schedule 40, class 6 | 74 | m |
| | - 1 1/2" ø, stainless steel pipe, schedule 40, class 3 | 107 | m |
| | - 2" ø stainless steel, schedule 40, class 3 | 112 | m |
| | - 3" ø, stainless steel pipe, schedule 40, class 3 | 71 | m |
| | - Cap, 1/2" ø stainless steel, class 6 | 8 | EA |
| | - Elbow, 1/2" ø stainless steel, 90 deg., class 6 | 15 | EA |
| | - Elbow,1" ø stainless steel, 45 deg., class 6 | 3 | EA |
| | - Elbow,1" ø stainless steel, 90 deg., class 3 | 22 | EA |
| | - Elbow,1" ø stainless steel, 90 deg., class 6 | 17 | EA |
| | - Elbow, 1 1/2" ø stainless steel, 45 deg., class 3 | 5 | EA |
| | - Elbow, 2" ø stainless steel, 90 deg., class 3 | 19 | EA |
| | - Elbow, 3" ø stainless steel, 90 deg., class 3 | 31 | EA |
| | - Reducer, 1 1/2 " to 1" stainless steel, concentric, class 3 | 1 | EA |
| | - Reducer, 2 " to 1 1/2" stainless steel, concentric, class 3 | 1 | EA |
| | - Reducer, 3 " to 1 1/2" stainless steel, concentric, class 3 | 2 | EA |
| | - Tee, 1 x 1 x 1/2" ø stainless steel, class 3 | 2 | EA |
| | - Tee, 1 1/2 " ø stainless steel, class 3 | 1 | EA |
| | - Weldolet, 1 1/2" to 1/2" stainless steel, class 3 | 3 | EA |
| | - Weldolet, 1 1/2" to 3/4" stainless steel, class 3 | | EA |
| | - Weldolet, 2" to 1/2" stainless steel, class 3 | 1 | EA |
| | - Weldolet, 3" to 1/2" stainless steel, class 3 | 2 | EA |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|----------|
| 01 | PHT and Moderator D2O Systems (Cont'd) | | |
| 01.13 | west annex 100m el. tie in piping (cont'd) | | |
| | - adopters, unions, nipples, orifices etc. up to 1 1/2" ø, allow as required | 1 | LS |
| | - Ball valve, 1/2" ø, stainless steel, class 6 | 7 | EA |
| 01.14 | sampling panel (cabinet) 63811-pl10115, west annex hwmb -3/8" ø stainless steel, schedule 40, up to 5 m spool, class 6 | 40 | m |
| | - adopters, unions, nipples, orifices, o ring etc. up to 3/8" ø, allow as required | 1 | LS |
| | - Ball valve, 3/8" ø, stainless steel, class 6 | 10 | EA |
| | - Ball valve, 3/8" ø, 3 way stainless steel, class 6 | 7 | EA |
| | - Needle valve, 3/8" ø, stainless steel, class 6 | 7 | EA |
| | - flow indicating meter, 1/4" ø, stainless steel, class 6 | 1 | EA |
| | - hypodemic sampling station, 3/8 tube Connections, stainless steel |) 1 | ΕA FΔ |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|---|--|
| 02 | TRF Feed Product System | | |
| 02.01 | Equipment, tanks and pumps - Pumps P13/14, trf product pump, 5 l/s @ 30 m head c/w VFD - Pumps P15/16, trf feed pump, 5 l/s @ 38 m head c/w VFD - Tank skid TK-29 to 32, TRF feed & product tanks, D2O storage, 100 m3, class | 2 2 4 | EA EA EA |
| 02.02 | Pipe Supports Pipe supports as per detail on drg. NK38-DRAW-38008-10001- 0018/0049/0053/0054/0223/0225/0226/0232 to 0241/0243/0244/02450246/0248/0249/0250/0309/0310 1 1/2" carbon steel pipe, schedule 80, bevelled ends, up to 5 m spool pipe 2" carbon steel pipe, schedule 80, bevelled ends 2 1/2" carbon steel pipe, schedule 80, bevelled ends | 70 1 7 | EA EA m |
| | - 2 1/2 Carbon steel pipe, schedule 80, bevelled ends, up to 5 m spool piece - 3" carbon steel pipe, schedule 80, bevelled ends, up to 5 m spool piece | 1 | EA |
| 02.03 | West annex TRF pump suction / discharge piping - 3/8" ø stainless steel, class 6 - 3/8" ø stainless steel, schedule 40, up to 5 m spool, class 6 - 1/2" ø, stainless steel pipe, schedule 40, class 6 - 1/2" ø stainless steel, schedule 40, up to 5 m spool, class 6 - 3/4" ø stainless steel, schedule 40, up to 5 m spool, class 3 - 3/4" ø stainless steel, schedule 40, up to 5 m spool, class 6 - 3/4" ø stainless steel, schedule 80, up to 5 m spool, class 6 - 3/4" ø stainless steel, schedule 80, up to 5 m spool, class 6 - 3/4" ø stainless steel, schedule 40, up to 5 m spool, class 6 - 3/4" ø, stainless steel, schedule 40, up to 5 m spool, class 3 - 1" ø, stainless steel pipe, schedule 40, class 6 - 1 nø, stainless steel pipe, schedule 40, class 3 - 1" ø, stainless steel pipe, schedule 40, up to 5 m spool, class 3 - 1 nø, stainless steel pipe, schedule 40, up to 5 m spool, class 3 - 1 n/2" ø stainless steel pipe, schedule 40, up to 5 m spool, class 3 - 2" ø carbon steel, schedule 40, up to 5 m spool, class 3 - 2" ø stainless steel pipe, schedule 40, class 3 - 2" ø stainless steel pipe, schedule 40, class 3 - 2" ø, stainless steel pipe, schedule 40, class 3 - 2" ø, stainless steel pipe, schedule 40, class 3 - 2" ø, stainless steel pipe, schedule 40, class 3 - 2" ø, stainless steel pipe, schedule 40, class 3 - 2" ø, stainless steel pipe, schedule 40, class 3 | 95 1 2 1 1 1 94 2 40 29 1 1 79 208 15 85 | m EA m EA EA EA m m EA EA m m m m m |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 02 | TRF Feed Product System (Cont'd) | | |
| 02.03 | West annex TRF pump suction / discharge piping (cont'd) | | |
| | - 3" ø, stainless steel pipe, schedule 40, class 3 | 98 | m |
| | - Cap, 3/8" ø stainless steel, class 6 | 6 | EA |
| | - Cap, 1/2" ø stainless steel, class 6 | 4 | EA |
| | - Cap,1" ø stainless steel, class 3 | 4 | EA |
| | - Elbow, 3/4" ø stainless steel, 90 deg., class 6 | 53 | EA |
| | - Elbow,1" ø stainless steel, 45 deg., class 6 | 2 | EA |
| | - Elbow,1" ø stainless steel, 90 deg., class 3 | 9 | EA |
| | - Elbow,1" ø stainless steel, 90 deg., class 6 | 18 | EA |
| | - Elbow, 1 1/2" ø stainless steel, 45 deg., class 3 | 4 | EA |
| | - Elbow, 1 1/2" ø stainless steel, 90 deg. class 3 | 14 | EA |
| | - Elbow, 2" ø stainless steel, 45 deg., class 3 | 8 | EA |
| | - Elbow, 2" ø stainless steel, 90 deg., class 3 | 88 | EA |
| | - Elbow, 2" ø stainless steel, 90 deg., class 6 | 2 | EA |
| | - Elbow, 2 1/2" ø stainless steel, 45 deg., class 3 | 3 | EA |
| | - Elbow, 2 1/2" ø stainless steel, 90 deg., class 3 | 15 | EA |
| | - Elbow, 3" ø stainless steel, 45 deg., class 3 | 3 | EA |
| | - Elbow, 3" ø stainless steel, 90 deg., class 3 | 31 | EA |
| | - Flange c/w gasket & studs, 3/4" stainless steel, weld neck, class 6 | 4 | EA |
| | - Flange c/w gasket & studs, 1" stainless steel, weld neck, class 6 | 4 | EA |
| | - Flange c/w gasket & studs, 1 1/2" stainless steel, weld neck, class 3 | 9 | EA |
| | - Flange c/w gasket & studs, 2" stainless steel, weld neck, class 3 | 20 | EA |
| | - Flange c/w gasket & studs, 2 1/2" stainless steel, weld neck, class 3 | 6 | EA |
| | - Flange c/w gasket & studs, 3" stainless steel, weld neck, class 3 | 3 | EA |
| | -Orifice, 1 1/2" ø-18 mm , stainless steel, class 3 | 1 | EA |
| | -Orifice, 2" ø-12.5 mm , stainless steel, class 3 | 2 | EA |
| | -Orifice, 2" ø-13.5 mm , stainless steel, class 3 | 1 | EA |
| | -Orifice, 2" ø-20 mm , stainless steel, class 6 | 1 | EA |
| | -Orifice, 2" ø-22 mm , stainless steel, class 3 | 1 | EA |
| | -Orifice, 2" ø-26 mm , stainless steel, class 3 | 1 | EA |
| | -Orifice, 2" ø-29 mm , stainless steel, class 3 | 1 | EA |
| | -Orifice, 2" ø-29 mm , stainless steel, class 6 | 1 | EA |
| | - Reducer, 3/4 " to 1/2" stainless steel, concentric, class 6 | 4 | EA |
| | - Reducer, 1 " to 3/4" stainless steel, concentric, class 6 | 4 | EA |
| | - Reducer, 2 " to 1" stainless steel, concentric, class 6 | 4 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|--------------------------|---|---|--|
| 02 | TRF Feed Product System (Cont'd) | | |
| Item Ref. 02 02.03 | Item Description TRF Feed Product System (Cont'd) West annex TRF pump suction / discharge piping (cont'd) - Reducer, 2 1/2 " to 2" stainless steel, concentric, class 3 - Reducer, 3" to 1 1/2" stainless steel, concentric, class 3 - Reducer, 3" to 2 1/2" stainless steel, concentric, class 3 - Reducer, 3" to 2 1/2" stainless steel, concentric, class 3 - strainer 2 1/2" stainless steel, class 6 (replace existing with flange section pipe) - Tee, 3/4" x1/2" ø stainless steel, class 6 - Tee, 1 x1 x 3/4" ø stainless steel, class 6 - Tee, 1 x1 x 3/4" ø stainless steel, class 3 - Tee, 1 x1 x 3/4" ø stainless steel, class 3 - Tee, 2 x 1 y ø stainless steel, class 3 - Tee, 2 x 1 y ø stainless steel, class 3 - Tee, 2 x 1 y ø stainless steel, class 3 - Tee, 2 x 1 y ø stainless steel, class 3 - Tee, 2 x 1 y ø stainless steel, class 3 - Tee, 2 x 1 y ø stainless steel, class 3 - Tee, 2 y ø stainless steel, class 3 - Tee, 2 y ø stainless steel, class 3 - Tee, 2 y ø stainless steel, class 3 - Tee, 2 y ø stainless steel, class 3 - Tee, 2 y ø stainless steel, class 3 - Tee, 3 / ø stainless steel, class 3 - Tee, 3 / ø stainless steel, class 3 - Tee, 3 / ø stainless steel, class 3 - Tee, 3 / ø stainless steel, class 3 - Tee, 3 / ø stainless steel, class 3 - Weldolet, 1 1/2" to 3/4" stainless steel, class 3 - Weldolet, 2 1/2" to 3/4" stainless steel, class 3 - Weldolet, 2 1/2" to 3/4" stainless steel, class 3 - Weldolet, 2 1/2" to 3/4" stainless steel, class 3 - Weldolet, 2 1/2" to 3/4" stainless steel, class 3 - Weldolet, 2 1/2" to 3/4" stainless steel, class 3 - Weldolet, 2 1/2" to 3/4" stainless steel, class 3 - Weldolet, 2 1/2" to 3/4" stainless steel, class 3 - Weldolet, 2 1/2" to 3/4" stainless steel, class 3 - Weldolet, 2 1/2" to 3/4" stainless steel, class 3 - Weldolet, 2 1/2" to 3/4" stainless steel, class 3 - Weldolet, 2 1/2" to 3/4" stainless steel, class 3 - Weldolet, 2 1/2" to 3/4" stainless steel, class 3 - Weldolet, 2 1/2" to 3/4" stainles | Quantity 4 4 4 2 4 2 8 10 4 2 2 2 2 2 2 2 2 2 2 2 2 1 4 2 5 8 1 1 7 6 4 1 1 7 6 4 1 1 4 1 4 1 4 4 4 4 4 4 4 4 4 4 4 4 | Unit EA EA EA EA EA EA EA EA EA EA EA EA EA |
| | Ball valve, 1/2" ø, stainless steel, class 6 Ball valve, 3/4" ø, stainless steel, class 6 Ball valve, 1" ø, stainless steel, class 3 Ball valve, 1" ø, stainless steel, class 6 Relief valve, 3/4" ø, stainless steel, class 6 Relief valve, 1 1/2" ø, stainless steel, class 3 Check valve, 1 "ø, stainless steel, class 3 Check valve, 1 1/2" ø, stainless steel, class 3 Check valve, 2" ø, stainless steel, class 3 | 4 16 4 2 4 3 1 3 12 | EA EA EA EA EA EA EA EA |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 02 | TRF Feed Product System (Cont'd) | | |
| 02.03 | West annex TRF pump suction / discharge piping (cont'd) | | |
| | - Diaphragm valve, 3/4" ø, stainless steel, class 6 | 4 | EA |
| | - Diaphragm valve, 1" ø, stainless steel, class 3 | 2 | EA |
| | - Diaphragm valve, 1 1 /2" ø, stainless steel, class 3 | 3 | EA |
| | - Diaphragm valve, 2" ø, stainless steel, class 3 | 11 | EA |
| | - Diaphragm valve, 2 1/2" ø, stainless steel, class 3 | 4 | EA |
| | - Globe valve, 1/2" ø, stainless steel, class 6 | 4 | EA |
| | - Globe valve, 3/4" ø, stainless steel, class 6 | 8 | EA |
| | - Flow indicating meter, 3/4" ø, stainless steel, class 6 | 2 | EA |
| 02.04 | West annex TRF tank inlet and vent piping | | |
| | - 1/2" ø stainless steel, schedule 40, up to 5 m spool, class 6 | 2 | EA |
| | - 3/4" ø stainless steel, schedule 40, up to 5 m spool, class 3 | 1 | EA |
| | - 2" ø stainless steel, schedule 40, class 3 | 73 | m |
| | - 3" ø, stainless steel pipe, schedule 40, class 3 | 44 | m |
| | - Elbow, 3/4" ø stainless steel, 45 deg., class 6 | 1 | EA |
| | - Elbow, 3/4" ø stainless steel, 90 deg., class 6 | 4 | EA |
| | - Elbow, 2" ø stainless steel, 45 deg., class 3 | 14 | EA |
| | - Elbow, 2" ø stainless steel, 90 deg., class 3 | 23 | EA |
| | - Elbow, 3" ø stainless steel, 45 deg., class 3 | 4 | EA |
| | - Elbow, 3" ø stainless steel, 90 deg., class 3 | 5 | EA |
| | - Tee, 2" ø stainless steel, class 3 | 8 | EA |
| | - Flange c/w gasket & studs, 2" stainless steel, weld neck, class 3 | 3 | EA |
| | - Flange c/w gasket & studs, 3" stainless steel, weld neck, class 3 | 1 | EA |
| | - Weldolet, 2 1/2" to 1/2" stainless steel, class 3 | 1 | EA |
| | - Weldolet, 2" to 1/2" stainless steel, class 3 | 2 | EA |
| | - cap, 1/2" ø stainless steel, class 6 | 2 | EA |
| | - cap, 2" ø stainless steel | 5 | EA |
| | - Adopters, unions, nipples, orifices etc. up to 1 1/2" ø, allow for additional as required | 1 | LS |
| | - Relief valve, 2" ø, stainless steel, class 3 | 3 | EA |
| | - Diaphragm valve, 2" ø, stainless steel, class 3, pneumatic | 4 | EA |
| | - Globe valve, 1/2" ø, stainless steel, class 6 | 1 | EA |
| | - Globe valve, 3/4" ø, stainless steel, class 6 | 4 | EA |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|--|---|
| 03 | Downgraded D2O System | | |
| 03.01 | Equipment, tanks and pumps - P7/8, Downgraded pump, 3.8 l/s @ 1035 kPa head - Tank skid TK-8/9, Downgraded tanks, D2O storage, 50 m3, class 3 - Tank skid TK-10, Downgraded tank, D2O storage, 25 m3, class 3 - Tank skid TK-11, RV Discharge tank, D2O storage, 22 m3, class 3 | 2 2 1 1 | EA EA EA EA |
| 03.02 | Pipe Supports - Pipe supports as per detail on drg. NK38-DRAW-38008-10001- 0224/0242/0247/0251 to 0290/299/300 | 126 | EA |
| 03.03 | West annex downgraded pump suction / discharge piping - 1/2" ø stainless steel, schedule 80, up to 5 m spool, class 6 - 3/4" ø stainless steel, schedule 40, up to 5 m spool, class 3 - 3/4" ø stainless steel, schedule 40, up to 5 m spool, class 3 - 3/4" ø, stainless steel, schedule 80, up to 5 m spool, class 6 - 3/4" ø, stainless steel pipe, schedule 40, class 6 - 1" ø stainless steel pipe, schedule 40, class 3 - 1" ø, stainless steel pipe, schedule 40, class 3 - 1 1/2" ø, stainless steel pipe, schedule 40, class 3 - 1 1/2" ø, stainless steel pipe, schedule 40, class 3 - 1 1/2" ø, stainless steel pipe, schedule 40, class 3 - 1 1/2" ø, stainless steel pipe, schedule 40, class 3 - 1 1/2" ø, stainless steel pipe, schedule 40, class 3 - 2" ø stainless steel pipe, schedule 40, class 3 - 2" ø stainless steel pipe, schedule 40, class 3 - 2" ø stainless steel pipe, schedule 40, class 3 - 2" ø stainless steel, schedule 40, class 3 - Cap, 1/2" ø stainless steel, class 6 - Cap, 3/4" ø stainless steel, class 6 - Cap, 1/2" ø stainless steel, class 6 - Cap, 1" ø stainless steel, class 6 - Coupler, quick connect, 3/4" ø stainless steel, class 6 - Elbow, 1/2" ø stainless steel, 90 deg., class 6 - Elbow, 1/2" ø stainless steel, 90 deg., class 3 - Elbow, 1 1/2" ø stainless steel, 90 deg., class 3 - Elbow, 1 1/2" ø stainless steel, 90 deg., class 3 - Elbow, 1 1/2" ø stainless steel, 90 deg., class 3 - Elbow, 1 1/2" ø stainless steel, 90 deg., class 3 - Elbow, 1 1/2" ø stainless steel, 90 deg., class 3 - Elbow, 1 1/2" ø stainless steel, 90 deg., class 3 - Elbow, 1 1/2" ø stainless steel, 90 deg., class 3 - Elbow, 1 1/2" ø stainless steel, 90 deg., class 3 - Elbow, 1 1/2" ø stainless steel, 90 deg. class 3 - Elbow, 1 1/2" ø stainless steel, 90 deg. class 3 - Elbow, 1 1/2" ø stainless steel, 90 deg. class 3 | 1 2 101 2 119 139 7 1 27 44 25 1 1 27 44 25 1 1 1 6 20 64 6 58 15 42 5 | EA EA E M E M M M M M M M M M M M M M M |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 03 | Downgraded D2O System (Cont'd) | | |
| 03.03 | West annex downgraded pump suction / discharge piping (cont'd) | | |
| | Elbow 2" a steipless steel 45 deg. close 2 | 0 | E۸ |
| | - Elbow, 2 Ø stainless steel, 45 deg., class 3 | 0 24 | EA |
| | - LIDOW, 2 Ø Stalliess steel, 90 deg., class 3 | 24 | |
| | - Elange c/w gasket & stude 3/4" stainless steel weld neck class 6 | 2 | EA |
| | - Flange c/w gasket & studs, 0/4 stainless steel, weld neck, class 0 | 2 | ΕA |
| | - Flange c/w gasket & studs, 1" ø stainless steel, weld neck, class 5 | 2 | ΕA |
| | | 2 | |
| | - Flange c/w gasket & studs, 1 1/2" ø stainless steel, weld neck, class 3 | 16 | EA |
| | - Flange c/w gasket & studs, 2" ø stainless steel, weld neck, class 3 | 7 | EA |
| | - Flange c/w gasket & studs, 3" ø stainless steel, weld neck, class 3 | 1 | EA |
| | - Reducer, 3/4 " to 1/2" ø stainless steel, concentric, class 6 | 6 | EA |
| | - Reducer, 1 " to 3/4" ø stainless steel, concentric, class 6 | 2 | EA |
| | - Reducer, 2 " to 1" ø stainless steel, concentric, class 6 | 2 | EA |
| | - Reducer, 2 1/2 " to 2" ø stainless steel, concentric, class 3 | 4 | EA |
| | - Reducer, 3" to 1 1/2" ø stainless steel, concentric, class 3 | 2 | EA |
| | - strainer 2" ø stainless steel, class 6 (replace existing with flange section pipe) | 1 | EA |
| | - Tee,3/4" x1/2" ø stainless steel, class 6 | 4 | EA |
| | - Tee,3/4" ø stainless steel, class 6 | 3 | EA |
| | - Tee,1" ø stainless steel, class 6 | 2 | EA |
| | - Tee, 1x 1/2" ø stainless steel, class 3 | 1 | EA |
| | - Tee, 1x 3/4" ø dia stainless steel, class 6 | 1 | EA |
| | - Tee, 1 1/2 " ø stainless steel, class 3 | 12 | EA |
| | - Tee, 1 1/2 x 1" ø stainless steel, class 3 | 4 | EA |
| | - Tee, 2" ø stainless steel, class 6 | 1 | EA |
| | - Tee, 2"x1" ø stainless steel, class 3 | 1 | EA |
| | - Tee, 2 x 3/4" ø stainless steel, class 6 | 1 | EA |
| | - Tee, 2" ø stainless steel, class 3 | 5 | EA |
| | - Tee, 3" ø stainless steel, class 3 | 1 | EA |
| | - Weldolet, 1 1/2" to 1/2" stainless steel, class 3 | 13 | EA |
| | - Weldolet, 1 1/2" to 3/4" stainless steel, class 3 | 12 | EA |
| | - Weldolet, 2" to 3/4" stainless steel, class 3 | 1 | EA |
| | -Orifice, 1 1/2" ø-12.75 mm , stainless steel, class 3 | 2 | EA |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| 03 Downgraded D2O System (Cont'd) 03.03 West annex downgraded pump suction / discharge piping (cont'd) -Orifice, 1 1/2" ø-40.9 mm , stainless steel, class 3 2 - Adopters, unions, nipples, orifices etc. up to 1 1/2" ø, allow for additional as required 1 - Ball valve, 1/2" ø, stainless steel, class 6 5 - Ball valve, 1/2" ø, stainless steel, class 6 12 - Ball valve, 1" ø, stainless steel, class 6 12 - Ball valve, 1" ø, stainless steel, class 6 1 - Relief valve, 3/4" ø, stainless steel, class 6 1 - Relief valve, 3/4" ø, stainless steel, class 3 2 - Check valve, 1" ø, stainless steel, class 3 2 - Check valve, 1" ø, stainless steel, class 3 2 - Check valve, 11/2" ø, stainless steel, class 3 2 - Diaphragm valve, 11/2" ø, stainless steel, class 3 3 - Diaphragm valve, 11/2" ø, stainless steel, class 3 3 - Diaphragm valve, 11/2" ø, stainless steel, class 6 2 - Diaphragm valve, 11/2" ø, stainless steel, class 6 3 - Diaphragm valve, 2" ø, stainless steel, class 6 3 - Diaphragm valve, 2" ø, stainless steel, class 6 3 - Diaphragm valve, 2" ø, stainless steel, class 6 <td< th=""><th>EA LS EA EA EA EA EA EA EA</th></td<> | EA LS EA EA EA EA EA EA EA |
|---|--|
| 03.03 West annex downgraded pump suction / discharge piping (cont'd) -Orifice, 1 1/2" ø-40.9 mm , stainless steel, class 3 2 - Adopters, unions, nipples, orifices etc. up to 1 1/2" ø, allow for additional as required 1 - Ball valve, 1/2" ø, stainless steel, class 6 5 - Ball valve, 1" ø, stainless steel, class 6 12 - Ball valve, 1" ø, stainless steel, class 6 12 - Ball valve, 1" ø, stainless steel, class 6 12 - Ball valve, 1" ø, stainless steel, class 6 12 - Relief valve, 1 1/2" ø, stainless steel, class 6 1 - Check valve, 1" ø, stainless steel, class 3 2 - Check valve, 1 1/2" ø, stainless steel, class 3 2 - Diaphragm valve, 1 1/2" ø, stainless steel, class 3 3 - Diaphragm valve, 1 1/2" ø, stainless steel, class 3 7 - Diaphragm valve, 1 1/2" ø, stainless steel, class 3 7 - Diaphragm valve, 2" ø, stainless steel, class 3 7 - Diaphragm valve, 2" ø, stainless steel, class 6 2 - Diaphragm valve, 2" ø, stainless steel, class 3 3 - Diaphragm valve, 2" ø, stainless steel, class 6 3 - Diaphragm valve, 2" ø, stainless steel, class 6 2 - Diaphragm valve, 2" ø, stainless steel, c | EA LS EA EA EA EA EA EA EA |
| •Orifice, 1 1/2" ø-40.9 mm, stainless steel, class 32- Adopters, unions, nipples, orifices etc. up to 1 1/2" ø, allow for additional as required1- Ball valve, 1/2" ø, stainless steel, class 65- Ball valve, 1/2" ø, stainless steel, class 612- Ball valve, 1" ø, stainless steel, class 612- Ball valve, 1" ø, stainless steel, class 612- Relief valve, 3/4" ø, stainless steel, class 61- Relief valve, 1 1/2" ø, stainless steel, class 33- Check valve, 1" ø, stainless steel, class 32- Check valve, 1" ø, stainless steel, class 33- Check valve, 1" ø, stainless steel, class 34- Diaphragm valve, 1/2" ø, stainless steel, class 33- Diaphragm valve, 1/2" ø, stainless steel, class 34- Diaphragm valve, 1/2" ø, stainless steel, class 37- Diaphragm valve, 1/2" ø, stainless steel, class 62- Diaphragm valve, 2/4" ø, stainless steel, class 63- Diaphragm valve, 2/4" ø, stainless steel, class 63- Globe valve, 1/2" ø, stainless steel, class 63- Globe valve, 1/2" ø, stainless steel, class 61- J/2" ø stainless steel, schedule 40, up to 5 m spool, class 61- 3/4" ø stainless steel, schedule 40, class 36- 3/4" ø stainless steel pipe, schedule 40, class 36- 1/2" ø stainless steel pipe, schedule 40, class 3106- 1/2" ø stainless steel pipe, schedule 40, class 328- 2" ø stainless steel pipe, schedule 40, class 328- 2" ø stainless steel pipe, schedule 40, class 3 <td>EA LS EA EA EA EA EA EA EA</br></td> | EA LS EA |
| -Orffice, 1 1/2" ø-40.9 mm , stainless steel, class 3 Adopters, unions, nipples, orifices etc. up to 1 1/2" ø, allow for additional as required Ball valve, 1/2" ø, stainless steel, class 6 Ball valve, 3/4" ø, stainless steel, class 6 Ball valve, 1" ø, stainless steel, class 6 Ball valve, 1" ø, stainless steel, class 6 Ball valve, 1" ø, stainless steel, class 6 Relief valve, 3/4" ø, stainless steel, class 6 Relief valve, 1 n ø, stainless steel, class 3 Check valve, 1 n ø, stainless steel, class 3 Check valve, 1 n ø, stainless steel, class 3 Check valve, 1 n ø, stainless steel, class 3 Check valve, 1 n ø, stainless steel, class 3 Check valve, 1 n ø, stainless steel, class 3 Diaphragm valve, 1 n ø, stainless steel, class 3 Diaphragm valve, 1 n ø, stainless steel, class 3 Diaphragm valve, 1 1/2" ø, stainless steel, class 3 Diaphragm valve, 2" ø, stainless steel, class 6 Diaphragm valve, 2" ø, stainless steel, class 6 Diaphragm valve, 2" ø, stainless steel, class 6 Globe valve, 1/2" ø, stainless steel, class 6 Globe valve, 1/2" ø, stainless steel, class 6 Globe valve, 3/4" ø, stainless steel, class 6 1 1/2" ø stainless steel, steel, class 6 1 1/2" ø stainless steel, steel, class 6 1 1/2" ø stainless steel, steel, class 6 1 1/2" ø stainless steel, steel, class 6 1 1/2" ø stainless steel, steel, class 6 1 1/2" ø stainless steel, schedule 40, up to 5 m spool, class 6 1 1/2" ø stainless steel pipe, schedule 40, class 3 1 1/2" ø stainless steel pipe, schedule 40, class 3 1 1/2" ø stainless steel pipe, schedule 40, class 3 2 1/2" ø stainless steel pipe, schedule 40, class 3 2 1 2" ø stainless steel pipe, schedule 40, class 3 2 1 2" ø stainless steel pipe, schedule 40, class 3 | EA LS EA EA EA EA EA EA EA |
| - Adopters, unions, nipples, orifices etc. up to 1 1/2" ø, allow for additional as required 1 - Ball valve, 1/2" ø, stainless steel, class 6 5 - Ball valve, 3/4" ø, stainless steel, class 6 12 - Ball valve, 1" ø, stainless steel, class 6 12 - Ball valve, 1" ø, stainless steel, class 6 1 - Relief valve, 3/4" ø, stainless steel, class 6 1 - Relief valve, 1/2" ø, stainless steel, class 6 2 - Relief valve, 1 1/2" ø, stainless steel, class 3 3 - Check valve, 1 "ø, stainless steel, class 3 2 - Check valve, 1 1/2" ø, stainless steel, class 3 2 - Check valve, 1 1/2" ø, stainless steel, class 3 4 - Diaphragm valve, 1 1/2" ø, stainless steel, class 3 4 - Diaphragm valve, 1 1/2" ø, stainless steel, class 3 7 - Diaphragm valve, 2" ø, stainless steel, class 6 2 - Diaphragm valve, 2" ø, stainless steel, class 6 3 - Diaphragm valve, 2" ø, stainless steel, class 6 3 - Globe valve, 1/2" ø, stainless steel, class 6 3 - Diaphragm valve, 2" ø, stainless steel, class 6 3 - Globe valve, 3/4" ø, stainless steel, class 6 3 - Globe valve, 3/4" ø, stainless steel, class 6 1 | LS EA EA EA EA EA EA EA |
| Ball valve, 1/2" ø, stainless steel, class 6 Ball valve, 3/4" ø, stainless steel, class 6 Ball valve, 1" ø, stainless steel, class 6 Ball valve, 1" ø, stainless steel, class 6 Ball valve, 1" ø, stainless steel, class 6 Relief valve, 1" ø, stainless steel, class 6 Relief valve, 1 1/2" ø, stainless steel, class 3 Check valve, 1" ø, stainless steel, class 3 Check valve, 1 1/2" ø, stainless steel, class 3 Check valve, 1 1/2" ø, stainless steel, class 3 Check valve, 1 1/2" ø, stainless steel, class 3 Diaphragm valve, 1 1 /2" ø, stainless steel, class 3 Diaphragm valve, 1 1 /2" ø, stainless steel, class 3 Diaphragm valve, 1 1/2" ø, stainless steel, class 3 Diaphragm valve, 1 1/2" ø, stainless steel, class 6 Diaphragm valve, 2" ø, stainless steel, class 6 Diaphragm valve, 2" ø, stainless steel, class 6 Diaphragm valve, 2" ø, stainless steel, class 6 Clobe valve, 1/2" ø, stainless steel, class 6 Globe valve, 3/4" ø, stainless steel, class 6 Globe valve, 3/4" ø, stainless steel, class 6 flow indicating meter, 3/4" ø, stainless steel, class 6 11/2" ø stainless steel, schedule 40, up to 5 m spool, class 6 34" ø stainless steel pipe, schedule 40, class 3 106 11/2" ø stainless steel pipe, schedule 40, class 3 28 2" ø stainless steel pipe, schedule 40, class 3 | EA EA EA EA EA EA |
| Ball valve, 3/4" ø, stainless steel, class 6 Ball valve, 1" ø, stainless steel, class 6 Ball valve, 1" ø, stainless steel, class 6 Relief valve, 3/4" ø, stainless steel, class 6 Relief valve, 1 1/2" ø, stainless steel, class 3 Check valve, 1 ø, stainless steel, class 3 Check valve, 1 ø, stainless steel, class 3 Check valve, 1 1/2" ø, stainless steel, class 3 Check valve, 1 1/2" ø, stainless steel, class 3 Diaphragm valve, 1 1/2" ø, stainless steel, class 3 Diaphragm valve, 1 1/2" ø, stainless steel, class 3 Diaphragm valve, 1 1/2" ø, stainless steel, class 3 Diaphragm valve, 1 1/2" ø, stainless steel, class 3 Diaphragm valve, 2" ø, stainless steel, class 6 Globe valve, 3/4" ø, stainless steel, class 6 flow indicating meter, 3/4" ø, stainless steel, class 6 1/2" ø stainless steel, schedule 40, up to 5 m spool, class 6 3/4" ø stainless steel pipe, schedule 40, class 3 106 11/2" ø stainless steel pipe, schedule 40, class 3 28 2" ø stainless steel pipe, schedule 40, class 3 | EA EA EA EA EA EA |
| Ball valve, 1" ø, stainless steel, class 3 Ball valve, 1" ø, stainless steel, class 6 Relief valve, 3/4" ø, stainless steel, class 6 Relief valve, 1 1/2" ø, stainless steel, class 3 Check valve, 1 " ø, stainless steel, class 3 Check valve, 1 1/2" ø, stainless steel, class 3 Check valve, 1 1/2" ø, stainless steel, class 3 Check valve, 1 1/2" ø, stainless steel, class 3 Diaphragm valve, 1 1/2" ø, stainless steel, class 3 Diaphragm valve, 1 1/2" ø, stainless steel, class 3 Diaphragm valve, 1 1/2" ø, stainless steel, class 3 Diaphragm valve, 1 1/2" ø, stainless steel, class 3 Diaphragm valve, 1 1/2" ø, stainless steel, class 3 Diaphragm valve, 1 1/2" ø, stainless steel, class 3 Diaphragm valve, 2" ø, stainless steel, class 3 Diaphragm valve, 2" ø, stainless steel, class 3 Globe valve, 1/2" ø, stainless steel, class 6 Globe valve, 3/4" ø, stainless steel, class 6 flow indicating meter, 3/4" ø, stainless steel, class 6 flow indicating meter, 3/4" ø, stainless steel, class 6 1/2" ø stainless steel, schedule 40, up to 5 m spool, class 6 3/4" ø stainless steel pipe, schedule 40, class 3 106 1 1/2" ø stainless steel pipe, schedule 40, class 3 28 2" ø stainless steel pipe, schedule 40, class 3 | EA EA EA EA EA |
| - Ball valve, 1" ø, stainless steel, class 61- Relief valve, 3/4" ø, stainless steel, class 62- Relief valve, 1 1/2" ø, stainless steel, class 33- Check valve, 1" ø, stainless steel, class 32- Check valve, 1 1/2" ø, stainless steel, class 38- Diaphragm valve, 1 1/2" ø, stainless steel, class 34- Diaphragm valve, 1 1 /2" ø, stainless steel, class 37- Diaphragm valve, 1 1 /2" ø, stainless steel, class 37- Diaphragm valve, 1 1 /2" ø, stainless steel, class 37- Diaphragm valve, 1 1 /2" ø, stainless steel, class 33- Diaphragm valve, 2" ø, stainless steel, class 62- Diaphragm valve, 2" ø, stainless steel, class 33- Diaphragm valve, 2" ø, stainless steel, class 63- Diaphragm valve, 3/4" ø, stainless steel, class 63- Globe valve, 3/4" ø, stainless steel, class 64- 1/2" ø stainless steel, schedule 40, up to 5 m spool, class 61- 3/4" ø stainless steel, schedule 40, class 36- 3/4" ø stainless steel pipe, schedule 40, class 3106- 1 1/2" ø stainless steel pipe, schedule 40, class 328- 2" ø stainless steel pipe, schedule 40, class 355 | EA EA EA EA |
| - Relief valve, 3/4" ø, stainless steel, class 62- Relief valve, 1 1/2" ø, stainless steel, class 33- Check valve, 1 "ø, stainless steel, class 32- Check valve, 1 "ø, stainless steel, class 38- Diaphragm valve, 1 "ø, stainless steel, class 34- Diaphragm valve, 1 1/2" ø, stainless steel, class 37- Diaphragm valve, 1 1/2" ø, stainless steel, class 37- Diaphragm valve, 1 1/2" ø, stainless steel, class 37- Diaphragm valve, 1 1/2" ø, stainless steel, class 3, pneumatic3- Diaphragm valve, 2" ø, stainless steel, class 62- Diaphragm valve, 2" ø, stainless steel, class 33- Globe valve, 1/2" ø, stainless steel, class 63- Globe valve, 3/4" ø, stainless steel, class 66- flow indicating meter, 3/4" ø, stainless steel, class 61- 1/2" ø stainless steel, schedule 40, up to 5 m spool, class 61- 3/4" ø stainless steel pipe, schedule 40, class 36- 11/2" ø stainless steel pipe, schedule 40, class 3106- 1 1/2" ø stainless steel pipe, schedule 40, class 328- 2" ø stainless steel pipe, schedule 40, class 355 | EA EA EA |
| - Relief valve, 1 1/2" ø, stainless steel, class 33- Check valve, 1" ø, stainless steel, class 32- Check valve, 1 1/2" ø, stainless steel, class 38- Diaphragm valve, 1 1/2" ø, stainless steel, class 34- Diaphragm valve, 1 1/2" ø, stainless steel, class 37- Diaphragm valve, 1 1/2" ø, stainless steel, class 37- Diaphragm valve, 1 1/2" ø, stainless steel, class 37- Diaphragm valve, 1 1/2" ø, stainless steel, class 37- Diaphragm valve, 2 " ø, stainless steel, class 62- Diaphragm valve, 2" ø, stainless steel, class 33- Diaphragm valve, 2" ø, stainless steel, class 33- Diaphragm valve, 2" ø, stainless steel, class 63- Diaphragm valve, 2" ø, stainless steel, class 63- Diaphragm valve, 2" ø, stainless steel, class 63- Diaphragm valve, 1/2" ø, stainless steel, class 63- Diaphragm valve, 1/2" ø, stainless steel, class 63- Jobe valve, 1/2" ø, stainless steel, class 61- flow indicating meter, 3/4" ø, stainless steel, class 61- 1/2" ø stainless steel, schedule 40, up to 5 m spool, class 61- 3/4" ø stainless steel, schedule 40, up to 5 m spool, class 61- 3/4" ø stainless steel pipe, schedule 40, class 36- 1" ø stainless steel pipe, schedule 40, class 328- 2" ø stainless steel pipe, schedule 40, class 355 | EA EA |
| - Check valve, 1" ø, stainless steel, class 32- Check valve, 1 1/2" ø, stainless steel, class 38- Diaphragm valve, 1" ø, stainless steel, class 34- Diaphragm valve, 1 1/2" ø, stainless steel, class 37- Diaphragm valve, 1 1/2" ø, stainless steel, class 37- Diaphragm valve, 1 1/2" ø, stainless steel, class 37- Diaphragm valve, 3/4" ø, stainless steel, class 62- Diaphragm valve, 2" ø, stainless steel, class 62- Diaphragm valve, 2" ø, stainless steel, class 33- Globe valve, 1/2" ø, stainless steel, class 63- Globe valve, 1/2" ø, stainless steel, class 63- Globe valve, 3/4" ø, stainless steel, class 66- flow indicating meter, 3/4" ø, stainless steel, class 61- 1/2" ø stainless steel, schedule 40, up to 5 m spool, class 61- 3/4" ø stainless steel pipe, schedule 40, class 36- 1" ø stainless steel pipe, schedule 40, class 3106- 1 1/2" ø stainless steel pipe, schedule 40, class 328- 2" ø stainless steel pipe, schedule 40, class 355 | EA |
| - Check valve, 1 1/2" ø, stainless steel, class 38- Diaphragm valve, 1" ø, stainless steel, class 34- Diaphragm valve, 1 1/2" ø, stainless steel, class 37- Diaphragm valve, 1 1/2" ø, stainless steel, class 3, pneumatic3- Diaphragm valve, 3/4" ø, stainless steel, class 62- Diaphragm valve, 2" ø, stainless steel, class 33- Diaphragm valve, 2" ø, stainless steel, class 63- Diaphragm valve, 1/2" ø, stainless steel, class 63- Diaphragm valve, 3/4" ø, stainless steel, class 63- Globe valve, 3/4" ø, stainless steel, class 61- 1/2" ø stainless steel, schedule 40, up to 5 m spool, class 61- 3/4" ø stainless steel, schedule 40, up to 5 m spool, class 61- 3/4" ø stainless steel pipe, schedule 40, class 3106- 1 1/2" ø stainless steel pipe, schedule 40, class 328- 2" ø stainless steel pipe, schedule 40, class 328- 2" ø stainless steel pipe, schedule 40, class 355 | |
| Diaphragm valve, 1" ø, stainless steel, class 3 Diaphragm valve, 1 1/2" ø, stainless steel, class 3 Diaphragm valve, 1 1/2" ø, stainless steel, class 3, pneumatic Diaphragm valve, 3/4" ø, stainless steel, class 6 Diaphragm valve, 2" ø, stainless steel, class 3, pneumatic Diaphragm valve, 2" ø, stainless steel, class 3 Diaphragm valve, 2" ø, stainless steel, class 3 Diaphragm valve, 2" ø, stainless steel, class 3 Globe valve, 1/2" ø, stainless steel, class 6 Globe valve, 1/2" ø, stainless steel, class 6 Globe valve, 3/4" ø, stainless steel, class 6 flow indicating meter, 3/4" ø, stainless steel, class 6 flow indicating meter, 3/4" ø, stainless steel, class 6 1/2" ø stainless steel, schedule 40, up to 5 m spool, class 6 3/4" ø stainless steel pipe, schedule 40, class 3 106 1 1/2" ø stainless steel pipe, schedule 40, class 3 28 2" ø stainless steel pipe, schedule 40, class 3 | EA |
| - Diaphragm valve, 1 1/2" ø, stainless steel, class 37- Diaphragm valve, 1 1/2" ø, stainless steel, class 3, pneumatic3- Diaphragm valve, 3/4" ø, stainless steel, class 62- Diaphragm valve, 2" ø, stainless steel, class 33- Globe valve, 1/2" ø, stainless steel, class 63- Globe valve, 3/4" ø, stainless steel, class 66- flow indicating meter, 3/4" ø, stainless steel, class 61- 1/2" ø stainless steel, schedule 40, up to 5 m spool, class 62- 3/4" ø stainless steel pipe, schedule 40, class 36- 1" ø stainless steel pipe, schedule 40, class 3106- 1 1/2" ø stainless steel pipe, schedule 40, class 328- 2" ø stainless steel pipe, schedule 40, class 328- 2" ø stainless steel pipe, schedule 40, class 355 | EA |
| - Diaphragm valve, 1 1/2" ø, stainless steel, class 3, pneumatic3- Diaphragm valve, 3/4" ø, stainless steel, class 62- Diaphragm valve, 2" ø, stainless steel, class 3, pneumatic3- Diaphragm valve, 2" ø, stainless steel, class 33- Globe valve, 1/2" ø, stainless steel, class 63- Globe valve, 3/4" ø, stainless steel, class 66- flow indicating meter, 3/4" ø, stainless steel, class 61- 1/2" ø stainless steel, schedule 40, up to 5 m spool, class 62- 3/4" ø stainless steel, schedule 40, up to 5 m spool, class 61- 3/4" ø stainless steel pipe, schedule 40, class 36- 1 1/2" ø stainless steel pipe, schedule 40, class 328- 2" ø stainless steel pipe, schedule 40, class 355 | EA |
| - Diaphragm valve, 3/4" ø, stainless steel, class 62- Diaphragm valve, 2" ø, stainless steel, class 3, pneumatic3- Diaphragm valve, 2" ø, stainless steel, class 33- Globe valve, 1/2" ø, stainless steel, class 63- Globe valve, 3/4" ø, stainless steel, class 66- flow indicating meter, 3/4" ø, stainless steel, class 61- 1/2" ø stainless steel, schedule 40, up to 5 m spool, class 62- 3/4" ø stainless steel, schedule 40, up to 5 m spool, class 61- 3/4" ø stainless steel pipe, schedule 40, class 36- 1 " ø stainless steel pipe, schedule 40, class 3106- 1 1/2" ø stainless steel pipe, schedule 40, class 328- 2" ø stainless steel pipe, schedule 40, class 355 | EA |
| - Diaphragm valve, 2" ø, stainless steel, class 3, pneumatic3- Diaphragm valve, 2" ø, stainless steel, class 33- Globe valve, 1/2" ø, stainless steel, class 63- Globe valve, 3/4" ø, stainless steel, class 66- flow indicating meter, 3/4" ø, stainless steel, class 61- 1/2" ø stainless steel, schedule 40, up to 5 m spool, class 62- 3/4" ø stainless steel, schedule 40, up to 5 m spool, class 61- 3/4" ø stainless steel pipe, schedule 40, class 36- 1" ø stainless steel pipe, schedule 40, class 3106- 1 1/2" ø stainless steel pipe, schedule 40, class 328- 2" ø stainless steel pipe, schedule 40, class 355 | EA |
| - Diaphragm valve, 2" ø, stainless steel, class 33- Globe valve, 1/2" ø, stainless steel, class 63- Globe valve, 3/4" ø, stainless steel, class 66- flow indicating meter, 3/4" ø, stainless steel, class 61- 1/2" ø stainless steel, schedule 40, up to 5 m spool, class 62- 3/4" ø stainless steel, schedule 40, up to 5 m spool, class 61- 3/4" ø stainless steel pipe, schedule 40, class 36- 1" ø stainless steel pipe, schedule 40, class 3106- 1 1/2" ø stainless steel pipe, schedule 40, class 328- 2" ø stainless steel pipe, schedule 40, class 355 | EA |
| - Globe valve, 1/2" ø, stainless steel, class 63- Globe valve, 3/4" ø, stainless steel, class 66- flow indicating meter, 3/4" ø, stainless steel, class 61- 1/2" ø stainless steel, schedule 40, up to 5 m spool, class 62- 3/4" ø stainless steel, schedule 40, up to 5 m spool, class 61- 3/4" ø stainless steel pipe, schedule 40, class 36- 1 /2" ø stainless steel pipe, schedule 40, class 3106- 1 /2" ø stainless steel pipe, schedule 40, class 328- 2" ø stainless steel pipe, schedule 40, class 355 | EA |
| - Globe valve, 3/4" ø, stainless steel, class 66- flow indicating meter, 3/4" ø, stainless steel, class 61- 1/2" ø stainless steel, schedule 40, up to 5 m spool, class 62- 3/4" ø stainless steel, schedule 40, up to 5 m spool, class 61- 3/4" ø stainless steel pipe, schedule 40, class 36- 1" ø stainless steel pipe, schedule 40, class 3106- 1 1/2" ø stainless steel pipe, schedule 40, class 328- 2" ø stainless steel pipe, schedule 40, class 355 | EA |
| - flow indicating meter, 3/4" ø, stainless steel, class 61- 1/2" ø stainless steel, schedule 40, up to 5 m spool, class 62- 3/4" ø stainless steel, schedule 40, up to 5 m spool, class 61- 3/4" ø stainless steel pipe, schedule 40, class 36- 1" ø stainless steel pipe, schedule 40, class 3106- 1 1/2" ø stainless steel pipe, schedule 40, class 328- 2" ø stainless steel pipe, schedule 40, class 355 | EA |
| - 1/2" ø stainless steel, schedule 40, up to 5 m spool, class 62- 3/4" ø stainless steel, schedule 40, up to 5 m spool, class 61- 3/4" ø stainless steel pipe, schedule 40, class 36- 1" ø stainless steel pipe, schedule 40, class 3106- 1 1/2" ø stainless steel pipe, schedule 40, class 328- 2" ø stainless steel pipe, schedule 40, class 355 | EA |
| - 3/4" ø stainless steel, schedule 40, up to 5 m spool, class 61- 3/4" ø stainless steel pipe, schedule 40, class 36- 1" ø stainless steel pipe, schedule 40, class 3106- 1 1/2" ø stainless steel pipe, schedule 40, class 328- 2" ø stainless steel pipe, schedule 40, class 355 | EA |
| - 3/4" ø stainless steel pipe, schedule 40, class 36- 1" ø stainless steel pipe, schedule 40, class 3106- 1 1/2" ø stainless steel pipe, schedule 40, class 328- 2" ø stainless steel pipe, schedule 40, class 355 | EA |
| - 1" ø stainless steel pipe, schedule 40, class 3106- 1 1/2" ø stainless steel pipe, schedule 40, class 328- 2" ø stainless steel pipe, schedule 40, class 355 | m |
| - 1 1/2" ø stainless steel pipe, schedule 40, class 328- 2" ø stainless steel pipe, schedule 40, class 355 | m |
| - 2" ø stainless steel pipe, schedule 40, class 3 55 | m |
| | m |
| - 3" ø, stainless steel pipe, schedule 40, class 3 138 | m |
| - Elbow, 3/4" ø stainless steel, 45 deg., class 6 4 | EA |
| - Elbow, 3/4" ø stainless steel, 90 deg., class 6 7 | EA |
| - Elbow, 1" ø stainless steel, 45 deg., class 3 4 | EA |
| - Elbow, 1" ø stainless steel, 90 deg., class 3 20 | EA |
| - Elbow, 1 1/2" ø stainless steel, 45 deg., class 3 6 | EA |
| - Elbow, 1 1/2" ø stainless steel, 90 deg., class 3 11 | EA |
| | |
| | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|---|--|
| 03 | Downgraded D2O System (Cont'd) | | |
| 03.03 | West annex downgraded pump suction / discharge piping (cont'd) | | |
| 03.03 | West annex downgraded pump suction / discharge piping (cont'd) = Elbow, 2" ø stainless steel, 45 deg., class 3 = Elbow, 3" ø stainless steel, 90 deg., class 3 = Elbow, 3" ø stainless steel, 90 deg., class 3 = Tee, 11/2" ø stainless steel, class 3 = Tee, 2" X 1" ø stainless steel, class 3 = Tee, 3" ø stainless steel, class 3 = Tee, 3" ø stainless steel, class 3 = Flange c/w gasket & studs, 2" stainless steel, weld neck, class 3 = Flange c/w gasket & studs, 3" ø stainless steel, weld neck, class 3 = Weldolet, 2" to 1/2" ø stainless steel, class 3 = Weldolet, 3" to 1" ø stainless steel, class 3 = Check valve, 1" ø, stainless steel, class 3 = Check valve, 1" ø, stainless steel, class 3 = Vacuum relief valve, 2" ø, stainless steel, class 3 = Jiangragn valve, 11/2" ø, stainless steel, class 3 = Globe valve, 3/4" ø, stainless steel, class 6 = Globe valve, 3/4" ø, stainless steel, class 6 | 2 18 6 32 2 1 7 2 3 2 1 3 2 1 3 1 2 1 1 2 3 1 4 | EA EA EA EA EA EA EA EA EA EA EA EA EA |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| . Item Description | Quantity | Unit |
|--|--|--|
| D2O Clean-up System | | |
| Equipment, tanks and pumps - P5/9, Downgraded pump, 3.8 l/s @ 25 m head - Tank skid TK-7/8/9, Downgraded tanks, D2O storage, 25 m3, CS/SS stee, | 2 | EΑ |
| class 3I | 5 | LA |
| Pipe Supports - Pipe supports | 28 | EA |
| West annex Clean-up pump suction / discharge piping - 1/2" ø stainless steel, schedule 80, up to 5 m spool, class 6 - 1/2" ø stainless steel, schedule 40, up to 5 m spool, class 6 - 3/4" ø, stainless steel, schedule 40, up to 5 m spool, class 6 - 3/4" ø, stainless steel pipe, schedule 40, class 6 - 1" ø, stainless steel pipe, schedule 40, class 3 - 1" ø, stainless steel pipe, schedule 40, class 3 - 1" ø, stainless steel pipe, schedule 40, class 6 - 1 1/2" ø, stainless steel pipe, schedule 40, class 3 - 1 1/2" ø, stainless steel pipe, schedule 40, class 3 - 2" ø stainless steel, schedule 40, up to 5 m spool, class 3 - 2" ø stainless steel, schedule 40, up to 5 m spool, class 3 - 2" ø stainless steel, schedule 40, up to 5 m spool, class 6 - 3" ø, stainless steel, schedule 40, class 3 - Cap, 1/2" ø stainless steel, class 6 - Cap, 3/4" ø stainless steel, class 6 - Cupler, quick connect, 3/4" ø stainless steel, class 3 - Elbow, 1/2" ø stainless steel, 45 deg., class 6 | 2 1 3 56 1 85 7 14 1 1 25 1 5 1 2 1 2 1 1 | EA EA EA m EA m m EA EA EA EA EA EA |
| Elbow, 3/4" ø stainless steel, 45 deg., class 6 Elbow, 3/4" ø stainless steel, 90 deg., class 6 Elbow, 1" ø stainless steel, 45 deg., class 3 Elbow, 1" ø stainless steel, 90 deg., class 3 Elbow, 1" ø stainless steel, 90 deg., class 6 Elbow, 1 1/2" ø stainless steel, 45 deg., class 3 Elbow, 1 1/2" ø stainless steel, 90 deg. class 3 Elbow, 3" ø stainless steel, 45 deg., class 3 Elbow, 3" ø stainless steel, 45 deg., class 3 | 1 59 2 33 5 1 11 11 12 | EA EA EA EA EA EA EA EA |
| | Item Description Description Description Description Standard Stand | Item DescriptionQuantityD2O Clean-up SystemEquipment, tanks and pumps - P5/9, Downgraded pump, 3.8 I/s @ 25 m head - Tank skid TK-7/8/9, Downgraded tanks, D2O storage, 25 m3, CS/SS stee, class 31Pipe Supports - Pipe supports28West annex Clean-up pump suction / discharge piping - 1/2" ø stainless steel, schedule 80, up to 5 m spool, class 6 - 12" ø stainless steel, schedule 40, up to 5 m spool, class 6 - 3/4" ø stainless steel, schedule 40, up to 5 m spool, class 6 - 3/4" ø stainless steel pipe, schedule 40, up to 5 m spool, class 6 - 11" ø, stainless steel pipe, schedule 40, class 6 - 11" ø, stainless steel pipe, schedule 40, class 3 - 11 % of stainless steel pipe, schedule 40, class 3 - 11 % of stainless steel pipe, schedule 40, class 3 - 11 % of stainless steel pipe, schedule 40, class 3 - 11 % of stainless steel pipe, schedule 40, class 3 - 11 % of stainless steel pipe, schedule 40, class 3 - 11 % of stainless steel pipe, schedule 40, up to 5 m spool, class 3 - 11 % of stainless steel pipe, schedule 40, up to 5 m spool, class 3 - 11 % of stainless steel, class 6 - 22" ø stainless steel, class 6 - 24" ø stainless steel, class 6 - 25" of stainless steel, class 6 - 26, 34" ø stainless steel, class 6 - 26 - 27" ø stainless steel, 90 deg., class 6 - 26 - 2000pler, quick connect, 14" ø stainless steel, class 6 - 21 - 21000000000000000000000000000000000000 |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 04 | D2O Clean-up System (Cont'd) | | |
| 04.03 | West annex Clean-up pump suction / discharge piping (cont'd) | | |
| | | | |
| | - Flange c/w gasket & studs, 3/4" stainless steel, weld neck, class 6 | 2 | EA |
| | - Flange c/w gasket & studs, 1" stainless steel, weld neck, class 3 | 4 | EA |
| | - Flange c/w gasket & studs, 1 1/2" stainless steel, weld neck, class 3 | 7 | EA |
| | - Flange c/w gasket & studs, 2" stainless steel, weld neck, class 3 | 2 | EA |
| | - Flange c/w gasket & studs, 3" stainless steel, weld neck, class 3 | 1 | EA |
| | - Reducer, 3/4 " to 1/2" stainless steel, concentric, class 6 | 6 | EA |
| | - Reducer, 1" to 1/2" stainless steel, concentric, class 3 | 1 | EA |
| | - Reducer, 1 " to 3/4" stainless steel, concentric, class 6 | 2 | EA |
| | - Reducer, 1 1/2 " to 3/4" stainless steel, concentric, class 3 | 1 | EA |
| | - Reducer, 1 1/2 " to 1" stainless steel, concentric, class 3 | 2 | EA |
| | - Reducer, 2 " to 1" stainless steel, concentric, class 6 | 2 | EA |
| | - Reducer, 2 " to 1 1/2" stainless steel, concentric, class 3 | 2 | EA |
| | - Reducer, 3" to 1" stainless steel, concentric, class 3 | 1 | EA |
| | - Reducer, 3" to 1 1/2" stainless steel, concentric, class 3 | 3 | EA |
| | - strainer 1 1/2" stainless steel, class 6 (replace existing with flange section pipe) | 1 | EA |
| | - Tee,3/4" x1/2" ø stainless steel, class 6 | 4 | EA |
| | - Tee,3/4" ø stainless steel, class 6 | 3 | EA |
| | - Tee,1" ø stainless steel, class 3 | 5 | EA |
| | - Tee,1" ø stainless steel, class 6 | 2 | EA |
| | - Tee, 1x 3/4" ø stainless steel, class 6 | 1 | EA |
| | - Tee, 1 1/2" ø stainless steel, class 3 | 3 | EA |
| | - Tee, 2 x 3/4" ø stainless steel, class 6 | 1 | EA |
| | - Tee, 2" ø stainless steel, class 6 | 2 | EA |
| | - Tee, 3" ø stainless steel, class 3 | 1 | EA |
| | - Weldolet, 1" to 3/4" ø stainless steel | 1 | EA |
| | - Weldolet, 1 1/2" to 3/4" ø stainless steel, class 3 | 1 | EA |
| | - Weldolet, 3" to 1/2" ø stainless steel, class 3 | 1 | EA |
| | - Weldolet, 3" to 3/4" ø stainless steel, class 3 | 1 | EA |
| | - Ball valve, 1/2" ø, stainless steel, class 6 | 4 | EA |
| | - Ball valve, 3/4" ø, stainless steel, class 6 | 10 | EA |
| | - Ball valve, 1" ø, stainless steel, class 3 | 3 | EA |
| | - Relief valve, 3/4" ø, stainless steel, class 6 | 2 | EA |
| | | | |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|----------|
| 04 | D2O Clean-up System (Cont'd) | | |
| 04.03 | West annex Clean-up pump suction / discharge piping (cont'd) | | |
| | | 1 | |
| | - Relief valve, 1 1/2 Ø, stalniess steel, class 3 | 1 | EA |
| | - Check valve, 1 1/2" a stainless steel, class 5 | 2 | |
| | - Check valve, 1 1/2 Ø, stallliess steel, class 5 | 1 | |
| | - Diaphragm valve, 3/4 Ø, stainless steel, class 0 | 2 | EA EA |
| | - Diaphragm valve, 1 %, stainless steel, class 3 | + 2 | EA EA |
| | - Diaphragm valve, 1 %, stainless steel, class 5, pheumatic | 2 | ΕΔ |
| | - Dianhragm valve, 1 1/2" ø stainless steel, class 3 | 5 | ΕΛ ΕΔ |
| | - Globe valve, 1/2" ø, stainless steel, class 6 | 2 | FA |
| | - Globe valve, 3/4" ø, stainless steel, class 6 | 5 | FA |
| | - flow indicating meter, 3/4" ø, stainless steel, class 6 | 1 | EA |
| 04.04 | West annex clean-up tank inlet and vent piping | | |
| | - 3/4" ø stainless steel, schedule 40, up to 5 m spool, class 6 | 2 | EA |
| | - 1" ø stainless steel pipe, schedule 40, class 3 | 60 | m |
| | - 2" ø stainless steel pipe, schedule 40, class 3 | 18 | m |
| | - Elbow, 3/4" ø stainless steel, 90 deg., class 6 | 3 | EA |
| | - Elbow, 1" ø stainless steel, 45 deg., class 3 | 4 | EA |
| | - Elbow, 1" ø stainless steel, 90 deg., class 3 | 26 | EA |
| | - Elbow, 1 1/2" ø stainless steel, 90 deg., class 3 | 2 | EA |
| | - Elbow, 2" ø stainless steel, 90 deg., class 3 | 2 | EA |
| | - Reducer, 1 1/2 " to 1" stainless steel, concentric, class 3 | 3 | EA |
| | - Tee, 1" ø stainless steel, class 3 | 7 | EA |
| | - Tee, 2" ø stainless steel, class 3 | 1 | EA |
| | - Adopters, unions, nipples, orifices etc. up to 1 1/2" ø, allow for additional as required | 1 | LS |
| | - Diaphragm valve, 1" ø, stainless steel, class 3 | 3 | EA |
| | - Diaphragm valve, 1" ø, stainless steel, class 3, pneumatic | 3 | EA |
| | - Globe valve, 3/4" ø, stainless steel, class 6 | 3 | EA |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 04 | D2O Clean-up System (Cont'd) | | |
| 04.05 | Supply of demineralized water to the west annex including tie in to | | |
| | the existing station demineralized water | | |
| | - 1/2" dia stainless steel pipe, schedule 40 | 70 | m |
| | - 3/4" dia stainless steel pipe, schedule 40 | 80 | m |
| | - 1" dia stainless steel pipe, schedule 40 | 85 | m |
| | - 2" dia aluminum pipe, schedule 80, up to 5 m spool | 1 | EA |
| | - 2" dia stainless steel pipe, schedule 40 | 110 | m |
| | - Cap, 3/4" dia stainless steel | 5 | EA |
| | - Cap, 1" dia stainless steel | 4 | EA |
| | - Cap, 2" dia stainless steel | 4 | EA |
| | - Elbow, 1/2" dia stainless steel, 45 deg | 5 | EA |
| | - Elbow, 3/4" dia stainless steel, 45 deg | 5 | EA |
| | - Elbow, 3/4" dia stainless steel, 90 deg | 18 | EA |
| | - Elbow, 1" dia stainless steel, 45 deg | 5 | EA |
| | - Elbow, 1" dia stainless steel, 90 deg | 46 | EA |
| | - Elbow, 1 1/2" dia stainless steel, 90 deg | 15 | EA |
| | - Elbow, 2" dia stainless steel, 45 deg | 8 | EA |
| | - Elbow, 2" dia stainless steel, 90 deg | 20 | EA |
| | - Elbow, 2" dia aluminum, 90 deg | 1 | EA |
| | - Flange c/w gasket & studs, 1" ø stainless steel, weld neck | 1 | EA |
| | - Flange c/w gasket & studs, 2" ø stainless steel, weld neck | 3 | EA |
| | - Flange c/w gasket & studs, 2" ø aluminum, socket weld | 1 | EA |
| | - Sockolet, 3" to 2" ø aluminum | 1 | EA |
| | - Tee, 3/4" ø stainless steel | 2 | EA |
| | - Tee, 1 1/2" ø stainless steel | 3 | EA |
| | - Tee, 1"X1"X 3/4" ø stainless steel | 1 | EA |
| | - Tee, 2"X2"X 3/4" ø stainless steel | 1 | EA |
| | - Tee, 2" ø stainless steel | 4 | EA |
| | - Tee, 3" X 3" X 2" ø, aluminum | 1 | EA |
| | - Nipple, 2" ø stainless steel | 1 | EA |
| | - Blank, 2" ø stainless steel | 1 | EA |
| | - Adopters, unions, nipples, orifices etc. up to 1 1/2" ø, allow for additional as required | 1 | LS |
| | - Ball valve, 3/4" ø, stainless steel | 5 | EA |
| | - Diaphragm valve, 3/4" ø, stainless steel | 4 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref | Item Description | Quantity | Unit |
|----------|---|----------|------|
| 04 | D2O Clean-up System (Cont'd) | | |
| 04.05 | Supply of demineralized water to the west annex including tie in to the existing station demineralized water (cont'd) | | |
| | - Diaphragm valve, 1" ø, stainless steel | 3 | EA |
| | - Diaphragm valve, 1 1/2" ø, stainless steel | 1 | EA |
| | - Diaphragm valve, 2" ø, stainless steel | 4 | EA |
| | - Flexible metal hose, 3/4" ø stainless steel, 6 ft | 1 | EA |
| | - Flexible metal hose, 3/4" ø stainless steel, 25 ft | 7 | EA |
| | - Insulation, 2" ø X 1" th | 100 | EA |
| | - Insulation, 1 1/2" ø X 1" th | 70 | EA |
| | - Insulation, 1" ø X 1" th | 90 | EA |
| | - Insulation, 3/4" ø X 1" th | 70 | EA |
| 04.06 | D2O cleanup system to increase flexibility for HWMB | | |
| | - 1 1/2" ø stainless steel pipe, schedule 40, plain ends, class 3 | 20 | m |
| | - Pressure boundary, pipe, 3" ø carbon steel spool piece up to 5 m, class 6 | 1 | EA |
| | - Elbow, pipe, 1/12" ø, buttweld, stainless steel 304l, 90 deg. schedule 40, class 3 | 4 | EA |
| | - Elbow, pipe, 1/12" ø, buttweld, stainless steel 304l, 45 deg. schedule 40, class 3 | 3 | EA |
| | - Tee,1/2" ø stainless steel, class 6 | 4 | EA |
| | - Diaphragm valve, 1 1/2" ø, stainless steel | 3 | EA |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|---|--|
| 05 | Active Drain System | | |
| 05.01 | Equipment, tanks and pumps - P5/6, Pump, 85 GPM @140ft head - Tank skid TK1, Tank, 3.8 m3, stainless steel - P4, Pump, 083 l/s @23 m head | 2 1 1 | EA EA EA |
| 05.02 | Mechanical modifications to the loading bay 1" ø, piping, carbon steel, sch 80 c/w support 1 1/2" ø, piping, carbon steel, sch 80 Coupling, 1-1/2" x 1" ø, socket weld, carbon steel Union, pipe, 1" ø, socket weld carbon steel. Elbow, 1" ø, socket weld, carbon steel, 90 deg. Elbow, 1" ø, socket weld, carbon steel, 45 deg. Elbow, 1-1/2" ø, threaded, carbon steel Cap, 1" ø, socket weld, carbon steel Strainer, y, 1" ø, stainless steel Gate valve, 1" ø, carbon steel Hi temperature insulation for up to 1 1/2" ø condensate pipe | 28 1 2 4 1 1 2 1 1 1 29 | m EA EA EA EA EA EA EA EA M |
| 05.03 | Active plant drainage system and D2O liquid recovery tie-in - 1 1/4" ø, piping, carbon steel, sch 40 c/w support & fitting -2" ø pipe, carbon steel, spool piece. Up to 5 m length c/w support & fittings | 18 1 | m EA |
| 05.04 | West Annex Active Plant Drainage discharge and vent line piping 1/2" ø pipe, stainless steel, spool piece. Up to 5 m length c/w support & fittings 3/4" ø pipe, stainless steel, c/w support & fittings 1 1/2" ø pipe, stainless steel, c/w support & fittings 2" ø pipe, stainless steel c/w support 2" ø pipe, carbon steel c/w support 2 1/2" ø pipe, carbon steel, spool piece. Up to 5 m length c/w support, sch 80 -3" ø pipe, carbon steel, spool piece. Up to 5 m length c/w support, sch 80 | 1 12 10 312 65 1 1 | EA m m m EA EA |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 05 | Active Drain System (Cont'd) | | |
| 05.04 | West Annex Active Plant Drainage discharge and vent line piping (cont'd) | | |
| | - 3" ø pipe, stainless steel c/w support | 8 | m |
| | - Elbow, 1/2" ø. carbon steel, 90 deg. | 4 | EA |
| | - Elbow, 3/4" ø, stainless steel, 90 deg. | 9 | EA |
| | - Elbow, 1 1/2" ø, stainless steel, 90 deg. | 5 | EA |
| | - Elbow, 2" ø, stainless steel, 45 deg. | 15 | EA |
| | - Elbow, 2" ø, carbon steel, 90 deg. | 18 | EA |
| | - Elbow, 2" ø, stainless steel, 90 deg. | 90 | EA |
| | - Elbow, 3" ø, stainless steel, 90 deg. | 5 | EA |
| | - Elbow, 3" ø, stainless steel, 90 deg., short radius | 1 | EA |
| | - Flange c/w gasket & studs, 3/4" ø, stainless steel | 3 | EA |
| | - Flange c/w gasket & studs, 1" ø, stainless steel | 1 | EA |
| | - Flange c/w gasket & studs, 1 1/2" ø, stainless steel | 3 | EA |
| | - Flange c/w gasket & studs, 2" ø, stainless steel | 4 | EA |
| | - Flange c/w gasket & studs, 3" ø, stainless steel | 7 | EA |
| | - Flange c/w gasket & studs, 3" ø, stainless steel, slipon | 1 | EA |
| | - Reducer, 2"X1/2" ø, stainless steel | 2 | EA |
| | - Tee, 1 1/2"X1 1/2"X1/2" ø, stainless steel | 1 | EA |
| | - Tee, 2"X2"X1/2" ø, stainless steel | 3 | EA |
| | - Tee, 2"X2"X1 1/2" ø, stainless steel | 2 | EA |
| | - Tee, 2" ø, stainless steel | 10 | EA |
| | - Tee, 3" ø, stainless steel | 1 | EA |
| | - Weldolet, 2"X1/2" ø, stainless steel | 2 | EA |
| | - Adopters, unions, nipples, orifices etc. up to 1 1/2" ø, allow for additional as required | 1 | LS |
| | - Ball valve, 1/2" ø, stainless steel | 5 | EA |
| | - Check valve, 2" ø, stainless steel | 3 | EA |
| | - Diaphragm valve, 1 1/2" ø, stainless steel | 2 | EA |
| | - Diaphragm valve, 2" ø, stainless steel | 7 | EA |
| | - Diaphragm valve, 3" ø, stainless steel | 3 | EA |
| | - Globe valve, 1/2" ø, stainless steel | 3 | EA |
| | - Globe valve, 3/4" ø, stainless steel, class 150 | 3 | EA |
| | - Globe valve, 1 1/2" ø, stainless steel | 2 | EA |
| | - Needle valve, 1/2" ø, stainless steel | 2 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 05 | Active Drain System (Cont'd) | | |
| 05.04 | West Annex Active Plant Drainage discharge and vent line piping (cont'd) | | |
| | - Strainer valve, 3" ø, stainless steel | 1 | EA |
| | - Flexible metal hose, 1/2" ø stainless steel, 4 m long c/w quick coupling in both end | 1 | EA |
| 05.05 | D2O management building- D2O liquid recovery discharge piping | | |
| | - 1/2" ø pipe, stainless steel, spool piece. Up to 5 m length c/w support & fittings | 1 | EA |
| | - 3/4" ø pipe, stainless steel, c/w support & fittings | 50 | m |
| | - 1" ø pipe, stainless steel, spool piece. Up to 5 m length c/w support & fittings | 1 | EA |
| | - 1" ø pipe, stainless steel c/w support | 30 | m |
| | - 1 1/2" ø pipe, stainless steel, c/w support & fittings | 42 | m |
| | - Cap, 1/2" ø, stainless steel | 1 | EA |
| | - Elbow, 3/4" ø, stainless steel, 45 deg. | 4 | EA |
| | - Elbow, 3/4" ø, stainless steel, 90 deg. | 32 | EA |
| | - Elbow, 1" ø, stainless steel, 90 deg. | 13 | EA |
| | - Elbow, 1 1/2" ø, stainless steel, 45 deg. | 2 | EA |
| | - Elbow, 1 1/2" ø, stainless steel, 90 deg. | 13 | EA |
| | - Flange c/w gasket & studs, 1" ø, stainless steel | 1 | EA |
| | - Flange c/w gasket & studs, 1 1/2" ø, stainless steel | 1 | EA |
| | - Orifice assey, 3/4" ø, stainless steel, Class 6 | 1 | EA |
| | - Reducer, 1 1/2"X1" ø, stainless steel | 1 | EA |
| | - Reducer, 1"X1/2" ø, stainless steel | 1 | EA |
| | - Tee, 3/4" ø, stainless steel | 4 | EA |
| | - Tee, 1"X1"X1/2" ø, stainless steel | 1 | EA |
| | - Tee, 1"X1"X3/4" ø, stainless steel | 2 | EA |
| | - Tee, 1" ø, stainless steel | 2 | EA |
| | - Adopters, unions, nipples, orifices etc. up to 1 1/2" ø, allow for additional as required | 1 | LS |
| | - Ball valve, 3/4" ø, stainless steel | 1 | EA |
| | - Check valve, 1" ø, stainless steel, class 150# | 2 | EA |
| | - Diaphragm valve, 3/4" ø, stainless steel | 3 | EA |
| | - Diaphragm valve, 1" ø, stainless steel | 4 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 05 | Active Drain System (Cont'd) | | |
| 05.05 | D2O management building- D2O liquid recovery discharge piping (cont'd) | | |
| | - Globe valve, 1/2" ø, stainless steel | 2 | EA |
| | - Globe valve, 3/4" ø, stainless steel, class 150 | 4 | EA |
| 05.06 | D2O Management building- West annex fl. el. 100.0 active drainage piping | | |
| | - 1/2" ø pipe, stainless steel, c/w support & fittings | 10 | m |
| | - 1" ø pipe, stainless steel c/w support | 15 | m |
| | - 2" ø pipe, carbon steel c/w support | 70 | m |
| | - 3" ø pipe, stainless steel c/w support | 35 | m |
| | - 4" ø pipe, stainless steel c/w support | 17 | m |
| | - Cap, 1" ø, stainless steel | 1 | EA |
| | - Elbow, 1/2" ø, stainless steel, 90 deg. | 3 | EA |
| | - Elbow, 1" ø, stainless steel, 90 deg. | 2 | EA |
| | - Elbow, 2" ø, stainless steel, 45 deg. | 17 | EA |
| | - Elbow, 2" ø, stainless steel, 90 deg. | 19 | EA |
| | - Elbow, 3" ø, stainless steel, 45 deg | 3 | EA |
| | - Elbow, 3" ø, stainless steel, 90 deg. | 4 | EA |
| | - Elbow, 4" ø, stainless steel, 45 deg | 3 | EA |
| | - Elbow, 4" ø, stainless steel, 90 deg. | 1 | EA |
| | - Flange c/w gasket & studs, 4" ø, stainless steel | 1 | EA |
| | - Reducer, 2"X1/2" ø, stainless steel | 1 | EA |
| | - Reducer, 3"X2" ø, stainless steel | 2 | EA |
| | - Reducer, 4"X3" ø, stainless steel | 1 | EA |
| | - Tee, 2"X1" ø, stainless steel | 1 | EA |
| | - Tee, 2" ø, stainless steel | 1 | EA |
| | - Tee, 3"X2" ø, stainless steel | 1 | EA |
| | - Tee, 3" ø, stainless steel | 1 | EA |
| | - Tee, 4" ø, stainless steel | 1 | EA |
| | - Tee, 4"X3" ø, stainless steel | 1 | EA |
| | - Adopters, unions, nipples, orifices etc. up to 1 1/2" ø, allow for additional as required | 1 | LS |
| | - Inhibitor koppers, Tar | 5 | USG |
| | - Floor drain, 3" ø, cast stainless steel. | 2 | EA |
| | - Floor drain, stainless steel. | 10 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 05 | Active Drain System (Cont'd) | | |
| 05.07 | D2O Management building- West annex fl. el. 107.8 active drainage piping | | |
| | - 2" ø pipe, stainless steel c/w support | 13 | m |
| | - 3" ø pipe, stainless steel c/w support | 50 | m |
| | - 4" ø pipe, stainless steel c/w support | 8 | m |
| | - Cap, 2" ø, stainless steel | 1 | EA |
| | - Elbow, 2" ø, stainless steel, 45 deg. | 3 | EA |
| | - Elbow, 2" ø, stainless steel, 90 deg. | 1 | EA |
| | - Elbow, 3" ø, stainless steel, 45 deg | 5 | EA |
| | - Elbow, 3" ø, stainless steel, 90 deg. | 4 | EA |
| | - Elbow, 4" ø, stainless steel, 90 deg. | 1 | EA |
| | - Reducer, 4"X3" ø, stainless steel | 1 | EA |
| | - Floor drain, 3" ø, cast stainless steel. | 3 | EA |
| | - Floor drain, stainless steel. | 1 | EA |
| 05.08 | D2O Management building fl.el.86.700 active plant drainage act. drainage discharge piping | | |
| | - 2 " ø pipe, carbon steel, spool piece. Up to 5 m length c/w support, sch 40 | 1 | EA |
| | - Cap, 1/2" ø, stainless steel, class 6 | 2 | EA |
| | - Cap, 2" ø, stainless steel | 2 | EA |
| | - Elbow, 2" ø, stainless steel, 90 deg. | 4 | EA |
| | - Tee, 2" ø, stainless steel | 1 | EA |
| | - Weldolet, 2"X1/2" ø, stainless steel, class 6 | 2 | EA |
| | - Adopters, unions, nipples, orifices etc. up to 1 1/2" ø, allow for additional as required | 1 | LS |
| | - Diaphragm valve, 2" ø, stainless steel | 3 | EA |
| 05.09 | D2O management building - fl. el. 87.00 D2O liquid recovery piping | | |
| | - 1/2" ø pipe, stainless steel, spool piece. Up to 5 m length c/w support & fittings | 1 | EA |
| | - 3/4" ø pipe, stainless steel, spool piece. Up to 5 m length c/w support & fittings | 1 | EA |
| | - 1" ø pipe, stainless steel, spool piece. Up to 5 m length c/w support & fittings | 1 | EA |
| | - 2" ø pipe, stainless steel c/w support | 230 | m |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 05 | Active Drain System (Cont'd) | | |
| 05.09 | D2O management building - fl. el. 87.00 D2O liquid recovery | | |
| | piping (cont d) | 2 | |
| | - Cap, 3/4 0, stainless steel - Elbow 2" a stainless steel 45 dea | 40 | ΕA |
| | - Elbow, 2" ø, stainless steel, 40 deg. | 16 | ΕA |
| | - Flance c/w casket & studs 2" ø stainless steel | 2 | FA |
| | - Reducer, 2"X1/2" ø, stainless steel | 1 | FA |
| | - Reducer, 2"X1" ø, stainless steel | 8 | FA |
| | - Tee, 2" ø. stainless steel | 8 | EA |
| | - Weldolet, 2"X3/4" ø, stainless steel | 2 | EA |
| | - Adopters, unions, nipples, orifices etc. up to 1 1/2" ø, allow for additional as | 1 | |
| | required | I | LS |
| | - Gate valve, 1/2" ø, stainless steel | 2 | EA |
| | - Gate valve, 1" ø, stainless steel | 9 | EA |
| | - Plug valve, 2" ø, stainless steel | 3 | EA |
| | - Floor drain, stainless steel. | 20 | EA |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|------------------|----------------------|
| 06 | Inactive Drain System | | |
| 06.01 | Equipment, tanks and pumps - P62/63, Pump, 85 GPM @140ft head - Tank skid TK3, Tank, 3.8 m3, stainless steel | 2 1 | EA EA |
| 06.02 | Tie-in to inactive plant drainage (roof/condensate) 2" ø pipe, carbon steel, spool piece5 m length c/w support & fittings Gate valve, 2", carbon steel Cap, 2" ø, carbon steel Elbow, 2" ø, carbon steel Tie into existing | 1 1 3 1 | EA EA EA LS |
| 06.03 | Pipe supports - Pipe supports | 5 | EA |
| 06.04 | HWMB West annex in-active plant drainage | | |
| | - 1/2" Ø pipe, carbon steel, spool piece. Up to 5 m length c/w support & fittings | 1 | EA |
| | - 3/4" ø pipe, stainless steel, spool piece. Up to 5 m length c/w support & fittings | 1 | EA |
| | - 3/4" ø pipe, carbon steel, c/w support & fittings | 14 | m |
| | - 1 1/2" ø pipe, carbon steel, c/w support & fittings | 12 | m |
| | - 2" ø pipe, carbon steel c/w support | 185 | m |
| | - 2 1/2" ø pipe, carbon steel, spool piece. Up to 5 m length c/w support, sch 80 | 1 | EA |
| | - 3" ø pipe, carbon steel, spool piece. Up to 5 m length c/w support & fittings, sch 80 | 1 | EA |
| | - 3" ø pipe, carbon steel c/w support | 12 | m |
| | - Cap, 2" ø, carbon steel | 47 | EA |
| | - Elbow, 3/4" ø, stainless steel, 90 deg. | 3 | EA |
| | - Elbow, 2" ø, carbon steel, 45 deg. | 5 | EA |
| | - Flange c/w gasket & studs, 3/4" ø, stainless steel | 2 | EA |
| | - Flange c/w gasket & studs, 2 Ø, carbon steel | 4 | EA |
| | - Flange c/w gasket & studs, 5 %, carbon steel | 1 | ΕA |
| | - Adopter 3/8" ø staipless steel Class 1 | 2 | FA |
| | - Tee, 2"X2"X1/2" ø, carbon steel | 2 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 06 | Inactive Drain System (Cont'd) | | |
| 06.04 | HWMB West annex in-active plant drainage (cont'd) | | |
| | - Tee, 2"X2"X1 1/2" ø, carbon steel | 1 | EA |
| | - Tee, 2" ø, carbon steel | 2 | EA |
| | - Tee, 3" ø, carbon steel | 1 | EA |
| | - Elbow, 3" ø, carbon steel, 90 deg. | 9 | EA |
| | - Check valve, 2" ø, carbon steel | 1 | EA |
| | - Gate valve, 2" ø, carbon steel | 4 | EA |
| | - Gate valve, 3" ø, carbon steel | 2 | EA |
| | - Globe valve, 1/2" ø, carbon steel | 2 | EA |
| | - Globe valve, 3/4" ø, stainless steel, class 150 | 2 | EA |
| | - Globe valve, 3/4" ø, carbon steel, class 800 | 3 | EA |
| | - Globe valve, 1 1/2" ø, carbon steel | 1 | EA |
| | - Needle valve, 3/4" ø, carbon steel | 1 | EA |
| | - Strainer valve, 3" ø, carbon steel | 2 | EA |
| | - Flexible metal hose, 1/2" stainless steel, 4 m long c/w quick coupling in both | 1 | EA |
| | - Flexible metal hose, 1/2" stainless steel, 7 m long c/w quick coupling in both end | 1 | EA |
| | - Painting, compound, sealing, etc. allow | 1 | LS |
| | - Insulation on flanges | 1 | LS |
| 06.05 | HWMB West annex inactive floor drainage piping | | |
| | - Floor drain, 3" ø, cast iron. | 4 | EA |
| | - Utility drain, 3" ø, cast iron. | 1 | EA |
| | - 2" ø pipe, carbon steel sch 80 c/w support | 26 | m |
| | - 3" ø pipe, carbon steel c/w support | 16 | m |
| | - 4" ø pipe, carbon steel c/w support | 70 | m |
| | - 6" ø pipe, carbon steel c/w support | 12 | m |
| | - Coupling, 3" ø, stainless steel | 4 | EA |
| | - Elbow, 2" ø, carbon steel, 45 deg. | 4 | EA |
| | - Elbow, 2" ø, carbon steel, 90 deg. | 3 | EA |
| | - Elbow, 3" ø, carbon steel, 45 deg. | 2 | EA |
| | - Elbow, 3" ø, carbon steel, 90 deg. | 3 | EA |
| | - Elbow, 4" ø, carbon steel, 45 deg. | 6 | EA |
| | - Elbow, 4" ø, carbon steel, 90 deg. | 11 | EA |
| | - Elbow, 6" ø, carbon steel, 90 deg. | 2 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|------------------|----------------------|
| 06 | Inactive Drain System (Cont'd) | | |
| 06.05 | HWMB West annex inactive floor drainage piping (cont'd) Plug, 2" ø, carbon steel Reducer, 4"X2" ø, carbon steel Reducer, 6"X4" ø, carbon steel Tee, 2"X2"X1 1/4" ø, carbon steel | 4 3 1 3 | EA EA EA EA |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|----------|
| 07 | Drum Handling and Cleaning Systems | | |
| 07.01 | HWMB West annex D2O drum handling emptying and cleaning | | |
| | isometric piping, filling and pressure testing | | |
| | - 3/8" ø copper, type L up to 5 m spool, class 6 | 1 | EA |
| | - 1/2" Ø stainless steel, schedule 40, class 6 | 7 | m |
| | - 1/2" Ø stainless steel, schedule 40, up to 5 m spool, class 6 | 1 | EA |
| | - 3/4" Ø stainless steel, schedule 40, up to 5 m spool, class 3 | 1 | EA |
| | - 3/4" ø, stainless steel pipe, schedule 40, class 6 | 15 | m |
| | - 1" ø copper, type L up to 5 m spool, class 6 | 1 | EA |
| | - 1" ø, stainless steel pipe, schedule 40, class 3 | 55 | m |
| | - 1" ø, stainless steel pipe, schedule 40, class 6 | 50 | m |
| | - 2" ø stainless steel, schedule 40, up to 5 m spool, class 6 | 1 | EA |
| | - 2" ø, stainless steel pipe, schedule 40, class 6 | 35 | m |
| | - Cap, 1" ø stainless steel, class 6 | 6 | EA |
| | - Elbow, 1/2" ø stainless steel, 90 deg., class 6 | 8 | EA |
| | - Elbow, 3/4" Ø stainless steel, 90 deg., class 6 | 10 | EA |
| | - Elbow, 1" Ø stainless steel, 45 deg., class 6 | 1 | EA |
| | - Elbow, 1" Ø stainless steel, 90 deg., class 3 | 28 | EA |
| | - Elbow, 1 % Stainless steel, 90 deg., class 6 | 47 | EA |
| | - Elbow, 1 1/2" Ø stalniess steel, 90 deg. class 6 | 15 | EA |
| | - Elbow, 2" Ø stalniess steel, 90 deg., class 6 | 18 | EA |
| | - Flange c/w gasket & stude, 1" stainless steel, weld neck, class 5 | 10 | EA |
| | - Flange c/w gasket & stude, 1 1/2" stainless steel, weld neck, class 6 | 20 | EA |
| | - Flange C/w gasket & studs, 1 1/2 stainless steel, weld neck, class o | 12 | |
| | - Flange C/W gasket & study, 2 stalliess steel, weld neck, class o | 2 | |
| | - Reducer, 3/4 to 1/2 stainless steel, concentric, class 6 | 4 Q | |
| | - Reducer, 1 " to 3/4" stainless steel, concentric, class 0 | 0 | EA |
| | - Reducer, 1 " to 3/4" stainless steel, concentric, class 5 | 10 | EA EA |
| | - Reducer, 1 1/2 " to 1/2" a stainless steel, concentric, class 6 | 13 | EA EA |
| | - Reducer, 1 1/2 to 1/2 of stainless steel, concentric, class 6 | 2 | EA |
| | - Reducer, 2 to 1 1/2" a stainless steel, concentric, class 6 | 2 | EA |
| | | I | LA |
| | - strainer 1" ø stainless steel, class 6 (replace existing with flange section pipe) | 1 | EA |
| | - Tee,1/2" ø stainless steel, class 6 | 5 | EA |
| | - Tee,3/4" ø stainless steel, class 6 | 4 | EA |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 07 | Drum Handling and Cleaning Systems (Cont'd) | | |
| 07.01 | HWMB West annex D2O drum handling emptying and cleaning isometric piping, filling and pressure testing (cont'd) | | |
| | - Tee,1" ø stainless steel, class 3 | 11 | EA |
| | - Tee,1" ø stainless steel, class 6 | 20 | EA |
| | - Tee, 1x 1/2" ø stainless steel, class 6 | 4 | EA |
| | - Tee, 1x 3/4" ø stainless steel, class 6 | 3 | EA |
| | - Tee, 1 1/2" ø stainless steel, class 6 | 1 | EA |
| | - Tee, 2"x1" ø stainless steel, class 6 | 1 | EA |
| | - Tee, 2"x1 1/2" ø stainless steel, class 6 | 10 | EA |
| | - Ball valve, 1/2" ø, stainless steel, class 300# | 5 | EA |
| | - Ball valve, 3/4" ø, stainless steel, class 300# | 4 | EA |
| | - Ball valve, 1" ø, stainless steel, class 150# | 7 | EA |
| | - Air release valve, 1" ø, stainless steel, class 150 | 1 | EA |
| | - Relief valve, 1" ø, stainless steel, class 150 | 2 | EA |
| | - Relief valve, 1 1/2" ø, stainless steel, class 150# | 1 | EA |
| | - Check valve, 1" ø, stainless steel, class 150 | 7 | EA |
| | - Diaphragm valve, 1" ø, stainless steel, class 150 | 14 | EA |
| | - Globe valve, 1/2" ø, stainless steel, class 150# | 6 | EA |
| | - Globe valve, 3/4" ø, stainless steel, class 150# | 4 | EA |
| | - PRV valve, 1/2" ø, stainless steel, class 150# | 1 | EA |
| | - PRV valve, 1" ø, stainless steel, class 150# | 12 | EA |
| | - flow indicating meter, 3/4" ø, stainless steel, class 3 | 1 | EA |
| | - flow indicating meter, 1" ø, stainless steel | 1 | EA |
| | - Gauge, flow, 2" ø, straight through bullseye | 1 | EA |
| | - Gauge, pressure, 4" øl, Class 6 | 4 | EA |
| | - Electric heater, 2" inlet and outlet, 75 kW | 1 | EA |
| | - Flexible metal hose, 1/2" stainless steel, 4 m long | 16 | EA |
| | - Flexible metal hose, 3/4" stainless steel, 4 m long | 19 | EA |
| | - TRF pumping tool | 3 | EA |
| | - Tool balancer, 360 deg., stroke 1.3 m | 2 | EA |
| | Digital scale, 300 kg capacity | 2 | EA |
| 07.02 | HWMB west annex D2O drum handling - drum filling transfer tool | 6 | EA |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 07 | Drum Handling and Cleaning Systems (Cont'd) | | |
| 07.03 | HWMB west annex D2O drum handling - drum emptying transfer tool | 3 | EA |
| 07.04 | HWMB west annex D2O drum drying tool | 3 | EA |
| 07.05 | HWMB west annex D2O drum handling - misc. tooling - Pump, Vacuum, 1/8 HP, 1.1CFM (duplex)@ 60 psi c/w Accessories such as steel drum, 55 Gal, filter housing, etc. | 1 | LS |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 08 | Controls | | |
| 08.01 | Controls & software , refer D_EC_DSGN-124819, 137109, 137115, 137116, 137109, 137115 & 137116) | 1 | LS |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

OCTOBER 25, 2019

E - Process Support Systems

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 01 | Chilled Water Supply System | | |
| 01.01 | Chilled water equipment | | |
| • • • • | - Chilled water system, packaged unit with a cooling capacity of 1,080,000 BTU/HR | 1 | EA |
| | - Fluid cooler, air cooled, vertical airflow, direct drive propellers, and independent fan motors. (capacity, no detail) | 2 | No. |
| | - ACU9, ACU10, Air conditioning unit, 52.3MBH/ 15.3kw cooling capacity, inline horizontal coils, stainless steel tubes, aluminum fins. | 2 | EA |
| | - ACU11, ACU12, Air conditioning unit, 115MBH/ 33.9kW cooling capacity, inline horizontal coils, stainless steel tubes, aluminum fins. | 2 | EA |
| | - ACU13, ACU14, Air conditioning unit, 52.6MBH/ 15.5kw cooling capacity, inline horizontal coils, stainless steel tubes, aluminum fins. | 2 | EA |
| 01.02 | Chilled water piping and fittings | | |
| | - 4" ø pipe, stainless steel, schedule 40s, butt weld | 95 | m |
| | - 1 1/2" ø pipe, stainless steel, schedule 40s, butt weld | 165 | m |
| | - 1" ø pipe, stainless steel, NPS 1 | 300 | m |
| | - 1" ø pipe, stainless steel, NPS 2 | 10 | m |
| | - Ball valve, 1", stainless steel, socket weld ends, manual operated | 18 | EA |
| | - Ball valve, 1 1/2", stainless steel, socket weld ends, manual operated | 16 | EA |
| | - Ball valve (temperature control), 1-1/2", stainless steel, socket weld ends | 2 | EA |
| | - Ball valve, 4", stainless steel, butt weld ends, manual operated | 2 | EA |
| | - Valve, pressure control, ball, 4", stainless steel | 1 | EA |
| | - Flange assembly, 150#, 304L SS, for 2" sched 40s pipe, incl. non-metallic compressed gasket, flat ring | 4 | EA |
| | - Flange assembly, 150#, 304L SS, for 1" sched 40s pipe, incl. non-metallic compressed gasket, flat ring | 4 | EA |
| | - Flange assembly, 150#, 304L SS, for 1 $\frac{1}{2}$ " sched 40s pipe, incl. non-metallic compressed gasket, flat ring | 12 | EA |
| | - Flange assembly, 300#, 304L SS, for 1 $\frac{1}{2}$ sched 40s pipe, incl. non-metallic compressed gasket, flat ring | 4 | EA |
| | - Flange assembly, 150#, 304L SS, for 1 ¼" sched 40s pipe, incl. non-metallic compressed gasket, flat ring | 4 | EA |
| | Portable venturi meter, linear δp, 0-50" wg, w/standard fitting kit: including 2 quick disconnect fittings, hose, shutoff valves | 1 | EA |
| | - Insulation, fiberglass, 1.5" thick, with stucco embossed aluminum jacketing for NPS4, | 90 | m |
| | - Elbow, 90 deg, long radius, 4" nps, buttweld | 11 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 01 | Chilled Water Supply System (Cont'd) | | |
| 01.02 | Chilled water piping and fittings (cont'd) | | |
| | - Sock-o-let, 4" x 1" nps, socket weld, schedule 40 | 12 | EA |
| | - Reducing tee, 4"x1 1/2" nps, buttweld, schedule 40s, ss 304L | 16 | EA |
| | - Elbow, 90 deg, short radius, 4" nps, buttweld, schedule 40s | 2 | EA |
| | - Insulation, fiberglass, 1" with stucco embossed aluminum jacketing, for 1" nps | 180 | m |
| | - Insulation, fiberglass, 1" with stucco embossed aluminum jacketing, for 3/4" NPS | 10 | m |
| | Insulation, fiberglass, 1" with stucco embossed aluminum jacketing, for 1 1/2" NPS | 165 | m |
| | - Valve, ball, 3/4", stainless steel, socket weld ends, manual operated | 33 | EA |
| | - Air release valve, 3/4" NPT inlet x 3/8" NPT outlet, stainless steel internals, brass body option | 18 | EA |
| | - Venturi flow element, 1" NPT, brass body, c/w brass valves and quick connect fittings | 6 | EA |
| | Venturi flow element, 1 1/2" NPT, brass body, c/w brass valves and quick connect fittings | 8 | EA |
| | - Thermowell, 1⁄2" mNPT external thread, 1⁄2" fNPT | 2 | EA |
| | - Plate, metal, 48" x 96" x ½" (1200 mm x 2400 mm x 12 mm) steel, hot rolled | 2 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|------------------|----------------------|
| 02 | D2O Vapour Recovery System | | |
| 02.01 | Equipment - DR12/13, Twin tower desiccant dryer, class 6, assembly - Blower, regenerative, 229 SCFM, - DR1, Desiccant wheel dryer, class exempt, assembly - FUH1 to 5, Fume hood, 1520X3496X500 mm, stainless steel | 1 1 1 5 | EA EA EA EA |
| 02.02 | Piping and fittings | | |
| | - 3/4" ø pipe, stainless steel, c/w support & fittings, class 6, allow for field run & D2O collection to PHT on drg. NK38-DRAW-38309-10001/10002, class 6 | 1 | LS |
| | - 1" ø pipe, stainless steel, c/w support & fittings, class 6, allow for field run & D2O collection to PHT on drg. NK38-DRAW-38309-10001, class 6 | 1 | LS |
| | - 1 1/2" ø pipe, stainless steel, c/w support & fittings, class 6, allow for field run & D2O collection to PHT on drg. NK38-DRAW-38309-10001, class 6 | 1 | LS |
| | - Elbow, 1/2" ø, stainless steel, 90 deg. Class 6 | 10 | EA |
| | - Elbow, 3/4" ø, stainless steel, 45 deg., class 6 | 4 | EA |
| | - Elbow, 3/4" ø, stainless steel, 90 deg., class 6, allow as required | 1 | LS |
| | - Elbow, 1" ø, stainless steel, 90 deg., class 6, allow as required | 1 | LS |
| | - Elbow, 1 1/2" ø, stainless steel, 45 deg., class 6 | 1 | EA |
| | - Elbow, 1 1/2" ø, stainless steel, 90 deg., class 6, allow as required | 1 | LS |
| | - Elbow, 2" ø, stainless steel, 45 deg., class 6 | 2 | EA |
| | - Elbow, 2" ø, stainless steel, 90 deg., class 6, allow as required | 1 | LS |
| | - Flange c/w gasket & studs, 3/4" ø, stainless steel, class 6 | 11 | EA |
| | - Flange c/w gasket & studs, 1" ø, stainless steel, class 6 | 1 | EA |
| | - Flange c/w gasket & studs, 1 1/2" ø, stainless steel, class 6 | 6 | EA |
| | - Flange c/w gasket & studs, 2" ø, stainless steel, class 6 | 16 | EA |
| | - Quick connect adopter, 3/4" ø, stainless steel, Class 6 | 1 | EA |
| | - Nipple, 3"X1/2" ø, stainless steel, class 6 | 2 | EA |
| | - Reducer, 1"X3/4" ø, stainless steel, class 6 | 1 | EA |
| | - Reducer, 1 1/2"X3/4" ø, stainless steel, class 6 | 1 | EA |
| | - Reducer, 2"X1 1/2" ø, stainless steel, class 6 | 1 | EA |
| | - Reducer insert, 2"X3/4" ø, stainless steel, class 6 | 2 | EA |
| | - Tee, 1/2" ø, stainless steel, class 6 | 1 | EA |
| | - Tee, 1 1/2"X1" ø, stainless steel, class 6 | 2 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 02 | D2O Vapour Recovery System (Cont'd) | | |
| 02 02 | Piping and fittings (cont'd) | | |
| 02.02 | - Tee 1 1/2"X1/2" ø stainless steel class 6 | 4 | FA |
| | - Tee, 2"X1 1/2" ø stainless steel, class 6 | 2 | FA |
| | - Tee, 2" ø. stainless steel, class 6 | - 7 | EA |
| | - Weldolet, 2"X1/2" ø, stainless steel, class 6 | 3 | EA |
| | - Adopters, unions, nipples, orifices etc. up to 1 1/2" ø, allow for additional as required | 1 | LS |
| | - Ball valve, 3/4" ø, stainless steel, class 300# | 1 | EA |
| | - Check valve, 3/4" ø, stainless steel, class 6, class 150# | 1 | EA |
| | - Check valve, 2" ø, stainless steel, class 150# | 3 | EA |
| | - Diaphragm valve, 1 1/2" ø, stainless steel, class 6 | 1 | EA |
| | - Diaphragm valve, 2" ø, stainless steel, class 6 | 5 | EA |
| | - Globe valve, 1/2" ø, stainless steel, class 150# | 1 | EA |
| | - Relief valve, 1 1/2" X 2" inlet ø, Class 150# | 1 | EA |
| | - Relief valve, 1 1/2" X 2" inlet ø, Class 6 | 1 | EA |
| | - Relief valve, 3/4" X 1 1/2" inlet ø | 2 | EA |
| | - Pressure regulating valve, 1/2" ø, stainless steel, class 6 | 1 | EA |
| | - Pressure indicator, 20-34 kPa(g), Air | 1 | EA |
| | - DP, Manual damper, 10" ø, stainless steel | 11 | EA |
| | - DP, Manual damper, 14" ø, stainless steel | 1 | EA |
| | - FD, Fire damper, 14" ø, stainless steel | 2 | EA |
| | - Tooling cabinet, 1X1X2 m | 1 | EA |
| | - 3/4" ø pipe, stainless steel, c/w support & fittings, class 6, allow for field run | 1 | LS |
| | - 1" ø pipe, stainless steel, c/w support & fittings, class 6 | 1 | LS |
| | - 1" ø pipe, stainless steel, spool piece. Up to 5 m length c/w support & fittings, class 6 | 1 | EA |
| | - 2" ø pipe, stainless steel c/w support, allow as required in field run | 1 | LS |
| | - 4" ø pipe, stainless steel, spool piece. Up to 5 m length c/w support & fittings, class 6 | 1 | EA |
| | - 6" ø pipe, stainless steel, spool piece. Up to 5 m length c/w support & fittings, class 6 | 1 | EA |
| | - 10" ø pipe, stainless steel c/w support, class 6 | 60 | m |
| | - 14" ø pipe, stainless steel c/w support, class 6 | 60 | m |
| | - Coupling, 2" ø, stainless steel | 1 | EA |
| | - Union, 2" ø, stainless steel | 4 | EA |
| | | | |

Filed: 2021-08-17 EB-2020-0290 J3.6 Attachment 1 Report Date: 101 of 151 Page No.: E - 5

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Description | Quantity | Unit |
|--|---|---|
| D2O Vapour Recovery System (Cont'd) | | |
| Piping and fittings (cont'd) - Elbow, 3/4" ø, stainless steel, 90 deg., class exempt, allow as required for field run Elbow, 1" ø, etainless steel, 00 deg., class 6 | 1 | LS |
| Elbow, 1" ø, stainless steel, 50 deg., class 6 Elbow, 2" ø, stainless steel, 45 deg., class 6 Elbow, 2" ø, stainless steel, 90 deg., class 6, allow as required Elbow, 10" ø, long radius, stainless steel, 90 deg., class 6 | 2 1 6 | EG EA LS EA |
| Elbow, 14" ø, long radius, stainless steel, 45 deg., class exempt Elbow, 14" ø, long radius, stainless steel, 90 deg., class 6 Elbow, 14" ø, short radius, stainless steel, 90 deg., class 6 Flange c/w gasket & studs, 3/4" ø, stainless steel, class 6 Flange c/w gasket & studs, 1" ø, stainless steel, class 6 | 2 10 1 2 2 | EA EA EA EA EA |
| Flange c/w gasket & studs, 14" ø, stainless steel, class exempted Flange c/w gasket & studs, blind, 14" ø, stainless steel, class exempted | 6 1 | EA EA |
| Quick connect socket, 2" ø, stainless steel, Class 6 Nipple, 2" ø, 6" long stainless steel, class exempt Reducer, 1 1/2"X1" ø, stainless steel, class 6 | 8 2 2 | EA EA EA |
| Reducer, eccentric, 2"X1" ø, stainless steel, class exempt Reducer, 14"X10" ø, stainless steel, class exempt Tee, 2" X2" ø, stainless steel, class 6 | 2 1 1 | EA EA EA |
| Tee, 2" X2" ø, stainless steel, class exempt Tee, 10"X14"X14" ø, stainless steel, class exempt Tee, 14"X14"X14" ø, stainless steel, class exempt Threadolet, 2"X1/4" ø, stainless steel, class exempt | 2 11 2 1 | EA EA EA EA |
| Weldolet, 2"X2"X1/2" ø, stainless steel, class exempt Weldolet, 14"X14"X2" ø, stainless steel, class exempt Diaphragm valve, 1" ø, stainless steel, class exempt Relief valve, 2" inlet ø | 8 2 1 1 | EA EA EA EA |
| - Pressure gauge, 0-40 kPa(g), Air, exempt | 1 | EA |
| | Item Description D2D Vapour Recovery System (Cont'd) Piping and fittings (cont'd) - Elbow, 3/4" ø, stainless steel, 90 deg., class exempt, allow as required for field run - Elbow, 1" ø, stainless steel, 90 deg., class 6 - Elbow, 2" ø, stainless steel, 90 deg., class 6, allow as required - Elbow, 10" ø, long radius, stainless steel, 90 deg., class 6 - Elbow, 14" ø, long radius, stainless steel, 90 deg., class 6 - Elbow, 14" ø, long radius, stainless steel, 90 deg., class 6 - Elbow, 14" ø, long radius, stainless steel, 90 deg., class 6 - Elbow, 14" ø, long radius, stainless steel, 90 deg., class 6 - Elbow, 14" ø, long radius, stainless steel, 20 deg., class 6 - Elbow, 14" ø, long radius, stainless steel, class exempted - Elbow, 14" ø, stainless steel, 90 deg., class 6 - Flange c/w gasket & studs, 14" ø, stainless steel, class exempted - Guick connect socket, 2" ø, stainless steel, class exempt - Quick connect socket, 2" ø, stainless steel, class exempt - Reducer, 11/2"X1" ø, stainless steel, class exempt - Reducer, 14"X10" ø, stainless steel, class exempt - Reducer, 14"X10" ø, stainless steel, class exempt - Tee, 2"X2" ø, stainless steel, class exempt - Tee, 10"X14"X14" ø, stainless steel, class exempt - Tee, 10"X14"X14" ø, stainless steel, class ex | Item Description Quantity D2O Vapour Recovery System (Cont'd) - Piping and fittings (cont'd) - - Elbow, 3/4" ø, stainless steel, 90 deg., class exempt, allow as required for field run 1 - Elbow, 1" ø, stainless steel, 90 deg., class 6 12 - Elbow, 1" ø, stainless steel, 90 deg., class 6 12 - Elbow, 1" ø, stainless steel, 90 deg., class 6 6 - Elbow, 14" ø, long radius, stainless steel, 90 deg., class 6 6 - Elbow, 14" ø, long radius, stainless steel, 90 deg., class 6 10 - Elbow, 14" ø, long radius, stainless steel, 90 deg., class 6 10 - Elbow, 14" ø, short radius, stainless steel, 90 deg., class 6 10 - Elbow, 14" ø, short radius, stainless steel, class 6 2 - Flange c/w gasket & studs, 14" ø, stainless steel, class 6 2 - Flange c/w gasket & studs, 14" ø, stainless steel, class exempted 1 - Quick connect socket, 2" ø, stainless steel, class exempt 2 - Reducer, 11/2"X1" ø, stainless steel, class exempt 2 - Reducer, 14"X10" ø, stainless steel, class exempt 1 - Tee, 2"X2" ø, stainless steel, class exempt 1 - Tee, 2"X2" ø, stainless steel, class exempt |

Filed: 2021-08-17 EB-2020-0290 J3.6 Attachment 1 Report Date: 102 of 154 Page No.: E - 6

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 03 | Instrument & Service Air Systems | | |
| 03.01 | Heavy water management building west annex | | |
| | instrument and service air supply | | |
| | - 2" ø pipe , type L copper c/w fitting | 37 | m |
| | - 1 1/2" ø pipe , type L copper c/w fitting | 22 | m |
| | - 1" ø pipe , type L copper c/w fitting | 128 | m |
| | - 3/4" ø pipe , type L copper c/w fitting | 8 | m |
| | - 1/2" ø Pipe, seamless type K, copper. Spool piece | 1 | LS |
| | - Tee, solder joint, 2 ", solder connection, copper | 3 | EA |
| | - Trap, liquid drain, 3/4" npt, 4.6" wide x 6.2" long x 3.3" deep, cast iron body, st. steel internals | 2 | EA |
| | - Diaphragm valve, 1/2" ø, 1034kpa(g), manual | 2 | EA |
| | - Diaphragm valve, 3/4" ø, 1034kpa(g), manual | 2 | EA |
| | - Diaphragm valve, 1" ø, 1034kpa(g), manual | 8 | EA |
| | - Diaphragm valve, 1 1/2" ø, 1034kpa(g), manual | 5 | EA |
| | - Valve, angle port(30 degrees), 1" inlet 3/4" outlet, manual | 16 | EA |
| 03.02 | Instrument air for new D2O west annex building | | |
| | - Air compressor, rotary screw, 108.8 l/s @ 1035kpa(g) | 2 | EA |
| | - Air dryer, heatless, Atlas copco CD 100+ | 2 | EA |
| | - Receiver, 757 liter | 2 | EA |
| | - Receiver, 1508 liter | 2 | EA |
| | - Filter pre, 117.7 l/s@8 bar | 2 | EA |
| | - Filter after, 117.7 l/s@8 bar | 2 | EA |
| | - 2" ø pipe, type L copper c/w fitting | 55 | m |
| | - 1 1/2" ø pipe , type L copper c/w fitting | 90 | m |
| | - 2 " ø pipe , type L copper c/w fitting | 165 | m |
| | - 3/4 " ø pipe , type L copper c/w fitting | 7 | m |
| | - 1/2 " ø pipe , type K copper c/w fitting | 11 | m |
| | - Tee, solder joint, 2 " ø, copper | 6 | EA |
| | - Trap, liquid drain, 3/4" ø, 4.6" wide x 6.2" long x 3.3" deep, cast iron body, st. steel internals | 2 | EA |
| | - Manifold, instrument air, stainless steel | 8 | EA |
| | - Globe valve, 1/2" | 4 | EA |
| | - Diaphragm valve, 1/4" ø | 68 | EA |
| | - Diaphragm valve, 1/2" ø | 20 | EA |
| | | | |
ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

PROCESS SUPPORT SYSTEMS

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 03 | Instrument & Service Air Systems (Cont'd) | | |
| 03.02 | Instrument air for new D2O west annex building (cont'd) | | |
| | - Diaphragm valve, 3/4" ø | 9 | EA |
| | - Diaphragm valve, 1" ø | 8 | EA |
| | - Diaphragm valve, 1 1/2" ø | 14 | EA |
| | - Diaphragm valve, 2" ø | 5 | EA |
| | - Relief valve, 1/2" ø | 2 | EA |
| | - Relief valve, 1" ø | 4 | EA |
| | - Nipple, pipe, 1/4", 2" | 50 | EA |
| | - Gauge, pressure, NC6, 0-400 p sig, 4" dial, 1/4" npt | 4 | EA |
| 03.03 | HWMB west annex D2O mgmt bldg breathing air piping | | |
| | - 1/2" ø Pipe, seamless type L | 1 | EA |
| | - 1/2" ø Pipe, seamless type L, copper. Spool piece | 1 | LS |
| | - 1" ø pipe , type L copper c/w fitting, class 6 | 128 | m |
| | - 1 1/2" ø pipe , type L copper c/w fitting, class 6 | 250 | m |
| | - 2" ø pipe , type L copper c/w fitting, class 6 | 78 | m |
| | - Tee, solder joint, 2 ", solder connection, copper, class 6 | 2 | EA |
| | - Diaphragm valve, 2" ø, manual, class 6 | 2 | EA |
| | - Diaphragm valve, 1" ø, manual, class 6 | 21 | EA |
| | - Diaphragm valve, 1/2" ø, manual, class 6 | 21 | EA |
| | - Breaching air station manifold assembly & hook up | 21 | EA |
| | - Tie into existing | 1 | LS |
| 03.04 | Relocation of the argon tank & line 7555Q-L9Q1-A1 1/2ATC | | |
| | - 1/2" ø Pipe, seamless type L c/w fitting | | EA |
| | - 1/2" ø Pipe, seamless type L, copper. Spool piece | | LS |
| | - 1" ø pipe , type K copper c/w fitting & supports | 19 | m |
| | - 1 1/2" ø pipe , type K copper c/w fitting & supports | 35 | m |
| | - Cap, 1" ø, copper | 4 | EA |
| | - Cap, 1 1/2" ø, copper | 4 | EA |
| | - Ball valve, 1", manual, 600 PSI | 4 | EA |
| | - Ball valve lockout device | 1 | EA |
| | - Rubber hose, 1" ø, 50 ft long | 6 | EA |
| | - 6" ø pipe , steel for bollard | 15 | m |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

PROCESS SUPPORT SYSTEMS

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 03 | Instrument & Service Air Systems (Cont'd) | | |
| 03.04 | Relocation of the argon tank & line 7555Q-L9Q1-A1 1/2ATC (cont'd) | | |
| | - Tie into existing | 1 | EA |
| | - Tie into venders line | 1 | EA |
| | - Pipe supports, allow | 11 | EA |
| | - Fencing & bollards, included elsewhere | 1 | Nil |
| | - Tank, leased and relocated by Vender | 1 | Nil |
| 03.05 | Relocation of the oxygen tank & underground line 75510- L70 1- O_2ATC | | |
| | - 1" ø pipe , type K copper c/w fitting & supports | 75 | m |
| | - Ball valve, 1", manual, 690 kPa | 2 | EA |
| | - Tie into existing | 1 | EA |
| | - Tie into venders line | 1 | EA |
| | - Pipe supports, allow | 1 | LS |
| | - Fencing & bollards, included elsewhere | 1 | Nil |
| | - Tank, leased and relocated by Vender | 1 | Nil |
| | - Trenching , Excavation and back fill as per detail D2 on drg NK38-DRAW- 75519 -10001 | 50 | m |
| | - Trenching , Excavation and back fill as per detail D3 on drg NK38-DRAW- 75519 -10001 | 5 | m |
| | - Trenching , Excavation and back fill as per detail D4 on drg NK38-DRAW-75519 -10001 | 5 | m |
| 03.06 | Tritium removal facility helium supply system line relocation | | |
| | - 1/2" ø Pipe, stainless steel c/w coupling & support | 125 | EA |
| | - Cap, 1/2" ø, stainless steel | 3 | EA |
| | - Elbow, 1/2" ø stainless steel, 90 deg | 20 | EA |
| | - Tie into existing | 2 | EA |
| | - Tie into venders line | 1 | EA |
| | - Pipe supports, allow | 14 | EA |
| | - Trenching , Excavation and back fill as per detail D2 on drg NK38-DRAW-75549 -10002 | 90 | m |
| | | | |

OCTOBER 25, 2019

F - Building Support Systems tie-in (Mechanical)

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

BUILDING SUPPORT SYSTEMS TIE-IN

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 01 | Plumbing & Drainage | | |
| 01.01 | Supply of domestic water to the West annex including tie in to the existing station domestic water | | |
| | - 2" ø copper pipe type I, 2" copper c/w fittings, support, etc. | 75 | m |
| | - Coupling, solder joint, 2", solder connection | 18 | EA |
| | - Elbow, solder joint, 2", solder, copper, 90 deg, long radius | 16 | EA |
| | - Elbow, solder joint, 2", solder, copper, 45 deg, long radius | 4 | EA |
| | - Tee, solder joint, 3" x 3" x 2", solder connection, copper | 1 | EA |
| | - Insulation, pipe anti-sweat, 2" pipe size, 1" thick, ap Armaflex | 75 | m |
| | - Coupling, 2" x 1/2" | 1 | EA |
| | - Connection to phase 1 capped pipe | 1 | EA |
| | - Valve, gate, 2", 125lb, solder | 1 | EA |
| | - Connection to existing pipe | 1 | EA |
| 01.02 | Construction water tie-in for HWMB West annex | | |
| | - 2" ø copper pipe type I, 2" copper c/w fittings, support, etc. | 10 | m |
| | - Insulation, pipe, 2", 3" thick, calcium silicate for buried portion | 2 | m |
| | - Insulation, pipe, 2", 2" thick, calcium silicate for horizontal portion | 8 | m |
| | - Cap, solder joint, 2" | 1 | EA |
| | - Coupling, 2" x 1 1/4" | 1 | EA |
| | - Coupling, solder joint, 2", solder connection | 1 | EA |
| | - Elbow, solder joint, 2", solder, copper, 90 deg, long radius | 1 | EA |
| | - Tee, solder joint, 2" x2" x 3/4", solder connection, copper | 1 | EA |
| | - Valve, gate, 2", 125lb, solder | 1 | EA |
| | - Valve, globe, solid wedge, 3/4" | 1 | EA |
| | - Valve, globe, solid wedge, 1 1/4" | 1 | EA |
| | - Backflow preventer, 2" | 1 | EA |
| | - 8" ø, plastic pipe for drainage | 5 | m |
| | - Water entry c/w insulation, grouting, painting, etc. | 1 | LS |
| | - Jacket insulation for all valves | 1 | LS |
| | - Heat tracing | 10 | m |
| | - Tie into existing capped pipe | 1 | EA |
| | | | |
| | | | |
| | | | |

Filed: 2021-08-17 EB-2020-0290 J3.6 Attachment 1 Report Date: 107 of 151, 2019 Page No.: F - 2

BUILDING SUPPORT SYSTEMS TIE-IN

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 02 | Heating Steam & Condensate System | | |
| 02.01 | D2O management building fl. el. 94.000 to 104.200 8 NPS header to PRV 30 heating steam piping | | |
| | - Pipe 1" ø, carbon steel c/w fittings | 1 | EA |
| | - 6" ø pipe, class 6. carbon 98624-1 pipe steel | 4 | m |
| | - Branch, pipe, sockolet 6" to 10" run, 1" branch, carbon | 1 | EA |
| | - Insulation, pipe, 3" thick, 6" ø, fiberglass, ciw vapour barrier | 4 | m |
| | - Insulation, pipe elbow, 90 deg, lr, 3" thick. 6" ø, fiberglass | 1 | EA |
| | - Insulation. pipe. 3" thick | 1 | LS |
| | - Cap, pipe, 6" ø | 1 | EA |
| | - Elbow, pipe, 6" ø | 1 | EA |
| | - Nipple, pipe, 1",4" lg, threaded, carbon steel sch 80 | 1 | EA |
| | - Tee reducer, 8"x8"x6" | 1 | EA |
| | - Gate valve, 6" ø | 1 | EA |
| | - Gate valve, 1" ø | 1 | EA |
| | Tie-in to the existing TRF & D2O management building steam & condensate system | 1 | EA |
| | - Tie into existing steam header | 1 | LS |
| 02.02 | L505-W3B thru-tunnel return from 020 bldg. HGT. stm. condensate piping | | |
| | - 2" ø pipe, carbon steel | 2 | m |
| | - Insulation, pipe, 1" thick, 2" ø fiberglass, c/vv vapour barrier | 1 | LS |
| | - Insulation, pipe, 1-1/2" thick, 3"ø, fiberglass, c/vv vapour barrier | 1 | LS |
| | - Cap, 2" ø. | 1 | EA |
| | - Tee, pipe reducer, 3" x 3" x 2", | 1 | EA |
| | - Gate valve, manual, socket weld, 2" ø. | 1 | EA |
| | - Tie into existing condensate header | 1 | LS |
| 02.03 | D2O Mgm't bldg fl. el. 87.000 & 94.00 P3 & P4 discharge to tk1 htg. steam cond. piping | | |
| | - 2" ø pipe, carbon steel | 2 | m |
| | - Insulation, pipe, 1" thick, 2" ø fiberglass, c/vv vapour barrier | 1 | LS |
| | - Insulation, pipe, 1-1/2" thick, 3" ø, fiberglass, c/vv vapour barrier | 1 | LS |
| | - Tee, pipe reducer,2-1/2 x 2-1/2 x 2, | 1 | EA |
| | - Gate valve, 2" ø, manual, 2" ø. | 1 | EA |
| | - Cap, 2" ø. | 1 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

BUILDING SUPPORT SYSTEMS TIE-IN

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|---------------------------------------|---------------------------------------|
| 03 | Fire Protection System | | |
| 03.01 | D2O management building west annex fire protection piping tie-in | | |
| | - 6" ø, pipe, sch 40, seamless pipe, plain ends. - Elbow class 6, 6" ø, lr, 90 deg, carbon steel - Elbow, class 6, 6" ø, lr, 45 deg, carbon steel - Connection to existing - Tee, class 6, reducing, 8" x 8" x 6", butt weld - Flange, Class 6, 6" ø, weldneck flat face, carbon steel - Gate valve 6" ø - Cap, class 6, 6" ø, butt weld, carbon steel | 42 9 3 1 1 2 1 1 | m EA EA EA EA EA EA |
| 03.02 | Temporary foam fire suppression connection at standby generator fuel management building no.1 - 2 1/2" ø, Pipe , 1 m c/w support - Union, 2" ø - Nipple, 2" ø - Coupling, 2-1/2" X 2", - 10" ø, pipe 6.1 m long, DR-18 - Coupling, 10" - Tie into existing | 1 1 1 2 2 2 | LS EA EA EA EA |

OCTOBER 25, 2019

G - Building Support Systems (Mechanical)

File Name: Path]T5257 HWMB-WA BOQ _Oct. 25, 2019T5257 HWMB-WA BOQ _Oct. 25, 2019G Print Date: 25/10/20199:42 AM

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 01 | Plumbing & Drainage | | |
| 01.01 | Plumbing fixtures | | |
| | - Emergency eye/face wash, floor mount, model # 7361-7461 | 3 | FA |
| | - Emergency shower/eyewash combination unit, haws model 8300-8309, model | Ũ | 273 |
| | 9001 Alarm, and model sp220 foot tradle, floor mounted | 1 | EA |
| | - Fixture rough in | 4 | EA |
| 01.02 | Domestic water | | |
| | - Tanked water heater, 120 gallon, 9 kW X 3 elements | 1 | EA |
| | - Inline tankless water heater Hubbell Mod. # TX021-3T6 or equivalent | 3 | EA |
| | - 1/2" Pipe, type L copper c/w fittings, support, etc. | 20 | m |
| | - 1" Pipe, type L copper c/w fittings, support, etc. | 10 | m |
| | - 1 1/4" Pipe, type L copper c/w fittings, support, etc. | 20 | m |
| | - 1 1/2" Pipe, type L copper c/w fittings, support, etc. | 10 | m |
| | - 2" Pipe, type L copper c/w support, etc. | 100 | m |
| | - 1 1/2" hi temperature pipe | 10 | m |
| | - 1/2' pipe insulation | 20 | m |
| | - 1" pipe insulation | 10 | m |
| | - 1 1/4" pipe insulation | 20 | m |
| | - 1 1/2' pipe insulation | 10 | m |
| | - 2" pipe insulation | 100 | m |
| | - Cap, 2" ø, type L copper | 1 | EA |
| | - Coupling, 2", type L copper | 20 | EA |
| | - Elbow, 2", 90° type L copper | 22 | EA |
| | - Elbow, 2", 45° type L copper | 12 | EA |
| | - Tee, 2", type L copper | 4 | EA |
| | - Reducer, 2" x 1-1/4" type L copper | 1 | EA |
| | - Reducing tee, 2" x 1 1/2", type L copper | 1 | EA |
| | - Reducer, 2" to 3/4" ø, class 6 | 1 | EA |
| | - Double check valve, 2" | 1 | EA |
| | - Reducer, 2" x 1" type L copper, | 1 | EA |
| | - Reducing tee, 2" x 1 1/4" ø, type L | 1 | EA |
| | - Reducing tee, 2" x 1/2" ø, type L | 3 | EA |
| | - Gate valve, 2", bronze body | 1 | EA |
| | - Gate valve, 1-1/2", bronze body | 1 | EA |
| | - Gate valve, 3/4", bronze body | 1 | EA |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|---|--|
| 01 | Plumbing & Drainage (Cont'd) | | |
| 01.02 | Domestic water (cont'd) Gate valve, 1/2" RP, Back flow preventer, 1/2" ø RP, Back flow preventer, 3/4" ø RP, Back flow preventer, 1" ø Valve, gate, pressure boundary Valve, relief, pressure boundary Valve, thermostatic mixing | 3 5 7 2 1 1 1 | EA EA EA EA EA EA |
| 01.03 | Sanitary drainage & vent Carried with active and inactive drainage under process support system | | |
| 01.04 | Storm drainage - 8" pipe, cast iron, no hub c/w ss coupling - 6" pipe, cast iron, no hub c/w ss coupling - 4" pipe, cast iron, no hub c/w ss coupling - Reducer, 6" x 4" ø, cast iron - Wye, 4" ø, class 4000 cast iron - Wye, 6" ø, class 4000 cast iron - Wye, 6" x4" ø, class 4000 cast iron - Wye, 8" ø, class 4000 cast iron - Wye, 8" ø, class 4000 cast iron - Wye, 8" ø, dass 4000 cast iron - Wye, 8" ø, glass 4000 cast iron - Wye, 8" ø, glass 4000 cast iron - Elbow, 8" 45 deg., class 4000 cast iron - Elbow, 6" 45 deg., class 4000 cast iron - Elbow, 4" 45 deg., class 4000 cast iron - Cleanout, 6" ø, cast iron, no hub, - Cleanout, 6" ø, cast iron, no hub, - Cleanout, 4" ø, cast iron, no hub, - Cleanout, 8" ø, deck plate, cast iron - Elbow, 4" ø, 90 deg., class 4000 cast iron - Elbow, 4" ø, 90 deg., class 4000 cast iron - Elbow, 4" ø, 90 deg., class 4000 cast iron - Elbow, 4" ø, 90 deg., class 4000 cast iron - Elbow, 4" ø, 90 deg., class 4000 cast iron - Elbow, 4" ø, 90 deg., class 4000 cast iron - Elbow, 4" ø, 90 deg., class 4000 cast iron - Elbow, 4" ø, 90 deg., class 4000 cast iron - Elbow, 6" ø, 90 deg., class 4000 cast iron - Elbow, 6" ø, 90 deg., class 4000 cast iron - Elbow, 8" ø, 90 deg., class 4000 cast iron - Elbow, 8" ø, 90 deg., class 4000 cast iron - Elbow, 8" ø, 90 deg., class 4000 cast iron - Elbow, 8" ø, 90 deg., class 4000 cast iron | 81 40 70 4 11 3 4 6 3 4 16 8 10 6 2 10 6 2 10 6 2 5 1 | M M M EA EA EA EA EA EA EA EA EA EA EA EA EA |

Filed: 2021-08-17 EB-2020-0290 J3.6 Attachment 1 Report Date: Oct 25, 2019 Page No.: G - 3

| | Quantity | Unit |
|--|--|--|
| 02 <u>Heating Steam & Condensate System</u> | | |
| 62.01 Equipment Heat exchanger, vertical flooded type packaged unit. the steam reqmts are 5,409 lb/hr @75psig to provide 230gpm hot water at 58.6 ft head. c/w Heat exchanger, pumps, control valves, etc. HX29 to 31, Radiator, 2" ø, steel tube, steel fins, total heat load of 10,447 btu/hr, | 1 3 | EA EA |
| 02.02 Piping & fittings 3/8" ø pipe, sch 80 Spool piece 1/2' ø, pipe, sch 80 c/w fittings 3/4" ø, pipe, class 6, carbon steel c/w fittings 4" ø, pipe, class 6, carbon steel Concentric reducer, 6" x 4" ø, buttweld, schedule 40 Elbow, 90 deg, long radius, 4" ø, buttweld, schedule 40 Elbow, 90 deg, long radius, 4" ø, butweld, schedule 40 Elbow, 90 deg, long radius, 4" ø, butweld, schedule 40 Elbow, 45 deg, long radius, 4" ø, butweld, schedule 40 Flange, 4" ø, buttweld Tee, 2" ø, socket weld Insulation, pipe, 3" thickx36" long for 4" pipe Insulation, pipe, 3" thickx36" long for 2" pipe Insulation, pipe, 2" thickx36" long for 1/2" pipe Pvc jacketing for insulation, for 4" pipe with Pvc jacketing for insulation, for 2" pipe with Cap, 1" ø, threaded Ball valve, 2" ø, carbon steel Cate valve, 1", 600 lb, socket weld, carbon steel Gate valve, 2" ø Gate valve, 2" ø Gate valve, 2" ø, class 2999 Globe valve, 3/4" ø, , class 2090 Globe valve, 3/4" ø, jde blowdown, carbon steel | 1 5 4 77 96 1 20 27 3 3 6 96 77 4 7 96 77 4 7 96 77 4 1 2 3 4 2 4 4 2 2 2 | EA m m m m E E E E E E E M m m m m E E E E |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| 02 Heating Steam & Condensate System (Cont'd) 02.02 Piping & fittings (cont'd) - 2" ø, 3-way manual ball valve, flanged, cs, class 150. 1 - Flow indicator, 2" flanged asme class 150, stainless steel 316L. 1 - Air vent, 3/4", fnpt thermostatic, stainless steel 1 - Air vent, 1", fnpt thermostatic, stainless steel 2 02.03 Hot water piping, valves and supports 2 - 1" ø, pipe, carbon steel c/w fittings 2 m - 2" ø, pipe, carbon steel 3 m - 1sulation, pipe, 2" thickx36" long for 1/2" pipe 7 m - Flange, 3" ø 8 EA - Elbow, 3" ø, 90 deg 8 EA - Elbow, 3" ø, 45 deg 4 EA - Gate valve, 2" ø 8 EA | Item Ref. | . Item Description | Quantity | Unit |
|--|-----------|--|---|---|
| 02.02 Piping & fittings (cont'd) - 2" ø, 3-way manual ball valve, flanged, cs, class 150. 1 EA - Flow indicator, 2" flanged asme class 150, stainless steel 316L 1 EA - Air vent, 3/4", fnpt thermostatic, stainless steel 1 EA - Air vent, 1", fnpt thermostatic, stainless steel 2 EA 02.03 Hot water piping, valves and supports 2 m - 1" ø, pipe, carbon steel c/w fittings 2 m - 2" ø, pipe, carbon steel c/w fittings 20 m - 3" ø, pipe, carbon steel c/w fittings 20 m - 4" ø, pipe, carbon steel 3 m - Insulation, pipe, 2" thickx36" long for 1/2" pipe 7 m - Flange, 3" ø 8 EA EA - Elbow, 3" ø, 90 deg 8 EA - Elbow, 3" ø, 45 deg 4 EA - Gate valve, 1" ø 8 EA - Gate valve, 1" ø 8 EA - Flexible hose, 1.2 m face to face, single braided, 3 ø, 150# rf weldneck flanged 2 - Flexible hose, 4 m face to face, single braided, 3 ø, 150# rf weldneck flanged 2 EA | 02 | Heating Steam & Condensate System (Cont'd) | | |
| 02.03Hot water piping, valves and supports-1" ø, pipe, carbon steel c/w fittings2-2" ø, pipe, carbon steel c/w fittings20-3" ø, pipe, carbon steel15-4" ø, pipe, carbon steel3-4" ø, pipe, carbon steel3-1nsulation, pipe, 2" thickx36" long for 1/2" pipe7-Flange, 2" ø, socket weld8-Flange, 3" ø8-Elbow, 3" ø, 90 deg8-Elbow, 3" ø, 90 deg8-Elbow, 3" ø, 45 deg4-Reducer, concentric 3" x 2", butt weld schedule 408-Gate valve, 2" ø8-Gate valve, 1" ø8-Flexible hose, 0.525 m lg, single braided, 3 ø, 150# rf weldneck flanged2-Flexible hose, 4 m face to face, single braided, 3 ø, 150# rf weldneck flanged2-Flexible hose, 4 m face to face, single braided, 3 ø, 150# rf weldneck flanged2-Flexible hose, 4 m face to face, single braided, 3 ø, 150# rf weldneck flanged2-Flexible hose, 4 m face to face, single braided, 3 ø, 150# rf weldneck flanged2-Flexible hose, 4 m face to face, single braided, 3 ø, 150# rf weldneck flanged2-Flexible hose, 4 m face to face, single braided, 3 ø, 150# rf weldneck flanged2-Flexible hose, 4 m face to face, single braided, 3 ø, 150# rf weldneck flanged2-Flexible hose, 4 m face to face, single braided, 3 ø, 150# rf weldneck flanged2-Flexible hose, 4 m face to face, single braided, 3 ø, 150# rf weldneck flanged2-Flexible hose, 4 m face to face, single braided, 3 ø, 150# rf weldneck flanged2-Flexible h | 02.02 | Piping & fittings (cont'd) - 2" ø, 3-way manual ball valve, flanged, cs, class 150. - Flow indicator, 2" flanged asme class 150, stainless steel 316L - Air vent,3/4", fnpt thermostatic, stainless steel - Air vent,1", fnpt thermostatic, stainless steel | 1 1 1 2 | EA EA EA EA |
| eliminator 4 EA | 02.03 | Hot water piping, valves and supports -1" ø, pipe, carbon steel c/w fittings -2" ø, pipe, carbon steel c/w fittings -3" ø, pipe, carbon steel -4" ø, pipe, carbon steel -Insulation, pipe, 2" thickx36" long for 1/2" pipe -Flange, 2" ø, socket weld -Flange, 3" ø -Elbow, 3" ø, 90 deg -Elbow, 3" ø, 90 deg -Reducer, concentric 3" x 2", butt weld schedule 40 -Union, di-electric, 3" ø, 30001b, stainless -Gate valve, 2" ø -Gate valve, 1" ø -Flexible hose, 0.525 m lg, single braided, 3 ø, 150# rf weldneck flanged -Flexible hose, 4 m face to face, single braided, 3 ø, 150# rf weldneck flanged -Automatic air release valve float type, 1" ø, class 150 spirax sarco 13ws air eliminator | 2 20 15 3 7 8 8 8 8 8 8 8 8 8 8 8 4 2 2 2 4 | m m m EA EA EA EA EA EA EA EA |

Filed: 2021-08-17 EB-2020-0290 J3.6 Attachment 1 Report Date: Oct 25, 2019 Page No.: G - 5

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------------|
| 03 | Ventilation System | | |
| 03.01 | HVAC Equipment | | |
| | - HVU5, Heating ventilation unit, packaged unit c/w 2 supply fans each air flow 59,000 CFM @5.22" w. g., electric snow arresting system, filters, hot water heating coils with integral face bypass dampers, VFD's , plenum, flow switches and sensors. Based on York D2O Custom unit model TC or Equivalent | 1 | EA |
| | - F26 & F27, Exhaust fan, class4, centrifugal, 71,536 CFM @ 9.2" w. g. c/w 125 hp motor fan to include suction and discharge isolation dampers, variable frequency drive motors. flow switches, etc. Based on Twin city fan & blower BAE-SW Efficient Airfoil centrifugal fan, SWSI or approved | | E . |
| | - FR21 & FR22, Filter unit, design airflow of 71,536 CFM @7.05" wg, c/w housing, isolation dampers, prefilters, HEPA filters & carbon filters | 2 | EA |
| | - Cabinet heater, electric, 600v, 3ph, rated for 2000 watts, surface mount with tamper proof thermostat. | 6 | EA |
| | - Fan, centrifugal, ceiling type, 2650 cfm | 2 | EA |
| | Exhaust Stack, 1.450 m dia, 15.5 m height + extending 2.07m below top face of stack c/w support, etc. | 1 | Sum |
| | - Stack control monitoring | 1 | Sum |
| 03.02 | Ventilation & exhaust ductwork & devices | | |
| | - Air register, exhaust, 24"x12", 304 SS, surface mount | 3 | EA |
| | - Air register, exhaust, 30"x8", 304 SS, surface mount | 24 | EA |
| | - Air register, exhaust, 20"x8", 304 SS, surface mount | 20 | EA |
| | - Air register, exhaust, 8"x6", 304 SS, surface mount | 1 | EA |
| | - Air register, exhaust, 22"x22", 304 SS, surface mount | 7 | EA |
| | - Air register, exhaust, 14"x6", 304 SS, surface mount | 5 | EA |
| | - Air register, supply, 30"x8", 304 SS, surface mount | 23 | EA |
| | - Air register, supply, 18"x6", 304 SS, surface mount | 10 | EA |
| | - Air register, supply, 22"x8", 304 SS, surface mount | 18 | EA |
| | - Air register, supply, 8"x6", 304 SS, surface mount | 2 | EA |
| | - Air register, supply, 36"x12", 304 SS, surface mount | 27 | EA |
| | - Air register, 31.5" x 31.5", 304 SS | 4 | EA |
| | - Air register, 43 1/4" x 14 5/8", 304 SS | 2 | EA |
| | - Air register, 30" x 18", 304 SS | 2 | EA |
| | - Air register, 30" x 15", 304 SS | 2 | EA |
| | - Diffuser, supply, 12"x12", 304 SS, surface mount | 3 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 03 | Ventilation System (Cont'd) | | |
| 03.02 | Ventilation & exhaust ductwork & devices (cont'd) | | |
| | - Fire damper for exhaust, 54"x30" | 1 | EA |
| | - Fire damper for exhaust, 76"x45" | 1 | EA |
| | - Fire damper for exhaust, 56"x38" | 1 | EA |
| | - Fire damper for exhaust, 14" round | 3 | EA |
| | - Fire damper for exhaust, 24"x18" | 3 | EA |
| | - Fire damper for exhaust, 16"x14" | 3 | EA |
| | - Fire damper for exhaust, 24"x20" | 1 | EA |
| | - Fire damper for exhaust, 13"x6" | 1 | EA |
| | - Fire damper, for exhaust 36"x20" | 1 | EA |
| | - Fire damper, for exhaust 38"x20" | 1 | EA |
| | - fire damper, for exhaust, 41"x17" | 1 | EA |
| | - Fire damper, 31.5"x31.5" | 2 | EA |
| | - Fire / smoke damper for supply, 24"x20",airfoil type, galvanized steel, factory mounted electric actuator | 1 | EA |
| | - Fire/smoke damper, for supply 68"x48", airfoil type, galvanized steel, factory mounted electric actuator | 1 | EA |
| | - Fire/smoke damper, for supply 30"x15", airfoil type, galvanized steel, factory mounted electric actuator | 1 | EA |
| | - Fire/smoke damper, for supply 44"x29", airfoil type, galvanized steel, factory mounted electric actuator | 1 | EA |
| | - Fire/smoke damper, for supply 48"x40", airfoil type, galvanized steel, factory mounted electric actuator | 1 | EA |
| | - Fire/smoke damper, for supply 24"x12", airfoil type, galvanized steel, factory mounted electric actuator | 2 | EA |
| | - Fire/smoke damper, for supply 39"x16", airfoil type, galvanized steel, factory mounted electric actuator | 2 | EA |
| | - Fire/smoke damper, for supply 12 xo , alrioli type, galvanized steel, factory mounted electric actuator | 2 | EA |
| | - Fire/smoke damper, for supply 2 x0, anoir type, gaivanized steel, factory mounted electric actuator | 1 | EA |
| | - Fire/smoke damper, for supply 20 X14, anoli type, galvanized steel, factory mounted electric actuator | 1 | EA |
| | mounted electric actuator | 1 | EA |
| | - Damper, for balancing, manual 39"x16", opposed blade, galvanized steel | 1 | EA |
| | - Damper, for balancing, manual 24"x12", opposed blade, galvanized steel | 2 | EA |
| | | | |

Filed: 2021-08-17 EB-2020-0290 J3.6 Attachment 1 Report Date: Oct 25, 2019 Page No.: G - 7

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 03 | Ventilation System (Cont'd) | | |
| 03.02 | Ventilation & exhaust ductwork & devices (cont'd) | | |
| | - Damper, for balancing, manual 12"x8", opposed blade, galvanized steel | 1 | EA |
| | - Damper, for balancing, manual 14"x18", opposed blade, galvanized steel | 1 | EA |
| | - Damper, for balancing, manual 22"x15", opposed blade, galvanized steel | 1 | EA |
| | - Damper, for balancing, manual 36"x24", opposed blade, galvanized steel | 1 | EA |
| | - Damper, for balancing, manual 30"x15", opposed blade, galvanized steel | 1 | EA |
| | - Damper, for balancing, manual 44"x29", opposed blade, galvanized steel | 1 | EA |
| | - Damper, for balancing, manual 18"x16", opposed blade, galvanized steel | 1 | EA |
| | - Damper, for balancing, manual 34"x14", opposed blade, galvanized steel | 1 | EA |
| | - Damper, for balancing, manual 34"x26", opposed blade, galvanized steel | 1 | FA |
| | - Damper, for balancing, manual 34"x22", opposed blade, galvanized steel | 1 | FA |
| | - Damper, for balancing, manual 42"x40", opposed blade, galvanized steel | 1 | ΕΔ |
| | - Damper, for balancing, manual 25"x15", opposed blade, galvanized steel | 1 | EA |
| | - Damper, for balancing, manual 32"x19", opposed blade, galvanized steel | 1 | |
| | - Damper, for balancing, manual 10"x6", opposed blade, galvanized steel | 1 | |
| | - Damper, for balancing, manual 44"x32", opposed blade, galvanized steel | I | EA |
| | - Damper, for balancing, manual 24"x16", opposed blade, galvanized steel | 1 | EA |
| | - Damper, for balancing, manual 21"x8" opposed blade, galvanized steel | 1 | EA |
| | - Damper, for balancing, manual 48"x24", opposed blade, galvanized steel | 1 | EA |
| | Damper, for balancing, manual 34"x16" appased blade, galvanized steel | 1 | EA |
| | - Damper, for balancing, manual 34 x to , opposed blade, galvanized steel | 1 | EA |
| | - Damper, for balancing, manual 42"x28", opposed blade, galvanized steel | 1 | EA |
| | | | |

Filed: 2021-08-17 EB-2020-0290 J3.6 Attachment 1 Report Date: Oct 25, 2019 Page No.: G - 8

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 03 | Ventilation System (Cont'd) | | |
| 03.02 | Ventilation & exhaust ductwork & devices (cont'd) | | |
| | - Damper, for balancing, manual 54"x31", opposed blade, galvanized steel | 1 | EA |
| | - Damper, for balancing, manual 10"x8", opposed blade, galvanized steel | 1 | FA |
| | - Damper, for balancing, manual 10"x8", opposed blade, galvanized steel | 1 | FA |
| | - Damper, for balancing, manual 44"x26", opposed blade, galvanized steel | 1 | EA |
| | - Damper, for balancing, manual 18"x14", opposed blade, galvanized steel | 1 | EA |
| | - Damper, for balancing, manual 27"x21", opposed blade, galvanized steel | 1 | EA |
| | - Damper, for balancing, manual 27"x16", opposed blade, galvanized steel | 1 | EA |
| | - Damper, for balancing, manual 28"x39", opposed blade, galvanized steel | 1 | EA |
| | - Damper, for balancing, manual 27"x17", opposed blade, galvanized steel | 1 | EA |
| | - Damper, for balancing, manual 34"x24", opposed blade, galvanized steel | 1 | EA |
| | - Damper, for balancing, manual 25"x8", opposed blade, galvanized steel | 1 | EA |
| | - Damper, for balancing, manual 41"x17", opposed blade, galvanized steel | 1 | EA |
| | - Damper, control, motorized 24"x20", opposed blade, 304 SS | 1 | EA |
| | - Damper, control, motorized 18"x15", opposed blade, 304 SS | 1 | EA |
| | - Damper, control, motorized 14" round, opposed blade, 304 SS | 1 | EA |
| | - Damper, control, motorized 26"x17", opposed blade, 304 SS | 1 | EA |
| | - Damper, control, motorized 28"x14", opposed blade, 304 SS | 1 | EA |
| | - Damper, control, motorized 25"x11", opposed blade, 304 SS | 1 | EA |
| | - Damper, control, motorized 30"x18", opposed blade, 304 SS | 2 | EA |
| | - Sheet metal, galvanized, 10 gage, welded for filtration unit to stack | 12,700 | KG |
| | - Sheet metal, 304 SS, 16 gage | 10,000 | KG |
| | - Sheet metal, 20 gage, non-welded. | 25,500 | KG |
| | - Insulation, for ductwork, 2" thick | 6,300 | m2 |
| | - Aluminum jacket, 0.02" thick for all duct | 3,680 | m2 |
| | - Intake louvre, 240"x216" | 1 | EA |
| | - Pipe, 2" ø, stainless steel | 1 | m |
| | - Pipe, 3" ø, stainless steel | 1 | m |
| | - Damper, backdraft, 31.5"x31.5" | 2 | EA |

Filed: 2021-08-17 EB-2020-0290 J3.6 Attachment 1 Report Date: Oct 25, 2019 Page No.: G - 9

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 04 | D2O Leak Detection System | | |
| 04.01 | Allow for D2O leak detection system c/w 36 No. points | 1 | Sum |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Filed: 2021-08-17 EB-2020-0290 J3.6 Attachment 1 Report Date: Oct 25, 2019 Page No.: G - 10

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 05 | Fixed Gaseous Effluent Radioactivity Monitoring | | |
| 05.01 | Carried under Electrical | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Filed: 2021-08-17 EB-2020-0290 J3.6 Attachment 1 Report Date: Oct 25, 2019 Page No.: G - 11

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 06 | Fixed Area Alarming Gamma and Tritium Monitors | | |
| 06.01 | Carried under Electrical | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 07 | Fire Protection System | | |
| 07.01 | West annex fire protection standpipe system | | |
| | - 1/2" ø, pipe, sch 80 | 10 | m |
| | - 2" ø, pipe, sch 80, plain ends c/w fittings | 70 | m |
| | - 4" ø, pipe, sch 40, plain ends. | 150 | m |
| | - 6" ø, pipe, sch 40, plain ends. | 50 | m |
| | - 1-1/2" ø, pipe, sch 80, seamless c/w fittings | 10 | m |
| | - Elbow, 4" ø, 45 deg. | 7 | FA |
| | - Elbow, 4" ø, 90 deg. | 22 | EA |
| | - Elbow, 6" ø, 90 deg. | 5 | EA |
| | - Reducing Tee, 6" x6"x 4" ø | 2 | EA |
| | - Tee, 6" ø | 1 | EA |
| | - Tee, 4" ø | 8 | EA |
| | - Reducer, 6" x 4" ø , concentric | 3 | EA |
| | - Reducer, 4" x 2" ø , concentric | 12 | EA |
| | - Elbow, 1 1/2" ø, 90 degree | 10 | EA |
| | - Elbow, 2" ø, 90 deg, long radius, threaded | 36 | EA |
| | - Reducer, 2" x 1-1/2", fnpt, carbon steel | 11 | EA |
| | - Reducer, 4" x 1-1/2", victaulic grooved | 2 | EA |
| | - Tee, 2"x2"x2" | 4 | EA |
| | - Ball valve, 1/2" ø | 6 | EA |
| | - Gate valve, 4" ø | 3 | EA |
| | - Gate valve, 6" ø | 1 | EA |
| | - Check valve, 6" ø | 2 | EA |
| | - Automatic ball drip, 1/2" ø | 1 | EA |
| | - Victaulic coupling, 4" ø | 150 | EA |
| | - Victaulic coupling, 6" ø | 100 | EA |
| | - Victaulic firelock flange adaptor, 4" ø | 6 | EA |
| | - Victaulic firelock flange adaptor, 6" ø | 10 | EA |
| | - 2.5"x2.5" x6" fire department Siamese connection | 1 | EA |
| | - Pressure gauge, 4" dial | 6 | EA |
| | - Cabinet, 100' firehose, 22" x 30" x 6", preassembled, right hand | 1 | EA |
| | - Cabinet, 100' firehose, 22" x 30" x 6", preassembled, left hand | 9 | EA |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---------------------------------------|----------|------|
| 07 | Fire Protection System (Cont'd) | | |
| 07.02 | Fire protection sprinkler system | | |
| | - 1/2" ø, pipe, sch 80 c/w fittings | 2 | m |
| | - 1 1/4" ø, pipe, sch 80 c/w fittings | 130 | m |
| | - 1 1/2" ø, pipe, sch 80 c/w fittings | 20 | m |
| | - 1" ø, pipe, sch 80 c/w fittings | 750 | m |
| | - 2 1/2" ø, pipe, sch 40 | 75 | m |
| | - 2" ø, pipe, sch 80 c/w fittings | 55 | m |
| | - 3" ø, pipe, sch 40 | 50 | m |
| | - 4" ø, pipe, sch 40 | 200 | m |
| | - Tee, 4"ø | 22 | EA |
| | - Elbow, 4"ø, 90 degree | 35 | EA |
| | - 3"ø, 90 degree elbow | 14 | EA |
| | - Reducer, 3"x2.5", concentric | 15 | EA |
| | - Reducer, 4"x1.25", concentric | 8 | EA |
| | - Reducer, 2.5"x1", concentric | 14 | EA |
| | - Reducer, 3"x1 1/4", concentric | 6 | EA |
| | - Reducer, 3"x2", concentric | 15 | EA |
| | - Reducer, 2.5"x2", concentric | 8 | EA |
| | - Reducer, 2.5"x1.25", concentric | 8 | EA |
| | - Reducer 2"x1 .5", concentric | 8 | EA |
| | - Reducer, 4"x3", concentric | 8 | EA |
| | - Reducer, 4"x2", concentric | 1 | EA |
| | - Tee, 3"ø | 18 | EA |
| | - Tee, 2"ø | 8 | EA |
| | - Reducing tee, 3"x1.25" ø | 20 | EA |
| | - 3"x1 ", reducing tee | 2 | EA |
| | - 2.5"x1.5", reducing tee | 4 | FA |
| | - 2.5"x1.25". reducina tee | 20 | FA |
| | - 2.5"x1", reducing tee | 12 | EA |
| | - 2"x1", reducing tee | 8 | FA |
| | - 2"x1.25", reducing tee | 10 | EA |
| | - 2.5"ø , straight tee | 22 | EA |
| | - 2.5"ø, 90 degree elbow | 4 | EA |
| | - 4" gate valve | 6 | EA |
| | - 4" check valve, swing | 2 | EA |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|---|--|
| 07 | Fire Protection System (Cont'd) | | |
| 07.02 | Fire protection sprinkler system (cont'd) - 4" victaulic firelock flange adapter - 1/2" automatic ball drip - 3/4" gate valve - 1" ball valve - 4" victaulic coupling - 3" victaulic coupling - 2.5" victaulic coupling - 2.5" victaulic coupling - 2.5" victaulic coupling - 2.5" victaulic sprinkler head - 1" site glass w/threaded npmt - pressure gauge, 5-1/2" dial - 3" x2", reducing tee - 4" ø , 45 degree elbow - 2 1/2" ø, 45 degree elbow | 16 1 14 120 72 80 1 271 5 5 2 6 4 | EA EA EA EA EA EA EA EA EA EA |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 08 | Miscellaneous Setting out & sleeving Crane Hire Testing & disinfecting for plumbing Testing, adjusting & balancing for HVAC Tagging & identification | | |
| | | | |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 09 | Building control system | | |
| 09.01 | Building control system | | |
| | - Package HVAC unit c/w VFD motors | 1 | EA |
| | Exhaust fan c/w VFD motor Auto / Manual mode | 2 | EA |
| | - Packaged Filter system (HEPA) c/w dampers | 1 | SET |
| | - Electric heater | 6 | EA |
| | - Fire / smoke damper | 14 | EA |
| | - Control damper | 8 | EA |
| | - Fan, ceiling | 2 | EA |
| | - Heat exchanger / duplex pump package | 1 | EA |
| | - Radiator | 3 | EA |
| | - HVAC Snow stop heater (c/w 3 heater) | 1 | EA |
| | - Reingerant leak delection system | 1 | LS |
| | - PD (open / close monitoring) | 30 | EA |
| | Control System as per Spec D_SPEC_TS_NK38-TS-67369- | | |
| 09.02 | 10001 003 | 1 | EA |
| | - HVAC supervisory control and monitoring PLC panel PL14001 (Appendix A, Fig- 1) | 1 | EA |
| | - HVAC ventilation supply Air Control PLC panel PL14002 (Appendix A, Fig-2) | 1 | EA |
| | - Snow stop heater control panel with sensors PL14012 (Appendix A, Fig-9) | 1 | EA |
| | - Heating steam and condensate control panel PL5996 (Appendix A, Fig-10) | 1 | EA |
| | - Heating steam and condensate control panel PL5997 (Appendix A, Fig-10) | 1 | EA |
| | - Supply fan F24 and F25 VFD panels PL14006A, PL14007A (Appendix A, Fig-2) | 2 | EA |
| | - Supply fan F24 disconnect panels PL14006, PL14006B (Appendix A, Fig-2) | 2 | EA |
| | - Supply fan F25 disconnect panels PL14007, PL14007B (Appendix A, Fig-2) | 2 | EA |
| | - Hot water pumps P5 and P6 VFD panels PL5998, PL5999 (Appendix A, Fig-01) | 2 | EA |
| | - Snow stop heater electrical panel PL14010 (Appendix A, Fig-9) | 1 | EA |
| | - HVAC ventilation exhaust air control PLC panel PL14003 (Appendix A, Fig-11) | 1 | EA |
| | - Exhaust fan F26 and F27 VFD panels PL14008, PL14009 (Appendix A, Fig-11) | 1 | EA |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|-------------|----------|
| 09 | Building control system (Cont'd) | | |
| 09.02 | Control System as per Spec D_SPEC_TS_NK38-TS-67369- 10001_003 (cont'd) | 1 | EA |
| | - Exhaust Fan F26 disconnect panels PL14008, PL14008B (Appendix A, Fig-11) | 2 | EA |
| | - Exhaust Fan F27 disconnect panels PL14009, PL14009B (Appendix A, Fig-11) - Refrigerant leak detection control panel PL6000 with sensors (Appendix A, Fig- | 2 | EA |
| | 17) - Drum handling room Box Up logic control PLC panel PL14004 (Appendix A, Fig- | 1 | EA |
| | - Drum handling Room box up local monitoring panel PL14014 (appendix A, Fig- 18) | 1 | EA |
| | - Drum handling room box up remote panel PL14015 (appendix A, Fig-18) | 1 | EA |
| | - Building zone and space monitoring PLC panel PL14005 (appendix A, Fig-21) - HWMB WA instrument room and electrical Room ACU panels PL14016, | 1 | EA |
| | PL14017 (Appendix A, Fig-23) | 2 | EA |
| | HWMB WA UPS Room ACU Control Panel PL14018 (Appendix A, Fig-22) HVAC Fire Damper Panel PL14119 (Appendix A, Fig-24) Staircase Heaters Panels PL 14122 PL 14123 (Appendix A, Fig-01) | 1 1 2 | EA EA |
| | - Transmitters, alarm units, indications, printer, alarm annunciators, allow | 2 | LS |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

OCTOBER 25, 2019

H - Electrical

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 01 | Service & Distribution | | |
| 01.01 | 13.8KV Distribution | | |
| | - 13.8KV Switchgear Assembly - metal clad indoor unit | 1 | EA |
| | - 2.5MVA Transformer 13.8KV to 600/347V, dry type indoor | 1 | EA |
| 01.02 | 600V Normal Power Distribution | | |
| | - 3000A 600V Switchgear Assembly c/w 5-1200A draw out breakers | 1 | EA |
| | - Relay / Control Panel | 4 | EA |
| | - Multifunction Metering | 1 | EA |
| | - 600V/AC-125V/DC Rectifier | 2 | EA |
| | - 1200A 600V MCC66 | 1 | EA |
| | - 1200A 600V MCC67 | 1 | EA |
| 01.03 | 600V Emergency Power Distribution | | |
| | - 1250kVA 600V Standby Generator set | 1 | EA |
| | - 600V Generator Distribution Panel | 1 | EA |
| | - 1200A Test Load Bank | 1 | EA |
| | - 1200A 600V Manual Transfer Switch mechanical interlock | 2 | EA |
| | - 1200A 600V MCC68 & MCC69 | 2 | EA |
| 01.04 | Transformers and 208V Power Distribution | | |
| | - 45kVA 600V to 347/600V Lighting transformer | 3 | EA |
| | - 15kVA 600V to 347/600V Emergency Lighting transformer | 2 | EA |
| | - 125A 347/600V Lighting Panel | 3 | EA |
| | - 60A 347/600V Emergency Lighting Panel | 3 | EA |
| | - 45kVA 600V to 120/208V Lighting transformer | 2 | EA |
| | - 30kVA 600V to 120/208V Distribution transformer | 4 | EA |
| | - 15kVA 600V to 120/208V receptacle transformer | 4 | EA |
| | - 120/208V Lighting Panel, 42 ccts | 2 | EA |
| | - 120/208V Lighting Panel, 30 ccts | 2 | EA |
| | - 100A 120/208V Receptacle Panel, 18 ccts | 4 | EA |
| 01.05 | 600V UPS Power Distribution | | |
| | - 200kVA 600V 3Ph UPS c/w maintenance by-pass & batteries | 1 | EA |
| | - 600V UPS Power Distribution Panel | 1 | EA |
| | - 60A 600V Manual Transfer Switch | 1 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|--|--|
| 01 | Service & Distribution (Cont'd) | | |
| 01.05 | 600V UPS Power Distribution (cont'd) - 15kVA 600V to 120/208V Transformer - 120/208V UPS Power panel, 30 circuits | 4 | EA EA |
| 01.05 | 600V UPS Power Distribution (cont'd) - 15kVA 600V to 120/208V Transformer - 120/208V UPS Power panel, 30 circuits Feeders - Normal, Emergency & UPS Power - 15KV Teck 90 cable 3x1/C #250MCM direct buried and in duct bank (duct bank included below) - Teck cable termination kit - Teck cable termination kit - Teck cable connectors c/w fittings - 3C #500MCM in 103mm C - normal power - 3C #500MCM in below plc. conduit & duct bank - emergency power - Concrete encased duct bank - 15 x 103mm plc. duct - Direct buried conduits SCH 40 - 12 x 103mm plc. duct c/w excavation and backfill - Rigid Galvanized Conduit GRC - 78mm - 2 runs 3C #250MCM in 78mm C - 3 #2/0 + gnd in 78mm C - 3 #2/0 + gnd in 78mm C - 3 #2 + gnd in 41mm C - 4 #2 + gnd in 41mm C - 3 #2 + gnd in 41mm C - 3 #2 + gnd in 41mm C - 3 #2 + gnd in 41mm C - 3 #8 + gnd in 41mm C - 3 #8 + gnd in 41mm C - 3 #8 + gnd in 41mm C - 3 #8 + gnd in 41mm C - 3 #10 + gnd in 27mm C #500MCM cable termination #220MCM cable termination - #210 cable termination - #1/0 cable termination | 4 4 4 210 8 332 576 16 40 180 90 15 140 25 80 170 190 6 120 170 190 6 120 170 56 92 26 38 10 | EA EA M EA EA M M M M M M M M M M M M M M M M M M M |
| | #2 cable termination #2 Teck cable termination #3 cable termination #4 cable termination #6 cable termination #8 cable termination | 130 8 3 26 82 35 | EA EA EA EA EA EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|--|---|
| 01 | Service & Distribution (Cont'd) | | |
| 01.06 | Feeders - Normal, Emergency & UPS Power (cont'd) - #10 cable termination - #12 cable termination | 26 10 | EA EA |
| 01.07 | Temporary Relocation of SG Fuel Power & Controls Direct buried conduits - 6 x 53mm plc. duct c/w excavation and backfill 3 #10 Teck 90 Power cable 3/C #16 AWG Control cable Teck cable connectors c/w fittings 1-5/8", SQ Unistrut channel | 20 400 1,200 20 36 | m m EA m |
| 01.08 | Temporary Power Distribution - Portable Power cart #1 c/w 60A 600V main fused switch, 70A splitter box, 1- 60A, 1-30A fused disconnect switches & WP enclosure - Portable Power cart #2 c/w 60A 600V main fused switch, 70A splitter box, 1- 60A, 1-30A fused disconnect switches, 30kVA 600-120/208V transf. 120/208V papel 15A/3P motor starter & WP enclosure | 1 | EA EA |
| | 3 #4 Teck 90 Power cable 3 #12 Teck 90 Power cable 3 #10 Teck 90 Power cable Teck cable #4 connectors c/w fittings Teck cable #12 & #10 connectors c/w fittings 1-5/8", SQ Unistrut channel Power connection to Sump Pump 5HP #12 cable termination #14 cable termination | 140 8 25 8 18 36 1 35 18 | m m EA EA m EA EA EA |
| 01.09 | Grounding - Ground bus bar - Grounding rod, 3m long, 19mm dia. - Grounding steel bollard - Grounding plate, surface mounted - Grounding plate, flush mounted - Cadweld connection - Exposed t-connection - Exothermic weld connection | 102 36 18 23 32 480 15 8 | EA EA EA EA EA EA EA |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 01 | Service & Distribution (Cont'd) | | |
| 01.09 | Grounding (cont'd) | | |
| | - Grounding grid connection | 80 | EA |
| | - Grounding bolted connection | 65 | EA |
| | - Mechanical connection | 42 | EA |
| | - Bonding connection to equipment | 12 | EA |
| | - Pigtail grounding #2/0 AWG | 60 | EA |
| | - Cable riser #4/0 AWG | 24 | EA |
| | - Cadweld cross 500MCM to 500MCM | 10 | EA |
| | - Cadweld horizontal tee mold 500MCM to #4/0 AWG | 8 | EA |
| | - Ground cable #500MCM u/g conductor | 210 | m |
| | - Ground cable #4/0 | 460 | m |
| | - Ground cable #4/0, surface run | 185 | m |
| | - Ground cable #4/0, buried conductor | 10 | m |
| | - Ground cable #4/0 CU, bonding conductor | 20 | m |
| | - Embedded ground cable #4/0 | 1,600 | m |
| | - Ground cable #2/0, platform | 260 | m |
| | - Ground cable #2/0, buried conductor | 6 | m |
| | - Ground cable #2/0 above ground conductor | 25 | m |
| | - Ground cable #4 above ground conductor | 8 | m |
| | - Ground testing | 1 | Sum |
| 01.10 | Generator Grounding | | |
| | - Copper clad grounding rod | 4 | EA |
| | - Ground conductor connection to ground terminal | 4 | EA |
| | - Ground conductor connection to staircase structural steel | 4 | EA |
| | - Cadweld connection | 16 | EA |
| | - Ground cable #4/0 | 42 | m |
| | - Ground cable #500MCM | 55 | m |
| | - Ground testing | 1 | Sum |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|--------------------------------|----------------------------|
| 01 | Service & Distribution (Cont'd) | | |
| 01.11 | Lightning Protection - Air terminal rod, height 457.2mm - Bolted connection - Bolted tee connection - Down conductor to grounding electrode - Grounding conductor 4/0 AWG - Lightning protection testing | 33 4 24 6 400 1 | EA EA EA m Sum |
| 01.12 | Short Circuit / Coordination Study | 1 | Sum |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 02 | Lighting, Devices etc. | | |
| 02.01 | Light fixtures - supply, install & wiring | | |
| | - Type FHE 52" Suspended mount LED luminaire, normal power | 182 | EA |
| | - Type FHE 52" Suspended mount LED luminaire, UPS power | 96 | EA |
| | - Type IBL 45" Suspended mount LED luminaire, normal power | 52 | EA |
| | - Type IBI 45" Suspended mount LED luminaire. UPS power | 33 | FA |
| | - Exterior flood light c/w 250W HPS | 1 | FA |
| | - Exterior wall mounted light c/w 100W HPS | 7 | EA |
| | - Junction box for power supply to light fixtures | 387 | EA |
| | - Light fixture wiring - Teck 90 cable | 2,200 | m |
| | - Teck 90 cable connector | 810 | EA |
| 02.02 | Exit and Emergency light | | |
| | - Exit light, single face | 51 | EA |
| | - Exit light, double face | 2 | EA |
| | - Emergency battery unit c/w double remote heads | 83 | EA |
| | - 15A 120V duplex receptacle for emergency battery | 83 | EA |
| | - Exit light wiring | 420 | m |
| 02.03 | Power Outlets and connections | | |
| | - 15A 120V duplex receptacle | 18 | EA |
| | - 15A 120V duplex receptacle, GFI, WP | 47 | EA |
| | - 20A 120V Single T-lock receptacle, GFI | 11 | EA |
| | - 20A 120V Single T-lock receptacle, GFI, WP | 12 | EA |
| | - Power outlets wiring - Teck 90 cable | 1,800 | m |
| | - Teck 90 cable connector | 210 | EA |
| | - 60A 600V Welding receptacles | 6 | EA |
| | - Junction box for 600V Welding receptacles | 2 | EA |
| | - Conduit & cabling for 600V welding receptacle junction box from MCC, 3 $\#2/0$ in 53mm C | 56 | m |
| | - #2/0 cable termination | 12 | EA |
| | - #3 cable termination | 4 | EA |
| | - Conduit & cabling for 600V welding receptacle, 3 #4 + gnd in 53 mm C | 150 | m |
| | - #4 cable termination | 40 | EA |
| | - #8 cable termination | 13 | EA |
| | - 60A 600V Inlet receptacle c/w wiring | 1 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 02 | Lighting, Devices etc. (Cont'd) | | |
| 02.03 | Power Outlets and connections (cont'd) | | |
| | - Power connection to motor operated door c/w sensors & controls | 4 | EA |
| | - Power connection to 1HP Hoist/Trolley c/w 600V disconnect switch | 4 | EA |
| | - Hoist power connection conduit & cabling, 3 #12 + gnd in 27mm C | 150 | m |
| | - #12 cable termination | 35 | EA |
| | - #14 cable termination | 18 | EA |
| | - Power connection to weight scale, water tight | 4 | No |
| | - Weight scale power connection 2 #14 Tech 90 cable | 210 | m |
| | - Teck cable connector for weight scale | 8 | No |
| | - Pull box for power supply 8"x8" | 44 | EA |
| | - Pull box for power supply 12"x12" | 5 | EA |
| 02.04 | Mechanical motor connections | | |
| | - Power connection to Transfer Pump up to 15HP | 3 | EA |
| | - Feeder to Transfer Pump up to 15HP - 3 #8 in 41mm C | 120 | m |
| | - Feeder to Transfer Pump up to 15HP - 3 #10 in 27mm C | 50 | m |
| | - Power connection to Transfer Pump up to 7.5HP | 2 | EA |
| | - Feeder to Transfer Pump up to 7.5HP - 3 #10 in 27mm C | 120 | m |
| | - Power connection to active/inactivate drainage pump 10HP | 4 | EA |
| | - Feeder to active/inactivate drainage pump 10HP - 3 #10 in 27mm C | 170 | m |
| | - Power connection to heating steam condensate pump 7.5HP | 2 | EA |
| | - Feeder to heating steam condensate pump 7.5HP - 3 #10 in 27mm C | 48 | m |
| | - Power connection to VRS dryer heater and pump 75kVA | 2 | EA |
| | - Feeder to VRS dryer heater and pump 75kVA - 3 #3/0 in 63mm C | 112 | m |
| | - Power connection to drum washing station heater 75kw | 1 | EA |
| | - Feeder to drum washing station heater 75kw - 3 #3/0 in 63mm C | 30 | m |
| | - Power connection to vent. supply fan 50HP | 2 | EA |
| | - Feeder to vent. supply fan 50HP - 3 #2/0 in 53mm C | 90 | m |
| | - Power connection to contamination control dryer | 1 | EA |
| | - Feeder to contamination control dryer - 3 #2/0 in 53mm C | 48 | m |
| | - Power connection to inst. air compressor 55kW | 2 | EA |
| | - Feeder to inst. air compressor 55kW - 3 #250MCM in 78mm C | 140 | m |
| | - Power connection to vent. exhaust fan 125HP | 2 | EA |
| | - Feeder to vent. exhaust fan 125HP - 3 #350MCM in 78mm C | 112 | m |
| | - Power connection to chiller unit | 2 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|--|--|
| 02 | Lighting, Devices etc. (Cont'd) | | |
| 02 | Lighting, Devices etc. (Cont d) - Feeder to chiller unit - 2 runs 3 #500MCM in 78mm C - Power connection to sump pump 5HP - Feeder to sump pump 5HP - 3 #12 in 27mm C - Power connection to vapour recirculation fan 3.7kW - Feeder to vapour recirculation fan 3.7kW - 3 #12 in 27mm C - Power connection to snow stop heater 67.5kVA - Feeder to snow stop heater 67.5kVA - 3 #3/0 in 63mm C - Power connection to moderator supply pump 30HP - Feeder to moderator supply pump 30HP - Feeder to clean up transfer pump 5HP - Feeder to clean up transfer pump 5HP - Feeder to clean up transfer pump 10HP - Feeder to clean up transfer pump 10HP - Feeder to clean up transfer pump 75HP - Feeder to PHT supply pump 75HP - Feeder to PHT supply pump 75HP - Feeder to PHT supply pump 75HP - Feeder to PHT supply pump 75HP - Feeder to EW+ES/inline water heater up to 20kW - #350MCM cable termination - #350MCM cable termination - #320 cable termination - #20 cable termination - #20 cable termination - #21 cable termination - #22 cable termination - #22 cable termination - #22 cable termination - #22 cable termination - #22 cable termination - #22 cable termination - #22 cable termination - #22 cable termination - #22 cable termination - #22 cable termination - #22 cable termination - #22 cable termination - #22 cable termination - #22 cable termination - #22 cable termination - #22 cable termination - #22 cable termination - #4 cable termination - #4 cable termination - #4 cable termination - #4 cable termination - #4 cable termination - #4 cable termination - #4 cable termination - #4 cable termination - #4 cable termination - #4 cable termination - #4 cable termination - #4 cable termination - #4 cable termination | 150 1 55 1 58 1 18 2 165 2 94 1 65 2 160 2 100 4 210 26 14 14 40 29 10 14 8 14 40 29 10 14 8 14 40 62 14 | m EA m EA m EA m EA m EA m EA m EA EA EA EA EA EA EA EA EA EA EA EA EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|---|---|
| 02 | Lighting, Devices etc. (Cont'd) | | |
| 02.05 | Heat Tracing - Heat tracing self regulating cable 8 W/FT - Heat tracing self regulating cable 5 W/FT - Heat tracing thermostat - Heat tracing light indicator - Heat tracing power connection & 120V GFI receptacle - Heat tracing power cable 2/C #12 Teck 90 cable - Heat tracing grounding cable #4 bare AWG - #12 Teck cable termination - Grounding cable connection | 60 20 2 2 40 50 20 12 6 | m EA EA EA m m EA EA |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 03 | Systems & Ancillaries | | |
| 03.01 | Fire Detection System | | |
| | - Main Fire Alarm Control Panel FACP | 1 | EA |
| | - Remote Zone Annunciator Panel | 1 | EA |
| | - Manual pull station | 18 | EA |
| | - Smoke detector | 33 | EA |
| | - Beam smoke detector | 6 | EA |
| | - Duct smoke detector | 1 | EA |
| | - Heat detector | 50 | EA |
| | - Remote indicator | 3 | EA |
| | - Fire alarm module | 3 | EA |
| | - Isolation module | 29 | EA |
| | - Tamper switch | 4 | EA |
| | - Fire alarm connection to electric powered door | 4 | EA |
| | - Fire alarm devices wiring - 2/C #14 AWG, 2 hour fire rated | 2,100 | m |
| | - Fire Alarm cable 2/C #16 AWG, 2 hour fire rated | 300 | m |
| | - Fire Alarm cable 3/C #12 AWG, stranded | 150 | m |
| | - Fire Alarm cable termination | 340 | EA |
| | - Control cable 1 pair #16 AWG | 600 | m |
| | - Control cable 2 pair #14 AWG | 150 | m |
| | - 1" EMT Conduit | 1,800 | m |
| | - 1" EMT Conduit connector | 125 | EA |
| | - Teck connector 1/2" size | 75 | EA |
| | - 103mm rigid PVC | 20 | m |
| | - Fire alarm devices testing | 151 | EA |
| 03.02 | Telephone System | | |
| | - Telephone outlet c/w conduit | 18 | EA |
| | - Telephone/Lan outlet c/w conduit | 2 | EA |
| | - Telephone cabling Cat.6 | 2,750 | m |
| | - Communication Panduit | 74 | EA |
| | - Telecommunication rack c/w power bar, 750VA UPS, Surge protection SPD and grounding | 1 | EA |
| | - LAN switch | 1 | EA |
| | - 24 Port Patch Panel | 3 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|--|--------------------------------|
| 03 | Systems & Ancillaries (Cont'd) | | |
| 03.02 | Telephone System (cont'd) - 25 Port Patch BIX Panel - Horizontal cable manager - Trunk cable - 50 pair #16 AWG - 3" Conduit riser | 2 5 1,120 20 | EA EA m m |
| 03.03 | Cable Tray - Cable tray 300mm wide c/w fittings - Cable tray 450mm wide c/w fittings - Cable tray 530mm wide c/w fittings - Cable tray wall penetration | 20 18 440 16 | m m EA |
| 03.04 | Public Address System PA Speaker wall mounted uni-directional PA Speaker wall mounted uni-directional, exterior Junction box panel 12"x10"x5" NEMA 4 for power supply Pull box for power supply to speakers PA Speaker wiring - 2pr #14, 2 hours fire rated PA cable termination 1-5/8" Unistrut channel Public Address rack c/w amplifier, voice activated relay, terminal strip, failure detector/relay | 31 2 1 4 18 1,470 75 220 1 | EA EA EA m EA m |
ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 04 | Instrumentation and Controls | | |
| 04.01 | Normal Power Supply Control Cabling | | |
| | - Control cable 2/C #1 + gnd Teck 90 | 20 | m |
| | - Control cable 2/C #8 + gnd Teck 90 | 150 | m |
| | - Control cable 2/C #10 + gnd Teck 90 | 1,500 | m |
| | - Control cable 6/C #12 + gnd Teck 90 | 350 | m |
| | - Control cable 2/C #12 + gnd Teck 90 | 250 | m |
| | - Control cable 30/C #14 + gnd Teck 90 | 50 | m |
| | - Control cable 20/C #14 + gnd Teck 90 | 200 | m |
| | - Control cable 4/C #14 + gnd Teck 90 | 50 | m |
| | - Control cable 2/C #14 + gnd Teck 90 | 150 | m |
| | - Control cable 2 pair #16 AWG | 150 | m |
| | - Teck cable connector watertight 1" size | 10 | EA |
| | - Teck cable connector watertight 3/4" size | 30 | EA |
| | - Teck cable connector watertight 1/2" size | 86 | EA |
| 04.02 | Generator Power Control Cabling | | |
| | - Control cable 4/C #16 AWG | 90 | m |
| | - Control cable 25/C #14 AWG | 180 | m |
| | - Control cable 2 pair #14 AWG | 90 | m |
| | - Control cable 2 pair #16 AWG | 190 | m |
| | - Control cable 2 pair #24 AWG | 180 | m |
| | - Control cable 1 pair #16 AWG | 190 | m |
| | - 1-5/8", SQ Unistrut channel c/w fittings | 3 | m |
| 04.03 | UPS Power Control Cabling | | |
| | - Control cable 1 pair #16 AWG | 78 | m |
| | - Control cable 2/C #6 AWG + gnd | 120 | m |
| | - Control cable 2/C #14 AWG + gnd | 60 | m |
| | - 1-5/8", SQ Unistrut channel c/w fittings | 12 | m |
| | - Rigid galvanized steel Conduit 1/2" | 6 | m |
| 04.04 | Shower and Eyewash Alarm Power and Control Cabling | | |
| | - Emergency shower & eyewash Alarm Panel c/w 16"x12"x10" NEMA 4 enclosure and grounding | 1 | No |
| | - Flow Switch 120V for emergency shower & evewash | 4 | No |
| | - Power connection to emergency shower & eyewash, water tight | 4 | No |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|---|--|
| 04 | Instrumentation and Controls (Cont'd) | | |
| 04.04 | Shower and Eyewash Alarm Power and Control Cabling (cont'd) | | |
| | Cable, electrical, 4 #16AWG for emergency shower & eyewash Cable, Teck 90, 2 #12 AWG for emergency shower & eyewash Control cable 1 pair #16 AWG Ground wire #4 bare Cu Rigid galvanized steel Conduit 1" Cable connector for emergency shower & eyewash Flow switch 120V for emergency shower & eyewash Head-end equipment, programming, software, commissioning | 310 80 20 10 310 8 4 1 | m m m Mo No Sum |
| 04.05 | Personnel Surface Contamination Monitoring Hand and foot monitor Whole body monitor Proportional counter 20A 125V 2Pole 3 Wire Receptacle T-lock c/w single gang box & cover Monitoring panel PC-6 c/w 120V UPS power supply Teck cable 2/C #12 Teck cable connectors Head-end equipment, programming, software, commissioning | 1 1 3 1 250 6 1 | EA EA EA EA m EA Sum |
| 04.06 | Breathing Air System BAS Controls Breathing air station Control Panel - supplied by vendor 16'x12'x6' Junction box c/w terminal block and NEMA 4 enclosure Control cable 25pr #22 AWG Control cable 2pr #16 AWG Power cable 3 #12 AWG 1" Rigid conduit c/w fittings 1-1/4" Rigid conduit c/w fittings 1-5/8", SQ Unistrut channel Head-end equipment, programming, software, commissioning | 21 2 180 900 70 550 92 75 1 | EA EA m m m m m Sum |
| 04.07 | Relocation of Gas Services Control & Cabling - Control cable 2/C #16 AWG + gnd - Direct buried conduits - 2 x 53mm plc. duct c/w excavation and backfill | 190 20 | m m |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|--|---|
| 04 | Instrumentation and Controls (Cont'd) | | |
| 04.07 | Relocation of Gas Services Control & Cabling (cont'd) - Direct buried conduits - 1 x 53mm plc. duct c/w excavation and backfill - 8"x8"x4" Pull box, NEMA 3-3R enclosure - 1-5/8", SQ Unistrut channel c/w fittings - Ground cable #4 bare Cu c/w lugs | 28 2 12 | m EA m |
| | Ground cable #4 bare Cd C/W lugs Ground terminal connector 2" Rigid conduit c/w fittings 16"x12"8" Pull box, NEMA 4 enclosure Control cable 1pr #16 AWG Connector / splice / sleeve | 3 3 1 100 12 | EA m EA m EA |
| 04.08 | Leak Detection System - Instrument rack assembly c/w 2 moisture alarm units MIA, indicator lamp, wiring & grounding | 1 | EA |
| | - 16x16x8 Junction c/w NEMA 4 enclosure, terminal blocks, wiring & grounding - 12x10x5 Junction c/w NEMA 4 enclosure, terminal blocks, wiring & grounding | 2 3 | EA |
| | Moisture / Leakage detection point c/w tubing & wiring Power cable 2/C #14 AWG Control cable 1 pair #16 AWG Control cable 7 pair #16 AWG Control cable 10 pair #16 AWG Control cable 20 pair #16 AWG Ground cable #4 bare Cu c/w lugs 3/4" Rigid galvanized conduit c/w fittings 3/4" Flexible conduit c/w fittings 1-1/2" Rigid galvanized conduit c/w fittings 1-1/2" Rigid galvanized conduit c/w fittings 1-5/8", SQ Unistrut channel c/w fittings Head-end equipment, programming, software, commissioning | 34 700 1,000 700 180 150 70 600 600 110 60 50 | EA m m m m m m m m Sum |
| 04.09 | Mod./Transfer from HWMB to West Annex Storage Tanks Control Cabling - 3/8" Stainless steel tubing c/w fittings - Pressure gauge | 14 10 | m EA |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 04 | Instrumentation and Controls (Cont'd) | | |
| 04.09 | Mod./Transfer from HWMB to West Annex Storage Tanks Control Cabling (cont'd) | | |
| | - Stainless steel swagelok fitting 3/8" tube | 2 | EA |
| | - Stainless steel plug & tee 3/8" | 16 | EA |
| | - Stainless steel convulted hose | 16 | EA |
| | - 1-5/8", Unistrut channel c/w fittings | 6 | m |
| | - Control Panel c/w 6 leak alarm control units, strobe/horn, terminal blocks, wiring, grounding & NEMA 4 encl. | 1 | EA |
| | - Post base and junction box for leak system | 6 | EA |
| | - Power cable 2/C #14 Teck | 20 | m |
| | - Control cable 2/C #16 AWG | 500 | m |
| | - Leak sensor | 6 | EA |
| | - Portable FAATM | 2 | EA |
| | - Portable FAAGM | 1 | EA |
| | - Head-end equipment, programming, software, commissioning | 1 | Sum |
| 04.10 | FAATM & FAAGM System Control & Cabling | | |
| | - Gamma monitor | 3 | EA |
| | - Alarm horn | 3 | EA |
| | - Alarm indicator | 3 | EA |
| | - Control cable 7/C #14 AWG | 500 | m |
| | - Control cable 2 pair #16 AWG | 2,000 | m |
| | - Control cable 4 pair #16 AWG | 100 | m |
| | - Control cable 2/C #14 AWG, armoured | 2,500 | m |
| | - 1" Flex conduit c/w fittings | 30 | m |
| | - 3/4" Flex conduit c/w fittings | 900 | m |
| | - Connector for Flex conduit | 25 | EA |
| | - 1" Rigid galvanized conduit c/w fittings | 150 | m |
| | - 1-5/8", Unistrut channel c/w fittings | 60 | m |
| | - Ground cable #4 bare Cu c/w lugs | 100 | m |
| | - Power cable 1/C #14 AWG | 100 | m |
| | - FAAGM Control Panel c/w 3 relay control units, rail mounting, terminal blocks, wiring, grounding & NEMA 4 encl. | 1 | EA |
| | - FAATM monitor | 13 | EA |
| | - Alarm horn | 10 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 04 | Instrumentation and Controls (Cont'd) | | |
| 04.10 | FAATM & FAAGM System Control & Cabling (cont'd) | | |
| | - Alarm indicator | 7 | EA |
| | - FAATM remote annunciator | 1 | EA |
| | - FAATM Control Panel c/w rail mounting, terminal blocks, wiring, grounding & NEMA 4 encl. | 1 | EA |
| | - Control cable 2/C #14 AWG, armoured | 2,550 | m |
| | - Control cable 7/C #14 AWG | 1,000 | m |
| | - Control cable 30/C #14 AWG | 250 | m |
| | - Control cable 2 pair #16 AWG | 2,000 | m |
| | - Control cable 4 pair #16 AWG | 100 | m |
| | - Control cable 7 pair #16 AWG | 250 | m |
| | - Control cable 20 pair #16 AWG | 350 | m |
| | - Cable connector | 107 | EA |
| | - 1" Rigid galvanized conduit c/w fittings | 380 | m |
| | - 1" Flex conduit c/w fittings | 60 | m |
| | - 1-1/4" Rigid galvanized conduit c/w fittings | 60 | m |
| | - 1-1/4" Flex conduit c/w fittings | 15 | m |
| | - 1-5/8", Unistrut channel c/w fittings | 150 | m |
| | - Ground cable #4 bare Cu c/w lugs | 300 | m |
| | - Ground connection | 5 | EA |
| | - Teck Cable connector | 30 | EA |
| | - Power cable 1/C #8 AWG | 1,000 | m |
| | - Main Control Panel c/w 39 relay control units, rail mounting, terminal blocks, wiring, grounding & NEMA 4 encl. | 1 | EA |
| | - Power cable 1/C #14 AWG | 150 | m |
| | - Head-end equipment, programming, software, commissioning | 1 | Sum |
| 04.11 | Drainage and Liquid Recovery Pump Controls | | |
| | terminal blocks, wiring & grounding | 1 | EA |
| | - Control cable 10/C #14 Teck 90 | 10 | m |
| | - Control cable 14/C #16 AWG | 100 | m |
| | - Control cable 2pr #16 AWG | 100 | m |
| | - Teck cable connector | 2 | EA |
| | - Float level switch | 1 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 04 | Instrumentation and Controls (Cont'd) | | |
| 04.11 | Drainage and Liquid Recovery Pump Controls (cont'd) | | |
| | - Pressure indicator | 3 | EA |
| | - 1" Rigid conduit c/w fittings | 30 | m |
| | - 1-5/8", SQ Unistrut channel c/w fittings | 6 | m |
| | - 3/8" Seamless Stainless steel tubing c/w fittings | 24 | m |
| | - Stainless steel fitting 3/8" tube | 8 | EA |
| | - Transmitter / shut-off valve | 4 | EA |
| | Inactive/Active Drainage control assembly c/w hand switch, control relays, indicating lamps, terminal blocks, wiring & grounding | 2 | EA |
| | - 36"x24"x10" NEMA 4 Steel enclosure | 2 | EA |
| | - Pressure / level indicator | 4 | EA |
| | - Control cable 2pr #16 AWG | 80 | m |
| | - Control cable 1pr #16 AWG | 20 | m |
| | - Control cable 2/C #12 + gnd Teck 90 | 80 | m |
| | - Control cable 14/C #16 AWG | 160 | m |
| | - Teck cable connector | 2 | EA |
| | - 1" Rigid conduit c/w fittings | 60 | m |
| | - Ground cable #4 bare Cu c/w lugs | 15 | m |
| | - Head-end equipment, programming, software, commissioning | 1 | Sum |
| 04.12 | Chilled Water System Control and Cabling | | |
| | - Power cable 2/C #10 AWG | 240 | m |
| | - Power cable 3/C #14 AWG | 50 | m |
| | - Control cable 1pr #16 AWG | 340 | m |
| | - 3/4" Rigid galvanized conduit c/w fittings | 460 | m |
| | - 1" Rigid galvanized conduit c/w fittings | 400 | m |
| | - 1-1/2" Rigid galvanized conduit c/w fittings | 180 | m |
| | - Ground cable #4 bare Cu c/w lugs | 25 | m |
| | - 1-5/8", SQ Unistrut channel c/w fittings | 30 | m |
| | - 3/4" Flexible galvanized conduit, liquid tight c/w fittings | 180 | m |
| | - 1" Flexible galvanized conduit, liquid tight c/w fittings | 150 | m |
| | - Chiller Control System Panel c/w enclosure - by vendor | 8 | EA |
| | - Transmitter / level pressure control - by vendor | 2 | EA |
| | - Refrigerant leak detector - by vendor | 1 | EA |
| | - Pressure/flow switch control - supplied by vendor, install only | 2 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 04 | Instrumentation and Controls (Cont'd) | | |
| 04.12 | Chilled Water System Control and Cabling (cont'd) | | |
| | - Programmable controller for chilled water - supplied by vendor, install only | 4 | EA |
| | - Soft starter controller - supplied by vendor, install only | 2 | EA |
| | - Evaporator controller - supplied by vendor, install only | 2 | EA |
| | - Ethernet switch - supplied by vendor, install only | 4 | EA |
| | - Detector leak for condenser & chilled water - supplied by vendor, install only | 2 | EA |
| | - Power cable 1/C #14 AWG - supplied by vendor, install only | 1,110 | m |
| | - Power cable 1/C #1/0 AWG - supplied by vendor, install only | 224 | m |
| | - Power cable 1/C #6 AWG - supplied by vendor, install only | 150 | m |
| | - Power cable 1/C #4 AWG - supplied by vendor, install only | 61 | m |
| | - Power cable 1/C #250MCM - supplied by vendor, install only | 184 | m |
| | - Power cable 1/C #8 AWG - supplied by vendor, install only | 24 | m |
| | - Ethernet cable 4 pr Cat.5- supplied by vendor, install only | 4 | EA |
| | - 120" Unistrut telestrut c/w fittings | 2 | EA |
| | - 144" Unistrut telestrut c/w fittings | 2 | EA |
| | - 1-5/8", SQ Unistrut channel c/w fittings | 2 | m |
| | - 102x76x6.4 carbon steel c/w post base | 2 | m |
| | - Rooftop concrete support 152mm high x 914mm long | 11 | EA |
| | - Head-end equipment, programming, software, commissioning | 1 | Sum |
| 04 13 | HVAC Control and Cabling | | |
| •• | - Control cable 2/C #10 + gnd Teck 90 | 165 | m |
| | - Control cable Cat.6 | 100 | m |
| | - 3/4" Rigid conduit c/w fittings | 25 | m |
| | - Ground cable #4 bare Cu | 40 | m |
| | - Teck cable connector | 4 | EA |
| | - Cat.6 cable connector | 6 | EA |
| | - 1-5/8", SQ Unistrut channel c/w fittings | 25 | m |
| | - HVAC Control Panel - by vendor | 2 | EA |
| | - Pump Control Panel / VFD - by vendor | 2 | EA |
| | - Flow switch - by vendor | 2 | EA |
| | - Transmitter / pressure control - by vendor | 4 | EA |
| | - Transmitter / temperature control - by vendor | 6 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 04 | Instrumentation and Controls (Cont'd) | | |
| 04.14 | Vapour Recovery System Control and Cabling | | |
| | - Power cable 2/C #6 AWG + gnd | 90 | m |
| | - Control cable 4/C #16 AWG | 115 | m |
| | - Control cable 1/C #16 AWG | 30 | m |
| | - 1" Rigid galvanized conduit c/w fittings | 75 | m |
| | - 3/4" Rigid galvanized conduit c/w fittings | 60 | m |
| | - Ground cable #4 bare Cu c/w lugs | 8 | m |
| | - Vapour Recovery control assembly c/w control relays, terminal blocks, wiring & grounding 3 modules - by vendor | 1 | EA |
| | - Marshalling box for vapour recovery - by vendor | 2 | EA |
| | - Differential pressure gauge | 19 | EA |
| | - Float level switch | 6 | EA |
| | - Level gauge, sight glass | 3 | EA |
| | - Transmitter pressure / temperature | 8 | EA |
| | - 3/16" dia. Thermocouple | 5 | EA |
| | - Temperature / resistance detector | 16 | EA |
| | - Thermometer | 7 | EA |
| | - Gas meter flow 1" conduit connection | 2 | EA |
| | Drum Handling Panel control assembly c/w control relays, terminal blocks, wiring & grounding - by vendor | 1 | EA |
| | - Control cable 2/C #16 AWG | 150 | m |
| | - Control cable 3/C #14 AWG | 160 | m |
| | - Control cable 7/C #14 AWG | 55 | m |
| | - 3/4" Rigid galvanized conduit c/w fittings | 72 | m |
| | - Ground cable #4 bare Cu c/w lugs | 4 | m |
| | - 1-5/8", SQ Unistrut channel c/w fittings | 32 | m |
| | - Float level switch | 2 | EA |
| | - Temperature sensor indicator | 6 | EA |
| | - Pressure sensor indicator | 4 | EA |
| | - Transmitter pressure / temperature | 2 | EA |
| | - Differential pressure gauge | 3 | EA |
| | Fan Control Panel assembly c/w hand switches, control relays, indicating lamps, alarms, terminal blocks, wiring & grounding | 1 | EA |
| | - Head-end equipment, programming, software, commissioning | 1 | Sum |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 04 | Instrumentation and Controls (Cont'd) | | |
| 04.15 | Air Compressor System Control & Cabling | | |
| | - Power cable 2/C #6 AWG + gnd | 220 | m |
| | - Control cable 2 pair #16 AWG | 275 | m |
| | - ATLAS Digital control panel c/w 6 control relays, terminal blocks, wiring & grounding - by vendor | 1 | EA |
| | - Transmitter pressure | 1 | EA |
| | - 1-5/8", Framing channel c/w fittings | 150 | m |
| | - 1-1/4" Rigid galvanized conduit c/w fittings | 90 | m |
| | - 1" Rigid galvanized conduit c/w fittings | 370 | m |
| | - 3/4" Rigid galvanized conduit c/w fittings | 45 | m |
| | - Ground cable #4 bare Cu c/w lugs | 25 | m |
| | - Ground connection | 25 | EA |
| | - Control cable 1 pair #22 AWG - by vendor | 140 | m |
| | - 3/4" Flex conduit c/w fittings | 30 | m |
| | - Power cable 2/C #12 AWG + gnd | 60 | m |
| | - Service / normal can connector - supplied by vendor, install | 3 | EA |
| | - Pressure valve - supplied by vendor, install only | 2 | EA |
| | - Control cable 7/C #14 AWG | 100 | m |
| | - Control cable 2/C #14 AWG | 60 | m |
| | Relay Control Panel c/w 2 relays, rail mounting, terminal blocks, wiring, grounding & NEMA 4/4X encl. | 1 | EA |
| | - Head-end equipment, programming, software, commissioning | 1 | Sum |
| 04.16 | Fixed Gaseous Monitoring and Exhaust Stack Control | | |
| | - Power cable 3/C #8 AWG | 100 | m |
| | - Control cable 3/C #10 + gnd Teck 90 | 200 | m |
| | - Control cable 3/C #14 + gnd Teck 90 | 80 | m |
| | - Control cable 7/C #16 AWG | 250 | m |
| | - Control cable 4/C #16 AWG | 100 | m |
| | - Control cable 2/C #16 AWG | 125 | m |
| | - Control cable 1/C #16 AWG | 152 | m |
| | - Cable tray, 24" width c/w fittings | 60 | m |
| | - 1" Stainless steel tubing c/w fittings | 125 | m |
| | - 1/2" Stainless steel tubing c/w fittings | 4 | m |
| | - 1/4" Stainless steel tubing c/w fittings | 65 | m |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 04 | Instrumentation and Controls (Cont'd) | | |
| 04.16 | Fixed Gaseous Monitoring and Exhaust Stack Control (cont'd) | | |
| | - 3" Galvanised steel liquid tight conduit c/w fittings | 16 | m |
| | - 1-1/4" Galvanised steel liquid tight conduit c/w fittings | 6 | m |
| | - 3/4" Galvanised steel liquid tight conduit c/w fittings | 30 | m |
| | - Ground cable #4 bare Cu c/w lugs | 155 | m |
| | - Teck cable connector | 20 | EA |
| | - Teck cable connector, watertight | 60 | EA |
| | - 1-5/8", SQ Unistrut channel c/w fittings | 2 | m |
| | - Plug c/w NEMA 4X enclosure | 1 | EA |
| | - 15A 125V heavy duty receptacle c/w WP cover | 1 | EA |
| | - 15A 125V toggle switch c/w WP cover | 1 | EA |
| | - Stainless steel swagelok fitting 1" tube | 25 | EA |
| | - Temperature controller - by vendor | 1 | EA |
| | - Heat tracing cable controller - by vendor | 2 | EA |
| | - Heat tracing cable c/w insulation | 110 | m |
| | - Temperature detector - by vendor | 2 | EA |
| | - Transmitter / mass flow control - by vendor | 3 | EA |
| | - Sampler gas & probe for stack monitoring - by vendor | 1 | EA |
| | - NO/NC detector & alarm - by vendor | 1 | EA |
| | - CO detector & alarm - by vendor | 1 | EA |
| | - Stack monitoring relay panel & transmitter - by vendor | 1 | EA |
| | - Leak detection & moisture transmitter - by vendor | 1 | EA |
| | - Head-end equipment, programming, software, commissioning | 1 | Sum |
| 04.17 | Supply and TRF Feed & Product System Control & Cabling - Intermediate Control Panel assembly PL10116 c/w hand switches, control | | |
| | relays, indicating lamps, level indicator, terminal blocks, wiring & grounding - 4 (four) modules | 1 | EA |
| | - Annunciator Alarm Panel | 1 | EA |
| | - Transmitter / isolating valve | 54 | EA |
| | - Shut-off valve | 44 | EA |
| | - Metal plate 48"x96"x1/4" and mounting support | 9 | EA |
| | - Level Transmitter | 19 | EA |
| | - Pressure Transmitter | 1 | EA |
| | - Pressure indicator | 13 | EA |
| | - 3/4" Stainless steel tubing c/w fittings | 675 | m |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|---|----------|------|
| 04 | Instrumentation and Controls (Cont'd) | | |
| 04.17 | Supply and TRF Feed & Product System Control & Cabling (cont'd) | | |
| | - Mounting pipe c/w fittings for floor mounted panels | 56 | m |
| | - 1-5/8", SQ Unistrut channel c/w fittings | 304 | m |
| | - Unistrut / telestrut carbon steel c/w fittings | 5 | m |
| | - Ground cable #4 bare Cu c/w lugs | 110 | m |
| | - Control cable 100/C #14 AWG | 400 | m |
| | - Control cable 30/C #14 AWG | 100 | m |
| | - Control cable 25/C #14 AWG | 720 | m |
| | - Control cable 7/C #14 AWG | 1,110 | m |
| | - Control cable 50pr #16 AWG | 500 | m |
| | - Control cable 25pr #16 AWG | 20 | m |
| | - Control cable 10pr #16 AWG | 100 | m |
| | - Control cable 2pr #16 AWG | 100 | m |
| | - Control cable 1pr #16 AWG | 1,000 | m |
| | - 1-1/2" Rigid galvanized conduit c/w fittings | 30 | m |
| | - 3" Rigid galvanized conduit c/w fittings | 60 | m |
| | - 1" Rigid galvanized conduit c/w fittings | 630 | m |
| | - 1/2" Rigid galvanized conduit c/w fittings | 500 | m |
| | - 6"x6"x4" Pull box | 1 | EA |
| | - 36"x24"x6" Junction box c/w mounting rail, terminal blocks, marking, grounding & NEMA 4/4X encl | 2 | EA |
| | - 1/2" Flex conduit c/w fittings for LT/PT | 30 | m |
| | - TRF Product Minor Control Panel assembly PL10128 c/w hand switches, indicating lamps, level indicator, terminal blocks, wiring, grounding and NEMA 4 enclosure | 1 | EA |
| | - Power cable 1/C #18 AWG | 35 | m |
| | - Head-end equipment, programming, software, commissioning | 1 | Sum |
| 04.18 | Cleanup & Downgraded Tank System Control and Cabling | | |
| | Intermediate Control Panel assembly PL10117 c/w hand switches, control relays, indicating lamps, alarms, terminal blocks, wiring & grounding - 4 (four) modules | 1 | EA |
| | - 20A 125V TL heavy duty receptacle c/w cover | 1 | EA |
| | - Annunciator Alarm Panel | 1 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 04 | Instrumentation and Controls (Cont'd) | | |
| 04.18 | Cleanup & Downgraded Tank System Control and Cabling (cont'd) | | |
| | - Instrument Control Panel assembly for cleanup tank c/w level transmitter, isolation / control valves | 3 | EA |
| | - 3/4" Stainless steel tubing c/w fittings | 40 | m |
| | - Transmitter / pressure valve | 6 | EA |
| | - Shut-off valve | 6 | EA |
| | - Level Transmitter | 3 | EA |
| | - Control cable 25/C #14 AWG | 500 | m |
| | - Control cable 7/C #14 AWG | 500 | m |
| | - Control cable 1pr #16 AWG | 500 | m |
| | - 1" Rigid galvanized conduit c/w fittings | 240 | m |
| | - 1/2" Rigid galvanized conduit c/w fittings | 70 | m |
| | - 1-1/2" Rigid galvanized conduit c/w fittings | 12 | m |
| | - 1/2" Flex conduit c/w fittings | 30 | m |
| | - Instrumentation cable 10pr #16 armoured | 15 | m |
| | - Instrumentation cable 50pr #16 AWG | 250 | m |
| | - Control cable 100/C #14 AWG | 200 | m |
| | - Junction box 30"x24"x6" NEMA 4 c/w mounting rail, terminal block, marking & grounding | 1 | EA |
| | - Ground cable #4 bare Cu c/w lugs | 75 | m |
| | - Control cable 1/C #16 AWG | 30 | m |
| | - 3" Conduit c/w fittings | 250 | m |
| | - Terminal blocks and marking inside PL1815 | 7 | EA |
| 04.19 | Clean-up System | | |
| | - 3/8" Stainless steel tubing c/w fittings | 350 | m |
| | - Transmitter / pressure valve | 2 | EA |
| | - Pressure indicator | 2 | EA |
| | Metal plate 48"x96"x1/4" and mounting support | 3 | EA |
| | - Transmitter / isolating valve | 15 | EA |
| | - Shut-off valve | 16 | EA |
| | - Level Transmitter | 3 | EA |
| | - Stainless steel Plug for drain & vent valve | 6 | EA |
| | - Level / Pressure Transmitter | 2 | EA |
| | | | |

ONTARIO POWER GENERATION HEAVY WATER MANAGEMENT BLDG. WEST ANNEX DARLINGTON, ONTARIO

| Item Ref. | Item Description | Quantity | Unit |
|-----------|--|----------|------|
| 04 | Instrumentation and Controls (Cont'd) | | |
| 04.20 | Downgraded Transfer System | | |
| | - Control cable 7 strand copper #16 AWG | 100 | m |
| | - Control cable 2pr #16 AWG | 100 | m |
| | - Control cable 7/C #14 AWG | 250 | m |
| | - 1" Rigid galvanized conduit c/w fittings | 200 | m |
| | - 6"x6"x4" Pull box c/w enclosure | 2 | EA |
| | - 3/8" Stainless steel tubing c/w fittings | 140 | m |
| | - Transmitter / isolating valve | 4 | EA |
| | - Pressure indicator | 4 | EA |
| | - Metal plate 48"x96"x1/4" and mounting support | 4 | EA |
| | - Head-end equipment, programming, software, commissioning | 1 | Sum |

Filed: 2021-08-17 EB-2020-0290 J3.7 Page 1 of 6

| 1 | 1 UNDERTAKING J3.7 | | | |
|--|---|--|--|--|
| 2 3 4 | Undertaking | | | |
| 5 6 7 8 | TO UPDATE IR STAFF 172 SHOWING UPDATES FOR MEAN COSTS AND EXPLAINING DERIVATION OF THE SENSITIVITY ANALYSES SHOWING ANY FORMULA OR MODELLING | | | |
| 9 10 11 | Response | | | |
| 12 13 | The following response was prepared by Bates White: | | | |
| 14 15 16 17 | Bates White used a productivity rate of 39% as an input in its cost model for labour costs. The point estimate of 39% represented the mean rate derived from two contractor productivity "wrench time" studies commissioned by OPG. | | | |
| 18 19 20 21 22 23 | To carry out the sensitivity analysis, Bates White calculated two sets of construction cost estimates using 36 different labour productivity rates, ranging from 31% to 66%. One set of estimates represented the total cost of the project; the other set, the direct cost of construction (including fee and contingency). The results are shown in Chart 1 and Chart 2 below. | | | |
| 24 25 26 27 28 29 30 31 | Bates White performed the sensitivity analyses using its cost model. This model started with an estimate of "overnight" costs, i.e., the cost estimate for performing all construction activities as if those activities were accomplished in late 2019. This estimate, based on a labour productivity rate of 39%, was \$371.6 million. This sum comprised \$55.0 million for construction-related labour and \$212.3 million for process-related labour. This estimate includes a 10% fee that was subsequently removed and included in a separate cost category labeled "fee and contingency." | | | |
| 32 33 34 35 36 37 | Bates White then de-escalated those 2019 cost estimates to reflect the nominal dollar values in the years those costs would be expended. The resulting direct cost of construction (without fee) was \$303.3 million. The deflation-adjusted construction-related labour cost was \$50.0 million, and the deflation-adjusted process-related labour cost was \$193.0 million. | | | |
| 38 39 40 41 | Because calculated labour cost was a function of the 39% productivity factor, Bates White could apply the distributive property of numbers and model the sum of labour costs as a function of a single productivity rate. Bates White then ran its cost model multiple times using different productivity rates, ranging from 31% to 66%. Each | | | |

different productivity rate changed the cost model's input values for overnight labour
costs and resulted in a new set of output values. Because Bates White created its
model in Microsoft Excel, it could perform this sensitivity analysis using Excel's "Data"
tool, designed to calculate multiple results by changing one or two variables.

6 Chart 1 below describes the impact of different average labour productivity rates on 7 the Bates White estimate of the project's total cost. The first column depicts average 8 labour productivity rates ranging from 31% to 66%. The second column depicts the 9 total construction cost associated with each row's productivity rate. The third column 10 indicates the rate of change of the total construction cost with each percentage point

11 increase in labour productivity.

Productivity **Total Cost** Rate of (%) (\$M) Change (%) 31 525.8 0.00 32 523.6 -0.42% 33 521.6 -0.39% 34 519.6 -0.37% 35 517.8 -0.35% 36 516.1 -0.33% -0.32% 37 514.5 -0.30% 38 512.9 39 512.1 -0.29% 40 510.1 -0.27% 41 -0.26% 508.7 42 507.5 -0.25% 43 506.3 -0.24% 44 505.1 -0.23% 45 504.0 -0.22% 503.0 -0.21% 46 47 502.0 -0.20% 48 501.0 -0.19% 49 500.1 -0.18% 499.2 50 -0.18% 498.3 -0.17% 51 52 497.5 -0.16% 53 496.7 -0.16% 496.0 54 -0.15% 55 495.2 -0.15% 494.5 -0.14% 56 57 493.8 -0.14% 493.2 58 -0.13% 492.5 -0.13% 59 491.9 -0.12% 60 61 491.3 -0.12% 62 490.8 -0.12% 63 490.2 -0.11% 64 489.7 -0.11% 489.1 65 -0.11% 66 488.6 -0.10%

1 Chart 1: Impact of Labour Productivity Rates and Total Construction Costs

1 Figure 1 is a graphical representation of this chart.

Figure 1: Total Construction Costs as a Function of Labour Productivity Rates



Total Cost as a Function of Productivity

4 5

6 The cost-productivity function in Figure 1 is slightly nonlinear. That nonlinearity is a 7 consequence of incorporating the annual inflation of wages and associated 8 compensation costs (e.g., health and life insurance costs) over the six years of 9 construction.

10

It should be noted that labour productivity affects only direct construction cost, not other
 elements in the total project cost. Chart 2 below depicts a sensitivity table of labour
 productivity rates on the Bates White estimate of direct construction cost.

| Productivity | Direct Cost | Rate of |
|--------------|-------------|------------|
| (%) | (\$M) | Change (%) |
| 31 | 314.0 | 0.00 |
| 32 | 312.3 | -0.54% |
| 33 | 310.7 | -0.51% |
| 34 | 309.2 | -0.48% |
| 35 | 307.8 | -0.46% |
| 36 | 306.5 | -0.43% |
| 37 | 305.2 | -0.41% |
| 38 | 304.0 | -0.39% |
| 39 | 303.3 | -0.37% |
| 40 | 301.8 | -0.36% |
| 41 | 300.8 | -0.34% |
| 42 | 299.8 | -0.32% |
| 43 | 298.9 | -0.31% |
| 44 | 298.0 | -0.30% |
| 45 | 297.1 | -0.28% |
| 46 | 296.3 | -0.27% |
| 47 | 295.5 | -0.26% |
| 48 | 294.8 | -0.25% |
| 49 | 294.1 | -0.24% |
| 50 | 293.4 | -0.23% |
| 51 | 292.7 | -0.22% |
| 52 | 292.1 | -0.22% |
| 53 | 291.5 | -0.21% |
| 54 | 290.9 | -0.20% |
| 55 | 290.4 | -0.19% |
| 56 | 289.8 | -0.19% |
| 57 | 289.3 | -0.18% |
| 58 | 288.8 | -0.18% |
| 59 | 288.3 | -0.17% |
| 60 | 287.8 | -0.16% |
| 61 | 287.3 | -0.16% |
| 62 | 286.9 | -0.15% |
| 63 | 286.5 | -0.15% |
| 64 | 286.1 | -0.15% |
| 65 | 285.7 | -0.14% |
| 66 | 285.3 | -0.14% |

1 Chart 2: Impact of Labour Productivity Rates and Direct Construction Costs



Figure 2: Direct Costs of Construction as a Function of Labour Productivity
 Rates



5