CONFIDENTIAL ATTORNEY WORK PRODUCT

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

Bates White Economic Consulting

August 16, 2021

Revised

BATES WHITE
ECONOMIC CONSULTING

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
VI.B. Step 3: EPC Indirect Costs, Commissioning Support and Close-Out Costs 22
VI.B.1. Indirect Costs 22
VI.B.2. EPC's Commissioning and Close-out Costs 24
VI.C. Step 4: Owner's Cost, Excluding Financing 24
VI.D. Step 5: Financing Cost 27
VI.D.1. Probability Distribution of Financing Cost 28
VI.D.2. Spend Plan and Annual Financing Cost 28
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) 28
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 21
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 26
Figure 8: Probability Distribution of Owner's Cost of Commissioning and Close-Out 26
Figure 9: Probability Distribution of Financing Cost 28
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 Hrs. C-5
Table C-7: Differentials betw. Non-Nuclear-Related Installation Hrs. and RSMeans-Presumed Installation Hrs. C-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: IWTU 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.

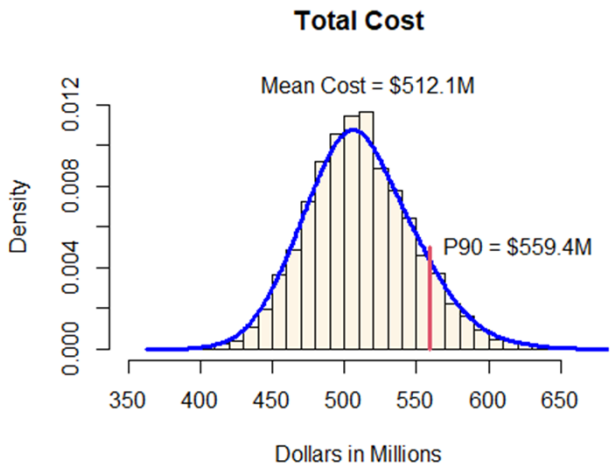
[1] The timeline begins with preliminary project work in 2012, continues through a six-year construction period that begins in January 2013 and is completed in December 2018, and is followed by a four-month commissioning process.

[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
    - 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. Appendix A provides *curricula vitae* for the senior team members. Appendix B 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 Appendix A.

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 well-recognized 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, https://www.federalreserve.gov/releases/H10/hist/.

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 Industries[10]

	Primary characteristic	Secondary characteristics		
Estimate class	**Maturity level of project definition deliverables** As % of complete definition	**End usage** Typical purpose of estimate	**Methodology** Typical estimating method	**Expected accuracy range** Typical variation in low and high ranges[a]
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, feasibility	Semi-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.

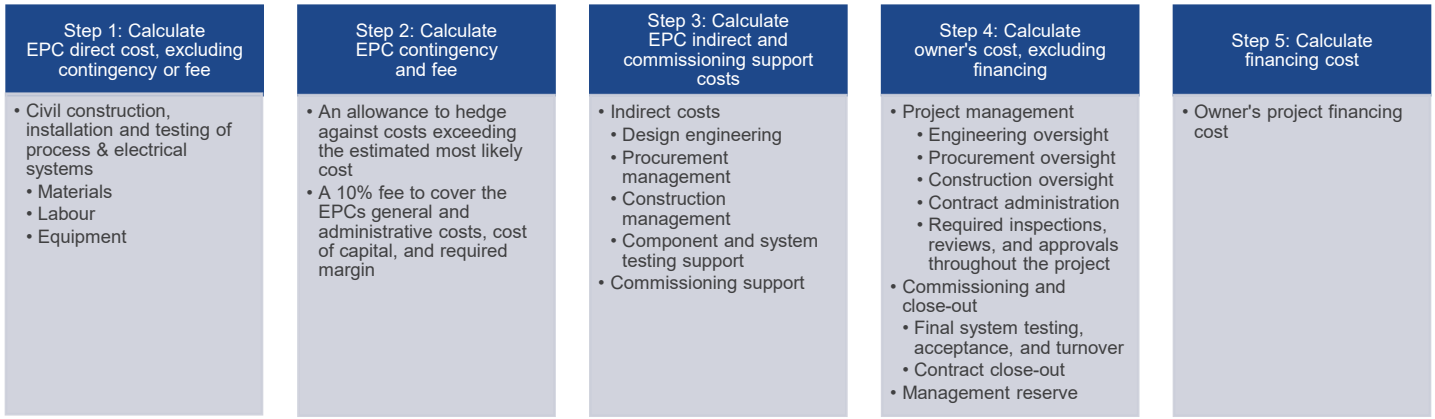
[12] "Typically, this provides an 80% confidence level that the actual cost will fall within the bounds of the low and high ranges. The estimate confidence interval or accuracy range is driven by the reliability of the scope information available at the time of the estimate in addition to the other variables and risk identified above." AACE International, *AACE International Recommended Practice No. 56R-08, Cost Estimate Classification System – As Applied for the Building and General Construction Industries*, TCM Framework: 7.3 – Cost Estimating and Budgeting, Rev. December 13, 2016.

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 Appendix A.
[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.

[16]The 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.

Table 4: Deflator Factors, 2013 to 2019.

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

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.

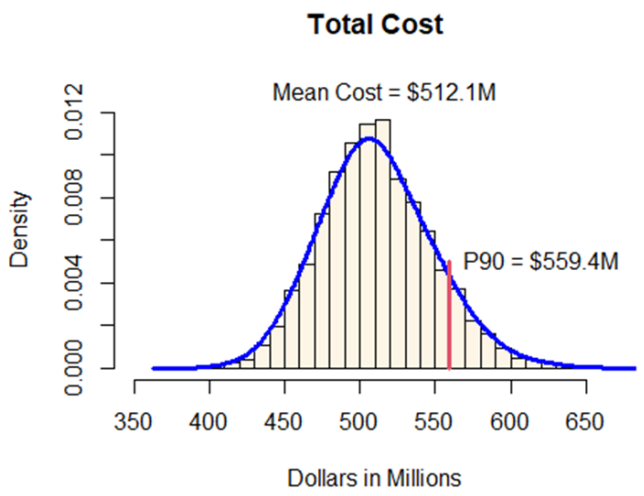
[17] Rounded for purposes of the discussion.
[18] Statistics Canada, "Building Construction Price Indexes, by Type of Building," accessed November 23, 2019, https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1810013501.

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 Guidelines[22] 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 dollar-denominated 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, https://www.rsmeansonline.com/, 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 wages[23]
- 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 non-nuclear 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.

---

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

[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.

[26] Building Price Index, https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1810013501#timeframe, 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 Appendix C.

[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, 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.

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 Appendix D.) 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.

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

	Materials	Labour	Equipment	Total
	All Costs include Inferred Amounts			
Construction	$33.3	$55.0	$0.3	$88.6
Process systems	$70.7	$212.3	$0.0	$283.0
Initial Estimate of overnight direct costs	**$104.0**	**$267.3**	**$0.4**	**$371.6**
Overnight direct costs with inferred amounts removed				**$337.8**

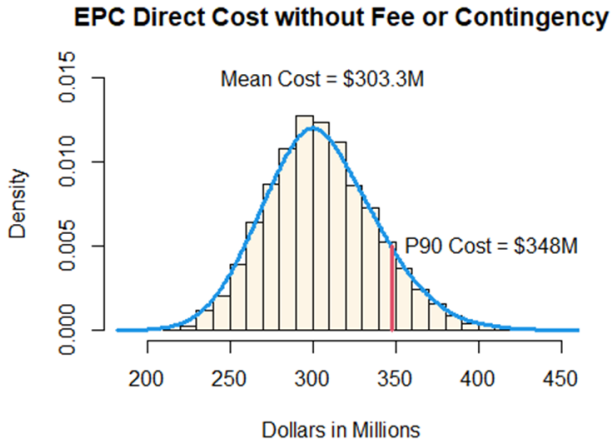
We converted the estimate of 2019 overnight costs of $337.8 million to amounts for each year of our six-year construction period. Summing the annual costs from each year's spend plan results in our estimate of the direct costs of construction, without fee or contingency, equal to **$303.3 million**, 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.

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.

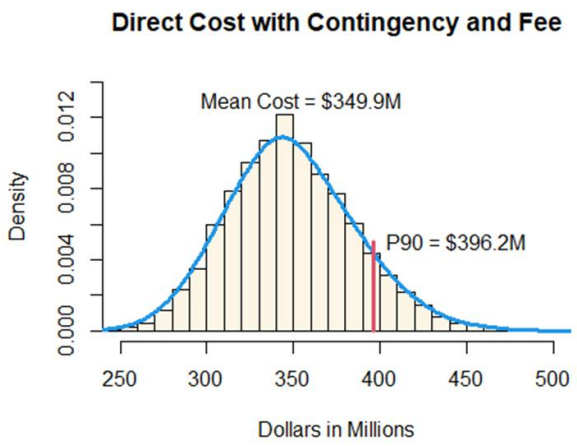
While it is common to assign a standard percentage of the base cost (say 10%) to compute a contingency allowance, we view that approach as arbitrary. We prefer a more sophisticated approach for determining the contingency allowance. Such an approach is premised on the notion that the contingency is a 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



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 total[a]
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 or fee	Contingency (4.86%)	Fee (10%)	Year total[a]
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 total[a]
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	Contingency (4.86%)	Fee (10%)	Year Total[a]
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

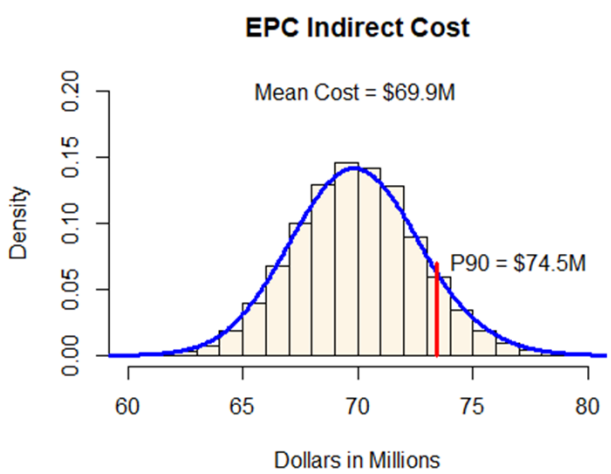
- Electrical engineering—Engineering to address power systems, distribution, and instrumentation and controls
- Engineering support—Maintenance of drawings, technical manuals, reports, and processing of changes thereto
- Mechanical engineering—Engineering to address piping system design, including pumps, 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 as-needed 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, https://www.glassdoor.com/Reviews/Ontario-Power-Generation-Reviews-E9274.htm.

Table 12: Spend Plan for the EPC Indirect Cost (Dollars in Millions)

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**

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, https://www.glassdoor.com/Reviews/Ontario-Power-Generation-Reviews-E9274.htm and the Ontario Sunshine List, accessed April 26, 2020, https://www.ontariosunshinelist.com/.

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 and contract close-out	$6.8
Management reserve	$8.5
Total owner's costs	**$42.1**

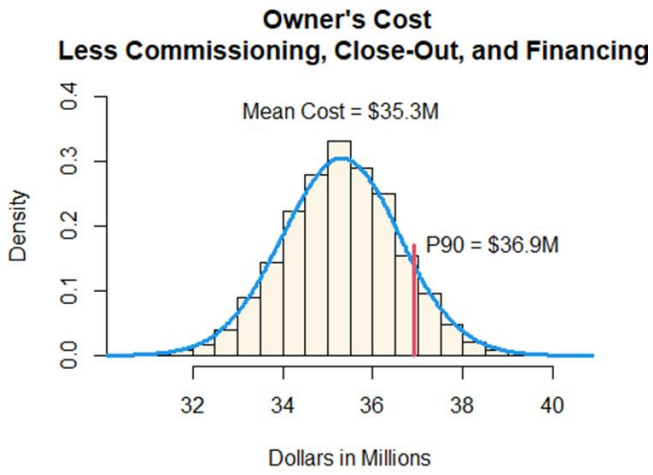
Further detail is available in Appendix G.

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.

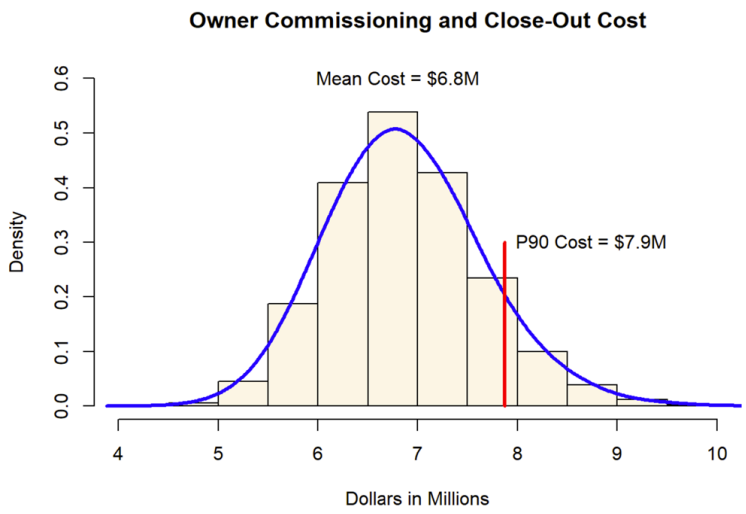
Figure 7: Probability Distribution of Owner's Cost Less Commissioning, Close-Out and Financing



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



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.

Table 16: Annual Project Financing Interest Rates, 2012 through 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%

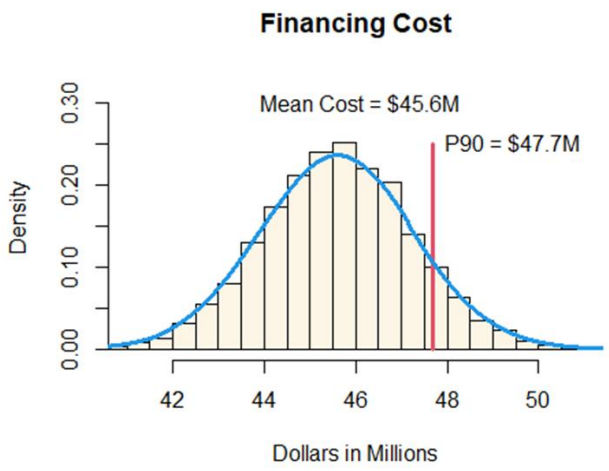
[36] Project financing rates provided by OPG.

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



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 Appendix H.

Table 17: Estimated Spend Plan and Financing Cost (Dollars in Millions)

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**

[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 EIA[38] 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 Appendix D. 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).

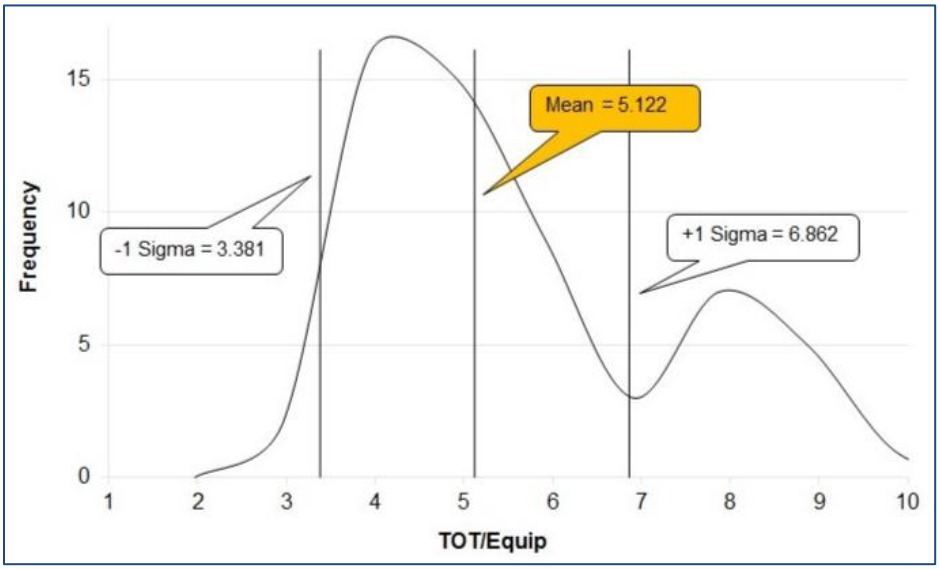
[41] T. E. Wolf, "Lang Factor Cost Estimates, 2013, *available at* http://www.prjmgrcap.com/langfactorestimating.html.

[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* http://prjmgrcap.com/estimateslangfactorupdate.html

[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=58[45]



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."[47] Therefore, "Because of the stringent specifications of a nuclear reprocessing plant, usually the most conservative (highest) values for the subfactors have been chosen."[48]

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]

---

[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. 133.

[47] Okan H. Zabunoglu, "Reprocessing of Long-Cooled Nuclear Fuel: Process Description and Plant Design" (PhD diss. Iowa State University, 1988), p. 133.

[48] Okan H. Zabunoglu, "Reprocessing of Long-Cooled Nuclear Fuel: Process Description and Plant Design" (PhD diss. Iowa State University, 1988), 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 quality 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 as-spent 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).

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			

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 above-market 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 clean-up 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.

CONFIDENTIAL ATTORNEY WORK PRODUCT

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.

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.

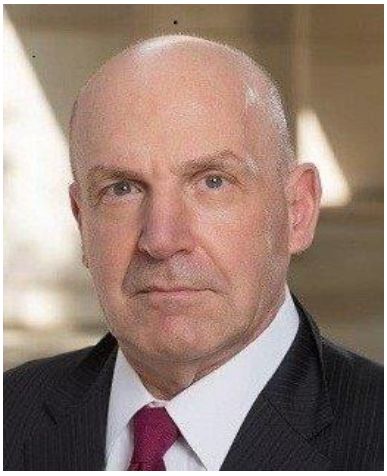
"Estimating Worker Collective Doses from a Revised Approach to Managing Commercial Nuclear Fuel" (with B. Burkhardt, A. Croff, and A. Sowder). *Radwaste Solutions*, vol. 22, no. 1 (January/June 2015).

"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.

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.

CONFIDENTIAL ATTORNEY WORK PRODUCT

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

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-38910-00001--000.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

CONFIDENTIAL ATTORNEY WORK PRODUCT

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-38300-00001--000.pdf	1
Dewatering Modification Design	**1**
Dewatering Modification Design Req.pdf	1
Drawings-SPEC	**135**
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 10006	3
Design_Specification_Technical Specification_NK38-Technical Specification-63800-10002 and 10003	2
Design_Specification_Technical Specification_NK38-Technical Specification-63811-10001_000.pdf	1
Design_Specification_Technical Specification_NK38-Technical Specification-63861-10001, 10003, 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

CONFIDENTIAL ATTORNEY WORK PRODUCT

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 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

CONFIDENTIAL ATTORNEY WORK PRODUCT

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	**18**
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

CONFIDENTIAL ATTORNEY WORK PRODUCT

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 West Annex (D2O)_Submittal_1.pdf	1
Nov 2012_Schedule_48070014-LTR-013.pdf	1
Nov 2012_Schedule_DNGS - (D2O) HWMBWA Schedule_Submission - Nov-07-2012.pdf	1
Sep 2012_Schedule_D2O-TOTAL SCHEDULE-Sep 142012 (2).pdf	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 dd 26-Apr-19.pdf	1
Dec 2015_D2O_Schedule_Critical Path20151203.pdf	1
Dec 2016_D2O_Schedule_ Critical activities 20161209.pdf	1
Mar 2016_D2O_Schedule_ Critical Stream20160311.pdf	1
Mar 2016_D2O_Schedule_ Near Critical activities 20160311.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 Tech Review 002.pdf	1
Memo re technical review.pdf	1
Nuclear Safety Design Guide Common Mode Incidents Seismic Design (revisions 5, 6, and 7)	3
RCMT Engineering Turnover Seismic Dike.pdf	1
RCMT Seismic Prs.pdf	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

CONFIDENTIAL ATTORNEY WORK PRODUCT

Tech Review Record EC.pdf	1
Technical Review Record.pdf	1
Soil Management	**20**
Borehole Drilling Investigation.pdf	1
Elev Tritium Levels.pdf	1
Elevated Tritium Concentrations Found in Groundwater Monitoring Well Samples.pdf	1
EXP Geotechnical Report - Additional Comments.pdf	1
EXP Geotechnical Report D2O Site.pdf	1
F1 soil management plan (Original and Revision 1)	2
Foundation Structural Analysis.pdf	1
Initial Survey for D2O Expansion - Buried Services Scan.pdf	1
Kinectrics Soil Sampling Report.pdf	1
Memo re Disposal&Mgmt.pdf	1
OPG Memo-Temp Use of DNNP site with D2O Soil Management Plan attached.pdf	1
Radiological Risks with soil.pdf	1
RCMT re Raising the Foundation El.pdf	1
Soil Handling Meeting.docx	1
Soil Management plan (original and revised)	2
Soil Sampling Mgmt-(original and update)	2
Trow Geotechnical Report for site.pdf	1
Valve Breakout	**8**
Purchase Order 249065 Rev 004.pdf	2
Purchase Order 249200 Rev 011.pdf	2
Purchase Order 249243 Rev 010.pdf	2
Purchase Order 250735 Rev 008.pdf	2
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	1
628411-K63811-52BX-0001 Rev02 Signed Purchase Order - CCI Thermal Technologies.pdf (Revisions 2 and 5)	2
628411-K63821-52BX-0001 Rev06 Signed Purchase Order - Custom Control Panels.pdf	1

CONFIDENTIAL ATTORNEY WORK PRODUCT

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 panel__Design_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. "Integrated Waste Treatment Unit," description, October 2017. https://fluor-idaho.com/Documents/ProjectFiles/iwtu/IWTU_100417.pdf.

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," https://www.glassdoor.com/Reviews/Ontario-Power-Generation-Reviews-E9274.htm.

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. https://nuclearsafety.gc.ca/eng/acts-and-regulations/regulatory-documents/published/html/regdoc2-3-1/index.cfm.

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.* https://www.corelogic.com/solutions/marshall-swift.aspx.

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. https://www2.gov.bc.ca/assets/gov/driving-and-transportation/transportation-infrastructure/planning/guidelines/cost_estimating_guidance.pdf.

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, https://www.federalreserve.gov/releases/h10/hist/dat00_ca.htm.
[53] Statistics Canada, "Building Construction Price Indexes, by Type of Building," accessed April 26, 2020, https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1810013501.

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.

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
  - 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.

Table C-5: Cost Differentials betw. Nuclear and Nonnuclear Materials

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

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.

Table C-6: Differentials betw. Nuclear-Related Installation Hrs. and RSMeans-Presumed Installation Hrs.

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

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.

Table C-7: Differentials betw. Non-Nuclear-Related Installation Hrs. and RSMeans-Presumed Installation Hrs.

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

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 motor-operated 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]

[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- https://www.grainger.com/search/plumbing/pipe-tubing-and-fittings/pipe-fittings/stainless-steel-pipe-fittings?optOut=0&searchQuery=steel+pipe+fittings&sst=1; Flanges- https://www.grainger.com/search?searchBar=true&searchQuery=stainless+seel+flange; Caps- https://www.grainger.com/search/pipe-hose-tube-fittings/pipe-products/pipe-fittings?sst=1&ts_optout=true&searchQuery=buttweld+pipe; Elbows- https://www.grainger.com/search?searchBar=true&searchQuery=stainless+steel+pipe+elbow.

Table C-8 Cost Data for Various Sizes and Types of Pipe Fixtures

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**

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.

<u>Stainless Steel Adjustment for Nuclear-Class Materials</u>

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 nuclear-grade 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.

Table C-9: Nuclear Grade Stainless Steel, Weighted Average Adjustment Factors

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	E-7	0	4	4	1.00

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 smallest tanks (RV Discharge, Cleanup, 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 Appendix D.

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.

Table C-12: Quantities in kg and meters, BOQ Section B, 5.01

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

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, Greatmats[59] 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, www.greatmats.com.
[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 equipment costs associated with constructing or installing the materials. The last 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
B_05	Metals		$9,357,953	$6,663,611	$133,523	$16,155,086
B_07	Thermal protection		$569,775	$1,591,434	$77,322	$2,238,531
B_08	Doors windows		$57,296	$41,268	$0	$98,564
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.

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 : 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
					$ -	**$ 9,135.36**	**$ 3,466.76**	**$ 12,602.12**
			Labor factor: 2.5	1.5		$ 13,703.04		$ 13,703.04
					$ -	$ 22,838.40	$ 3,466.76	$ 26,305.16

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
03-01 Drainage sub-slab								
Data Release : 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	$ -	$ 2,555.70
966	032211100100	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 accessories			$ 2,540.58	$ 4,192.44	$ -	$ 6,733.02
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	$ 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	$ -	$ -	$ 50,892.60
			Formwork factor: 1.55	0.550645482	$ 222.02			$ 222.02
			wire	0.659466328	$ 1,675.43			$ 1,675.43
			Concrete	0.500933908	$ 25,493.83			$ 25,493.83
					$ 81,227.66	**$ 14,737.50**	**$ 1,028.50**	**$ 96,993.66**
			EMWR adjustment					
			EMWR Concrete	**8.8**		**$ 8,392.56**		**$ 8,392.56**
			EMWR Forms	**5.710526316**		**$ 18,942.00**		**$ 18,942.00**
			EMWR Rebar	**0.776762402**		**$ 3,256.53**		**$ 3,256.53**
			Subotal			**$ 45,328.59**		**$ 127,584.75**
			Productivity adjustment					
			labor factor	**1.5**		**$ 67,992.88**		**$ 67,992.88**
			Concrete strength adjustment					
			Concrete factor	**0.011**	**$ 840.25**			**$ 840.25**
			Total		**$ 82,067.91**	**$ 113,321.47**	**$ 1,028.50**	**$ 196,417.88**
03-02 Basement Slab								
Data Release : 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	$ -	$ -	$ 203,149.80
966	033113702950	Structural concrete, placing, foundation mat, pumped, over 15.2 m3, includes leveling (strike off) & consolidation, excludes material			$ -	$ 15,542.94	$ 1,893.36	$ 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	$ -	$ 12,762.40
134	031513500050	Waterstop, PVC, ribbed, 6 mm thick x 150 mm wide			$ 1,732.62	$ 1,984.54	$ -	$ 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			$ 221.10	$ 3,090.04	$ -	$ 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	$ -	$ 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			$ 1,140.94
			QA	0.25		$ 64,134.61		$ 64,134.61
					$ 866,205.61	**$ 351,980.98**	**$ 1,893.36**	**$ 1,220,079.95**
			EMWR adjustment					

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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			$ 853,054.21		$ 1,721,153.18
			Productivity adjustment					
			labor factor	1.65		$ 1,407,539.45		$ 1,407,539.45
			Concrete strength adjustment					
			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 Topping Slab								
Data Release : Year 2020		**Unit Cost Estimate**						
160	033113350400	Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments			$ 33,648.00	$ -	$ -	$ 33,648.00
160	033113701600	Structural concrete, placing, elevated slab, pumped, over 254 mm thick, includes leveling (strike off) & consolidation, excludes material			$ -	$ 5,731.20	$ 696.00	$ 6,427.20
26	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			$ 299.52	$ 1,599.00	$ -	$ 1,898.52
			Concrete	0.500933908	$ 16,855.42			$ 16,855.42
			Forms	0.550645482	$ 164.93			$ 164.93
					$ 50,967.87	$ 7,330.20	$ 696.00	$ 58,994.07
			EMWR adjustment					
			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 adjustment					
			Concrete factor	0.011	$ 555.54			$ 555.54
			Total		$ 51,523.41	$ 167,239.73	$ 696.00	$ 219,459.14
03-04 - Wall Below Grade								
Data Release : Year 2020		**Unit Cost Estimate**						
2050	033113350400	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	033113705350	Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material			$ -	$ 109,552.00	$ 13,366.00	$ 122,918.00
3368	031113852700	C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 1 use, includes erecting, bracing, stripping and cleaning			$ 151,728.40	$ 590,343.04	$ -	$ 742,071.44
293.6	032111600750	Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for accessories			$ 552,666.77	$ 228,787.80	$ -	$ 781,454.57
269	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			$ 2,337.61	$ 4,177.57	$ -	$ 6,515.18
269	031513500050	Waterstop, PVC, ribbed, 6 mm thick x 150 mm wide			$ 3,478.17	$ 3,983.89	$ -	$ 7,462.06
			Concrete	0.500933908	$ 215,960.12			$ 215,960.12
			Forms	0.550645482	$ 84,835.75			$ 84,835.75
			rebar	0.555504185	$ 307,008.70			$ 307,008.70
			QA	0.25		$ 57,196.95		$ 57,196.95
					$ 1,749,130.53	$ 994,041.25	$ 13,366.00	$ 2,756,537.78
			EMWR adjustment					
			EMWR Concrere	12.1		$ 1,325,579.20		$ 1,325,579.20
			EMWR Forms	8.065789474		$ 4,761,582.68		$ 4,761,582.68
			EMWR Rebar	1.351827676		$ 309,281.68		$ 309,281.68

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
			Subotal			$ 7,390,484.81		$ 9,152,981.34
			Productivity adjustment					
			labor factor	1.5		$ 11,085,727.21		$ 11,085,727.21
			Concrete strength adjustment					
			Concrete factor	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 - Reinf Concrete Partition Wall								
Data Release : Year 2020	**Unit Cost Estimate**							
76	033113350400	Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments			$ 15,982.80	$ -	$ -	$ 15,982.80
76	033113705350	Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material			$ -	$ 4,061.44	$ 495.52	$ 4,556.96
496	031113852750	C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 2 use, includes erecting, bracing, stripping and cleaning			$ 12,226.40	$ 70,159.20	$ -	$ 82,385.60
9.88	032111600750	Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for 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	0.555504185	$ 10,331.22			$ 10,331.22
			QA	0.25		$ 1,924.75		$ 1,924.75
					$ 71,877.07	$ 83,844.38	$ 495.52	$ 156,216.96
			EMWR adjustment					
			EMWR Concrere	12.1		$ 49,143.42		$ 49,143.42
			EMWR Forms	8.065789474		$ 565,889.34		$ 565,889.34
			EMWR Rebar	1.351827676		$ 10,407.71		$ 10,407.71
			Subotal			$ 709,284.85		$ 781,657.43
			Productivity adjustment					
			labor factor	1.5		$ 1,063,927.27		$ 1,063,927.27
			Concrete strength adjustment					
			Concrete factor	0.011	$ 263.88			$ 263.88
			Total		$ 72,140.95	$ 1,773,212.12	$ 495.52	$ 1,845,848.58
03-06 Reinf Concrete Partition Wall 200m thick								
Data Release : Year 2020	**Unit Cost Estimate**							
11	033113350400	Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments			$ 2,313.30	$ -	$ -	$ 2,313.30
11	033113705350	Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material			$ -	$ 587.84	$ 71.72	$ 659.56
496	031113852750	C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 2 use, includes erecting, bracing, stripping and cleaning			$ 12,226.40	$ 70,159.20	$ -	$ 82,385.60
2.15	032111600750	Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for accessories			$ 4,047.12	$ 1,675.39	$ -	$ 5,722.50
			Concrete	0.500933908	$ 1,158.81			$ 1,158.81
			Forms	0.550645482	$ 12,226.40			$ 12,226.40
			rebar	0.555504185	$ 2,248.19			$ 2,248.19
			QA	0.25		$ 418.85		$ 418.85
					$ 34,220.22	$ 72,841.28	$ 71.72	$ 107,133.21
			EMWR adjustment					
			EMWR Concrere	12.1		$ 7,112.86		$ 7,112.86
			EMWR Forms	8.065789474		$ 565,889.34		$ 565,889.34
			EMWR Rebar	1.351827676		$ 2,264.84		$ 2,264.84
			Subotal			$ 648,108.32		$ 682,400.25
			Productivity adjustment					
			labor factor	1.5		$ 972,162.48		$ 972,162.48
			Concrete strength adjustment					
			Concrete factor	0.011	$ 38.19			$ 38.19
			Total		$ 34,258.42	$ 1,620,270.79	$ 71.72	$ 1,654,600.92
03_07 Reinf Concrete Partition Wall								

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
Data Release : Year 2020		**Unit Cost Estimate**						
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	$ -	$ -	$ 11,987.10
57	033113705350	Structural concrete, placing, walls, pumped, 380 mm thick, includes leveling (strike off) & consolidation, excludes material			$ -	$ 3,046.08	$ 371.64	$ 3,417.72
566	031113852750	C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 2 use, includes erecting, bracing, stripping and cleaning			$ 13,951.90	$ 80,060.70	$ -	$ 94,012.60
11.12	032111600750	Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for 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			$ 11,627.85
			QA	0.25		$ 2,166.32		$ 2,166.32
					$ 72,186.22	**$ 93,938.36**	**$ 371.64**	**$ 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 adjustment					
			Concrete factor	**0.011**	**$ 197.91**			**$ 197.91**
			Total		**$ 72,384.13**	**$ 1,970,656.53**	**$ 371.64**	**$ 2,043,412.30**
03-08 Reinf Concrete Suspended Slab								
Data Release : 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 treatments			$ 210.30	$ -	$ -	$ 210.30
1	033113701500	Structural concrete, placing, elevated slab, pumped, 150 mm to 254 mm thick, includes leveling (strike off) & 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
1	032111600400	Reinforcing steel, in place, elevated slabs, #13 to #22, A615M, grade 400, incl labor for accessories, excl material for accessories			$ 1,882.38	$ 1,064.98	$ -	$ 2,947.36
			Concrete	0.500933908	$ 105.35			$ 105.35
			Forms	0.550645482	$ 104.17			$ 104.17
			rebar	0.555504185	$ 1,045.67			$ 1,045.67
			QA	0.25		$ 266.25		$ 266.25
					$ 3,537.05	**$ 1,832.87**	**$ 4.92**	**$ 5,374.83**
			EMWR adjustment					
			EMWR Concrere	**8.8**		**$ 355.17**		**$ 355.17**
			EMWR Forms	**5.710526316**		**$ 2,634.15**		**$ 2,634.15**
			EMWR Rebar	**0.776762402**		**$ 827.24**		**$ 827.24**
			Subotal			**$ 5,649.42**		**$ 9,191.39**
			Productivity adjustment					
			labor factor	**1.5**		**$ 8,474.13**		**$ 8,474.13**
			Concrete strength adjustment					
			Concrete factor	**0.011**	**$ 3.47**			**$ 3.47**
			Total		**$ 3,540.52**	**$ 14,123.55**	**$ 4.92**	**$ 17,668.99**

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
03-09 Reinf Concrete Composite Slab								
Data Release : Year 2020		**Unit Cost Estimate**						
677	033113350400	Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments			$ 142,373.10	$ -	$ -	$ 142,373.10
677	033113701600	Structural concrete, placing, elevated slab, pumped, over 254 mm thick, includes leveling (strike off) & consolidation, excludes material			$ -	$ 24,250.14	$ 2,944.95	$ 27,195.09
148	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			$ 2,991.08	$ 24,424.44	$ -	$ 27,415.52
286.37	032111600400	Reinforcing steel, in place, elevated slabs, #13 to #22, A615M, grade 400, incl labor for accessories, excl material for accessories			$ 539,057.16	$ 304,978.32	$ -	$ 844,035.48
					$ 684,421.34	**$ 353,652.90**	**$ 2,944.95**	**$ 1,041,019.19**
			EMWR adjustment					
			EMWR Concrere	**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					
			labor factor	**1.5**		**$ 1,884,540.18**		**$ 1,884,540.18**
			Concrete strength adjustment					
			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 Reinf Concrete Curb								
Data Release : Year 2020		**Unit Cost Estimate**						
11	033113350400	Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments			$ 2,313.30	$ -	$ -	$ 2,313.30
11	033113704650	Structural concrete, placing, slab on grade, pumped, over 150 mm thick, includes leveling (strike off) & consolidation, excludes material			$ -	$ 381.48	$ 46.75	$ 428.23
76	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			$ 1,535.96	$ 12,542.28	$ -	$ 14,078.24
					$ 3,849.26	**$ 12,923.76**	**$ 46.75**	**$ 16,819.77**
			EMWR adjustment					
			EMWR Concrere	**12.1**		**$ 4,615.91**		**$ 4,615.91**
			EMWR Forms	**8.065789474**		**$ 101,163.39**		**$ 101,163.39**
			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 adjustment					
			Concrete factor	**0.011**	**$ 25.45**			**$ 25.45**
			Total		**$ 3,874.71**	**$ 296,757.65**	**$ 46.75**	**$ 300,679.10**
03-11 Reinf Concrete Slab								
Data Release : Year 2020		**Unit Cost Estimate**						
118	033113350400	Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments			$ 24,815.40	$ -	$ -	$ 24,815.40
118	033113704650	Structural concrete, placing, slab on grade, pumped, over 150 mm thick, includes leveling (strike off) & consolidation, excludes material			$ -	$ 4,092.24	$ 501.50	$ 4,593.74

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
23	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			$ 464.83	$ 3,795.69	$ -	$ 4,260.52
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	$ 36,081.52	$ -	$ 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**
			EMWR Forms	**8.065789474**		**$ 30,615.24**		**$ 30,615.24**
			EMWR Rebar	**1.351827676**		**$ 48,776.00**		**$ 48,776.00**
			Subotal			**$ 172,876.79**		**$ 262,433.56**
			Productivity adjustment					
			labor factor	**1.5**		**$ 259,315.18**		**$ 259,315.18**
			Concrete strength adjustment					
			Concrete factor	**0.011**	**$ 272.97**			**$ 272.97**
			Total		**$ 89,328.23**	**$ 432,191.97**	**$ 501.50**	**$ 522,021.71**
03-12 Reinf Concrete Pad								
Data Release : Year 2020		**Unit Cost Estimate**						
7	033113350400	Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments			$ 1,472.10	$ -	$ -	$ 1,472.10
7	033113704650	Structural concrete, placing, slab on grade, pumped, over 150 mm thick, includes leveling (strike off) & consolidation, excludes material			$ -	$ 242.76	$ 29.75	$ 272.51
5	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			$ 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 adjustment					
			Concrete factor	**0.011**	**$ 16.19**			**$ 16.19**
			Total		**$ 1,589.34**	**$ 26,651.98**	**$ 29.75**	**$ 28,271.07**
03-13 Roughen surface level channel								
Data Release : Year 2020		**Unit Cost Estimate**						
56	051223400672	Channel framing, structural steel, field fabricated, C200x17, incl cutting & welding			$ 2,278.08	$ 12,364.80	$ 970.48	$ 15,613.36
					$ 2,278.08	**$ 12,364.80**	**$ 970.48**	**$ 15,613.36**
			Labor factor: 2.5	1.5		**$ 18,547.20**		**$ 18,547.20**
			Concrete factor	**0.011**	**$ 25.06**			**$ 25.06**
03-14 Reinf Concrete Slab			Total		**$ 2,303.14**	**$ 30,912.00**	**$ 970.48**	**$ 34,185.62**
Data Release : Year 2020		**Unit Cost Estimate**						
91	033113350400	Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments			$ 19,137.30	$ -	$ -	$ 19,137.30
91	033113704650	Structural concrete, placing, slab on grade, pumped, over 150 mm thick, includes leveling (strike off) & consolidation, excludes material			$ -	$ 3,155.88	$ 386.75	$ 3,542.63
14	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			$ 282.94	$ 2,310.42	$ -	$ 2,593.36

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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	$ 36,081.52	$ -	$ 99,856.56
					$ 83,195.27	**$ 41,547.82**	**$ 386.75**	**$ 125,129.85**
			Labor factor: 2.5	1.5		**$ 62,321.73**		**$ 62,321.73**
			Concrete factor	**0.011**	**$ 210.51**			**$ 210.51**
			Total		**$ 83,405.78**	**$ 103,869.55**	**$ 386.75**	**$ 187,662.09**
03-15 Reinf Concrete Bulkhead Curb								
Data Release : 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			$ -	$ 69.36	$ 8.50	$ 77.86
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	$ -	$ 2,408.12
					$ 683.33	**$ 2,214.75**	**$ 8.50**	**$ 2,906.58**
			Labor factor: 2.5	1.5		**$ 3,322.13**		**$ 3,322.13**
			Concrete factor	**0.011**	**$ 4.63**			**$ 4.63**
			Total		**$ 687.96**	**$ 5,536.88**	**$ 8.50**	**$ 6,233.33**
03-16 Reinforced Concrete Bulkhead Beam								
Data Release : 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 treatments			$ 210.30	$ -	$ -	$ 210.30
1	033113704650	Structural concrete, placing, slab on grade, pumped, over 150 mm thick, includes leveling (strike off) & consolidation, excludes material			$ -	$ 34.68	$ 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	$ 495.09	$ -	$ 555.72
					$ 270.93	**$ 529.77**	**$ 4.25**	**$ 804.95**
			Labor factor: 2.5	1.5		**$ 794.66**		**$ 794.66**
			Concrete factor	**0.011**	**$ 2.31**			**$ 2.31**
			Total		**$ 273.24**	**$ 1,324.43**	**$ 4.25**	**$ 1,601.92**
03-17 Reinf Concrete Suspended Slab								
Data Release : Year 2020	**Unit Cost Estimate**							
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
7	033113704650	Structural concrete, placing, slab on grade, pumped, over 150 mm thick, includes leveling (strike off) & consolidation, excludes material			$ -	$ 242.76	$ 29.75	$ 272.51
7	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			$ 141.47	$ 1,155.21	$ -	$ 1,296.68

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. 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
					$ 7,990.18	**$ 3,101.94**	**$ 29.75**	**$ 11,121.87**
			Labor factor: 2.5	1.5		**$ 4,652.91**		**$ 4,652.91**
			Concrete factor	**0.011**	**$ 53.21**			**$ 53.21**
03-18 Slab on Grade			Total		**$ 8,043.39**	**$ 7,754.85**	**$ 29.75**	**$ 15,827.99**
Data Release : 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
13	031113651100	C.I.P. concrete forms, slab on grade, bulkhead with keyway, wood, 150 mm high, 4 uses, includes erecting, 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, bracing, stripping and cleaning			$ 262.73	$ 2,145.39	$ -	$ 2,408.12
25	033113704650	Structural concrete, placing, slab on grade, pumped, over 150 mm thick, includes leveling (strike off) & consolidation, excludes material			$ -	$ 867.00	$ 106.25	$ 973.25
18.84	032111600400	Reinforcing steel, in place, elevated slabs, #13 to #22, A615M, grade 400, incl labor for accessories, excl material for accessories			$ 35,464.04	$ 20,064.22	$ -	$ 55,528.26
					$ 41,892.88	**$ 23,731.83**	**$ 106.25**	**$ 65,730.96**
			EMWR adjustment					
			EMWR Concrere	**12.1**		**$ 10,490.70**		**$ 10,490.70**
			EMWR Forms	**8.065789474**		**$ 17,304.26**		**$ 17,304.26**
			EMWR Rebar	**1.351827676**		**$ 27,123.37**		**$ 27,123.37**
			Subotal			**$ 78,650.16**		**$ 120,649.29**
			Productivity adjustment					
			labor factor	**1.5**		**$ 117,975.24**		**$ 117,975.24**
			Concrete strength adjustment					
			Concrete factor	**0.011**	**$ 57.83**			**$ 57.83**
			Total		**$ 41,950.71**	**$ 196,625.40**	**$ 106.25**	**$ 238,682.37**
03-19 Wall Below Grade								
Data Release : Year 2020		**Unit Cost Estimate**						
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
25	033113704650	Structural concrete, placing, slab on grade, pumped, over 150 mm thick, includes leveling (strike off) & consolidation, excludes material			$ -	$ 867.00	$ 106.25	$ 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

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour 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
24	031513500050	Waterstop, PVC, ribbed, 6 mm thick x 150 mm wide			$ 310.32	$ 355.44	$ -	$ 665.76
25	030513800050	Waterproofing and dampproofing, integral waterproofing, add to cost of regular concrete			$ 953.00	$ -	$ -	$ 953.00
					$ 10,468.53	**$ 16,143.40**	**$ 106.25**	**$ 26,718.18**
			EMWR adjustment					
			EMWR Concrere	**12.1**		**$ 10,490.70**		**$ 10,490.70**
			EMWR Forms	**8.065789474**		**$ 117,343.04**		**$ 117,343.04**
			EMWR Rebar	**1.351827676**		**$ -**		**$ -**
			Subotal			**$ 143,977.14**		**$ 154,551.92**
			Productivity adjustment					
			labor factor	**1.5**		**$ 215,965.71**		**$ 215,965.71**
			Concrete strength adjustment					
			Concrete factor	**0.011**	**$ 57.83**			**$ 57.83**
			Total		**$ 10,526.36**	**$ 359,942.85**	**$ 106.25**	**$ 370,575.47**
03-20 Reinf Concrete Composite Slab								
Data Release : Year 2020	**Unit Cost Estimate**							
26	033113350400	Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments			$ 5,467.80	$ -	$ -	$ 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	$ -	$ 2,408.12
26	030513800050	Waterproofing and dampproofing, integral waterproofing, add to cost of regular concrete			$ 991.12	$ -	$ -	$ 991.12
13	030513800050	Waterproofing and dampproofing, integral waterproofing, add to cost of regular concrete			$ 495.56	$ -	$ -	$ 495.56
					$ 7,217.21	**$ 3,047.07**	**$ 110.50**	**$ 10,374.78**
			EMWR adjustment					
			EMWR Concrere	**12.1**		**$ 10,910.33**		**$ 10,910.33**
			EMWR Forms	**8.065789474**		**$ 17,304.26**		**$ 17,304.26**
			EMWR Rebar	**1.351827676**		**$ -**		**$ -**
			Subotal			**$ 31,261.66**		**$ 38,589.37**
			Productivity adjustment					
			labor factor	**1.5**		**$ 46,892.49**		**$ 46,892.49**
			Concrete strength adjustment					
			Concrete factor	**0.011**	**$ 60.15**			**$ 60.15**
			Total		**$ 7,277.36**	**$ 78,154.16**	**$ 110.50**	**$ 85,542.01**
03-21 Low Strength Concrete Fill								
Data Release : 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
					$ 15,083.60	**$ 7,646.80**	**$ 970.90**	**$ 23,701.30**
			Labor factor: 2.5	1.5		**$ 11,470.20**		**$ 11,470.20**
			Concrete factor	**0.011**	**$ 165.92**			**$ 165.92**

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
03-22 Strip Footing			Total		**$ 15,249.52**	**$ 19,117.00**	**$ 970.90**	**$ 35,337.42**
Data Release : Year 2020		**Unit Cost Estimate**						
4	033113350400	Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments			$ 841.20	$ -	$ -	$ 841.20
4	033113704650	Structural concrete, placing, slab on grade, pumped, over 150 mm thick, includes leveling (strike off) & consolidation, excludes material			$ -	$ 138.72	$ 17.00	$ 155.72
9	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			$ 181.89	$ 1,485.27	$ -	$ 1,667.16
0.34	032111600400	Reinforcing steel, in place, elevated slabs, #13 to #22, A615M, grade 400, incl labor for accessories, excl material for accessories			$ 640.01	$ 362.09	$ -	$ 1,002.10
11	031113651100	C.I.P. concrete forms, slab on grade, bulkhead with keyway, wood, 150 mm high, 4 uses, includes erecting, bracing, stripping and cleaning			$ 18.15	$ 253.66	$ -	$ 271.81
					$ 1,681.25	**$ 2,239.74**	**$ 17.00**	**$ 3,937.99**
			EMWR adjustment					
			EMWR Concrere	**8.8**		**$ 1,220.74**		**$ 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**
			Productivity adjustment					
			labor factor	**1.5**		**$ 18,335.11**		**$ 18,335.11**
			Concrete strength adjustment					
			Concrete factor	**0.011**	**$ 9.25**			**$ 9.25**
			Total		**$ 1,690.50**	**$ 30,558.52**	**$ 17.00**	**$ 32,266.02**
03-23 Foundation Wall								
Data Release : Year 2020		**Unit Cost Estimate**						
3	033113350400	Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments			$ 630.90	$ -	$ -	$ 630.90
3	033113704650	Structural concrete, placing, slab on grade, pumped, over 150 mm thick, includes leveling (strike off) & consolidation, excludes material			$ -	$ 104.04	$ 12.75	$ 116.79
17	031113852700	C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 1 use, includes erecting, bracing, stripping and cleaning			$ 765.85	$ 2,979.76	$ -	$ 3,745.61
1	032111600750	Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for accessories			$ 1,882.38	$ 779.25	$ -	$ 2,661.63
3	030513800050	Waterproofing and dampproofing, integral waterproofing, add to cost of regular concrete			$ 114.36	$ -	$ -	$ 114.36
					$ 3,393.49	**$ 3,863.05**	**$ 12.75**	**$ 7,269.29**
			EMWR adjustment					
			EMWR Concrere	**8.8**		**$ 915.55**		**$ 915.55**
			EMWR Forms	**5.710526316**		**$ 17,016.00**		**$ 17,016.00**
			EMWR Rebar	**0.776762402**		**$ 605.29**		**$ 605.29**
			Subotal			**$ 22,399.89**		**$ 25,806.13**
			Productivity adjustment					

Quantity	Line Number	Description			Ext. 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 adjustment					
			Concrete factor	0.011	$ 6.94			$ 6.94
			Total		$ 3,400.43	$ 55,999.73	$ 12.75	$ 59,412.91
03-24 Reinf Concrete Slab								
Data Release : Year 2020	**Unit Cost Estimate**							
8	033113350400	Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments			$ 1,682.40	$ -	$ -	$ 1,682.40
8	033113704650	Structural concrete, placing, slab on grade, pumped, over 150 mm thick, includes leveling (strike off) & consolidation, excludes material			$ -	$ 277.44	$ 34.00	$ 311.44
1.91	032111600750	Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for accessories			$ 3,595.35	$ 1,488.37	$ -	$ 5,083.71
					$ 5,277.75	$ 1,765.81	$ 34.00	$ 7,077.55
			EMWR adjustment					
			EMWR Concrere	8.8		$ 2,441.47		$ 2,441.47
			EMWR Forms	5.710526316		$ -		$ -
			EMWR Rebar	0.776762402		$ 1,156.11		$ 1,156.11
			Subotal			$ 5,363.39		$ 10,675.13
			Productivity adjustment					
			labor factor	1.5		$ 8,045.09		$ 8,045.09
			Concrete strength adjustment					
			Concrete factor	0.011	$ 18.51			$ 18.51
			Total		$ 5,296.26	$ 13,408.48	$ 34.00	$ 18,738.73
03-25 Stub Column								
Data Release : Year 2020	**Unit Cost Estimate**							
4	031113256500	C.I.P. concrete forms, column, square, plywood, 610 mm x 610 mm, 1 use, includes erecting, bracing, stripping and cleaning			$ 193.04	$ 561.72	$ -	$ 754.76
1	033113704650	Structural concrete, placing, slab on grade, pumped, over 150 mm thick, includes leveling (strike off) & consolidation, excludes material			$ -	$ 34.68	$ 4.25	$ 38.93
1	033113350400	Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments			$ 210.30	$ -	$ -	$ 210.30
0.3	032111600750	Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for accessories			$ 564.71	$ 233.78	$ -	$ 798.49
					$ 968.05	$ 830.18	$ 4.25	$ 1,802.48
			EMWR adjustment					
			EMWR Concrere	8.8		$ 305.18		$ 305.18
			EMWR Forms	5.710526316		$ 3,207.72		$ 3,207.72
			EMWR Rebar	0.776762402		$ 181.59		$ 181.59
			Subotal			$ 4,524.67		$ 5,496.97
			Productivity adjustment					
			labor factor	1.5		$ 6,787.01		$ 6,787.01
			Concrete strength adjustment					
			Concrete factor	0.011	$ 2.31			$ 2.31
			Total		$ 970.36	$ 11,311.68	$ 4.25	$ 12,286.29
03-26 Reinf Concrete Partition Wall								
Data Release : Year 2020	**Unit Cost Estimate**							
4	033113350400	Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments			$ 841.20	$ -	$ -	$ 841.20

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
4	033113704650	Structural concrete, placing, slab on grade, pumped, over 150 mm thick, includes leveling (strike off) & consolidation, excludes material			$ -	$ 138.72	$ 17.00	$ 155.72
29	031113852700	C.I.P. concrete forms, wall, job built, plywood, over 4.88 m high, 1 use, includes erecting, bracing, stripping and cleaning			$ 1,306.45	$ 5,083.12	$ -	$ 6,389.57
0.7	032111600750	Reinforcing steel, in place, walls, #25 to #57, A615M, grade 400, incl labor for accessories, excl material for 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 adjustment					
			Concrete factor	**0.011**	**$ 9.25**			**$ 9.25**
			Total		**$ 3,474.57**	**$ 91,097.64**	**$ 17.00**	**$ 94,589.20**
03-27 Reinf Concrete Slab								
Data Release : Year 2020		**Unit Cost Estimate**						
6	033113350400	Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments			$ 1,261.80	$ -	$ -	$ 1,261.80
6	033113704650	Structural concrete, placing, slab on grade, pumped, over 150 mm thick, includes leveling (strike off) & consolidation, excludes material			$ -	$ 208.08	$ 25.50	$ 233.58
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	$ 495.09	$ -	$ 555.72
35	032111600400	Reinforcing steel, in place, elevated slabs, #13 to #22, A615M, grade 400, incl labor for accessories, excl material for accessories			$ 65,883.30	$ 37,274.30	$ -	$ 103,157.60
41	032211100700	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 accessories			$ 404.26	$ 249.28	$ -	$ 653.54
					$ 67,609.99	**$ 38,226.75**	**$ 25.50**	**$ 105,862.24**
			Labor factor: 2.5	1.5		**$ 57,340.13**		**$ 57,340.13**
			Concrete factor	**0.011**	**$ 13.88**			**$ 13.88**
03-28 Reinf Concrete Slab			Total		**$ 67,623.87**	**$ 95,566.88**	**$ 25.50**	**$ 163,216.24**
Data Release : Year 2020		**Unit Cost Estimate**						
9	033113350400	Structural concrete, ready mix, heavyweight, 34 MPa, includes local aggregate, sand, Portland cement (Type I) and water, delivered, excludes all additives and treatments			$ 1,892.70	$ -	$ -	$ 1,892.70
9	033113704650	Structural concrete, placing, slab on grade, pumped, over 150 mm thick, includes leveling (strike off) & consolidation, excludes material			$ -	$ 312.12	$ 38.25	$ 350.37

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
5	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			$ 101.05	$ 825.15	$ -	$ 926.20
1	032111600400	Reinforcing steel, in place, elevated slabs, #13 to #22, A615M, grade 400, incl labor for accessories, excl material for accessories			$ 1,882.38	$ 1,064.98	$ -	$ 2,947.36
69	032211100700	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 accessories			$ 680.34	$ 419.52	$ -	$ 1,099.86
					$ 4,556.47	**$ 2,621.77**	**$ 38.25**	**$ 7,216.49**
			Labor factor: 2.5	1.5		**$ 3,932.66**		**$ 3,932.66**
			Concrete factor	**0.011**	**$ 20.82**			**$ 20.82**
03-29 Precast Wall Panel			Total		**$ 4,577.29**	**$ 6,554.43**	**$ 38.25**	**$ 11,169.96**
Data Release : Year 2020		**Unit Cost Estimate**						
984	034513500750	Precast wall panel, smooth, gray, uninsulated, high rise, 3.05 m x 6.10 m 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 Precast Wall Panel			Total		**$ 619,258.04**	**$ 137,120.40**	**$ 22,199.04**	**$ 778,577.48**
Data Release : Year 2020		**Unit Cost Estimate**						
1165	034513500750	Precast wall panel, smooth, gray, uninsulated, high rise, 3.05 m x 6.10 m 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**			**$ 7,977.08**
03-31 Precast Wall Panel			Total		**$ 733,166.28**	**$ 162,342.75**	**$ 26,282.40**	**$ 921,791.43**
Data Release : Year 2020		**Unit Cost Estimate**						
61	034513500750	Precast wall panel, smooth, gray, uninsulated, high rise, 3.05 m x 6.10 m 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		**$ 38,388.96**	**$ 8,500.35**	**$ 1,376.16**	**$ 48,265.47**
03-32 Precast Panel Wall								
Data Release : Year 2020		**Unit Cost Estimate**						
151	034513500750	Precast wall panel, smooth, gray, uninsulated, high rise, 3.05 m x 6.10 m x 150 mm thick, 21 mPa			$ 93,994.48	$ 8,416.74	$ 3,406.56	$ 105,817.78
					$ 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
			Rework	0.05	$ 273,254.78	$ 1,586,443.58	$ 3,877.86	$ 1,863,576.21
			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 Masonry								
Data Release : 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	$ -	$ 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
249	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			$ 80,989.74	$ 34,501.44	$ -	$ 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

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
103	040523130020	Control joint, rubber, for double wythe 200 mm minimum wall (Brick/CMU)			$ 2,274.24	$ 554.14	$ -	$ 1,691.26
257	031516302800	Expansion joint, polyethylene foam, 25 mm X 300 mm			$ 7,406.74	$ 1,845.26	$ -	$ 5,548.63
19	078413100860	Firestopping, construction joints, concrete/CMU wall joints, 100mm wide			$ 6,738.16	$ 983.06	$ -	$ 4,352.14
3	040519162800	Masonry anchors, column flange wall ties, wire, mill galvanized, 6 mm diameter, up to 175 mm wide			$ 1,227.60	$ 188.10	$ -	$ 801.90
41	040519161440	Masonry anchors, mesh wall ties, hot dip galvanized, 13 mm, 16 gauge, 300 mm long x 300 mm wide			$ 23,894.80	$ 3,191.85	$ -	$ 15,139.25
59	040519162800	Masonry anchors, column flange wall ties, wire, mill galvanized, 6 mm diameter, up to 175 mm wide			$ 24,142.80	$ 3,699.30	$ -	$ 15,770.70
33	040519161440	Masonry anchors, mesh wall ties, hot dip galvanized, 13 mm, 16 gauge, 300 mm long x 300 mm wide			$ 19,232.40	$ 2,569.05	$ -	$ 12,185.25
2	040519162800	Masonry anchors, column flange wall ties, wire, mill galvanized, 6 mm diameter, up to 175 mm wide			$ 818.40	$ 125.40	$ -	$ 534.60
3	040519161440	Masonry anchors, mesh wall ties, hot dip galvanized, 13 mm, 16 gauge, 300 mm long x 300 mm wide			$ 1,748.40	$ 233.55	$ -	$ 1,107.75
20	040519162800	Masonry anchors, column flange wall ties, wire, mill galvanized, 6 mm diameter, up to 175 mm wide			$ 8,184.00	$ 1,254.00	$ -	$ 5,346.00
6	040519161440	Masonry anchors, mesh wall ties, hot dip galvanized, 13 mm, 16 gauge, 300 mm long x 300 mm wide			$ 3,496.80	$ 467.10	$ -	$ 2,215.50
36	040519162800	Masonry anchors, column flange wall ties, wire, mill galvanized, 6 mm diameter, up to 175 mm wide			$ 14,731.20	$ 2,257.20	$ -	$ 9,622.80
75	040519161440	Masonry anchors, mesh wall ties, hot dip galvanized, 13 mm, 16 gauge, 300 mm long x 300 mm wide			$ 43,710.00	$ 5,838.75	$ -	$ 27,693.75
					$ 839,675.76	**$ 313,767.08**	**$ -**	**$ 733,604.96**
					$ 839,675.76	$ 313,767.08	$ -	$ 733,604.96
			Labor factor: 2.5	1.5		$ 470,650.62		$ 470,650.62
			Total		**$839,675.76**	**$ 784,417.70**		**$1,624,093.46**

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
05_01 Metals -- First Floor								
Data Release : Year 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
193	051223752100	Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W360x44, A992 steel, shop fabricated, incl shop primer, bolted connections			$ 37,293.39	$ 3,856.14	$ 1,542.07	$ 42,691.60
179	051223754500	Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W530x92, A992 steel, shop fabricated, incl shop primer, bolted connections			$ 71,805.85	$ 4,446.36	$ 1,346.08	$ 77,598.29
8	051223754500	Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W530x92, A992 steel, shop fabricated, incl shop primer, bolted connections			$ 3,209.20	$ 198.72	$ 60.16	$ 3,468.08
160	051223755300	Structural steel beam or girder, 90 metric ton project, 1 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
9	051223756100	Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W760x147, A992 steel, shop fabricated, incl shop primer, bolted connections			$ 5,746.05	$ 194.22	$ 58.68	$ 5,998.95
6	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			$ 7,458.00	$ 139.08	$ 41.94	$ 7,639.02
16	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			$ 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	$ 785.85	$ 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, incl shop primer, bolted connections			$ 2,995.22	$ 924.11	$ 371.69	$ 4,291.02
					$ 388,476.45	**$ 27,981.21**	**$ 9,906.06**	**$ 426,363.72**
05-02 Metals -- Second Floor								
Data Release : Year 2020		**Unit Cost Estimate**						
3	051223400400	Angle framing, structural steel, 100 mm and larger, field fabricated, incl cutting & welding			$ 6.87	$ 36.27	$ 2.85	$ 45.99
1254	051223400400	Angle framing, structural steel, 100 mm and larger, field fabricated, incl cutting & welding			$ 2,871.66	$ 15,160.86	$ 1,191.30	$ 19,223.82
3945	051223400400	Angle framing, structural steel, 100 mm and larger, field fabricated, incl cutting & welding			$ 9,034.05	$ 47,695.05	$ 3,747.75	$ 60,476.85
5	051223751500	Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W310x39, A992 steel, shop fabricated, incl shop primer, bolted connections			$ 836.20	$ 102.10	$ 40.85	$ 979.15
63	051223751580	Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W310x86, A992 steel, shop fabricated, incl shop primer, bolted connections			$ 23,492.70	$ 1,495.62	$ 603.54	$ 25,591.86
264	051223751700	Structural steel beam or girder, 90 metric ton project, 1 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	Column base plates, structural, heavy, 90 metric ton 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. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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								
Data Release : 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			$ 9,983.55	$ 872.65	$ 265.98	$ 11,122.18
24	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			$ 8,542.80	$ 556.32	$ 169.20	$ 9,268.32
75	051223755300	Structural steel beam or girder, 90 metric ton project, 1 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, bolted connections			$ 9,763.20	$ 427.32	$ 130.14	$ 10,320.66
42	051223755720	Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W610x140, A992 steel, shop fabricated, incl shop primer, bolted connections			$ 25,391.10	$ 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			$ 7,548.40	$ 198.72	$ 59.68	$ 7,806.80
10	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			$ 9,435.50	$ 248.40	$ 74.60	$ 9,758.50
165	051223755800	Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W690x125, A992 steel, shop fabricated, incl shop primer, bolted connections			$ 89,496.00	$ 3,588.75	$ 1,085.70	$ 94,170.45
28	051223755920	Structural steel beam or girder, 90 metric ton project, 1 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
10	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			$ 10,396.00	$ 226.30	$ 68.20	$ 10,690.50
10	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			$ 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								
Data Release : 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	Ext. Total O&P
39	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			$ 12,559.95	$ 925.86	$ 373.62	$ 13,859.43
27	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			$ 5,918.94	$ 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
48	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			$ 15,458.40	$ 1,351.20	$ 411.84	$ 17,221.44
101	051223755300	Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W610x101, A992 steel, shop fabricated, incl shop primer, bolted connections			$ 44,510.70	$ 2,341.18	$ 712.05	$ 47,563.93
27	051223755700	Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W610x125, A992 steel, shop fabricated, incl shop primer, bolted connections			$ 14,644.80	$ 640.98	$ 195.21	$ 15,480.99
17	051223755720	Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W610x140, A992 steel, shop fabricated, incl shop primer, bolted connections			$ 10,277.35	$ 403.58	$ 122.91	$ 10,803.84
1765	051223400600	Channel framing, structural steel, 200 mm and larger, 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 : Year 2020		**Unit Cost Estimate**						
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
44	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			$ 29,583.40	$ 1,092.96	$ 328.24	$ 31,004.60
19	051223755760	Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W610x174, A992 steel, shop fabricated, incl shop primer, bolted connections			$ 14,277.55	$ 471.96	$ 141.74	$ 14,891.25
					$ 129,644.90	**$ 7,151.30**	**$ 2,169.03**	**$ 138,965.23**
05-06 Platf+A5:B11orms								
Data Release : Year 2020		**Unit Cost Estimate**						
175	051223400400	Angle framing, structural steel, 100 mm and larger, field fabricated, incl cutting & welding			$ 400.75	$ 2,115.75	$ 166.25	$ 2,682.75
53	051223400450	Angle framing, structural steel, less than 100 mm, field fabricated, incl cutting & welding			$ 125.08	$ 1,067.95	$ 84.27	$ 1,277.30
42	051223751500	Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W310x39, A992 steel, shop fabricated, incl shop primer, bolted connections			$ 7,024.08	$ 857.64	$ 343.14	$ 8,224.86
5	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			$ 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
					$ 10,838.21	**$ 4,244.49**	**$ 675.22**	**$ 15,757.92**
05-07 Mezzanine								
Data Release : 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
11	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			$ 1,553.75	$ 224.62	$ 89.87	$ 1,868.24
11	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			$ 3,542.55	$ 261.14	$ 105.38	$ 3,909.07
21	051223751900	Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W360x39, A992 steel, shop 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			$ 11,746.35	$ 764.94	$ 232.65	$ 12,743.94
10	051223755500	Structural steel beam or girder, 90 metric ton project, 1 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
					$ 27,510.87	**$ 13,782.89**	**$ 1,587.84**	**$ 42,881.60**
05-08 Stairs								
Data Release : 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
30	051223751900	Structural steel beam or girder, 90 metric ton project, 1 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								
Data Release : 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	Structural steel beam or girder, 90 metric ton project, 1 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								
Data Release : 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			$ 2,941.39	$ 315.78	$ 126.16	$ 3,383.33
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			$ 2,941.39	$ 315.78	$ 126.16	$ 3,383.33
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
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								
Data Release : Year 2020		**Unit Cost Estimate**						
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			$ 2,047.26	$ 10,808.46	$ 849.30	$ 13,705.02
10	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			$ 1,288.20	$ 298.10	$ 119.90	$ 1,706.20
213	051223750320	Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W200x22, A992 steel, shop fabricated, incl shop primer, bolted connections			$ 20,580.06	$ 6,349.53	$ 2,553.87	$ 29,483.46
					$ 24,249.86	**$ 19,221.23**	**$ 3,661.77**	**$ 47,132.86**
05-12 Metals - Column								
Data Release : 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 : Year 2020		**Unit Cost Estimate**						

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total 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			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
05-14 - Metals - Monorail								
Data Release : 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
					$ 6,024.03	**$ 944.53**	**$ 378.16**	**$ 7,346.72**
05-15 Metals Vent STack								
Data Release : Year 2020		**Unit Cost Estimate**						
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	051223400672	Channel framing, structural steel, field fabricated, C200x17, incl cutting & welding			$ 284.76	$ 1,545.60	$ 121.31	$ 1,951.67
3	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			$ 386.46	$ 89.43	$ 35.97	$ 511.86
7	051223752100	Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W360x44, A992 steel, shop fabricated, incl shop primer, bolted connections			$ 1,352.61	$ 139.86	$ 55.93	$ 1,548.40
6	051223753520	Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W460x68, A992 steel, shop fabricated, incl shop primer, bolted connections			$ 1,776.36	$ 162.30	$ 48.66	$ 1,987.32
					$ 3,955.91	**$ 2,759.31**	**$ 326.47**	**$ 7,041.69**
05-16 Metals - Framing								
Data Release : 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			$ 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
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
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
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					**$ 50,313.25**	**$ 1,614.60**	**$ 649.35**	**$ 52,577.20**
05-17 - Base Plate								
Data Release : 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
198	051223774400	Column base plates, structural, heavy, 90 metric ton project, over 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 896.94	$ 318.78	$ 128.70	$ 1,344.42
					$ 3,325.02	**$ 1,181.74**	**$ 477.10**	**$ 4,983.86**
05-18 - Column - grd and Upper Levels								
Data Release : 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
30	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			$ 16,780.50	$ 844.50	$ 336.60	$ 17,961.60

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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 Plate								
Data Release : 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	Ext. Total O&P
05-20 Metal Decking								
Data Release : 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
					$ 83,236.35	**$ 11,046.40**	**$ 647.25**	**$ 94,930.00**
05-21 Metal Decking 2nd Floor								
Data Release : Year 2020		**Unit Cost 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
					$ 75,849.70	**$ 8,732.87**	**$ 520.97**	**$ 85,103.54**
05-22 Metal Decking Roof								
Data Release : 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 Chase								
Data Release : Year 2020		**Unit Cost Estimate**						
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 Platforms at Elevation								
Data Release : 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			$ 4,000.00	$ 741.76	$ 50.80	$ 4,792.56
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
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
22	055216500020	Railing, industrial, welded, 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
3	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	$ 363.09	$ 9,682.53
					$ 20,615.00	**$ 5,775.30**	**$ 1,616.40**	**$ 28,006.70**
05-29 to 33 Platforms at Elevation								
Data Release : Year 2020		**Unit Cost Estimate**						
189	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			$ 29,673.00	$ 23,904.72	$ 11,103.75	$ 64,681.47
9	055119500020	Stair, shop fabricated, steel, 1050 mm W, incl pipe railing, stringers, grating treads w/ safety nosing, per riser			$ 3,870.00	$ 714.69	$ 48.87	$ 4,633.56

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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 Platforms at Elevation								
Data Release : Year 2020		**Unit Cost 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
22	024113660200	Selective demolition, miscellaneous metal fences & 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 Platforms - Beams and Brace								
Data Release : Year 2020		**Unit Cost Estimate**						
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	Ext. Total O&P
05-41 to 44 Platform supports								
Data Release : 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	Column base plates, structural, heavy, 90 metric ton 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								
Data Release : 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								
Data Release : Year 2020		**Unit Cost Estimate**						
128	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			$ 16,256.00	$ 4,016.64	$ -	$ 20,272.64
46	051223400672	Channel framing, structural steel, field fabricated, C200x17, incl cutting & welding			$ 1,871.28	$ 10,156.80	$ 797.18	$ 12,825.26
29	051223400672	Channel framing, structural steel, field fabricated, C200x17, incl cutting & welding			$ 1,179.72	$ 6,403.20	$ 502.57	$ 8,085.49
34	051223400672	Channel framing, structural steel, field fabricated, C200x17, incl cutting & welding			$ 1,383.12	$ 7,507.20	$ 589.22	$ 9,479.54
73	051223400672	Channel framing, structural steel, field fabricated, C200x17, incl cutting & welding			$ 2,969.64	$ 16,118.40	$ 1,265.09	$ 20,353.13
44	055313700424	Floor grating, steel, painted, 31x5 mm bearing bars @ 30 mm OC, cross bars @ 100 mm OC, over 28 m2, field fabricated from panels			$ 6,292.00	$ 3,724.16	$ 1,731.84	$ 11,748.00
34	051223400476	Angle framing, structural steel, 76x76x9.5 mm, field fabricated, incl cutting & welding			$ 864.62	$ 4,729.40	$ 371.62	$ 5,965.64
46	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			$ 24,610.00	$ 3,499.68	$ 238.74	$ 28,348.42
					$ 55,426.38	**$ 56,155.48**	**$ 5,496.26**	**$ 117,078.12**
05-47 Sump pit								
Data Release : 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 Loading Dock Extension								
Data Release : Year 2020		**Unit Cost Estimate**						
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

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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	$ 25,520.96
25	051223751500	Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W310x39, A992 steel, shop fabricated, incl shop primer, bolted connections			$ 4,181.00	$ 510.50	$ 204.25	$ 4,895.75
3	051223751900	Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W360x39, A992 steel, shop fabricated, incl shop primer, bolted connections			$ 501.72	$ 54.33	$ 21.87	$ 577.92
22	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			$ 4,822.84	$ 485.76	$ 195.14	$ 5,503.74
2	051223754500	Structural steel beam or girder, 90 metric ton project, 1 to 2 story building, W530x92, A992 steel, shop fabricated, incl shop primer, bolted connections			$ 802.30	$ 49.68	$ 15.04	$ 867.02
					$ 21,482.58	**$ 52,413.53**	**$ 4,439.28**	**$ 78,335.39**
05-49 Columns								
Data Release : 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 : 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
36	051223774400	Column base plates, structural, heavy, 90 metric ton project, over 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 163.08	$ 57.96	$ 23.40	$ 244.44
					$ 294.45	**$ 104.65**	**$ 42.25**	**$ 441.35**
05-51 to 53 Loading Dock Extension								
Data Release : 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 Condensate Platform								
Data Release : 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
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
3.9	051223650300	Steel plate, structural, for connections & stiffeners, 9 mm T, shop fabricated, incl shop primer			$ 1,145.82	$ 726.00	$ -	$ 1,871.82
4.32	051223650300	Steel plate, structural, for connections & stiffeners, 9 mm T, shop fabricated, incl shop primer			$ 1,269.22	$ 653.40	$ -	$ 1,922.62
1.14	051223650400	Steel plate, structural, for connections & stiffeners, 13 mm T, shop fabricated, incl shop primer			$ 444.43	$ 145.20	$ -	$ 589.63
3.3	051223650400	Steel plate, structural, for connections & stiffeners, 13 mm T, shop fabricated, incl shop primer			$ 1,286.51	$ 363.00	$ -	$ 1,649.51
0.75	051223650400	Steel plate, structural, for connections & stiffeners, 13 mm T, shop fabricated, incl shop primer			$ 292.39	$ 72.60	$ -	$ 364.99
7.56	051223650450	Steel plate, structural, for connections & stiffeners, 19 mm T, shop fabricated, incl shop primer			$ 4,442.26	$ 653.40	$ -	$ 5,095.66
2.79	051223650450	Steel plate, structural, for connections & stiffeners, 19 mm T, shop fabricated, incl shop primer			$ 1,639.40	$ 217.80	$ -	$ 1,857.20
9.18	051223650450	Steel plate, structural, for connections & stiffeners, 19 mm T, shop fabricated, incl shop primer			$ 5,394.17	$ 653.40	$ -	$ 6,047.57
6.66	051223650450	Steel plate, structural, for connections & stiffeners, 19 mm T, shop fabricated, incl shop primer			$ 3,913.42	$ 435.60	$ -	$ 4,349.02

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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 Condensate Platform								
Data Release : 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
29767	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 129,188.78	$ 52,687.59	$ -	$ 181,876.37
26540	051223774300	Column base plates, structural, light, 90 metric ton 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	Column base plates, structural, light, 90 metric ton 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
14718	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 63,876.12	$ 26,050.86	$ -	$ 89,926.98
166169	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 721,173.46	$ 294,119.13	$ -	$ 1,015,292.59
67895	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 294,664.30	$ 120,174.15	$ -	$ 414,838.45
245014	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 1,063,360.76	$ 433,674.78	$ -	$ 1,497,035.54
193439	051223774300	Column base plates, structural, light, 90 metric ton 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 Chase								
Data Release : 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	Angle framing, structural steel, 76x51x9.5 mm, field fabricated, incl cutting & welding			$ 663.68	$ 3,921.28	$ 306.56	$ 4,891.52
16	051223400474	Angle framing, structural steel, 76x51x9.5 mm, field fabricated, incl cutting & welding			$ 331.84	$ 1,960.64	$ 153.28	$ 2,445.76
					$ 2,554.92	**$ 5,881.92**	**$ 459.84**	**$ 8,896.68**
05-58 Base Ring								
Data Release : Year 2020		**Unit Cost Estimate**						
19	052119106400	Individual steel bearing plate, 150 x 150 x 6 mm, with J-hook			$ 272.08	$ 82.46	$ -	$ 354.54
2	052119106400	Individual steel bearing plate, 150 x 150 x 6 mm, with J-hook			$ 28.64	$ 8.68	$ -	$ 37.32
4	052119106400	Individual steel bearing plate, 150 x 150 x 6 mm, with J-hook			$ 57.28	$ 17.36	$ -	$ 74.64
1	052119106400	Individual steel bearing plate, 150 x 150 x 6 mm, with J-hook			$ 14.32	$ 4.34	$ -	$ 18.66
					$ 372.32	**$ 112.84**	**$ -**	**$ 485.16**
05-59 Embedded Plates								
Data Release : 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	Ext. 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	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 1,028.58	$ 419.49	$ -	$ 1,448.07
57	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 247.38	$ 100.89	$ -	$ 348.27
157	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 681.38	$ 277.89	$ -	$ 959.27
237	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 1,028.58	$ 419.49	$ -	$ 1,448.07
130	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 564.20	$ 230.10	$ -	$ 794.30
237	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 1,028.58	$ 419.49	$ -	$ 1,448.07
130	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 564.20	$ 230.10	$ -	$ 794.30
130	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 564.20	$ 230.10	$ -	$ 794.30
19	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 82.46	$ 33.63	$ -	$ 116.09
60	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 260.40	$ 106.20	$ -	$ 366.60
28	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 121.52	$ 49.56	$ -	$ 171.08
318	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 1,380.12	$ 562.86	$ -	$ 1,942.98
5	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 21.70	$ 8.85	$ -	$ 30.55
47	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 203.98	$ 83.19	$ -	$ 287.17
					$ 11,279.66	**$ 4,600.23**	**$ -**	**$ 15,879.89**
05_60-61_Embedment								
Data Release : Year 2020		**Unit Cost Estimate**						
232	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 1,006.88	$ 410.64	$ -	$ 1,417.52
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	$ 44.25	$ -	$ 152.75
47	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 203.98	$ 83.19	$ -	$ 287.17
94	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 407.96	$ 166.38	$ -	$ 574.34
170	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 737.80	$ 300.90	$ -	$ 1,038.70
94	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 407.96	$ 166.38	$ -	$ 574.34
188	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 815.92	$ 332.76	$ -	$ 1,148.68

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. 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	$ 44.25	$ -	$ 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	$ 600.03	$ -	$ 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	$ 104.43	$ -	$ 360.49
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
8	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 34.72	$ 14.16	$ -	$ 48.88
79	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 342.86	$ 139.83	$ -	$ 482.69
141	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 611.94	$ 249.57	$ -	$ 861.51
154	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 668.36	$ 272.58	$ -	$ 940.94
38	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 164.92	$ 67.26	$ -	$ 232.18
170	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 737.80	$ 300.90	$ -	$ 1,038.70
60	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 260.40	$ 106.20	$ -	$ 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	$ 44.25	$ -	$ 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	$ 939.87	$ -	$ 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	$ 42.48	$ -	$ 146.64
88	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 381.92	$ 155.76	$ -	$ 537.68
112	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 486.08	$ 198.24	$ -	$ 684.32
85	051223774300	Column base plates, structural, light, 90 metric ton project, up to 68 kg each, A992 steel, shop fabricated, incl shop primer			$ 368.90	$ 150.45	$ -	$ 519.35
					$ 12,590.34	**$ 5,134.77**	**$ -**	**$ 17,725.11**
					$ 7,240,195.51	$ 2,665,444.44	$ 133,522.55	$ 10,039,162.49
			Labor factor: 2.5	1.5		$ 3,998,166.66		
			Steel factor	0.175	$ 1,267,034.21			
					$ 8,507,229.72			
			05.62 10% allow	10%	$ 850,722.97			
			Total		***$ 9,357,952.70***	***$ 6,663,611.10***	***$ 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 Release : 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
					$ 29,084.72	**$ 34,172.68**	**$ 6,331.96**	**$ 69,589.36**
B_07_02								
Data Release : Year 2020		**Unit Cost Estimate**						
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								
Data Release : 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
					$ 18,104.10	**$ 4,195.80**	**$ -**	**$ 22,299.90**
B_07_04								
Data Release : 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
					$ 383.04	**$ 319.20**	**$ -**	**$ 702.24**
B_07_05								
Data Release : 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
902	072613101200	Vapor retarders, building paper, polyethylene vapor barrier, standard, 0.25mm thick			$ 1,416.14	$ 2,065.58	$ -	$ 3,481.72
902	072216100130	Roof deck insulation, fiberboard high density, 75mm thick, 0.67m2.K/W, fastening excluded			$ 18,021.96	$ 6,999.52	$ -	$ 25,021.48
					$ 58,602.94	**$ 25,418.36**	**$ 487.08**	**$ 84,508.38**
B_07_07								
Data Release : 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 Release : Year 2020		**Unit Cost Estimate**						

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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								
Data Release : 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, ballast, in place, 19mm -40mm			$ -	$ -	$ -	$ -
64	072113101960	Wall insulation, rigid, extruded polystyrene, 172kPa compressive strength, 75mm thick, 2.64m2.K/W			$ 1,728.64	$ 741.12	$ -	$ 2,469.76
64	072613101200	Vapor retarders, building paper, polyethylene vapor barrier, standard, 0.25mm thick			$ 100.48	$ 146.56	$ -	$ 247.04
64	072216100130	Roof deck insulation, fiberboard high density, 75mm thick, 0.67m2.K/W, fastening excluded			$ 1,278.72	$ 496.64	$ -	$ 1,775.36
					$ 4,158.08	**$ 1,803.52**	**$ 34.56**	**$ 5,996.16**
B_07_10 thru B_07_13								
Data Release : 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
					$ 890.09	**$ 143.45**	**$ -**	**$ 1,033.54**
B_07_14								
Data Release : 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 Firestops								
Data Release : 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. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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. 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
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
1	078413100470	Firestopping, ductwork, insulated and non insulated, rectangular, with stiffener/closure angle, through walls, 600mm x 1200mm			$ 125.49	$ 197.12	$ -	$ 322.61

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. 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
					$ 20,482.25	**$ 22,493.35**	**$ -**	**$ 42,975.60**
					$ 569,774.50	**$ 636,573.65**	**$ 77,322.00**	**$1,283,670.15**
			Labor factor: 2.5	1.5		$ 954,860.48		$ 954,860.48
			Total		**$ 569,774.50**	**$ 1,591,434.13**	**$ 77,322.00**	**$2,238,530.63**

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
B_08_01								
Data Release : 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	$ -	$ 511.46
4	087120300020	Door hardware, door closer, rack and pinion, adjustable backcheck, 3 way mount, all sizes, regular arm			$ 778.60	$ 419.32	$ -	$ 1,197.92
6	088165101500	Wire glass, pinstripe, obscure, 6 mm thick			$ 4,173.00	$ 603.12	$ -	$ 4,776.12
					$ 8,741.60	**$ 1,943.94**	**$ -**	**$ 10,685.54**
B_08_02								
Data Release : 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	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 Release : 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
2	088165101500	Wire glass, pinstripe, obscure, 6 mm thick			$ 1,391.00	$ 201.04	$ -	$ 1,592.04
					$ 4,274.12	**$ 1,021.80**	**$ -**	**$ 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 Release : 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
					$ 2,639.20	**$ 740.18**	**$ -**	**$ 3,379.38**
B_08_05								
Data Release : 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								
Data Release : 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
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
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	081313131740	Doors, commercial, steel, insulated, full panel, 1.2 mm, 813 mm x 2134 mm x 44 mm thick			$ 420.69	$ 77.60	$ -	$ 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	Ext. 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	$ -	$ 3,980.10
					$ 11,334.00	**$ 2,679.70**	**$ -**	**$ 14,013.70**
B_08_07								
Data Release : 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**
B_08_08								
Data Release : Year 2020		**Unit Cost Estimate**						
2	081313131530	Doors, hollow metal, commercial, steel, flush, full panel, hollow core, 1-3/4" thick, 16 ga., 2'-8" x 6'-8"			$ 962.66	$ 124.16	$ -	$ 1,086.82
					$ 962.66	**$ 124.16**	**$ -**	**$ 1,086.82**
B_08_09								
Data Release : 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	088165101000	Wire glass, polished wire, diamond, clear, 6 mm thick			$ 417.30	$ 100.52	$ -	$ 517.82
					$ 1,065.39	**$ 255.72**	**$ -**	**$ 1,321.11**
B_08_10								
Data Release : 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			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
B_08_11								
Data Release : 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 Release : 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			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
B_08_13								
Data Release : 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 Release : 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 Release : 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
					$ 648.09	**$ 155.20**	**$ -**	**$ 803.29**
B_08_16								
Data Release : 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		$ 24,760.91		$ 24,760.91
					$ 57,295.60	**$ 41,268.18**		**$ 98,563.78**

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
09_04 Wall Finish								
Data Release : 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
					$ 22,548.48	**$ 90,992.64**	**$ -**	**$ 113,541.12**
09_05_thru_07 Loading dock extension								
Data Release : 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		$ 137,308.50		$ 137,308.50
			Total		**$ 22,932.60**	**$ 228,847.50**		**$ 251,780.10**

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
31-Earthwork								
Data Release : 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, hydraulic backhoe			$ -	$ 5,480.64	$ 3,755.52	$ 9,236.16
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
55	312316462220	Excavating, bulk, dozer, open site, bank measure, common earth, 60 kW dozer, 45 m haul			$ -	$ 361.90	$ 187.00	$ 548.90
45	312323142220	Backfill, structural, common earth, 60 kW dozer, 45 m haul, from existing 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
223	313313102065	Rock bolts, hollow core, prestressable, ASTM A615, 50 mm diameter, 3 m long			$ 278,415.50	$ 13,342.09	$ -	$ 291,757.59
3	313313102065	Rock bolts, hollow core, prestressable, ASTM A615, 50 mm diameter, 3 m long			$ 3,745.50	$ 179.49	$ -	$ 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
8478	312316430200	Excavating, large volume projects,152,905 Bm3, 6.12 m3 bucket, loader, 110% fill factor, unrestricted operation			$ -	$ 2,119.50	$ 6,188.94	$ 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**
			Labor factor: 2.5	1.5		$ 89,769.45		$ 89,769.45
			Total		**$ 303,843.19**	**$ 149,615.75**	**$ 34,430.40**	**$ 487,889.34**

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
32 Site Improvements								
Data Release : 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	$ 724.19	$ -	$ 2,004.20
2	321713138900	Security bollards, SS, lighted, group of 3, 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
2	323113800110	Chain link fence, gates, residential, single, 1.2m, includes concrete, hinges, latch and post hardware			$ 415.96	$ 330.86	$ 64.62	$ 811.44
1	321713138900	Security bollards, SS, lighted, group of 3, 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
25	033053404535	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 finishing			$ 39,972.50	$ 47,612.00	$ 392.25	$ 87,976.75
23	033053404535	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 finishing			$ 36,774.70	$ 43,803.04	$ 360.87	$ 80,938.61
111	321216130480	Plant-mix asphalt paving, for highways and large paved areas, wearing course, 100 mm thick, no hauling included			$ 3,028.08	$ 268.62	$ 120.99	$ 3,417.69
3	033053403580	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), placing and finishing			$ 1,414.62	$ 1,586.13	$ 13.11	$ 3,013.86
1082	329223101000	Sodding, bent grass sod, on level ground, over 557 m2			$ 3,451.58	$ 1,568.90	$ 140.66	$ 5,161.14
25	107316207500	Walkway cover, steel, vinyl finish, flat, to 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**
					$ 8,521.50	**$ 312,271.97**	**$ 2,302.93**	**$ 711,105.82**
			Labor factor: 2.5	1.5		$ 468,407.96		$ 468,407.96
			Total		**$ 8,521.50**	**$ 780,679.93**	**$ 2,302.93**	**$ 791,504.36**

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
33_01 Underground inactive drainage line								
Data Release : 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	$ -	$ 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
1	221113470630	Gasket and bolt set, for flanges, 1034 kPa, 50 mm 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
6	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			$ 574.20	$ 343.68	$ -	$ 917.88
1	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			$ 160.52	$ 84.11	$ -	$ 244.63
13	221113470630	Gasket and bolt set, for flanges, 1034 kPa, 50 mm pipe size			$ 131.04	$ 798.20	$ -	$ 929.24
			Q2 welder and QA	0.67		$ 119.03		$ 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**		**$ 5,902.95**		**$ 5,902.95**
			Total		**$ 5,850.07**	**$ 9,838.24**		**$ 15,688.31**
33_02 Subdrain								
Data Release : 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
7	221113762200	Elbow, 90 Deg., plastic, PVC, socket joint, 150 mm, schedule 80			$ 857.15	$ 996.94	$ -	$ 1,854.09

Quantity	Line Number	Description			Ext. 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
22	312316140750	Excavating, chain trencher, utility trench, common earth, 9 kW, 200 mm wide, 900 mm deep, 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
95	221113762640	Coupling, plastic, PVC, socket joint, 150 mm, schedule 80			$ 10,069.05	$ 13,529.90	$ -	$ 23,598.95
					$ 22,180.71	**$ 25,592.70**	**$ 97.04**	**$ 47,870.45**
			Labor factor	**1.50**		**$ 38,389.05**		**$ 38,389.05**
			Total		**$ 22,180.71**	**$ 63,981.75**		**$ 86,162.46**
33_03 Cut and cap								
Data Release : Year 2020		**Unit Cost Estimate**						
270	312316140750	Excavating, chain trencher, utility trench, common earth, 9 kW, 200 mm wide, 900 mm deep, operator walking			$ -	$ 2,022.30	$ 599.40	$ 2,621.70
270	312316141750	Excavating, chain trencher, utility trench, common earth, 200 mm wide, 900 mm deep, backfill by hand, includes compaction, add			$ -	$ 3,580.20	$ 456.30	$ 4,036.50
1	221113484950	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 20 mm diameter			$ 28.30	$ 7.95	$ -	$ 36.25
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
			Q1 welder and QA	1.00		$ 39.75		$ 39.75
					$ 141.50	**$ 5,682.00**	**$ 1,055.70**	**$ 6,879.20**
			Labor factor	**1.50**		**$ 8,523.00**		**$ 8,523.00**
			Total		**$ 141.50**	**$ 14,205.00**		**$ 14,346.50**
33_04 Cut and cap								
Data Release : Year 2020		**Unit Cost Estimate**						
2	221113484950	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 20 mm diameter			$ 56.60	$ 15.90	$ -	$ 72.50
1	221113485010	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 80 mm diameter			$ 55.05	$ 21.16	$ -	$ 76.21
1	221113485110	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 300 mm diameter			$ 421.89	$ 69.66	$ -	$ 491.55
			Q1 welder and QA	1.00		$ 106.72		$ 106.72
					$ 533.54	**$ 213.44**	**$ -**	**$ 746.98**
			Labor factor	**1.50**		**$ 320.16**		**$ 320.16**
			Total		**$ 533.54**	**$ 533.60**		**$ 1,067.14**

Quantity	Line Number	Description			Ext. Mat O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
33_05 Yard drainage temporary provision								
Data Release : Year 2020		**Unit Cost Estimate**						
		Soil Management and Dewatering (based on actuals)						
		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**

Table D-2: BOQ Section C – Process Systems Tie-in

			Overnight materials costs	Overnight labour costs	Overnight equipment costs	Total overnight costs
Section C, Process Systems Tie-in						
C_01	PHT and Moderator D2O Systems		$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	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
C_01_01 Tie into mod D20 supply system								
Data Release : 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
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
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	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			$ 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			$ 105.99	$ 50.05	$ -	$ 156.04
1	221113484908	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm 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	221113484950	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 20 mm diameter			$ 28.30	$ 7.95	$ -	$ 36.25
					$ 44,060.49	**$ 277.93**	**$ -**	**$ 44,338.42**
			Q1 Buttweld Welder&QA	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**
			QA inspection	0.5		$ 118.33		**$ 118.33**
			Base subtotal labor			$ 1,106.21		$ 45,166.70
			EMWG pipe factor	35.97826087		$ 39,799.33		**$ 39,799.33**
			Subtotal with EMGW			$ 40,905.54		$ 84,966.03
			Labor factor 2.5x	1.5		$ 61,358.31		**$ 61,358.31**
			SS premium fixtures 2.5x	2.5	**$ 656.00**			**$ 656.00**
			sutotal material		**$ 44,716.49**			$ 146,980.33
			NC SS factor	0.324480494	**$ 14,509.63**			**$ 14,509.63**
					$ 59,226.12	**$ 102,263.84**		**$ 161,489.96**
C_01_02 Tie into PHT D20 supply system								
Data Release : 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			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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			$ 50.42	$ 35.60	$ -	$ 86.02
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			$ 14,564.77	$ 47.99	$ -	**$ 14,612.76**
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			$ 14,564.77	$ 34.57	$ -	**$ 14,599.34**
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	0.5		**$ 413.83**		**$ 413.83**
			Welder P	1		**$ 99.44**		**$ 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**
			Subtotal with EMGW			$ 47,449.58		$ 77,545.35
			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		**$ 30,384.42**			$ 149,008.36
			NC SS factor	0.324480494	**$ 9,859.15**			**$ 9,859.15**
					$ 40,243.56	**$ 118,623.95**		**$ 158,867.51**
C_01_03 Relocation of discharge line								
Data Release : 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	312323160035	Fill by borrow and utility bedding, borrow, select fill for shoulders and embankments, spread fill, with front-end loader			$ 2,256.10	$ 172.90	$ 261.80	$ 2,690.80

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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 backfill			$ 9,519.60	$ 2,094.60	$ 240.60	$ 11,854.80
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
1	333111253775	Public sanitary utility sewerage piping, piping SDR 35, 90< elbow, 600 mm diameter			$ 3,437.53	$ 153.17	$ -	$ 3,590.70
20	050523900660	Weld rod, steel, 3 mm diameter, 225 kg to 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			$ 82.66	$ 1,715.78		$ 1,798.44
1		Cadweld mold			$ 407.29	$ 1,715.78		$ 2,123.07
20		Sleeve for making cadweld			$ 1,373.59	$ 1,715.78		$ 3,089.37
					$ 79,187.00	**$ 48,294.18**	**$ 20,932.71**	**$ 148,413.89**
			Q2	0.333333333		**$ 5,039.80**		**$ 5,039.80**
			Skwk	0.333333333		**$ 357.40**		**$ 357.40**
			QA inspection	0.5		$ 2,698.60		**$ 2,698.60**
			Base subtotal labor			$ 56,389.98		$ 156,509.69
			EMWG pipe factor	12.86956522		$ 725,714.46		**$ 725,714.46**
			Subtotal with EMGW			$ 782,104.44		$ 882,224.15
			Labor factor 2.5x	1.5		$ 1,173,156.65		**$ 1,173,156.65**
			SS premium fixtures 2.5x	1.5	**$ -**			**$ -**
			sutotal material		**$ 79,187.00**			**$ 2,055,380.80**
			NC SS factor	0.324480494	**$ 25,694.64**			**$ 25,694.64**
					$ 104,881.64	**$ 1,955,261.09**	**$ 20,932.71**	**$2,081,075.44**
C_01_04 Tie into upgrade sysem for HWMB West Annex								
Data Release : Year 2020		**Unit Cost Estimate**						
1	221113451560	Elbow, 90 Deg., steel, cast iron, black, straight, threaded, extra heavy weight, 40 mm			$ 100.33	$ 71.72	$ -	$ 172.05
1	221113451580	Elbow, 90 Deg., steel, cast iron, black, 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			$ 129.64	$ 235.28	$ -	$ 364.92
2	221113440560	Pipe, steel, black, threaded, 15 mm diameter, schedule 40, Spec. A-53, includes coupling and clevis hanger assembly sized for covering, 3 m OC			$ 29.94	$ 82.56	$ -	$ 112.50

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	$ 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
1	221113485000	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 65 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
1	221113484960	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 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	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter			$ 28.30	$ 7.95	$ -	$ 36.25
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	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
					$ 87,787.69	**$ 736.87**		**$ 88,524.56**
			Q1 Buttweld Welder&QA	**$ 1.00**		**$ 151.18**		**$ 151.18**
			P Buttweld Welder&QA	**$ 2.00**		**$ 629.48**		**$ 629.48**
			Welder Q1	0.5		**$ 422.28**		**$ 422.28**
			Welder P	1		**$ 314.59**		**$ 314.59**
			QA inspection	0.5		$ 368.44		**$ 368.44**
			Base subtotal labor			$ 2,622.84		$ 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		$ 145,481.82		**$ 145,481.82**
			SS premium fixtures 3.5x	2.5	**$ 1,975.98**			**$ 1,975.98**
			subtotal material		**$ 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 D20 tanks piping and equipment								
Data Release : Year 2020		**Unit Cost Estimate**						
10	078413100180	Firestopping, metallic piping, non insulated, through floors, 300mm dia			$ 192.30	$ 394.20	$ -	$ 586.50
					$ 192.30	**$ 394.20**		**$ 586.50**
			Labor factor 2.5x	1.5		$ 591.30		**$ 591.30**
					$ 192.30	**$ 985.50**		**$ 1,177.80**
					$ 323,433.85	**$ 2,419,604.07**	**$ 20,932.71**	**$2,763,970.63**

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
C_02_01 Tie into TRF incoming and outgoing system								
Data Release : Year 2020		**Unit Cost Estimate**						
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
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	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			$ 95,059.96	$ 103.71	$ -	$ 95,163.67
4	221113643610	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 304, includes couplings and hangers 3 m OC			$ 773.80	$ 330.24	$ -	$ 1,104.04
5	221113643610	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 304, includes couplings and hangers 3 m OC			$ 967.25	$ 412.80	$ -	$ 1,380.05
3	221113484960	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter			$ 84.90	$ 23.85	$ -	$ 108.75
1	221113484950	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 20 mm diameter			$ 28.30	$ 7.95	$ -	$ 36.25
					$ 97,270.25	**$ 1,100.43**		**$ 98,370.68**
			Buttweld P&QA	**$ 2.00**		**443.76**		**$ 443.76**
			Welder Q1	0.5		**$ 371.52**		**$ 371.52**
			Welder P	1		**$ 357.39**		**$ 357.39**
			QA inspection	0.5		$ 364.46		**$ 364.46**
			Base subtotal labor			$ 2,637.56		$ 99,907.81
			EMWG pipe factor	35.97826087		$ 94,894.64		**$ 94,894.64**
			Subtotal with EMGW			$ 97,532.20		$ 194,802.45
			Labor factor 2.5x	1.5		$ 146,298.30		**$ 146,298.30**
			SS premium fixtures 2.5x	2.5	**$ 1,173.10**			**$ 1,173.10**
			subtotal material		**$ 98,443.35**			$ 342,273.84
			NC factor	0.324480494	**$ 31,942.95**			**$ 31,942.95**
					$ 130,386.30	**$ 243,830.49**		**$ 374,216.79**
C_02_02 Tie into TRF and project system for West Annex								
Data Release : Year 2020		**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	$ -	$ 597.24
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

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			$ 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	0.5		$ 633.73		**$ 633.73**
			Base subtotal labor			$ 3,168.65		$ 14,847.11
			EMWG pipe factor	35.97826087		$ 114,002.52		**$ 114,002.52**
			Subtotal with EMGW			$ 117,171.17		$ 128,849.63
			Labor factor 2.5x	1.5		$ 175,756.75		**$ 175,756.75**
			SS premium fixtures 2.5x	2.5	**$ 1,539.65**			**$ 1,539.65**
			subtotal material		**$ 13,218.11**			$ 306,146.03
			NC factor	0.324480494	**$ 4,289.02**			**$ 4,289.02**
					$ 17,507.13	**$ 292,927.92**		**$ 310,435.04**
					$ 147,893.43	**$ 536,758.41**		**$ 684,651.83**

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
C_03_01 Tie into clean up system for HWMB West Annex								
Data Release : Year 2020		**Unit Cost Estimate**						
3	221113451560	Elbow, 90 Deg., steel, cast iron, black, straight, threaded, extra heavy weight, 40 mm			$ 300.99	$ 215.16	$ -	$ 516.15
3	221113451850	Tee, steel, cast iron, black, straight, threaded, extra heavy weight, 40 mm			$ 478.50	$ 331.26	$ -	$ 809.76
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
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
9	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 3,009.87	$ 743.04	$ -	$ 3,752.91
3	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 1,003.29	$ 247.68	$ -	$ 1,250.97
3	221113484950	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 20 mm diameter			$ 84.90	$ 23.85	$ -	$ 108.75
3	221113484950	Pipe, fittings & valves, coupling, steel, painted, 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	$ -	$ 1,267.47
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
			subtotal		**$ 268,331.37**	**$ 1,900.68**	**$ -**	**$ 270,232.05**
			Buttweld P&QA	**$ 2.00**		**$ 315.84**		**$ 315.84**
								$ 270,547.89
			Welder Q1	0.5		**$ 768.57**		**$ 768.57**
			Welder P	1		**$ 363.54**		**$ 363.54**
			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			$ 144,758.24		$ 413,089.61
			Labor factor 2.5x	1.5		$ 217,137.36		**$ 217,137.36**
			SS premium fixtures 2.5x	2.5	**$ 8,315.78**			**$ 8,315.78**
			subtotal material		**$ 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	Ext. Total O&P
C_04_01 Mechanical Mods to the loading bay								
Data Release : Year 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			$ 806.68	$ 1,387.12	$ -	$ 2,193.80
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			$ 50.42	$ 15.94	$ -	$ 66.36
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
1	221113484910	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 40 mm diameter			$ 39.10	$ 11.87	$ -	$ 50.97
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 handle, excl joint coupling material			$ 2,147.16	$ 26.32	$ -	$ 2,173.48
29	220719106870	Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 25 mm wall, 25 mm iron pipe size			$ 118.90	$ 558.83	$ -	$ 677.73
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			$ 47.34	$ 82.56	$ -	$ 129.90
1	232120701020	Steam trap, cast iron body, float and thermostatic type, threaded, 103 kPa, 25 mm pipe size			$ 218.15	$ 54.18	$ -	$ 272.33
1	077123106600	Steel wire strainers, galvanized, rectangular, 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**
			Welder P	1		**$ 2,186.55**		**$ 2,186.55**
			QA inspection	0.5		$ 1,107.98		**$ 1,107.98**
			Base subtotal labor			$ 5,629.18		$ 9,428.55
			EMWG pipe factor	12.86956522		$ 72,445.10		**$ 72,445.10**
			Subtotal with EMGW			$ 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	**$ -**			
					$ 3,799.37	**$ 195,185.70**		**$ 198,985.07**

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
C_05_01 Tie-in to inactive plant drainage								
Data Release : 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	$ -	$ 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 joint coupling material			$ 50.42	$ 31.99	$ -	$ 82.41
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
			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			$ 866.86		$ 3,272.33
			EMWG pipe factor	12.86956522		$ 11,156.14		**$ 11,156.14**
			Subtotal with EMGW			$ 12,023.01		$ 14,428.48
			Labor factor 2.5x	1.5		$ 18,034.51		**$ 18,034.51**
			SS premium fixtures 2	2.5	**$ -**			**$ -**
			subtotal material		**$ 2,405.47**			$ 32,462.98
			NC adjustment	0	**$ -**			**$ -**
					$ 2,405.47	**$ 30,057.51**		**$ 32,462.98**

Table D-3: BOQ Section D – Process Systems

			Overnight materials costs	Overnight labour costs	Overnight equipment costs	Total overnight costs
Section 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 Systems		$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	Ext. Equip. O&P	Ext. Total O&P
D_01_01 Equipment tanks and pumps								
Data Release : Year 2020		**Unit Cost Estimate**						
28	OPG PO #0024	Tanks (PHT, Moderator, Feed, Product)			$ 4,495,958.00	$ 243,461.70		$ 4,739,419.70
3	OPG PO #0024	Heat Exchangers			$ 308,202.80	$ 3,130.22		$ 311,333.02
17	OPG PO #0024	Pumps			$ 1,563,010.00	$ 17,737.92		$ 1,580,747.92
					$ 6,367,170.80	**$ 264,329.84**	**$ -**	**$ 6,631,500.64**
			Tank crew	0.2		**$ 48,692.34**		**$ 48,692.34**
			Heat ex crew	0.33		**$ 1,043.41**		**$ 1,043.41**
			Pump crew	0.33		**$ 5,912.64**		**$ 5,912.64**
			subtotal labor			$ 319,978.23		$ 6,687,149.03
			Labor factor 2.5x	1.5		$ 479,967.34		**$ 479,967.34**
			SS premium fixtures 2.5x	2.5	**$ -**			**$ -**
					$ 6,367,170.80	**$ 799,945.57**		**$ 7,167,116.37**
D_01_02 Pipe supports and misc fittings								
Data Release : Year 2020		**Unit Cost Estimate**						
4	221113481080	Pipe, fittings & valves, steel, black, grooved joint, 50 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC			$ 144.08	$ 262.12	$ -	$ 406.20
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
6	221113481050	Pipe, fittings & valves, steel, black, grooved joint, 25 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC			$ 142.02	$ 247.68	$ -	$ 389.70
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	$ -	$ 824.60
5	221113481070	Pipe, fittings & valves, steel, black, grooved joint, 40 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC			$ 156.90	$ 255.40	$ -	$ 412.30
2	221113481090	Pipe, fittings & valves, steel, black, grooved joint, 65 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC			$ 122.46	$ 165.12	$ -	$ 287.58
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
6	221113481100	Pipe, fittings & valves, steel, black, grooved joint, 80 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC			$ 487.74	$ 563.46	$ -	$ 1,051.20
22	221113481100	Pipe, fittings & valves, steel, black, grooved joint, 80 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC			$ 1,788.38	$ 2,066.02	$ -	$ 3,854.40
2	221113481110	Pipe, fittings & valves, steel, black, grooved joint, 100 mm diameter, schedule 40, includes coupling & clevis type hanger 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
					$ 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**
			QA inspection	0.5		$ 1,655.79		**$ 1,655.79**
			subtotal labor			$ 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. Equip. O&P	Ext. Total O&P
			SS premium fixtures 2.5x	2.5	**$ 9,587.73**			**$ 9,587.73**
					$ 17,313.70	**$ 84,218.20**		**$ 101,531.90**
D_01_03 West Annex PHT pump suction piping								
Data Release : Year 2020		**Unit Cost Estimate**						
12	221113643640	Pipe, stainless steel, threaded, 100 mm diameter, schedule 40, type 304, includes couplings and hangers 3 m OC			$ 5,865.36	$ 1,721.40	$ -	$ 7,586.76
38	221113643640	Pipe, stainless steel, threaded, 100 mm diameter, schedule 40, type 304, includes couplings and hangers 3 m OC			$ 18,573.64	$ 5,451.10	$ -	$ 24,024.74
8	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			$ 403.36	$ 127.52	$ -	$ 530.88
5	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			$ 478.50	$ 286.40	$ -	$ 764.90
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
10	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			$ 957.00	$ 572.80	$ -	$ 1,529.80
26	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			$ 2,488.20	$ 1,489.28	$ -	$ 3,977.48
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	$ -	$ 986.22
2	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			$ 440.42	$ 92.88	$ -	$ 533.30

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. 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
8	221113484916	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 80 mm diameter			$ 518.64	$ 169.28	$ -	$ 687.92
2	221113485030	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 100 mm diameter			$ 158.46	$ 57.80	$ -	$ 216.26
2	221113485030	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 100 mm diameter			$ 158.46	$ 57.80	$ -	$ 216.26
7	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			$ 1,123.64	$ 588.77	$ -	$ 1,712.41
1	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			$ 160.52	$ 84.11	$ -	$ 244.63
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	$ -	$ 489.26
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

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			$ 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 handle, excl joint 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 joint 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 handle, excl joint coupling material			$ 16,125.32	$ 52.64	$ -	$ 16,177.96
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			$ 64,501.28	$ 210.56	$ -	$ 64,711.84
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			$ 16,125.32	$ 130.04	$ -	$ 16,255.36
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			$ 8,062.66	$ 65.02	$ -	$ 8,127.68
8	221113643580	Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 304, includes couplings and hangers 3 m OC			$ 724.40	$ 466.48	$ -	$ 1,190.88
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	$ 15.94	$ -	$ 65.33

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. 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	$ -	$ 36.25
8	221113470630	Gasket and bolt set, for flanges, 1034 kPa, 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	221113484918	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 100 mm 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**
			Welder P	1		**$ 1,909.73**		**$ 1,909.73**
			QA inspection	0.5		$ 3,975.00		**$ 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			$ 1,672,746.21		$ 1,950,983.91
			Labor factor 2.5x	1.5		$ 2,509,119.31		**$ 2,509,119.31**
			SS premium fixtures 2.5x	2.5	**$ 88,278.50**			**$ 88,278.50**
			Material subtotal		**$ 366,516.20**			$ 4,548,381.71
			NC factor	0	**$ -**			**$ -**
					$ 366,516.20	**$ 4,181,865.51**		**$ 4,548,381.71**
D_01_04 West Annex PHT Pump discharge piping								
Data Release : 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
54	221113644390	Pipe, stainless steel, threaded, 100 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 37,507.32	$ 7,746.30	$ -	$ 45,253.62

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. 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
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
41	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			$ 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	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
25	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			$ 1,260.50	$ 799.75	$ -	$ 2,060.25
13	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			$ 1,143.74	$ 563.42	$ -	$ 1,707.16
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	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
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
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

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			$ 1,975.68	$ 414.84	$ -	$ 2,390.52
4	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			$ 880.84	$ 185.76	$ -	$ 1,066.60
4	221113484950	Pipe, fittings & valves, coupling, steel, 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 mm 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	Ext. Equip. O&P	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
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
6	221113484990	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter			$ 256.20	$ 95.64	$ -	$ 351.84
1	221113484908	Pipe, fittings & valves, coupling, steel, 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 handle, 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
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
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
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
3	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			$ 24,187.98	$ 143.97	$ -	$ 24,331.95
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
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
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

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. 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	$ -	$ 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	$ -	$ 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 handle, excl joint coupling material			$ 16,125.32	$ 95.98	$ -	$ 16,221.30
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			$ 43,498.65	$ 47.99	$ -	$ 43,546.64
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 handle, excl joint coupling material			$ 43,498.65	$ 26.32	$ -	$ 43,524.97
1	232120880120	Venturi flow, measuring device, 25 mm diameter			$ 344.72	$ 42.83	$ -	$ 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
4	221113484960	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter			$ 113.20	$ 31.80	$ -	$ 145.00
6	221113484960	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter			$ 169.80	$ 47.70	$ -	$ 217.50
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	221113470630	Gasket and bolt set, for flanges, 1034 kPa, 50 mm pipe size			$ 10.08	$ 61.40	$ -	$ 71.48

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
					$ 623,920.18	**$ 39,059.10**	**$ -**	**$ 662,979.28**
			Sampling			**$ 19,057.50**		**$ 19,057.50**
			Welder Q1	0.5		**$ 4,092.42**		**$ 4,092.42**
			Welder Q2	0.33		**$ 2,582.10**		**$ 2,582.10**
			Welder P	1		**$ 23,127.97**		**$ 23,127.97**
			QA inspection	1		$ 29,802.49		**$ 29,802.49**
			Base subtotal labor			$ 117,721.57		$ 741,641.75
			EMWG pipe factor	35.9782609		$ 4,235,417.36		**$ 4,235,417.36**
			Subtotal with EMGW			$ 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 West Annex PHT tank inlet and vent piping								
Data Release : Year 2020		**Unit Cost Estimate**						
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
5	221113643560	Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 304, includes couplings and hangers 3 m OC			$ 231.55	$ 250.25	$ -	$ 481.80
2	221113643580	Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 304, includes couplings and hangers 3 m OC			$ 181.10	$ 116.62	$ -	$ 297.72
11	221113644320	Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 1,324.29	$ 561.88	$ -	$ 1,886.17
52	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 17,390.36	$ 4,293.12	$ -	$ 21,683.48
114	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 38,125.02	$ 9,411.84	$ -	$ 47,536.86
40	221113644390	Pipe, stainless steel, threaded, 100 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 27,783.20	$ 5,738.00	$ -	$ 33,521.20
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
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
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
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
31	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			$ 1,563.02	$ 991.69	$ -	$ 2,554.71

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	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	$ -	$ 262.64
7	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			$ 615.86	$ 303.38	$ -	$ 919.24
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	$ -	$ 597.63
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	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
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	221113484908	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm diameter			$ 156.40	$ 31.80	$ -	$ 188.20
2	221113484908	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm diameter			$ 78.20	$ 15.90	$ -	$ 94.10
1	221113484908	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm diameter			$ 39.10	$ 7.95	$ -	$ 47.05
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 handle, excl joint coupling material			$ 16,125.32	$ 52.64	$ -	$ 16,177.96
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
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			$ 64,501.28	$ 210.56	$ -	$ 64,711.84

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. 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
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
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
20	221113470630	Gasket and bolt set, for flanges, 1034 kPa, 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 West annex mod pump suction piping								
Data Release : 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
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
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
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
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 joint coupling material			$ 655.46	$ 462.80	$ -	$ 1,118.26
19	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			$ 957.98	$ 676.40	$ -	$ 1,634.38

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	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	$ -	$ 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 joint 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 handle, excl joint coupling material			$ 8,062.66	$ 26.32	$ -	$ 8,088.98
9	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			$ 391,487.85	$ 431.91	$ -	$ 391,919.76
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			$ 304,490.55	$ 184.24	$ -	$ 304,674.79

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
1	221113484908	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm diameter			$ 39.10	$ 7.95	$ -	$ 47.05
1	221113484914	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 65 mm diameter			$ 56.08	$ 17.91	$ -	$ 73.99
1	221113484960	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter			$ 28.30	$ 7.95	$ -	$ 36.25
1	221113484912	Pipe, fittings & valves, coupling, steel, painted, rigid 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
1	221113484914	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 65 mm diameter			$ 56.08	$ 17.91	$ -	$ 73.99
1	221113484960	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter			$ 28.30	$ 7.95	$ -	$ 36.25
4	221113470630	Gasket and bolt set, for flanges, 1034 kPa, 50 mm pipe size			$ 40.32	$ 245.60	$ -	$ 285.92
2	221113484918	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 100 mm diameter			$ 180.08	$ 57.80	$ -	$ 237.88
7	221113484920	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 125 mm diameter			$ 813.96	$ 249.20	$ -	$ 1,063.16
					$ 787,668.27	**$ 6,969.07**	**$ -**	**$ 794,637.34**
			Sampling			**$ 19,057.50**		**$ 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			$ 32,211.23		$ 819,879.50
			EMWG pipe factor	35.9782609		$ 1,158,903.95		**$ 1,158,903.95**
			Subtotal with EMGW			$ 1,191,115.17		$ 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		**$ 802,742.47**			$ 3,780,530.40
			NC factor	0.32448049	**$ 4,891.28**			**$ 4,891.28**
					$ 807,633.75	**$ 2,977,787.93**		**$ 3,785,421.69**
D_01_07 West annext mod pump discharge piping								
Data Release : 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	$ -	$ 780.20
33	221113644310	Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 3,497.67	$ 1,651.65	$ -	$ 5,149.32
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
129	221113644320	Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 15,530.31	$ 6,589.32	$ -	$ 22,119.63
78	221113644330	Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 13,002.60	$ 4,548.18	$ -	$ 17,550.78

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. 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
21	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			$ 1,966.44	$ 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 joint 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	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			$ 857.14	$ 270.98	$ -	$ 1,128.12
11	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			$ 554.62	$ 175.34	$ -	$ 729.96
16	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			$ 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
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

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	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	$ -	$ 398.42
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
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	$ -	$ 597.63
14	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			$ 2,304.96	$ 483.98	$ -	$ 2,788.94
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			$ 164.64	$ 34.57	$ -	$ 199.21
1	221113484990	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter			$ 42.70	$ 15.94	$ -	$ 58.64
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
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

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	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	$ -	$ 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	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	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	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
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	$ -	$ 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, excl joint coupling material			$ 100.33	$ 21.16	$ -	$ 121.49
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
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
11	221113484912	Pipe, fittings & valves, coupling, steel, 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
1	221113484914	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 65 mm diameter			$ 56.08	$ 17.91	$ -	$ 73.99
1	221113484910	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 40 mm diameter			$ 39.10	$ 11.87	$ -	$ 50.97

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
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			$ 260,991.90	$ 157.92	$ -	$ 261,149.82
12	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			$ 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 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 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 handle, excl joint coupling material			$ 43,498.65	$ 26.32	$ -	$ 43,524.97
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 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
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 joint coupling material			$ 173,994.60	$ 138.28	$ -	$ 174,132.88

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. 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 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
9	221113484960	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter			$ 254.70	$ 71.55	$ -	$ 326.25
9	221113484960	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter			$ 254.70	$ 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**
			SS premium fixtures 2.5x	2.5	**$ 52,029.78**			**$ 52,029.78**
			Materials subtotal		**$ 1,351,648.67**			$ 14,974,961.36
			NC factor	0.32448049	**$ 16,882.65**			**$ 16,882.65**
					$ 1,368,531.31	**$ 13,623,312.70**		**$ 14,991,844.01**
D_01_08 West annex mod tank inlet and vent piping								
Data Release : 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	$ -	$ 780.20
5	221113644310	Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 529.95	$ 250.25	$ -	$ 780.20
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
10	221113644320	Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 1,203.90	$ 510.80	$ -	$ 1,714.70
62	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 20,734.66	$ 5,118.72	$ -	$ 25,853.38
160	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 53,508.80	$ 13,209.60	$ -	$ 66,718.40
22	221113644390	Pipe, stainless steel, threaded, 100 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 15,280.76	$ 3,155.90	$ -	$ 18,436.66
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
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 joint coupling material			$ 1,361.34	$ 654.75	$ -	$ 2,016.09
3	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			$ 151.26	$ 72.75	$ -	$ 224.01
32	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			$ 1,613.44	$ 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	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
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 joint coupling material			$ 329.28	$ 69.14	$ -	$ 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	$ 7.95	$ -	$ 36.25
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			**$ 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	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&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 West annex vapor recovry piping								
Data Release : 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	$ -	$ 780.20
5	221113644310	Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 529.95	$ 250.25	$ -	$ 780.20
5	221113644310	Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 529.95	$ 250.25	$ -	$ 780.20
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
60	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 20,065.80	$ 4,953.60	$ -	$ 25,019.40
80	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 26,754.40	$ 6,604.80	$ -	$ 33,359.20
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
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	$ -	$ 1,565.79
53	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			$ 2,672.26	$ 1,695.47	$ -	$ 4,367.73
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

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	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

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			$ 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 joint 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 joint 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	$ 207.42	$ -	$ 261,199.32
20	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			$ 161,253.20	$ 691.40	$ -	$ 161,944.60
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			$ 48,375.96	$ 157.92	$ -	$ 48,533.88
4	221119263030	Pressure regulator, steam, high capacity, bronze body, stainless steel trim, threaded, 20 mm diameter			$ 13,891.52	$ 134.16	$ -	$ 14,025.68
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
					$ 931,384.50	**$ 20,712.43**	**$ -**	**$ 952,096.93**
			Sampling			**$ 19,057.50**		**$ 19,057.50**
			Welder Q1	0.5		**$ 5,856.60**		**$ 5,856.60**
			Welder P	1		**$ 8,999.23**		**$ 8,999.23**
			QA inspection	1		$ 14,855.83		**$ 14,855.83**
			Base subtotal labor			$ 69,481.59		$ 1,000,866.09
			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		$ 3,853,962.54		**$ 3,853,962.54**
			SS premium fixtures 2.5x	2.5	**$ 114,862.40**			**$ 114,862.40**
			Materials subtotal		**$ 1,046,246.90**			$ 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 West annex vapor recovery drain piping								
Data Release : Year 2020		**Unit Cost Estimate**						
45	221113644320	Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 5,417.55	$ 2,298.60	$ -	$ 7,716.15
37	221113644330	Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 6,167.90	$ 2,157.47	$ -	$ 8,325.37

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. 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 joint coupling material			$ 1,217.32	$ 207.22	$ -	$ 1,424.54
17	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			$ 857.14	$ 270.98	$ -	$ 1,128.12
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	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	$ -	$ 202.86
2	221113484960	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter			$ 56.60	$ 15.90	$ -	$ 72.50
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
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
8	221113470630	Gasket and bolt set, for flanges, 1034 kPa, 50 mm pipe size			$ 80.64	$ 491.20	$ -	$ 571.84
					$ 145,041.20	**$ 5,694.10**	**$ -**	**$ 150,735.30**
			Welder P	1		**$ 5,694.10**		**$ 5,694.10**
			QA 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		**$ 152,440.70**			$ 1,731,625.06
			NC factor	0.32448049	**$ 49,464.03**			**$ 49,464.03**
					$ 201,904.73	**$ 1,579,184.36**		**$ 1,781,089.10**
D_01_11 West annex 87m elev tie in piping								
Data Release : Year 2020		**Unit 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

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	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 joint coupling material			$ 2,067.22	$ 994.25	$ -	$ 3,061.47
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
25	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			$ 1,929.50	$ 1,174.00	$ -	$ 3,103.50
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
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
10	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			$ 1,059.90	$ 650.20	$ -	$ 1,710.10
1	221113484916	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 80 mm diameter			$ 64.83	$ 21.16	$ -	$ 85.99
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	Ext. Equip. O&P	Ext. Total O&P
2	221113484916	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 80 mm diameter			$ 129.66	$ 42.32	$ -	$ 171.98
1	221113484916	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 80 mm diameter			$ 64.83	$ 21.16	$ -	$ 85.99
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
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			$ 64,501.28	$ 210.56	$ -	$ 64,711.84
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
8	221113484960	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter			$ 226.40	$ 63.60	$ -	$ 290.00
4	221113484960	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter			$ 113.20	$ 31.80	$ -	$ 145.00
2	221113470630	Gasket and bolt set, for flanges, 1034 kPa, 50 mm pipe size			$ 20.16	$ 122.80	$ -	$ 142.96
					$ 169,031.50	**$ 19,825.27**	**$ -**	**$ 188,856.77**
			Welder Q1	0.5		**$ 4,973.24**		**$ 4,973.24**
			Welder Q2	0.33		**$ 1,625.77**		**$ 1,625.77**
			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		$ 2,386,554.58		**$ 2,386,554.58**
			SS premium fixtures 2.5x	2.5	**$ 22,887.03**			**$ 22,887.03**
			Subtotal material		**$ 191,918.53**			$ 4,169,509.50
			NC factor	0.32448049	**$ 62,273.82**			**$ 62,273.82**
					$ 254,192.34	**$ 3,977,590.97**		**$ 4,231,783.32**
D_01_12 West Annex tunnel and 94m elev tie in piping								
Data Release : Year 2020		**Unit Cost Estimate**						
49	221113644310	Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 5,193.51	$ 2,452.45	$ -	$ 7,645.96
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
37	221113644330	Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 6,167.90	$ 2,157.47	$ -	$ 8,325.37
35	221113644330	Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 5,834.50	$ 2,040.85	$ -	$ 7,875.35
163	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 54,512.09	$ 13,457.28	$ -	$ 67,969.37

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	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	$ -	$ 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	$ 41,170.15	$ -	$ 240,514.61
21	221113644390	Pipe, stainless steel, threaded, 100 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 14,586.18	$ 3,012.45	$ -	$ 17,598.63
19	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			$ 1,779.16	$ 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			$ 3,932.88	$ 669.48	$ -	$ 4,602.36
5	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	$ -	$ 547.90
3	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			$ 151.26	$ 47.82	$ -	$ 199.08
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
11	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			$ 554.62	$ 175.34	$ -	$ 729.96

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	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	$ -	$ 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 joint coupling material			$ 3,025.20	$ 1,455.00	$ -	$ 4,480.20
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 coupling labor, excl joint coupling material			$ 1,159.66	$ 735.77	$ -	$ 1,895.43
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	$ -	$ 247.23
96	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			$ 4,840.32	$ 3,071.04	$ -	$ 7,911.36
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	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

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
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
1	221113484908	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm 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	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
2	221113484916	Pipe, fittings & valves, coupling, steel, 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
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	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
12	221113484980	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 40 mm diameter			$ 475.44	$ 142.44	$ -	$ 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. O&P	Ext. Total O&P
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
1	221113484990	Pipe, fittings & valves, coupling, steel, 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
1	221113485010	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 80 mm diameter			$ 55.05	$ 21.16	$ -	$ 76.21
1	221113485010	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 80 mm diameter			$ 55.05	$ 21.16	$ -	$ 76.21
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			$ 48,375.96	$ 157.92	$ -	$ 48,533.88
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
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
24	221113484960	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter			$ 679.20	$ 190.80	$ -	$ 870.00
1	221113484960	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter			$ 28.30	$ 7.95	$ -	$ 36.25
61	221113470630	Gasket and bolt set, for flanges, 1034 kPa, 50 mm pipe size			$ 614.88	$ 3,745.40	$ -	$ 4,360.28
					$ 492,101.20	**$ 107,561.29**	**$ -**	**$ 599,662.49**
			Welder Q1	0.5		**$ 22,029.36**		**$ 22,029.36**
			Welder Q2	0.33		**$ 14,727.53**		**$ 14,727.53**
			Welder P	1		**$ 19,319.98**		**$ 19,319.98**
			QA inspection	1		$ 56,076.87		**$ 56,076.87**
			Base subtotal labor			$ 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	Ext. 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**
			Subtotal matertials		**$ 576,192.53**			$ 20,887,891.46
			NC factor	0.32448049	**$ 136,131.66**			**$ 136,131.66**
					$ 712,324.18	**$ 20,311,698.93**		**$ 21,024,023.11**
D_01_13 West annex 100m elev tie in piping								
Data Release : Year 2020		**Unit Cost Estimate**						
35	221113644310	Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 3,709.65	$ 1,751.75	$ -	$ 5,461.40
70	221113644330	Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 11,669.00	$ 4,081.70	$ -	$ 15,750.70
74	221113644330	Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 12,335.80	$ 4,314.94	$ -	$ 16,650.74
107	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 35,784.01	$ 8,833.92	$ -	$ 44,617.93
112	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 37,456.16	$ 9,246.72	$ -	$ 46,702.88
71	221113644390	Pipe, stainless steel, threaded, 100 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 49,315.18	$ 10,184.95	$ -	$ 59,500.13
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
3	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			$ 151.26	$ 47.82	$ -	$ 199.08
22	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			$ 1,109.24	$ 350.68	$ -	$ 1,459.92
17	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			$ 857.14	$ 270.98	$ -	$ 1,128.12
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	$ -	$ 373.35
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	$ -	$ 1,565.79

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
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 joint coupling material			$ 2,727.38	$ 1,343.54	$ -	$ 4,070.92
1	221113484910	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 40 mm diameter			$ 39.10	$ 11.87	$ -	$ 50.97
1	221113484912	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter			$ 49.39	$ 15.94	$ -	$ 65.33
2	221113484916	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 80 mm diameter			$ 129.66	$ 42.32	$ -	$ 171.98
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	$ -	$ 202.86
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
3	221113484910	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 40 mm diameter			$ 117.30	$ 35.61	$ -	$ 152.91
1	221113484912	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter			$ 49.39	$ 15.94	$ -	$ 65.33
2	221113484916	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 80 mm diameter			$ 129.66	$ 42.32	$ -	$ 171.98
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
40	221113470630	Gasket and bolt set, for flanges, 1034 kPa, 50 mm pipe size			$ 403.20	$ 2,456.00	$ -	$ 2,859.20
8	221113484960	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter			$ 226.40	$ 63.60	$ -	$ 290.00
					$ 215,543.76	**$ 44,347.62**	**$ -**	**$ 259,891.38**
			Welder Q1	0.5		**$ 9,754.41**		**$ 9,754.41**
			Welder Q2	0.33		**$ 3,394.98**		**$ 3,394.98**
			Welder P	1		**$ 14,653.85**		**$ 14,653.85**
			QA inspection	0.5		$ 13,901.62		**$ 13,901.62**
			Base subtotal labor			$ 86,052.49		$ 301,596.25
			EMWG pipe factor	35.9782609		$ 3,096,018.75		**$ 3,096,018.75**
			Subtotal with EMGW			$ 3,182,071.24		$ 3,397,615.00
			Labor factor 2.5x	1.5		$ 4,773,106.86		**$ 4,773,106.86**
			SS premium fixtures 2.5x	2.5	**$ 22,088.35**			**$ 22,088.35**
			Subtotal materials		**$ 237,632.11**			$ 8,192,810.21
			NC factor	0.32448049	**$ 51,626.51**			**$ 51,626.51**
					$ 289,258.62	**$ 7,955,178.10**		**$ 8,244,436.72**
D_01_14 Sampling panel								
Data Release : Year 2020		**Unit Cost Estimate**						
40	221113644300	Pipe, stainless steel, threaded, 10 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 3,807.20	$ 1,981.60	$ -	$ 5,788.80

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. 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	$ -	$ 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	$ -	$ 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			$ 2,773.19	$ 184.24	$ -	$ 2,957.43
1	628411-	Sampling panel			$ 210,465.10	$ 2,782.42		$ 213,247.52
					$ 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		**$ 417,482.31**			$ 1,707,085.05
			NC factor	0.32448049	**$ 135,464.86**			$ 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. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
D_02_01 Equipment tanks and pumps								
Data Release : Year 2020		**Unit Cost Estimate**						
		See D01.01						
D_02_02 Pipe supports								
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	$ -	$ 4,067.70
5	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			$ 162.05	$ 294.10	$ -	$ 456.15
7	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			$ 180.11	$ 512.89	$ -	$ 693.00
5	221113440620	Pipe, steel, black, threaded, 65 mm diameter, schedule 40, Spec. A-53, includes coupling and clevis hanger assembly sized for covering, 3 m OC			$ 210.95	$ 469.55	$ -	$ 680.50
5	221113440630	Pipe, steel, black, threaded, 80 mm diameter, schedule 40, Spec. A-53, includes coupling and clevis hanger assembly sized for covering, 3 m OC			$ 267.55	$ 546.95	$ -	$ 814.50
Total					**$ 1,167.86**	**$ 5,543.99**	**$ -**	**$ 6,711.85**
			Welder P	1		**$ 5,543.99**		**$ 5,543.99**
			QA inspection	1		$ 5,543.99		**$ 5,543.99**
			subtotal labor			$ 16,631.97		$ 17,799.83
			Labor factor 2.5x	1.5		$ 24,947.96		**$ 24,947.96**
			SS premium fixtures 2.5x	0.32448049	**$ 68.45**			**$ 68.45**
					$ 1,236.31	**$ 41,579.93**		**$ 42,816.23**
D_02_03 West annex TRF pump suction discharge piping								
Data Release : Year 2020		**Unit Cost Estimate**						
95	221113644300	Pipe, stainless steel, threaded, 10 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 9,042.10	$ 4,706.30	$ -	$ 13,748.40
5	221113644300	Pipe, stainless steel, threaded, 10 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 475.90	$ 247.70	$ -	$ 723.60
5	221113644310	Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 529.95	$ 250.25	$ -	$ 780.20
5	221113644310	Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 529.95	$ 250.25	$ -	$ 780.20
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

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	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
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 hangers 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
79	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 26,419.97	$ 6,522.24	$ -	$ 32,942.21
208	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 69,561.44	$ 17,172.48	$ -	$ 86,733.92
15	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 5,016.45	$ 1,238.40	$ -	$ 6,254.85
85	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 28,426.55	$ 7,017.60	$ -	$ 35,444.15
98	221113644390	Pipe, stainless steel, threaded, 100 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 68,068.84	$ 14,058.10	$ -	$ 82,126.94

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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
18	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			$ 907.56	$ 286.92	$ -	$ 1,194.48
4	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			$ 201.68	$ 97.00	$ -	$ 298.68
14	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			$ 705.88	$ 339.50	$ -	$ 1,045.38
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
88	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			$ 4,436.96	$ 2,815.12	$ -	$ 7,252.08
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
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 coupling labor, excl joint coupling material			$ 151.26	$ 106.80	$ -	$ 258.06
16	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			$ 806.72	$ 569.60	$ -	$ 1,376.32

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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 joint coupling material			$ 2,727.38	$ 1,343.54	$ -	$ 4,070.92
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
9	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			$ 1,481.76	$ 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
6	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			$ 1,228.62	$ 232.20	$ -	$ 1,460.82
3	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			$ 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
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
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

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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			$ 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

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
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	$ -	$ 202.86
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	$ -	$ 202.86
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
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
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
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, excl joint 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, excl joint coupling material			$ 308.72	$ 187.84	$ -	$ 496.56
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
5	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			$ 529.95	$ 325.10	$ -	$ 855.05
8	221113484910	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 40 mm diameter			$ 312.80	$ 94.96	$ -	$ 407.76
1	221113484914	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 65 mm diameter			$ 56.08	$ 17.91	$ -	$ 73.99
17	221113484912	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter			$ 839.63	$ 270.98	$ -	$ 1,110.61

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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
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
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
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
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
12	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			$ 96,751.92	$ 575.88	$ -	$ 97,327.80
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

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			$ 24,187.98	$ 78.96	$ -	$ 24,266.94
11	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			$ 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
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
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			$ 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
6	221113484960	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter			$ 169.80	$ 47.70	$ -	$ 217.50
4	221113484960	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 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
Total					**$ 2,494,678.35**	**$ 77,085.29**	**$ -**	**$ 2,571,763.64**
			Welder Q1	0.5		**$ 18,183.95**		**$ 18,183.95**
			Welder Q2	0.33		**$ 4,686.03**		**$ 4,686.03**
			Welder P	1		**$ 40,719.36**		**$ 40,719.36**
			QA inspection	1		$ 63,589.34		**$ 63,589.34**
			subtotal labor			$ 204,263.98		$ 2,698,942.33
			EMWG pipe factor	35.9782609		$ 7,349,062.64		**$ 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**			**$ 813,103.52**
					$ 3,318,966.08	**$ 18,883,316.54**		**$22,202,282.62**
D_02_04 West annex TRF tank inlet and vent piping								
Data Release : 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	$ -	$ 780.20
5	221113644310	Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 529.95	$ 250.25	$ -	$ 780.20
1	221113644320	Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 120.39	$ 51.08	$ -	$ 171.47
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
44	221113644390	Pipe, stainless steel, threaded, 100 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 30,561.52	$ 6,311.80	$ -	$ 36,873.32
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
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	$ -	$ 438.32
14	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			$ 705.88	$ 447.86	$ -	$ 1,153.74
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 coupling labor, excl joint coupling material			$ 1,159.66	$ 735.77	$ -	$ 1,895.43
4	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			$ 382.80	$ 229.12	$ -	$ 611.92
5	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			$ 439.90	$ 216.70	$ -	$ 656.60
8	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			$ 617.44	$ 375.68	$ -	$ 993.12
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	$ -	$ 597.63

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. 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
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			$ 130,495.95	$ 103.71	$ -	$ 130,599.66
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			$ 173,994.60	$ 138.28	$ -	$ 174,132.88
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
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**		**$ 2,103.93**
			Welder P	1		**$ 2,765.47**		**$ 2,765.47**
			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**
			Subtotal with EMGW			$ 1,179,243.27		$ 1,585,084.44
			Labor factor 2.5x	1.5		$ 1,768,864.91		**$ 1,768,864.91**
			SS premium fixtures 2.5x	2.5	**$ 12,205.30**			**$ 12,205.30**
			Subtotal materials		**$ 418,046.47**			$ 3,366,154.65
			NC factor	0.32448049	**$ 135,647.93**			**$ 135,647.93**
					$ 553,694.40	**$ 2,948,108.18**		**$ 3,501,802.57**
			Total		**$ 3,873,896.79**	**$ 21,873,004.64**		**$25,746,901.43**

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
D_03_01 Equipment tanks and pumps								
Data Release : Year 2020		**Unit Cost Estimate**						
		See D01.01						
D_03_02 Pipe Supports								
Data Release : Year 2020		**Unit Cost Estimate**						
126	221113470628	Gasket and bolt set, for flanges, 1034 kPa, 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**		**$ 6,696.90**
			QA inspection	1		$ 6,696.90		**$ 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	**$ -**			
					$ 624.96	**$ 50,226.75**		**$ 50,851.71**
D_03_03 West annex downgraded pump suction								
Data Release : 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	$ -	$ 780.20
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	$ -	$ 1,560.40
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
10	221113644320	Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 1,203.90	$ 510.80	$ -	$ 1,714.70
101	221113644320	Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 12,159.39	$ 5,159.08	$ -	$ 17,318.47
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
119	221113644330	Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 19,837.30	$ 6,938.89	$ -	$ 26,776.19
129	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 43,141.47	$ 10,650.24	$ -	$ 53,791.71
7	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 2,341.01	$ 577.92	$ -	$ 2,918.93
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
27	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 9,029.61	$ 2,229.12	$ -	$ 11,258.73
44	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 14,714.92	$ 3,632.64	$ -	$ 18,347.56
25	221113644390	Pipe, stainless steel, threaded, 100 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 17,364.50	$ 3,586.25	$ -	$ 20,950.75

Quantity	Line Number	Description			Ext. Mat. 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
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, excl joint coupling material			$ 252.10	$ 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 labor, excl joint coupling material			$ 403.36	$ 255.92	$ -	$ 659.28
24	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			$ 1,210.08	$ 767.76	$ -	$ 1,977.84
7	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			$ 615.86	$ 303.38	$ -	$ 919.24
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	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

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
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
16	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			$ 2,634.24	$ 553.12	$ -	$ 3,187.36
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			$ 1,152.48	$ 241.99	$ -	$ 1,394.47
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
6	221113484908	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm diameter			$ 234.60	$ 47.70	$ -	$ 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
3	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			$ 300.99	$ 63.48	$ -	$ 364.47
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	$ -	$ 202.86
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	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
12	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			$ 926.16	$ 433.44	$ -	$ 1,359.60

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	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	$ 234.80	$ -	$ 620.70
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
13	221113484980	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 40 mm diameter			$ 515.06	$ 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	$ 131.60	$ -	$ 217,624.85
12	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			$ 521,983.80	$ 315.84	$ -	$ 522,299.64
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
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 handle, excl joint coupling material			$ 43,498.65	$ 26.32	$ -	$ 43,524.97

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, excl joint coupling material			$ 86,997.30	$ 52.64	$ -	$ 87,049.94
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			$ 347,989.20	$ 210.56	$ -	$ 348,199.76
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
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
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 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 joint coupling material			$ 24,187.98	$ 103.71	$ -	$ 24,291.69
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
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			$ 48,375.96	$ 157.92	$ -	$ 48,533.88
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	$ -	$ 1,560.40
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
6	221113644320	Pipe, stainless steel, threaded, 20 mm 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. O&P	Ext. Total O&P
106	221113644330	Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 17,670.20	$ 6,180.86	$ -	$ 23,851.06
28	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 9,364.04	$ 2,311.68	$ -	$ 11,675.72
55	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 18,393.65	$ 4,540.80	$ -	$ 22,934.45
138	221113644390	Pipe, stainless steel, threaded, 100 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 95,852.04	$ 19,796.10	$ -	$ 115,648.14
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	$ -	$ 438.32
7	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			$ 655.48	$ 111.58	$ -	$ 767.06
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
20	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			$ 1,008.40	$ 318.80	$ -	$ 1,327.20
6	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			$ 302.52	$ 145.50	$ -	$ 448.02
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
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
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, excl joint coupling material			$ 907.56	$ 575.82	$ -	$ 1,483.38
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
32	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			$ 2,815.36	$ 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
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
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	$ -	$ 597.63
2	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			$ 440.42	$ 92.88	$ -	$ 533.30
1	221113484912	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter			$ 49.39	$ 15.94	$ -	$ 65.33
3	221113484916	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 80 mm diameter			$ 194.49	$ 63.48	$ -	$ 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	$ 52.64	$ -	$ 16,177.96
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			$ 8,062.66	$ 47.99	$ -	$ 8,110.65
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
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	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

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			$ 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			$ 173,994.60	$ 105.28	$ -	$ 174,099.88
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
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**
			Base subtotal labor			$ 132,410.73		$ 2,736,999.21
			EMWG pipe factor	35.9782609		$ 4,763,907.91		**$ 4,763,907.91**
			Subtotal with EMGW			$ 4,896,318.64		$ 7,500,907.12
			Labor factor 2.5x	1.5		$ 7,344,477.96		**$ 7,344,477.96**
			SS premium fixtures 2.5x	2.5	**$ 16,217.83**			**$ 16,217.83**
			subtotal materials		**$ 2,620,806.31**			$ 14,861,602.90
			NC factor	0.32448049	**$ 850,400.52**			**$ 850,400.52**
					$ 3,471,206.83	**$ 12,240,796.60**		**$ 15,712,003.43**
			Total		**$ 3,471,831.79**	**$ 12,291,023.35**		**$ 15,762,855.14**

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
D_04_01 Equipment tanks and pumps								
Data Release : Year 2020		**Unit Cost Estimate**						
		See D01.01						
D_04_02 Pipe Supports								
Data Release : Year 2020		**Unit Cost Estimate**						
28	221113470628	Gasket and bolt set, for flanges, 1034 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		$ 1,488.20		**$ 1,488.20**
			subtotal labor			$ 4,464.60		$ 4,603.48
			Labor factor 2	1.5		$ 6,696.90		**$ 6,696.90**
			SS premium fi	2.5	**$ 347.20**			**$ 347.20**
					$ 486.08	**$ 11,161.50**		**$ 11,647.58**
D_04_03 West annex cleanup pump suction								
Data Release : Year 2020		**Unit Cost Estimate**						
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	$ -	$ 1,560.40
5	221113644310	Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 529.95	$ 250.25	$ -	$ 780.20
15	221113644320	Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 1,805.85	$ 766.20	$ -	$ 2,572.05
56	221113644320	Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 6,741.84	$ 2,860.48	$ -	$ 9,602.32
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
85	221113644330	Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 14,169.50	$ 4,956.35	$ -	$ 19,125.85
7	221113644330	Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 1,166.90	$ 408.17	$ -	$ 1,575.07
14	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 4,682.02	$ 1,155.84	$ -	$ 5,837.86
5	221113644310	Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 529.95	$ 250.25	$ -	$ 780.20

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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	$ 412.80	$ -	$ 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	$ 3,586.25	$ -	$ 20,950.75
1	221113484950	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 20 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
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
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
59	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			$ 5,524.76	$ 940.46	$ -	$ 6,465.22
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
33	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			$ 1,663.86	$ 526.02	$ -	$ 2,189.88
5	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			$ 252.10	$ 79.70	$ -	$ 331.80

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
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
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
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			$ 1,152.48	$ 241.99	$ -	$ 1,394.47
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
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

Quantity	Line Number	Description			Ext. Mat. 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	221113484910	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 40 mm diameter			$ 78.20	$ 23.74	$ -	$ 101.94
2	221113484912	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter			$ 98.78	$ 31.88	$ -	$ 130.66
2	221113484912	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter			$ 98.78	$ 31.88	$ -	$ 130.66
1	221113484916	Pipe, fittings & valves, coupling, steel, 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	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	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			$ 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
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	$ -	$ 202.86

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
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
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	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
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			$ 434,986.50	$ 263.20	$ -	$ 435,249.70
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 handle, excl joint coupling material			$ 24,187.98	$ 78.96	$ -	$ 24,266.94

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			$ 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
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 handle, 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 handle, excl joint coupling material			$ 16,125.32	$ 52.64	$ -	$ 16,177.96
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			$ 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

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			$ 16,125.32	$ 52.64	$ -	$ 16,177.96
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	232120880120	Venturi flow, measuring device, 25 mm diameter			$ 344.72	$ 42.83	$ -	$ 387.55
1	221113484960	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter			$ 28.30	$ 7.95	$ -	$ 36.25
5	221113484960	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter			$ 141.50	$ 39.75	$ -	$ 181.25
1	221113484970	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 32 mm diameter			$ 36.53	$ 9.96	$ -	$ 46.49
				$ 13,973.37	**$ 1,067,021.42**	**$ 20,742.86**	**$ -**	**$ 1,087,764.28**
			Welder 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**
			QA inspection	1		$ 17,127.10		**$ 17,127.10**
			subtotal labor			$ 54,997.05		$ 1,122,018.47
			EMWG pipe fa	35.97826087		$ 1,978,698.33		**$ 1,978,698.33**
			Subtotal with EMGW			$ 2,033,695.39		$ 3,100,716.81
			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 materials		**$ 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**
D_04_04 West annex clueanup tank inlet								
Data Release : 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
18	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 6,019.74	$ 1,486.08	$ -	$ 7,505.82

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. 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
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	$ -	$ 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	$ 63.98	$ -	$ 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	$ -	$ 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	$ -	$ 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	$ -	$ 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	$ -	$ 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			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
					$ 304,242.90	**$ 6,644.34**	**$ -**	**$ 310,887.24**
			Welder Q1	0.5		**$ 743.04**		**$ 743.04**
			Welder Q2	0.33		**$ -**		**$ -**
			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 materials		**$ 311,244.15**			$ 2,016,583.55
			NC factor	0.324480494	**$ 100,992.66**			**$ 100,992.66**
					$ 412,236.81	**$ 1,705,339.40**		**$ 2,117,576.20**
D_04_05 Supply of demineralized water to the west annex								
Data Release : Year 2020		**Unit Cost Estimate**						
70	221113644310	Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 7,419.30	$ 3,503.50	$ -	$ 10,922.80
80	221113644320	Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 9,631.20	$ 4,086.40	$ -	$ 13,717.60
85	221113644330	Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 14,169.50	$ 4,956.35	$ -	$ 19,125.85
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
11	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 3,678.73	$ 908.16	$ -	$ 4,586.89
5	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	$ -	$ 547.90
5	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	$ -	$ 547.90
18	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			$ 1,685.52	$ 286.92	$ -	$ 1,972.44
5	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			$ 252.10	$ 79.70	$ -	$ 331.80
46	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			$ 2,319.32	$ 733.24	$ -	$ 3,052.56

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
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 joint coupling material			$ 50.42	$ 31.99	$ -	$ 82.41
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
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	$ -	$ 597.63
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	221113484916	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 80 mm diameter			$ 64.83	$ 21.16	$ -	$ 85.99
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
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

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
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
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
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	221113484912	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter			$ 49.39	$ 15.94	$ -	$ 65.33
1	221113484912	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter			$ 49.39	$ 15.94	$ -	$ 65.33
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
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
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
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
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
1	221119140160	Flexible metal hose, bronze braided, bronze ends, threaded, 20 mm diameter x 300 mm			$ 44.76	$ 40.25	$ -	$ 85.01
7	221119140160	Flexible metal hose, bronze braided, bronze ends, threaded, 20 mm diameter x 300 mm			$ 313.32	$ 281.75	$ -	$ 595.07
100	220719108449	Insulation, pipe covering (price copper tube one size less than I.P.S.), rubber tubing flexible closed cell foam, 25 mm wall, 50 mm iron pipe size			$ 2,838.00	$ 2,938.00	$ -	$ 5,776.00

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
70	220719108448	Insulation, pipe covering (price copper tube one size less than I.P.S.), rubber tubing flexible closed cell foam, 25 mm wall, 40 mm iron pipe size			$ 1,618.40	$ 2,021.60	$ -	$ 3,640.00
90	220719108446	Insulation, pipe covering (price copper tube one size less than I.P.S.), rubber tubing flexible closed cell foam, 25 mm wall, 25 mm iron pipe size			$ 1,191.60	$ 2,510.10	$ -	$ 3,701.70
70	220719108445	Insulation, pipe covering (price copper tube one size less than I.P.S.), rubber tubing flexible closed cell foam, 25 mm wall, 20 mm iron pipe size			$ 1,033.90	$ 1,952.30	$ -	$ 2,986.20
5	221113484960	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter			$ 141.50	$ 39.75	$ -	$ 181.25
4	221113484960	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter			$ 113.20	$ 31.80	$ -	$ 145.00
4	221113484970	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 32 mm diameter			$ 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	1		**$ 26,047.26**		**$ 26,047.26**
			QA inspection	1		$ 26,750.83		**$ 26,750.83**
			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	1.5		$ 1,684,238.03		**$ 1,684,238.03**
			SS premium fi	2.5	**$ 42,101.75**			**$ 42,101.75**
					$ 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**						
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
5	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			$ 362.70	$ 294.10	$ -	$ 656.80
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	$ -	$ 438.32
3	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			$ 151.26	$ 72.75	$ -	$ 224.01

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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 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**
			Total		**$ 2,151,089.06**	**$ 10,075,942.91**		**$ 12,227,031.97**

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
D_05_01 Equipment tanks and pumps								
Data Release : Year 2020		**Unit Cost Estimate**						
		See D01.01						
D_05_02 Mechanical modifications to the loading bay								
Data Release : Year 2020		**Unit Cost Estimate**						
28	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			$ 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	$ -	$ -
1	221113484910	Pipe, fittings & valves, coupling, steel, painted, 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	$ -	$ -
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	$ -	$ -
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	221113484960	Pipe, fittings & valves, coupling, steel, painted, 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	$ -	$ -
1	232120701020	Steam trap, cast iron body, float and thermostatic type, threaded, 103 kPa, 25 mm pipe size			$ 218.15	$ 54.18	$ -	$ -

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
1	077123106600	Steel wire strainers, galvanized, rectangular, 50mm x 75mm			$ 30.51	$ 5.69	$ -	$ -
1	221113484910	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 40 mm diameter			$ 39.10	$ 11.87	$ -	$ -
					$ 4,834.56	**$ 2,903.29**	**$ -**	**$ 2,173.48**
			Welder Q1	0.5		**$ 29.41**		**$ 29.41**
			Welder P	1		**$ 2,844.47**		**$ 2,844.47**
			QA inspection	1		$ 2,873.88		**$ 2,873.88**
			subtotal labor			$ 8,651.05		**$ 8,651.05**
					$ 4,834.56	**$ 8,651.05**		**$ 13,485.61**
D_05_03 Active plant drainage 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	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			$ 290.70	$ 366.35	$ -	$ -
					$ 1,170.54	$ 1,313.69	$ -	$ -
			Welder Q1	0.5		**$ 473.67**		**$ 473.67**
			QA inspection	1		$ 473.67		**$ 473.67**
			subtotal labor			$ 2,261.03		$ 947.34
			EMWG pipe factor	12.86956522		$ 29,098.47		$ 29,098.47
			Subtotal with EMGW			$ 31,359.50		$ 30,045.81
			Labor factor 2.5x	1.5		$ 47,039.25		$ 47,039.25
					$ 1,170.54	**$ 78,398.76**		**$ 79,569.30**
D_05_04 West Annex active plant drainage discharge and vent line piping								
Data Release : 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	$ -	$ -
65	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			$ 3,779.10	$ 4,762.55	$ -	$ -
5	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			$ 391.00	$ 469.55	$ -	$ -
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. 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	$ -	$ -
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	$ -	$ -
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, excl joint coupling material			$ 907.56	$ 575.82	$ -	$ -
90	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			$ 4,537.80	$ 2,879.10	$ -	$ -
5	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			$ 439.90	$ 216.70	$ -	$ -
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	$ -	$ -
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	$ -	$ -
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	$ -	$ -

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			$ 1,541.47	$ 325.08	$ -	$ -
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	$ -	$ -
2	221113484912	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter			$ 98.78	$ 31.88	$ -	$ -
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	$ -	$ -
3	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			$ 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			$ 154.36	$ 93.92	$ -	$ -
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			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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
7	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			$ 15,030.12	$ 241.99	$ -	$ 15,272.11
3	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			$ 6,441.48	$ 143.97	$ -	$ 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
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	$ -	$ -
					$ 199,819.70	$ 41,555.77	$ -	$ 67,547.06
			Welder Q1	0.5		**$ 16,625.96**		**$ 16,625.96**
			Welder Q2	0.33		**$ 382.53**		**$ 382.53**

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	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	**$ 3,116,673.92**		**$ 3,349,834.50**

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
D_05_05 D2O 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, excl joint coupling material			$ 2,996.48	$ 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	$ 207.22	$ -	$ -
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	$ -	$ -
13	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			$ 655.46	$ 315.25	$ -	$ -
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	$ -	$ -
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	$ -	$ -

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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 joint coupling labor, excl joint 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	$ 78.96	$ -	$ 6,520.44
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
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
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
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	221113484960	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter			$ 28.30	$ 7.95	$ -	$ -
10	221113470630	Gasket and bolt set, for flanges, 1034 kPa, 50 mm pipe size			$ 100.80	$ 614.00	$ -	$ -
					$ 66,930.27	**$ 10,811.14**	**$ -**	**$ 34,775.68**
			Welder Q1	0.5		**$ 1,733.76**		**$ 1,733.76**
			Welder P	1		**$ 7,343.62**		**$ 7,343.62**
			QA inspection	1		$ 9,077.38		**$ 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			Ext. 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**			**$ 15,364.25**
					$ 82,294.52	**$ 1,004,361.10**		**$ 1,086,655.62**
D_05_06 Management building west annex at elev 100								
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	$ -	$ -
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			$ 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	$ -	$ -
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	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	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	$ -	$ -
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	$ -	$ -
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	$ -	$ -
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	$ -	$ -
1	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			$ 160.52	$ 84.11	$ -	$ -
1	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			$ 160.52	$ 84.11	$ -	$ -

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
2	221316502820	Drain, shower, with strainer, uniform diameter trap, bronze top, 100 mm pipe size			$ 936.40	$ 408.68	$ -	$ -
12	221316502820	Drain, shower, with strainer, uniform diameter trap, bronze top, 100 mm pipe size			$ 5,618.40	$ 2,452.08	$ -	$ -
1	221113484960	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter			$ 28.30	$ 7.95	$ -	$ -
2	221113470630	Gasket and bolt set, for flanges, 1034 kPa, 50 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**
			Welder P	1		**$ 2,847.10**		**$ 2,847.10**
			QA inspection	1		$ 10,972.55		**$ 10,972.55**
			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 D2O management building west annex elev 107								
13	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 4,347.59	$ 1,073.28	$ -	$ -
50	221113644390	Pipe, stainless steel, threaded, 100 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 34,729.00	$ 7,172.50	$ -	$ -
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	$ -	$ -
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	$ -	$ -
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	$ -	$ -
5	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			$ 439.90	$ 216.70	$ -	$ -
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	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
1	221113484110	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, 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	$ -	$ -
3	221316502820	Drain, shower, with strainer, uniform diameter 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	$ -	$ -
1	221113484990	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter			$ 42.70	$ 15.94	$ -	$ -
					$ 47,859.68	**$ 10,845.32**	**$ -**	**$ -**
			Welder Q1	0.5		**$ 1,190.66**		$ 1,190.66
			Welder Q2	0.33		**$ 2,773.37**		$ 2,773.37
			Welder P	1		**$ 143.90**		$ 143.90
			QA inspection	1		$ 4,107.93		$ 4,107.93
			subtotal labor			$ 19,061.17		$ 8,215.85
			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		$ 396,555.28		$ 396,555.28
			SS premium fixtures 2	2.5	**$ 8,066.13**			$ 8,066.13
					$ 55,925.81	**$ 660,925.47**		**$ 716,851.27**
D_05_08 D2O management bldg el 86_7 discharge piping								
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	$ -	$ -
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	$ -	$ -
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	$ -	$ -
2	221113484912	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter			$ 98.78	$ 31.88	$ -	$ -
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	221113484990	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter			$ 85.40	$ 31.88	$ -	$ -

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
1	221113470630	Gasket and bolt set, for flanges, 1034 kPa, 50 mm pipe size			$ 10.08	$ 61.40	$ -	$ -
					$ 7,151.30	**$ 747.34**	**$ -**	**$ 6,545.19**
			Welder P	1		**$ 747.34**		**$ 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			$ 31,095.84		$ 36,893.69
			Labor factor 2.5x	1.5		$ 46,643.76		$ 46,643.76
			SS premium fixtures 2	2.5	**$ 1,774.55**			$ 1,774.55
					$ 8,925.85	**$ 77,739.61**		**$ 86,665.46**
D_05_09 D2O management building elev 87								
5	221113644310	Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 529.95	$ 250.25	$ -	$ -
5	221113644320	Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 601.95	$ 255.40	$ -	$ -
5	221113644330	Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 833.50	$ 291.55	$ -	$ -
230	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 76,918.90	$ 18,988.80	$ -	$ -
40	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			$ 2,016.80	$ 1,279.60	$ -	$ -
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	$ -	$ -
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	$ -	$ -
1	221113484912	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter			$ 49.39	$ 15.94	$ -	$ -
8	221113484912	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter			$ 395.12	$ 127.52	$ -	$ -

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
8	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			$ 617.44	$ 375.68	$ -	$ -
2	221113484912	Pipe, fittings & valves, coupling, steel, painted, 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
9	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			$ 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
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 mm pipe size			$ 302.40	$ 1,842.00	$ -	$ -
					$ 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		$ 17,005.68		$ 17,005.68
			subtotal labor			$ 62,554.84		$ 64,464.83
			EMWG pipe factor	12.86956522		$ 805,053.59		$ 805,053.59
			Subtotal with EMGW			$ 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**
			Total		**$ 646,245.42**	**$ 8,567,081.48**		**$ 9,213,326.89**

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
D_06_01 Equipment tanks and pumps								
		See D01.01						
D_06_02 Tie in to inactive plant drainage								
5	221113481080	Pipe, fittings & valves, steel, black, grooved joint, 50 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC	$ -	$ 101.55	$ 180.10	$ 327.65	$ -	$ 507.75
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	$ -	$ 430.74	$ 2,144.16	$ 34.57	$ -	$ 2,178.73
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	$ -	$ 82.41	$ 151.26	$ 95.97	$ -	$ 247.23
1	221113484990	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter	$ -	$ 58.64	$ 42.70	$ 15.94	$ -	$ 58.64
1	221113484912	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter	$ -	$ 65.33	$ 49.39	$ 15.94	$ -	$ 65.33
					$ 2,567.61	**$ 490.07**	**$ -**	**$ 3,057.68**
			Welder P	1		**$ 490.07**		**$ 490.07**
			QA inspection	1		$ 490.07		**$ 490.07**
			subtotal labor			$ 1,470.21		$ 4,037.82
			Labor factor 2.5x	1.5		$ 2,205.32		**$ 2,205.32**
					$ 2,567.61	**$ 3,675.53**		**$ 6,243.14**
D_06_03 Pipe supports								
5	221113470628	Gasket and bolt set, for flanges, 1034 kPa, 40 mm pipe size	$ -	$ 58.11	$ 24.80	$ 265.75	$ -	$ 290.55
					$ 24.80	**$ 265.75**	**$ -**	**$ 290.55**
			Welder Q1	0.5		**$ 132.88**		**$ 132.88**
			Welder P	1		**$ 265.75**		**$ 265.75**
			QA inspection	1		$ 398.63		**$ 398.63**
			subtotal labor			$ 1,063.00		$ 1,087.80
			Labor factor 2.5x	1.5		$ 1,594.50		**$ 1,594.50**
			SS premium fixture	2.5	**$ -**			
					$ 24.80	**$ 2,657.50**		**$ 2,682.30**
D_06_04 HWMB West Annex inactive plant drainge								
5	221113481040	Pipe, fittings & valves, steel, black, grooved joint, 20 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC	$ -	$ 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
5	221113484990	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 50 mm diameter			$ 213.50	$ 79.70	$ -	$ 293.20
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
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
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			$ 1,541.47	$ 325.08	$ -	$ 1,866.55
1	221113485830	Pipe, fittings & valves, flange, black steel, painted, with grooved face for gasket, grooved 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. O&P	Ext. Total O&P
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 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
9	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			$ 791.82	$ 390.06	$ -	$ 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
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
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

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
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	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	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			$ 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
1	221119140120	Flexible metal hose, bronze braided, bronze ends, threaded, 10 mm diameter x 300 mm			$ 31.90	$ 30.96	$ -	$ 62.86
47	221113484990	Pipe, fittings & valves, coupling, steel, painted, 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
		Painting compound sealing allow			$ 971.10			$ 971.10
				$ 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
			QA inspection	1		$ 16,961.50		$ 16,961.50
			subtotal labor			$ 52,412.85		$ 104,774.62
			Labor factor 2.5x	1.5		$ 78,619.28		$ 78,619.28
			SS premium fixture	2.5	**$ -**			
					$ 52,361.77	**$ 131,032.13**		**$ 183,393.90**
D_06_05 HWMB West Annex 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
16	221113481100	Pipe, fittings & valves, steel, black, grooved joint, 80 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC			$ 1,300.64	$ 1,502.56	$ -	$ 2,803.20
70	221113481110	Pipe, fittings & valves, steel, black, grooved joint, 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	Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	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	$ -	$ 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	$ -	$ 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	$ -	$ 247.23
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	$ -	$ 262.64
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
6	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			$ 574.20	$ 343.68	$ -	$ 917.88
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
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
3	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			$ 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	$ -	$ 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**		$ 771.95
			Welder P	1		**$ 2,132.35**		$ 2,132.35
			QA inspection	1		$ 8,433.45		$ 8,433.45

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
			subtotal labor			$ 32,373.40		$ 49,814.40
			Labor factor 2.5x	1.5		$ 48,560.11		$ 48,560.11
					$ 17,441.00	**$ 80,933.51**		**$ 98,374.51**
			Total		**$ 72,395.18**	**$ 218,298.66**		**$ 290,560.96**

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
D_07_01 West annex D2O drum handling								
5	221113232120	Pipe, copper, tubing, solder, 10 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC			$ 62.00	$ 154.80	$ -	$ 216.80
7	221113644310	Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 741.93	$ 350.35	$ -	$ 1,092.28
5	221113644310	Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 529.95	$ 250.25	$ -	$ 780.20
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
15	221113644310	Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 1,589.85	$ 750.75	$ -	$ 2,340.60
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
55	221113644330	Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 9,168.50	$ 3,207.05	$ -	$ 12,375.55
50	221113644330	Pipe, stainless steel, threaded, 25 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 8,335.00	$ 2,915.50	$ -	$ 11,250.50
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
35	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 11,705.05	$ 2,889.60	$ -	$ 14,594.65
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
10	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			$ 936.40	$ 159.40	$ -	$ 1,095.80
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	$ -	$ 66.36

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
28	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			$ 1,411.76	$ 446.32	$ -	$ 1,858.08
47	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			$ 2,369.74	$ 749.18	$ -	$ 3,118.92
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
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, excl joint coupling material			$ 907.56	$ 575.82	$ -	$ 1,483.38
28	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			$ 4,609.92	$ 967.96	$ -	$ 5,577.88
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
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
4	221113484908	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm diameter			$ 156.40	$ 31.80	$ -	$ 188.20
8	221113484908	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm diameter			$ 312.80	$ 63.60	$ -	$ 376.40
2	221113484908	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm diameter			$ 78.20	$ 15.90	$ -	$ 94.10
19	221113484908	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 25 mm diameter			$ 742.90	$ 151.05	$ -	$ 893.95
1	221113484910	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 40 mm diameter			$ 39.10	$ 11.87	$ -	$ 50.97

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
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
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
5	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			$ 501.65	$ 105.80	$ -	$ 607.45
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
11	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			$ 848.98	$ 266.75	$ -	$ 1,115.73
20	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			$ 1,543.60	$ 485.00	$ -	$ 2,028.60
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
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	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	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
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
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
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
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

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
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	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			$ 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	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			$ 55,566.00	$ 3,426.24	$ -	$ 58,992.24
1	113015433600	Heater, residential appliances, electric, built-in, ceiling type, 1250 watt, maximum			$ 264.82	$ 232.78	$ -	$ 497.60
16	221119140120	Flexible metal hose, bronze braided, bronze ends, threaded, 10 mm diameter x 300 mm			$ 510.40	$ 495.36	$ -	$ 1,005.76

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
19	221119140160	Flexible metal hose, bronze braided, bronze ends, threaded, 20 mm diameter x 300 mm			$ 850.44	$ 764.75	$ -	$ 1,615.19
2	108805104000	Scales, portable, digital type, 454 kg capacity, 610 mm x 762 mm platform			$ 34,633.31	$ 346.88		$ 34,980.19
16	221119140160	Flexible metal hose, bronze braided, bronze ends, threaded, 20 mm diameter x 300 mm			$ 716.16	$ 644.00	$ -	$ 1,360.16
19	221119140160	Flexible metal hose, bronze braided, bronze ends, threaded, 20 mm diameter x 300 mm			$ 850.44	$ 764.75	$ -	$ 1,615.19
6	221113484960	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter			$ 169.80	$ 47.70	$ -	$ 217.50
					$ 328,394.35	**$ 28,353.90**	**$ -**	**$ 356,748.25**
			Welder Q1	0.5		**$ 1,651.20**		**$ 1,651.20**
			Welder Q2	0.33		**$ 1,998.64**		**$ 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		**$ 328,394.35**			$ 7,147,624.62
			NC factor	0.3244805	**$ 106,557.56**			**$ 106,557.56**
					$ 434,951.91	**$ 6,819,230.27**		**$ 7,254,182.18**
D_07_02 to 05 Drum filling transfer tool								
6	118226101420	Waste handling equipment, for handling hazardous waste materials, w/charcoal & HEPA filter, 208 L drum packer			$ 305,200.80	$ 10,434.07	$ -	$ 315,634.87
3	118226101420	Waste handling equipment, for handling hazardous waste materials, w/charcoal & HEPA filter, 208 L drum packer			$ 152,600.40	$ 5,217.04	$ -	$ 157,817.44
3	118226101420	Waste handling equipment, for handling hazardous waste materials, w/charcoal & HEPA filter, 208 L drum packer			$ 152,600.40	$ 5,217.04	$ -	$ 157,817.44
1	221123103220	628411-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**
			SS premium fixture	2.5	**$ -**			
					$ 644,360.55	**$ 2,893,753.22**		**$ 3,538,113.77**
			Total		**$ 1,079,312.46**	**$ 9,712,983.49**		**$ 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 Systems		$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			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
E_01_01 Chilled water equipment								
Data Release : 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 controls, excludes water tower			$ 676,785.40	$ 44,198.60	$ -	$ 720,984.00
					$ 676,785.40	**$ 44,198.60**	**$ -**	**$ 720,984.00**
			Welder Q1	0.5				
			Steamfitter Q7	0.25		**$ 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 Chilled water piping and fittings								
Data Release : 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
185	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 61,869.55	$ 15,273.60	$ -	$ 77,143.15
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	$ -	$ 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

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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			$ 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
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
1	232120880220	Venturi flow, measuring device, 80 mm diameter			$ 648.27	$ 104.23	$ -	$ 752.50
90	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			$ 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	221113484918	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 100 mm diameter			$ 1,080.48	$ 346.80	$ -	$ 1,427.28

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
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	$ -	$ 314.10
165	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			$ 2,003.10	$ 3,179.55	$ -	$ 5,182.65
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
					$ 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 Q2	0.33		**$ 4,542.58**		$ 4,542.58
			Welder P	1		**$ 21,776.64**		$ 21,776.64
			QA inspection	1		$ 147,900.01		$ 147,900.01
			subtotal labor			$ 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 Equipment								
Data Release : 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	35.97826087		$ 457,936.54		**$ 457,936.54**
			Subtotal with EMGW			$ 470,664.69		$ 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 Piping and fittings								
Data Release : Year 2020		**Unit Cost Estimate**						
15	221113644320	Pipe, stainless steel, threaded, 20 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 1,805.85	$ 766.20	$ -	$ 2,572.05
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	$ -	$ 3,375.15
15	221113644360	Pipe, stainless steel, threaded, 50 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 5,016.45	$ 1,238.40	$ -	$ 6,254.85
10	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			$ 936.40	$ 159.40	$ -	$ 1,095.80
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	$ -	$ 438.32
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
15	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			$ 756.30	$ 239.10	$ -	$ 995.40
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

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
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
6	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			$ 987.84	$ 207.42	$ -	$ 1,195.26
16	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			$ 2,634.24	$ 553.12	$ -	$ 3,187.36
1	221113484950	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 20 mm diameter			$ 28.30	$ 7.95	$ -	$ 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
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
2	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			$ 154.36	$ 106.30	$ -	$ 260.66
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
3	221113484914	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 65 mm diameter			$ 168.24	$ 53.73	$ -	$ 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	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
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			$ 1,188.51	$ 103.71	$ -	$ 1,292.22
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
5	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			$ 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	$ -	$ 2,140.86
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
10	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			$ 2,675.40	$ 892.70	$ -	$ 3,568.10
1	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			$ 267.54	$ 89.27	$ -	$ 356.81
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	$ 69.14	$ -	$ 398.42
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

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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	$ -	$ 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	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
11	221113484840	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			$ 13,299.88	$ 2,043.36	$ -	$ 15,343.24
2	221113484851	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			$ 3,087.00	$ 495.36	$ -	$ 3,582.36
1	221113484912	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter			$ 49.39	$ 15.94	$ -	$ 65.33
8	221113484912	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter			$ 395.12	$ 127.52	$ -	$ 522.64
2	221113485120	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 350 mm diameter			$ 1,193.64	$ 185.76	$ -	$ 1,379.40

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	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, excl 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	$ -	$ 3,429.24
					$ 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 Q2	0.33		**$ 1,860.39**		$ 1,860.39
			Welder P	1		**$ 34,644.55**		$ 34,644.55
			QA 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		**$ 253,838.26**			$ 12,751,190.65
			NC factor	0.324480494	**$ 82,365.56**			$ 82,365.56
					$ 336,203.82	**$ 12,497,352.39**		**$ 12,833,556.21**
				Total	**$ 4,587,783.57**	**$ 13,674,014.11**	**$ -**	**$ 18,261,797.68**

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
E_03_01 Heavy water mngt bldg wsst annex								
Data Release : Year 2020		**Unit Cost Estimate**						
37	221113232260	Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC			$ 2,588.89	$ 2,310.28	$ -	$ 4,899.17
22	221113232240	Pipe, copper, tubing, solder, 40 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC			$ 950.84	$ 1,101.10	$ -	$ 2,051.94
128	221113232200	Pipe, copper, tubing, solder, 25 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC			$ 3,622.40	$ 4,887.04	$ -	$ 8,509.44
8	221113232180	Pipe, copper, tubing, solder, 20 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC			$ 139.92	$ 276.56	$ -	$ 416.48
5	221113231140	Pipe, copper, tubing, solder, 15 mm diameter, type K, includes coupling & clevis hanger assembly 3 m OC			$ 98.25	$ 167.70	$ -	$ 265.95
3	221113250540	Tee, copper, wrought, copper x copper, 50 mm			$ 196.02	$ 340.56	$ -	$ 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	$ 239.42	$ -	$ 751.86
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	220523201060	Valves, bronze, angle, rising stem, threaded or soldered same price, 1034 kPa, 15 mm			$ 390.98	$ 69.72	$ -	$ 460.70
2	220523201070	Valves, bronze, angle, rising stem, threaded or soldered same price, 1034 kPa, 20 mm			$ 529.70	$ 76.70	$ -	$ 606.40
8	220523201080	Valves, bronze, angle, rising stem, threaded or soldered same price, 1034 kPa, 25 mm			$ 2,900.80	$ 322.72	$ -	$ 3,223.52
5	220523201100	Valves, bronze, angle, rising stem, threaded or soldered same price, 1034 kPa, 40 mm			$ 3,021.65	$ 296.30	$ -	$ 3,317.95
16	220523201110	Valves, bronze, angle, rising stem, threaded, 1034 kPa, 50 mm			$ 15,638.88	$ 1,115.52	$ -	$ 16,754.40
10	221113231180	Pipe, copper, tubing, solder, 20 mm diameter, type K, includes coupling & clevis hanger assembly 3 m OC			$ 319.00	$ 350.90	$ -	$ 669.90
					$ 31,702.11	**$ 11,607.16**	**$ -**	**$ 43,309.27**
			Welder Q1	0.5		**$ 170.28**		**$ 170.28**
			Welder P	1		**$ 11,367.74**		**$ 11,367.74**
			QA inspection	1		$ 11,538.02		**$ 11,538.02**
			subtotal labor			$ 34,683.20		$ 66,385.31
			Labor factor 2.5x	1.5		$ 52,024.80		**$ 52,024.80**
			Total		**$ 31,702.11**	**$ 86,708.00**		**$ 118,410.11**
E_03_02 Instrument air for new D2O west annex								
Data Release : Year 2020		**Unit Cost Estimate**						
2	236213100700	Condensing unit, air cooled, compressor, 70 kW, includes standard controls			$ 23,607.60	$ 10,901.00	$ -	$ 34,508.60

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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	Ext. Total O&P
2	220523201060	Valves, bronze, angle, rising stem, threaded or soldered same price, 1034 kPa, 15 mm			$ 390.98	$ 69.72	$ -	$ 460.70
4	220523201080	Valves, bronze, angle, rising stem, threaded or soldered same price, 1034 kPa, 25 mm			$ 1,450.40	$ 161.36	$ -	$ 1,611.76
2	232223102150	Pump, condensate return system, duplex, float 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
2	232223102150	Pump, condensate return system, duplex, float 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
2	234113103100	Air filter, mechanical media filtration units, high efficiency type, with frame, supported			$ 281.92	$ 70.00	$ -	$ 351.92
2	234113103100	Air filter, mechanical media filtration units, high efficiency type, with frame, supported			$ 281.92	$ 70.00	$ -	$ 351.92
50	221113250612	Tee, copper, wrought, copper x copper, 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	$ -	$ 2,126.80
					$ 230,280.22	**$ 56,932.82**	**$ -**	**$ 287,213.04**
			Sampling			**$ 19,057.50**		**$ 19,057.50**
			Welder Q1	0.5		**$ 3,009.31**		**$ 3,009.31**
			Welder Q 5	0.5		**$ 622.36**		**$ 622.36**
			Welder Q6	0.50		**$ 5,450.50**		**$ 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		**$ 41,077.85**
			subtotal labor			$ 158,146.02		$ 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	0.324480494	**$ 74,721.44**			**$ 74,721.44**
			Total		**$ 305,001.66**	**$ 395,365.05**		**$ 700,366.71**
E_03_03 HWMB west annex D2O mngt bldg breathing ari piping								
Data Release : Year 2020		**Unit Cost Estimate**						
5	221113232140	Pipe, copper, tubing, solder, 15 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC			$ 68.45	$ 162.55	$ -	$ 231.00
5	221113232140	Pipe, copper, tubing, solder, 15 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC			$ 68.45	$ 162.55	$ -	$ 231.00
128	221113232200	Pipe, copper, tubing, solder, 25 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC			$ 3,622.40	$ 4,887.04	$ -	$ 8,509.44
250	221113232240	Pipe, copper, tubing, solder, 40 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC			$ 10,805.00	$ 12,512.50	$ -	$ 23,317.50
78	221113232260	Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC			$ 5,457.66	$ 4,870.32	$ -	$ 10,327.98
2	221113250540	Tee, copper, wrought, copper x copper, 50 mm			$ 130.68	$ 227.04	$ -	$ 357.72
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

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
21	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			$ 8,319.57	$ 552.72	$ -	$ 8,872.29
21	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			$ 8,319.57	$ 725.97	$ -	$ 9,045.54
21	230943104690	Pneumatic control system, air supply for pneumatic, tank mounted duplex compressor, starter, alternator, piping, dryer, PRV station & filter control system, 4 kW			$ 796,763.10	$ 106,671.60	$ -	$ 903,434.70
40	221113250700	Coupling, copper, wrought, copper x copper, 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 Q1	0.5		**$ -**		**$ -**
			Welder Q19	0.33		**$ 35,557.20**		**$ 35,557.20**
			Welder P	1		**$ 132,331.73**		**$ 132,331.73**
			QA inspection	1		$ -		**$ -**
			subtotal labor			$ 319,278.16		$ 1,153,748.18
			Labor factor 2.5x	1.5		$ 478,917.24		**$ 478,917.24**
			subtotal materials		**$ 834,470.02**			$ 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**						
19	221113231200	Pipe, copper, tubing, solder, 25 mm diameter, type K, includes coupling & clevis hanger assembly 3 m OC			$ 899.27	$ 754.87	$ -	$ 1,654.14
35	221113231240	Pipe, copper, tubing, solder, 40 mm diameter, type K, includes coupling & clevis hanger assembly 3 m OC			$ 2,412.90	$ 1,824.20	$ -	$ 4,237.10
15	221113481130	Pipe, fittings & valves, steel, black, grooved joint, 150 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC			$ 2,917.20	$ 2,616.15	$ -	$ 5,533.35
11	221113470630	Gasket and bolt set, for flanges, 1034 kPa, 50 mm pipe size			$ 110.88	$ 675.40	$ -	$ 786.28
4	220523201500	Valves, bronze body, ball, 1034 kPa, 50 mm, threaded or soldered			$ 386.76	$ 278.88	$ -	$ 665.64
1	220523201500	Valves, bronze body, ball, 1034 kPa, 50 mm, threaded or soldered			$ 96.69	$ 69.72	$ -	$ 166.41
4	221113484960	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter			$ 113.20	$ 31.80	$ -	$ 145.00
4	221113484980	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 40 mm diameter			$ 158.48	$ 47.48	$ -	$ 205.96
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
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

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
6		Rubber hose, 1" diam, 50 ft. long			$ 1,100.00	$ 100.00		$ 1,200.00
1	221113250710	Coupling, copper, wrought, copper x copper, 25 mm			$ 6.02	$ 44.38	$ -	$ 50.40
					$ 10,182.25	**$ 6,574.48**	**$ -**	**$ 16,756.73**
			Welder Q1	0.5		**$ -**		**$ -**
			Welder Q2	0.33		**$ 872.05**		**$ 872.05**
			Welder P	1		**$ 3,858.33**		**$ 3,858.33**
			subtotal labor			$ 11,304.86		$ 21,487.11
			Labor factor 2.5x	1.5		$ 16,957.29		**$ 16,957.29**
			SS premium fixture	2.5	**$ -**			**$ -**
			Total		**$ 10,182.25**	**$ 28,262.15**		**$ 38,444.40**
E_03_05 Relocation of the oxygen tank and undergrd line								
Data Release : Year 2020		**Unit Cost Estimate**						
75	221113231200	Pipe, copper, tubing, solder, 25 mm diameter, type K, includes coupling & clevis hanger assembly 3 m OC			$ 3,549.75	$ 2,979.75	$ -	$ 6,529.50
2	220523201470	Valves, bronze, ball, 1034 kPa, 25 mm, threaded or soldered			$ 73.58	$ 80.68	$ -	$ 154.26
7	221113470630	Gasket and bolt set, for flanges, 1034 kPa, 50 mm pipe size			$ 70.56	$ 429.80	$ -	$ 500.36
50	312316140450	Excavating, chain trencher, utility trench, common earth, 9 kW, 150 mm wide, 900 mm deep, operator walking			$ -	$ 249.00	$ 74.00	$ 323.00
50	312316141450	Excavating, chain trencher, utility trench, common earth, 150 mm wide, 900 mm deep, backfill by hand, includes compaction, add			$ -	$ 496.00	$ 63.50	$ 559.50
5	312316140450	Excavating, chain trencher, utility trench, common earth, 9 kW, 150 mm wide, 900 mm deep, operator walking			$ -	$ 24.90	$ 7.40	$ 32.30
5	312316141450	Excavating, chain trencher, utility trench, common earth, 150 mm wide, 900 mm deep, backfill by hand, includes compaction, add			$ -	$ 49.60	$ 6.35	$ 55.95
5	312316140450	Excavating, chain trencher, utility trench, common earth, 9 kW, 150 mm wide, 900 mm deep, operator walking			$ -	$ 24.90	$ 7.40	$ 32.30
5	312316141450	Excavating, chain trencher, utility trench, common earth, 150 mm wide, 900 mm deep, backfill by hand, includes compaction, add			$ -	$ 49.60	$ 6.35	$ 55.95
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
					$ 3,858.53	**$ 4,418.80**	**$ 165.00**	**$ 8,442.33**
			Welder P	1		**$ 3,490.23**		**$ 3,490.23**
			subtotal labor			$ 7,909.03		$ 11,932.56
			Labor factor 2.5x	1.5		$ 11,863.55		**$ 11,863.55**
			Total		**$ 3,858.53**	**$ 19,772.58**	**$ 165.00**	**$ 23,796.11**
E_03_06 Tritium removal facility helium supply system								
Data Release : Year 2020		**Unit Cost Estimate**						
125	221113644310	Pipe, stainless steel, threaded, 15 mm diameter, schedule 40, type 316, includes couplings and hangers 3 m OC			$ 13,248.75	$ 6,256.25	$ -	$ 19,505.00

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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		$ 12,859.38		**$ 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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

Table D-5: BOQ Section F – Building Support Systems Tie-in

			Overnight materials costs	Overnight labour 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 Condensate System		$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			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
F_01_01 Supply of domestic water to the West Annex								
Data Release : Year 2020		**Unit Cost Estimate**						
75	221113232260	Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC			$ 5,247.75	$ 4,683.00	$ -	$ 9,930.75
18	221113250718	Coupling, copper, wrought, copper x copper, 50 mm			$ 311.22	$ 1,105.20	$ -	$ 1,416.42
16	221113250160	Elbow, 90 Deg., copper, wrought, copper x copper, 50 mm			$ 535.04	$ 1,155.84	$ -	$ 1,690.88
4	221113250340	Elbow, 45 Deg., copper, wrought, copper x copper, 50 mm			$ 137.88	$ 288.96	$ -	$ 426.84
1	221113250560	Tee, copper, wrought, copper x copper, 80 mm			$ 179.05	$ 204.34	$ -	$ 383.39
75	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			$ 732.75	$ 2,129.25	$ -	$ 2,862.00
1	221113250718	Coupling, copper, wrought, copper x copper, 50 mm			$ 17.29	$ 61.40	$ -	$ 78.69
2	221113250718	Coupling, copper, wrought, copper x copper, 50 mm			$ 34.58	$ 122.80	$ -	$ 157.38
1	220523203980	Valves, bronze, gate, rising stem, soldered, 2069 kPa, 50 mm			$ 714.68	$ 69.72	$ -	$ 784.40
					$ 7,910.24	**$ 9,820.51**	**$ -**	**$ 17,730.75**
			Welder Q1	0.5		**$ 102.17**		**$ 102.17**
			Welder Q2	0.33		**$ -**		**$ -**
			Welder P	1		**$ 7,486.92**		**$ 7,486.92**
			QA inspection	1		$ -		**$ -**
			subtotal labor			$ 17,409.60		$ 25,319.84
			Labor factor 2.5	1.5		$ 26,114.40		**$ 26,114.40**
			SS premium fixt	2.5	**$ -**			
			Total		**$ 7,910.24**	**$ 43,524.00**		**$ 51,434.24**
F_01_02 jConstruction water tie-in for HWMB West Annex								
Data Release : Year 2020		**Unit Cost Estimate**						
10	221113232260	Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC			$ 699.70	$ 624.40	$ -	$ 1,324.10
2	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			$ 24.28	$ 38.54	$ -	$ 62.82
8	220719108180	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			$ 72.32	$ 219.12	$ -	$ 291.44
1	221113250718	Coupling, copper, wrought, copper x copper, 50 mm			$ 17.29	$ 61.40	$ -	$ 78.69
1	221113250718	Coupling, copper, wrought, copper x copper, 50 mm			$ 17.29	$ 61.40	$ -	$ 78.69
1	221113250718	Coupling, copper, wrought, copper x copper, 50 mm			$ 17.29	$ 61.40	$ -	$ 78.69
1	221113250160	Elbow, 90 Deg., copper, wrought, copper x copper, 50 mm			$ 33.44	$ 72.24	$ -	$ 105.68
1	221113250540	Tee, copper, wrought, copper x copper, 50 mm			$ 65.34	$ 113.52	$ -	$ 178.86

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
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**
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
					$ 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**
			Total		**$ 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 header to PRV 30								
Data Release : Year 2020		**Unit Cost Estimate**						
4	221113481050	Pipe, fittings & valves, steel, black, grooved joint, 25 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC			$ 94.68	$ 165.12	$ -	$ 259.80
4	221113481130	Pipe, fittings & valves, steel, black, grooved joint, 150 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC			$ 777.92	$ 697.64	$ -	$ 1,475.56
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
4	220719107490	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			$ 159.76	$ 260.96	$ -	$ 420.72
1	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			$ 12.14	$ 19.27	$ -	$ 31.41
4	220719107490	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			$ 159.76	$ 260.96	$ -	$ 420.72
1	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			$ 267.54	$ 89.27	$ -	$ 356.81
1	221113484960	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 25 mm diameter			$ 28.30	$ 7.95	$ -	$ 36.25
1	221113484830	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			$ 946.68	$ 158.93	$ -	$ 1,105.61
1	221113488070	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			$ 1,260.53	$ 97.01	$ -	$ 1,357.54
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	221113484922	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 150 mm diameter			$ 153.32	$ 44.38	$ -	$ 197.70
1	221113484922	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 150 mm diameter			$ 153.32	$ 44.38	$ -	$ 197.70
					$ 4,842.30	**$ 2,003.25**	**$ -**	**$ 6,845.55**
			Labor factor 2.5x	1.5		$ 3,004.88		$ 3,004.88
			Total		**$ 4,842.30**	**$ 5,008.13**		**$ 9,850.43**

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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
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
					$ 730.58	**$ 368.11**	**$ -**	**$ 1,098.69**
			Labor factor 2.5x	1.5		$ 552.17		$ 552.17
			Total		**$ 730.58**	**$ 920.28**		**$ 1,650.86**
F_02_03 D2O Mngt Bldg discharge to htg steam cond piping								
Data Release : Year 2020		**Unit Cost Estimate**						
2	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			$ 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
2	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			$ 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	$ -	$ 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
					$ 711.12	**$ 374.61**	**$ -**	**$ 1,085.73**
			Sampling			**$ 19,057.50**		$ 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 D2O Mngt Bldg West Annex fire protection tie in								
Data Release : Year 2020		**Unit Cost Estimate**						
42	221113481130	Pipe, fittings & valves, steel, black, grooved joint, 150 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC			$ 8,168.16	$ 7,325.22	$ -	$ 15,493.38
9	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			$ 2,407.86	$ 803.43	$ -	$ 3,211.29
3	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			$ 802.62	$ 267.81	$ -	$ 1,070.43
1	221113484922	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 150 mm diameter			$ 153.32	$ 44.38	$ -	$ 197.70
1	221113484830	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			$ 946.68	$ 158.93	$ -	$ 1,105.61
2	221113485840	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			$ 740.88	$ 194.02	$ -	$ 934.90
1	221113488070	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			$ 1,260.53	$ 97.01	$ -	$ 1,357.54
1	221113484922	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 150 mm diameter			$ 153.32	$ 44.38	$ -	$ 197.70
					$ 14,633.37	**$ 8,935.18**	**$ -**	**$ 23,568.55**
			Buttweld Q2&QA	**$ 0.67**		**$ 714.16**		**$ 714.16**
			subtotal labor			$ 9,649.34		$ 24,282.71
			Labor factor 2.5x	1.5		$ 14,474.01		**$ 14,474.01**
			Total		**$ 14,633.37**	**$ 24,123.35**		**$ 38,756.72**
F_03_02 Temporary foam fire suppression connection								
Data Release : Year 2020		**Unit Cost Estimate**						
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
1	221113484912	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 50 mm diameter			$ 49.39	$ 15.94	$ -	$ 65.33
1	221113484912	Pipe, fittings & valves, coupling, steel, painted, rigid 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
2	221113481950	Pipe, fittings & valves, steel, galvanized, grooved joint, 250 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC			$ 843.78	$ 472.66	$ -	$ 1,316.44
2	221113484914	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 65 mm diameter			$ 112.16	$ 35.82	$ -	$ 147.98
2	221113485000	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 65 mm diameter			$ 99.82	$ 35.82	$ -	$ 135.64
					$ 1,271.85	**$ 676.65**	**$ -**	**$ 1,948.50**
			Labor factor 2.5x	1.5		$ 1,014.98		$ 1,014.98

Quantity	LineNumber	Description				Ext. Mat. O&P	Ext. 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 Systems[63]

			Overnight materials costs	Overnight labour costs	Overnight equipment costs	Total overnight costs
Section G, Building Support Systems						
G_01	Plumbing fixtures		$234,613	$198,191	$0	$432,804
G_02	Heating Steam and Condensate 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 Radioactiity Monitoring		Carried under Section H, Electrical			
G_06	Fixed Area Alarming Gamma and Tritium Monitors		Carried under Section 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**

[63] Section G_05 and G_06 are consistent with OPG BOQ Section G.

CONFIDENTIAL ATTORNEY WORK PRODUCT

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
G_01_01 Piumbing fixtures								
Data Release : Year 2020		**Unit Cost Estimate**						
3	224526104200	Industrial safety fixture, eye and face wash, combination fountain, stainless steel, pedestal mounted, excludes rough-in			$ 3,858.75	$ 1,068.12	$ -	$ 4,926.87
4		Rough-in			$ 68,713.60	$ 4,646.40		$ 73,360.00
1	224513106400	Industrial safety fixture, shower, single head, drench, ball valve, pull, freestanding, multi-nozzle, shower only, 12 spray, excludes rough-in			$ 2,392.43	$ 356.04	$ -	$ 2,748.47
					$ 74,964.78	**$ 6,070.56**	**$ -**	**$ 81,035.34**
			Labor factor 2.5x	1.5		$ 9,105.84		$ 9,105.84
			Total		**$ 74,964.78**	**$ 15,176.40**		**$ 90,141.18**
G_01_02 Domestic Water								
Data Release : Year 2020		**Unit Cost Estimate**						
1	223436136080	Water heater, gas fired, 35.1 kW input, 416 L/hr, includes standard controls, excludes vent			$ 10,187.10	$ 665.64	$ -	$ 10,852.74
3	223413109440	Water heaters, tankless, on-demand, natural gas/propane, .6 L/s, excludes vent			$ 3,550.05	$ 1,486.08	$ -	$ 5,036.13
20	221113232140	Pipe, copper, tubing, solder, 15 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC			$ 273.80	$ 650.20	$ -	$ 924.00
10	221113232200	Pipe, copper, tubing, solder, 25 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC			$ 283.00	$ 381.80	$ -	$ 664.80
20	221113232220	Pipe, copper, tubing, solder, 32 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC			$ 885.00	$ 897.80	$ -	$ 1,782.80
10	221113232240	Pipe, copper, tubing, solder, 40 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC			$ 432.20	$ 500.50	$ -	$ 932.70
100	221113232260	Pipe, copper, tubing, solder, 50 mm diameter, type L, includes coupling & clevis hanger assembly 3 m OC			$ 6,997.00	$ 6,244.00	$ -	$ 13,241.00
10	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			$ 73.60	$ 234.10	$ -	$ 307.70
20	220719106870	Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 25 mm wall, 25 mm iron pipe size			$ 82.00	$ 385.40	$ -	$ 467.40
10	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			$ 67.80	$ 214.10	$ -	$ 281.90
20	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			$ 147.20	$ 468.20	$ -	$ 615.40
10	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			$ 73.60	$ 234.10	$ -	$ 307.70
200	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			$ 1,954.00	$ 5,678.00	$ -	$ 7,632.00

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
1	221113250718	Coupling, copper, wrought, copper x copper, 50 mm			$ 17.29	$ 61.40	$ -	$ 78.69
20	221113250718	Coupling, copper, wrought, copper x copper, 50 mm			$ 345.80	$ 1,228.00	$ -	$ 1,573.80
22	221113250160	Elbow, 90 Deg., copper, wrought, copper x copper, 50 mm			$ 735.68	$ 1,589.28	$ -	$ 2,324.96
12	221113250340	Elbow, 45 Deg., copper, wrought, copper x copper, 50 mm			$ 413.64	$ 866.88	$ -	$ 1,280.52
4	221113250540	Tee, copper, wrought, copper x copper, 50 mm			$ 261.36	$ 454.08	$ -	$ 715.44
1	221113250540	Tee, copper, wrought, copper x copper, 50 mm			$ 65.34	$ 113.52	$ -	$ 178.86
1	221113250540	Tee, copper, wrought, copper x copper, 50 mm			$ 65.34	$ 113.52	$ -	$ 178.86
1	221113250540	Tee, copper, wrought, copper x copper, 50 mm			$ 65.34	$ 113.52	$ -	$ 178.86
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	221113250540	Tee, copper, wrought, copper x copper, 50 mm			$ 65.34	$ 113.52	$ -	$ 178.86
1	221113250540	Tee, copper, wrought, copper x copper, 50 mm			$ 65.34	$ 113.52	$ -	$ 178.86
3	221113250540	Tee, copper, wrought, copper x copper, 50 mm			$ 196.02	$ 340.56	$ -	$ 536.58
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	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
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
5	221119421030	Backflow preventer, double check principle, corrosion resistant, automatic operation, ball valves, threaded, 25 mm pipe size, includes valves and four test cocks			$ 1,435.45	$ 283.80	$ -	$ 1,719.25
7	221119421140	Backflow preventer, double check principle, corrosion resistant, automatic operation, gate valves, threaded, 40 mm pipe size, includes valves and four test cocks			$ 9,724.05	$ 556.22	$ -	$ 10,280.27

CONFIDENTIAL ATTORNEY WORK PRODUCT

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Total O&P
2	221119421160	Backflow preventer, double check principle, corrosion resistant, automatic operation, gate valves, threaded, 50 mm pipe size, includes valves and four test cocks			$ 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	$ 73.79	$ -	$ 6,067.72
1	221119263100	Pressure regulator, steam, high capacity, bronze body, stainless steel trim, threaded, 50 mm diameter			$ 5,993.93	$ 73.79	$ -	$ 6,067.72
1	221119263100	Pressure regulator, steam, high capacity, bronze body, stainless steel trim, threaded, 50 mm diameter			$ 5,993.93	$ 73.79	$ -	$ 6,067.72
					$ 63,333.32	**$ 24,636.89**	**$ -**	**$ 87,970.21**
			Labor factor 2.5x	1.5		$ 36,955.34		$ 36,955.34
					$ 63,333.32	**$ 61,592.23**		**$ 124,925.55**
G_01_04 Storm Drainage								
Data Release : Year 2020	**Unit Cost Estimate**							
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
40	221316202200	Pipe, cast iron soil, one hub, service weight, 150 mm diameter, lead and oakum joints 3 m OC, includes clevis hanger assemblies 1.6 m OC			$ 6,297.60	$ 4,004.00	$ -	$ 10,301.60
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	221316302540	Y, cast iron soil, hub and spigot, service weight, 150 mm, includes lead & oakum joints			$ 769.68	$ 809.08	$ -	$ 1,578.76
6	221316302550	Y, cast iron soil, hub and spigot, service weight, 200 mm, includes lead & oakum 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 joints			$ 1,872.80	$ 1,733.76	$ -	$ 3,606.56

CONFIDENTIAL ATTORNEY WORK PRODUCT

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Total O&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
10	220576100140	Cleanout, floor type, round or square, scoriated nickel bronze top, 100 mm pipe 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	$ -	$ 7,926.30
2	220576100200	Cleanout, floor type, round or square, scoriated nickel 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	$ -	$ 18,055.68
8	221113451610	Elbow, 90 Deg., steel, cast iron, black, straight, threaded, extra heavy weight, 100 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
6	221113451610	Elbow, 90 Deg., steel, cast iron, black, straight, threaded, extra heavy weight, 100 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	221316308380	Coupling, cast iron soil, no hub, cast iron clamp and neoprene gasket (by MG), 200 mm			$ 124.51	$ 91.85	$ -	$ 216.36
					$ 96,314.99	**$ 48,568.95**	**$ -**	**$ 144,883.94**
			Labor factor 2.5x	1.5		$ 72,853.43		$ 72,853.43
			Total		**$ 96,314.99**	**$ 121,422.38**		**$ 217,737.37**
			Total		**$ 234,613.09**	**$ 198,191.00**	**$ -**	**$ 432,804.09**

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
G_02_01 Equipment								
Data Release : Year 2020		**Unit 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	$ 1,043.41	$ -	$ 483,208.41
3	238229103250	Hydronic heating, radiator, cast iron, free standing or wall hung, adjustable brackets, 2 per wall radiator up to 30 sections	$ -	$ 107.37	$ 249.27	$ 72.84	$ -	$ 322.11
					$ 482,414.27	**$ 1,116.25**	**$ -**	**$ 483,530.52**
			Labor factor 2.5x	1.5		$ 1,674.37		$ 1,674.37
			Total		**$ 482,414.27**	**$ 2,790.62**		**$ 485,204.89**
G_02_02 Piping and fittings								
Data Release : Year 2020		**Unit Cost Estimate**						
2	221113441300	Pipe, steel, galvanized, threaded, 10 mm, schedule 40, Spec. A-53, includes coupling and clevis hanger assembly sized for covering, 3 m OC			$ 61.74	$ 80.50	$ -	$ 142.24
5	221113441310	Pipe, steel, galvanized, threaded, 15 mm, schedule 40, Spec. A-53, includes coupling and clevis hanger assembly 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	$ 171.32	$ -	$ 245.80
77	221113441360	Pipe, steel, galvanized, threaded, 50 mm, schedule 40, Spec. A-53, includes coupling and clevis hanger assembly sized for covering, 3 m OC			$ 2,258.41	$ 5,641.79	$ -	$ 7,900.20
96	221113441400	Pipe, steel, galvanized, threaded, 100 mm, schedule 40, Spec. A-53, includes coupling and clevis hanger assembly sized for covering, 3 m OC			$ 9,137.28	$ 12,581.76	$ -	$ 21,719.04
1	221113484922	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 150 mm diameter			$ 153.32	$ 44.38	$ -	$ 197.70
20	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			$ 1,914.00	$ 1,145.60	$ -	$ 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
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	$ -	$ 458.94

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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			$ 882.87	$ 187.32	$ -	$ 1,070.19
6	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			$ 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 kPa, 50 mm			$ 2,963.84	$ 384.44	$ -	$ 3,348.28
2	230523802000	Valves, steel, cast, gate, flanged, 1034 kPa, 50 mm			$ 1,481.92	$ 192.22	$ -	$ 1,674.14
4	230523802000	Valves, steel, cast, gate, flanged, 1034 kPa, 50 mm			$ 2,963.84	$ 384.44	$ -	$ 3,348.28

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
4	230523802000	Valves, steel, cast, gate, flanged, 1034 kPa, 50 mm			$ 2,963.84	$ 384.44	$ -	$ 3,348.28
2	230523802000	Valves, steel, cast, gate, flanged, 1034 kPa, 50 mm			$ 1,481.92	$ 192.22	$ -	$ 1,674.14
2	232120780100	Strainer, Y type, iron body, screwed, 1724 kPA, 15 mm pipe size			$ 45.28	$ 80.50	$ -	$ 125.78
2	232120700070	Steam trap, cast iron body, inverted bucket type, threaded, 20 mm pipe size			$ 637.98	$ 162.02	$ -	$ 800.00
1	230523803760	Valves, steel, cast, globe, flanged, 1034 kPa, 100 mm			$ 2,023.18	$ 463.14	$ -	$ 2,486.32
					$ 38,950.21	**$ 33,374.15**	**$ -**	**$ 72,324.36**
			Sampling			**$ 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		$ 83,214.83		$ 83,214.83
			Total		**$ 38,950.21**	**$ 138,691.38**		**$ 177,641.59**
G_02_03 Hot water piping valves and supports								
Data Release : Year 2020		**Unit Cost Estimate**						
2	221113481050	Pipe, fittings & valves, steel, black, grooved joint, 25 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC			$ 47.34	$ 82.56	$ -	$ 129.90
20	221113481080	Pipe, fittings & valves, steel, black, grooved joint, 50 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC			$ 720.40	$ 1,310.60	$ -	$ 2,031.00
15	221113481100	Pipe, fittings & valves, steel, black, grooved joint, 80 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC			$ 1,219.35	$ 1,408.65	$ -	$ 2,628.00
3	221113481110	Pipe, fittings & valves, steel, black, grooved joint, 100 mm diameter, schedule 40, includes coupling & clevis type hanger 3 m OC			$ 290.19	$ 312.69	$ -	$ 602.88
7	220719106870	Insulation, pipe covering (price copper tube one size less than I.P.S.), fiberglass with all service jacket, 25 mm wall, 25 mm iron pipe size			$ 28.70	$ 134.89	$ -	$ 163.59
8	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			$ 1,317.12	$ 276.56	$ -	$ 1,593.68
8	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			$ 1,761.68	$ 371.52	$ -	$ 2,133.20

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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	$ 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
4	221119140220	Flexible metal hose, bronze braided, bronze ends, threaded, 50 mm diameter x 450 mm			$ 423.96	$ 295.16	$ -	$ 719.12
2	221119140220	Flexible metal hose, bronze braided, bronze ends, threaded, 50 mm diameter x 450 mm			$ 211.98	$ 147.58	$ -	$ 359.56
2	221119140220	Flexible metal hose, bronze braided, bronze ends, threaded, 50 mm diameter x 450 mm			$ 211.98	$ 147.58	$ -	$ 359.56
					$ 17,335.78	**$ 6,640.59**	**$ -**	**$ 23,976.37**
			Sampling			**$ 19,057.50**		$ 19,057.50
			Buttweld Q1&QA	1		$ (520.08)		$ (520.08)
			subtotal labor			$ 25,178.01		$ 42,513.79
			Labor factor 2.5x	1.5		$ 37,767.02		$ 37,767.02
			Total		**$ 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	Ext. Total O&P
G_03_01 HVAC Equipment								
Data Release : Year 2020		**Unit 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
					$ 1,778,225.00	**$ 6,179.42**	**$ -**	**$ 1,784,404.42**
G_03_02 Ventilation and Exhaust Ductwork and Devices								
Data Release : Year 2020		**Unit Cost Estimate**						
3	233713604240	Register, floor, enameled steel, 350 mm x 500 mm, includes toe operated 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 damper			$ 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			$ 83.09	$ 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
3	233313163400	Duct accessories, fire damper, curtain type, vertical, 600 mm x 500 mm, UL label, 1-1/2 hour rated			$ 249.27	$ 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			$ 249.27	$ 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			$ 249.27	$ 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			$ 83.09	$ 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
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
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
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
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

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 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

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
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
1	221113644360	Pipe, stainless steel, threaded, 50 mm 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
2	233313136180	Duct accessories, multi-blade dampers, 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
3680	230713103940	Duct thermal insulation, pipe covering (price copper tube one size less than I.P.S.), finishes, .4 mm thick, for 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
1	233113130580	Metal ductwork, fabricated rectangular, 4.6 to 6 m high, incl fittings, joints, supports & allow for a flexible connections field sketches, excl as-built drawings & insulation, add to labor for elevated installation of fabricated 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			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	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 & allow for a flexible connections field sketches, excl as-built drawings & insulation, add to labor for elevated installation of fabricated ductwork			$ -	$ 58,860.00	$ -	$ 58,860.00
1	233113131060	Metal ductwork, fabricated rectangular, 4.6 to 6 m high, incl fittings, joints, supports & allow for a flexible connections field sketches, excl as-built drawings & insulation, add to labor for elevated installation of fabricated ductwork			$ -	$ 23,544.00	$ -	$ 23,544.00
1	233113131060	Metal ductwork, fabricated rectangular, for high pressure ductwork, add			$ -	$ 166,770.00	$ -	$ 166,770.00
1	233113131060	Metal ductwork, fabricated rectangular, 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. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
G_04_01 D2O Leak Detection System								
Data Release : 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, modem, RS232 port			$ 9,045.90	$ 2,420.00	$ -	$ 11,465.90
					$ 9,045.90	**$ 2,420.00**	**$ -**	**$ 11,465.90**
			Labor factor 2.5x	1.5		$ 3,630.00		$ 3,630.00
			Total		**$ 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	Ext. Total O&P
G_07_01 West annex fire protection 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	$ -	$ 824.60
7	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			$ 669.90	$ 400.96	$ -	$ 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, excl joint coupling material			$ 2,105.40	$ 1,260.16	$ -	$ 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	Ext. 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 joint coupling material			$ 308.72	$ 187.84	$ -	$ 496.56
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
3	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			$ 1,883.07	$ 195.06	$ -	$ 2,078.13
1	221113488080	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			$ 1,646.40	$ 123.84	$ -	$ 1,770.24
150	221113484918	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 100 mm diameter			$ 13,506.00	$ 4,335.00	$ -	$ 17,841.00
100	221113484920	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 125 mm diameter			$ 11,628.00	$ 3,560.00	$ -	$ 15,188.00
6	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			$ 1,765.74	$ 374.64	$ -	$ 2,140.38
10	221113485840	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			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	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	$ -	$ 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		Pressure gauge			$ 12,364.91	$ 326.70		$ 12,691.61
1	221113484914	Pipe, fittings & valves, coupling, steel, painted, rigid style, grooved joint, 65 mm diameter			$ 56.08	$ 17.91	$ -	$ 73.99
					$ 96,245.46	**$ 49,878.42**	**$ -**	**$ 146,123.88**
			Labor factor 2.5x	1.5		$ 74,817.63		$ 74,817.63
			Total		**$ 96,245.46**	**$ 124,696.05**		**$ 220,941.51**
G_07_02 Fire Protection Sprinkler System								
Data Release : Year 2020		**Unit Cost 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	Ext. 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	$ 1,850.42	$ -	$ 5,381.86
35	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			$ 3,349.50	$ 2,004.80	$ -	$ 5,354.30
14	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			$ 1,231.72	$ 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
8	221113485000	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 65 mm diameter			$ 399.28	$ 143.28	$ -	$ 542.56
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
1	221113485030	Pipe, fittings & valves, coupling, steel, painted, standard, flexible, grooved joint, 100 mm diameter			$ 79.23	$ 28.90	$ -	$ 108.13
18	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			$ 1,907.82	$ 1,170.36	$ -	$ 3,078.18
8	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			$ 617.44	$ 375.68	$ -	$ 993.12
20	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			$ 2,119.80	$ 1,300.40	$ -	$ 3,420.20

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	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
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 joint coupling material			$ 308.72	$ 212.60	$ -	$ 521.32
20	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			$ 1,543.60	$ 1,063.00	$ -	$ 2,606.60
12	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			$ 926.16	$ 637.80	$ -	$ 1,563.96
8	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			$ 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 joint coupling material			$ 1,697.96	$ 1,169.30	$ -	$ 2,867.26
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 joint coupling material			$ 308.72	$ 212.60	$ -	$ 521.32
8	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			$ 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
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

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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
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
6	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			$ 574.20	$ 343.68	$ -	$ 917.88

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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	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			$ 635.94	$ 390.12	$ -	$ 1,026.06
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
5	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			$ 2,855.50	$ 239.95	$ -	$ 3,095.45
					$ 237,988.10	**$ 127,362.70**	**$ -**	**$ 365,350.80**
			Labor factor 2.5x	1.5		$ 191,044.05		$ 191,044.05
			Total		**$ 237,988.10**	**$ 318,406.75**		**$ 556,394.85**
			Total		**$ 334,233.56**	**$ 443,102.80**	**$ -**	**$ 777,336.36**

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
G_09-01 Building Control System								
Data Release : 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
0	230943104630	Pneumatic control system, air supply for pneumatic, tank mounted duplex compressor, starter, alternator, piping, dryer, PRV station & filter control 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			$ -	$ -	$ -	$ -
0	238216200360	Duct heater, electric, finned tubular 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
1	223530101100	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, 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**	**$ -**	**$ 114,459.45**
			Labor factor 2.5x	1.5		$ 17,043.57		$ 17,043.57
			Total		**$ 103,097.07**	**$ 28,405.95**		**$ 131,503.02**
G_09_02 Control System per spec								
Data Release : 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
1	230943100260	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 panelboard if required			$ 6,200.90	$ 3,660.30	$ -	$ 9,861.20
2	230943100320	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	$ -	$ 11,966.10
2	230943100620	Pneumatic control system, heating & ventilating, split system, cooling tower, fan cycle, damper control, control system, including water readout in/out at panel			$ 14,030.86	$ 6,374.40	$ -	$ 20,405.26

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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
					$ 87,721.78	**$ 45,796.08**	**$ -**	**$ 133,517.86**
			Labor factor	1.5		$ 68,694.12		$ 68,694.12
			Total		$ 87,721.78	$ 114,490.20	$ -	$ 202,211.98
			Total		**$ 190,818.85**	**$ 142,896.15**	**$ -**	**$ 333,715.00**

Table D-7: BOQ Section H - Electrical

			Overnight materials costs	Overnight labour costs	Overnight equipment costs	Total overnight costs
Section 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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equipment O&P	Total O&P
H_01_01 Distribution								
Data Release : Year 2020		**Unit Cost Estimate**						
		Incorporated in H01.02 and H01.03 (based on invoice 628411-K53300-52BX-0001).						
H_01_02 and H_01_03 600V Power Distribution								
Data Release : Year 2020		**Unit Cost Estimate**						
4	628411-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 Transformers and Power Distribution								
Data Release : Year 2020		**Unit Cost Estimate**						
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					**$ 86,054.10**	**$ 48,189.15**	**$ -**	**$ 134,243.25**
H_01_05								
Data Release : 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	Transformer, dry-type, single phase 240/480 V primary 120/240 V secondary, 15 kVA			$ 9,718.80	$ 5,086.20	$ -	$ 14,805.00

CONFIDENTIAL ATTORNEY WORK PRODUCT

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equipment O&P	Total 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**
H_01_06								
Data Release : 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	$ -	$ 4,326.00
8	Termination kits	Termination Kit			$ 1,533.31	$ 2,775.06	$ -	$ 4,308.37
3	260519255800	Cable connectors, armored, 15 kV, #1			$ 490.20	$ 569.85	$ -	$ 1,060.05
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
16	260543100100	Trench duct, steel with cover, standard adjustable, straight, single compartment, depths to 102 mm, 229 mm wide			$ 17,942.40	$ 1,992.96	$ -	$ 19,935.36
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
16	262513100050	Bus duct, aluminum, 3 pole 4 wire, indoor, plug-in, straight section, 225 amp			$ 3,229.60	$ 548.00	$ -	$ 3,777.60
40	260533131140	Aluminum conduit, 4" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF			$ 897.20	$ 872.00	$ -	$ 1,769.20
180	260533131930	Rigid galvanized steel conduit, 3" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF			$ 3,344.40	$ 5,418.00	$ -	$ 8,762.40
90	260519200100	Armored cable, copper, solid, 600 V, 3 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
15	260526800750	Ground wire, copper wire, bare 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	$ -	$ 146,288.80
140	260526800370	Ground wire, copper wire, bare solid, #4			$ 16,147.60	$ 13,297.20	$ -	$ 29,444.80
25	260519200500	Armored cable, PVC jacket, 600 V, 3 conductor, #2, in cable tray			$ 23,763.00	$ 8,304.00	$ -	$ 32,067.00
25	260526800380	Ground wire, copper wire, bare solid, #2			$ 3,711.25	$ 3,788.75	$ -	$ 7,500.00
80	260519200500	Armored cable, PVC jacket, 600 V, 3 conductor, #2, in cable tray			$ 76,041.60	$ 26,572.80	$ -	$ 102,614.40

CONFIDENTIAL ATTORNEY WORK PRODUCT

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equipment O&P	Total 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
					$ 786,737.57	**$ 533,567.05**	**$ -**	**$ 1,320,304.62**
H_01_07								
Data Release : 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
20	260519250400	Cable connectors, nonmetallic, 600 volt, #10-3 wire to #14-4 and #12-4 wire			$ 40.20	$ 151.60	$ -	$ 191.80

CONFIDENTIAL ATTORNEY WORK PRODUCT

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equipment O&P	Total O&P
36	260529204110	Hangers, channel, steel, 16 gauge, 1-5/8" x 13/16"			$ 240.48	$ 342.00	$ -	$ 582.48
					$ 112,379.48	**$ 266,270.80**	**$ -**	**$ 378,650.28**
H_01_08								
Data Release : Year 2020		**Unit Cost Estimate**						
2	Port Power	Portable power cart			$ 14,230.02	$ 693.77	$ -	$ 14,923.79
140	260519200450	Armored cable, PVC jacket, 600 V, 3 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								
Data Release : Year 2020		**Unit Cost Estimate**						
102	262513306450	Bus duct, copper, ground neutralizer, 3 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
32	264113134640	Aluminum bonding plates, I-beam, 8" square			$ 639.04	$ 3,454.40	$ -	$ 4,093.44
480	260526807000	Exothermic weld, cadweld exothermic 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
8	260526802500	Exothermic weld, exothermic welding reusable mold, cable to cable, parallel, vertical			$ 3,161.28	$ 759.84	$ -	$ 3,921.12
80	260526805195	Copper electrolytic ground rod system, straight vertical type, 2" diameter, 40' 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	$ 3,182.34	$ -	$ 4,258.80
12	264113134740	Bonding strap, copper, flexible braided 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
10	260533232300	Wireway, cross, 2-1/2" x 2-1/2", NEMA 1, to 10' high			$ 485.90	$ 472.30	$ -	$ 958.20

CONFIDENTIAL ATTORNEY WORK PRODUCT

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equipment O&P	Total O&P
8	260526802520	Exothermic weld, exothermic welding reusable mold, cable to cable, termination, Tee			$ 3,118.56	$ 759.84	$ -	$ 3,878.40
210	260519201010	Armored cable, PVC jacket, 600 V, 4 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	$ -	$ 4,778,448.00
260	260519200650	Armored cable, PVC jacket, 600 V, 3 conductor, 2/0, in cable tray			$ 347,100.00	$ 116,048.40	$ -	$ 463,148.40
6	260519200650	Armored cable, PVC jacket, 600 V, 3 conductor, 2/0, in cable tray			$ 8,010.00	$ 2,678.04	$ -	$ 10,688.04
25	260519200650	Armored cable, PVC jacket, 600 V, 3 conductor, 2/0, in cable tray			$ 33,375.00	$ 11,158.50	$ -	$ 44,533.50
8	260519200450	Armored cable, PVC jacket, 600 V, 3 conductor, #4, in cable tray			$ 6,108.96	$ 2,250.40	$ -	$ 8,359.36
1	Ground Test	Ground testing				$ 693.72	$ -	$ 693.72
					$ 8,252,912.35	**$ 1,598,562.79**	**$ -**	**$ 9,851,475.14**
H_01_10								
Data Release : 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
42	260526801000	Ground wire, copper wire, bare 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								
Data Release : 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 grounding electrode			$ 1,815.00	$ 346.88	$ -	$ 2,161.88

CONFIDENTIAL ATTORNEY WORK PRODUCT

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equipment O&P	Total O&P
400	260526800280	Ground wire, ground bare armored, #4-1 conductor			$ 68,352.00	$ 188,916.00	$ -	$ 257,268.00
1	Light Test	Lighting protection testing			$ -	$ 693.72	$ -	$ 693.72
					$ 72,204.63	**$ 195,113.44**	**$ -**	**$ 267,318.07**
H_01_12								
Data Release : Year 2020		**Unit Cost Estimate**						
1	Study	Short Circuit /Coordination Study				$ 500,000.00		$ 500,000.00
					$ -	**$ 500,000.00**	**$ -**	**$ 500,000.00**
					$ 13,542,906.50	$ 3,248,571.64	$ -	$ 16,791,478.14
			Labor factor 2.5x	1.5		$ 4,872,857.46		$ 4,872,857.46
				Total	**$ 13,542,906.50**	**$ 8,121,429.11**		**$ 21,664,335.61**

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
H_02_01								
Data Release : 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			$ 20,270.64	$ 6,908.72	$ -	$ 27,179.36
33	265113553020	Interior LED fixtures, linear, suspended mounted, 74 watt, two light bar 4' long, 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 Release : 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 Release : Year 2020		**Unit Cost Estimate**						
18	262726202460	Duplex receptacle, grounded, 120 volt, 15 amp			$ 34.20	$ 340.92	$ -	$ 375.12

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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
150	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			$ 1,642.50	$ 2,071.50	$ -	$ 3,714.00

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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	$ -	$ 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								
Data Release : 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	260519200150	Armored cable, copper, solid, 600 V, 2 conductor, #12, BX, exposed			$ 2,818.22	$ 19,265.28	$ -	$ 22,083.50
18	260519200700	Armored cable, PVC jacket, 600 V, 3 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
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
8	260519350100	Terminal lugs, solderless, #8 to #4			$ 6.96	$ 203.44	$ -	$ 210.40

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
14	260519352000	Crimp 1 hole lugs, copper or aluminum, 600 volt, #4			$ 66.08	$ 392.42	$ -	$ 458.50
44	260519351780	Crimp 1 hole lugs, copper or aluminum, 600 volt, #8			$ 77.88	$ 936.32	$ -	$ 1,014.20
80	260519351640	Crimp 1 hole lugs, copper or aluminum, 600 volt, #10			$ 93.60	$ 1,349.60	$ -	$ 1,443.20
62	260519351630	Crimp 1 hole lugs, copper or aluminum, 600 volt, #12			$ 72.54	$ 939.30	$ -	$ 1,011.84
14	260519351620	Crimp 1 hole lugs, copper or aluminum, 600 volt, #14			$ 9.66	$ 177.24	$ -	$ 186.90
					$ 1,378,540.86	**$ 491,296.74**	**$ -**	**$ 1,869,837.60**
H_02_05								
Data Release : Year 2020		**Unit Cost Estimate**						
60	260523200500	Thermostat cable, jacket non-plenum, twisted, #18-2 conductor			$ 717.60	$ 5,698.80	$ -	$ 6,416.40
20	260523200500	Thermostat cable, jacket non-plenum, twisted, #18-2 conductor			$ 239.20	$ 1,899.60	$ -	$ 2,138.80
2	260590109520	Thermostat, residential, hook-up, using low voltage wire, heating only, 25' of #18-3			$ 15.92	$ 63.32	$ -	$ 79.24
2	Light Ind	Heat Tracing Light Indicator			$ 200.00	$ 173.44	$ -	$ 373.44
2	260529204650	Junction boxes, steel channel, 1 channel			$ 87.58	$ 94.46	$ -	$ 182.04
2	262726202460	Duplex receptacle, grounded, 120 volt, 15 amp			$ 3.80	$ 37.88	$ -	$ 41.68
40	260519200150	Armored cable, copper, solid, 600 V, 2 conductor, #12, BX, exposed			$ 1,943.60	$ 13,286.40	$ -	$ 15,230.00
50	260519200150	Armored cable, copper, solid, 600 V, 2 conductor, #12, BX, exposed			$ 2,429.50	$ 16,608.00	$ -	$ 19,037.50
20	260519200450	Armored cable, PVC jacket, 600 V, 3 conductor, #4, in cable tray			$ 15,272.40	$ 5,626.00	$ -	$ 20,898.40
12	260519351630	Crimp 1 hole lugs, copper or aluminum, 600 volt, #12			$ 14.04	$ 181.80	$ -	$ 195.84
6	260583100600	Motor connections, flexible conduit and fittings, 3 phase, 230 V, 75 kW motor			$ 852.24	$ 3,020.58	$ -	$ 3,872.82
					$ 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		$ 3,182,155.91
				Total	**$3,449,617.22**	**$ 5,303,593.18**	**$ 84.01**	**$8,753,294.41**

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
H_03_01								
Data Release : 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
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 type, addressable, excl. wires & conduit			$ 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 tray			$ 29,274.00	$ 132,972.00	$ -	$ 162,246.00
300	260519905390	Wire, copper, solid, 600 volt, #14, type XLPE-USE (RHW), normal installation conditions in wireway, conduit, cable tray			$ 4,182.00	$ 18,996.00	$ -	$ 23,178.00
150	260519900100	Wire, copper, stranded, 600 volt, #12, type THW, normal installation conditions in wireway, conduit, cable 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, TFFN			$ 8,712.00	$ 34,878.00	$ -	$ 43,590.00
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			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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
					$ 254,101.71	**$ 325,892.28**	**$ -**	**$ 579,993.99**
H_03_02								
Data Release : 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
20	260533131930	Rigid galvanized steel conduit, 3" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF			$ 371.60	$ 602.00	$ -	$ 973.60
					$ 210,081.12	**$ 129,810.09**	**$ -**	**$ 339,891.21**
H_03_03								
Data Release : Year 2020		**Unit Cost Estimate**						

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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	$ -	$ 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								
Data Release : Year 2020		**Unit Cost 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	$ -	$ 113,572.20
75	260519350040	Wire connector, screw type, insulated, #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		$ 851,695.23		$ 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	Ext. 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 2020		**Unit Cost Estimate**						
90	260523100100	Control cable, copper, THHN wire with PVC jacket, 600 V, 4 wires, #14			$ 5,719.50	$ 9,715.50	$ -	$ 15,435.00
180	260523101000	Control cable, copper, THHN wire with PVC jacket, 600 V, 22 wires, #14			$ 74,973.60	$ 48,765.60	$ -	$ 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	$ -	$ 25,917.90
3	260529204110	Hangers, channel, steel, 16 gauge, 1-5/8" x 13/16"			$ 20.04	$ 28.50	$ -	$ 48.54
					$ 114,727.64	**$ 113,161.60**	**$ -**	**$ 227,889.24**
H_04_03								
Data Release : Year 2020		**Unit Cost Estimate**						
78	260523100020	Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14			$ 4,081.74	$ 6,558.24	$ -	$ 10,639.98
120	260523100020	Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14			$ 6,279.60	$ 10,089.60	$ -	$ 16,369.20
120	260526800360	Ground wire, copper wire, bare solid, #6			$ 5,575.20	$ 9,092.40	$ -	$ 14,667.60
60	260523100020	Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14			$ 3,139.80	$ 5,044.80	$ -	$ 8,184.60
60	260526800330	Ground wire, copper wire, bare solid, #12			$ 906.60	$ 3,487.80	$ -	$ 4,394.40
12	260529204110	Hangers, channel, steel, 16 gauge, 1-5/8" x 13/16"			$ 80.16	$ 114.00	$ -	$ 194.16
6	260533131750	Rigid galvanized steel conduit, 1/2" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF			$ 19.50	$ 50.46	$ -	$ 69.96
					$ 20,082.60	**$ 34,437.30**	**$ -**	**$ 54,519.90**
H_04_04								
Data Release : Year 2020		**Unit Cost Estimate**						
1	284620504020	Detection system, fire alarm control panel, alarm device, excluding wires & conduits			$ 331.68	$ 87.29	$ -	$ 418.97
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	$ -	$ 530.51
4	211313506165	Flow switch, (valve supervisory switch)			$ 1,174.48	$ 172.72	$ -	$ 1,347.20
4	260519353800	Crimp 1 hole lugs, copper or aluminum, 600 volt, 500 kcmil			$ 96.12	$ 506.56	$ -	$ 602.68
310	260519200050	Armored cable, copper, solid, 600 V, 2 conductor, #14, BX, exposed			$ 14,235.20	$ 98,142.90	$ -	$ 112,378.10
80	260519200150	Armored cable, copper, solid, 600 V, 2 conductor, #12, BX, exposed			$ 3,887.20	$ 26,572.80	$ -	$ 30,460.00
20	260523100020	Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14			$ 1,046.60	$ 1,681.60	$ -	$ 2,728.20
10	260526800370	Ground wire, copper wire, bare solid, #4			$ 1,153.40	$ 949.80	$ -	$ 2,103.20
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	$ -	$ 6,435.60
8	260519250200	Cable connectors, nonmetallic, 600 volt, #14-3 wire to #12-2 wire			$ 16.08	$ 45.68	$ -	$ 61.76
4	211313506165	Flow switch, (valve supervisory switch)			$ 1,174.48	$ 172.72	$ -	$ 1,347.20
1	Head-end	Head-on equipment, programming, software, commissioning			$ -	$ 108,900.00	$ -	$ 108,900.00
					$ 26,118.01	**$ 241,195.41**	**$ -**	**$ 267,313.42**
H_04_05								
Data Release : Year 2020		**Unit Cost Estimate**						

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
1	628411-K62321-52BX-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								
Data Release : Year 2020		**Unit Cost Estimate**						
21	628411-K75160-52BX-0001	Breathing air station			$ 455,679.50	$ 10,813.99	$ -	$ 466,493.49
2	260529204800	Junction boxes, steel channel, 4 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
2	262716201640	Cabinets & enclosures, enclosures polyester, small, pushbutton, 3 hole, 10-3/16" H x 3-5/16" W x 3-1/16" D, 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 couplings 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	$ -	$ 1,306.50
1	Lump sum	Head-end equipment, programming, software, commissioning			$ -	$ 108,900.00	$ -	$ 108,900.00
					$ 813,480.48	**$ 395,704.18**	**$ -**	**$ 1,209,184.66**
H_04_07								
Data Release : Year 2020		**Unit Cost Estimate**						
190	260523100020	Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14			$ 9,942.70	$ 15,975.20	$ -	$ 25,917.90
190	260526800330	Ground wire, copper wire, bare solid, #12			$ 2,870.90	$ 11,044.70	$ -	$ 13,915.60
20	260533131870	Rigid galvanized steel conduit, 2" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF			$ 230.60	$ 337.40	$ -	$ 568.00
28	260533131870	Rigid galvanized steel conduit, 2" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF			$ 322.84	$ 472.36	$ -	$ 795.20
2	260533182200	Pull boxes, steel, type SC, raintight & 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	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	$ -	$ 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
					$ 21,428.11	**$ 39,814.26**	**$ -**	**$ 61,242.37**
H_04_08								
Data Release : Year 2020		**Unit Cost Estimate**						
2	260529204800	Junction boxes, steel channel, 4 channel			$ 201.86	$ 151.54	$ -	$ 353.40
34	Invoice 628411-K63861-52BX-0001	Tank leak detection systems, for hydrocarbons & hazardous liquids/vapors, controller, data acquisition, for use with all probes, 24 channel, incl. printer, modem, RS232 port			$ 58,804.56	$ 10,813.99	$ -	$ 69,618.55
700	260519200050	Armored cable, copper, solid, 600 V, 2 conductor, #14, BX, exposed			$ 32,144.00	$ 221,613.00	$ -	$ 253,757.00
1000	260523100020	Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14			$ 52,330.00	$ 84,080.00	$ -	$ 136,410.00
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			$ 52,065.00	$ 37,990.50	$ -	$ 90,055.50
70	260526800370	Ground wire, copper wire, bare solid, #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 LF			$ 3,618.00	$ 5,700.00	$ -	$ 9,318.00
60	260533350200	Flexible metallic conduit, steel, 3/4" diameter			$ 43.20	$ 284.40	$ -	$ 327.60
110	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			$ 1,204.50	$ 1,519.10	$ -	$ 2,723.60
60	260533131870	Rigid galvanized steel conduit, 2" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF			$ 691.80	$ 1,012.20	$ -	$ 1,704.00
50	260529204150	Channel, steel, 12 gauge, 1-5/8" x 1-5/8"			$ 406.00	$ 757.50	$ -	$ 1,163.50
1	Lump sum	Head-end equipment, programming, software, commissioning			$ -	$ 108,900.00	$ -	$ 108,900.00
					$ 323,968.81	**$ 579,916.84**	**$ -**	**$ 903,885.65**
H_04_09								
Data Release : Year 2020		**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	Ext. Total O&P
2	221113618207	Elbow, 90 Deg., stainless steel, tube fittings, compression type, 3/8", type 316			$ 48.36	$ 72.24	$ -	$ 120.60
16	221113618224	Union tee, stainless steel, tube fittings, compression type, 3/8", type 316			$ 568.00	$ 850.40	$ -	$ 1,418.40
16	221119147060	Flexible metal hose, molded teflon with stainless steel flanges, 150 psi,			$ 27,988.80	$ 6,026.88	$ -	$ 34,015.68
6	260529204110	Hangers, channel, steel, 16 gauge, 1-5/8" x 13/16"			$ 40.08	$ 57.00	$ -	$ 97.08
6	260529300250	Rooftop channel support, 13/16" L x 1-5/8" W, 14 ga. hot dip galv., sngl. base			$ 44.88	$ 81.30	$ -	$ 126.18
6	060523606742	Timber connectors, post bases, 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, software, commissioning			$ -	$ 108,900.00	$ -	$ 108,900.00
					$ 81,569.40	**$ 168,082.52**	**$ -**	**$ 249,651.92**
H_04_10								
Data Release : Year 2020		**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
150	260533131800	Rigid galvanized steel conduit, 1" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 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	$ -	$ 1,171.92

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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	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
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	Armored cable, copper, solid, 600 V, 2 conductor, #14, BX, exposed			$ 6,888.00	$ 47,488.50	$ -	$ 54,376.50
1	Allowance lump sum	Head-end, equipment, programming, software, commissioning			$ -	$ 108,900.00	$ -	$ 108,900.00
					$ 2,498,342.94	**$ 1,972,405.05**	**$ -**	**$ 4,470,747.99**
H_04_11								
Data Release : Year 2020		**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	Rooftop 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
4	220523208814	Valves, bronze, water heater water & gas safety shut off, valve			$ 908.08	$ 191.24	$ -	$ 1,099.32
2	262716200990	Cabinets & enclosures, enclosures fiberglass, small, pushbutton, 30 hole, 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
80	260523100020	Control cable, copper, THHN wire with 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
160	260526800330	Ground wire, copper wire, bare solid, #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	Ext. Total O&P
15	260519350100	Terminal lugs, solderless, #8 to #4			$ 13.05	$ 381.45	$ -	$ 394.50
1	Summary	Head-end equipment, programming, software, commissioning			$ -	$ 108,900.00	$ -	$ 108,900.00
					$ 231,178.36	**$ 171,137.39**	**$ -**	**$ 402,315.75**
H_04_12								
Data Release : Year 2020		**Unit Cost Estimate**						
240	260519200250	Armored cable, copper, solid, 600 V, 2 conductor, #10, BX, exposed			$ 22,941.60	$ 90,928.80	$ -	$ 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 LF			$ 2,773.80	$ 4,370.00	$ -	$ 7,143.80
460	260533250100	Conduit fittings for rigid galvanized steel, standard, locknuts, 3/4" diameter			$ 216.20	$ 6,957.50	$ -	$ 7,173.70
400	260533131800	Rigid galvanized steel conduit, 1" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF			$ 3,632.00	$ 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
180	260533250700	Conduit fittings for rigid galvanized steel, standard, locknuts, 1-1/2" 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
30	260529204110	Hangers, channel, steel, 16 gauge, 1-5/8" 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
180	260533131770	Rigid galvanized steel conduit, 3/4" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF			$ 1,085.40	$ 1,710.00	$ -	$ 2,795.40
180	260533250100	Conduit fittings for rigid galvanized steel, standard, locknuts, 3/4" diameter			$ 84.60	$ 2,722.50	$ -	$ 2,807.10

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
150	260533350250	Flexible metallic conduit, steel, 1" diameter			$ 211.50	$ 1,137.00	$ -	$ 1,348.50
8	628411-K73870-52BX-0002 and 628411-K73870-52BX-0001	Chiller control system			$ 5,243,301.00	$ 10,299.04	$ -	$ 5,253,600.04
2	260529204110	Hangers, channel, steel, 16 gauge, 1-5/8" x 13/16"			$ 13.36	$ 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
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 2020		**Unit Cost Estimate**						
165	260523100020	Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14			$ 8,634.45	$ 13,873.20	$ -	$ 22,507.65
165	260526800340	Ground wire, copper wire, bare solid, #10			$ 3,427.05	$ 10,447.80	$ -	$ 13,874.85
100	260523100020	Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14			$ 5,233.00	$ 8,408.00	$ -	$ 13,641.00
25	260533131770	Rigid galvanized steel conduit, 3/4" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF			$ 150.75	$ 237.50	$ -	$ 388.25
25	260533250100	Conduit fittings for rigid galvanized 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
25	260529300270	Rooftop channel support, 1-5/8" L x 1-5/8" 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 2020		**Unit Cost Estimate**						
90	260519200380	Armored cable, copper, stranded, 600 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	Ext. Total O&P
90	260526800360	Ground wire, copper wire, bare solid, #6			$ 4,181.40	$ 6,819.30	$ -	$ 11,000.70
115	260523100100	Control cable, copper, THHN wire with PVC jacket, 600 V, 4 wires, #14			$ 7,308.25	$ 12,414.25	$ -	$ 19,722.50
30	260523100020	Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14			$ 1,569.90	$ 2,522.40	$ -	$ 4,092.30
75	260533131800	Rigid galvanized steel conduit, 1" diameter, to 10' H, incl 2 terminations, 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
60	260533131770	Rigid galvanized steel conduit, 3/4" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF			$ 361.80	$ 570.00	$ -	$ 931.80
60	260533250100	Conduit fittings for rigid galvanized steel, standard, locknuts, 3/4" 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
19	230953103084	Control component, gauges, pressure, differential, magnehelic, with air filter kit, 0-2" W.C.			$ 1,857.06	$ 2,479.12	$ -	$ 4,336.18
6	221429132202	Pump, pedestal sump, single stage, for general purpose float switch, copper coated float, add			$ 728.52	$ 1,721.40	$ -	$ 2,449.92
3	230913609030	Water level control, water gauges, complete, rough brass, wheel type, 125 psi at 350Deg.F, 3/8" pipe size			$ 256.98	$ 213.63	$ -	$ 470.61
8	230953109220	Control component, pressure controllers & switches, pressure transmitter			$ 2,110.40	$ 780.88	$ -	$ 2,891.28
5	238216205160	Duct heater, duct heater modifications and accessories, overheat thermocouple (removable)			$ 5,157.00	$ 1,223.90	$ -	$ 6,380.90
16	vendor	Temperature / Resistancec detector			$ 175.69	$ 1,387.53		$ 1,563.22
7	230953104120	Control component, thermometers, dial type, liquid type, union connection, 3-1/2" diameter			$ 3,531.36	$ 170.80	$ -	$ 3,702.16
2	260533152780	Rigid galvanized steel conduit nipples, close, 1" diameter, incl locknuts and bushings			$ 12.82	$ 66.44	$ -	$ 79.26
150	260523100020	Control cable, copper, THHN wire with 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
72	260533131770	Rigid galvanized steel conduit, 3/4" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF			$ 434.16	$ 684.00	$ -	$ 1,118.16

Quantity	Line Number	Description			Ext. 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 2020		**Unit Cost Estimate**						
220	260519200380	Armored cable, copper, stranded, 600 V, 2 conductor, #6, BX, exposed			$ 64,849.40	$ 127,881.60	$ -	$ 192,731.00
220	260526800360	Ground wire, copper wire, bare solid, #6			$ 10,221.20	$ 16,669.40	$ -	$ 26,890.60
275	260523100020	Control cable, copper, THHN wire with PVC jacket, 600 V, 2 wires, #14			$ 14,390.75	$ 23,122.00	$ -	$ 37,512.75
1	230953109220	Control component, pressure 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
90	260533250500	Conduit fittings for rigid galvanized steel, standard, locknuts, 1-1/4" 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
45	260533131770	Rigid galvanized steel conduit, 3/4" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF			$ 271.35	$ 427.50	$ -	$ 698.85
45	260533250100	Conduit fittings for rigid galvanized steel, standard, locknuts, 3/4" 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
125	260523100020	Control cable, copper, THHN wire with 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			$ 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

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
4	221113605023	Pipe, stainless steel, tubing, .035 wall, 1/2", type 304, excludes joints and hangers			$ 47.96	$ 19.88	$ -	$ 67.84
65	221113605021	Pipe, stainless steel, tubing, .035 wall, 1/4", type 304, excludes joints and 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 LF			$ 297.28	$ 481.60	$ -	$ 778.88
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	$ -	$ -	$ 5.58
30	260533131770	Rigid galvanized steel conduit, 3/4" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF			$ 180.90	$ 285.00	$ -	$ 465.90
30	260533250100	Conduit fittings for rigid galvanized steel, standard, locknuts, 3/4" diameter			$ 14.10	$ -	$ -	$ 14.10
155	260526800370	Ground wire, copper wire, bare solid, #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	$ 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
1	262726205530	Plug, locking, 20 amp, 480 volt, NEMA L8			$ 23.50	$ 25.43	$ -	$ 48.93
					$ 259,364.92	**$ 420,470.56**	**$ -**	**$ 679,835.48**
H_04_16								
Data Release : Year 2020		**Unit Cost Estimate**						
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

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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
100	260523100100	Control cable, copper, THHN wire with 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
152	260523100020	Control cable, copper, THHN wire with 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
65	221113605021	Pipe, stainless steel, tubing, .035 wall, 1/4", type 304, excludes joints and 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 LF			$ 297.28	$ 481.60	$ -	$ 778.88
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	$ -	$ -	$ 5.58
30	260533131770	Rigid galvanized steel conduit, 3/4" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF			$ 180.90	$ 285.00	$ -	$ 465.90
30	260533250100	Conduit fittings for rigid galvanized steel, standard, locknuts, 3/4" diameter			$ 14.10	$ -	$ -	$ 14.10
155	260526800370	Ground wire, copper wire, bare solid, #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	$ 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
1	262726205530	Plug, locking, 20 amp, 480 volt, NEMA L8			$ 23.50	$ 25.43	$ -	$ 48.93
1	262726205000	Duplex receptacle, duplex receptacle,combo 15A/125V, 3 wire w/2-5V 0.7A, port USB, AL			$ 22.43	$ 28.03	$ -	$ 50.46
1	260590104500	Receptacle devices, residential, weather-proof cover or above receptacles, add			$ 2.37	$ 23.87	$ -	$ 26.24

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. Total O&P
1	262726200200	Toggle switch, quiet type, single pole, 15 amp			$ 0.61	$ 18.94	$ -	$ 19.55
25	221113618212	Elbow, 90 Deg., stainless steel, tube fittings, compression type, 1", type 316			$ 3,344.25	$ 993.25	$ -	$ 4,337.50
110	220533200150	Temperature maintenance cable, components, heating cable, 208 V, 140 Deg.F			$ 1,294.70	$ 143.00	$ -	$ 1,437.70
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 2020		**Unit Cost Estimate**						
1	Panel Assem	Intermediate Control panel assembly			$ 1,036,450.00	$ 6,937.66	$ -	$ 1,043,387.66
2	628411-K60712-52BX-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
44	230523501040	Valves, cast iron body, multipurpose, functions as a shut off, balancing, check and metering valve, threaded, 2-1/2" size			$ 31,445.92	$ 12,402.28	$ -	$ 43,848.20
9	052119106400	Individual steel bearing plate, 6" x 6" x 1/4", with J-hook			$ 128.88	$ 39.06	$ -	$ 167.94
19	628411-K60431-52BX-0001	Level transmitter			$ 868,380.10	$ 49,435.37		$ 917,815.47
1	230953109220	Control component, pressure controllers & switches, pressure transmitter			$ 263.80	$ 97.61	$ -	$ 361.41
13	230913609530	Water level control, water gauges, complete, high pressure, 500 psi at 450Deg.F, 3/4" pipe size, type 316 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
59	260513165000	Medium-cable single cable, copper, XLP shielding, grounded neutral, 35 kV, 500 kcmil, in conduit, excl splicing & terminations			$ 3,591.92	$ 1,469.69	$ -	$ 5,061.61
304	260529204110	Hangers, channel, steel, 16 gauge, 1-5/8" x 13/16"			$ 2,030.72	$ 2,888.00	$ -	$ 4,918.72
304	260529300270	Rooftop channel support, 1-5/8" L x 1-5/8" W, 12 ga. hot dip galv., sngl. base			$ 638.40	$ 4,274.24	$ -	$ 4,912.64
5	Telestrut	Unitstrut / telestrut carbon steel			$ 493.69	$ 520.32	$ -	$ 1,014.02
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
400	260523101000	Control cable, copper, THHN wire with PVC jacket, 600 V, 22 wires, #14			$ 166,608.00	$ 108,368.00	$ -	$ 274,976.00
100	260523101000	Control cable, copper, THHN wire with PVC jacket, 600 V, 22 wires, #14			$ 41,652.00	$ 27,092.00	$ -	$ 68,744.00

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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 LF			$ 328.50	$ 414.30	$ -	$ 742.80
30	260533250700	Conduit fittings for rigid galvanized steel, standard, locknuts, 1-1/2" 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
500	260533131750	Rigid galvanized steel conduit, 1/2" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF			$ 1,625.00	$ 4,205.00	$ -	$ 5,830.00
500	260533250050	Conduit fittings for rigid galvanized 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	**$ 1,011,051.97**	**$ -**	**$ 4,125,472.50**
H_04_18								
Data Release : Year 2020		**Unit Cost Estimate**						

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	Ext. 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 PVC jacket, 600 V, 8 wires, #14			$ 81,700.00	$ 71,620.00	$ -	$ 153,320.00
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	$ -	$ 4,982.40
240	260533250300	Conduit fittings for rigid galvanized steel, standard, locknuts, 1" diameter			$ 175.20	$ -	$ -	$ 175.20
70	260533131750	Rigid galvanized steel conduit, 1/2" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 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
12	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			$ 131.40	$ 165.72	$ -	$ 297.12
12	260533250700	Conduit fittings for rigid galvanized steel, standard, locknuts, 1-1/2" diameter			$ 18.60	$ -	$ -	$ 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 2020		**Unit Cost Estimate**						
350	221113605022	Pipe, stainless steel, tubing, .035 wall, 3/8", type 304, excludes joints and hangers			$ 2,485.00	$ 1,739.50	$ -	$ 4,224.50
2	220523207860	Valves, bronze, reducing, water pressure, high capacity, iron body, 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
445	055413200020	Floor plate, steel checkered plate, 6 & 9 mm T, 185 to 465 m2, field fabricated, bolted			$ 863.30	$ 938.95	$ 62.30	$ 1,864.55
15	220523403570	Valves, cast iron, lined, corrosion resistant, high purity, check lift, horizontal, PPL or SL lined, flanged, 125 lb., 3"			$ 26,406.45	$ 4,631.40	$ -	$ 31,037.85
16	230523501040	Valves, cast iron body, multipurpose, functions as a shut off, balancing, check and metering valve, threaded, 2-1/2" size			$ 11,434.88	$ 4,509.92	$ -	$ 15,944.80
6	221119301250	Pressure & temperature safety plug, 3/4" external thread, 3/8" diameter element, 7-1/2" insertion, 316 stainless steel			$ 395.16	$ 151.68	$ -	$ 546.84
2	230953109220	Control component, pressure 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 2020		**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	260533131800	Rigid galvanized steel conduit, 1" diameter, to 10' H, incl 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF			$ 1,816.00	$ 2,336.00	$ -	$ 4,152.00
200	260533250300	Conduit fittings for rigid galvanized steel, standard, locknuts, 1" diameter			$ 146.00	$ -	$ -	$ 146.00

Quantity	Line Number	Description			Ext. Mat. O&P	Ext. Labour O&P	Ext. Equip. O&P	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	$ -	$ 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**
					$ 17,395,419.76	$ 8,054,627.03	$ 145.32	$ 25,450,192.11
			Labor factor 2.5x	1.5		$ 12,081,940.55		$ 12,081,940.55
				Total	**$ 17,395,419.76**	**$ 20,136,567.58**	**$ 145.32**	**$ 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.

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

Table E-3: EPC Engineering Support Spend Profile Details

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

Table E-5: EPC Nuclear Mechanical Engineering Spend Profile Details

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

Table E-6: EPC Nuclear Structural Engineering Spend Profile 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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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-by-system 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.

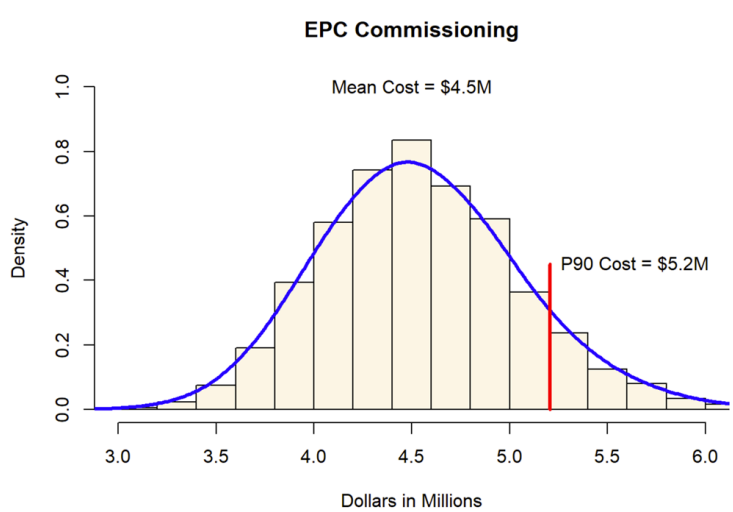
As shown below, we calculate EPC contractor's commissioning support cost of **$4.5 million**, and owner's commissioning and close-out cost of **$6.8 million.** As a percentage of total construction cost, these commissioning and close-out costs fall within the range described in the literature.[71]

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



[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, "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).

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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

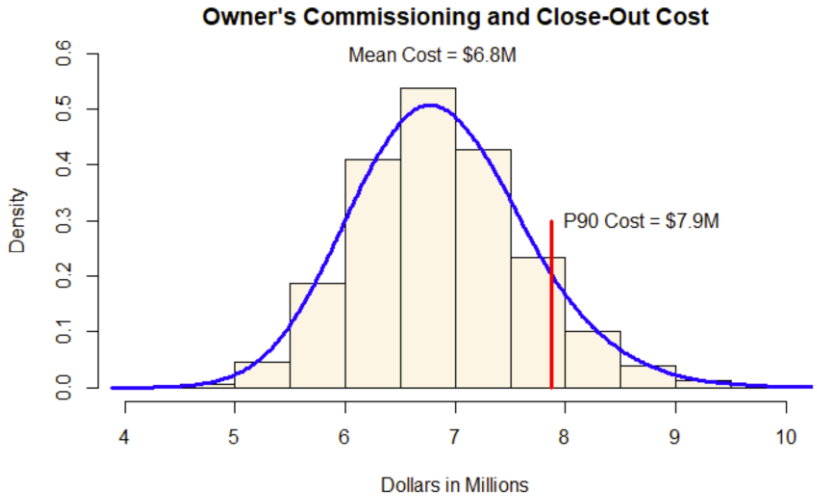


Table F-4: Owner's Commissioning and Close-Out Cost Spend Profile Details

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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 re-scale 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.

CONFIDENTIAL ATTORNEY WORK PRODUCT

Table G-1: Owner's Costs Spend Profile Details

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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**

CONFIDENTIAL ATTORNEY WORK PRODUCT

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				
	Construction		Process systems		Total EPC direct with fee and contingency	EPC indirect costs	EPC commis-sioning	Excluding commissioning, close-out and financing	Commis-sioning and close-out	Total project cost less financing	Financing	
	Materials and equipment	Labour	Materials and equipment	Labour							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 m^3] nominal capacity) underground double-walled 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 m^3) of salt solution per year. The waste currently in storage at SRS presently includes approximately 84 million US gallons (320,000 m^3) of salt solution that must be processed, of which 75 million US gallons (280,000 m^3) 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, https://www.srs.gov/general/news/facts.htm 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.

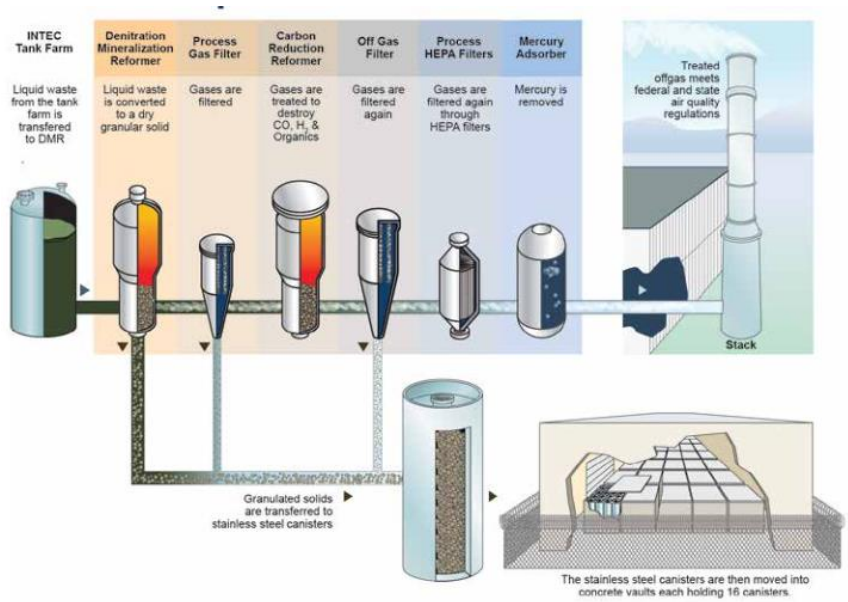
[75] US Department of Energy, "Construction of Salt Waste Processing Facility (SWPF): Charting the Course for Major EM Successes in 2016–2017," September 29, 2015, https://www.energy.gov/sites/prod/files/2015/10/f27/SheppardEMSuccessPanel%20FINAL%20FINAL.pdf. Data estimated based on percentage complete as reported.

[76] Fluor Idaho, "Integrated Waste Treatment Unit," video, accessed April 26, 2020, https://fluor-idaho.com/projects/Projects_IWTU.aspx.

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 Flow[77]



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

	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/Projects_IWTU.aspx.

BATES WHITE
ECONOMIC CONSULTING

2001 K Street, NW
North Building, Suite 500
Washington, DC 20006 USA

BATESWHITE.COM