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Production of Cost Estimates for the Construction of Heavy Water Storage Facilities

Kinectrics Report K-015634-REP-0001-R00

Ontario Power Generation P.O. 4400032110

January 5, 2011

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SUMMARY

As part of the decommissioning plans for OPG's nuclear facilities, cost estimates for storing all heavy water used in the primary heat transport and moderator systems have been prepared. The storage will be handled by dedicated on-site facilities at the five nuclear sites: Darlington A, Pickering A and B, Bruce A and B. The heavy water storage facility is a stand alone building utilizing 100 and 150 Mg stainless steel tanks. The different costing scenarios utilize either all Class 3 tanks or a combination of Class 3 and Class 6 tanks. The total storage capacity for each nuclear site ranges from 6,332 to 13,113 Mg dependent on the number of storage tanks utilized.

The estimated cost for the storage facilities utilizing Class 3 tanks range from a low of 23 M$ (Darlington A, 4 tanks) to a high of 65.9 M$ (Darlington A, 31 tanks). In the case of a mixture of Class 3 and Class 6 tanks the cost estimates range from 22.2 M$ (Darlington A, 4 tanks) to 60.4 M$ (Darlington A, 31 tanks).

The estimates include design, procurement, construction, equipment installation and commissioning activities. The construction cost estimate does not include pricing specific to the nuclear site location. The stand alone storage facility location within the site is undefined. Additionally, the estimates apply to construction outside the protected area. The soil at each site is assumed to be ready for construction and detailed soil analysis has not been conducted for this study. Preliminary engineering identified the processes and components associated with a heavy water storage facility. Supplier quotes were obtained for a significant number of components.

An order of magnitude estimate has been performed for the dismantling of the heavy water storage facilities at the end of life; the costs range from 1.3 to 4.2 M$ for the 4 and 31 tank facilities respectively. The cost estimate excludes working in a protected area with its associated radioactive work practices, decontamination, and nuclear waste disposal (packaging, transportation, final storage). The amount of conventional waste generated from the dismantling of the facility ranges from 6500 to 14000 m^3 while the nuclear waste volume varies from 670 to 4200 m^3.

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DISCLAIMER

Kinectrics Inc. has prepared this report in accordance with and subject to the Master Services Agreement (MSA) between Kinectrics Inc. and Ontario Power Generation Inc. (OPG).

1. BACKGROUND

At the end of life for OPG's nuclear generating stations, all heavy water used in the primary heat transport and moderator systems is required to be removed from the units and stored in dedicated on-site storage facilities as part of decommissioning activities. In order for OPG to update their decommissioning plans for its nuclear facilities and consider financial obligations, cost estimates have been produced by Kinectrics for construction and dismantling of the heavy water storage facilities for various storage scenarios.

Cost estimates have been produced for heavy water storage facilities using storage capacity scenarios forecast by OPG for each of their nuclear sites. These storage capacities, which depend on the availability of existing storage tanks for each site, range from 6,332 to 13,113 Mg. Separate heavy water storage facilities are required for each of the five (5) nuclear sites.

The construction cost estimates include design, procurement, construction, equipment installation and commissioning activities. Stand alone buildings containing an array of heavy water storage tanks, with individual capacities of 100 and 150 Mg, complete with features such as containment dikes, heavy water transfer equipment and facilities, building ventilation and tritium monitors. Although the intent is to detritiate all heavy water before storage, the cost estimates also consider cases having Class 3 storage tanks required for tritium concentration in heavy water exceeding 2 Ci/kg. Preliminary engineering has been performed to the extent necessary to produce this level of cost estimates.

The construction cost estimate does not include labour pricing specific to the nuclear site location. The stand alone storage facility location within the site is undefined. Additionally, the estimate applies to a construction outside the protected area. Other key assumptions that impact project costs are identified in Section 3.

2. OPG REFERENCES

Kinectrics has produced the cost estimates based on the following OPG reference documents:

i. Specification #2010419- Production of Cost Estimates for the Construction of Heavy Water Storage Facilities.
ii. Appendix A- Storage of Heavy Water Following Unit Shut Down
iii. Appendix B- Specifications- Heavy Water Storage Facility
iv. Appendix C1- Project Cost Estimate- Construction
v. Appendix C2- Project Cost Estimate- Dismantling

3. SCOPE OF COST ESTIMATES

Cost estimates have been produced based on the various heavy water storage capacity options specified by OPG in Table 1.

Table 1: Heavy Water Storage Options

Site	Heavy Water Storage Capacity (Mg)			
	Option 1	**Option 2**	**Option 3**	**Option 4**
PA	1994	1994	1869	1504
PB	1989	1989	1864	1499
DA	3282	1582	799	415
BA	2918	2118	1652	1196
BB	2930	2930	2329	1728
PA – Pickering Nuclear A side, PB- Pickering Nuclear B side, DA – Darlington Nuclear				
BA – Bruce Power A side, BB – Bruce Power B side				

(Source: OPG Specification #2010419)

The actual storage capacities shall be at least 110% of the storage capacities quoted above.

In addition, space is provided in each facility option for up to two (2) extra 100 Mg tanks. For storage layout options having up to eleven (11) tanks, space is provided for one (1) extra 100 Mg storage tank.

For equipment requiring replacement during the 50 year lifetime of the facility, additional labour and replacement equipment costs are considered. The items requiring replacement and the replacement intervals are provided in Table 2. The costs of these interval replacements are included in the total project cost.

Table 2: Replacement Intervals

Item	Expected Life (years)	Number of Installations
Tank Level Indicators	15	4
Beetles	15	4
Radiation Monitors	15	4
Sump Pump	15	4
Canned Pump (transfer pump)	10	5
Hoses	15	4
Class 3 Vent Condenser for Cover Gas System	25	2
Silica Gel Trap for Cover Gas System	20	3
Misc. Mechanical Fasteners	25	2
Building Roof	15	4
Ventilation System (HVAC)	15	4
Water Heater	15	4
Instrument Air Compressor and Dryer	15	4
Breathing Air System (compressor/pumps)	15	4
Fire Protection Sprinkler System Pumps	15	4

Cost estimates are covered for two (2) separate cases for each option:

Case A: 100% of tanks are Class 3 tanks

Case B: Approximately 50% of tanks are Class 3 and remaining 50% of tanks are Class 6.

The ancillary building is considered identical for all storage options. The ancillary building houses facilities outside the storage tanks area (i.e. transfer bay, drum transfer area, laboratory, office, storage area washrooms and equipment penthouse).

Key items excluded from the cost estimate:

- Preparation of the building site and all facilities external to the building (e.g. roadways, lighting, fencing)
- Laboratory analytical equipment and facilities,
- Taxes, interest on borrowed funds, bonds, permits, etc,
- Cost of OPG site supervision during construction and commissioning activities,
- Building security, external radiation monitoring facilities, drum storage area, drum cleaning facility, change rooms and showers, overhead crane.
- Cost of decontamination and waste disposal.

The full list of assumptions made in preparing this cost estimate is provided in Appendix C. The key assumptions impacting cost are summarized in Table 3.

Table 3: Key Assumptions Impacting Cost

No.	Assumption
1	The storage facilities are stand-alone facilities which are not required to interface with other facilities.
2	During construction, a construction island separated from the nuclear site, shall be temporarily erected. Within this construction island, controlled by the general contractor, construction work proceeds as if it is a general commercial building.
3	Being a new facility, no engineering change (ECC) process is applied to the design and construction activities.
4	Local work force assumed (no per diem expenses).

Additionally, the following guidelines provided by OPG impact on the costing exercise:

1) No site visits or detailed investigation of site conditions for building.
2) Site will be ready for construction.
3) Site will be serviced (basic service only).
4) Specific location on site for the storage facility location is undefined.
5) All approvals are in place.
6) Construction to be done as per an “owner only” contract – OHSA rules apply.

Kinectrics has produced the cost estimates in accordance with our ISO 9001 quality program.

4. STORAGE FACILITIES DESCRIPTION

Layout sketches of the heavy water storage facilities have been produced based on the preliminary design. Layouts are shown in the Appendix A for the reference case facility (18 tanks) and the eight (8) storage building footprints.

Based on preliminary design, key features of the storage facilities are as follows:

- Stand alone storage facility for each nuclear site,
- Storage of heavy water for a minimum nominal period of 50 years,
- Array of storage tanks enable segregation of contents according to tritium activity and isotopic content.
- Use of tritium compatible equipment and materials for heavy water handling systems,
- 300 series stainless steel tanks and process equipment,

- Heavy water is stored in 100 Mg tanks or 150 Mg tanks,
- Approximately 50% of volume is stored in 100 Mg tanks, the remainder is stored in 150 Mg tanks,
- Heavy water storage tanks and transfer bay containment dikes to contain heavy water spills and enable recovery,
- Means of tank contents sampling and analysis,
- Tank cover gas system equipped with heavy water vapour recovery system,
- Common headers are used on the pump discharge and pump suction to enable the transfer of heavy water between any set of tanks,
- Tank recirculation and heavy water transfer using Class 3 pumps,
- Storage tanks are arranged in rows of three (3) for all facility options,
- Catwalks are situated near the top of the storage tanks for inspection and maintenance access,
- Tanks (150 Mg) are spaced 2 m apart for supports loading,
- Horizontal distance from tank wall to containment dike is at 0.9 m,
- Manual isolation valves are used to direct the flow of heavy water,
- Heavy water loading/ unloading bay for Multi-Purpose Transportation Package (MPTP), tanker and drums,
- No automatic controls are applied to process equipment,
- The building is equipped with a ventilation system that meets all requirements relating the storage of tritiated heavy water within a Zone 3 designated area,
- Ventilation designed for a minimum of 4 air changes per hour in heavy water handling areas (high speed fan operation triggered by area tritium monitors),
- Building maintained at slightly negative pressure with respect to ambient,
- Building is equipped with electrical space heating equipment (i.e. no air conditioning),
- Back-up diesel generator for operation of building ventilation fans, process instrumentation and tritium monitors,
- Active drainage system for lab and drum transfer area floor drains,
- Heavy water spill recovery equipment including building sumps,
- Tritium in air monitoring (one monitor each 3 rows of tanks, plus 2 in transfer bay/drum transfer area),
- Tritium stack monitor,
- Breathing air manifolds for use of plastic suits,

- Heavy water emissions collection bed (silica gel),
- A full service air set-up and an air compressor is provided.
- The superstructure of the building is braced steel frame resting on concrete structure, the building is not seismically qualified,
- Combination of 100 Mg and 150 Mg tanks, with no single tank exceeding a storage capacity of 150 Mg (options for Class 3 and Class 6 tanks to be considered),
- Interconnect piping to permit isolation and transfer of contents to any other storage tank within the storage facility utilizing manually operated isolation valves,
- Building height to the underside of the roof is 18 m (includes 2 meter truss height allowance). Height of transfer bay is 12 m.
- Capability to ship, receive, transfer, drain, fill and transfer heavy water,
- Use of instrument air for pressurizing heavy water drums, transport packages and tanker for transfer of heavy water to the storage tanks,
- Tank cover gas system (instrument air) for tank venting with tank over-pressure protection and tank under-pressure protection,
- Monitoring and alarm capabilities are provided to ensure regulatory requirements are satisfied with respect to environment emissions and hazards to personnel,
- Sampling laboratory (with floor area of ~50 sq. m) with future provisions for connections to active ventilation and active drainage systems.
- Measure of storage tank level and pressure featuring both local and remote displays and alarms,
- Determination of heavy water inventory using tank level transmitters no sight glasses or weigh tank provided),
- Beetles are situated on the floor below each storage tank to provide indication of spills of heavy water,
- The building sub-structure and tank containment dikes are seismically qualified to DBE category D,
- Buildings meet the requirements of a Zone 3 area, the National Building Code of Canada (2005), the National Fire Code of Canada (2005), CSA N293-07-Fire Protection for CANDU Nuclear Power Plants and all federal, provincial and local regulations.

5. METHODOLOGY

The cost estimates and estimate of waste volume were produced by Kinectrics according to the following plan:

- Produce preliminary engineering design concepts for process equipment and buildings,
- Presentation of guiding assumptions and draft facility layout to OPG,
- Obtain supplier quotations for basis of major equipment facility cost estimates,
- Estimate process equipment and materials and labour costs,
- Materials and labour estimated per tank basis for reference case facility (18 tanks),
- Subcontract cost estimates for building structural, HVAC, utilities and conventional facilities to The Walter Fedy Partnership,
- Produce high level estimates of dismantling cost and waste volume, overview of preliminary design and major equipment costs with CPUS subject matter expert,
- Follow-up sessions with OPG as required.

The preliminary engineering was performed by applying generally accepted practices for nuclear facilities designed for handling and storage of tritiated heavy water. The basis for costing the majority of building and facilities items was the RSMeans Building Construction Cost Data Book (33rd annual ed., 2010), an industry accepted reference for cost estimates.

The facilities utilize 100 Mg and 150 Mg storage tanks with the intent to have approximately 50% of the water volume for each facility stored in 100 Mg tanks and the remaining volume stored in 150 mg tanks for storage flexibility. For the design of heavy water handling and storage equipment, a reference design case was developed based on a storage capacity of 2,200 Mg heavy water in eighteen (18) tanks. This represents the middle range of all specified storage capacity options.

Process equipment construction and dismantling cost estimates were produced by breaking down costs on a per tank basis plus costs which are fixed for all facility options. This allows the cost estimate for any facility option to be calculated for any combination of storage tank capacity or code classification.

Building structure, utilities, facilities and dismantling cost estimates were produced for each of eight (8) storage building footprints according to the total number of storage tanks as follows:

- 4 tanks,
- 8 tanks,
- 11 tanks,
- 14, 15 & 16 tanks
- 17, 18 & 19 tanks,
- 21 tanks,
- 27 tanks,
- 31 tanks.

As building equipment, such as heating ventilation and air conditioning systems, does not scale by the number of storage tanks, cost estimates and dismantling estimates for the building

facilities and support systems were produced for each one of these eight building footprints. A layout drawing showing these options is included in the appendices.

During the production of this cost estimate no site visit specific to this project were undertaken.

Supplier quotations were obtained for the following equipment:

- 100 Mg tanks, Class 3 and Class 6 (quotes received from two suppliers)
- 150 Mg tanks, Class 3 and Class 6 (quotes received from two suppliers)
- Transfer pumps (canned pumps),
- Process isolation valves, Class 3 and Class 6,
- Heavy water loading arms,
- Process piping, Class 3 and Class 6,
- SAM monitor,
- HVAC equipment,
- Electrical components (transformers, switch gear)
- Mobile crane for tanks installation, dismantling,
- Instrument air and breathing air system components.

Copies of quotations for major equipment, such as the storage tanks and valves, are included in Appendix B.

Note: tank quotes are on a per tank basis. A 7% discount was quoted for quantity greater than 4 tanks by one of the storage tank suppliers. This discount has not been considered in the cost estimates.

6. RESULTS

6.1 SUMMARY OF COST ESTIMATES

The following is a summary of the construction and dismantling costs estimates. Detailed results are shown Appendix C and the associated costing spreadsheet (MS Excel file) provided to OPG with this report.

Table 4: Cost Estimate Summary for CASE A: 100% Class 3 Tanks

CASE A- 100% Class 3 Tanks							
	#Tanks			Construction	Dismantling	Conventional	Nuclear
	Class 3			Cost Estimates	Cost	Waste	Waste
	100 Mg	150 Mg	Total	(M$)	(M$)	(m^3)	(m^3)
Option 1							
PA	10	8	**18**	46.1	2.8	9,507	2,575
PB	10	8	**18**	46.1	2.8	9,507	2,575
DA	20	11	**31**	65.9	4.2	14,021	4,209
BA	16	11	**27**	60.3	3.8	13,146	3,756
BB	16	11	**27**	60.3	3.8	13,146	3,756
Option 2							
PA	10	8	**18**	46.1	2.8	9,507	2,575
PB	10	8	**18**	46.1	2.8	9,507	2,575
DA	7	7	**14**	40.0	2.4	8,777	2,075
BA	10	9	**19**	47.7	2.9	9,508	2,733
BB	16	11	**27**	60.3	3.8	13,146	3,756
Option 3							
PA	10	7	**17**	44.5	2.7	9,506	2,417
PB	10	7	**17**	44.5	2.7	9,506	2,417
DA	5	3	**8**	28.9	1.7	7,319	1,170
BA	8	7	**15**	41.4	2.5	8,778	2,184
BB	11	10	**21**	49.2	3.1	11,688	3,019
Option 4							
PA	9	5	**14**	40.0	2.4	8,777	1,976
PB	9	5	**14**	40.0	2.4	8,777	1,976
DA	2	2	**4**	23.0	1.3	6,589	670
BA	6	5	**11**	33.8	2.0	8,048	1,612
BB	9	7	**16**	42.0	2.6	8,779	2,292

Table 5: Cost Estimate Summary for CASE B: 50% Class 3 Tanks, Remainder Class 6 Tanks

CASE B- ~50% Class 3 Tanks, remainder Class 6 Tanks						
	Class 3	Class 6	Class 3	Class 6		Construction
	100 Mg	100 Mg	150 Mg	150 Mg	Total	Cost Estimates
Option 1						(M$)
PA	5	5	4	4	18	42.7
PB	5	5	4	4	18	42.7
DA	10	10	6	5	31	60.4
BA	8	8	6	5	27	55.4
BB	8	8	6	5	27	55.4
Option 2						
PA	5	5	4	4	18	42.7
PB	5	5	4	4	18	42.7
DA	4	3	4	3	14	37.6
BA	5	5	5	4	19	44.2
BB	8	8	6	5	27	55.4
Option 3						
PA	5	5	4	3	17	41.5
PB	5	5	4	3	17	41.5
DA	3	2	2	1	8	27.7
BA	4	4	4	3	15	38.6
BB	6	5	5	5	21	45.4
Option 4						
PA	5	4	3	2	14	37.6
PB	5	4	3	2	14	37.6
DA	1	1	1	1	4	22.2
BA	3	3	3	2	11	32.0
BB	5	4	4	3	16	39.3

The level of uncertainty in the major cost categories are presented in Table 6. The labour effort is believed to have the highest level of uncertainty followed by electrical materials. In most projects electrical and instrumentation is a large risk factor. Material costs uncertainties are generally lower due to availability of manufacturer quotes. Design has the lowest level of uncertainty because the building and process are straightforward and are not integrated with other facilities.

Table 6: Level of Uncertainty in the Cost Estimates

Level of Uncertainty in the Cost Estimate							
	Design	**Materials**				**Labour**	
		Building Structural	**Electrical**	**Mechanical**	**D2O Tanks**	**Building**	**Process**
Low (%)	-10	-10	-15	-10	-15	-20	-25
High (%)	+15	+25	+35	+20	+20	+50	+50

6.2 CONSTRUCTION COST ESTIMATES

The construction cost estimates were produced using a spreadsheet program.

- All cost estimates are in Canadian dollars (2010),
- As imperial units are commonly used as the basis for costing and materials estimating in the construction industry, conversions have been made for reporting in metric units,
- The assumptions are specified on a worksheet in the spreadsheet,
- Workflow process is shown on the Costing Overview worksheet,
- Process equipment costs are determined using a combination of costs dependent on the number of tanks and costs independent of number of tanks to allow scaling of process equipment costs for number of tanks,
- Building costs are shown for each of eight (8) building footprints covering all storage facility options.

6.3 FACILITY DISMANTLING ESTIMATES

High level estimates were produced for cost and resultant waste volume at the end of life for each facility option. Results are shown in the costing spreadsheet provided to OPG with this report.

Equipment and materials are categorized as either nuclear waste or conventional waste depending upon its function and potential exposure to tritiated water. To reduce the volume of nuclear waste due to the high cost of disposal, it is assumed equipment and materials in this category are packaged with a higher degree of care compared to conventional waste.

At the end of facility life, equipment and materials assumed to be nuclear waste includes: storage tanks, heavy water process equipment, piping and instruments, tank vent piping, containment dikes, active drainage system, sump pumps, sumps and the top 10 cm layer of

concrete slab. Conventional waste includes components and materials such as: building envelope components, building structural steel, catwalks, stairways, electrical equipment, HVAC system, tritium area monitors and the cover gas supply system.

Volume minimization has not been considered. For example, it is estimated the resultant volume per tank would be 15% of original volume, if compacted. The effort of cutting tanks into smaller pieces has not been considered in the cost estimates.

The cost estimate excludes working in a protected area with its associated radioactive work practices, decontamination, and nuclear waste disposal (packaging, transportation, final storage).

To reduce the volume of nuclear waste, contaminated components can be placed into opened storage tanks for disposal or alternatively the storage tanks and other equipment can be compacted. Compaction has not been considered in the overall waste volume estimates.

7. COST COMPARISON

A previous construction cost estimate produced by Kinectrics for addition of four (4), Class 3, 100 Mg tanks at Darlington in an extension to the Heavy Water Management building was 27.1 M$ (2006)[1]. If costs for interest, OPG field management and OPG project management costs are excluded the total cost estimate of construction for this project was ~21 M$ (2006). This cost estimate included additional costs for engineering changes to an existing facility.

The cost estimate produced in 2006 is in the same vicinity of the construction cost estimate produced herein for a four (4), Class 3, tank storage facility consisting of two (2), 100 Mg tanks and two (2), 150 Mg tanks (Option 4- DA, Case A) of 23 M$ (2010).

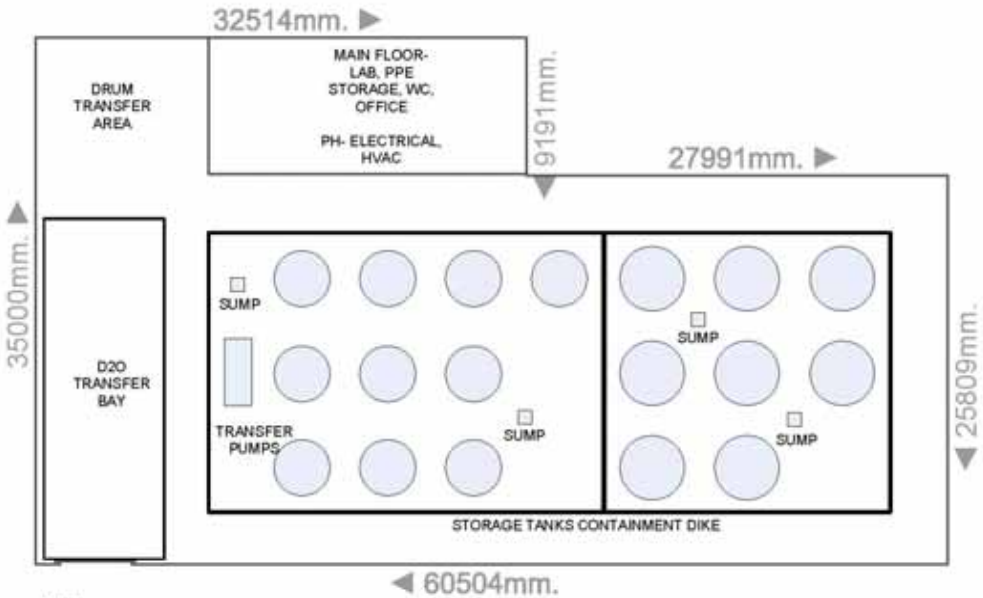
[1] Kinectrics Report K-012667-001-RA-0001-R01, March 2007, OPG Heavy Water Storage Management and Drum Handling – Study of Preferred Solution.

APPENDICES

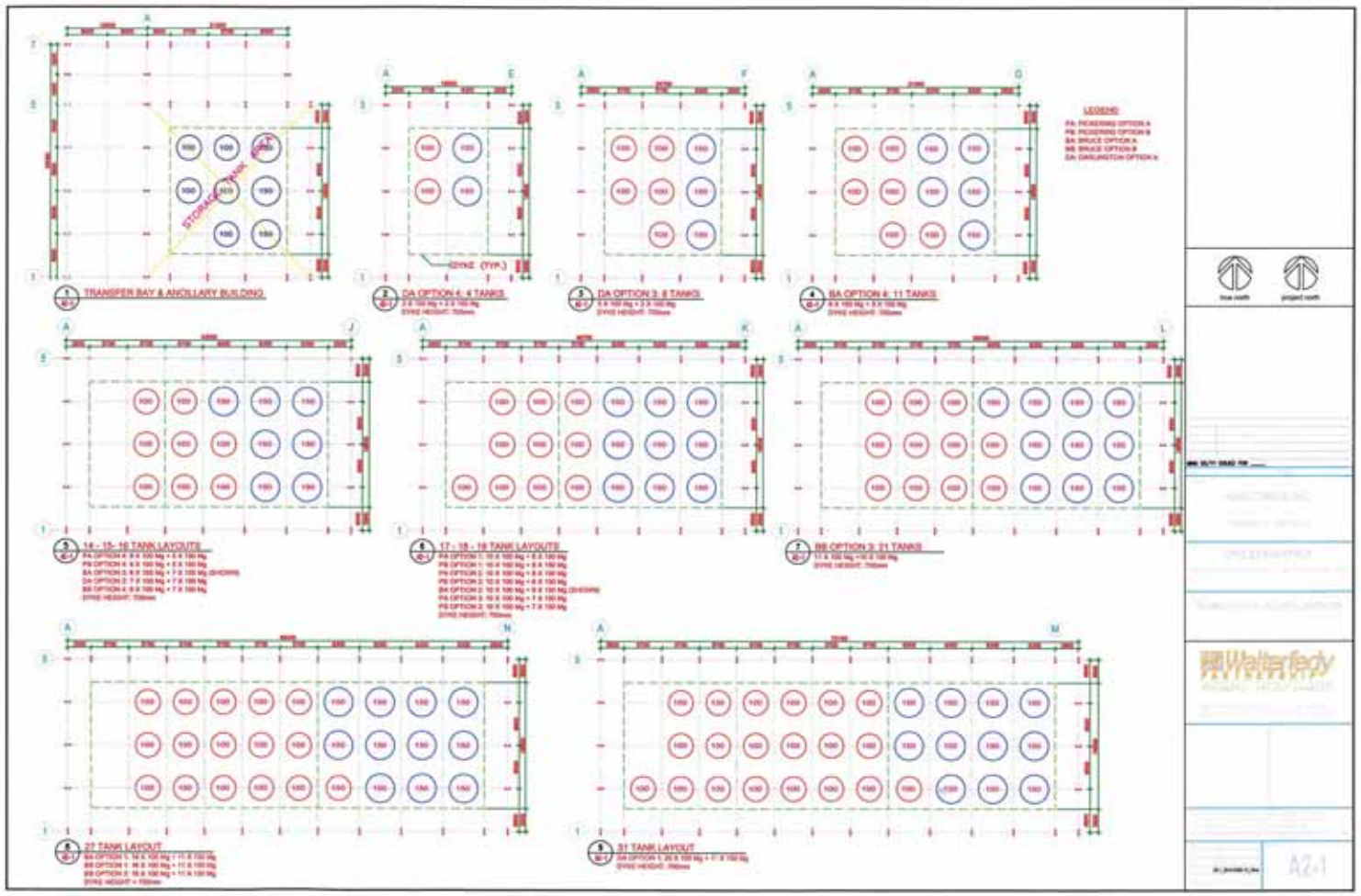
APPENDIX A- LAYOUT SKETCHES

Heavy Water Storage Facility
K-015634-GA-0001 Rev 00

Reference case layout -18 storage tanks (10 X 100 Mg & 8 x 150 Mg= 2200 Mg)



Notes:
- Building Layout sketch is for costing estimating purposes only. Not all equipment and facilities are shown.
- This sketch does not represent the engineered layout of equipment.
- Each storage tank containment dike is sized to contain the contents of a single tank of largest size.
- D2O Transfer Bay is equipped with a 10 cm high dike.
- Storage tanks to be arranged in rows of three (3) for all storage capacity options.


TRANSFER BAY & ANCILLARY BUILDING
DA OPTION 4: 4 TANKS
DA OPTION 3: 8 TANKS
BA OPTION 4: 11 TANKS
14 - 15 - 16 TANK LAYOUTS
17 - 18 - 19 TANK LAYOUTS
BB OPTION 3: 21 TANKS
27 TANK LAYOUT
31 TANK LAYOUT
LEGEND
Walterfedy
A2-1

APPENDIX B - COSTING ASSUMPTIONS

I.	**General**
1	The storage facilities are stand-alone facilities which are not required to interface with other systems or structures at site.
2	During construction, a construction island separated from the site, shall be temporarily erected. Within this construction island, controlled by the general contractor and not OPG, construction work proceeds as if it is a general commercial building.
3	Being a new facility, no engineering change (ECC) process is applied to the design and construction activities.
4	Local work force assumed (no per diem expenses)
5	The storage facilities are to be equipped with the following facilities:
	· Building floor sumps,
	· Heavy water loading/ unloading bay for tanker truck, drums, TDO packages and ISO containers,
	· Drum handling facility for loading /unloading,
	· Cover gas system equipped with vent condenser for vapour recovery,
	· Tritium in air monitoring and tritium stack monitoring,
	· Active drainage system,
	· Heavy water spill recovery equipment (i.e. sumps, pumps, and hoses),
	· Hand and foot radiation monitors and a small article monitor (SAM),
	· Storage cabinets for PPE and supplies,
	· Washrooms and emergency shower
6	The storage facilities do not include the following:
	· External monitoring (e.g. environmental, well monitoring),
	· Drum storage area,
	· Drum cleaning facility,
	· Dryers for building atmosphere detritiation,
	· Change rooms and showers,
	· Building security,
	· Loading dock,
	· Ground water monitoring wells in the vicinity of the heavy water storage facilities.
II.	**Facilities**
1	As storage and handling of heavy water within the facilities is at ambient temperature, no pipe lagging is required.
2	Entire storage building is zone 3 area.
3	A 3.5 m corridor is provided around the storage tanks containment dike for equipment access.
4	Catwalks are used to provide access to the top of tanks for inspection and maintenance of equipment located above the level of the storage tanks (e.g. vent recovery condenser and instruments).
5	No overhead crane is required. Catwalks and mobile cranes (rental) are used for maintenance.
6	Analytical Laboratory fume hoods, analysis equipment for tritiated heavy water is the responsibility of OPG. The lab has been costed as unfinished space. The cost of analytical equipment is not included in this estimate. A 500 sq ft laboratory space with ventilation for two (2) fume hoods will be provided.
7	All drum handling is performed using a dolly or forklift truck. Cranes are not used.

8	The drum transfer area is equipped to unload up to four (4) drums at once. A ventilation hood is provided in this area.
9	The storage tanks containment dike shall have sufficient capacity to contain the heavy water stored in one tank of the highest storage capacity,
10	The containment dike is subdivided into up to 3 parts to reduce the spread of contamination in the event of a spill.
11	A 10 cm high containment dike surrounds the transfer bay.
12	Ventilation system would be sized to provide minimum of 4 air changes per hour for the storage tanks, transfer bay and drum transfer area.
13	Buildings are maintained at slightly negative pressure (-50 Pa) with respect to ambient
14	Make up air unit fan and exhaust fan are 2 speed fans. Low speed to be for normal operation (No leak situation) as required by ASHRAE 62, high speed would be for leak situation (High speed would be activated by tritium monitors signal to provide 4 ACH).
15	Ventilation to the storage building consists of make-up air unit (100% outside air) located in the penthouse and ducted to the storage. Exhaust air distribution system in the storage building connected to an exhaust fan located in the penthouse that exhaust air to the outside thru a stack.
16	Building designed to climatic data as per clause 1.1.3 NBC (2005) geotechnical parameters not known.
17	Assumed bearing capacity of 150 kPa for design of footings.
18	Underside of all footings assumed 1.2 m deep below grade for frost protection.
19	Reference ground condition used for determination of seismic hazard for design of building and foundation (excludes tank foundation) is site class C (NBC 2005 Clause 4.1.8.4)
20	The building height of the storage tanks containment dike is 700 mm for all storage options.
21	The building height to the underside of the transfer bay roof truss is 12 m
22	The height to the underside of the storage area roof truss is 16 m
23	Materials and labour for the shared support for the transfer bay and storage tank area is tabulated under the ancillary building
III.	**Heavy Water Storage Tanks**
1	Singly contained storage tanks are used for storage of heavy water.
2	Storage tanks are vertical orientation.
3	All storage tanks are located on a single level.
4	Storage tanks are required to be seismically qualified.
5	For each facility option, ~50% of heavy water is stored in 100 Mg tanks, the remainder is stored in 150 Mg tanks.
6	Class 3 valves are used for instrument isolation on class 3 tanks.
7	Class 6 valves are used for instrument isolation on class 6 tanks.
8	Installed storage capacity for each facility includes 10% surplus capacity.
9	No volume discount on tank prices are assumed for multiple tanks.
10	No sight glasses are provided on storage tanks.
11	A beetle to detect heavy water spills is positioned beneath each tank.
12	Heavy water inventory is determined by the level transmitters. An intermediate weigh tank is not required.
13	Space to be allowed for up to two (2) 100 Mg storage tanks for each facility option. Facilities having up to 11 tanks will have space for one (1) extra 100 Mg tank.
IV.	**Process Equipment**
1	Isolation valves on heavy water process piping are class 3 valves.
2	No radiation shielding is required on any equipment.
3	Drip pans to be used for drum transfers and D2O sampling to contain small spills.

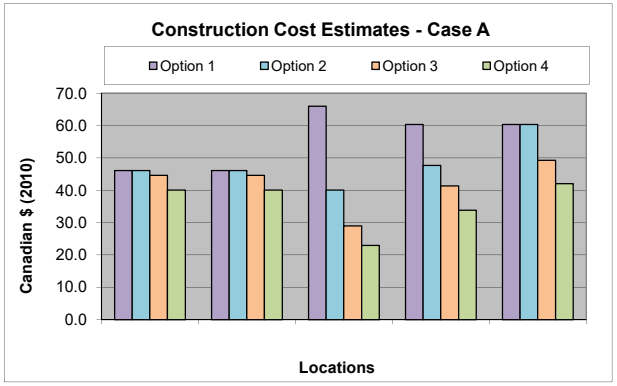
4	Heavy water is sampled from the discharge header of the transfer pumps.
V.	**Utilities and Auxiliary Systems**
1	Electrical power is provided by the grid during construction and operation
2	Back-up power for storage facility ventilation, compliance monitors and instrumentation supplied by diesel generator.
3	Electric heating equipment is used for space heating of buildings.
4	Ventilation to the storage building consists of make-up air unit (100% outside air) located in the penthouse and ducted to the storage area and transfer area, drum type diffusers capability of long throw of air to be mounted on the side of the duct (Two runs of ducts). Exhaust air distribution system in the storage building connected to an exhaust fan located in the penthouse that exhausts air to the outside thru a stack. One run of exhaust duct located in the middle of the storage room.
5	ventilation ducting is stainless steel
6	Breathing air system is required for use of plastic suits during maintenance and spill clean-up.
7	The active drainage system is provided for the lab floor drain, lab sink and drum transfer area floor drain.
8	A silica gel drum trap is used to determine heavy water emissions from the cover gas system.
VI.	**Storage Facility Dismantling**
1	At the end of life, dismantling includes removal of all equipment and buildings. All equipment and material will be waste and will not be salvaged.
2	Waste volume estimates are high level approximations
3	Piping will be chopped up into reasonably straight sections during dismantling to reduce the volume of waste.
4	All necessary decontamination has been performed by OPG prior to dismantling equipment and facilities
5	Top 10 cm of concrete slab in dike containment, transfer bay and drum transfer facility and all containment dike materials is considered nuclear waste
6	All D2O storage and handling equipment (i.e. wetted by D2O) is considered nuclear waste
7	Waste categorized as nuclear waste will be deposited into waste containers with some degree of care to minimize volume
8	All decontamination has been performed by OPG prior to dismantling.
9	All equipment and material will be waste and will not be salvaged.
10	An option is to place all process equipment categorized as nuclear waste in open end of storage tanks, remaining tanks can be compacted
11	In the event storage tanks are compacted for volume reduction, estimated resultant volume per tank is 15% of original volume
12	Dismantling costs does not include a premium for working within the OPG security fence and contaminated facility, factor of 2 to be applied

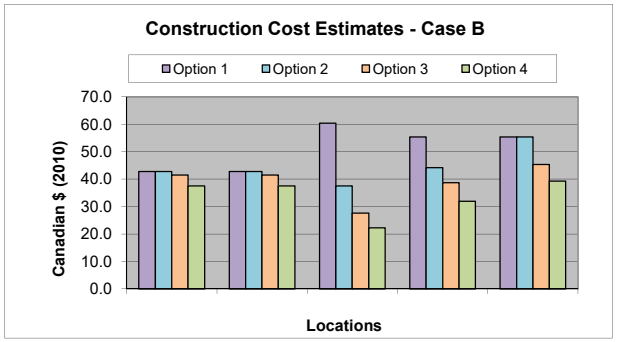
APPENDIX C- COSTING DETAILS

CASE A- 100% Class 3 Tanks							
	#Tanks			Construction	Dismantling	Conventional	Nuclear
	Class 3			Cost Estimates	Cost	Waste	Waste
	100 Mg	150 Mg	Total	($M)	($M)	(m^3)	(m^3)
Option 1							
PA	10	8	**18**	46.1	2.8	9,507	2,575
PB	10	8	**18**	46.1	2.8	9,507	2,575
DA	20	11	**31**	65.9	4.2	14,021	4,209
BA	16	11	**27**	60.3	3.8	13,146	3,756
BB	16	11	**27**	60.3	3.8	13,146	3,756
Option 2							
PA	10	8	**18**	46.1	2.8	9,507	2,575
PB	10	8	**18**	46.1	2.8	9,507	2,575
DA	7	7	**14**	40.0	2.4	8,777	2,075
BA	10	9	**19**	47.7	2.9	9,508	2,733
BB	16	11	**27**	60.3	3.8	13,146	3,756
Option 3							
PA	10	7	**17**	44.5	2.7	9,506	2,417
PB	10	7	**17**	44.5	2.7	9,506	2,417
DA	5	3	**8**	28.9	1.7	7,319	1,170
BA	8	7	**15**	41.4	2.5	8,778	2,184
BB	11	10	**21**	49.2	3.1	11,688	3,019
Option 4							
PA	9	5	**14**	40.0	2.4	8,777	1,976
PB	9	5	**14**	40.0	2.4	8,777	1,976
DA	2	2	**4**	23.0	1.3	6,589	670
BA	6	5	**11**	33.8	2.0	8,048	1,612
BB	9	7	**16**	42.0	2.6	8,779	2,292

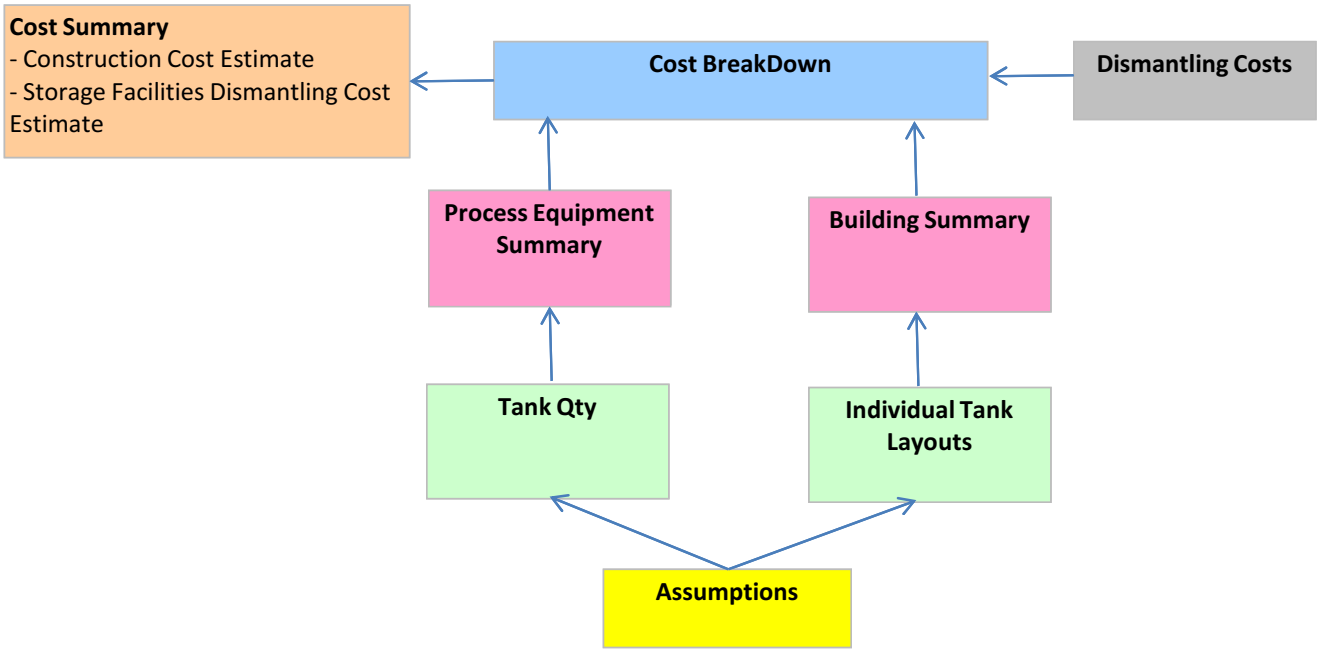
CASE B- ~50% Class 3 Tanks, remainder Class 6 Tanks						
	Class 3	Class 6	Class 3	Class 6		Construction
	100 Mg	100 Mg	150 Mg	150 Mg	Total	Cost Estimates
Option 1						($M)
PA	5	5	4	4	18	42.7
PB	5	5	4	4	18	42.7
DA	10	10	6	5	31	60.4
BA	8	8	6	5	27	55.4
BB	8	8	6	5	27	55.4
Option 2						
PA	5	5	4	4	18	42.7
PB	5	5	4	4	18	42.7
DA	4	3	4	3	14	37.6
BA	5	5	5	4	19	44.2
BB	8	8	6	5	27	55.4
Option 3						
PA	5	5	4	3	17	41.5
PB	5	5	4	3	17	41.5
DA	3	2	2	1	8	27.7
BA	4	4	4	3	15	38.6
BB	6	5	5	5	21	45.4
Option 4						
PA	5	4	3	2	14	37.6
PB	5	4	3	2	14	37.6
DA	1	1	1	1	4	22.2
BA	3	3	3	2	11	32.0
BB	5	4	4	3	16	39.3

Notes:
Case A- 100% class 3 tanks
Case B-~50% class 3, ~50% class 6 tanks
All costs expressed in 2010 $CAN
Case B dismantling is identical to Case A





Linkage of all the workbook sheets



CASE A- 100% Class 3 Tanks

	#Tanks				CAN $ 2010										
	Class 3				DESIGN	MATERIALS					CONSTRUCTION LABOUR		Labour Total	TOTAL PROJECT COST	Construction Labour
	100 Mg	150 Mg	Total		Total Design	Building Structural	Electrical	Mechanical	D2O Tanks	Total Materials	Building Labour	Process Labour			(hours)
Option 1															
PA	10	8	**18**		$3,391,009	$3,922,839	$3,016,996	$8,246,060	$14,175,000	$29,360,895	$5,701,377	$7,641,623	$13,343,000	$46,094,904	150,264
PB	10	8	**18**		$3,391,009	$3,922,839	$3,016,996	$8,246,060	$14,175,000	$29,360,895	$5,701,377	$7,641,623	$13,343,000	$46,094,904	150,264
DA	20	11	**31**		$3,811,283	$4,856,415	$3,733,073	$11,647,028	$23,415,000	$43,651,516	$6,976,152	$11,487,782	$18,463,934	$65,926,733	204,129
BA	16	11	**27**		$3,712,019	$4,664,121	$3,432,128	$10,594,749	$20,895,000	$39,585,997	$6,682,939	$10,293,714	$16,976,653	$60,274,670	188,737
BB	16	11	**27**		$3,712,019	$4,664,121	$3,432,128	$10,594,749	$20,895,000	$39,585,997	$6,682,939	$10,293,714	$16,976,653	$60,274,670	188,737
Option 2															
PA	10	8	**18**		$3,391,009	$3,922,839	$3,016,996	$8,246,060	$14,175,000	$29,360,895	$5,701,377	$7,641,623	$13,343,000	$46,094,904	150,264
PB	10	8	**18**		$3,391,009	$3,922,839	$3,016,996	$8,246,060	$14,175,000	$29,360,895	$5,701,377	$7,641,623	$13,343,000	$46,094,904	150,264
DA	7	7	**14**		$3,282,142	$3,682,770	$2,787,143	$7,172,806	$11,305,000	$24,947,720	$5,365,203	$6,447,556	$11,812,759	$40,042,621	134,290
BA	10	9	**19**		$3,391,009	$3,922,839	$3,043,396	$8,500,428	$15,155,000	$30,621,663	$5,701,377	$7,936,300	$13,637,677	$47,650,349	153,260
BB	16	11	**27**		$3,712,019	$4,664,121	$3,432,128	$10,594,749	$20,895,000	$39,585,997	$6,682,939	$10,293,714	$16,976,653	$60,274,670	188,737
Option 3															
PA	10	7	**17**		$3,391,009	$3,922,839	$2,990,596	$7,991,692	$13,195,000	$28,100,127	$5,701,377	$7,346,946	$13,048,324	$44,539,459	147,268
PB	10	7	**17**		$3,391,009	$3,922,839	$2,990,596	$7,991,692	$13,195,000	$28,100,127	$5,701,377	$7,346,946	$13,048,324	$44,539,459	147,268
DA	5	3	**8**		$2,934,825	$2,865,381	$2,545,669	$5,485,150	$6,125,000	$17,021,200	$4,304,730	$4,679,495	$8,984,226	$28,940,251	103,747
BA	8	7	**15**		$3,282,142	$3,682,770	$2,909,543	$7,427,174	$11,935,000	$25,954,488	$5,365,203	$6,757,593	$12,122,796	$41,359,425	137,286
BB	11	10	**21**		$3,511,779	$4,168,107	$2,745,853	$9,017,136	$16,765,000	$32,696,097	$4,584,330	$8,448,854	$13,033,183	$49,241,059	157,727
Option 4															
PA	9	5	**14**		$3,282,142	$3,682,770	$2,787,143	$7,172,806	$11,305,000	$24,947,720	$5,365,203	$6,447,556	$11,812,759	$40,042,621	134,290
PB	9	5	**14**		$3,282,142	$3,682,770	$2,787,143	$7,172,806	$11,305,000	$24,947,720	$5,365,203	$6,447,556	$11,812,759	$40,042,621	134,290
DA	2	2	**4**		$2,819,811	$2,569,355	$2,411,692	$4,458,420	$3,255,000	$12,694,467	$3,945,813	$3,500,788	$7,446,601	$22,960,879	87,459
BA	6	5	**11**		$3,080,337	$3,195,595	$2,270,617	$6,335,234	$8,715,000	$20,516,446	$4,748,145	$5,502,086	$10,250,231	$33,847,013	117,992
BB	9	7	**16**		$3,282,142	$3,682,770	$2,455,943	$7,681,542	$12,565,000	$26,385,256	$5,365,203	$6,975,470	$12,340,672	$42,008,070	140,282

CASE B- ~50% Class 3 Tanks, remainder Class 6 Tanks

	#Tanks				CAN $ 2010										
	Class 3	Class 6	Class 3	Class 6	DESIGN	MATERIALS					CONSTRUCTION LABOUR		Labour Total	TOTAL PROJECT COST	Construction Labour
	100 Mg	100 Mg	150 Mg	150 Mg	Total Design	Building Structural	Electrical	Mechanical	D2O Tanks	Total Materials	Building Labour	Process Labour			(hours)
Option 1															
PA	5	5	4	4	$3,391,009	$3,922,839	$3,016,996	$6,484,580	$12,610,000	$26,034,415	$5,701,377	$7,598,855	$13,300,232	$42,725,656	148,857
PB	5	5	4	4	$3,391,009	$3,922,839	$3,016,996	$6,484,580	$12,610,000	$26,034,415	$5,701,377	$7,598,855	$13,300,232	$42,725,656	148,857
DA	10	10	6	5	$3,811,283	$4,856,415	$3,733,073	$8,613,368	$21,000,000	$38,202,856	$6,976,152	$11,416,502	$18,392,654	$60,406,793	186,866
BA	8	8	6	5	$3,712,019	$4,664,121	$3,432,128	$7,952,529	$18,720,000	$34,768,777	$6,682,939	$10,231,938	$16,914,877	$55,395,674	186,704
BB	8	8	6	5	$3,712,019	$4,664,121	$3,432,128	$7,952,529	$18,720,000	$34,768,777	$6,682,939	$10,231,938	$16,914,877	$55,395,674	175,195
Option 2															
PA	5	5	4	4	$3,391,009	$3,922,839	$3,016,996	$6,484,580	$12,610,000	$26,034,415	$5,701,377	$7,598,855	$13,300,232	$42,725,656	148,857
PB	5	5	4	4	$3,391,009	$3,922,839	$3,016,996	$6,484,580	$12,610,000	$26,034,415	$5,701,377	$7,598,855	$13,300,232	$42,725,656	148,857
DA	4	3	4	3	$3,282,142	$3,682,770	$2,787,143	$5,802,766	$10,230,000	$22,502,680	$5,365,203	$6,419,044	$11,784,247	$37,569,069	133,352
BA	5	5	5	4	$3,391,009	$3,922,839	$3,043,396	$6,641,088	$13,590,000	$27,197,323	$5,701,377	$7,893,532	$13,594,909	$44,183,241	151,853
BB	8	8	6	5	$3,712,019	$4,664,121	$3,432,128	$7,952,529	$18,720,000	$34,768,777	$6,682,939	$10,231,938	$16,914,877	$55,395,674	175,195
Option 3															
PA	5	5	4	3	$3,391,009	$3,922,839	$2,990,596	$6,328,072	$11,880,000	$25,121,507	$5,701,377	$7,308,930	$13,010,308	$41,522,823	146,017
PB	5	5	4	3	$3,391,009	$3,922,839	$2,990,596	$6,328,072	$11,880,000	$25,121,507	$5,701,377	$7,308,930	$13,010,308	$41,522,823	146,017
DA	3	2	2	1	$2,934,825	$2,865,381	$2,545,669	$4,702,270	$5,670,000	$15,783,320	$4,304,730	$4,649,879	$8,954,610	$27,672,755	103,278
BA	4	4	4	3	$3,282,142	$3,682,770	$2,909,543	$5,959,274	$10,740,000	$23,291,588	$5,365,203	$6,708,969	$12,074,172	$38,647,901	136,191
BB	6	5	5	5	$3,511,779	$4,168,107	$2,745,853	$6,962,076	$14,950,000	$28,826,037	$4,584,330	$8,478,134	$13,062,463	$45,400,279	156,163
Option 4															
PA	5	4	3	2	$3,282,142	$3,682,770	$2,787,143	$5,802,766	$10,230,000	$22,502,680	$5,365,203	$6,419,044	$11,784,247	$37,569,069	133,352
PB	5	4	3	2	$3,282,142	$3,682,770	$2,787,143	$5,802,766	$10,230,000	$22,502,680	$5,365,203	$6,419,044	$11,784,247	$37,569,069	133,352
DA	1	1	1	1	$2,819,811	$2,569,355	$2,411,692	$4,066,980	$2,920,000	$11,968,027	$3,945,813	$3,475,924	$7,421,737	$22,209,575	87,147
BA	3	3	3	2	$3,080,337	$3,195,595	$2,270,617	$5,258,774	$7,890,000	$18,614,986	$4,748,145	$5,539,766	$10,287,911	$31,983,233	117,210
BB	5	4	4	3	$3,282,142	$3,682,770	$2,455,943	$6,115,782	$11,370,000	$23,624,496	$5,365,203	$7,003,646	$12,368,848	$39,275,486	139,187

Production of Cost Estimates for the Construction of Heavy Water Storage Facilities
OPG Purchase Order: 4400032110
Kinectrics Project Number: K-015634

System	Installation (total effort) (hours)	Total Material Cost ($)	Installation Cost ($)	Total Cost ($)
COST DEPENDENT ON # TANKS				
Class 3 Tank Cost (per tank)				
D2O Tanks				
100 Mg Class 3 Tanks (inc. shipping)	160	$ 630,000	$ 12,800	$ 642,800
150 Mg Class 3 Tanks (inc. shipping)	160	$ 980,000	$ 12,800	$ 992,800
Seismic Design Charge (per tank design)		$ 35,000		$ 35,000
Contingency	*32*	*$ -*	*$ 2,560*	*$ 2,560*
Tank Valves				
All valves	252	$ 135,000	$ 20,160	$ 155,160
Contingency	*50*	*$ 27,000*	*$ 4,032*	*$ 31,032*
Process Piping				
All piping	273	$ 27,300	$ 21,840	$ 49,140
Contingency	*55*	*$ 5,460*	*$ 4,368*	*$ 9,828*
Process Instrumentation				
Tank level&Beetles	120	$ 22,000	$ 9,600	$ 31,600
Contingency	*24*	*$ 4,400*	*$ 1,920*	*$ 6,320*
Commissioning				
Cost per tank	48	$ 3,840	*$ 3,840*	$ 7,680
Contingency	*10*	*$ 768*	*$ 768*	*$ 1,536*
Total Installation Effort per Class 3 tank	**1126**			
Total Cost of Aux. per Class 3 tank		**$ 225,768**	**$ 74,717**	**$ 300,485**
Class 6 Tank Cost (per tank)				
D2O Tanks				
100 Mg Class 6 Tanks (inc. shipping)	160	$ 510,000	$ 12,800	$ 522,800
150 Mg Class 6 Tanks (inc. shipping)	160	$ 730,000	$ 12,800	$ 742,800
Seismic Design Charge (per tank design)		$ 35,000	$ -	$ 35,000
Contingency	32	*$ -*	*$ 2,560*	*$ 2,560*
Tank Valves				
All valves	220	$ 55,400	$ 17,600	$ 73,000
Contingency	*44*	*$ 11,080*	*$ 3,520*	*$ 14,600*
Process Piping				
All piping	260	$ 25,350	$ 20,800	$ 46,150
Contingency	*52*	*$ 5,070*	*$ 4,160*	*$ 9,230*
Process Instrumentation				
Tank level & Beetles	120	$ 22,000	$ 9,600	$ 31,600
Contingency	*24*	*$ 4,400*	*$ 1,920*	*$ 6,320*
Commissioning				
Cost per tank	48	$ 3,840	$ 3,840	$ 7,680
Contingency- 10%	*10*	*$ 768*	*$ 768*	*$ 1,536*
Total Installation Effort per Class 6 tank	**970**			
Total Cost of Aux. per Class 6 tank		**$ 127,908**	**$ 69,965**	**$ 197,873**
Area Tritium Monitors				
Area tritium monitor	160	$ 80,000	$ 12,800	$ 92,800
Contingency	*32*	*$ 16,000*	*$ 2,560*	*$ 18,560*
Total area tritium monitors /array of tanks rows	***192***	**$ 96,000**	**$ 15,360**	**$ 111,360**
On Site Variable Costs				
Installation QA/scaffolding/crane	1496	$ 44,000	$ 119,680	$ 163,680
Contingency	374	$ 11,000	$ 29,920	$ 40,920

Production of Cost Estimates for the Construction of Heavy Water Storage Facilities
OPG Purchase Order: 4400032110
Kinectrics Project Number: K-015634

COST INDEPENDENT OF # TANKS				
Instrumentation				
All Instrumentation	2253	$ 942,040	$ 180,260	$ 1,122,300
Contingency	*451*	*$ 188,408*	*$ 36,052*	*$ 224,460*
D2O spill recovery system				
Sumps/valves/piping	3516	$ 54,400	*$ 281,280*	$ 335,680
Contingency	*703*	*$ 6,880*	*$ 56,256*	*$ 63,136*
D2O Transfer pumps				
Pumps, piping, valves	4238	$ 1,170,200	$ 339,040	$ 1,509,240
Contingency	*848*	*$ 234,040*	*$ 67,808*	*$ 301,848*
D2O Transfer- package & drums				
Facility/piping/hosing/loading arm/fittings/supports	2918	$ 421,100	$ 233,440	$ 654,540
Contingency	*424*	*$ 52,220*	*$ 33,888*	*$ 86,108*
Cover gas system				
Valves, piping,condensor, vapour trap, valves	2224	$ 411,300	$ 177,920	$ 589,220
Contingency	*315*	*$ 56,260*	*$ 25,184*	*$ 81,444*
Miscellaneous				
Mechanical equipment, fasteners	4000	$ 200,000	$ 320,000	$ 520,000
Contingency	800	*$ 40,000*	*$ 64,000*	*$ 104,000*
Commissioning	960	$ -	$ 76,800	$ 76,800
QA	800	$ -	$ 64,000	$ 64,000
Contingency (Commissioning & QA)	*352*	*$ -*	*$ 28,160*	*$ 28,160*
Site clean-up/ waste disposal				
Total (24 weeks)	740	$ 20,000	$ 59,200	$ 79,200
Contingency	*148*	*$ 4,000*	*$ 11,840*	*$ 15,840*
Total Fixed Cost Tasks	**29218**	**$3,800,848**	**$2,260,641**	**$6,061,489**
Labour-Process Equipment			**Quantity**	**Cost**
			(hours)	**($)**
Engineering Design Cost				
Total			5625	$703,125
Instrumentation & Control&Elect Design				
Total			1025	$128,125
Drafting & Sketches				
Total			1000	$125,000
QA- design (10% of total design)			750	$ 93,750
Procurement (10% of total design)			750	$ 93,750
Project Management (10% of total design+QA+Procurement)			915	$ 114,375
Contingency on QA/Procurement/PM)			*2013*	*$ 251,625*
Total Design & Procurement Costs			**12,078**	**$ 1,509,750**
Total Fixed Costs				**$ 7,571,239**

Notes
All costs in 2010 CAN$
Estimated number of installations (major equipment only) during 50 year design life of the facility
Maintenance costs and spares not included
Installation effort includes NDE
Procurement includes incoming inspection of materials and equipment
Assumed labour rate of $80/h
Assumed professional rate of $125/h

OPG Heavy Water Storage Facilities

Site	Estimated Storage	Storage Capacity	No. Tanks	No. Tanks	No. Tanks	Total Volume	Total Volume	Total Storage	Excess	Excess	50% Class 3, 50% Class 6 tanks				No.
		(inc. 10% surplus)	100 Mg	150 Mg	Total	100 Mg tanks	150 Mg tanks	Capacity	Capacity	%	class 3	class 6	class 3	class 6	Area Tritium
	(Mg)	(Mg)				(Mg)	(Mg)	(Mg)	(Mg)		100 Mg	100 Mg	150 Mg	150 Mg	Monitors
Option 1															
PA	1994	2193	10	8	18	1000	1200	2200	206	10%	5	5	4	4	5
PB	1989	2188	10	8	18	1000	1200	2200	211	11%	5	5	4	4	5
DA	3282	3610	20	11	31	2000	1650	3650	368	11%	10	10	6	5	6
BA	2918	3210	16	11	27	1600	1650	3250	332	11%	8	8	6	5	5
BB	2930	3223	16	11	27	1600	1650	3250	320	11%	8	8	6	5	5
Option 2															
PA	1994	2193	10	8	18	1000	1200	2200	206	10%	5	5	4	4	5
PB	1989	2188	10	8	18	1000	1200	2200	211	11%	5	5	4	4	5
DA	1582	1740	7	7	14	700	1050	1750	168	11%	4	3	4	3	4
BA	2118	2330	10	9	19	1000	1350	2350	232	11%	5	5	5	4	5
BB	2930	3223	16	11	27	1600	1650	3250	320	11%	8	8	6	5	5
Option 3															
PA	1869	2056	10	7	17	1000	1050	2050	181	10%	5	5	4	3	5
PB	1864	2050	10	7	17	1000	1050	2050	186	10%	5	5	4	3	5
DA	799	879	5	3	8	500	450	950	151	19%	3	2	2	1	3
BA	1652	1817	8	7	15	800	1050	1850	198	12%	4	4	4	3	4
BB	2329	2562	11	10	21	1100	1500	2600	271	12%	6	5	5	5	5
Option 4															
PA	1504	1654	9	5	14	900	750	1650	146	10%	5	4	3	2	4
PB	1499	1649	9	5	14	900	750	1650	151	10%	5	4	3	2	4
DA	415	457	2	2	4	200	300	500	85	20%	1	1	1	1	3
BA	1186	1305	6	5	11	600	750	1350	164	14%	3	3	3	2	4
BB	1728	1901	9	7	16	900	1050	1950	222	13%	5	4	4	3	4

Notes

1 Storage capacity represents 110% of estimated heavy water storage requirements for each facility

2 Number of tanks determined to attain ~50% volume in 100 Mg tanks, remainder in 150 Mg tanks

Production of Cost Estimates for the Construction of Heavy Water Storage Facilities
OPG Purchase Order: 4400032110
Kinectrics Project Number: K-015634

Construction Costs

Number of tanks	Total Design	Total Construction Value	Material Value	Labour Value	Construction Labour (hours)
4	$1,310,061	$ 9,926,319	$ 4,670,445	$ 3,945,813	46258
8	$1,425,075	$ 10,777,432	$ 5,047,626	$ 4,304,730	50561
11	$1,570,587	$ 11,871,597	$ 5,552,865	$ 4,748,145	55819
14, 15, and 16	$1,772,392	$ 13,385,643	$ 6,248,048	$ 5,365,203	63128
17, 18 and 19	$1,881,259	$ 14,197,062	$ 6,614,425	$ 5,701,377	67119
21	$2,002,029	$ 15,113,552	$ 8,527,193	$ 4,584,330	65594
27	$2,202,269	$ 16,605,414	$ 7,720,207	$ 6,682,939	78628
31	$2,301,533	$ 17,366,918	$ 8,089,233	$ 6,976,152	82036

Dismantling Costs

Number of tanks	Total Construction Value	Material Value	Labour Value	Labour (hours)
4	$ 351,640	$ 70,328	$ 281,312	3516
8	$ 394,027	$ 78,805	$ 315,221	3940
11	$ 440,878	$ 88,176	$ 352,702	4409
14, 15, and 16	$ 530,131	$ 106,026	$ 424,105	5301
17, 18 and 19	$ 572,523	$ 114,505	$ 458,018	5725
21	$ 619,379	$ 123,876	$ 495,503	6194
27	$ 704,179	$ 140,836	$ 563,343	7042
31	$ 746,552	$ 149,310	$ 597,241	7466

Notes
1. Per diem for site work not included
2. Dismantling costs does not include a premium for working within the OPG security fence and contaminated facility, factor of 2 to be applied

THE walterfedy PARTNERSHIP

CAPITAL COST ESTIMATE

PROJECT NAME: Kinectrics OPG Estimating - 4 Tank Layout
PROJECT NO.: 2010-0262-10
DATE SUBMITTED: 8-Dec-10

TRADE OR ACTIVITY		Total Construction Value	Material Value	Labour Value	Labour Hours (Hrs)
GROSS FLOOR AREA Sq. m		1,296			
General Requirements		$461,058	$230,578	$230,480	3,073
Existing Conditions (Demolition)		$0	$0	$0	0
Concrete Foundations & Footings		$344,457	$103,337	$241,120	3,215
Concrete Floor Finishing		$237,004	$71,101	$165,903	2,212
Masonry		$302,118	$151,059	$151,059	2,014
Structural Steel		$485,583	$364,187	$121,396	1,619
Miscellaneous Metals		$254,962	$191,221	$63,740	850
Steel Deck		$34,867	$26,150	$8,717	116
Rough & Finish Carpentry		$33,749	$6,750	$27,000	360
Architectural Woodworks		$0	$0	$0	0
Siding		$603,320	$301,660	$301,660	4,022
Fireproofing		$52,030	$34,860	$17,170	229
Roofing		$193,497	$129,643	$63,854	851
Re-Roofing - 15 Year Life Cycle		$241,871	$162,053	$79,817	1,064
Re-Roofing - 30 Year Life Cycle		$241,871	$162,053	$79,817	1,064
Hollow Metal Supply		$26,272	$26,272	$0	0
Overhead Doors		$20,000	$15,000	$5,000	67
Glass & Glazing		$74,962	$59,970	$14,992	200
Door Hardware		$23,750	$23,750	$0	0
Drywall & Acoustics		$0	$0	$0	0
Flooring		$238,289	$119,144	$119,144	1,589
Paint		$88,431	$44,215	$44,215	590
Specialties		$16,740	$11,216	$5,524	74
Total Architectural/Structural		$3,974,831	$2,234,222	$1,740,610	23,208
Mechanical		$ 1,110,042	$670,042	$440,000	5,500
Electrical		$ 1,163,085	$688,386	$474,699	5,233
Commissioning		$62,480	$0	$62,480	658
SUBTOTAL		**$6,310,438**	**$3,592,650**	**$2,717,788**	**34,599**
DESIGN CONTINGENCY (15%)		$946,566	$538,897	$407,668	5,096
CONSTRUCTION CONTINGENCY (15%)		$946,566	$538,897	$407,668	5,096
TOTAL COST OF THE WORK		$8,203,569	$4,670,445	$3,533,124	44,791
HST ON CONSTRUCTION (0%)		$0	$0	$0	0
TOTAL COST OF THE WORK INCLUDING CONTINGENCY AND HST (0%)		**$8,203,569**	**$4,670,445**	**$3,533,124**	**44,791**
GC/CM FEE (10%)		$820,357	$0	$820,357	6,563
HST ON GC/CM FEE (0%)		$0	$0	$0	$0
TOTAL CONSTRUCTION COST		$9,023,926	$4,670,445	$4,353,481	51,353
ARCHITECTURAL/ENGINEERING FEES (10%)		$902,393	$0	$902,393	7,219
CIVIL ENGINEERING FEE		$0	$0	$0	0
LANDSCAPE DESIGN FEE		$0	$0	$0	0
HST ON FEES (0%)		$0	$0	$0	0
TOTAL PROJECT COST		**$9,926,319**	**$4,670,445**	**$5,255,874**	**58,573**

Scope of Work: Construction of a new heavy water storage facility.

Additional Scope: The above estimate does not include for dismantling costs at the end of building life cycle.

Dismantling Costs		$351,640	$70,328	$281,312	3,516

Notes:

1. Taxes, Development Charges, Permit Fees, Bonding, Insurance, Inspections & Testing, Civil/Landscape, & Material Disposal Costs are not included in the above estimate.
2. Costs are determined using 2010 Canadian Dollars.
3. No 'Nuclear Factors' have been applied.
4. Soils have been assumed to be uniform throughout the three locations. Bearing capacity of 200 Kpa ULS has been assumed for design of footings.
5. Lab spaces have been assumed unfinished space.
6. Exterior road and security fencing have not been allowed for.

THE walterfedy PARTNERSHIP

CAPITAL COST ESTIMATE		PROJECT NAME: Kinectrics OPG Estimating - 8 Tank Layout PROJECT NO.: 2010-0262-10 DATE SUBMITTED: 8-Dec-10			
TRADE OR ACTIVITY		**Total Construction Value**	**Material Value**	**Labour Value**	**Labour Hours (Hrs)**
GROSS FLOOR AREA Sq. m		1,444			
General Requirements		$495,839	$236,549	$259,290	3,457
Existing Conditions (Demolition)		$0	$0	$0	0
Concrete Foundations & Footings		$373,925	$112,177	$261,747	3,490
Concrete Floor Finishing		$277,055	$83,117	$193,939	2,586
Masonry		$302,118	$151,059	$151,059	2,014
Structural Steel		$577,489	$433,117	$144,372	1,925
Miscellaneous Metals		$312,580	$234,435	$78,145	1,042
Steel Deck		$38,854	$29,141	$9,714	130
Rough & Finish Carpentry		$35,342	$7,068	$28,274	377
Architectural Woodworks		$0	$0	$0	0
Siding		$648,774	$324,387	$324,387	4,325
Fireproofing		$59,008	$39,535	$19,473	260
Roofing		$218,826	$146,614	$72,213	963
Re-Roofing - 15 Year Life Cycle		$273,533	$183,267	$90,266	1,204
Re-Roofing - 30 Year Life Cycle		$273,533	$183,267	$90,266	1,204
Hollow Metal Supply		$26,847	$26,847	$0	0
Overhead Doors		$20,000	$15,000	$5,000	67
Glass & Glazing		$74,962	$59,970	$14,992	200
Door Hardware		$25,150	$25,150	$0	0
Drywall & Acoustics		$0	$0	$0	0
Flooring		$286,138	$143,069	$143,069	1,908
Paint		$93,301	$46,650	$46,650	622
Specialties		$16,740	$11,216	$5,524	74
Total Architectural/Structural		$4,430,016	$2,491,636	$1,938,380	25,845
Mechanical		$ 1,134,092	$678,092	$456,000	5,700
Electrical		$ 1,219,570	$713,061	$506,508	5,610
Commissioning		$67,837	$0	$67,837	714
SUBTOTAL		**$6,851,514**	**$3,882,789**	**$2,968,725**	**37,869**
DESIGN CONTINGENCY (15%)		$1,027,727	$582,418	$445,309	5,566
CONSTRUCTION CONTINGENCY (15%)		$1,027,727	$582,418	$445,309	5,566
TOTAL COST OF THE WORK		$8,906,968	$5,047,626	$3,859,342	49,002
HST ON CONSTRUCTION (0%)		$0	$0	$0	0
TOTAL COST OF THE WORK INCLUDING					25,845
CONTINGENCY AND HST (0%)		**$8,906,968**	**$5,047,626**	**$3,859,342**	**49,002**
GC/CM FEE (10%)		$890,697	$0	$890,697	7,126
HST ON GC/CM FEE (0%)		$0	$0	$0	$0
TOTAL CONSTRUCTION COST		$9,797,665	$5,047,626	$4,750,039	56,128
ARCHITECTURAL/ENGINEERING FEES (10%)		$979,767	$0	$979,767	7,838
CIVIL ENGINEERING FEE		$0	$0	$0	0
LANDSCAPE DESIGN FEE		$0	$0	$0	0
HST ON FEES (0%)		$0	$0	$0	0
TOTAL PROJECT COST		**$10,777,432**	**$5,047,626**	**$5,729,806**	**63,966**
Scope of Work: Construction of a new heavy water storage facility.					
Additional Scope: The above estimate does not include for dismantling costs at the end of building life cycle.					
Dismantling Costs		$394,027	$78,805	$315,221	3,940

Notes:

1. Taxes, Development Charges, Permit Fees, Bonding, Insurance, Inspections & Testing, Civil/Landscape, & Material Disposal Costs are not included in the above estimate.
2. Costs are determined using 2010 Canadian Dollars.
3. No 'Nuclear Factors' have been applied.
4. Soils have been assumed to be uniform throughout the three locations. Bearing capacity of 200 Kpa ULS has been assumed for design of footings.
5. Lab spaces have been assumed unfinished space.
6. Exterior road and security fencing have not been allowed for.

THE walterfedy PARTNERSHIP

CAPITAL COST ESTIMATE

PROJECT NAME: Kinectrics OPG Estimating - 11 Tank Layout
PROJECT NO.: 2010-0262-10
DATE SUBMITTED: 8-Dec-10

TRADE OR ACTIVITY		Total Construction Value	Material Value	Labour Value	Labour Hours (Hrs)
GROSS FLOOR AREA Sq. m		1,608			
General Requirements		$527,629	$239,529	$288,100	3,841
Existing Conditions (Demolition)		$0	$0	$0	0
Concrete Foundations & Footings		$392,516	$117,755	$274,761	3,663
Concrete Floor Finishing		$329,302	$98,790	$230,511	3,073
Masonry		$302,118	$151,059	$151,059	2,014
Structural Steel		$708,843	$531,633	$177,211	2,363
Miscellaneous Metals		$350,002	$262,501	$87,500	1,167
Steel Deck		$43,262	$32,446	$10,815	144
Rough & Finish Carpentry		$37,437	$7,487	$29,949	399
Architectural Woodworks		$0	$0	$0	0
Siding		$711,027	$355,514	$355,514	4,740
Fireproofing		$66,721	$44,703	$22,018	294
Roofing		$246,508	$165,160	$81,348	1,085
Re-Roofing - 15 Year Life Cycle		$308,135	$206,450	$101,684	1,356
Re-Roofing - 30 Year Life Cycle		$308,135	$206,450	$101,684	1,356
Hollow Metal Supply		$27,422	$27,422	$0	0
Overhead Doors		$20,000	$15,000	$5,000	67
Glass & Glazing		$74,962	$59,970	$14,992	200
Door Hardware		$26,550	$26,550	$0	0
Drywall & Acoustics		$0	$0	$0	0
Flooring		$339,027	$169,514	$169,514	2,260
Paint		$99,257	$49,629	$49,629	662
Specialties		$16,740	$11,216	$5,524	74
Total Architectural/Structural		$4,935,592	$2,778,778	$2,156,814	28,758
Mechanical		$ 1,257,727	$753,727	$504,000	6,300
Electrical		$ 1,279,063	$738,929	$540,133	5,984
Commissioning		$74,724	$0	$74,724	787
SUBTOTAL		**$7,547,105**	**$4,271,434**	**$3,275,671**	**41,828**
DESIGN CONTINGENCY (15%)		$1,132,066	$640,715	$491,351	6,142
CONSTRUCTION CONTINGENCY (15%)		$1,132,066	$640,715	$491,351	6,142
TOTAL COST OF THE WORK		$9,811,237	$5,552,865	$4,258,372	54,111
HST ON CONSTRUCTION (0%)		$0	$0	$0	0
TOTAL COST OF THE WORK INCLUDING					28,758
CONTINGENCY AND HST (0%)		**$9,811,237**	**$5,552,865**	**$4,258,372**	**54,111**
GC/CM FEE (10%)		$981,124	$0	$981,124	7,849
HST ON GC/CM FEE (0%)		$0	$0	$0	0
TOTAL CONSTRUCTION COST		$10,792,361	$5,552,865	$5,239,496	61,960
ARCHITECTURAL/ENGINEERING FEES (10%)		$1,079,236	$0	$1,079,236	8,634
CIVIL ENGINEERING FEE		$0	$0	$0	0
LANDSCAPE DESIGN FEE		$0	$0	$0	0
HST ON FEES (0%)		$0	$0	$0	0
TOTAL PROJECT COST		**$11,871,597**	**$5,552,865**	**$6,318,732**	**70,594**
Scope of Work: Construction of a new heavy water storage facility.					
Additional Scope: The above estimate does not include for dismantling costs at the end of building life cycle.					
Dismantling Costs		$440,878	$88,176	$352,702	4,409

Notes:

1. Taxes, Development Charges, Permit Fees, Bonding, Insurance, Inspections & Testing, Civil/Landscape, & Material Disposal Costs are not included in the above estimate.
2. Costs are determined using 2010 Canadian Dollars.
3. No 'Nuclear Factors' have been applied.
4. Soils have been assumed to be uniform throughout the three locations. Bearing capacity of 200 Kpa ULS has been assumed for design of footings.
5. Lab spaces have been assumed unfinished space.
6. Exterior road and security fencing have not been allowed for.

THE walterfedy PARTNERSHIP

CAPITAL COST ESTIMATE

PROJECT NAME: Kinectrics OPG Estimating - 15 & 16 Tank Layout
PROJECT NO.: 2010-0262-10
DATE SUBMITTED: 8-Dec-10

TRADE OR ACTIVITY		Total Construction Value	Material Value	Labour Value	Labour Hours (Hrs)
GROSS FLOOR AREA Sq. m		1,920			
General Requirements		$570,803	$253,893	$316,910	4,225
Existing Conditions (Demolition)		$0	$0	$0	0
Concrete Foundations & Footings		$419,689	$125,907	$293,782	3,917
Concrete Floor Finishing		$394,660	$118,398	$276,262	3,683
Masonry		$302,118	$151,059	$151,059	2,014
Structural Steel		$823,035	$617,276	$205,759	2,743
Miscellaneous Metals		$404,342	$303,257	$101,086	1,348
Steel Deck		$51,658	$38,744	$12,915	172
Rough & Finish Carpentry		$41,539	$8,308	$33,231	443
Architectural Woodworks		$0	$0	$0	0
Siding		$832,565	$416,283	$416,283	5,550
Fireproofing		$81,415	$54,548	$26,867	358
Roofing		$296,527	$198,673	$97,854	1,305
Re-Roofing - 15 Year Life Cycle		$370,659	$248,342	$122,318	1,631
Re-Roofing - 30 Year Life Cycle		$370,659	$248,342	$122,318	1,631
Hollow Metal Supply		$28,572	$28,572	$0	0
Overhead Doors		$20,000	$15,000	$5,000	67
Glass & Glazing		$74,962	$59,970	$14,992	200
Door Hardware		$29,350	$29,350	$0	0
Drywall & Acoustics		$0	$0	$0	0
Flooring		$439,783	$219,892	$219,892	2,932
Paint		$110,763	$55,381	$55,381	738
Specialties		$16,740	$11,216	$5,524	74
Total Architectural/Structural		$5,679,840	$3,202,409	$2,477,432	33,032
Mechanical		$ 1,362,482	$818,482	$544,000	6,800
Electrical		$ 1,383,051	$785,300	$597,750	6,615
Commissioning		$84,254	$0	$84,254	887
SUBTOTAL		**$8,509,627**	**$4,806,191**	**$3,703,436**	**47,334**
DESIGN CONTINGENCY (15%)		$1,276,444	$720,929	$555,515	6,944
CONSTRUCTION CONTINGENCY (15%)		$1,276,444	$720,929	$555,515	6,944
TOTAL COST OF THE WORK		$11,062,515	$6,248,048	$4,814,467	61,222
HST ON CONSTRUCTION (0%)		$0	$0	$0	0
TOTAL COST OF THE WORK INCLUDING					28,807
CONTINGENCY AND HST (0%)		**$11,062,515**	**$6,248,048**	**$4,814,467**	**61,222**
GC/CM FEE (10%)		$1,106,252	$0	$1,106,252	8,850
HST ON GC/CM FEE (0%)		$0	$0	$0	0
TOTAL CONSTRUCTION COST		$12,168,767	$6,248,048	$5,920,718	70,072
ARCHITECTURAL/ENGINEERING FEES (10%)		$1,216,877	$0	$1,216,877	9,735
CIVIL ENGINEERING FEE		$0	$0	$0	0
LANDSCAPE DESIGN FEE		$0	$0	$0	0
HST ON FEES (0%)		$0	$0	$0	0
TOTAL PROJECT COST		**$13,385,643**	**$6,248,048**	**$7,137,595**	**79,807**

Scope of Work: Construction of a new heavy water storage facility.

Additional Scope: The above estimate does not include for dismantling costs at the end of building life cycle.

Dismantling Costs		$530,131	$106,026	$424,105	5,301

Notes:

1. Taxes, Development Charges, Permit Fees, Bonding, Insurance, Inspections & Testing, Civil/Landscape, & Material Disposal Costs are not included in the above estimate.
2. Costs are determined using 2010 Canadian Dollars.
3. No 'Nuclear Factors' have been applied.
4. Soils have been assumed to be uniform throughout the three locations. Bearing capacity of 200 Kpa ULS has been assumed for design of footings.
5. Lab spaces have been assumed unfinished space.
6. Exterior road and security fencing have not been allowed for.

THE walterfedy PARTNERSHIP

CAPITAL COST ESTIMATE

PROJECT NAME: Kinectrics OPG Estimating - 17,18,19 Tank Layout
PROJECT NO.: 2010-0262-10
DATE SUBMITTED: 8-Dec-10

TRADE OR ACTIVITY		Total Construction Value	Material Value	Labour Value	Labour Hours (Hrs)
GROSS FLOOR AREA Sq. m		2,068			
General Requirements		$605,510	$259,790	$345,720	4,610
Existing Conditions (Demolition)		$0	$0	$0	0
Concrete Foundations & Footings		$441,503	$132,451	$309,052	4,121
Concrete Floor Finishing		$434,526	$130,358	$304,168	4,056
Masonry		$302,118	$151,059	$151,059	2,014
Structural Steel		$800,008	$600,006	$200,002	2,667
Miscellaneous Metals		$510,340	$382,755	$127,585	1,701
Steel Deck		$55,646	$41,735	$13,912	185
Rough & Finish Carpentry		$43,233	$8,647	$34,586	461
Architectural Woodworks		$0	$0	$0	0
Siding		$888,889	$444,444	$444,444	5,926
Fireproofing		$88,394	$59,224	$29,170	389
Roofing		$321,860	$215,646	$106,214	1,416
Re-Roofing - 15 Year Life Cycle		$402,325	$269,557	$132,767	1,770
Re-Roofing - 30 Year Life Cycle		$402,325	$269,557	$132,767	1,770
Hollow Metal Supply		$28,572	$28,572	$0	0
Overhead Doors		$20,000	$15,000	$5,000	67
Glass & Glazing		$74,962	$59,970	$14,992	200
Door Hardware		$29,350	$29,350	$0	0
Drywall & Acoustics		$0	$0	$0	0
Flooring		$487,638	$243,819	$243,819	3,251
Paint		$116,016	$58,008	$58,008	773
Specialties		$16,740	$11,216	$5,524	74
Total Architectural/Structural/Civil		$6,069,954	$3,411,164	$2,658,790	35,451
Mechanical		$ 1,426,988	$866,988	$560,000	7,000
Electrical		$ 1,439,165	$809,867	$629,298	6,959
Commissioning		$89,361	$0	$89,361	941
SUBTOTAL		**$9,025,469**	**$5,088,020**	**$3,937,449**	**50,350**
DESIGN CONTINGENCY (15%)		$1,353,820	$763,203	$590,617	7,383
CONSTRUCTION CONTINGENCY (15%)		$1,353,820	$763,203	$590,617	7,383
TOTAL COST OF THE WORK		$11,733,109	$6,614,425	$5,118,684	65,115
HST ON CONSTRUCTION (0%)		$0	$0	$0	0
TOTAL COST OF THE WORK INCLUDING					30,841
CONTINGENCY AND HST (0%)		**$11,733,109**	**$6,614,425**	**$5,118,684**	**65,115**
GC/CM FEE (10%)		$1,173,311	$0	$1,173,311	9,386
HST ON GC/CM FEE (0%)		$0	$0	$0	0
TOTAL CONSTRUCTION COST		$12,906,420	$6,614,425	$6,291,995	74,502
ARCHITECTURAL/ENGINEERING FEES (10%)		$1,290,642	$0	$1,290,642	10,325
CIVIL ENGINEERING FEE		$0	$0	$0	0
LANDSCAPE DESIGN FEE		$0	$0	$0	0
HST ON FEES (0%)		$0	$0	$0	0
TOTAL PROJECT COST		**$14,197,062**	**$6,614,425**	**$7,582,637**	**84,827**

Scope of Work: Construction of a new heavy water storage facility.

Additional Scope: The above estimate does not include for dismantling costs at the end of building life cycle.

Dismantling Costs		$572,523	$114,505	$458,018	5,725

Notes:

1. Taxes, Development Charges, Permit Fees, Bonding, Insurance, Inspections & Testing, Civil/Landscape, & Material Disposal Costs are not included in the above estimate.
2. Costs are determined using 2010 Canadian Dollars.
3. No 'Nuclear Factors' have been applied.
4. Soils have been assumed to be uniform throughout the three locations. Bearing capacity of 200 Kpa ULS has been assumed for design of footings.
5. Lab spaces have been assumed unfinished space.
6. Exterior road and security fencing have not been allowed for.

THE walterfedy PARTNERSHIP

CAPITAL COST ESTIMATE

PROJECT NAME: Kinectrics OPG Estimating - 21 Tank Layout
PROJECT NO.: 2010-0262-10
DATE SUBMITTED: 8-Dec-10

TRADE OR ACTIVITY		Total Construction Value	Material Value	Labour Value	Labour Hours (Hrs)
GROSS FLOOR AREA Sq. m		2,232			
General Requirements		$596,356	$250,636	$345,720	4,610
Existing Conditions (Demolition)		$0	$0	$0	0
Concrete Foundations & Footings		$458,543	$137,563	$320,980	4,280
Concrete Floor Finishing		$477,966	$143,390	$334,576	4,461
Masonry		$302,118	$151,059	$151,059	2,014
Structural Steel		$943,011	$707,259	$235,753	3,143
Miscellaneous Metals		$455,140	$341,355	$113,785	1,517
Steel Deck		$60,054	$45,041	$15,014	200
Rough & Finish Carpentry		$45,554	$9,111	$36,443	486
Architectural Woodworks		$0	$0	$0	0
Siding		$951,141	$475,570	$475,570	6,341
Fireproofing		$96,108	$64,392	$31,715	423
Roofing		$349,544	$234,195	$115,350	1,538
Re-Roofing - 15 Year Life Cycle		$436,930	$292,743	$144,187	1,922
Re-Roofing - 30 Year Life Cycle		$436,930	$292,743	$144,187	1,922
Hollow Metal Supply		$29,722	$29,722	$0	0
Overhead Doors		$20,000	$15,000	$5,000	67
Glass & Glazing		$74,962	$59,970	$14,992	200
Door Hardware		$32,150	$32,150	$0	0
Drywall & Acoustics		$0	$0	$0	0
Flooring		$540,533	$270,267	$270,267	3,604
Paint		$122,123	$61,061	$61,061	814
Specialties		$16,740	$11,216	$5,524	74
Total Architectural/Structural		$6,445,624	$3,624,441	$2,821,183	37,616
Mechanical		$ 1,457,920	$873,920	$584,000	7,300
Electrical		$ 1,609,432	$922,613	$686,819	7,471
Commissioning		$95,130	$0	$95,130	1,001
SUBTOTAL		**$9,608,107**	**$5,420,975**	**$4,187,132**	**53,388**
DESIGN CONTINGENCY (15%)		$1,441,216	$813,146	$628,070	7,851
CONSTRUCTION CONTINGENCY (15%)		$1,441,216	$813,146	$628,070	7,851
TOTAL COST OF THE WORK		$12,490,539	$7,047,267	$5,443,272	69,090
HST ON CONSTRUCTION (0%)		$0	$0	$0	0
TOTAL COST OF THE WORK INCLUDING					33,006
CONTINGENCY AND HST (0%)		**$12,490,539**	**$7,047,267**	**$5,443,272**	**69,090**
GC/CM FEE (10%)		$1,249,054	$704,727	$544,327	4,355
HST ON GC/CM FEE (0%)		$0	$0	$0	0
TOTAL CONSTRUCTION COST		$13,739,592	$7,751,994	$5,987,599	73,445
ARCHITECTURAL/ENGINEERING FEES (10%)		$1,373,959	$0	$1,373,959	4,790
CIVIL ENGINEERING FEE		$0	$0	$0	0
LANDSCAPE DESIGN FEE		$0	$0	$0	0
HST ON FEES (0%)		$0	$0	$0	0
TOTAL PROJECT COST		**$15,113,552**	**$8,527,193**	**$6,586,359**	**78,235**

Scope of Work: Construction of a new heavy water storage facility.

Additional Scope: The above estimate does not include for dismantling costs at the end of building life cycle.

Dismantling Costs		$619,379	$123,876	$495,503	6,194

Notes:

1. Taxes, Development Charges, Permit Fees, Bonding, Insurance, Inspections & Testing, Civil/Landscape, & Material Disposal Costs are not included in the above estimate.
2. Costs are determined using 2010 Canadian Dollars.
3. No 'Nuclear Factors' have been applied.
4. Soils have been assumed to be uniform throughout the three locations. Bearing capacity of 200 Kpa ULS has been assumed for design of footings.
5. Lab spaces have been assumed unfinished space.
6. Exterior road and security fencing have not been allowed for.

THE walterfedy PARTNERSHIP

CAPITAL COST ESTIMATE

PROJECT NAME: Kinectrics OPG Estimating - 27 Tank Layout
PROJECT NO.: 2010-0262-10
DATE SUBMITTED: 8-Dec-10

TRADE OR ACTIVITY		Total Construction Value	Material Value	Labour Value	Labour Hours (Hrs)
GROSS FLOOR AREA Sq. m		2,528			
General Requirements		$628,212	$253,682	$374,530	4,994
Existing Conditions (Demolition)		$0	$0	$0	0
Concrete Foundations & Footings		$513,921	$154,176	$359,745	4,797
Concrete Floor Finishing		$548,944	$164,683	$384,261	5,123
Masonry		$302,118	$151,059	$151,059	2,014
Structural Steel		$1,060,918	$795,689	$265,230	3,536
Miscellaneous Metals		$526,420	$394,815	$131,605	1,755
Steel Deck		$68,031	$51,024	$17,008	227
Rough & Finish Carpentry		$49,387	$9,877	$39,510	527
Architectural Woodworks		$0	$0	$0	0
Siding		$1,063,787	$531,894	$531,894	7,092
Fireproofing		$110,068	$73,745	$36,322	484
Roofing		$400,217	$268,146	$132,072	1,761
Re-Roofing - 15 Year Life Cycle		$500,272	$335,182	$165,090	2,201
Re-Roofing - 30 Year Life Cycle		$500,272	$335,182	$165,090	2,201
Hollow Metal Supply		$30,872	$30,872	$0	0
Overhead Doors		$20,000	$15,000	$5,000	67
Glass & Glazing		$74,962	$59,970	$14,992	200
Door Hardware		$34,950	$34,950	$0	0
Drywall & Acoustics		$0	$0	$0	0
Flooring		$636,262	$318,131	$318,131	4,242
Paint		$132,930	$66,465	$66,465	886
Specialties		$16,740	$11,216	$5,524	74
Total Architectural/Structural/Civil		$7,219,283	$4,055,757	$3,163,526	42,180
Mechanical		$ 1,526,620	$918,620	$608,000	7,600
Electrical		$ 1,706,102	$964,243	$741,859	8,110
Commissioning		$104,520	$0	$104,520	1,100
SUBTOTAL		**$10,556,525**	**$5,938,620**	**$4,617,905**	**58,991**
DESIGN CONTINGENCY (15%)		$1,583,479	$890,793	$692,686	8,659
CONSTRUCTION CONTINGENCY (15%)		$1,583,479	$890,793	$692,686	8,659
TOTAL COST OF THE WORK		$13,723,483	$7,720,207	$6,003,276	76,308
HST ON CONSTRUCTION (0%)		$0	$0	$0	0
TOTAL COST OF THE WORK INCLUDING CONTINGENCY AND HST (0%)		**$13,723,483**	**$7,720,207**	**$6,003,276**	**76,308**
GC/CM FEE (10%)		$1,372,348	$0	$1,372,348	10,979
HST ON GC/CM FEE (0%)		$0	$0	$0	$0
TOTAL CONSTRUCTION COST		$15,095,831	$7,720,207	$7,375,625	87,287
ARCHITECTURAL/ENGINEERING FEES (10%)		$1,509,583	$0	$1,509,583	12,077
CIVIL ENGINEERING FEE		$0	$0	$0	0
LANDSCAPE DESIGN FEE		$0	$0	$0	0
HST ON FEES (0%)		$0	$0	$0	0
TOTAL PROJECT COST		**$16,605,414**	**$7,720,207**	**$8,885,208**	**99,363**

Scope of Work: Construction of a new heavy water storage facility.

Additional Scope: The above estimate does not include for dismantling costs at the end of building life cycle.

Dismantling Costs		$704,179	$140,836	$563,343	7,042

Notes:

1. Taxes, Development Charges, Permit Fees, Bonding, Insurance, Inspections & Testing, Civil/Landscape, & Material Disposal Costs are not included in the above estimate.
2. Costs are determined using 2010 Canadian Dollars.
3. No 'Nuclear Factors' have been applied.
4. Soils have been assumed to be uniform throughout the three locations. Bearing capacity of 200 Kpa ULS has been assumed for design of footings.
5. Lab spaces have been assumed unfinished space.
6. Exterior road and security fencing have not been allowed for.

Production of Cost Estimates for the Construction of Heavy Water Storage Facilities
OPG Purchase Order: 4400032110
Kinectrics Project Number: K-015634

THE walterfedy PARTNERSHIP

CAPITAL COST ESTIMATE

PROJECT NAME: Kinectrics OPG Estimating - 31 Tank Layout
PROJECT NO.: 2010-0262-10
DATE SUBMITTED: 8-Dec-10

TRADE OR ACTIVITY		Total Construction Value	Material Value	Labour Value	Labour Hours (Hrs)
GROSS FLOOR AREA Sq. m		2,676			
General Requirements		$660,993	$257,653	$403,340	5,378
Existing Conditions (Demolition)		$0	$0	$0	0
Concrete Foundations & Footings		$494,688	$148,407	$346,282	4,617
Concrete Floor Finishing		$589,025	$176,708	$412,318	5,498
Masonry		$302,118	$151,059	$151,059	2,014
Structural Steel		$1,024,772	$768,579	$256,193	3,416
Miscellaneous Metals		$594,130	$445,597	$148,532	1,980
Steel Deck		$72,018	$54,013	$18,004	240
Rough & Finish Carpentry		$51,533	$10,307	$41,227	550
Architectural Woodworks		$0	$0	$0	0
Siding		$1,120,111	$560,055	$560,055	7,467
Fireproofing		$117,044	$78,419	$38,624	515
Roofing		$428,540	$287,122	$141,418	1,886
Re-Roofing - 15 Year Life Cycle		$535,675	$358,902	$176,773	2,357
Re-Roofing - 30 Year Life Cycle		$535,675	$358,902	$176,773	2,357
Hollow Metal Supply		$32,022	$32,022	$0	0
Overhead Doors		$20,000	$15,000	$5,000	67
Glass & Glazing		$74,962	$59,970	$14,992	200
Door Hardware		$37,750	$37,750	$0	0
Drywall & Acoustics		$0	$0	$0	0
Flooring		$684,096	$342,048	$342,048	4,561
Paint		$138,483	$69,241	$69,241	923
Specialties		$16,740	$11,216	$5,524	74
Total Architectural/Structural		$7,530,374	$4,222,970	$3,307,404	44,099
Mechanical		$ 1,556,887	$948,887	$608,000	7,600
Electrical		$ 1,844,061	$1,050,630	$793,430	8,671
Commissioning		$109,313	$0	$109,313	1,151
SUBTOTAL		**$11,040,635**	**$6,222,487**	**$4,818,147**	**61,520**
DESIGN CONTINGENCY (15%)		$1,656,095	$933,373	$722,722	9,034
CONSTRUCTION CONTINGENCY (15%)		$1,656,095	$933,373	$722,722	9,034
TOTAL COST OF THE WORK		$14,352,825	$8,089,233	$6,263,592	79,588
HST ON CONSTRUCTION (0%)		$0	$0	$0	0
TOTAL COST OF THE WORK INCLUDING CONTINGENCY AND HST (0%)		**$14,352,825**	**$8,089,233**	**$6,263,592**	**79,588**
GC/CM FEE (10%)		$1,435,282	$0	$1,435,282	11,482
HST ON GC/CM FEE (0%)		$0	$0	$0	$0
TOTAL CONSTRUCTION COST		$15,788,107	$8,089,233	$7,698,874	91,070
ARCHITECTURAL/ENGINEERING FEES (10%)		$1,578,811	$0	$1,578,811	12,630
CIVIL ENGINEERING FEE		$0	$0	$0	0
LANDSCAPE DESIGN FEE		$0	$0	$0	0
HST ON FEES (0%)		$0	$0	$0	0
TOTAL PROJECT COST		**$17,366,918**	**$8,089,233**	**$9,277,685**	**103,701**
Scope of Work: Construction of a new heavy water storage facility.					
Additional Scope: The above estimate does not include for dismantling costs at the end of building life cycle.					
Dismantling Costs		$746,552	$149,310	$597,241	7,466

Notes:

1. Taxes, Development Charges, Permit Fees, Bonding, Insurance, Inspections & Testing, Civil/Landscape, & Material Disposal Costs are not included in the above estimate.
2. Costs are determined using 2010 Canadian Dollars.
3. No 'Nuclear Factors' have been applied.
4. Soils have been assumed to be uniform throughout the three locations. Bearing capacity of 200 Kpa ULS has been assumed for design of footings.
5. Lab spaces have been assumed unfinished space.
6. Exterior road and security fencing have not been allowed for.

APPENDIX D- SUPPLIER QUOTES

1390 ADVANCE ROAD, OAKVILLE, ONTARIO L6L 6L6
T (905) 827-2600 TF (888) 252-6179 F (905) 827-1600
Web www.hooperwelding.com

November 25, 2010

KINECTRICS, INC.
800 Kipling Avenue
Toronto, Ontario,
CANADA M8Z 6C4

ATTN: Andy Heics

RE: Inquiry – OPG/Darlington Storage Tanks

REF: 10-312-382 R.2 – REVISED SIZING

Thank you for the opportunity to quote your requirements. Should you have any questions, feel free to contact our offices **toll free 1-888-252-6179**.

ITEM	FABRICATION DETAIL	UNITS	BUDGET ONLY PRICE/ UNIT
1	150 m 3 STORAGE TANKS (VERTICAL) Estimated Weight: 75,000 lbs. ASME CLASS 3 NUCLEAR Design 30 PSI @ 150 F Shell & Head Material SA240 304L Shell 168”OD x 360”t/t x 3/8”thk. Heads (2) 2:1 Semi-Ellip. 168”OD x 0.32”min. Support Skirt constructed Material SA516-70 c/w Base Ring and Accesses as required HWE providing design, engineering, material, labour, rolling, welding and final assembly. Budget Nozzles and Manways Assumption (2) 18” 150# RFWN Manways	1	$ 950,000.00 Nuclear $ 700,000.00 Non-Nuclear

HOOPER WELDING

1390 ADVANCE ROAD, OAKVILLE, ONTARIO L6L 6L6
T (905) 827-2600 TF (888) 252-6179 F (905) 827-1600
Web www.hooperwelding.com

	(2) ¾" 150# RFWN (4) 2" 150# RFWN (2) 3" 150# RFWN Designed & Manufactured to ASME Section III, Class III All Design for HWE to evaluate 'best design' 'Seismic Design not included' Certified to N285.0 Section III, Class III		
1	100 m 3 STORAGE TANKS (VERTICAL) Estimated Weight: 60,000 lbs. Design 30 PSI @ 150 F Shell & Head Material SA240 304L Shell 144"OD x 384"t/t x 5/16"thk. Heads (2) 2:1 Semi-Ellip. 144"OD x 0.25"min. Internal Head 143.25"OD x 0.56"min. Support Skirt constructed Material SA516-70 c/w Base Ring and Accesses as required HWE providing design, engineering, material, labour, rolling, welding and final assembly. Budget Nozzles and Manways Assumption (2) 18" 150# RFWN Manways (2) ¾" 150# RFWN (4) 2" 150# RFWN (2) 3" 150# RFWN Designed & Manufactured to ASME Section III, Class III	1	$ 600,000.00 Nuclear $ 480,000.00 Non-Nuclear

HOOPER WELDING

1390 ADVANCE ROAD, OAKVILLE, ONTARIO L6L 6L6
T (905) 827-2600 TF (888) 252-6179 F (905) 827-1600
Web www.hooperwelding.com

	All Design for HWE to evaluate 'best design' 'Seismic Design not included' **Certified to N285.0 Section III, Class III**		
	Cost Adder for Seismic Design		**$35,000.00 per Design**
	Notes: • NDE per code • History docket and MTR to be provided for material provided by HWE • Design Report and Drawings be HWE to be approved before fabrication • HWE reserves the right to review any new specifications and design changes for cost or schedule impact		

DELIVERY:

- **Design and Engineering 4-5 weeks ARO**
- **Material 12-16 weeks ARO**
- **Fabrication 16-20 weeks after receipt of material**

BID VALIDITY:

- **Bid is budget only, no validity**

LIQUIDATED DAMAGES:

- **There shall be NO Liquidated Damages for Late Delivery**

TERMS:

- **10% After Submission of Design Report & Drawings**
- **45% After Receipt of Major Material (Defined as Shell Plate)**
- **Balance per Unit Shipped**
- **NET 30**

1390 ADVANCE ROAD, OAKVILLE, ONTARIO L6L 6L6
T (905) 827-2600 TF (888) 252-6179 F (905) 827-1600
Web www.hooperwelding.com

CANCELLATION CLAUSE:
In the event of contract cancellation, Buyer shall be responsible to pay HWE the following. The dates are based on Week 1 – Placement of Purchase Order

- **Week 0-1 – 5% of P.O. Value**
- **Week 2-3 - 15% of P.O. Value**
- **Week 4 - 25% of P.O. Value**
- **Week 4 – Material Procured**
- **Week 5-8 - 40% of P.O. Value**
- **Week 9-10 - 60% of P.O. Value**
- **Week 11-14 - 65% of P.O. Value**
- **Week 15-20 - 75% of P.O. Value**
- **Week 21-25 - 80% of P.O. Value**
- **Week 26-30 - 90% of P.O. Value**
- **Week 31+ - 100% of P.O. Value**

F.O.B.:

- **HWE - Oakville, Ontario**

Should you have any questions, feel free to contact our offices **toll free 1-888-252-6179**. Thank you.

Sincerely,

Chris L. Hooper
Vice President, Sales & Marketing

CCI Thermal Technologies INC

Quotation

KINECTRICS Inc.
800 Kipling Avenue, Unit 2, KR312
Toronto, ON M8Z 6C4

Attention: **Ruth Burany,** PhD
Senior Scientist, Nuclear Waste & Tritium Solutions
Generation Life Cycle Management

DATE	Nov 30, 2010
YOUR DOCUMENT NUMBER	e-mail inquiry
OUR REFERENCE NUMBER	10-746 R1

WE ARE PLEASED TO SUBMIT THE FOLLOWING QUOTATION FOR YOUR CONSIDERATION

1.0 Preamble

1.1 This quotation covers the design, document preparation, fabrication and assembly, testing, inspection, preparation for shipment, supply, and warranty for **one (1) CCI Model # PVV144360E030 N285 Class 3, one (1) CCI Model # PVV144360E030 ASME VIII-1 and one (1) CCI Model # PVV168360E030 N285 Class 3 and one (1) PVV168360E030 ASME VIII-1.**

1.2 This quotation is in general compliance with the supplied specifications with comments to the specifications as detailed in Appendix B. For reference, a summary of the quotation sections and appendices is detailed below.

Summary of Quotation	
Section	**Description**
1.0	Preamble
2.0	Description and Price
3.0	Delivery & Production Schedule
4.0	Payment
5.0	Cancellation Charges
6.0	Storage Instructions
7.0	Start-up Assistance
8.0	Closing
Appendix	
A	Equipment Summary Sheets
B	Comments to Specifications
C	Quality Control Certificates
D	Terms and Conditions

❑ **Edmonton**
Head Office
5918 Roper Road
Edmonton, Alberta
Canada T6B 3E1
T 780-466-3178
F 780-468-5904
1-800-661-8529

❑ **Toronto**
2721 Plymouth Drive
Oakville, Ontario
Canada L6H 5R5
T 905-829-4422
F 905-829-4430
1-800-410-3131

❑ **Orillia**
1 Hunter Valley Road
P.O. Box 44
Orillia, Ontario
Canada L3V 6H9
T 705-325-3473
F 705-325-2106
1-877-325-3473

❑ **U.S.A.**
1420 West Main Street
Greensburg, Indiana
U.S.A. 47240
T 812-663-4141
F 812-663-4202
1-800-473-2402

❑ **Montreal**
T 1-866-513-5252
F 1-888-252-4477

www.ccithermal.com
info@ccithermal.com

CCI Thermal Technologies INC

Quotation

KINECTRICS Inc.
800 Kipling Avenue, Unit 2, KR312
Toronto, ON M8Z 6C4

Attention: **Ruth Burany,** PhD
Senior Scientist, Nuclear Waste & Tritium Solutions
Generation Life Cycle Management

DATE	Nov 30, 2010
YOUR DOCUMENT NUMBER	e-mail inquiry
OUR REFERENCE NUMBER	10-746 R1

WE ARE PLEASED TO SUBMIT THE FOLLOWING QUOTATION FOR YOUR CONSIDERATION

2.0 Description and Price

2.1 A brief description of the equipment offered and its pricing is provided in the table below. Please refer to Appendix B for the equipment data sheets and detailed description.

Item	Description - Vessel	Qty	Unit Price (CDN $)	Price (CDN $)
1	**CCI Model # PVV144360E030 (100m^3 capacity), 304 Stainless Steel Material vertical vessel configuration on skirt support. N285 Class 3, "U" Stamped and CRN registered. Mill finish exterior and interior. No level gauges or transmitters are included in the base quote. Design reports, including seismic, will use Finite Element.**	1	$674,750	$674,750
2	**CCI Model # PVV144360E030 (100m^3 capacity), 304 Stainless Steel Material vertical vessel configuration on skirt support. ASME VIII-1, "U" Stamped and CRN registered. Mill finish exterior and interior. No level gauges or transmitters are included in the base quote. Seismic and code calculations performed using conventional ASME VIII-1 code calculation software (COMPRESS).**	1	$471,750	$471,750
3	**CCI Model # PVV144360E030 (150m^3 capacity), 304 Stainless Steel Material vertical vessel configuration on skirt support. N285 Class 3, "U" Stamped and CRN registered. Mill finish exterior and interior. No level gauges or transmitters are included in the base quote. Design reports, including seismic, will use Finite Element.**	1	$792,250	$792,250
4	**CCI Model # PVV144360E030 (150m^3 capacity), 304 Stainless Steel Material vertical vessel configuration on skirt support. ASME VIII-1, "U" Stamped and CRN registered. Mill finish exterior and interior. No level gauges or transmitters are included in the base quote. Seismic and code calculations performed using conventional ASME VIII-1 code calculation software (COMPRESS).**	1	$550,250	$550,250

2.2 All prices are net prices in **CDN** dollars, valid for 30 days.

❑ **Edmonton**
Head Office
5918 Roper Road
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1-800-661-8529

❑ **Toronto**
2721 Plymouth Drive
Oakville, Ontario
Canada L6H 5R5
T 905-829-4422
F 905-829-4430
1-800-410-3131

❑ **Orillia**
1 Hunter Valley Road
P.O. Box 44
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F 705-325-2106
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F 812-663-4202
1-800-473-2402

❑ **Montreal**
T 1-866-513-5252
F 1-888-252-4477

www.ccithermal.com
info@ccithermal.com

CCI Thermal Technologies INC

Quotation

KINECTRICS Inc.
800 Kipling Avenue, Unit 2, KR312
Toronto, ON M8Z 6C4

Attention: **Ruth Burany,** PhD
Senior Scientist, Nuclear Waste & Tritium Solutions
Generation Life Cycle Management

DATE	Nov 30, 2010
YOUR DOCUMENT NUMBER	e-mail inquiry
OUR REFERENCE NUMBER	10-746 R1

WE ARE PLEASED TO SUBMIT THE FOLLOWING QUOTATION FOR YOUR CONSIDERATION

2.3 Freight, Taxes and Duty Extra

2.4 FCA Oakville, Ontario

3.0 Delivery

3.1 Please allow 8 weeks for N285 and 2 weeks VIII after receipt of order for engineering and 22 weeks after receipt of approved drawings for procurement and fabrication. This applies to the initial order, for consequent orders a schedule will be arranged.

3.2 Preliminary production schedule is as follows:

a) Engineering and Approval drawing preparation – 2 weeks

b) Customer review and approval – 1 week

c) Procurement and delivery of major material – 6 week

d) Fabrication and Packaging – 16 weeks

4.0 Payment

Net 30 days.

5.0 Cancellation Charges

In the event the order must be cancelled by the purchaser the following schedule of charges would apply:

1) 15% if cancelled prior to return of all data/drawings submitted for review;
2) 20 % if cancelled once ordering of materials has commenced plus:
   a) direct costs of material order cancellations plus 10%
   b) direct costs of material consumed plus 10%
   c) direct costs of labour and overhead plus 10%
3) The maximum cancellation charge under this schedule shall not exceed 75% of the contract value provided the order is not complete
4) Once complete the cancellation charge is 100%

CCI Thermal Technologies INC

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KINECTRICS Inc.
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Attention: **Ruth Burany,** PhD
Senior Scientist, Nuclear Waste & Tritium Solutions
Generation Life Cycle Management

DATE	Nov 30, 2010
YOUR DOCUMENT NUMBER	e-mail inquiry
OUR REFERENCE NUMBER	10-746 R1

WE ARE PLEASED TO SUBMIT THE FOLLOWING QUOTATION FOR YOUR CONSIDERATION

6.0 Storage Instructions

Goods shall be stored within a fire-resistant, weather-tight and well-ventilated building or equivalent enclosure. Precautions shall be taken against vandalism. This area shall be situated and constructed so that it will not be subject to flooding; the floor shall be paved or equal and well drained. Goods shall be placed on pallets or shoring to permit air circulation. The area shall be provided with uniform heating and temperature control or its equivalent to prevent condensation and corrosion. The minimum temperature shall be 40°F (5°C), and the maximum temperature shall be 140°F (60°C).

7.0 Start-up Assistance

Start-up service at site by manufacturer is normally not required for this type of equipment as the customer can follow the straight forward procedures according to the IOM manual shipped with the equipment. However, if it is insisted, we can provide the supervision service by our specialist on request based on the following charges.

1. The round trip business air-ticket between Toronto-Canada and the international airport of the site located country; billed at cost plus 10%.
2. CDN$1,800 per 8-hours day including waiting, stand-by and traveling time. For overtime and work on public holidays, the hourly rate is CDN $300 for maximum 10 working hours per day.
3. CDN$ 350 accommodations per day.
4. Local transportation between airport, hotel and working site to be provided by the purchaser or billed at cost plus 10%.

8.0 Closing

We would like to thank you for the opportunity to quote on this project and trust that you will find our offer acceptable. If you have any questions, comments or would like to discuss this quotation, please do not hesitate to call or email the undersigned.

Sincerely,
Robert Simmons
Applications Specialist
PH: 905-829-4422
Email: rsimmons@ccithermal.com

CCI Thermal Technologies INC

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Attention: **Ruth Burany,** PhD
Senior Scientist, Nuclear Waste & Tritium Solutions
Generation Life Cycle Management

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APPENDIX A
Equipment Summary Sheets

Please refer to attached data sheet for additional information.

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F 1-888-252-4477

www.ccithermal.com
info@ccithermal.com

Specification Data Sheet version 2.0 Sep 11th 2009

Clear Inputs

Unit Of Measure: Imperial

(a) PROJECT DATA

Customer: Kinetrics
Project: D2O Storage Tanks
Project No:
Tag No:
CCI Quote No: 10-746
Qty: 1

(b) PROCESS DATA

Process Fluid: D2O
Contamination: None
Fluid Condtion: Liquid
Capacity: 100 m3
Op Temp: 120 °F
Op Pressure: 5 psig
CCI Thermal Model No: PVV144360E030

~~(c) FILTER MEDIA DATA~~

~~1st Stage:~~ ~~n/a~~
~~Description of Media:~~
~~Qty:~~
~~Recommended Media ΔP:~~ ~~n/a~~ ~~psig~~

(d) VESSEL DATA

Pressure Int: Design	30	psig	Temperature Int: Design	150	°F
Pressure Ext: Design	n/a	psig	Temperature Ext: Design	n/a	°F
~~Allowable Clean ΔP:~~		~~psig~~	~~Allowable Dirty ΔP:~~		~~psig~~
Corrosion: Shell	0	"	Corrosion: Nozzles	0	"
Configuration:	Vertical		Support Type:	Pedestal/Skirt	
Top Closure Style:	F & D Head		~~Top Gasket Type:~~		
Top Head Lift:	None		~~Top Gasket Matl:~~		
Btm Closure Style:	F & D Head		~~Btm Gasket Type:~~		
Btm Head Lift:	None		~~Btm Gasket Matl:~~		

(e) MATERIAL DATA

Shell:	SA-240 304/304L	Head:	SA-240 304/304L
Nozzles:	SA-312 TP304/304L SMLS	Flanges:	SA-182 F304/304L
Couplings:	SA-182 F304/304L	Bolting:	SA-193, Gr B8 / SA-194, Gr 8
Supports:	SA-240 304/304L	Insulation:	None
Internals:	None		

(f) FINISHES

External - Vessel: Shot Blast
Support: Shot Blast
Internal - Vessel: Clean and Dry

(g) CODE REQUIREMENTS

Service: Non-Lethal
PWHT : No °F
Code: CSA N285.0 CL3 Edition Latest Addenda: Latest
Canadian Registration Number (CRN): Yes
Province of Registration: Ontario / Quebec
ASME Code Stamp: None
National Board Registration: None

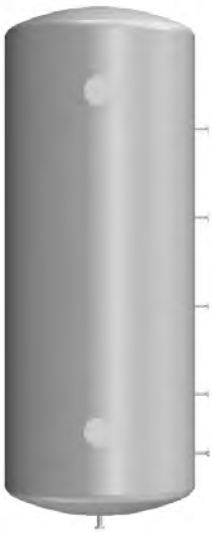
(h) TESTING REQUIREMENTS

Pressure Test Type: Hydraulic @ 39 psig 60 °F 60 min
Radiography: Long: Full
Circular: Full
Ultrasonic Testing (UT): No
UT of what Areas:
Liquid Penetrant Test (LP): Yes
LP of what Areas:
Magnetic Partical Testing (MT): No
MT of what Areas:
Positive Matl Identification (PMI): Yes
PMI of what Areas:
Impact Testing: No
Impact Test of:

Specification Data Sheet version 1.0 Aug. 16th 2006

CONNECTIONS

Mark #	Purpose	Size	Class	Bolting	Nuts	Gaskets	Qty
N1	Inlet	3"	150#	n/a	n/a	n/a	1
N2	Outlet	3"	150#	n/a	n/a	n/a	1
N3 to N6	Level Sensors	2"	150#	n/a	n/a	n/a	4
N7 to N8	Temperature Gauge	¾"	3000#	n/a	n/a	n/a	2



Vessel Total Height: 445¾" (Shell Length 360")
Vessel Diameter: 144" OD x ½" wall thickness

Specification Data Sheet version 2.0 Sep 11th 2009

Clear Inputs

Unit Of Measure: Imperial

(a) PROJECT DATA

Customer:	Kinetrics	Project:	D2O Storage Tanks		
Project No:		Tag No:		CCI Quote No:	10-746
		Qty:	1		

(b) PROCESS DATA

Process Fluid:	D2O	Contamination:	None	
Fluid Condtion:	Liquid	Capacity:	100	m3
Op Temp:	120 °F	Op Pressure:	5	psig
CCI Thermal Model No:	PVV144360E030			

~~(c) FILTER MEDIA DATA~~

~~1st Stage:~~	~~n/a~~	~~Description of Media:~~		
~~Qty:~~		~~Recommended Media ΔP:~~	~~n/a~~	~~psig~~

(d) VESSEL DATA

Pressure Int: Design	30	psig	Temperature Int: Design	150	°F
Pressure Ext: Design	n/a	psig	Temperature Ext: Design	n/a	°F
~~Allowable Clean ΔP:~~		~~psig~~	~~Allowable Dirty ΔP:~~		~~psig~~
Corrosion: Shell	0	"	Corrosion: Nozzles	0	"
Configuration:	Vertical		Support Type:	Pedestal/Skirt	
Top Closure Style:	F & D Head		~~Top Gasket Type:~~		
Top Head Lift:	None		~~Top Gasket Matl:~~		
Btm Closure Style:	F & D Head		~~Btm Gasket Type:~~		
Btm Head Lift:	None		~~Btm Gasket Matl:~~		

(e) MATERIAL DATA

Shell:	SA-240 304/304L	Head:	SA-240 304/304L
Nozzles:	SA-312 TP304/304L SMLS	Flanges:	SA-182 F304/304L
Couplings:	SA-182 F304/304L	Bolting:	SA-193, Gr B8 / SA-194, Gr 8
Supports:	SA-240 304/304L	Insulation:	None
Internals:	None		

(f) FINISHES

External - Vessel:	Shot Blast	Support:	Shot Blast
Internal - Vessel:	Clean and Dry		

(g) CODE REQUIREMENTS

Service:	Non-Lethal				
PWHT :	No		°F		
Code:	ASME VIII-1	Edition	Latest	Addenda:	Latest
Canadian Registration Number (CRN):	Yes				
Province of Registration:	Ontario / Quebec				
ASME Code Stamp:	None				
National Board Registration:	None				

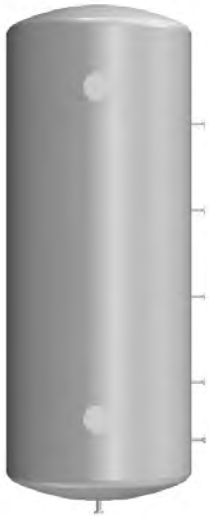
(h) TESTING REQUIREMENTS

Pressure Test Type:	Hydraulic	@	39	psig	60	°F	60	min
Radiography: Long:	Full			Circular:	Full			
Ultrasonic Testing (UT):	No			UT of what Areas:				
Liquid Penetrant Test (LP):	Yes			LP of what Areas:				
Magnetic Partical Testing (MT):	No			MT of what Areas:				
Positive Matl Identification (PMI):	Yes			PMI of what Areas:				
Impact Testing:	No			Impact Test of:				

Specification Data Sheet version 1.0 Aug. 16th 2006

CONNECTIONS

Mark #	Purpose	Size	Class	Bolting	Nuts	Gaskets	Qty
N1	Inlet	3"	150#	n/a	n/a	n/a	1
N2	Outlet	3"	150#	n/a	n/a	n/a	1
N3 to N6	Level Sensors	2"	150#	n/a	n/a	n/a	4
N7 to N8	Temperature Gauge	¾"	3000#	n/a	n/a	n/a	2



Vessel Total Height: 445¾" (Shell Length 360")
Vessel Diameter: 144" OD x ½" wall thickness

Specification Data Sheet version 2.0 Sep 11th 2009

Clear Inputs

Unit Of Measure: Imperial

(a) PROJECT DATA

Customer:	Kinetrics	Project:	D2O Storage Tanks		
Project No:		Tag No:		CCI Quote No:	10-746
		Qty:	1		

(b) PROCESS DATA

Process Fluid:	D2O	Contamination:	None	
Fluid Condtion:	Liquid	Capacity:	150	m3
Op Temp:	120 °F	Op Pressure:	5	psig
CCI Thermal Model No:	PVV168360E030			

~~(c) FILTER MEDIA DATA~~

~~1st Stage:~~	~~n/a~~	~~Description of Media:~~		
~~Qty:~~		~~Recommended Media ΔP:~~	~~n/a~~	~~psig~~

(d) VESSEL DATA

Pressure Int: Design	30	psig	Temperature Int: Design	150	°F
Pressure Ext: Design	n/a	psig	Temperature Ext: Design	n/a	°F
~~Allowable Clean ΔP:~~		~~psig~~	~~Allowable Dirty ΔP:~~		~~psig~~
Corrosion: Shell	0	"	Corrosion: Nozzles	0	"
Configuration:	Vertical		Support Type:	Pedestal/Skirt	
Top Closure Style:	F & D Head		~~Top Gasket Type:~~		
Top Head Lift:	None		~~Top Gasket Matl:~~		
Btm Closure Style:	F & D Head		~~Btm Gasket Type:~~		
Btm Head Lift:	None		~~Btm Gasket Matl:~~		

(e) MATERIAL DATA

Shell:	SA-240 304/304L	Head:	SA-240 304/304L
Nozzles:	SA-312 TP304/304L SMLS	Flanges:	SA-182 F304/304L
Couplings:	SA-182 F304/304L	Bolting:	SA-193, Gr B8 / SA-194, Gr 8
Supports:	SA-240 304/304L	Insulation:	None
Internals:	None		

(f) FINISHES

External - Vessel:	Shot Blast	Support:	Shot Blast
Internal - Vessel:	Clean and Dry		

(g) CODE REQUIREMENTS

Service:	Non-Lethal				
PWHT :	No		°F		
Code:	CSA N285.0 CL3	Edition	Latest	Addenda:	Latest
Canadian Registration Number (CRN):	Yes				
Province of Registration:	Ontario / Quebec				
ASME Code Stamp:	None				
National Board Registration:	None				

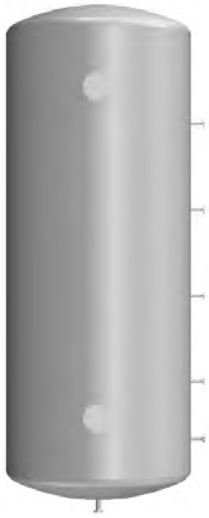
(h) TESTING REQUIREMENTS

Pressure Test Type:	Hydraulic	@	39	psig	60	°F	60	min
Radiography: Long:	Full			Circular:	Full			
Ultrasonic Testing (UT):	No			UT of what Areas:				
Liquid Penetrant Test (LP):	Yes			LP of what Areas:				
Magnetic Partical Testing (MT):	No			MT of what Areas:				
Positive Matl Identification (PMI):	Yes			PMI of what Areas:				
Impact Testing:	No			Impact Test of:				

Specification Data Sheet version 1.0 Aug. 16th 2006

CONNECTIONS

Mark #	Purpose	Size	Class	Bolting	Nuts	Gaskets	Qty
N1	Inlet	3"	150#	n/a	n/a	n/a	1
N2	Outlet	3"	150#	n/a	n/a	n/a	1
N3 to N6	Level Sensors	2"	150#	n/a	n/a	n/a	4
N7 to N8	Temperature Gauge	¾"	3000#	n/a	n/a	n/a	2



Vessel Total Height: 449¾" (Shell Length 360")
Vessel Diameter: 168" OD x ½" wall thickness

Specification Data Sheet version 2.0 Sep 11th 2009

Clear Inputs

Unit Of Measure: Imperial

(a) PROJECT DATA

Customer: Kinetrics
Project: D2O Storage Tanks
Project No:
Tag No:
CCI Quote No: 10-746
Qty: 1

(b) PROCESS DATA

Process Fluid: D2O
Contamination: None
Fluid Condtion: Liquid
Capacity: 150 m3
Op Temp: 120 °F
Op Pressure: 5 psig
CCI Thermal Model No: PVV168360E030

~~(c) FILTER MEDIA DATA~~

~~1st Stage:~~ ~~n/a~~
~~Description of Media:~~
~~Qty:~~
~~Recommended Media ΔP:~~ ~~n/a~~ ~~psig~~

(d) VESSEL DATA

Pressure Int: Design	30	psig	Temperature Int: Design	150	°F
Pressure Ext: Design	n/a	psig	Temperature Ext: Design	n/a	°F
~~Allowable Clean ΔP:~~		~~psig~~	~~Allowable Dirty ΔP:~~		~~psig~~
Corrosion: Shell	0	"	Corrosion: Nozzles	0	"
Configuration:	Vertical		Support Type:	Pedestal/Skirt	
Top Closure Style:	F & D Head		~~Top Gasket Type:~~		
Top Head Lift:	None		~~Top Gasket Matl:~~		
Btm Closure Style:	F & D Head		~~Btm Gasket Type:~~		
Btm Head Lift:	None		~~Btm Gasket Matl:~~		

(e) MATERIAL DATA

Shell:	SA-240 304/304L	Head:	SA-240 304/304L
Nozzles:	SA-312 TP304/304L SMLS	Flanges:	SA-182 F304/304L
Couplings:	SA-182 F304/304L	Bolting:	SA-193, Gr B8 / SA-194, Gr 8
Supports:	SA-240 304/304L	Insulation:	None
Internals:	None		

(f) FINISHES

External - Vessel: Shot Blast
Support: Shot Blast
Internal - Vessel: Clean and Dry

(g) CODE REQUIREMENTS

Service: Non-Lethal
PWHT : No °F
Code: ASME VIII-1 Edition Latest Addenda: Latest
Canadian Registration Number (CRN): Yes
Province of Registration: Ontario / Quebec
ASME Code Stamp: None
National Board Registration: None

(h) TESTING REQUIREMENTS

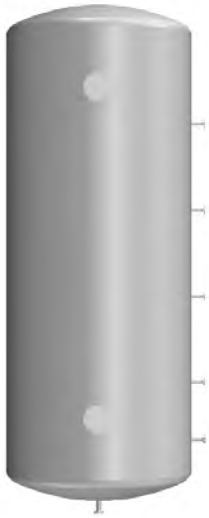
Pressure Test Type: Hydraulic @ 39 psig 60 °F 60 min

Radiography: Long:	Full	Circular:	Full
Ultrasonic Testing (UT):	No	UT of what Areas:	
Liquid Penetrant Test (LP):	Yes	LP of what Areas:	
Magnetic Partical Testing (MT):	No	MT of what Areas:	
Positive Matl Identification (PMI):	Yes	PMI of what Areas:	
Impact Testing:	No	Impact Test of:	

Specification Data Sheet version 1.0 Aug. 16th 2006

CONNECTIONS

Mark #	Purpose	Size	Class	Bolting	Nuts	Gaskets	Qty
N1	Inlet	3"	150#	n/a	n/a	n/a	1
N2	Outlet	3"	150#	n/a	n/a	n/a	1
N3 to N6	Level Sensors	2"	150#	n/a	n/a	n/a	4
N7 to N8	Temperature Gauge	¾"	3000#	n/a	n/a	n/a	2



Vessel Total Height: 449¾" (Shell Length 360")
Vessel Diameter: 168" OD x ½" wall thickness

CCI Thermal Technologies INC

Quotation

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Attention: **Ruth Burany,** PhD
Senior Scientist, Nuclear Waste & Tritium Solutions
Generation Life Cycle Management

DATE	Nov 30, 2010
YOUR DOCUMENT NUMBER	e-mail inquiry
OUR REFERENCE NUMBER	10-746 R1

APPENDIX B
Comments to the Specifications

CCI Thermal Technologies is in general compliance with the specifications provided.

As stated above the N285 Class 3 vessels pricing includes Design Reports and Finite Element Analysis for seismic calculations. On a single vessel the Engineering Cost associated with producing Design Reports and Seismic FEA is 2.1%. On multiple vessel purchases this would be prorated over the quantity. The VIII-1 vessel seismic analysis and code calculations will be performed using commercially available software, specifically COMPRESS.

On qty purchased greater than 4 vessels CCI Thermal Technologies can offer a 7% discount.

Please note CCI Thermal Technologies considers this to be a budgetary quotation.

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Attention: **Ruth Burany,** PhD
Senior Scientist, Nuclear Waste & Tritium Solutions
Generation Life Cycle Management

DATE	Nov 30, 2010
YOUR DOCUMENT NUMBER	e-mail inquiry
OUR REFERENCE NUMBER	10-746 R1

APPENDIX C
Quality Certificates

Refer to attached document.

Edmonton
Head Office
5918 Roper Road
Edmonton, Alberta
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F 1-888-252-4477

www.ccithermal.com
info@ccithermal.com

TECHNICAL STANDARDS & SAFETY AUTHORITY

CERTIFICATE OF AUTHORIZATION

This is to certify the named company as having had the adequacy of their quality program verified for the scope shown below in accordance with the Ontario Technical Standards and Safety Act, Boilers and Pressure Vessels Regulation

Company Name : CCI THERMAL TECHNOLOGIES INC

2721 PLYMOUTH DRIVE
OAKVILLE, ON
CA L6H 5R5

Scope : Construction of Class 1, 2, 3 & 4 Vessels; Class 1, 2, & 3 Pumps, Vessels, Line Valves and Piping Systems; Class 2 & 3 Storage Tanks; Class 1, 2, & 3 Shop Assembly; As a Material Organization Supplying Ferrous and Nonferrous Material; At the Above Location Only. In accordance with CSA Standard N285.0, General Requirements for Pressure Retaining Systems and Components in CANDU Nuclear Power Plants.

Authorized : December 09, 2008

Expires : December 20, 2011

Certificate Number : QA 181

Director
Boilers and Pressure Vessels Safety Program

3300 Bloor Street West, 14th Floor, Centre Tower, Toronto, Ontario M8X 2X4
Web site: www.tssa.org

Putting Public Safety First

PV 09094 (02/05)

CERTIFICATE OF AUTHORIZATION

The American Society of Mechanical Engineers

This certificate accredits the named company as authorized to use the indicated symbol of the American Society of Mechanical Engineers (ASME) for the scope of activity shown below in accordance with the applicable rules of the ASME Boiler and Pressure Vessel Code. The use of the Code symbol and the authority granted by this Certificate of Authorization are subject to the provisions of the agreement set forth in the application. Any construction stamped with this symbol shall have been built strictly in accordance with the provisions of the ASME Boiler and Pressure Vessel Code.

COMPANY:

CCI Thermal Technologies Inc.
2721 Plymouth Drive
Oakville, Ontario, L6H 5R5
Canada

SCOPE:

Manufacture of pressure vessels at the above location only

AUTHORIZED: **December 8, 2008**

EXPIRES: **December 8, 2011**

CERTIFICATE NUMBER: **27,443**

Chairman of The Boiler
And Pressure Vessel Committee

Director, Accreditation and Certification

CERTIFICATE OF AUTHORIZATION

The American Society of Mechanical Engineers

This certificate accredits the named company as authorized to use the indicated symbol of the American Society of Mechanical Engineers (ASME) for the scope of activity shown below in accordance with the applicable rules of the ASME Boiler and Pressure Vessel Code. The use of the Code symbol and the authority granted by this Certificate of Authorization are subject to the provisions of the agreement set forth in the application. Any construction stamped with this symbol shall have been built strictly in accordance with the provisions of the ASME Boiler and Pressure Vessel Code.

COMPANY:

CCI Thermal Technologies Inc.
2721 Plymouth Drive
Oakville, Ontario, L6H 5R5
Canada

SCOPE:

Manufacture of miniature pressure vessels at the above location only

AUTHORIZED: **December 1, 2009**
EXPIRES: **December 8, 2010**
CERTIFICATE NUMBER: **38,138**

Chairman of The Boiler
And Pressure Vessel Committee

Director, Accreditation and Certification

THE NATIONAL BOARD
OF
BOILER & PRESSURE VESSEL INSPECTORS

Certificate of Authorization

This is to certify that

CCI THERMAL TECHNOLOGIES INC.
2721 PLYMOUTH DRIVE
OAKVILLE, ON L6H 5R5
CANADA

is authorized to apply the "NB" mark and register boilers, pressure vessels, or other pressure retaining items with the National Board in accordance with its provisions.
The scope of Authorization is limited to items manufactured in accordance with:

ASME *Stamp(s):* *H S U UM*

ISSUE DATE: **December 20, 2008**

EXPIRATION DATE: **December 8, 2011**

Executive Director

CERTIFICATE OF AUTHORIZATION

This is to certify the named company as having had the adequacy of their quality program verified for the scope shown below in accordance with the Ontario Technical Standards and Safety Act, Boilers and Pressure Vessels Regulation

Company Name : CCI THERMAL TECHNOLOGIES INC

2721 PLYMOUTH DRIVE
OAKVILLE, ON
CA L6H 5R5

Scope : Manufacture of pressure vessels at the above location only in accordance with ASME Boiler and Pressure Vessel Code, Section VIII, Division 1 and CSA Standard B51, Boiler, Pressure Vessel and Pressure Piping Code.

Authorized : January 06, 2009

Expires : December 20, 2011

Certificate Number : QA 02216

Director
Boilers and Pressure Vessels Safety Program

TECHNICAL STANDARDS & SAFETY AUTHORITY

3300 Bloor Street West, 14th Floor, Centre Tower, Toronto, Ontario M8X 2X4
Web site: www.tssa.org

Putting Public Safety First

PV 09094 (02/05)

TECHNICAL STANDARDS & SAFETY AUTHORITY

CERTIFICATE OF AUTHORIZATION

This is to certify the named company as having had the adequacy of their quality program verified for the scope shown below in accordance with the Ontario Technical Standards and Safety Act, Boilers and Pressure Vessels Regulation

Company Name : CCI THERMAL TECHNOLOGIES INC

2721 PLYMOUTH DRIVE
OAKVILLE, ON
CA L6H 5R5

Scope : Fabrication of Class 1, 2, 3 & 4 Welded and Non-Welded Category A, B, E & H type Fittings only at the Above Location Only. In accordance with CSA Standard N285.0, General Requirements for Pressure Retaining Systems and Components in CANDU Nuclear Power Plants.

Authorized : December 09, 2008

Expires : December 20, 2011

Certificate Number : QA 03538

Director
Boilers and Pressure Vessels Safety Program

3300 Bloor Street West, 14th Floor, Centre Tower, Toronto, Ontario M8X 2X4
Web site: www.tssa.org

Putting Public Safety First

PV 09094 (02/05)

CERTIFICATE OF REGISTRATION

This is to certify that

CCI Thermal Technologies Inc.

2721 Plymouth Drive, Oakville, Ontario L6H 5R5 Canada

operates a

Quality Management System

which complies with the requirements of

ISO 9001:2000

for the following scope of registration

The registration covers the Quality Management System for the sale, design, manufacture, distribution, repairs and services electrical heating elements, electrical heating equipment, electrical controls, liquid filters, strainers, separators, and related accessories, which includes ASME pressure vessels and steam and water boilers.

Certificate No:	CERT-0027983	Original Certification Date:	October 23, 1996
File No:	003640	Current Certification Date:	September 25, 2008
Issue Date:	December 11, 2008	Certificate Expiry Date:	September 24, 2011

Wendy Tilford
President,
QMI-SAI Canada Limited

Alex Ezrakhovich
General Manager,
SAI Global Certification Services Pty Ltd

Certified System
ISO 9001

ANAB ACCREDITED

Registered by:
SAI Global Certification Services Pty Ltd, 286 Sussex Street, Sydney NSW 2000 Australia with QMI-SAI Canada Limited, 20 Carlson Court, Suite 100, Toronto, Ontario M9W 7K6 Canada (SAI GLOBAL). This registration is subject to the SAI Global Terms and Conditions for Certification. While all due care and skill was exercised in carrying out this assessment, SAI Global accepts responsibility only for proven negligence. This certificate remains the property of SAI Global and must be returned to them upon request.
To verify that this certificate is current, please refer to the SAI Global On-Line Certification Register: www.qmi-saiglobal.com/qmi_companies/

SAI GLOBAL
INFORM. INSPIRE. IMPROVE.

CCI Thermal Technologies INC

Quotation

KINECTRICS Inc.
800 Kipling Avenue, Unit 2, KR312
Toronto, ON M8Z 6C4

Attention: **Ruth Burany,** PhD
Senior Scientist, Nuclear Waste & Tritium Solutions
Generation Life Cycle Management

DATE	Nov 30, 2010
YOUR DOCUMENT NUMBER	e-mail inquiry
OUR REFERENCE NUMBER	10-746 R1

APPENDIX D
Terms and Conditions

Please refer to attached CCI Thermal Technologies standard Terms & Conditions

❑ **Edmonton**
Head Office
5918 Roper Road
Edmonton, Alberta
Canada T6B 3E1
T 780-466-3178
F 780-468-5904
1-800-661-8529

❑ **Toronto**
2721 Plymouth Drive
Oakville, Ontario
Canada L6H 5R5
T 905-829-4422
F 905-829-4430
1-800-410-3131

❑ **Orillia**
1 Hunter Valley Road
P.O. Box 44
Orillia, Ontario
Canada L3V 6H9
T 705-325-3473
F 705-325-2106
1-877-325-3473

❑ **U.S.A.**
1420 West Main Street
Greensburg, Indiana
U.S.A. 47240
T 812-663-4141
F 812-663-4202
1-800-473-2402

❑ **Montreal**
T 1-866-513-5252
F 1-888-252-4477

www.ccithermal.com
info@ccithermal.com

TERMS and CONDITIONS of SALE and QUOTATION

1. Warranty

1.01 CCI Thermal Technologies Inc., a body corporate with an office in the Town of Oakville in the province of Ontario (hereinafter referred to as "the Company"), covenants with the Purchaser with regard to the item(s) or system(s) purchased by the Purchaser from the Company (hereinafter referred to as "the Article") that, for a period of eighteen (18) months from the date of delivery or twelve (12) months from the date of start of operation (whichever occurs first), the Company will repair or replace at the shop facility of the Company the Article or part thereof which has been found to be defective as the result of the utilisation of improper materials in the manufacturing or construction process by the Company.

1.02 The Purchaser acknowledges that the decision as to whether the defective Article or part thereof shall be replaced, repaired or modified shall be made by the Company in its sole discretion.

1.03 The Purchaser acknowledges that the Warranty described as aforesaid in 1.01 offered by the Company to the Purchaser is subject to the following conditions:

(a) that the Purchaser notified the Company in writing of the defect immediately upon discovery by the Purchaser or so soon thereafter as it is practicable.

(b) that the defect in the Article is not due to an act or omission by the Purchaser, its agents, servants or independent contractors which for greater certainty, but not so as to limit the generality of the foregoing, includes physical, chemical or mechanical abuse, accident, improper installation of the article, improper storage and handling of the article, improper application or the misalignment of parts.

(c) that the defect in the Article or part thereof is not the result of vibration, radiation, erosion, corrosion, process contamination, abnormal process conditions, temperature and pressures, unusual surges or pulsation, fouling, ordinary wear and tear, incorrectly applied utilities such as voltage, air, gas, water, and others or any combination of the aforementioned causes not specifically allowed for in the design conditions.

(d) that the Article has not been altered or modified in any respect by the Purchaser, or any one of his servants, agents, independent contractors, private or public carriers after delivery of the Article to the Purchaser or his designated agent unless the alteration or modification has been specifically agreed to in writing by the Company.

1.04 The Purchaser agrees that all warranty work required after the initial commissioning of the product will be provided only if the Company has been paid by the Purchaser in full accordance with the terms and conditions of the contract.

2. Limitations of the Obligations of the Company

2.01 The Purchaser acknowledges that the liability of the Company for any defective Article or part thereof shall be strictly limited to the remedies set forth in Paragraph 1 herein, subject to the restrictions set forth in the agreement herein.

2.02 The Purchaser agrees that the Company shall not be liable for damages of any sort whatsoever arising from a defect contained in the Article or any part thereof which for greater certainty, but not so as to limit the generality of the foregoing, shall include damages arising from lack of use, business interruptions or any other consequential damages.

2.03 The Purchaser covenants with the Company not to seek damages from the Company of the nature set forth in paragraph 2.02 contained herein.

3. Waiver of Expressed or Implied Warranty

3.01 The Purchaser agrees that the Company makes no warranty or guarantee, express, implied or statutory, (**INCLUDING ANY WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE**) written or oral, of the Article or incidental labour, except as is expressed or contained in the agreement herein.

4. Entire Agreement

4.01 The Purchaser acknowledges that this instrument covers all agreements between the parties hereto relative to the conditions of sale and accordingly the parties hereto shall not be bound by any representations or promises made by any person relative to these conditions of sale unless made in writing by the duly authorised representatives of the parties and attached to the schedule of this agreement.

4.02 For greater certainty, an authorised representative of the Company means an officer, director or sales representative of the Company.

5. Articles Not Manufactured by the Company

5.01 The Purchaser acknowledges that the Warranty set forth in Paragraph 1 contained herein shall not apply to items of equipment or accessories incorporated in, or attached to, the Article which are not manufactured by the Company, except where the selection of the said items of equipment or accessories are improper for the intended purpose of the said equipment or accessories.

5.02 The Purchaser acknowledges that the items of equipment or accessories described in Paragraph 5.01 are purchased subject onto the warranty of the actual manufacturer, if any, and no other. The Company agrees that it will use its best efforts to pass on to the Purchaser any warranty of the actual manufacturer, if any.

5.03 The Purchaser acknowledges the right of the Company to provide these Articles manufactured by a different vendor to that named in the quote providing that the substituted product is equal to or greater than the product quoted.

6. Specifications Provided by Purchaser

6.01 The Purchaser acknowledges that it warrants the accuracy of calculations, sizing, specification and/or designs provided by the Purchaser, its servants, agents or independent contractors to the Company pertaining to any Article manufactured by the Company.

6.02 The Purchaser acknowledges that the Company shall bear no legal responsibility for any defect in any Article or part thereof where such defect was occasioned in whole or in part by the supply of inaccuracies, described particularly in Paragraph 6.01 herein, by the Purchaser, its servants, agents or independent contractors.

7. Service Call Indemnity

7.01 The Purchaser covenants with the Company to reimburse the Company for all expenses incurred by the Company when its representative(s) are dispatched to the field location of the Purchaser to inspect the Article for an alleged defect where the representative(s) of the Company determine in their sole discretion that the defect is not covered by the Warranty set forth in Paragraph 1 herein.

7.02 The Purchaser agrees to pay for any and all additional commissioning, start up assistance and training which may be required after the initial on site work has been completed by the Company. These services will be provided at the Purchaser's request. The Company's price to provide these additional services is as defined on the Company's offer..

8. Unauthorised Repairs

8.01 The Purchaser acknowledges that the Company shall not be responsible to reimburse the Purchaser for any expenditures made by the Purchaser with respect to any defective Article or part thereof where the written authorisation of the Company was not firstly obtained.

8.02 For greater certainty, but not so as to limit the generality of the foregoing, such unauthorised expenditures shall include transportation, service and labour costs.

9. Payment of Purchase Price

9.01 The Purchaser covenants with the Company to pay the full purchase price of the Article to the Company as defined on the payment terms described in the Company's offer

9.02 The Purchaser agrees to pay interest on the balance of the unpaid purchase price of the Article outstanding after thirty (30) days to the Company at the rate of two per cent (2%) per month compounding. Purchaser shall be liable to Company for all costs of collection including, but not limited to, reasonable attorneys' fees, court costs and other miscellaneous litigation costs.

9.03 The title and right of possession of the material and equipment covered by this agreement shall remain with the Company until full payment thereof in cash shall have been made. In event of default in any payment, the Company may repossess such material and equipment and all additions thereto, wherever found, free from all claims whatsoever, or assert a mechanics lien with respect thereto, and the Company shall not be held liable for such repossession nor for repayment of any money which may have been paid by the Purchaser in part payment for such materials or equipment. The Company shall have the right to elect to assert our claim of a mechanics lien against the real estate upon which the material or equipment is placed and may waive our right to repossession at any time before the expiration of the time fixed by law for filing a mechanics lien.

10. Change in Prices

10.01 The Purchaser acknowledges that all prices offered by the Company are free on board the shop facility of the Company unless otherwise specifically stated in the Company's offer.

10.02 The Purchaser acknowledges that the prices offered by the Company to the Purchaser are subject to change by the Company prior to the acceptance of the Company's offer by the Purchaser. Once the offer is accepted by the Purchaser, the prices will remain firm, unless the scope of the work changes whereby the prices will be adjusted accordingly.

11. Sales Tax, Customs Duty

11.01 Unless otherwise noted, any applicable sales tax (federal, provincial or state), or customs duty shall be extra to the prices quoted and shall be the responsibility of the Purchaser.

11.02 The Purchaser covenants with the Company to indemnify and save harmless the Company from all customs duty, taxes, interest, penalties, fines or any costs whatsoever arising from a determination by the applicable authorities that the purchase of the Article by the Purchaser is not exempt from such charges, provided that the said duties, taxes, interest, penalties, fines or other such costs do not arise from the Company having incorrectly specified categories or classifications for tax and duty purposes.

12. Purchaser's Right of Inspection

12.01 The Company acknowledges the right of the Purchaser to dispatch its representative(s) to inspect the Article during the course of manufacture during normal business hours.

13. Modification or Cancellation of the Purchase Order

13.01 The Purchaser acknowledges that no purchase order made by the Purchaser to the Company may be cancelled in whole or modified in any respect without the written consent of the Company having been firstly obtained.

13.02 The Purchaser agrees to indemnify forthwith, upon demand by the Company, the Company from any loss or damages incurred by the Company of any sort whatsoever occasioned by the cancellation or modification of a purchase order by the Purchaser or preparation by the Company of a change order as requested by the Purchaser.

13.03 The Purchaser acknowledges the amount of loss or damage referred to in Paragraph 13.02 herein shall be determined by the Company in its sole discretion or as defined in the cancellation schedule in the Company's offer.

14. Subsequent Technological Improvement Made by the Company

14.01 The Purchaser acknowledges that the Company shall be free to make changes in the design or improvements of its products from time to time.

14.02 The Purchaser acknowledges that the Company shall not be obligated to modify those Articles manufactured before the formulation of the changes in design or improvements of the products by the Company.

15. Delivery Schedule

15.01 The Purchaser acknowledges that the schedule of delivery set forth in the offer made by the Company shall be an approximation only and not a term or condition of the agreement herein.

15.02 The Company, however, covenants with the Purchaser to take all reasonable measures to ensure that the Article is ready for delivery to the Purchaser on a date within reasonable proximity to the delivery date set forth in the offer.

15.03 Delivery schedules shall not go into effect until signed/dated approval drawings have been returned to and accepted by the Company and until all other terms or provisions have been satisfied as set forth in this agreement.

15.04 The Purchaser agrees that the Company shall not be liable for damages of any sort whatsoever arising from late delivery of the Article or any part thereof which for greater certainty, but not so as to limit the generality of the foregoing shall include damages arising from lack of use, business interruptions or any other consequential damages.

16. Force Majeure

16.01 The Purchaser acknowledges that the Company shall not be liable to the Purchaser for any loss or damage of any sort whatsoever occasioned by the delay or failure to deliver the Article if the said delay or failure is the result of fire, labour disputes, wars, insurrections, riots, or the actions of any duly constituted governmental authority or any other cause whatsoever which is beyond the control of the Company.

17. Headings

17.01 The Purchaser acknowledges that the headings of the paragraphs of the Terms and Conditions contained herein have been inserted as a matter of convenience and for reference only and in no way define, limit, or enlarge the scope or meaning of these terms and conditions or any provisions hereof.

18. Legal Jurisdiction

18.01 The Purchaser acknowledges that this agreement shall be interpreted pursuant to the provisions and laws of the Province of Alberta. In the event litigation results, the prevailing party shall be entitled to recover all of its litigation costs and attorney fees.

19. Severability

19.01 The Purchaser acknowledges that the provisions contained herein are severable.

19.02 The Purchaser acknowledges that the finding that any paragraph or portion of a paragraph contained herein is invalid, illegal, or unenforceable does not in itself affect the validity, legality or enforceability of the remaining portions of the agreement herein.

20. Exclusive Use

20.01 Any information obtained from the Company or its authorised representative(s) transmitted via written agreement, informational drawing, facsimile, telephonic communication or by any other means, remains the exclusive property of the Company. Drawings and specifications relating to this agreement are loaned to the Purchaser for information purposes only and are subject to recall at any time prior to acceptance by the Company of the Purchaser's written purchase order for the work of this contract. Reproduction or copies of this agreement, drawings and specifications shall not be used in any way prejudicial to the interests of the Company.

21. Specific Purchaser Responsibilities:

Unless otherwise noted the following shall be Purchaser's responsibility

21.01 Assume all risk of loss or damage to the Article detailed in this agreement at the F.O.B. point detailed in the agreement.

21.02 Assume all charge(s) for any changes requested after signed approval drawings have been returned and accepted by the Company.

21.03 Unload all Articles from the carrier, uncrate, inspect for damage and locate Articles to a stage indoor storage site

or installation location. Notify the Company in case of damage to shipped Articles. Any outdoor storage of the Article detailed in this agreement shall void any warranties extended.

21.04 Site preparation including all foundation work and levelling of any flooring where the Article is to be installed. Any existing structural modifications of any kind required to complete installation should be made prior to installation personnel arrival to eliminate unnecessary delays.

21.05 Removal of any existing equipment where Article is to be installed. Provide an area clean and free from any obstacles that may hamper or delay installation personnel.

21.06 Provide utilities as required to the location(s) detailed in the approval drawings. It shall be the responsibility of the Purchaser to insure adequate utilities are available to allow proper operation of the Article.

21.07 Provide all roofing work including penetrations and curbing as required for proper equipment installation.

21.08 Locate Article at the equipment installation site. Any equipment required to position, locate or elevate Article or personnel shall be provided by the Purchaser unless otherwise requested. In the event that the Company agrees to perform such work, it is the responsibility of the Purchaser to provide a smooth and structurally adequate surface over which the Article may be moved.

21.09 Any equipment transfer or unloading charges will be the responsibility of the Purchaser.

21.10 Any costs or charges related to shipment, crating or special packaging or handling of any equipment detailed in this agreement shall pass to the Purchaser.

21.11 Provide safety interlocks beyond standard safeties included in this agreement as required by local, provincial, state or national codes including fire suppression system(s) either dry chemical/water sprinkler or other.

21.12 Provide any ductwork, ventilation or other equipment and connections for same not detailed or included in this agreement but necessary to complete installation.

21.13 Any labor included in this agreement is based on installation occurring Monday through Friday during the hours 7 a.m. to 5 p.m. Holidays, weekends and hours prior to or later than the hours detailed in the affirmation statement will be billed separately on a detailed basis at a rate to be agreed upon in writing by the Company and the Purchaser and shall become permanent part of this agreement. The installation price(s) included in this document have been based upon the Company's personnel having free and unencumbered access to the Article and installation site addressed in this agreement. Any delays in completion of installation due to no fault of the Company may be billed to cover lost time at the quoted rates. If installation is occurring during non-standard hours (standard hours are considered to be 7 a.m. - 5 p.m. Monday through Friday) or holidays or weekends an hourly premium will be substituted in lieu of the standard hourly rate provided for in this agreement.

21.14 Obtain and pay for any permits required to transport, construct, install or operate any equipment provided for in this agreement.

21.15 Insure that all and any national, state, province, county or local/municipal code requirements are met unless otherwise agreed to in writing by an authorised employee of the Company. Without limiting the generality of the foregoing, this would include requirements for spill containment and waste disposals.

21.16 Submit any requests for additions to, or changes to any equipment, terms, conditions or services provided for in this agreement to the Company in writing. These must be agreed to in writing by an authorised employee of the Company. No other person or company has the right to modify or alter this agreement after it has been submitted. No extra or additional work will be carried out by the Company without the Purchaser's written instruction or purchase order, which must clearly show the price for such work.

21.17 Should testing be a requirement prior to purchase, any freight charges or special transportation costs incurred to transport products to be tested to the test location, and returned from the test location, shall be the sole responsibility of the Purchaser.

21.19 Where required by the Company, review and approve drawings for the work submitted to the Purchaser for this purpose. The equipment manufacture will not commence until such approval is received by the Company.

21.20 Provide all necessary information relating to the desired Article location. A site survey is not included in the price and will be charged extra to the Purchaser by the Company.

21.21 Provide a minimum of fourteen (14) days notice to the Company that installation, start up or training services are required.

21.22 Provide and pay for the following equipment services or work if required for the Article being supplied by the Company:

(a) Concrete.
(b) Mechanical.
(c) Electrical.
(d) Plumbing
(e) Ventilation.
(f) Fire suppression.
(g) Piping.
(h) Insulation.
(i) Instrumentation.
(j) Any other work not specified in the Company's agreement.

21.23 Article malfunction or breakdown due to use of incorrect or non-specified spare parts shall be the responsibility of the Purchaser.

22. Modifications

22.01 The Company reserves the right to modify or alter the design as quoted in this agreement provided that such modification or alteration does not lessen the overall performance of the Article or services as quoted in this agreement or deviates from the Purchaser specifications.

HEICS Andy

From: Baranack, Greg [gbaranack@curtisswright.com]
Sent: Wednesday, November 24, 2010 4:51 PM
To: BURANY Ruth
Subject: RE: Budgetary Estimate for 3" 150# SS Diaphragm Valve

Ruth,
A 3" 150# Commercial Grade, non-nuclear, diaphragm valve, SS, BW, with HWO would be approximately $2,600 each with an 8-10 week delivery.

Greg Baranack

Proposals Manager
Enertech, a business unit of Curtiss-Wright Flow Control Company 2950 Birch St. Brea, CA 92821
Office: (714) 528-2301 Ext. 214
Cell: (714) 253-2269
Fax: (714) 528-0128
E-mail: gbaranack@curtisswright.com

-----Original Message-----
From: BURANY Ruth [mailto:Ruth.BURANY@kinectrics.com]
Sent: Wednesday, November 24, 2010 1:12 PM
To: Baranack, Greg
Subject: RE: Budgetary Estimate for 3" 150# SS Diaphragm Valve

Hi Greg; Would you be able to provide the differential if it was designated as non-nuclear?
Ruth

-----Original Message-----
From: Baranack, Greg [mailto:gbaranack@curtisswright.com]
Sent: Wednesday, November 24, 2010 4:07 PM
To: BURANY Ruth
Subject: RE: Budgetary Estimate for 3" 150# SS Diaphragm Valve

Class 6? Does this refer to the leakage criteria? ASME Code Section III, Class 1 (NB), Class 2 (NC), or Class 3 (ND) are the only ASME Code classes that I am aware of. Please advise what the class 6 refers to. Thanks.

Greg Baranack

Proposals Manager
Enertech, a business unit of Curtiss-Wright Flow Control Company
2950 Birch St. Brea, CA 92821
Office: (714) 528-2301 Ext. 214
Cell: (714) 253-2269
Fax: (714) 528-0128
E-mail: gbaranack@curtisswright.com

-----Original Message-----
From: BURANY Ruth [mailto:Ruth.BURANY@kinectrics.com]
Sent: Wednesday, November 24, 2010 11:58 AM
To: Baranack, Greg

Subject: RE: Budgetary Estimate for 3" 150# SS Diaphragm Valve

Thanks Greg; this is great.
What would be the order of magnitude cost difference if the valve was class 6?

Thanks,
Ruth
-----Original Message-----
From: Baranack, Greg [mailto:gbaranack@curtisswright.com]
Sent: Wednesday, November 24, 2010 12:20 PM
To: BURANY Ruth
Subject: Budgetary Estimate for 3" 150# SS Diaphragm Valve

Ruth,
Attached is an ITT Drawing for a 3" 150# SS Diaphragm Valve with Buttweld End Connections and Handwheel Operated. The budgetary (non-binding) estimate for this ASME Section III, Class 3 valve is approximately $22,500 each with a 20-22 week delivery. Please call or e-mail me if you have any questions or require further information.

Sincerely,

Greg Baranack

Proposals Manager
Enertech, a business unit of Curtiss-Wright Flow Control Company 2950 Birch St. Brea, CA 92821
Office: (714) 528-2301 Ext. 214
Cell: (714) 253-2269
Fax: (714) 528-0128
E-mail: gbaranack@curtisswright.com

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Kinectrics Inc. 800 Kipling Avenue, Unit 2 Toronto, Ontario, Canada M8Z 6C4

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TEIKOKU USA INC
CHEMPUMP

959 Means Road, Warminster, PA 18974
TEL: 215-343-6000 FAX: 267-466-1037
URL: http://www.chempump.com

Proposal

Date	Quote No.	Inquiry No.	Project Name	Terms (In US Currency):
11/19/2010	2010-11719	11/19/10 Email	Budgetary	Net 30

		Representative for Teikoku USA, Inc.
To:	Mohamed Moledina BPR Engineering, Inc.	Contact Chempump
Address:	1100 Burloak Drive, Suite 301 Ontario Burlington, L7L 6B2	
Country:	Canada	
Phone:	905-335-3972 x 225	
Fax:	905-335-5710	
Email:	mohamed.moledina@bpr.ca	

We promise to furnish the equipment listed below at the price shown subject to Teikoku USA's Conditions of Sale. FOB Factory

Item No.	Equip No.	Quantity	Pump Model	Unit Price	Total Price
1	Advise	1	GVE-3L-1S	$80,000.00	$80,000.00

Application Data:		Materials of Construction:		Motor Data:	
Fluid:	Heavy Water	Pump Case:	316 SS	Insulation:	1E
TDH (feet):	50.0	Impeller:	316 SS	Frame:	3L/180
Capacity (GPM):	121.0	Gaskets/O-rings:	EPDM	Stator Fill:	None
Specific Gravity:	1.1	Rotor Liner:	316L SS	Voltage:	575
Viscosity (cps):	1.0	Stator Liner:	316L SS	Phase:	3.0
Op. Temp. (F):	100.0	Brg. Hsg./Adapter:	316 SS	Hertz:	60.0
Vapor Press. (psia):		Shaft:	316 SS	RPM:	1750.0
Sp. Ht. (BTU/lbmF):		Bearings:	CG Type B, 316SS Sleeved	Design Power (hp):	3.58
Sucl. Press. (psig):		Journal/Sleeves:	M-3 (Chrome Oxide)	Runout Power (hp):	4.8
Dsch. Press. (psig):		Sucl. Conn:	3 / 150# Raised Face	Motor (hp):	4.8
Diff. Press (psi):	23.8	Dsch. Conn.:	2 / 150# Raised Face	F.L. Amp:	5.04
NPSHavail (feet):		Case Drain:	1/4" NPT	F.L. KW:	3.6
NPSHreq (feet):	4.39	Circ. Assy.:	316 SS	Start KVA:	17.0
Eff. @ Diam. (%):	47.9	Circulation Path:	Standard	Motor Rating:	TOTALLY ENCLOSED
Imp. Diam. (in):	7.75	Net Wgt. (lbs):	245	Area Class:	NONE
Design Pressure	150 PSI				
				Thermal TCO (F):	425.0
				Perf. Curve No.:	A-70116
				Bulletin Number:	1101
				Outline Dwg.:	A-60466
				Shipment:	40
				(wks) after drwg. approval or mfg. release.	

Options:

Electrical Junction Box: HIGH PRESSURE LEAD CONNECTOR
Other Modifications: ASME Section III, Class 3, with N-Stamp
Hydraulic Test: Non-Witnessed
Hydrostatic Test: Non-Witnessed

Comments:

Quantity of ten pumps ordered at one time, $75,000.00 net each. Prices are canned motor pump(s) only and do not include export freight charges, customs, duties, taxes, etc. Rough order of magnitude (ROM) budgetary prices. Prices are in US dollars.

Thank you for your inquiry.
Please feel free to visit our website at: www.chempump.com
Jim McDaniel/AE x1010

HEICS Andy

From: Fawaz Almassri [falmassri@twfp.com]
Sent: Thursday, December 09, 2010 10:28 AM
To: Jitender Singh
Subject: FW: OPG - Various Sites

Jitender, Here is the quotes for instrumentation air system and breathing air system.

For instrumentation air system I picked option B.

Thanks

Fawaz

From: louis.simonetto@ca.atlascopco.com [mailto:louis.simonetto@ca.atlascopco.com]
Sent: Monday, November 29, 2010 5:51 PM
To: Fawaz Almassri
Subject: Re: OPG - Various Sites

Hi Fawaz,

It has been a while! Sorry for the delay

Further to your request, first: in regards to the system selection for the 3 nm3/min. (105SCFM) for instrument air, depending on the air quality requirement you can either go with a) with a refrigerated air dryer (38 F PDP) or b) with a regenerative desiccant dryer (-40 F PDP). No pressure requirement mentioned so will assume standard requirement 100 Psig. I have outlined both below.

Quote Ref....220036/1110/8BNUQZ

a) with refrigerated air dryer.....**Total $ 16,940* (with all shown options)**

Atlas Copco Model GA18FF-100-500L 25 Hp rotary screw package, air receiver mounted, with integrated refrigerated air dryer, electronic control (load/no load capacity control, Capacity 108.7 cfm @ 100 psig... **Unit Price.....$ 16,050***
+
Atlas Copco Option # 0000 0034 38 Integrated Factory Mounted DD Coalescing Primary Filter and PD Coalescing Secondary Filter
... **Optional Adder.....$ 750***
+
P3NRA96BNG 3/4" Pressure Regulator with Gauge... **Unit Price.....$ 140***

*** Budget pricing based on single units.**

b) with desiccant air dryer.....**Total $ 20,820* (with all options shown)**

Atlas Copco Model GA18P-100-500L 25 Hp rotary screw package, air receiver mounted, with, electronic control (load/no load capacity control, Capacity 108.7** cfm @ 100 psig... **Unit Price.....$ 12,300***
+
Atlas Copco Option # 0000 0934 08 factory mounted EWD Electronic Drain on air receiver... **Unit Adder.....$ 540***
+
Atlas Copco Option # 0000 0034 43 Integrated and factory mounted GP Coalescing Filter ... **Unit Adder.....$ 390***

+
Atlas Copco Model CD50 Regenerative Desiccant Air Dryer with PD prefilter & DDP afterfilter Capacity 106 cfm** @ 100 psig...**Unit Price.....$ 5,500***

+ Optional but recommended for varying loads.

Atlas Copco # 0000 0208 21' Purge control , PDP sensor and PDP display, CD25-CD100...**Unit Price.....$ 1950***

+
P3NRA96BNG 3/4" Pressure Regulator with Gauge... **Unit Price.....$ 140***

*** Budget pricing based on single units.**
**** Average 15% purge loss on regeneration (approx 16 cfm) may have to increase size of compressor and dryer to accommodate exact flow requirement**

On the breathing air system side, capacity is 130 SCFM you indicated system. didn't know if you be looking at the supply and or the treatment equipment, however have outlined both below. **Total System Includes All Options Shown $ 41,300***

Compressor ... Atlas Copco Model GA26+100 40 Hp rotary screw package, Capacity 172.1** cfm @ 100 psig... **Unit Price.....$ 15,900***

+
Atlas Copco # 8971 9161 07+ 200-gallon vertical air receiver, with epoxy coated interior, gauge, safety valve and automatic electronic drain.
... Unit Price.....$ 2,350*

+
Del-Monox model DM135 6-Stage Breathing Air Purification System inlet capacity 162 SCFM & outlet capacity 135 SCFM **... Unit Price.....$ 15,700***

+
Optional Series 1000 CO monitor factory installed, with calibration kit...**Unit Adder.....$ 4,750***

+
Optional CompuSaveEMS energy saving purge system...**Unit Adder.....$ 2,600***

*** Budget pricing based on single units.**

General data attached, for all equipment, let me know if you need any detailed information, drawings etc...

Best regards,

Louis Simonetto
Technical Sales Representative

Atlas Copco Compressors Canada
125 McBrine Place, Unit 6, Kitchener, Ontario, Canada N2R 1G4

Phone: 519.748.2266 or 1.800.887.4192 - Cell.: 519.575.3880 - Fax: 519.748.6726
E-mail: louis.simonetto@ca.atlascopco.com

Visit Atlas Copco at: atlascopco.com

HEICS Andy

From: Dominic Cheng [dcheng@twfp.com]
Sent: Thursday, December 09, 2010 2:58 PM
To: Jitender Singh
Subject: FW: Distribution Pricing

Two of two.

Dominic Cheng
Ext. 231

From: Warren Locke
Sent: Wednesday, December 08, 2010 12:22 PM
To: Dominic Cheng
Subject: FW: Distribution Pricing

Compare with Rob's email.

Thanks,
Warren

Warren Locke
Ext. 421

From: Ray Silk [mailto:rsilk@gerrie.com]
Sent: Wednesday, December 08, 2010 11:13 AM
To: Warren Locke
Subject: RE: Distribution Pricing

13.8kV-600V delta-wye dry type transformers Standard Rate of Rise, and Copper Wiring:
1. 1500kVA- $54,000.00 Alum.....$60,000.00 Copper
2. 2000kVA- $63,000.00 Alum...$68,500.00 Copper
3. 2500kVA- $71,500.00 Alum....$77,830.00 Copper

Plus the corresponding 600V, 3ph, 4w Switchboards- with main breaker, distribution section:
1. 2000A - $25,795.00 Alum bus....$30,375.00 Copper bus
2. 2500A- $42,465.00 Alum bus...$49,960.00 Copper bus
3. 3000A- $44,855.00 Alum bus....$52,770.00 Copper bus

Note: All above Service Entrance Switchboards have 4- 400A 3P MCCB's in the distribution section .

Sub-Distribution:
75kVA - 600-120V delta-wye 3ph, 4w
112.5kVA 600-120V delta-wye 3ph,4w

Standard 208V, 3ph, 4W panelboards:
1. 225A - $1045.00 Alum bus...$1230.00 Copper bus...
2. 400A - $1150.00 Alum bus...$1350.00 Copper bus...

Note: Above panels are 42 circuit filled with 1P 15A breakers..

Thanks Warren.....if you need anything further please don't hesitate to ask....

Ray Silk

From: Warren Locke [mailto:wlocke@twfp.com]
Sent: Tuesday, December 07, 2010 1:15 PM
To: Ray Silk
Subject: Distribution Pricing

Hi Ray,
Would you have time to send me some budget pricing on the following items. They can be ballpark I don't need nailed down pricing but I do need a general idea for a project for later today or tomorrow if possible.

13.8kV-600V delta-wye dry type transformers Standard Rate of Rise, and Copper Wiring:
1. 1500kVA
2. 2000kVA
3. 2500kVA

Plus the corresponding 600V, 3ph, 4w Switchboards- with main breaker, distribution section:
4. 2000A
5. 2500A
6. 3000A

Sub-Distribution:
75kVA - 600-120V delta-wye 3ph, 4w
112.5kVA 600-120V delta-wye 3ph,4w

Standard 208V, 3ph, 4W panelboards:
3. 225A
4. 400A

Anything you could provide for me even if they're general rough estimates by the end of the day would be greatly appreciated.

Thanks,
Warren

***Warren Locke**, P.Eng.*
Electrical Engineering Team Leader
Engineering Services Group

THE Walterfedy PARTNERSHIP

Phone: 519-576-2150 x421
Fax: 519-576-5499
Web: www.twfp.com

Please be advised that TWFP's offices will close for the holidays at 12pm on December 24th.

HEICS Andy

From: Dominic Cheng [dcheng@twfp.com]
Sent: Thursday, December 09, 2010 2:58 PM
To: Jitender Singh
Subject: FW: Budget Distribution Pricing

One of two.

Dominic Cheng
Ext. 231

From: Warren Locke
Sent: Tuesday, December 07, 2010 3:18 PM
To: Dominic Cheng
Subject: FW: Budget Distribution Pricing

Pricing

Warren Locke
Ext. 421

From: Rob Crowther [mailto:rob.crowther@nedco.ca]
Sent: Tuesday, December 07, 2010 3:12 PM
To: Warren Locke
Subject: Budget Distribution Pricing

You didn't get em from me.

Rob Crowther
Account Manager
Nedco
33 McIntyre Dr.Units B & C
Kitchener Ontario
N2R 1E4
Phone 519-893-8078
Fax 519-893-1587
Cell 519-465-5671
e-mail rob.crowther@nedco.ca

-----Original Message-----
From: Warren Locke [mailto:wlocke@twfp.com]
Sent: Tuesday, December 07, 2010 1:15 PM

To: Rob Crowther
Subject: Distribution Pricing

Hi Rob,
Would you have time to send me some budget pricing on the following items. They can be ballpark I don't need nailed down pricing but I do need a general idea for a project for later today or tomorrow if possible.

13.8kV-600V delta-wye dry type transformers Standard Rate of Rise, and Copper Wiring:
1. 1500kVA $61,000.00
2. 2000kVA $73,000.00
3. 2500kVA $89,000.00

Plus the corresponding 600V, 3ph, 4w Switchboards- with main breaker, distribution section: full of branch breakers.

1. 2000A $20,000.00
2. 2500A $25,000.00
3. 3000A $30,000.00

Sub-Distribution:
75kVA - 600-120V delta-wye 3ph, 4w $1900.00
112.5kVA 600-120V delta-wye 3ph,4w $2600.00

Standard 208V, 3ph, 4W panelboards:

1. 225A $1500.00 72 cir c/w 72 15a 1p breakers
2. 400A $1900.00 72 cir c/w 72 15a 1p breakers

Anything you could provide for me even if they're general rough estimates by the end of the day would be greatly appreciated.

Thanks,
Warren

***Warren Locke**, P.Eng.*
Electrical Engineering Team Leader
Engineering Services Group

Phone: 519-576-2150 x421
Fax: 519-576-5499
Web: www.twfp.com

Please be advised that TWFP's offices will close for the holidays at 12pm on December 24th.
Our offices will re-open on January 3, 2011 at 8am.
We wish you a safe and happy holiday, and all the best in 2011!

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HEICS Andy

From: Fawaz Almassri [falmassri@twfp.com]
Sent: Thursday, December 09, 2010 10:22 AM
To: Jitender Singh
Subject: FW: OPG - Estimate - Various Locations

Quotes for the following equipment:

1. Ventilation Exhaust fan
2. Lab exhaust fan
3. Lab Make Up Air Unit
4. Drum transfer area 6m exhaust hood and Exhaust Fan

From: Nathan Martin [mailto:nathan@odellassoc.com]
Sent: Friday, November 26, 2010 6:47 AM
To: Fawaz Almassri
Subject: RE: OPG - Estimate - Various Locations

Fawaz,
I have tried to address all of your items below ...

Nathan Martin, P.Eng.
Ph. 519-772-0386
Fx. 519-772-1029
Mob. 519-570-5992
www.odellassoc.com

From: Fawaz Almassri [mailto:falmassri@twfp.com]
Sent: Thursday, November 25, 2010 9:11 AM
To: Nathan Martin
Subject: OPG - Estimate - Various Locations

Hi Nathan,

I am working on a budget estimate for OPG various sites and need quick selection and pricing for budget purposes only at this time. For now the study is for 5 locations (not sure at the end how many building OPG will do if any)

The cut sheet and price I need is for the following:
1. One large exhaust fan for each site to serve Heavy Water Storage Building, the fan would be in line located in a penthouse ducted to the storage and to the outside thru a stack (10high stack). This fan to be two speed fan, low speed for normal operation and hi speed for leak situation and to be triggered by area tritium monitors signal. Max. air flow rates vary for those building, so if you can send me selection for various sizes starts from 40,000 to 100,000CFM.***[Nathan Martin]*** See attached. I have only selected (2) fans (40K & 100K), you will be able to interpolate the data to determine budget pricing at any level in between. Budget Prices as follows: F1 - 100K = $28,000.00, F1 – 40K = $14,000.00. (Note: You are better getting VFDs for these fans to control different speeds. A VFD will be less expensive, and provide increased energy savings, over a 2-speed motor. We do not currently represent a VFD manufacturer, so I have not included pricing or selection.

2. Lab exhaust hood c/w exhaust fan (Two or each site).***[Nathan Martin]*** We do not supply lab hoods. Flow rate for each hood would be 500CFM. Also the fan to be inline fan ducted to the outside.***[Nathan Martin]*** I have provided both an inline selection (budget $1,800.00) and a roof mounted solution (budget $1,600.00). Since this is a lab, it would be more typical to see the fan mounted outside, as it eliminates any positively pressurized ductwork within the building.

3. MAU, 800CFM, one for each site. Two speed, interlocked with lab hood exhaust fan, low speed when one fan running, high speed when two fans running.***[Nathan Martin]*** You will definitely want to look at an electrical MUA for this application – airflow too low for gas. I would suggest, for cost & simplicity, that you simply use a (2) direct drive inline

fans in parallel. At low speed, run (1) fan. At high speed, run both fans. The duct heater would need to be 25-KW with SCR modulating control. Budget cost for all the equipment would be $2,000.00.

4. Exhaust hood (one per site), 6 meter canopy hood rated at 2,000CFM c/w exhaust fan and make up air rated at 2,400CFM.*[Nathan Martin]* See attached fan selection (budget $1,800.00). I would recommend and MTI-11-300 for the MUA (budget $12,000.00) see attached drawing.

If you can send me these items by end of tomorrow Friday that would be great.

Thanks

Fawaz

***Fawaz Almassri**, P.Eng*
Mechanical Engineering Services

THE Walterfedy PARTNERSHIP

Phone: 519-576-2150 x492
Fax: 519-576-5499
Web: www.twfp.com

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HEICS Andy

From: Fawaz Almassri [falmassri@twfp.com]
Sent: Thursday, December 09, 2010 10:03 AM
To: Jitender Singh
Subject: FW: OPG Make up air units

Ventilation Unit Quote. This is for gas but it would be very close for electric heat as well.

From: Wallace, Paul [mailto:WPWallace@trane.com]
Sent: Monday, November 08, 2010 9:56 AM
To: Fawaz Almassri
Subject: OPG Make up air units

Hi Fawaz

For units with return air and natural gas heat please use the attached catalogue to evaluate dimensions/performance/weight.

Depending on the temperature rise you will need for the amount of fresh air and location.

HDGH 100 budgets at 36K
HDGH 200 budgets at 46K
HDGH 250 budgets at 63K
HDGH 300 budgets at 75K
HDGH 350 budgets at 80K
HDGH 400 budgets at 87K
HDGH 500 budgets at 95K

I have included for v bank filter section with outside air hood.
Units based on down discharge plenum on the end
Units are all 304 SS heat exchangers at 20:1 turndown
Tamco 9000 dampers in the mixing box
All units are 2" double wall and have wire markings and marine lights
All units are heating only.

I don't have standard sizes for electric, if you can send me specific information for electric option I can work a few of these out.
To add cooling, I'll need some specific information about performance requirements.
Let me know how this info works out for now.

Working to Solutions

Paul Wallace, P.Eng.
Systems Sales
Trane Ontario - Waterloo Wellington
p519 580 0395
f519 746 6397
wpwallace@trane.com
www.trane.com

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