

RETURN BIDS TO:
RETOURNER LES SOUMISSIONS À:
Public Works Government Services Canada- Bid
Receiving / Réception des soumissions
189 Prince William Street
Room 405
Saint John
New Brunswick
E2L 2B9

SOLICITATION AMENDMENT MODIFICATION DE L'INVITATION

The referenced document is hereby revised; unless otherwise indicated, all other terms and conditions of the Solicitation remain the same.

Ce document est par la présente révisé; sauf indication contraire, les modalités de l'invitation demeurent les mêmes.

Comments - Commentaires

Vendor/Firm Name and Address
Raison sociale et adresse du
fournisseur/de l'entrepreneur

Issuing Office - Bureau de distribution
Public Works Government Services Canada- Bid
Receiving / Réception des soumissions
189 Prince William Street
Room 405
Saint John
New Bruns
E2L 2B9

| | |
|--|---|
| Title - Sujet Springhill Inst. - Solid Waste Mgmt | |
| Solicitation No. - N° de l'invitation EC016-150235/A | Amendment No. - N° modif. 007 |
| Client Reference No. - N° de référence du client EC016-150235 | Date 2014-10-03 |
| GETS Reference No. - N° de référence de SEAG PW-\$PWB-020-3461 | |
| File No. - N° de dossier PWB-4-37053 (020) | CCC No./N° CCC - FMS No./N° VME |
| Solicitation Closes - L'invitation prend fin at - à 02:00 PM on - le 2014-10-07 | Time Zone Fuseau horaire Atlantic Daylight Saving Time ADT |
| F.O.B. - F.A.B. Plant-Usine: <input type="checkbox"/> Destination: <input type="checkbox"/> Other-Autre: <input type="checkbox"/> | |
| Address Enquiries to: - Adresser toutes questions à: Donovan, Janine PWB | Buyer Id - Id de l'acheteur pwb020 |
| Telephone No. - N° de téléphone (506) 636-5347 () | FAX No. - N° de FAX (506) 636-4376 |
| Destination - of Goods, Services, and Construction: Destination - des biens, services et construction: | |

Instructions: See Herein

Instructions: Voir aux présentes

| | |
|--|--|
| Delivery Required - Livraison exigée | Delivery Offered - Livraison proposée |
| Vendor/Firm Name and Address Raison sociale et adresse du fournisseur/de l'entrepreneur | |
| Telephone No. - N° de téléphone Facsimile No. - N° de télécopieur | |
| Name and title of person authorized to sign on behalf of Vendor/Firm (type or print) Nom et titre de la personne autorisée à signer au nom du fournisseur/ de l'entrepreneur (taper ou écrire en caractères d'imprimerie) | |
| Signature | Date |

Solicitation No. - N° de l'invitation

EC016-150235/A

Client Ref. No. - N° de réf. du client

EC016-150235

Amd. No. - N° de la modif.

007

File No. - N° du dossier

PWB-4-37053

Buyer ID - Id de l'acheteur

pwb020

CCC No./N° CCC - FMS No/ N° VME

This Tender Amendment No. Seven (7) is raised to include the following Addendum No. Seven (7).

The following addendum to the tender is effective immediately. This addendum shall form part of the contract documents.

All other terms and conditions remain the same.

Addendum No. 7.

1. QUESTIONS AND ANSWERS

A10

a – Colphene 3000 is acceptable for exterior waterproofing and will be included in addendum #7

b – Soprasphalt OX is acceptable as a vapour retarder and bitumen. This will be included in Addendum #7

c – Xpress Vap'r Board – Not acceptable.

d – Xpress Board HD – Not acceptable.

Q11a

Please confirm if Aluminum Composite panels for Canopy Soffits are included in curtain wall scope. If yes, may we request for the specifications and intent color for reference?

A11a

Aluminum soffit panel is in 07 46 13, Preformed Metal Siding, scope.

Q11b Two finishes were specified, Clear anodized and Black Anodized. Please provide which aluminum finish to be used.

A11b – Back sections are to be clear anodized and mullion caps are to be black.

Q12: Please provide more details where the new 2-1/2" Building Service Hot-Water Heating lines are to be connected into the existing District Heating System as shown on drawing C-1. What are the sizes of the existing lines and accessibility, and the size and depth of the existing service chamber (shown as a black square at the existing Building 26)? Are new valves required inside the service chamber?

A12: Existing record information is limited. Bidders are to base their bid on the following:

1. The District Heating System Main at the indicated connection point is 200mm (8in) in size.
2. The District Heating System Main is accessed by removal of the vault top panels.
3. Tee into the District Heating System with 200mm (8in) Tees.
4. Provide 64mm (2.5in) isolation valves for the hot water supply and return lines at the service chamber.
5. Restore the insulation, chamber and area to match existing.
6. Allow for field fitting, but assume work can be fitted within the existing chamber

Q15: Please confirm pipe sizes for the Heating Piping Schematic as shown on Drawing M6.

A15: Pipe sizes on hot and cold side of HX-1 shall be 64mm. Pipe size from the air separator to the expansion tank shall be 19mm.

Q17 On drawing A1 in the recycling/Sorting Equipment Legend, there's a note 12 indicating Manual Pallet Trucks. Could you please provide a specification for this items.

A17 See attached specifications addendums.

Q19: The civil drawing C1 does not show the existing grades through the developed area, we would request that a drawing be provided showing the existing grades only.

A19: Sketch SKC1A is attached showing existing grades through the developed area.

Q20a: Section 32 12 16 - Hot Mix Asphalt Paving – calls for use of liquid asphalt primer. Is this primer required? This adds considerable cost.

A20a: Bidders are to include provision of liquid asphalt primer in their bid.

Q20b – Are large recycle bags part of this contract? If so, please provide spec.

A20b – Large recycle bags are not part of the contract. See Equipment Legend on sheet A1.

Q20c – Capacity is typically based on volume. Can you clarify the volume of this safe?

A20c – Section 10 80 00 Item 2.3.3 Volume is to be 0.60m³.

Q20d – Does this scale have to be intrinsically safe (ie bomb-proof?). This adds considerable cost to this item.

A20d – Section 10 80 00 Item 2.3.7.8, “EX required” can be removed.

Q21 . After talking to the distributors for the stationary automated bid washer specified in section 10 80 00. The Ginove G wash STD 11 has been changed to The Ginove SWS-100 series, but based on the performance specification we would require the Ginove SWS-1000 series. Which model is required?

Q21 - Ginove SWS-100 series

Q22. Can you confirm if a fire pump is required? The drawings do not indicate a fire pump and it is an expensive item if it is not needed.

A22 . The institution has a fire booster system located in their CHP. No building booster pump is required.

Q4

In reading the specification for the Fire Protection System Section 21 13 00 we require some clarification as follows.

1. Fire pump is mentioned throughout the section but there is nothing shown on the drawing. Is a pump required if so where is it to be installed?
2. The specification calls for 50 extra sprinkler heads this would more than double the number of sprinkler heads required for the total project due to the size of the building. Is this the correct amount to be carried in our bid?
3. Specification calls for standpipe system again nothing shown on the drawings.
4. Specification calls for ordinary hazard group one and the drawing indicate ordinary hazard group two. Which is the intent?
5. Specification calls for a flow meter is this required ?
6. Painting shows up in the Fire Protection section should this not be in the painting section or is it in both and the intent is for the painting contractor to carry out painting?

A4

2. Reference Specification Section 21 13 00 – Fire Protection Systems

- .1 Section 1.2.1.2; Delete this item.
- .2 Section 1.2.1.3; Delete this item.
- .3 Section 1.5.1.5; Delete this item.
- .4 Section 1.5.1.6; Delete this item.
- .5 Section 1.9.3.6; Delete the following wording “standpipe systems”
- .6 Section 1.9.3.9; Delete this item.
- .7 Section 1.10.1; Delete the following wording “NFPA 14, NFPA 20”
- .8 Section 1.12.4; Delete this item.
- .9 Section 1.14.4; Delete this item.
- .10 Section 1.15.7.3; Delete this item.
- .11 Section 1.15.7.4; Change the following wording “Ordinary Hazard Group 1” to read: “Ordinary Hazard Group 2”
- .12 Section 1.15.7.5; Change the following wording “Ordinary Hazard Group 1” to read: “Ordinary Hazard Group 2”

- .13 Section 1.15.7.7; Delete this item.
- .14 Section 1.17.1; Delete the following wording “and fire pump boost”
- .15 Section 1.17.3; Delete the following wording “and fire pump”
- .16 Section 1.17.4; Delete this item.
- .17 Section 2.2.2.8; Delete this item.
- .18 Section 2.30; Delete this item.
- .19 Section 3.1.2; Delete this item.
- .20 Section 3.3.9; Delete this item.
- .21 Section 3.3.10; Delete the following wording “Provide six (6) patio stones on roof for testing standpipe”
- .22 Section 3.3.11; Change the following wording “50” to read: “12”
- .23 Section 3.3.17; Delete this item.
- .24 Section 3.3.18; Delete the following wording “standpipe system”
- .25 Section 3.5.4; Delete this item.
- .26 Section 3.5.6; Delete this item.

Reference Specification Section 23 05 48 – Vibration Isolation

- .1 Section 2.9.4, Add “Mason”

Reference Specification Section 23 21 14 Hydronic Specialties

- .1 Section 2.12 Premixed Glycol Solution, Modify percentage glycol to 45%.

Reference Specification Section 23 33 15 – Dampers Operating

- .1 Section 2.1.7.14: Add “Ventex/Alumavent”

Reference Specification Section 23 33 16 – Dampers – Fire & Smoke

- .1 Section 2.1.12, Add “Ventex/Alumavent”

Reference Specification Section 23 34 00 – Commercial Fans

- .1 Section 2.1, Add .7 Acceptable manufacturers: Loren Cook, Greenheck, Twin City Fan, Penn, Acme

Reference Specification Section 23 83 16 – Radiant Heating Hydronic System

- .1 Section 2.1.1, Add “Uponor”
- .2 Section 2.3, Add “F1960 Fittings”
- .3 Section 2.3.2, Add “Engineered Polymer fittings with F1960 rated connections”
- .4 Section 2.4.1, Add “Engineered Polymer Manifolds”

A17

- .1 Add item 2.3.14 – Manual Pallet Truck – Pallet trucks to be constructed of 12ga Steel and fork dimensions to be 600mm x 1200mm. Pallet trucks to have a 900kg load capacity, a rubber coated handle, 210 degree operational arc and non-marking polyurethane wheels. Galvanized hydraulic pump to include an overload relief valve and breaking that can be actuated by both hand and foot controlled release. Hangers are to be constructed of cast iron, Frame is to have a powder coat paint finish, Fork thickness is to be 38mm. Forks to have helper rollers. Control handle is to have three position (raise/neutral/lower) fingertip control and ergonomically designed and free of pinch points. Spring loaded handle to return to upright position automatically. Pallet trucks to have a 5 year warranty.

A12, 14, 15

SECTION 23 07 13 – THERMAL INSULATION FOR DUCTING

- .1 Delete Section 23 07 13 – Thermal Insulation for Ducting and replace with new Section 23 07 13, dated September 22, 2014, attached.

SECTION 23 07 19 – THERMAL INSULATION FOR PIPING

- .1 Delete Section 23 07 19 – Thermal Insulation for Piping and replace with new Section 23 07 19, dated September 22, 2014, attached.

A3

.1 Page 3, delete Section 2.2.2 and replace with the following:

.2 Acceptable manufacturers: Renewaire, Engineered Air or equal.

SECTION 25 00 00 – BUILDING AUTOMATION SYSTEM

.1 Page 1, add new subsection 1.2 as follows and renumber subsequent subsections:

SECTION 26 29 23 – VARIABLE SPEED DRIVES

.1 Add new Section 26 29 23 – Variable Speed Drives, dated September 22, 2014, attached.

A10

1. SECTION 07 11 00 – EXTERIOR WATERPROOFING

.1 Replace 2.1.1.1 – “Acceptable material: W.R. Grace Bituthene 3000, Bakor Blueskin WP200, or approved equivalent.” With “Acceptable material: W.R. Grace Bituthene 3000, Bakor Blueskin WP200, or **Colphene 3000 by Soprema**.”

2. SECTION 07 52 00 – MODIFIED BITUMINOUS MEMBRANE ROOFING

.1 Add item 2.3.1.2.4 – “**SOPRASPHALT OX by Soprema**”.

.2 Add item 2.5.1.1.4 – “**SOPRASPHALT OX by Soprema**”.

3. SECTION 10 80 00 - MISCELLANEOUS SPECIALTIES

.1 Item 2.3.3 Replace “Capacity to be a minimum of 0.602” with “Capacity to be a minimum of 0.60m3”.

4. SECTION 10 80 00 – MISCELLANEOUS SPECIALTIES

.1 Item 2.3.7.8 Replace “Hazardous are approval: FM, EX and CSA.” with “Hazardous are approval: FM and CSA.”

A11

5. SECTION 08 44 13 – GLAZED ALUMINUM CURTAIN WALLS

.1 Add Item 2.6.7: “Interior mullion back-sections to be clear anodized. Exterior mullion caps to be black anodized.”

To the Drawings:

A5

1. Reference Drawing S4 – Structural Roof Framing Plan

.1 Add Note: The HRV-1 unit specified is listed with an approximate weight of 6,500lbs. Actual unit manufacturer, weight and dimensions will not be finalized until the approval of shop drawings, coordinate with the mechanical contractor upon receipt of approved shop drawings.

A20

1. Reference Drawing A1 – FLOOR PLAN – Recycling Sorting Equipment Legend

A) Replace “Item 10 - Large Recycle Bags” with “Item Large Recycle Bags: Not in Scope”

2. Reference drawing E7 – ELECTRICAL SCHEDULES

1. Revise fixture type L3 as follows:

A) LAMP: 3500lm LED ENGINE

B) FIXTURE WATTAGE: 50W

2. Revise manufacturers and basic cat numbers to fixture type L3 as follows:

A) KENALL MR13FDPPMB50L40KDVR80

B) LITHONIA VGR1C50LED4000KMVOLTDBLB

C) FAIL-SAFE TRR15CLD240840BKUNVEDCSTG

3. Add the following Manufacturers and basic cat numbers to fixture type L4:

A) DECO LIGHTING D445-LED-20-41-UNV-BL

B) SOLERA CSX48WLED120VETPDCOBL

4. Revise fixture type EM1 as follows:

A) ADDITIONAL DESCRIPTION: HIGH ABUSE

B) LISTINGS: DELETE NEMA 4X RATING

C) FIXTURE WATTAGE: 12W

D) VOLTAGE: 120 INPUT, 12 OPERATING

5. Revise manufacturers and basic cat numbers to fixture type EM1 as follows:

A) LUMACELL RG12XXQB2LD10AT

B) READY-LITE LDX12XXADLD10

C) AIMLITE EBQV12XX-25.7LLMR16WHT/ATD

6. Add fixture type EM2 as follows:

A) DESCRIPTION: EMERGENCY DUAL REMOTE HEAD

B) ADDITIONAL DESCRIPTION: HIGH ABUSE

C) LAMP: 2x6W LED

D) FIXTURE WATTAGE: 12W

E) VOLTAGE: 12V

7. Add manufacturers and basic cat numbers to fixture type EM2 as follows:

A) LUMACELL RSQBDMLD

Q23. The geotechnical report issued in Amendment 5 does not apply to the site for the proposed solid waste facility. The two closest boreholes (BH5 and BH6) are relatively far off from the actual site. Based on this, it is difficult to determine what type of material is going to be encountered at the proposed site.

A23. Bidders are to assume that soil conditions existing at the site are similar to those identified in the geotechnical report both in terms of material types and layer thicknesses.

Q24. There is a large pile of fill material that appears to be located at the footprint of the proposed building. This pile of fill is not shown on the drawings, but was seen at the bidder's meeting onsite. The tender documents do not reference this material. How is this material to be dealt with?

A24. Bidders are to assume that the material is classified as clean common fill and may incorporate it into the site under non-loadbearing areas (i.e. turf areas). Surplus material remaining is to be removed to a location outside the security fence as designated by the PWGSC Representative.

PART 1 - GENERAL

- | | | |
|-------------------------|----|--|
| <u>1.1 RELATED WORK</u> | .1 | Submittal Procedures: Section 01 33 00 |
| | .2 | Bases, Hangers and Supports: Section 23 05 29 |
| | .3 | Interior Painting; Section 09 91 23 |
| <u>1.2 REFERENCES</u> | .1 | American Society for Testing and Materials International, (ASTM) .1 ASTM B209M-10, Specification for Aluminum and Aluminum Alloy Sheet and Plate (Metric). .2 ASTM C335-10e1, Test Method for Steady State Heat Transfer Properties of Pipe Insulation. .3 ASTM C449-07 (R2013), Standard Specification for Mineral Fiber Hydraulic Setting Thermal Insulating and Finishing Cement. .4 ASTM C553-11, Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications. .5 ASTM C612-2014, Specification for Mineral Fiber Block and Board Thermal Insulation. .6 ASTM C921-10, Standard Practice for Determining Properties of Jacketing Materials for Thermal Insulation. |
| | .2 | Canadian General Standards Board (CGSB) .1 CGSB 51GP52Ma-1989, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation. |
| | .3 | Thermal Insulation Association of Canada (TIAC): National Insulation Standards. |
| | .4 | Underwriters Laboratories of Canada (ULC) .1 CAN/ULC S102-07, Surface Burning Characteristics of Building Materials and Assemblies. .2 CAN/ULC S701-11, Thermal Insulation Polystyrene, Boards and Pipe Covering. |
| <u>1.3 DEFINITIONS</u> | .1 | For purposes of this section: .1 "CONCEALED" insulated mechanical services and equipment in suspended ceilings (including |
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metal baffle ceilings) and non-accessible chases and furred-in spaces.

.2 "EXPOSED" will mean "not concealed" as defined herein.

.3 "Outside" shall include unheated sections of the parking garage.

.4 Insulation systems includes insulation material, fasteners, jackets, and other accessories.

.2 TIAC Codes:

.1 CRD: Commercial Round Ductwork,

.2 CRF: Commercial Rectangular Finish.

.3 CEF: Commercial Rigid Insulation External Application.

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 Submittal Procedures.

.2 Submit for approval manufacturer's catalogue literature related to installation, fabrication for duct jointing recommendations.

1.5 SAMPLES

.1 Submit samples in accordance with Section 01 33 00.

.2 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed. Mount sample on 12 mm plywood board. Affix typewritten label beneath sample indicating service.

1.6 MANUFACTURERS' INSTRUCTIONS

.1 Submit manufacturer's installation instructions in accordance with Section 01 33 00.

.2 Installation instructions to include procedures used and installation standards achieved.

1.7 QUALIFICATIONS

.1 Installer: specialist in performing work of this section, and have at least five (5) years successful experience in this size and type of project, qualified to standards of TIAC.

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|---|----|--|
| <u>1.8 DELIVERY, STORAGE AND HANDLING</u> | .1 | Deliver materials to site in original factory packaging, labelled with manufacturer's name, address. |
| | .2 | Protect from weather and construction traffic. |
| | .3 | Protect against damage from any source. |
| | .4 | Store at temperatures and conditions recommended by manufacturer. |

PART 2 - PRODUCTS

- | | | |
|--------------------------------------|----|--|
| <u>2.1 FIRE AND SMOKE RATING</u> | .1 | In accordance with CAN/ULCS102: .1 Maximum flame spread rating: 25. .2 Maximum smoke developed rating: 50. |
| <u>2.2 INSULATION</u> | .1 | Mineral fibre: as specified includes glass fibre, rock wool, slag wool. |
| | .2 | Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C335. |
| | .3 | Maximum conductivity: 0.23 w/m*°C@24°C mean |
| | .4 | Minimum 3 PCF density. |
| | .5 | TIAC Code C1: Rigid mineral fibre board to ASTM C612, with factory applied vapour retarder jacket to CGSB 51GP52Ma (as scheduled in PART 3 of this Section). |
| | .6 | TIAC Code C2: Mineral fibre blanket to ASTM C553 faced with factory applied vapour retarder jacket to CGSB 51GP52Ma (as scheduled in PART 3 of this section). .1 Mineral fibre: to ASTM C553. .2 Jacket: to CGSB 51GP52Ma. .3 Maximum "k" factor: to ASTM C553. |
| <u>2.3 JACKETS</u> | .1 | Canvas: .1 220 gm/m2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921. |

.2 Lagging adhesive: Compatible with insulation.

.2 Aluminum:

.1 To ASTM B209 with moisture barrier as scheduled in PART 3 of this section.

.2 Thickness: 0.40 mm sheet.

.3 Finish: Stucco embossed or corrugated.

.4 Jacket banding and mechanical seals: 12 mm wide, 0.5 mm thick stainless steel.

.3 Stainless steel:

.1 Type: 304 or 316 where additional corrosion protection is required.

.2 Thickness: 0.25 mm sheet.

.3 Finish: Corrugated or stucco embossed.

.4 Jacket banding and mechanical seals: 12mm wide, 0.5 mm thick stainless steel.

.4 Self-adhesive weather barrier membrane:

.1 Flexible SBS modified membrane impermeable to air, moisture vapour and water. UV light resistant, flame free adhesion.

.2 Bakor Foilskin, or approved equivalent.

2.4 ACCESSORIES

.1 Vapour retarder lap adhesive:

.1 Water based, fire retardant type, compatible with insulation.

.2 Indoor Vapour Retarder Finish:

.1 Vinyl emulsion type acrylic, compatible with insulation.

.3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C449.

.4 ULC Listed Canvas Jacket:

.1 220 gm/m2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921. Outdoor Vapour Retarder Mastic:

.1 Vinyl emulsion type acrylic, compatible with insulation.

.2 Reinforcing fabric: Fibrous glass, untreated 305 g/m2.

.5 Tape: self-adhesive, aluminum, reinforced, 75 mm wide minimum.

.6 Contact adhesive: quick-setting.

- .7 Canvas adhesive: washable.
- .8 Tie wire: 1.5 mm stainless steel.
- .9 Banding: 12 mm wide, 0.5 mm thick stainless steel.
- .10 Facing: 25 mm galvanized steel hexagonal wire mesh stitched on one face of insulation.
- .11 Fasteners: 4 mm diameter pins with 35 mm diameter or square clips, length to suit thickness of insulation.

PART 3 - EXECUTION

3.1 PREINSTALLATION REQUIREMENTS

- .1 Pressure testing of ductwork systems complete, witnessed and certified.
- .2 Surfaces clean, dry, free from foreign material.

3.2 INSTALLATION

- .1 Install in accordance with TIAC National Standards.
 - .2 Apply materials in accordance with manufacturer's instructions and as indicated.
 - .3 Use two layers with staggered joints when required nominal thickness exceeds 75 mm.
 - .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Hangers, supports to be outside vapour retarder jacket.
 - .5 Supports, Hangers in accordance with Section 23 05 29.
 - .1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.
 - .6 Fasteners: At 300 mm oc in horizontal and vertical directions, minimum two (2) rows each side.
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| | | |
|-----------------|----|--|
| 3.3 DUCTWORK | .1 | Insulation types and thicknesses: Conform to |
| INSULATION | | following Table: |
| <u>SCHEDULE</u> | | |

| | <u>Code</u> | <u>Retarder</u> | <u>(mm)</u> |
|---|--------------------------------------|-----------------|-------------|
| Rectangular supply air (exposed and in vertical shafts) | C1 | Yes | 50 |
| Round supply air ducts (concealed) | C2 | Yes | 25 |
| Rectangular supply air ducts (concealed) | C2 | Yes | 25 |
| Round supply air ducts (exposed and in vertical shafts) | C1 | Yes | 50 |
| Supply, return and exhaust ducts exposed in space being served | none (unless indicated on the plans) | | |
| Outside air ducts to mixing Plenum | C1 | Yes | 50 |
| Intake and exhaust plenums | C1 | Yes | 50 |
| Exhaust duct between dampers and louvers | C1 | Yes | 50 |
| Rectangular ducts outside | C1 | special | 75 |
| Round ducts outside | C1 | special | 75 |
| Supply & Exhaust Ducts within 3.0 metres of Roof Penetration | C1(Rect) C2(Round) | Yes | 50 |
| .2 Jackets: Exposed round ducts 600 mm and larger, smaller sizes where subject to abuse: | | | |
| .1 Use TIAC code C1 insulation, scored to suit diameter of duct. | | | |
| .2 Finishes: Conform to following table: | | | |

| | <u>TIAC Code</u> | |
|-------------------|--------------------|--------------|
| | <u>Rectangular</u> | <u>Round</u> |
| Indoor, concealed | None | None |
| Indoor, exposed | CRF/ | CRD/ |
| Within mechanical | Canvas | Canvas |
| Room | | |

PART 1 - GENERAL

| | | |
|-------------------------|----|---|
| <u>1.1 RELATED WORK</u> | .1 | Submittal Procedures: Section 01 33 00 |
| | .2 | Joint Sealing: Section 07 92 00 |
| <u>1.2 REFERENCES</u> | .1 | American Society for Testing and Materials (ASTM) .1 ASTM B209M-10, Specification for Aluminum and Aluminum Alloy Sheet and Plate Metric. .2 ASTM C335-10e1, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation .3 ASTM C449/C449M-07(R2013), Standard Specification for Mineral Fibre Hydraulic Setting Thermal Insulating and Finishing Cement. .4 ASTM C533-2013, Standard specification for Calcium Silicate Insulation Block and Pipe. .5 ASTM C534-2014, Standard Specification for Preformed Elastomeric Cellular Thermal Insulation in Sheet And Tubular Form. .6 ASTM C547-2012, Standard Specification for Mineral Fibre Pipe Insulation. .7 ASTM C921-10, Practice for Determining the Properties of Jacketing Materials for Thermal Insulation. |
| | .2 | Canadian General Standards Board (CGSB) .1 CGSB 51GP52Ma-1989, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation. .2 CAN/CGSB51.53, Poly (Vinyl Chloride) Jacketing Sheet, for Insulated Pipes, Vessels and Round Ducts. |
| | .3 | Manufacturer's Trade Associations .1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards. |
| | .4 | Underwriters' Laboratories of Canada (ULC) .1 CAN/ULCS102-10, Surface Burning Characteristics of Building Materials and Assemblies. .2 CAN/ULCS701-11, Thermal Insulation, Polystyrene, Boards and Pipe Covering. .3 CAN/ULCS702-09, Thermal Insulation, Mineral Fibre, for Buildings |

- 1.3 DEFINITIONS
- .1 For purposes of this section:
 - .1 "CONCEALED" - insulated mechanical services in suspended ceilings (including metal baffle ceilings) and non- accessible chases and furred-in spaces.
 - .2 "EXPOSED" - will mean "not concealed" as specified.
 - .3 "OUTSIDE" shall include unheated portions of the parking garage.
 - .2 TIAC ss:
 - .1 CPF: Commercial Piping Finish.
- 1.4 SHOP DRAWINGS
- .1 Shop drawings in accordance with Section 01 33 00.
 - .2 Submit for approval manufacturer's catalogue literature related to installation, fabrication for pipe, fittings, valves and jointing recommendations.
- 1.5 SAMPLES
- .1 Submit samples in accordance with Section 01 33 00.
- 1.6 MANUFACTURER'S INSTRUCTIONS
- .1 Submit manufacturers' installation instructions in accordance with Section 01 33 00.
 - .2 Installation instructions to include procedures to be used, installation standards to be achieved.
- 1.7 QUALIFICATIONS
- .1 Installer to be specialist in performing work of this Section, and have at least five (5) years successful experience in this size and type of project, qualified to standards of TIAC.
- 1.8 DELIVERY, STORAGE AND HANDLING
- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
-

- .2 Protect from weather, construction traffic.
- .3 Protect against damage from any source.
- .4 Store at temperatures and conditions required by manufacturer.

PART 2 - PRODUCTS

2.1 FIRE AND SMOKE RATING

- .1 In accordance with CAN/ULCS102.
 - .1 Maximum flame spread rating: 25.
 - .2 Maximum smoke developed rating: 50.

2.2 INSULATION

- .1 Mineral fibre specified includes glass fibre, rock wool, slag wool.
- .2 Thermal conductivity ("k" factor) not to exceed specified values at 24 C mean temperature when tested in accordance with ASTM C335.
- .3 TIAC Code A3: Rigid moulded mineral fibre with factory applied vapour retarder jacket.
 - .1 Mineral fibre: to CAN/ULC S702 and ASTM C547.
 - .2 Jacket: to CGSB 51GP52Ma.
 - .3 Maximum "k" factor: to CAN/ULCS702.
- .4 TIAC Code C2: Mineral fibre blanket faced with factory applied vapour retarder jacket (as scheduled in PART 3 of this section).
 - .1 Mineral fibre: to CAN/ULCS702.
 - .2 Jacket: to CGSB 51GP52Ma.
 - .3 Maximum "k" factor: to CAN/ULCS702.
- .5 Acceptable product: Manson, Knauf, Owens Corning.

2.3 INSULATION SECRETMENT

- .1 Tape: Self adhesive, aluminum, plain reinforced, 50 mm wide minimum.
 - .2 Contact adhesive: Quick setting.
 - .3 Canvas adhesive: Washable.
 - .4 Tie wire: 1.5 mm diameter stainless steel.
 - .5 Bands: Stainless steel, 19 mm wide, 0.5 mm thick.
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| PWGSC | THERMAL INSULATION | Section 23 07 19 |
| Solid Waste Management Facility | FOR PIPING | Page 4 |
| Springhill Institution | | |
| Project No. R.043944.002 | Addendum No. 7 | 2014-09-22 |

2.4 CEMENT .1 Thermal insulating and finishing cement:
.1 Hydraulic setting or air drying on
mineral wool, to ASTM C449/C449M.

| | | |
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| 2.5 VAPOUR RETARDER LAP ADHESIVE | .1 | Water based, fire retardant type, compatible with insulation. |
| 2.6 INDOOR VAPOUR RETARDER FINISH | .1 | Vinyl emulsion type acrylic, compatible with insulation. |
| 2.7 OUTDOOR VAPOUR RETARDER FINISH | .1 | Vinyl emulsion type acrylic, compatible with insulation. |
| | .2 | Reinforcing fabric: Fibrous glass, untreated 305 g/m2. |
| 2.8 JACKETS | .1 | Canvas: .1 220gm/m2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921. .2 Lagging adhesive: Compatible with insulation. |
| | .2 | Aluminum: .1 To ASTM B209. .2 Thickness: 0.40 mm sheet. .3 Finish: Stucco embossed or corrugated. .4 Joining: Longitudinal and circumferential slip joints with 50 mm laps. .5 Fittings: 0.5 mm thick die shaped fitting covers with factory attached protective liner. .6 Metal jacket banding and mechanical seals: stainless steel, 19 mm wide, 0.5 mm thick at 300 mm spacing. |
| | .3 | Stainless steel: .1 Type: 304 or type 316 where additional corrosion protection is required. .2 Thickness: 0.25 mm. .3 Finish: Smooth corrugated or stucco embossed. .4 Joining: Longitudinal and circumferential slip joints with 50 mm laps. .5 Fittings: 0.5 mm thick die shaped fitting covers with factory attached protective liner. .6 Metal jacket banding and mechanical seals: stainless steel, 19 mm wide, 0.5 mm thick at 300 mm spacing. |
| | .4 | Self adhesive weather barrier membrane: |

- .1 Flexible SBS modified membrane impermeable to air, moisture vapour and water. UV light resistant, flame free adhesion.
- .2 Bakor Foilskin, or approved equivalent.

2.9 WEATHERPROOF CAULKING FOR JACKETS INSTALLED OUTDOORS

- .1 Caulking: to Section 07 92 00.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION REQUIREMENT

- .1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.
- .2 Surfaces clean, dry, and free from foreign material.

3.2 INSTALLATION

- .1 Install in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturers instructions and this specification.
- .3 Use two (2) layers with staggered joints when required nominal wall thickness exceeds 75 mm.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Hangers, supports to be outside vapour retarder jacket.
- .5 Supports, Hangers:
 - .1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

3.3 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

- .1 Application: At expansion joints, valves, primary flow measuring elements flanges and unions at equipment.

- .2 Design: To permit movement of expansion joint and to permit periodic removal and replacement without damage to adjacent insulation.
- .3 Insulation:
 - .1 Insulation, fastenings and finishes: same as system.
 - .2 Jacket: Aluminum, SS, PVC high temperature fabric.

3.4 INSTALLATION OF ELASTOMERIC INSULATION

- .1 Insulation to remain dry at all times. Overlaps to manufacturer's instructions. Ensure tight joints.
- .2 Provide vapour retarder as recommended by manufacturer.

3.5 PIPING INSTALLATION SCHEDULES

- .1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.
 - .2 TIAC Code: A3.
 - .1 Securements: Tape at 300 mm oc.
 - .2 Seals: VR lap seal adhesive, VR lagging adhesive.
 - .3 Installation: TIAC Code: 1501C.
 - .3 TIAC Code: C2 with vapour retarder jacket.
 - .1 Insulation securements: 18 ga SS wire or 12 mm x 05 mm ss bands at 300 mm oc.
 - .2 Seals: lap seal adhesive, lagging adhesive.
 - .3 Installation: TIAC Code: 1501C.
 - .4 Thickness of insulation to be as listed in following table:
 - .1 Do not insulate exposed run outs to plumbing fixtures, chrome plated piping, valves, fittings.
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| <u>Application</u> | <u>Temp (°C)</u> | <u>TIAC code</u> | <u>Pipe sizes (NPS) and insulation thickness (mm)</u> | | | | | |
|---|----------------------|----------------------|---|-------------|-----------------------|-----------------------|---------------|---------------------|
| | | | <u>Run out</u> | <u>to 1</u> | <u>1-1/4 to 2</u> | <u>2-1/2 to 4</u> | <u>5 to 6</u> | <u>8 & over</u> |
| Hot Water Heating | 60-94 | A-3 | 25 | 25 | 38 | 38 | 50 | 50 |
| Hot Water Heating | up to 59 | A-3 | 25 | 25 | 25 | 38 | 38 | 38 |
| Glycol Heating | 60-94 | A-3 | 25 | 25 | 38 | 38 | 50 | 50 |
| Glycol Heating | up to 59 | A-3 | 25 | 25 | 25 | 38 | 38 | 38 |
| Chilled Water or Glycol | 4-13 | A-3 | 25 | 25 | 38 | 38 | 38 | 38 |
| Chilled Water or Glycol | below 4 | A-3 | 25 | 25 | 38 | 38 | 38 | 38 |
| Humidifier Steam & Condensate | | A-3 | 25 | 25 | 25 | 25 | | |
| Chilled Water or Glycol Pump Casing and Tanks | | A-3 | 25 | 25 | 25 | 25 | 25 | 25 |
| Domestic Potable and Non-Potable CWS | | A-3 | 25 | 25 | 25 | 25 | 25 | 25 |
| Domestic HWS and Pre-Heated Hot water | | A3 | 25 | 25 | 25 | 38 | 38 | 38 |
| RWL and RWP | | A-3 | 25 | 25 | 25 | 25 | 25 | 25 |
| Cooling Coil cond. Drain | | A-3 | 25 | 25 | 25 | 25 | 25 | 25 |

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| PWGSC | THERMAL INSULATION | Section 23 07 19 |
| Solid Waste Management Facility | FOR PIPING | Page 9 |
| Springhill Institution | | |
| Project No. R.043944.002 | Addendum No. 7 | 2014-09-22 |

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|------------|-----|----|----|----|----|----|----|
| Roof Drain | C-2 | 25 | 25 | 25 | 25 | 25 | 25 |
| Body | | | | | | | |

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| PWGSC | THERMAL INSULATION | Section 23 07 19 |
| Solid Waste Management Facility | FOR PIPING | Page 10 |
| Springhill Institution | | |
| Project No. R.043944.002 | Addendum No. 7 | 2014-09-22 |

- .5 Finishes:
 - .1 Exposed indoors: aluminum jacket or canvas.
 - .2 Exposed in mechanical rooms: aluminum jacket or canvas.
 - .3 Concealed, indoors: canvas on valves, fittings. All service jacket elsewhere.
 - .4 Use vapour retarder jacket on TIAC code A3 insulation compatible with insulation.
 - .5 Finish attachments: SS screws or bands, at 150 mm oc. or to manufacturers recommendations.
 - .6 Seals: wing or closed.
 - .7 Installation: To appropriate TIAC code CPF/1 through CPF/5.

PART 1 - GENERAL

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| <u>1.1 DESCRIPTION OF SYSTEM</u> | .1 | This specification describes the requirements for design, supply and delivery of variable speed drives. Refer to related specification sections for mechanical and process motor specifications. |
| <u>1.2 RELATED SECTIONS</u> | .1 | General Instruction: Section 01 00 50. |
| | .2 | Submittal Procedures: Section 01 33 00. |
| | .3 | HVAC Controls: Section 25 00 00. |
| | .4 | Electrical General Requirements: Section 26 05 00. |
| <u>1.3 CODES AND STANDARDS</u> | .1 | Drives covered by this specification shall conform to the latest edition of the following Codes, Standards and Regulations where applicable: <ul style="list-style-type: none"> .1 Canadian Standard Association. .2 Institute Electrical Electronic Engineers 519 - Harmonics Generating. .3 Institute Electrical Electronic Engineers 62.41 - Line Transients. .4 Canadian Electrical Code, Part I - Overload, 2012 edition. |
| <u>1.4 SHOP DRAWINGS</u> | .1 | Provide shop drawings in accordance with specification Section 01 33 00. |
| | .2 | Indicate: <ul style="list-style-type: none"> .1 Outline dimensions of cabinet(s). .2 Drive configuration. .3 Inter-wiring of drive components. .4 Schematic and wiring diagrams. .5 Component data sheets. .6 Input/Outputs required to communicate with HVAC controls system. |
| <u>1.5 WARRANTY</u> | .1 | Provide warranty for all material for a period of two (2) year minimum from the Substantial Completion Date and will replace, at no cost to the Departmental Representative, faulty |

materials. The warranty must include the cost of all labour, travel and expenses for repairs within the warranty period.

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| <u>1.6 OPERATION AND MAINTENANCE MANUAL</u> | .1 | Provide operation and maintenance information in accordance with Section 01 78 00. This includes information on the drives and any required relays and other components that make up the complete package. |
| <u>1.7 SPARE PARTS</u> | .1 | Submit list and price of recommended spare parts to have on site to limit downtime. |
| | .2 | Submit manufacturer's policy of providing spare parts for older equipment (e.g.: spare parts are to be available for 10 years minimum after original equipment has been manufactured). |
| <u>PART 2 - PRODUCTS</u> | | |
| <u>2.1 GENERAL</u> | .1 | Provide variable speed drives for the motors indicated on the drawings. |
| | .2 | Refer to the drawings for motor HP ratings and quantities. |
| <u>2.2 POWER SUPPLY</u> | .1 | The minimum required three phase momentary short circuit current (rms symmetrical) rating at rated voltage is as noted on the drawings. |
| <u>2.3 DESIGN CRITERIA</u> | .1 | Drive to be digital, pulse width modulated, modular construction, CSA approved. |
| | .2 | The drive must convert incoming fixed frequency three phase ac power into variable voltage and variable frequency utilizing pulse width modulation. |
| | .3 | Drive to include a full wave diode bridge rectifier to convert ac to dc. SCR and other switching power devices are not acceptable. |

- .4 Drive to utilize dc capacitors to filter out bus ripple and provide smooth dc power to the transistor section.
- .5 Drive to utilize IGBT transistors to produce a pulse width modulated output. SCR's are not acceptable. The IGBT minimum Vce rating to be 1200V.
- .6 Drive main input power to be 600V, 3 phase, 60hz. Voltage tolerance shall be +10% and -15% of nominal voltage. Frequency tolerance shall be +/- 5%.
- .7 The drive must be rated to provide current to support motors at 1.15 service factor continuously.
- .8 The efficiency of the drive must be a minimum of 95% at full load and full speed.
- .9 Displacement power factor must be greater than 0.95 lagging over the entire speed range.
- .10 Provide minimum 3% input line reactors or integral line input choke. Install a CSA approved enclosure over line reactors.
- .11 Provide output dv/dt filtering downstream of the drive in accordance with the drive manufacturer's recommendations to protect the motor against high voltage spikes. Install the filter in a CSA approved enclosure.
- .12 The drive must be able to provide full rated output current continuously, and shall be able to provide 110% of its normal duty current rating for one (1) minute every ten (10) minutes, and 130% overload for two (2) seconds.
- .13 Where a local disconnecting device is provided downstream of the VFD, the drive must be capable of accepting opening of the feeder disconnect without causing damage to the drive. Wire an auxiliary contact from each local disconnect back to the drive to prevent starting the drive on an open circuit condition.
- .14 Provide drive complete with power line loss ride

through feature for a minimum of 0.5 seconds.

- .15 The drive must be capable of starting into a coasting load.
- .16 Provide most recent version of programming software and appropriate interface hardware to enable drive configuration from a laptop computer.
- .17 Provide Digital Input/Output points, complete with connection to variable frequency drive and terminal blocks for field cabling for the following as a minimum: Drive Run (drive output), Drive Fault (drive output), Drive Start/Stop command (drive input). "Drive Run" and "Drive Fault" contacts must be dry contacts, rated minimum 0.4A at 120Vac.
- .18 Provide and programmable output signal (4-20mA) to indicate motor current.
- .19 Provide a programmable analog input points to accept a 4-20mA analog signal (speed control) from an external source and, where applicable, a voltage signal from a remote potentiometer (speed control).
- .20 Protective functions:
 - .1 The drive must have built in CSA approved adjustable overload protection to protect the connected motor.
 - .2 The drive must have input metal oxide varistors (MOV's) for surge protection.
 - .3 Provide complete with the following protective functions:
 - .1 Over and under voltage.
 - .2 Overcurrent.
 - .3 Ground fault.
 - .4 Drive over temperature.
 - .5 Blown dc bus fuse.
 - .6 Overload.
 - .7 Input and output phase loss.
 - .8 Unbalance current fault
 - .9 Motor stall protection.
 - .4 Provide for three (3) auto restart attempts following selected fault conditions.
 - .5 Drive to permit the operator to lock out

the reverse operation for applications where reverse would damage equipment.

- .21 Provide each drive complete with a removable keypad for local programming, monitoring, speed control and start/stop control. Each keypad must be visible and accessible from the front of the drive or drive control panel with the door closed. Provide the keypad complete with the following minimum features:
 - .1 LCD high resolution display (backlit).
 - .2 Keypad must indicate the following minimum operating conditions: drive run, drive stopped, drive fault.
 - .3 As a minimum, output speed, power, frequency and current shall be displayed continuously as selected by the user.
 - .4 Fault reset and hand-off-auto buttons.
 - .5 Present fault condition shall be displayed.
 - .6 Keypad entries shall be password protected.
 - .7 English Language.
- .22 Programming features:
 - .1 Drive must have a minimum of three (3) independently adjustable acceleration and deceleration ramps. Times are to be adjustable from 0.1 to 3200 seconds (nominal).
 - .2 Drive must have an adjustable output frequency from 25-320hz (nominal).
 - .3 Control methods available must be selectable sensorless vector and selectable Volts/hz patterns.
 - .4 Drive must have adjustable minimum and maximum speed settings.
 - .5 Drive must have an adjustable carrier frequency (nominal 1-16khz).
 - .6 Drive must have a minimum of three (3) adjustable frequency reject points to prevent system operation at resonant speed.
- .23 Drive to be sized for variable torque or constant torque load as determined by application.
- .24 Provide drive with BacNet communications with a BACnet RS-485 port as standard to interface with the Building Management System Controls. Drive supplier will verify compatibility with the

- control supplier at the time of the bid.
- .25 Drives to include EMI/RFI filters.

2.4 ENCLOSURE .1 Wall mount VFD's where indicated. VFD's must be minimum NEMA 12 rated if not mounted in an enclosure. Provide enclosures, minimum NEMA 12 rated, for the line reactors, dv/dt filtering and VFD controls for each drive.

- .2 VFD's must be ventilated in accordance with manufacturers' requirements.

- .3 Enclosures must be sprinkler proof.

2.5 ACCEPTABLE MATERIALS .1 Cutler Hammer.

.2 Schneider Electric.

.3 Siemens.

PART 3 - EXECUTION

3.1 INSTALLATION .1 Field mount VFD's where indicated on the Project Drawings. Provide 41mm, U-shaped strut (galvanized steel) on wall for mounting groups of VFD's.

- .2 Connect power, control and communications wiring (digital and analog inputs and outputs) as noted on the drawings. Coordinate HVAC controls requirements prior to the issuance of Shop Drawings.

- .3 All conduit for VFD power conductors (line and load side) must be steel (EMT or hot dipped galvanized steel).

- .4 Provide adequate spacing between VFD's for cooling in accordance with the manufacturer's requirements.

3.2 TESTING AND .1 Arrange and pay for a factory certified

COMMISSIONING

representative to set up and commission drive at site for proper operation to the satisfaction of the Departmental Representative. Document all testing and set- up and submit to Departmental Representative.

- .2 Provide commissioning test reports and setup/configuration parameters (hard copy and files on CD).
- .3 Coordinate with building controls system integrator during testing and commissioning of variable frequency drives to establish proper operation to the satisfaction of the Departmental Representative.

3.3 TRAINING

- .1 Provide a factory certified representative as required to train personnel at site.

END OF SECTION