

Addendum / Addenda

Project Description / Description de projet M58 Ground Floor East and West		
Solicitation No./N° de sollicitation 16-22087	Project No./N° de projet 5189	W.O. No./N° d'ordre de travail A1-009908-01-58
Departmental Representative / représentant ministériel Mark O'Connor		Date November 4, 2016
Notice: This addendum shall form part of the tender documents and all conditions shall apply and be read in conjunction with the original plans and specifications.		Nota: Cet addenda fait partie intégrale des dossiers d'appel; toutes les conditions énoncées doivent être lues et appliquées en conjonction avec les plans et les devis originaux.

- 1 Refer to attached question and answer document for requests that are not addressed elsewhere in the addendums. Answers and information provided in this document form part of this contract.
- 2 Clarification of specification section 125913.2.3.11.2 & .3 - The electrical contractor will be providing one 2-wire connection (+ bonding wire) for each workstation. As such all receptacles that are part of the workstation may be connected to a single set of wires that form the "whip" to which the electrician will be making a connection.
- 3 Specifications section 10 51 13.2.1 - Replace this section with the following:
 - 2.1 MANUFACTURED UNITS
 - .1 Colour: to be selected by NRC Departmental Representative from Manufacturers full range of available colours. Frame colour may be different from door at no additional charge.
 - .2 Lockers to be constructed of galvaneal metal.
 - .3 to include galvaneal steel box base, 89mm high, 44mm recessed from the locker face along the bottom of the lower row of lockers.
- 4 Specifications section 10 51 13.2.2 - Replace this section with the following:
 - 2.2 ACCESSORIES
 - .1 Locking system: to accept standard padlock. Supply of padlocks not included in contract.
 - .2 each locker to include 3 hooks.

5 Specifications section 265000.2.4.1 - The following are accepted as alternates subject to shop drawing approval for compliance with specified options and features as applicable:

Type A: Lithonia lighting 2GTL series, Metalux 24GR series

Type B: Lithonia lighting 2GTL series, Metalux 22GR series

Type C: Peerless Staple LED SPM9L series, Corelite DIVIDE DSI series

Type D: Portfolio LDSQ6A series

Type E: Lithonia lighting ZL1D, Metalux SNLED series

Type F: Halo HU10 series

Type G: Juno IC1420LEDG4 series, Portfolio LD4A series

Type H: Lithonia lighting SBL4 series, Metalux 14GR series

Type I: Lithonia lighting ZL1D, Metalux 2SNLED series

This acceptance does not relieve the contractor of the responsibility of meeting all requirements of the specifications.

6 Specifications section 265300.2.1 - The following is accepted as an alternate for exit signage subject to shop drawing approval for compliance with specified options and features as applicable:

Aimlite RPST series

7 Specifications section 262726.2.1.2 - The following are accepted as alternates for LED dimming switch subject to shop drawing approval for compliance with specified options and features as applicable:

Acuity Controls SPODMRD series

Greengate WBSD-010SLD-W

8 Perimeter heating unit covers : All perimeter heating unit covers to be new, primed and powder coated, pre-finished (factory painted) ready for installation. Paint colour to match general wall paint colour (P1). Refer to the architectural specifications.

9 Specifications section 238413.2.1.9 issued with addendum #1 - Nortec Model SETC-100 is an approved alternate under the provision that all costs required to modify the HVAC system/Design to suit alternate humidifier (including but not limited to provision/installation of steam condensate pump, modification of piping systems, modification of ductwork/AHU, modification to any doors/windows/ openings, relocation of elements, etc.) must be carried by contractor. Installation must meet functional purpose and manufacturer's recommendations. General products accepted but subject to shop drawings approval for options and features as applicable. Contractor should also consider the following elements:

- Manufacturer's recommended clearance/maximum distances are respected;
- Dispersion tubes should be installed in the Air handling unit;

10 Specifications section 062000.2.4 - Colour to be Caesar Stone Canada 6600 Nougat. Change slab thickness from 25mm to 30mm.

11 In some cases there was a problem viewing the description text on drawing 5189-M19. The drawing has been included with this addendum with a change noted.

12 Specification section 091300 - Contractor to provide 3rd party seismic design and installation review by a professional engineer licensed to practice in Ontario.

13 Specification section 091300 - Replace 091300.1.5.1 with the following: Provide twenty (20) ceiling tiles for each pattern and type on project. Extra materials shall be from same production run as installed materials, in unopened packages.



14 Specifications section 26 05 31 - Add the following:

2.3 ELECTRICAL FLOOR BOXES

- .1 Fire rated, flush mounted, suitably sized for services as indicated on floor plan.
- .2 separate boxes for power and data.
- .3 universal flange and cover assembly, suitable for carpet or tile installation, as required. Aluminum finish.
- .4 Include subplates for appropriate power and data devices as shown on drawing.
- .5 include extension sleeves, poke-through and any other components and/or labour and materials required to make a complete, functional system.

15 Concrete coring will be required for the floor boxes noted above. Scan floors and submit results to NRC Departmental Representative prior to scheduling coring. Confirm coring schedule with NRC Departmental Representative prior to performing work. Install fire caulking and seal opening to maintain fire separation.

16 Conduits for data outlets are to be sized to allow for 3 category 6 cables at each outlet location shown on the drawings.

17 Electrical Demolition - the following shall be included in the electrical demolition scope of work. Remove all wire and conduit to source and mark existing breaker as spare. Fill floor opening as described on architectural plans.

- Disconnect fed from panel L10, cct 38/40/42 located approximately at gridlines 1/L4.
- Disconnect marked as fed from panel LD4, cct 4 located approximately at gridlines 1/J4.
- Disconnect and splitter marked as fed from panel LD4, cct 4 located approximately at gridlines 1/O4.
- Conduit and wire at wall outside of janitor closet, near gridlines 7/P4. Source unknown - allow for 4 hours labour.

18 Replace specification section 23 84 13 - Humidifier with the attached specification section.

19 Refer to attached sketches ADD3-SK01 & ADD3-SK02. Added steam pressure reducing valve and safety valve including piping modifications.

20 New exterior wall opening shown on sketch ADD3-SK02 to be tight around vent pipe. Provide galvanized steel sleeve around exterior wall opening. The pipe sleeve to be 200mm (high) stainless steel construction, diameter: 150mm wider than the diameter of the vent pipe (75mm gap on either side of the vent pipe). Fill gap between the vent pipe and the S.S. sleeve with 50mm mineral wool insulation and leave 25mm air space between the insulation and the sleeve for air circulation. Provide 2-stage sealant system between the sleeve and the exterior wall precast panel, consisting of a backer rod and an exterior grade caulking system. Provide a high heat resistant silicone sealant (up to 500 degree F.) to seal the edge of the collar to the vent pipe.

21 Replace specification section 23 05 48 - VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT with the one attached.

22 Add attached specification section 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS.

NRC Tender 16-22087 Questions and Answers – included with addendum #3

1. If the products we are submitting have already been approved on the current Government Procurement tool, the Workspaces SA or the Seating SA, will test reports still be required for those products?

Answer: No.

2. Some products that you've requested do not have a corresponding CGSB standard category, such as some of the lounge chairs requested. In this case, what do you want us to do, in these cases?

Answer: Look at the product specified, indicate how your product meets or exceeds.

3. A) Some specification points give a specific dimension to follow or give two options such as spec point 2.2.3 "standard panel heights" calls for 1270mm (50") or 1447mm (57") our standard panel height is 51", in cases like this is a panel within the range between these two dimensions acceptable?
B) Panel heights requested are 1270 and 1447 ours are 1143 and 1346. The bid doesn't state a variance and I need to know before Tayco prices the floor out.

Answer: Refer to 2.2.1.3, Standard Panel Heights 1270 or 1447mm - add +/- 50mm. Max height for panel and glass topper shall be 1727mm

4. Panel specification point 2.2.1.7 requires "grippers". Grippers is a specific term used by one manufacturer, please remove from the requirement.

Answer: NRC doesn't want to show favoritism for one furniture supplier over another.

Please remove the word 'Gripper' from Panel Hung Component System Furniture, specification section 2.2.1.7 and replace it with the term "Carpet Gripper".

5. The storage tower shown in the Typical Workstation is noted as 1447 mm high (57"), however it appears to be the same height as the 68"h panel and in 2.3.7.1.1.3 it indicates it to be 68"h. Please confirm what panel height the storage tower is to coordinate with.

Answer: As per Panel Hung Component System Furniture, specification section 2.3.7.1.1.3 Height: 1727mm.

6. It states in the Addendum that LED lights are not required for workstations...Do you mean that no lights are required or that they don't have to be LED?

Answer: Under cabinet lights are not required in the workstations

7. What size is the modesty on the height adjustable work surface in the Manager's workstations?

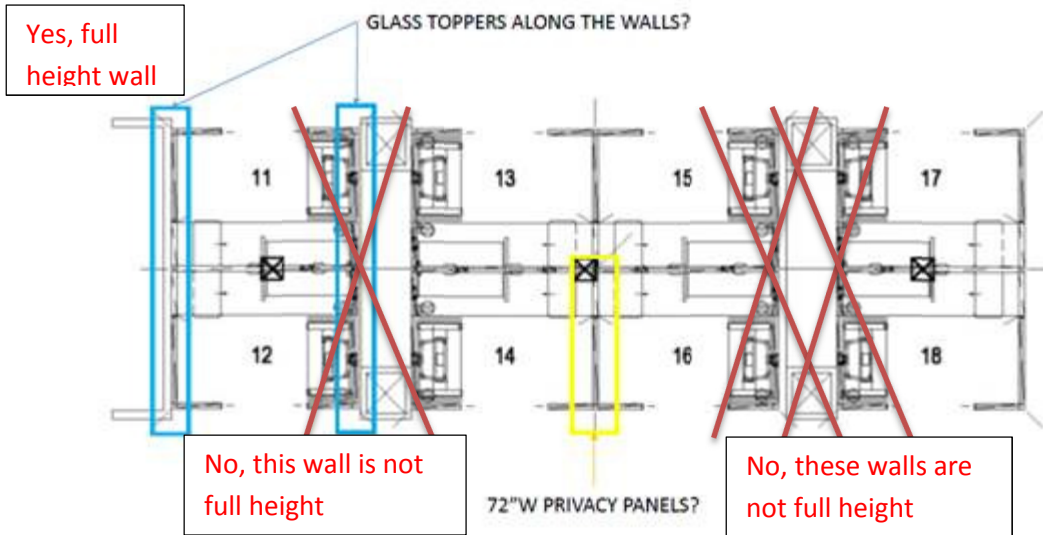
Answer: min 330mm, laminate to match work surface.

8. What size is the light in the Manager's workstations? It only states the light is required under open shelving (in cubicles is 1220mm).

Answer: Under cabinet light is not required in the manager's workstations

9. Can we use 72"w Panels in between the stations instead of a 24"w and a 48"w? Specifically panels that are dividing walls only as highlighted in yellow in the pdf.

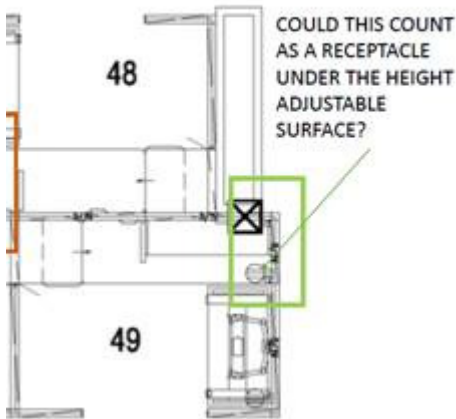
Answer: No, use 610mm wide and 1220mm wide panels.



10. Where the panels line up against walls/columns is glass still required (highlighted in drawing in blue above)?
 Answer: Where panels are up against full height partitions, no glass topper is required. Install full height panels.

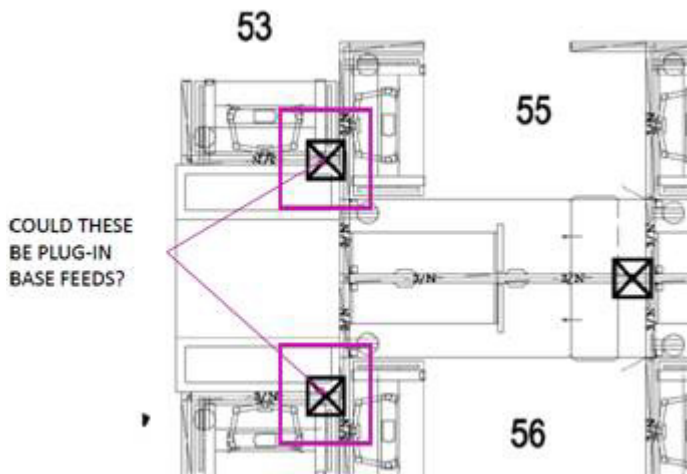
11. Can a receptacle in the 24" w panel next to the height adjustable surface count as a receptacle under the surface (location in green)?

SECTION OF 48" W



Answer: No

12. Can these two touchdown stations (purple highlighting) have the power from a basefeed or do they need to be a separate power pole each as they are not panels that are tied into the stations beside them meaning they won't share the infeed power of these stations.



Answer: No

13. When reviewing the Architectural drawings, the west wing extends to Grid Line 42, however, the detailed plans only go as far as Grid Line 33-34. & On the drawing 5189-A03 shows Area of work from grid line 1 to 42, but in the architectural drawings there is no work shown to do, only work in mechanical and electrical, Could you confirm this?

Answer: The work in the west wing, beyond gridlines 33-34 includes mechanical & electrical work, designated substance abatement, spray on fireproofing noted in addendum #2 and any architectural repairs required due to work by other disciplines in that space. This would include but not be limited to, the removal and reinstallation of T-bar ceiling in room WG-23 if necessary for duct removal and wall opening repairs where new ductwork is smaller than removed ductwork. It is the General Contractors responsibility to coordinate any and all requirements with their sub-contractors.

14. Could you please tell me what manufacturer the furniture design is based off?

Answer: Refer to specification section 125913.2.1.1

15. On the drawing 5189-A07 shows some washroom accessories, could you provide specification for these?

Answer: Washroom mirrors shall be 24" (W) x 36" (H), welded frame mirror, One-piece, roll-formed 3/4" x 3/4" (19 x 19mm) angle-frame, type 304 stainless steel angle with satin finish. Accepted product: B-290 2436 from Bobrick. Grab bars are specified in the Specs (Section 06 20 00). All other accessories are specified on Drawing 5189-A07.

16. In the hardware schedule, hardware package #6 has door operators and is labeled as Washrooms and locker rooms. On the door schedule, D#111(kitchen) is listed as receiving hardware package #6, the drawings however do not show a door operator on this door.

Answer: Refer to addendum #2.

17. Can you confirm whether there is an operator on D#111 or if the hardware group was mislabeled

Answer: Refer to addendum #2.

18. As no specific manufacturer was specified for the metal toilet partitions, submitted products will be reviewed for compliance with specifications during construction.

19. **Spec Section 23 73 10, Part 2 - 2.1.1 - All sections must be able to fit through a standard 2100 x 810 (82"x32") opening.** Can this dimension be confirmed as I thought we had access to double doors and a louver opening for the larger walk-in section.

Answer: Existing mechanical room has a double door. Unit section maximum dimension is 71.5".

20. **Spec Section 23 73 10, Part 2 - 2.5.3.1 – Wall and ceiling panels to be 3" nominal thickness and R-6.5.** Will a 3" or 4" cabinet be the only sizes accepted? OR would the client approve a smaller 2" cabinet as long as the R value is respected?

Answer: 3" inch minimum.

Part 1 GENERAL

1.1 SUMMARY

- .1 Section Contents
 - .1 Systems, vibration and seismic devices and associated installation methods.

1.2 RELATED SECTIONS

- .1 The requirements of sections 21 05 01 – Common Work Results for Mechanical and 23 05 00 – Common Work Results for HVAC are an integral part of this section.

1.3 REFERENCES

- .1 Requirements of the NBC 2015.
- .2 ANSI B31.1 (SI), Power Piping (SI Edition).
- .3 ANSI / MSS SP58 Pipe Hangers and Supports – Materials, Design and Manufacturer.
- .4 CAN / CSA S832: Seismic Risk Reduction of Operational and Functional Components of Buildings.
- .5 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .6 National Fire Protection Association (NFPA)
 - .1 NFPA 13-2002, Standard for the Installation of Sprinkler Systems.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 00 10 00 – General Instructions.

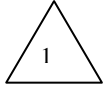
1.5 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual specified in Section 00 10 00 – General Instructions.

1.6 SCOPE OF WORK



- .1 The work largely includes the calculations, supply, installation, supervision and responsibility for all necessary materials and equipment of seismic restraint systems for **HVAC, duct and piping works and their related equipment in mechanical rooms and everywhere in new mechanical building installations for all trades:**
 - .1 Seismic restraint systems calculations and installation details to meet the required standards.



- .2 The supply and delivery of these seismic restraint systems to the site fall under the responsibility of the present section.
- .3 Supervision and installation of all devices for seismic restraint systems and presentation of a compliance report.
- .4 Seismic restraint systems include, without being limited to, the crossbracing of mechanical piping/ducts supports and equipment such as pumps, exchangers, air handling unit, coils, etc.**
- .2 The Contractor must hire an experienced manufacturer to design, supply and supervise the installation of all seismic restraint systems.
- .3 The seismic restraint systems manufacturer is responsible vis-à-vis the Contractor for designing, supplying and supervising the installation of seismic restraint systems. The manufacturer remains responsible for the structural integrity of the seismic restraint systems.
- .4 The manufacturer must have a professional engineer who specializes in seismic restraint systems design to make the calculations and develop the installation details of the seismic restraint systems.
- .5 Submit shop drawings and specifications in accordance with Section 00 10 00 – General Instructions.
- .6 Identify the following elements indicated in the manufacturer’s documentation:
 - .1 Anchors.
 - .2 Median elements.
 - .3 Supports.
 - .4 Riser clamps.
 - .5 Protection shields.
 - .6 Crossbracings.
- .7 Design, prepare and supply the shop drawings including those that illustrate the type of seismic restraint systems and their location.
- .8 Provide the calculations used. The shop drawings must bear the seal of a professional engineer who is a member of the *Professional Engineers of Ontario (PEO)*

1.7 SEISMIC RESTRAINT SYSTEMS

- .1 Unless otherwise indicated, the seismic control measures must be designed and chosen to meet the requirements of the latest edition of the National Building Code 2015 and its supplement:
 - .1 Seismic zone:
 - .1 To be defined by the Engineer.

- .2 Seismic importance factor:
 - .1 To be defined by the Engineer.
- .3 The other coefficients (C_p , A_r , A_x) will be taken from the Code and its supplement.
- .4 The Contractor must take into consideration floor level in which equipment is installed within the building, i.e. basement, ground floor, upper floor) during the seismic control equipment design.
- .2 During or following a seismic event, the anchored equipment may not necessarily remain in operational state as in normal use conditions. Mandatory requirements state that seismic restraint systems shall prevent the systems and mechanical equipment from causing personal injury and the equipment from moving from its normal position during a seismic event.
- .3 The manufacturer of seismic restraint systems must obtain from each Mechanical section involved, all information relating to the devices, pipes and equipment necessary for seismic restraint system calculations (weight, fluid type, number, thermal insulation, run, spacing between supports, grouping on trapezoid supports).
- .4 The seismic restraint systems manufacturer must obtain the required characteristics from the manufacturer of each device or equipment for calculation purposes.
- .5 The calculations and installation details of anchoring bolts and seismic restraint systems shall be approved by a professional engineer specializing in seismic restraint systems design.

1.8 QUALITY ASSURANCE

- .1 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 00 15 45 – General Safety Section & Fire Instructions.

1.9 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with Section 00 10 00 – General Instructions.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal
 - .1 Construction/Demolition Waste Management and Disposal: in accordance with Section 00 10 00 – General Instructions.

Part 2 Products

2.1 GENERAL

- .1 Size and shape of bases type and performance of vibration isolation as indicated.

2.2 ELASTOMERIC PADS

- .1 Type EP1 – neoprene waffle or ribbed; 50 durometer, 9 mm minimum thick; maximum loading 350 kPa.
- .2 Type EP2 – rubber waffle or ribbed; 30 durometer, 9 mm minimum thick; maximum loading 415 kPa.
- .3 Type EP3 – neoprene-steel-neoprene; 9 mm minimum thick neoprene bonded to 1.71 mm steel plate; 50 durometer neoprene waffle or ribbed; holes sleeved with isolation washers; maximum loading 350 kPa.
- .4 Type EP4 – rubber-steel-rubber, 9 mm minimum thick rubber bonded to 1.71 mm steel plate; 30 durometer natural rubber, waffle or ribbed; holes sleeved with isolation washers; maximum loading 415 kPa.

2.3 ELASTOMERIC MOUNTS

- .1 Type M1 – colour coded, neoprene in shear; maximum durometer of 60; threaded insert and two bolt-down holes; ribbed top and bottom surfaces.

2.4 SPRINGS

- .1 Design stable springs: ration of lateral to axial stiffness is equal to or greater than 1.2 times ratio of static deflection to working height. Select for 50% travel beyond rated load. Units complete with levelling devices.
- .2 Ratio of height when loaded to diameter of spring between 0.8 and 1.0.
- .3 Cadmium plate for outdoor 100% relative humidity installations.
- .4 Colour code springs.

2.5 SPRING MOUNT

- .1 Zinc or cadmium plated hardware; housings coated with rust resistant paint.
- .2 Type M2 – stable open spring: support on bonded 6 mm thick ribbed neoprene or rubber friction and acoustic pad.
- .3 Type M3 – stable open spring: support on bonded 6 mm thick ribbed neoprene or rubber friction and acoustic pad, levelling bolt for rigidly mounting to equipment.
- .4 Type M4 – restrained stable open spring: supported on bonded 6 mm thick ribbed neoprene or rubber friction and acoustic pad; built-in resilient limit stops, removable space plates.

- .5 Type M5 – enclosed spring mounts with snubbers for isolation up to 950 kg maximum.
- .6 Performance: as indicated.

2.6 HANGERS

- .1 Colour coded springs, rust resistant, painted box type hangers. Arrange to permit hanger box or rod to move through 30 degrees arc without metal to metal contact.
- .2 Type H1 – neoprene – in-shear, moulded with rod isolation bushing which passes through hanger box.
- .3 Type H2 – stable spring, elastomeric washer, cup with moulded isolation bushing which passes through hanger box.
- .4 Type H3 – stable spring, elastomeric element, cup with moulded isolation bushing which passes through hanger box.
- .5 Type H4 – stable spring, elastomeric element with precompression washer and nut with deflection indicator.
- .6 Performance: as indicated.

2.7 ACOUSTIC BARRIERS FOR ANCHORS AND GUIDES

- .1 Acoustic barriers: between pipe and support, consisting of 25 mm minimum thick heavy duty duck and neoprene isolation material.

2.8 HORIZONTAL THRUST RESTRAINT

- .1 Spring and elastomeric element housed in box frame; assembly complete with rods and angle brackets for equipment and ductwork attachment; provision for adjustment to limit maximum start and stop movement to 9 mm.
- .2 Arrange restraints symmetrically on either side of unit and attach at centreline of thrust.

2.9 STRUCTURAL BASES

- .1 Type B1 – Pre-fabricated steel base; integrally welded on sizes up to 2400 mm on smallest dimension, split for field welding on sizes over 2400 mm on smallest dimension and reinforced for alignment of drive and driven equipment; without supplementary hold-down devices; complete with isolation element attached to base brackets arranged to minimize height; pre-drilled holes to receive equipment anchor bolts; and complete with adjustable built-in motor slide rail where indicated.
- .2 Type B2 – Steel rail base: structural steel, positioned for alignment of drive and driven equipment; without supplementary hold-down devices; complete with isolation element attached to base brackets arranged to minimize height; and pre-drilled holes to receive equipment anchor bolts.
- .3 Bases to clear housekeeping pads by 25 mm minimum.

2.10 INERTIA BASE

- .1 Type B3 – Full depth perimeter structural or formed channels, frames: welded in place reinforcing rods running in both directions; spring mounted, carried by gusseted height-saving brackets welded to frame; and clear housekeeping pads by 50 mm minimum.
- .2 Pump bases: “T” shaped, where applicable, to provide support for elbows.
- .3 Concrete: to Section 03 30 00 – Cast-in-Place Concrete.

2.11 SEISMIC CONTROL MEASURES

- .1 General
 - .1 All equipment connected to emergency electrical power and their associated distribution networks must remain in operation during and after an earthquake. The seismic restraint systems to work in every direction.
 - .2 Fasteners and attachment points shall be capable of sustaining the same loads as the seismic restraint systems.
 - .3 Drilled or power driven anchors and fasteners not permitted.
 - .4 No equipment, equipment supports or mounts to fail before failure of structure.
 - .5 Supports of cast iron or threaded pipe not permitted.
 - .6 Seismic control measures not to interfere with integrity of firestopping.
 - .7 All seismic restraint systems must be entirely integrated and compatible with building mechanical and structural design. They must not hinder normal operation of mechanical systems.
 - .8 Manufacturers of seismic restraint systems to offer vibration isolators, integral and separate seismic shock absorbers, cable fasteners and other fastening systems from manufacturers that regularly fabricate this type of material.
 - .9 The seismic restraint systems shall be capable of resisting forces in all directions.
 - .10 Fasteners and fastener fittings must be able to resist same loads as seismic restraint equipment.
 - .11 For longitudinal crossbracings, the pipe fastener must be directly on the pipe (under thermal insulation).
 - .12 Seismic anchorings on pipes must be compatible with the anchoring and support specifications for the piping networks.
 - .13 High resistance mechanical expansion anchors must be used to secure seismic restraint systems to the concrete structures. Use of anchors and supports installed with a nail gun is prohibited.

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- .14 Supports of cast iron or threaded pipe or other breakable materials not permitted.
 - .15 The seismic restraint systems must not interfere with the functioning or integrity of firestopping equipment.
 - .16 Stiffeners shall be added to the suspension rods when necessary in order to avoid buckling.
 - .17 Seismic restraint crossbracings may be omitted for:
 - .1 32 mm and under piping.
 - .2 Individually suspended piping whose length of supports is 300 in. and under.
 - .18 Cast iron, glass or other pipes containing mechanical joints with rings and tightening screws with supports longer than 300 mm shall be equipped with a seismic restraint crossbracing at every change in direction (90° and +). Riser joints must be stabilized or have a crossbracing between the floors.
 - .19 Maximum spacing for seismic restraint crossbracings must be 24 m. in a longitudinal direction and 12 m in a transversal direction. The seismic restraint system calculations may necessitate shorter lengths.
 - .2 Static equipment:
 - .1 Anchor equipment to equipment supports. Anchor equipment supports to structure.
 - .2 Suspended equipment:
 - .1 Use one or more of following methods as per site conditions or as indicated.
 - .1 Install tight to structure.
 - .2 Cross brace in every direction.
 - .3 Brace back to structure.
 - .4 Cable restraint system.
 - .3 Seismic restraints
 - .1 Cushioning action gentle and steady.
 - .2 Never reach metal-like stiffness.
 - .3 Vibration isolated equipment
 - .1 Seismic control measures not to jeopardize noise and vibration isolation systems. Provide 6 to 9 mm clearance during normal operation of equipment and systems between seismic restraint and equipment.

- .2 Incorporate seismic restraints into vibration isolation system to resist complete isolator unloading.
- .3 As indicated.
- .4 Piping systems
 - .1 Fire protection systems: to NFPA 13.
 - .2 Piping systems: hangers longer than 300 mm; brace at each hanger.
 - .3 Compatible with requirements for anchoring and guiding of piping systems.
- .5 Bracing methods: approved by Consultant hired by Sub-contractor (see scope of work 1.7).
 - .1 Structural angles or channels.
 - .1 Cable resistant system incorporating grommets, shackles and other hardware to ensure alignment of restraints and to avoid bending of cables at connection points. Incorporate neoprene into cable connections to reduce shock loads.

2.12 MEDIAN ELEMENT (SUSPENSION ROD)

- .1 Threaded, carbon steel rod, black finish and electrogalvanized for mechanical rooms, stiffened with forged steel.
 - .1 Acceptable product: Anvil, Fig. 146 or approved equal

2.13 SUPPORTS

- .1 Cold water steel or cast iron pipes, hot water steel piping, with less than 25 mm horizontal movement; hot water steel piping suspended on rods longer than 300 mm: adjustable stirrup in accordance with Standard MSS-SP58-1983, type 1.
 - .1 Acceptable products: Anvil, Fig. 260 or 260 ISS or approved equal.
 - .2 If Fig. 260 ISS from Anvil is used, a protection shield (Fig. 167) is not necessary (see manufacturer's installation details).
- .2 Cold water copper pipes, hot water copper pipes, with less than 25 mm horizontal movement, hot water copper piping suspended on rods longer than 300 mm: adjustable stirrup in accordance with Standard MSS-SP58-1979, type 1, with copper finish.
 - .1 Acceptable product: Anvil, Fig. CT-65 or approved equal.
- .3 Suspended hot water steel and copper pipes with more than 25 mm horizontal movement, hot water steel piping suspended on rods 300 mm in length or shorter: roller stirrup in accordance with Standard MSS-SP58-1979, type 43.
 - .1 Acceptable product: Anvil, Fig. 181 or approved equal.

- .4 Steel or copper hot water piping, base supported: roller base in accordance with Standard MSS-SP58-1983, type 45.
- .1 Acceptable product: Anvil, Fig. 271 or approved equal.
- .5 Non-metallic piping: adjustable stirrup in accordance with Standard MSS-SP-69, type 9.
- .1 Acceptable product: Anvil, Fig. 97C or approved equal.
- .6 Type of supports:
- .1 Roll stands shall be installed for the following cases:
- .1 Case no.1:
- .1 On 60°C and + piping networks, with a suspension rod 500 mm or shorter; however, when the suspension rod is longer than 500 mm, the ratio between pipe expansion and suspension rod length must be greater than 1:24 (0.041) to install pipe roll stands.
- .2 Example:
- .1 50 mm expansion, 1 000 mm rod, ratio 1:20 (= 0.05). In this case, pipe roll stands are required.
- .2 Case no. 3*:
- .1 When there is vertical movement up to 32 mm expansion maximum, add Anvil Fig. 178 springs with Anvil Fig. 171. Choice of spring strength will be based on piping weight and content.
- .3 Case no. 4:
- .1 On 43°C and + piping networks, with piping supported by angle irons or another type of metal member.
- .2 Acceptable products:
- | Diameter including insulation | Anvil |
|-------------------------------|-------|
| 50 mm Ø to 1 065 mm Ø | 271 |
- .4 Case no. 5:
- .1 Unless otherwise mentioned above, the supports will be vertical adjustment type.

.2 Acceptable products:

Rod-suspended Roll Stands		
Diameter including insulation	Anvil	No. of rods per support
13 mm Ø to 760 mm Ø	260	1
for vertical piping support 200 mm Ø to 510 mm Ø	261	---

2.14 RISER CLAMP

- .1 For steel or cast iron piping: carbon steel clamp, black finish, in accordance with Standard MSS-SP58-1983, type 42, ULC stamped.
 - .1 Product of acceptance: Anvil, Fig. 261 or approved equal.
- .2 For copper piping: carbon steel clamp, copper finish, in accordance with Standard MSS-SP58-1983, type 42.
 - .1 Product of acceptance: Anvil, Fig. CT-121 or approved equal.
- .3 Non-metallic piping: carbon steel clamp in accordance with Standard MSS-SP-69, type 8.
 - .1 Acceptable product: Anvil, Fig. 261C or approved equal.

2.15 INSULATION PROTECTION SHIELDS

- .1 Cold water piping NPS 32 mm and +: protection shield for piping with high density thermal insulation and continuous vapour barrier.
 - .1 Acceptable product: Anvil, Fig. 167 or approved equal.
 - .2 It is not acceptable under any circumstances for cold water piping to come into direct contact with a shield.
 - .3 The contractor responsible for this section must present the shields to the contractor responsible for piping insulation. The latter shall install the shields and supply a wood block between the piping and shield for larger diameter piping. Refer to Section 27 07 15.
- .2 Hot water piping NPS 32 mm and +: protection shield for insulated piping.
 - .1 Acceptable product: Anvil, Fig. 160 and 166 or approved equal.
 - .2 Protection shields are not necessary only when Anvil Fig. 260 ISS is used.

2.16 EQUIPMENT SUPPORTS

- .1 Supply and install all necessary metal supports for the equipment, exchangers, tanks and accessories indicated on drawings and in specifications of the present section.

- .2 These supports will be made with U metal channels welded and manufactured by skilled labour according to trade practices and provincial code standards for this type of work.

2.17 RUBBER PADS

- .1 Supply and install pads between copper piping and each suspension element to eliminate contact between the copper and iron. This pad shall exceed 25 mm on each side of the collar.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications including product technical bulletins, handling, storage and installation instruction, and datasheets.

3.2 INSTALLATION

- .1 Seismic control measures to meet requirements of NBC 2015.
- .2 Install vibration isolation equipment in accordance with manufacturer's instructions and adjust mountings to level equipment.
- .3 Ensure piping, ducting and electrical connections to isolated equipment do not reduce system flexibility and that piping, conduit and ducting passage through walls and floors do not transmit vibrations.
- .4 Unless otherwise indicated, support piping connected to isolated equipment with spring mounts or spring hangers with 25 mm minimum static deflection as follows:
- .1 Up to NPS 4: first 3 points of support NPS 5 to NPS 8: first 4 points of support, NPS 10 and over: first 6 points of support.
 - .2 Fire protection piping: as per pertinent fire protection code.
 - .3 Copper piping NPS 12.7 mm and smaller: 1 mount/hanger every 1.5 m.
 - .4 Gas piping NPS 12.7 mm and smaller: 1 mount/hanger every 1.8 m.
 - .5 Corrugate pipe, flexible joints: in accordance with table below, but not less than one hanger at joints.
 - .6 Flexible joint roll groove pipe, flexible joints: in accordance with table below, but not less than one hanger at joints.
 - .7 First point of support: static deflection of twice deflection of isolated equipment, but not more than 50 mm.

3.3 INSTALLATION OF HANGERS/SUPPORTS

- .1 Space the anchoring points so that the suspension rods remain straight when the network is in service.
- .2 Adjust the height of suspension rods so that the load is spread uniformly between the hangers/supports.
- .3 Secure anchoring elements to the truss joints of steel columns.

3.4 INSTALLATION

- .1 Where isolation is bolted to floor use vibration isolation rubber washers.
- .2 Block and shim level bases so that ductwork and piping connections can be made to a rigid system at the operating level, before isolator adjustment is made. Ensure that there is no physical contact between isolated equipment and building structure.
- .3 Do not weld seismic restraint crossbracings directly to the supports or guides on mechanical pipe runs.
- .4 Verify on site that the anchoring bolts, insert diameters (anchors), depth of borings in the concrete, and length of welds are in accordance with the presented drawings and instructions.
- .5 The opening around bolts must be 1/16 in. maximum larger than the bolt diameter.
- .6 Anchoring points in concrete slabs must be at a distance from concrete sides and edges; follow the manufacturer's anchoring instructions.
- .7 Secure cables to the ceiling-suspended equipment so that the cables' axial projection does not exceed the equipment's centre of gravity.
- .8 Install cables using grommets, assembly lugs and other appropriate hardware to ensure the alignment of restraint devices. Anticipate bending cables at anchoring points.
- .9 Position support cables of ceiling-suspended equipment to create a 90° angle (approx.) between them (on drawing), then secure them to the ceiling slab so that the latter does not exceed 45°.
- .10 Always use identical crossbeams within the same bracing (do not use a rigid crossbeam with a cable).
- .11 All seismic restraint systems must be verified once the mechanical systems are put into service to ensure that the recommended clearances have been obtained (but not more than those recommended because the equipment's delicateness may be affected). Make any necessary adjustments. Ensure that vibration isolation seismic restraints do not cause short circuits at the vibration isolators, if applicable.
- .12 A clearance of at least 25.4 mm must be anticipated between the seismic restraint systems and all service equipment and components

3.5 INSPECTION AND CERTIFICATION

- .1 Seismic control measures equipment inspection and certification
 - .1 Experienced and competent sound and vibration testing professional engineer to take vibration measurement for HVAC systems after start-up and TAB of systems to Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.
 - .2 Provide NRC Representative with notice 24 hours in advance of commencement of tests.
 - .3 Establish adequacy of equipment isolation and acceptability of noise levels in occupied areas and where appropriate, remedial recommendations.
 - .4 Submit complete report of test results.

3.6 CLEANING

- .1 Proceed in accordance with Section 00 10 00 – General Instructions.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for steam injection mechanical, atomizing, plenum mounted drum, plenum or duct mounted pad, packaged electrode steam generating, packaged, gas fired, steam generator type humidifiers and accessories.
- .2 Related Sections:
 - .1 Section 00 10 00 – General Instructions.
 - .2 Section 00 15 45 – General Safety Section & Fire Instructions.
 - .3 Section 23 31 13.01 - Metal Ducts - Low Pressure to 500 Pa.

1.2 REFERENCES

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 00 10 00 – General Instructions.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet for heating, ventilation and air conditioning distribution piping and ductwork.
- .3 Shop Drawings:
 - .1 Submit shop drawings to indicate project layout, dimensions and extent of humidification system.
- .4 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .6 Instructions: submit manufacturer's installation instructions.
- .7 Manufacturer's field reports specified.
- .8 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 00 10 00 – General Instructions.

1.4 HEALTH AND SAFETY

- .1 Proceed with necessary measures in terms of health and safety in construction site as specified in section Section 00 15 45 – General Safety Section & Fire Instructions.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials in accordance with Section 00 10 00 – General Instructions.

1.6 MAINTENANCE

- .1 Extra Materials:
 - .1 Provide maintenance materials in accordance with Section 00 10 00 – General Instructions.
 - .2 Furnish list of individual manufacturer's recommended spare parts for equipment, addresses of suppliers, list of specialized tools necessary for adjusting, repairing or replacing, for inclusion into operating manual.
 - .3 Provide following: one complete set of renewable evaporator media.

Part 2 Products

2.1 STEAM TO STEAM HUMIDIFIER

- .1 CSA certified and ULC listed.
- .2 Steam to steam humidifier as described on mechanical drawings.
- .3 Complete unit with the following components:
 - .1 Stainless steel 304 evaporation chamber
 - .2 Copper steam heat exchanger
 - .3 Electronic water level control
 - .4 Steam electric modulating valve
 - .5 Access cover
 - .6 Control panel prewired in factory
 - .7 Support
 - .8 Cabinet thermal insulation
 - .9 Solid state panel.



- .10 Touch screen controller with intuitive color user interface.
- .11 BMS communication protocols BACnet MSTP with Web and USB Interface.
- .12 Modulating steam output of 20%-100%.
- .13 Internal Drain Water tempering to 140°F (60°C) or less.
- .14 Dispersion assembly shall disperse evaporative, non-pressurized humidification steam into ducted air and return pressurized condensate to steam boiler.**
- .15 Condensate management.**
- .16 Solenoid valve on water and drain lines.
- .17 Duct humidistat.
- .18 Airflow proving switch.
- .19 Adjustable flush cycle timer.
- .20 Amp meter.
- .21 Cylinder replacement indicator light.

- .4 Components housed in factory fabricated cabinet with factory enameled finish and electrically interlocked door.
- .5 Factory sealed disposable steam cylinder complete with factory installed electrodes to suit water condition.



- .6 Steam supply header/separator with integral condensate heat exchanger shall provide atmospheric condensate vaporizing and pressurized condensate return**

- .7 Drane cooler.
- .8 Capacity and characteristic on drawings.



- .9 Product: Dristeam STS with Ultrasorb XV or approved equivalent.**

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

- .1 Install in accordance with manufacturers instructions.
- .2 Humidifier and evaporator media to be new and clean when project is accepted.
- .3 Install humidistat as indicated in accessible location.
- .4 Water service overflow drain: to manufacturers' recommendation.
- .5 Install access doors or panels in adjacent ducting.
- .6 When installing in ducting, provide waterproof duct up and downstream in accordance with Section 23 31 13.01 - Metal Ducts - Low Pressure to 500 Pa.
- .7 Install capped drain connection at low point in duct.

3.3 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 Have manufacturer of products, supplied under this Section, review Work involved in the handling, installation/application, protection and cleaning, of its product[s] and submit written reports, in acceptable format, to verify compliance of Work with Contract.
 - .2 Manufacturer's Field Services: provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, at stages listed:
 - .1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of the Work, after cleaning is carried out.
 - .4 Obtain reports, within 3 days of review, and submit, immediately, to Ministry Representative
- .2 Performance Verification (PV):
 - .1 General: in accordance with Section 00 10 00 – General Instructions.
 - .2 Timing:
 - .1 After TAB of ducted air systems.
 - .2 At same time as PV of related air handling units.

- .3 PV procedures:
 - .1 Packaged Electrode Steam Generating type

- .3 Start-up:
 - .1 General: in accordance with Section 00 10 00 – General Instructions.

- .4 Commissioning Reports:
 - .1 General: in accordance with Section 00 10 00 – General Instructions. Include:
 - .1 PV results on approved PV Report Forms.
 - .2 Product Information Report Forms.

3.4 DEMONSTRATION

- .1 Training: in accordance with Section 00 10 00 – General Instructions.

3.5 CLEANING

- .1 Perform cleaning operations as specified in Section 00 10 00 – General Instructions.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .2 Divert unused metal materials from landfill to metal recycling facility as approved by the NRC Representative.
- .3 Fold up metal banding, flatten and place in designated area for recycling.

1.2 REFERENCES

- .1 National Building Code 2010 (NBC).
- .2 User's Guide – Structural Commentaries on the National Building Code 2010 (Part 4).
- .3 SMACNA – Seismic Restraint Manual Guideline for Mechanical Systems.

1.3 RELATED SECTIONS

- .1 Section 26 05 00 – Common Work Results for Electrical.

1.4 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 01 00 10.
- .2 Identify specified elements on the manufacturer's documentation:
 - .1 Anchoring.
 - .2 Supports.
 - .3 Bracing.
 - .4 Seismic protection.
- .3 Produce a drawing indicating types of seismic protection devices and their location.
- .4 Submit shop drawings and calculations for seismic restraint systems for approval. These documents must be stamped by a member of PEO.
- .5 Upon completion of work the Contractor must submit a signed and stamped certificate from NRC Representative confirming that the work has been carried out in accordance with standards in effect.
- .6 Provide separate shop drawings for each system, shop drawings of the overall system, complete with performance and product data.
- .7 Provide separate shop drawings and performance data for each seismic restraint system and devices used for equipment.

- .8 The Contractor must hire an experienced manufacturer to design, supply and supervise installation of all seismic control measures.
- .9 All manufacturers of seismic control measures are responsible for designing, supplying and supervising installation of seismic control measures. The manufacturer remains responsible for the structural integrity of seismic control measures.
- .10 The manufacturer shall hire a professional engineer specializing in seismic design to perform design calculations and develop seismic control measure installations.

1.5 SEISMIC CONTROL MEASURES

- .1 Seismic restraints must meet the requirements in the standards and guides listed in section 1.2.
- .2 Design, supply and install a complete seismic restraint system for electrical equipment, both vibration isolated and statically supported against vibrations and related systems.
- .3 The seismic restraint system is to be fully integrated, and compatible with noise and vibration controls of electrical equipment and related systems as specified on the drawings and elsewhere.
- .4 The seismic restraint system is to be fully compatible with the mechanical, electrical and structural design of the building.

1.6 SEISMIC SUPPORTS – SCOPE OF WORK

- .1 The Contractor must, without being limited to, supply and install all materials necessary to seismically restrain electrical equipment.
- .2 The Contractor shall supply and install two (2) suspension cables (without obligatory lateral crossbracing) able to resist seismic loads for the following equipment:
 - .1 Recessed, inverted T lighting fixtures or another type of suspended ceiling.
 - .2 Lighting fixtures (less than 10 kg) suspended more than 50 mm above the fixture up to the structural support.
 - .3 Any other equipment that is recessed and inverted T equipment or any other type of suspended ceiling.
 - .4 Any other equipment that is suspended more than 305 mm above the fixture up to the structural support.
- .3 The Contractor shall supply and install seismic restraints for the following equipment:
 - .1 Freestanding electrical equipment such as:
 - .1 Electrical sub-station.
 - .2 Switchgear centres.

- .3 Inverter.
- .4 Motor control centres.
- .5 Transformers.
- .6 Generator set.
- .2 Suspended electrical equipment (with mandatory lateral bracing) such as:
 - .1 Lighting fixtures (10 kg and heavier) suspended more than 305 mm from the structure.
 - .2 Transformers.
 - .3 Emergency power conduits suspended more than 305 mm from the structure.
 - .4 Electrical conduits 100 mm and larger.
 - .5 Cabletrays.
 - .6 Shielded bus ducts.
- .3 Electrical equipment secured to wall consoles such as:
 - .1 Transformers.
 - .2 Back-up batteries.

Part 2 Products

2.1 GENERAL

- .1 The dimensions and shape of pads, as well as performance characteristics on vibration isolation devices must be in accordance with indications.
- .2 The seismic restraint systems must be able to sustain forces in all directions.
- .3 Fasteners and attachments to structure must be able to resist the same loads as the seismic restraint materials.
- .4 High resistance chemical anchoring must be used to fasten seismic protection holes to the concrete structure. Drilled or power driven anchors and fasteners are not permitted.
- .5 Unless otherwise indicated, the seismic control measures must be designed and chosen to meet the requirements of the latest edition of the National Building Code 2010 and its supplement:
 - .1 Seismic zone:
 - .1 Ottawa: Z_a , Z_v , v to be confirmed by Engineer.

- .2 Seismic importance factor:
 - .1 With regard to this work, the seismic importance factor (I) will be equal to 1.5.
 - .3 The other coefficients (C_p , A_r , A_x) will be taken from the Code and its supplement.
- .6 The seismic restraint system shall prevent the mechanical and electrical systems and equipment and related systems from causing personal injury and moving from their normal position during a seismic event. The anchored equipment must remain in operation as if in normal conditions during a seismic event.
- .7 The manufacturer of the seismic restraint systems must obtain all information relating to the equipment and electrical conduits necessary for seismic restraint system design calculations (weight, number, thermal insulation, run, spacing between supports, and grouping on supports).
- .8 The manufacturer of the seismic restraint systems must obtain the information listed below from the equipment manufacturers:
 - .1 Weight, location of centre of gravity, number of fastening points, location of fastening points' centre of gravity, rotation speed, seismic sensitivity of internal components and so on.
- .9 The design calculations and installation details with regard to anchoring bolts and seismic restraint systems must be verified by a professional engineer specializing in seismic design.
- .10 Provide seismic restraint systems shop drawings and calculations.
 - .1 Provide for each piece of equipment:
 - .1 Identification.
 - .2 Manufacturer's name and model.
 - .3 Physical dimensions.
 - .4 Weight.
 - .5 Location of centre of gravity (indicate if location was obtained by equipment manufacturer or speculated).
 - .6 Location and number of fastening points.
 - .7 Location of fastening points' centre of gravity (if centre of gravity is different than the equipment's centre of gravity).
 - .8 Rotation speed (if necessary).
 - .9 Seismic sensitivity of equipment's internal components.

- .2 Anchoring bolt calculations indicating:
 - .1 Type of bolts, manufacturer and model.
 - .2 Diameter.
 - .3 Embedment in concrete.
 - .4 Concrete compression force.
 - .5 Minimum spacing between bolts and concrete edges or joints.
 - .6 Applied and allowable loads in shear and tension.
- .3 Types of seismic restraint systems for each piece of equipment and indicate characteristics of cables and rigid members.
- .11 The seismic restraint systems manufacturer must provide written proof confirming that the drawings, specifications, shop drawings, as well as the installation, were verified by a professional engineer specializing in seismic design and are adequate and compatible with the overall building and meet seismic standards.
- .12 All seismic control measures must be entirely integrated and compatible with sound attenuating standards, vibration isolation systems for electrical equipment and related systems, as specified on drawings and elsewhere.
- .13 All seismic control measures must be compatible with the electrical and structural design of the building. Seismic control measures must not impede on the normal functioning of electrical systems.
- .14 Do not add seismic control measures to existing electrical conduit supports without verifying the capacity of these supports to resist any additional forces.
- .15 Seismic restraint measures must not interfere with functioning or integrity of firestopping equipment.
- .16 When required to prevent buckling, stiffeners must be added to suspension rods.

2.2 FASTENERS AND EQUIPMENT SUPPORTS

- .1 Expansion anchors to be recessed in order to secure equipment to the surfaces of poured concrete.
- .2 Toggle bolts to secure equipment to hollow masonry walls or suspended ceilings.
- .3 Protection against mechanical damage of all instruments, ducts, etc., that are prone to breakage.
- .4 Components of the seismic restraint systems are to be manufactured in accordance with the following standards:

- .1 Cold formed angles must be in accordance with standards CSA S136-M89 and CSA S136.1-M91 for a minimum F_y equal to 230 MPa and a maximum F_y equal to 260 MPa. The following thicknesses must be respected.

Gauge	Minimum Thickness before Painting (mm)	Minimum Thickness after Galvanisation (mm)
12	2.66	2.75
14	1.90	1.99
16	1.52	1.61

- .2 Steel structural members: standard channels and plates must be in accordance with standard CSA G40.21, latest edition, grade 350W.
- .3 Steel tubing used as bracing must be in accordance with standard ASTM A53.
- .4 Bolts for assembly must be in accordance with standard ASTM A325. Anticipate an opening 2 mm larger than bolt diameter.
- .5 Provide technical data sheets and resistance of bolts to be secured to concrete.
- .6 Welding must be in accordance with standard CSA W59, latest edition and carried out by experienced welders according to standard CSA W47.1, latest edition.
- .7 Oblong openings for adjusting bolts are not permitted.

2.3 CONDUITS AND CABLE FASTENERS AND SUPPORTS

- .1 Flanges to fasten exposed cables or conduits to the building structure or support system.
- .1 One-hole malleable iron or steel flanges for surface fastening of conduits and cables 50 mm diameter or less.
- .2 Two-hole steel flanges to fasten conduits and cables of more than 50 mm diameter.
- .3 Steel frames to fasten conduits to exposed structural steel work.
- .2 Suspended support systems:
- .1 Support each cable or conduit with threaded rods and spring clips.
- .2 Support at least two (2) cables or conduits on suspended U channels to threaded suspended rods, when impractical to fasten them to the building structure.
- .3 Surface-mounted supports to stabilize two (2) or more conduits to the U channels. Use surface-mounted or suspended U channel supports of 41 mm x 41 mm x 2.5 mm thick. Acceptable products: Burndy, Unistrut, or Canstrut.

- .4 Provide metallic brackets, mounting, hooks, clamps and other types of supports in locations indicated or as needed to support the conduits and cables.
- .5 Do not use tie wires or perforated iron hangers to support or fasten conduits or cables.
- .6 Ensure adequate support for equipment with vertical-installed conduits when there is no wall support.
- .7 Do not use other trades' supports or installed equipment as conduit supports, unless otherwise permitted by other trades and with the NRC Representative's approval.
- .8 Use of Ramset nails is not permitted.

2.4 SEISMIC RESTRAINT SYSTEMS FOR STATIC EQUIPMENT (WITHOUT NEED FOR VIBRATION ISOLATED EQUIPMENT)

- .1 Floor-mounted equipment:
 - .1 Anchor equipment to supports, which must be anchored to structure by using bolt sizes as indicated on shop drawings.
- .2 Suspended equipment:
 - .1 Use one or a combination of the following methods as per site conditions:
 - .1 Anchor equipment tightly to structure.
 - .2 Cross-brace equipment in all directions.
 - .3 Brace back to structure.
 - .4 Anchor equipment with slack cables.
 - .2 Seismic restraint system to allow for cushioning action to be gentle and steady by utilizing elastomeric material or other means to avoid high impact loads.
- .3 Supports must be able to resist all static and dynamic conditions, including the following:
 - .1 Their weight, plus accessories, insulation and internal fluids.
 - .2 Forces imposed by thermal effect of expansion and contraction.
 - .3 Reactions as a result of start-ups and stops.
 - .4 Vibrations.
 - .5 Other occasional loads such as ice, wind and seismic forces.

2.5 SEISMIC RESTRAINT SYSTEMS FOR VIBRATION ISOLATED EQUIPMENT WITH SPRINGS

- .1 Floor-mounted equipment:
 - .1 Apply one or more of the following methods according to the site conditions:
 - .1 Use vibration isolation devices with integrated shock absorbing system.
 - .2 Use independent shock absorbers in addition to the vibration isolation devices.
 - .3 Use a manufactured shock absorbing system composed of structural elements and an elastomeric layer, with the NRC Representative's approval.
 - .4 Reinforce equipment in all directions.
 - .2 Seismic restraint system must not hinder performance of sound attenuating and vibration isolation systems. Anticipate a clearance of 4 mm to 8 mm—under normal operating conditions of equipment and systems—between the seismic restraint system's shock absorbers and equipment.
 - .3 Incorporate seismic restraints into vibration isolation systems to resist complete isolator unloading.
 - .4 Cushioning action, by utilizing elastomeric material or other means, must be gentle and steady to avoid high impact loads.
- .2 Suspended equipment:
 - .1 Use one or a combination of the following methods as per site conditions:
 - .1 Anchor equipment with slack cables.
 - .2 Reinforce equipment fastening points to the structure via vibration isolation devices with integrated shock absorbers or additional independent shock absorbers.
- .3 Supports must be able to resist all static and dynamic conditions, including the following:
 - .1 Their weight, plus accessories, insulation and internal fluids.
 - .2 Forces imposed by thermal effect of expansion and contraction.
 - .3 Reaction as a result of start-ups and stops.
 - .4 Vibrations.
 - .5 Other occasional loads such as ice, wind and seismic forces.
- .4 Seismic restraint system must provide gentle and steady cushioning action to avoid high impact loads.

Part 3 Execution**3.1 INSTALLATION**

- .1 Install vibration isolation equipment in accordance with the manufacturer's instructions and adjust mountings to level equipment.
- .2 Ensure conduit and cable connections to vibration isolation equipment and instruments do not reduce vibration isolation system flexibility and that conduits and cables passing through walls or floors do not transmit vibrations.
- .3 When vibration isolation equipment is bolted to floor, use vibration isolation rubber washers.
- .4 Block and shim level bases so that conduits and cables can be made to a rigid system at the operating level, before isolator adjustment is made. Ensure that there is no contact between the isolated equipment and building structure.
- .5 All fastening and attachment points to resist same maximum load as seismic restraint in accordance with the most recent edition of the National Building Code 2010 and its supplement.
- .6 Connect cable protection devices to suspended equipment so that axial projection of wires passes through centre of gravity of equipment.
- .7 Install cables using grommets, assembly lugs and other hardware to ensure alignment of restraints and to avoid bending of cables at connection points.
- .8 Orient restraint cables on ceiling-hung equipment at approximately 90° to each other (on drawing), tie back to structure at maximum 45° to structure.
- .9 Clearance of at least 25 mm is to be anticipated between seismic restraint equipment and any other equipment or service element.
- .10 Adjust restraint cables so that they are not visibly slack but permit vibration isolation system to function normally.
- .11 Bolt all equipment that is not isolated to the structure.
- .12 Install fasteners and supports according to each type of equipment, conduit or cable, while following the manufacturer's guidelines.
- .13 Brace all conduits and cables as follows:
 - .1 All conduits and cables 32 mm and larger nominal diameter in corridors, boiler rooms, mechanical, electrical and telecommunication rooms and generator set rooms.
 - .2 All conduits and cables 64 mm and larger nominal diameter.

- .3 However, the conduits or cables fastened by a suspension rod 300 mm long and smaller do not require bracing. The rod length is taken above the conduit or cable up to the structural fastener.

- .14 Use a flexible joint when conduits pass through a building expansion joint, or when conduits are securely fastened to equipment resting on vibration isolation systems.

- .15 Rigid conduits and cables must not be cross-braced to another cross-brace system within the same building because the systems will react differently during an earthquake.

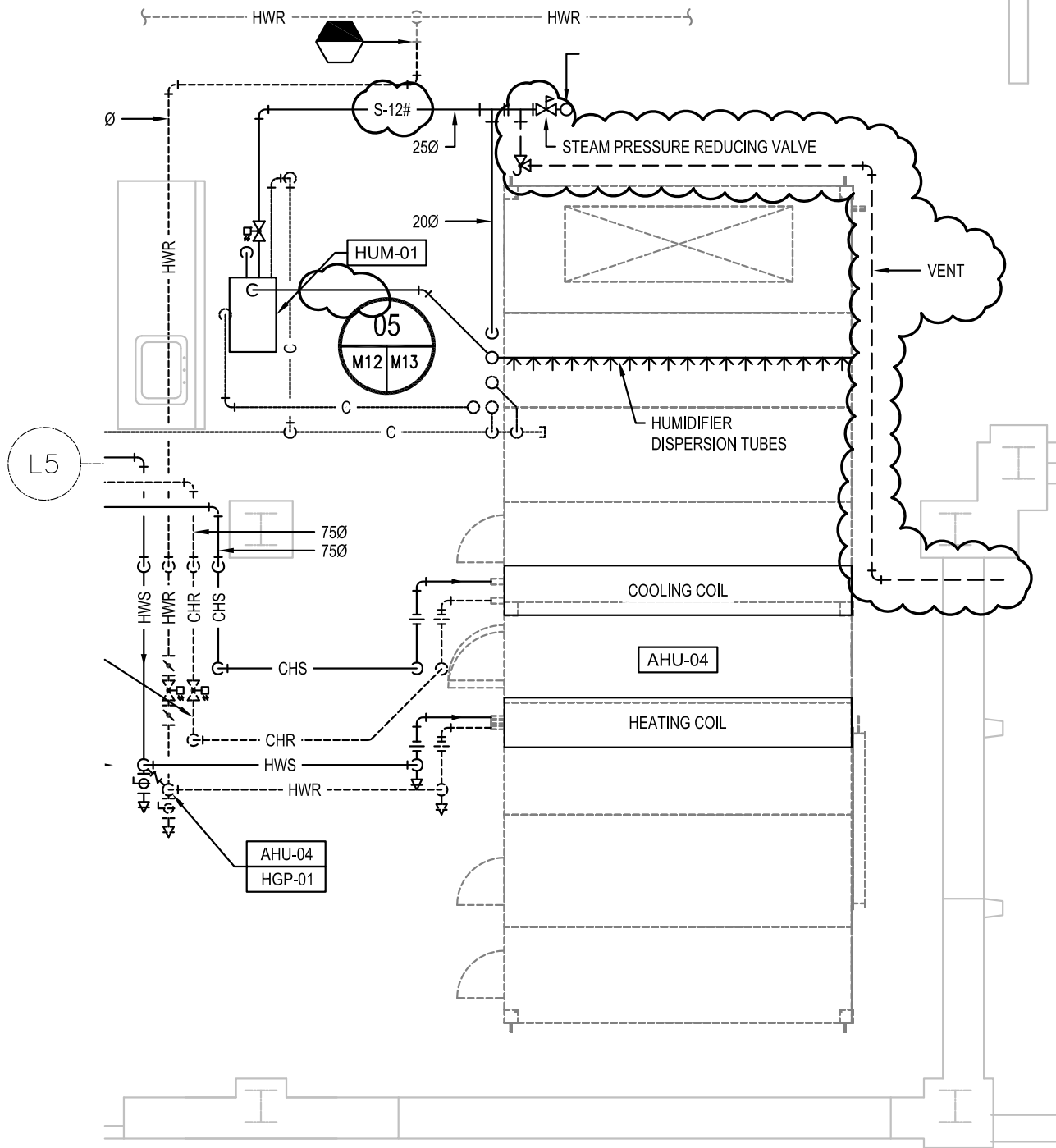
- .16 Riser pipes must be laterally supported at each floor.

- .17 Conduit supports must be equipped with longitudinal and transverse cross-bracing. They may be rigid or cable supports. Always use identical crossbeams within the same bracing (never use a rigid crossbeam with a cable).

END OF SECTION

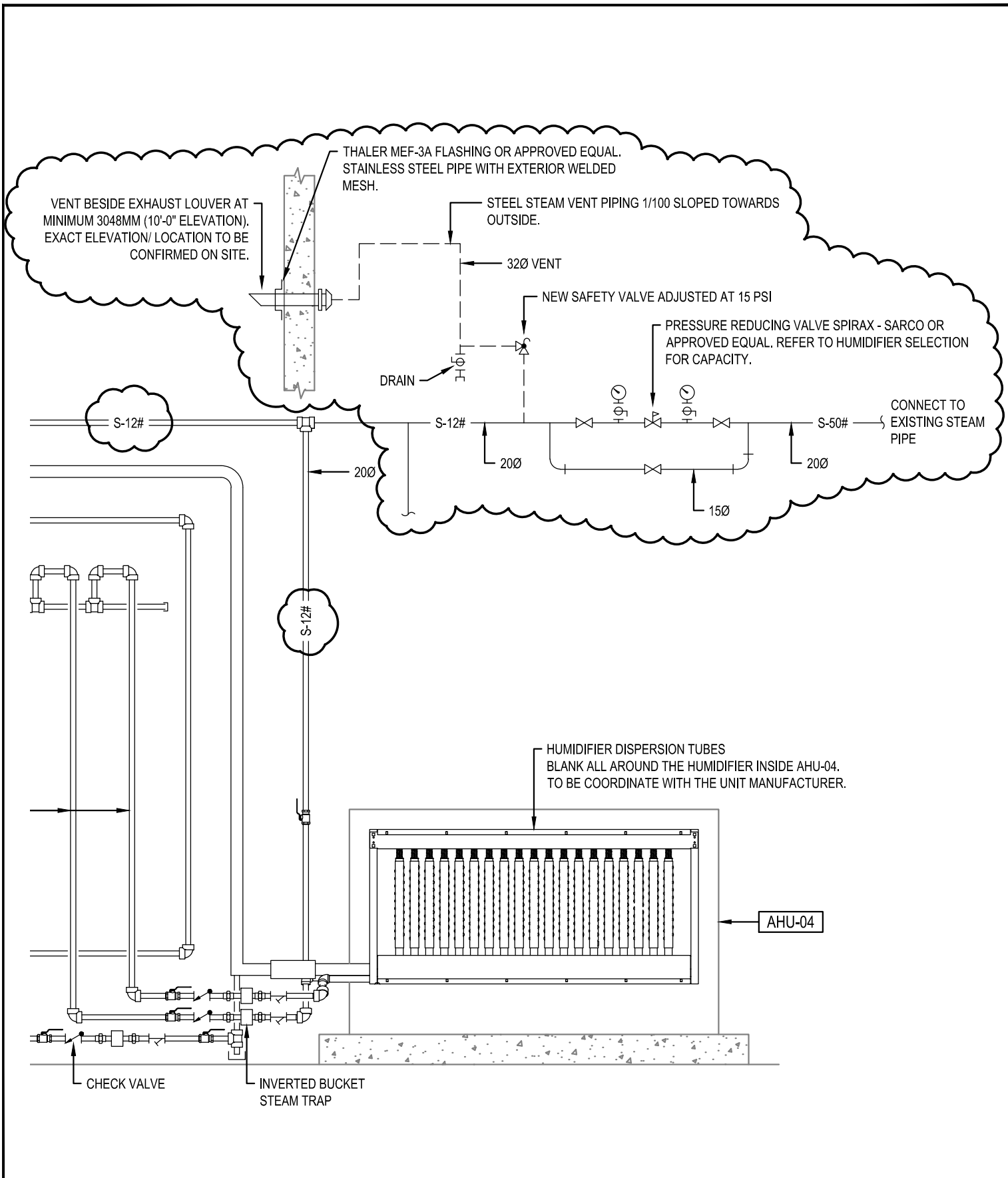
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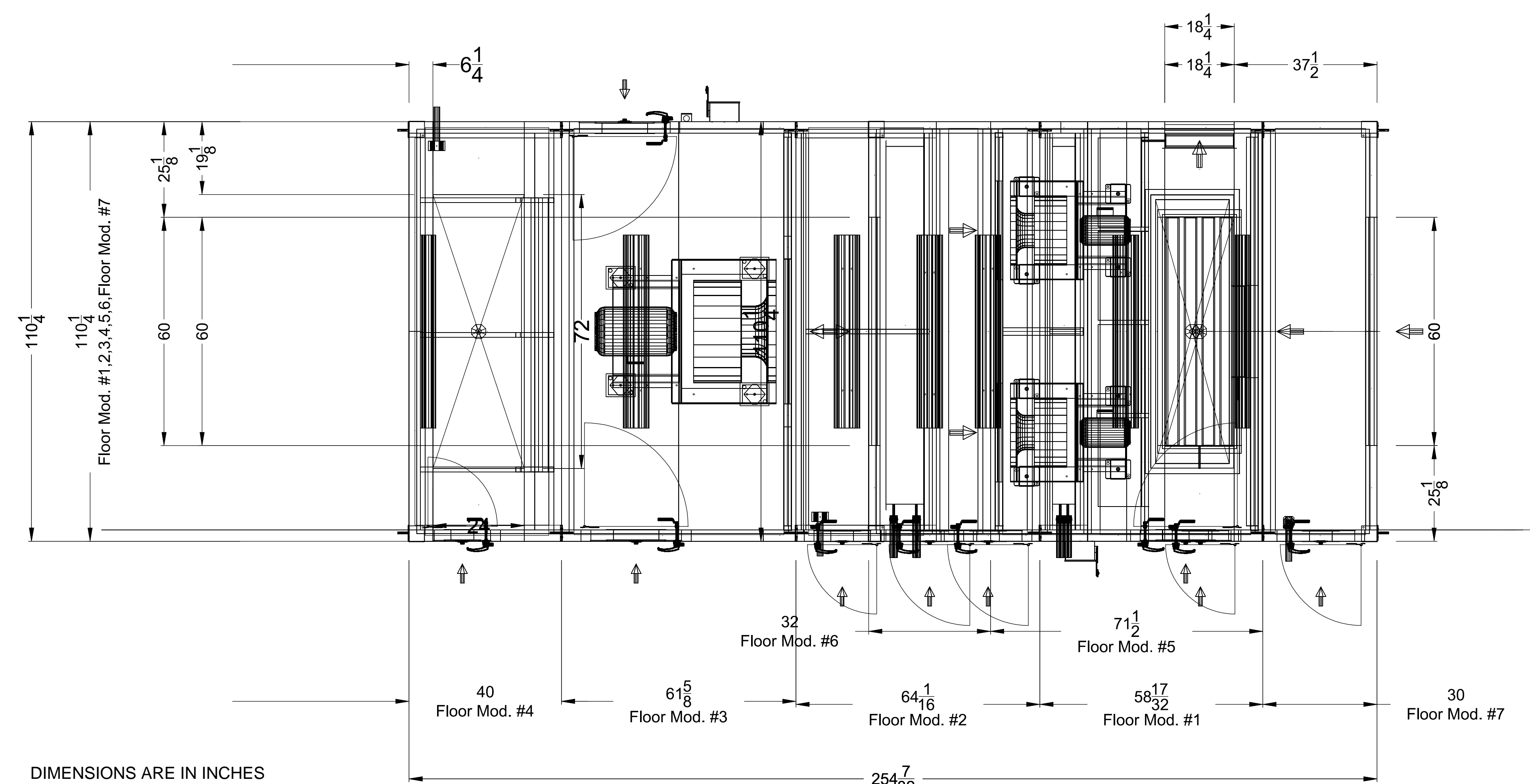
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<p>National Research Council Canada Administrative Services and Property Management Branch</p> <p>Conseil national de recherches Canada Division des services administratifs et gestion de l'immobilier</p>	project	projet	drawing	dessin	designed	conçu	checked	vérifié
	<p>NATIONAL RESEARCH COUNCIL CANADA BUILDING (M-58) GROUND FLOOR LEVEL EAST AND WEST WINGS RENOVATION MONTREAL ROAD CAMPUS</p>				<p>MECHANICAL - PLUMBING AND HEATING GROUND FLOOR NEW WORK PARTIAL PLAN VIEW - MECHANICAL ROOM (REFERENCE DRAWING M12)</p>			
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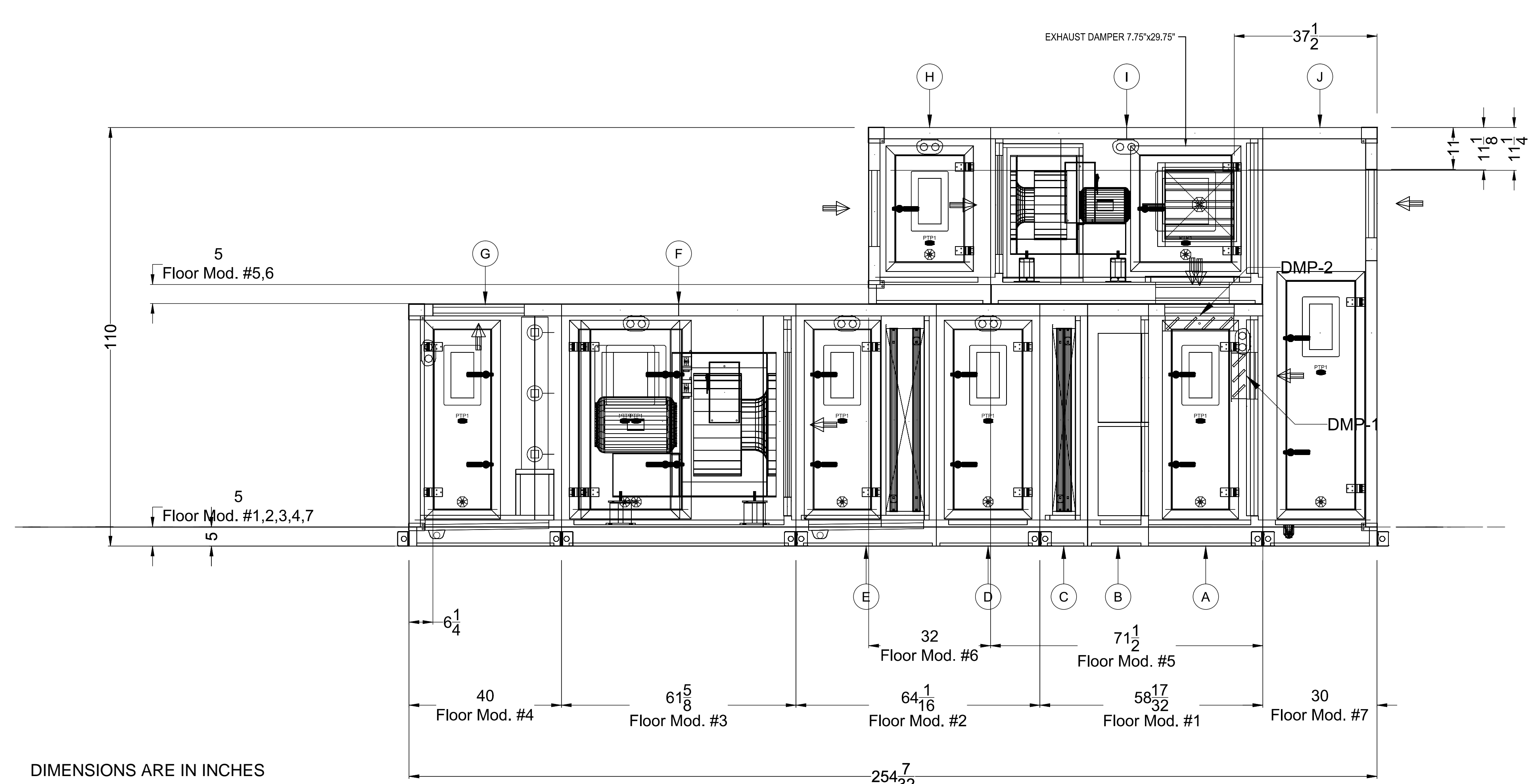


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<p>National Research Council Canada Administrative Services and Property Management Branch</p> <p>NRC - CNRC</p>	<p>Conseil national de recherches Canada Division des services administratifs et gestion de l'immobilier</p>	project	projet	drawing	dessin	designed ML	conçu	checked ML	vérifié		
		<p>NATIONAL RESEARCH COUNCIL CANADA BUILDING (M-58) GROUND FLOOR LEVEL EAST AND WEST WINGS RENOVATION</p> <p>MONTREAL ROAD CAMPUS</p>				<p>MECHANICAL PLUMBING AND HEATING DETAILS - HUMIDIFIER CONNECTION DETAIL (REFERENCE DETAIL 2/M13)</p>		drawn AC	dessiné	approved ML	approuvé
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DIMENSIONS ARE IN INCHES



DIMENSIONS ARE IN INCHES

Description																													
(A) MIXING BOX SECTION LENGTH : 30"	<table border="0"> <tr> <td>DMP-1 : Fresh Air Damper</td> <td>Manufacturer : Tamco</td> </tr> <tr> <td>Model : 1000</td> <td>Blade Orientation : Horizontal</td> </tr> <tr> <td>Blade Configuration : Parallel blades</td> <td>Blade Orientation : Horizontal</td> </tr> <tr> <td></td> <td>Blade Orientation : Horizontal</td> </tr> <tr> <td>DMP-2 : Return Air Damper</td> <td>Manufacturer : Tamco</td> </tr> <tr> <td>Model : 1000</td> <td>Blade Orientation : Horizontal</td> </tr> <tr> <td>Blade Configuration : Parallel blades</td> <td>Blade Orientation : Horizontal</td> </tr> <tr> <td></td> <td>Blade Orientation : Horizontal</td> </tr> <tr> <td>Door Opening Width : 15"</td> <td>Door Opening Height : 47.25"</td> </tr> </table>	DMP-1 : Fresh Air Damper	Manufacturer : Tamco	Model : 1000	Blade Orientation : Horizontal	Blade Configuration : Parallel blades	Blade Orientation : Horizontal		Blade Orientation : Horizontal	DMP-2 : Return Air Damper	Manufacturer : Tamco	Model : 1000	Blade Orientation : Horizontal	Blade Configuration : Parallel blades	Blade Orientation : Horizontal		Blade Orientation : Horizontal	Door Opening Width : 15"	Door Opening Height : 47.25"										
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(B) FILTER SECTION LENGTH : 16.031"	<table border="0"> <tr> <td>Pre-filter : Camfil FARR 30/30 PLEATED - 15 PLUS, MERV 8</td> <td></td> </tr> <tr> <td>Quantity / Dim(WxHxD) : 8x(24x24x2)"</td> <td></td> </tr> <tr> <td>Filter : Camfil FARR RF PH, MERV 13</td> <td></td> </tr> <tr> <td>Quantity / Dim(WxHxD) : 8x(24x24x12)"</td> <td></td> </tr> <tr> <td>Loading : Front Loading</td> <td></td> </tr> <tr> <td>Filter frame type : Panel frame plus</td> <td></td> </tr> </table>	Pre-filter : Camfil FARR 30/30 PLEATED - 15 PLUS, MERV 8		Quantity / Dim(WxHxD) : 8x(24x24x2)"		Filter : Camfil FARR RF PH, MERV 13		Quantity / Dim(WxHxD) : 8x(24x24x12)"		Loading : Front Loading		Filter frame type : Panel frame plus																	
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(C) HEATING COIL SECTION LENGTH : 12.5"	<table border="0"> <tr> <td>Type : Hot water coil</td> <td>Manufacturer : Aerofin</td> </tr> <tr> <td>Quantity : 1</td> <td>Circuit : </td> </tr> <tr> <td>Number of rows : 2</td> <td>Model : </td> </tr> <tr> <td>Connections : ø 2" M.P.T.</td> <td>Dims : (48x94x6)"</td> </tr> </table>	Type : Hot water coil	Manufacturer : Aerofin	Quantity : 1	Circuit :	Number of rows : 2	Model :	Connections : ø 2" M.P.T.	Dims : (48x94x6)"																				
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(D) ACCESS SECTION LENGTH : 27.25"	<table border="0"> <tr> <td>Door Opening Width : 18"</td> <td>Door Opening Height : 47.25"</td> </tr> </table>	Door Opening Width : 18"	Door Opening Height : 47.25"																										
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(E) COOLING COIL SECTION LENGTH : 36.8125"	<table border="0"> <tr> <td>Type : Cold water coil</td> <td>Manufacturer : Aerofin</td> </tr> <tr> <td>Quantity : 1</td> <td>Circuit : </td> </tr> <tr> <td>Number of rows : 8</td> <td>Model : </td> </tr> <tr> <td>Connections : ø 2" M.P.T.</td> <td>Dims : (48x94x10)"</td> </tr> <tr> <td>Door Opening Width : 15"</td> <td>Door Opening Height : 47.25"</td> </tr> </table>	Type : Cold water coil	Manufacturer : Aerofin	Quantity : 1	Circuit :	Number of rows : 8	Model :	Connections : ø 2" M.P.T.	Dims : (48x94x10)"	Door Opening Width : 15"	Door Opening Height : 47.25"																		
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(F) SUPPLY FAN SECTION LENGTH : 61.625"	<table border="0"> <tr> <td>Manufacturer : TWIN CITY</td> <td>Quantity of blowers : 1</td> </tr> <tr> <td>Arr. : A04</td> <td>Class : III</td> </tr> <tr> <td>Size : 270</td> <td>Width (%) : 100%</td> </tr> <tr> <td>Discharge : HORIZONTAL</td> <td>Rotation : CW</td> </tr> <tr> <td>Base type : Isolators</td> <td></td> </tr> <tr> <td>Motor : 20 HP</td> <td>Enclosure type : TEFC</td> </tr> <tr> <td>R.P.M. : 1800</td> <td>Frame : 256T</td> </tr> <tr> <td>Motor Elect. Box : F1</td> <td>Position : DIRECT_DRIVE</td> </tr> <tr> <td>Isolators : AMSR 2D</td> <td>Pulleys C/C : N/A</td> </tr> <tr> <td>Door : Right side</td> <td>Door Opening Width : 24"</td> </tr> <tr> <td>Door Opening Height : 47.25"</td> <td>Door Opening Height : 47.25"</td> </tr> <tr> <td>Door : Left side</td> <td>Door Opening Width : 24"</td> </tr> <tr> <td>Door Opening Height : 47.25"</td> <td>Door Opening Height : 47.25"</td> </tr> </table>	Manufacturer : TWIN CITY	Quantity of blowers : 1	Arr. : A04	Class : III	Size : 270	Width (%) : 100%	Discharge : HORIZONTAL	Rotation : CW	Base type : Isolators		Motor : 20 HP	Enclosure type : TEFC	R.P.M. : 1800	Frame : 256T	Motor Elect. Box : F1	Position : DIRECT_DRIVE	Isolators : AMSR 2D	Pulleys C/C : N/A	Door : Right side	Door Opening Width : 24"	Door Opening Height : 47.25"	Door Opening Height : 47.25"	Door : Left side	Door Opening Width : 24"	Door Opening Height : 47.25"	Door Opening Height : 47.25"		
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(G) HUMIDIFIER SECTION LENGTH : 40"	<table border="0"> <tr> <td>Manufacturer : DriSteem</td> <td>Model : Ultrisorb XV</td> </tr> <tr> <td>Dims : (40x72x7)"</td> <td></td> </tr> <tr> <td>Door Opening Width : 15"</td> <td>Door Opening Height : 47.25"</td> </tr> </table>	Manufacturer : DriSteem	Model : Ultrisorb XV	Dims : (40x72x7)"		Door Opening Width : 15"	Door Opening Height : 47.25"																						
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(H) RETURN AIR PLENUM SECTION LENGTH : 32"	<table border="0"> <tr> <td>Door Opening Width : 18"</td> <td>Door Opening Height : 28"</td> </tr> </table>	Door Opening Width : 18"	Door Opening Height : 28"																										
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(I) EXHAUST FAN SECTION LENGTH : 71.5"	<table border="0"> <tr> <td>Manufacturer : TWIN CITY</td> <td>Quantity of blowers : 2</td> </tr> <tr> <td>Arr. : A04</td> <td>Class : II</td> </tr> <tr> <td>Size : 182</td> <td>Width (%) : 100%</td> </tr> <tr> <td>Discharge : HORIZONTAL</td> <td>Rotation : CW</td> </tr> <tr> <td>Base type : Isolators</td> <td></td> </tr> <tr> <td>Motor : 5 HP</td> <td>Enclosure type : TEFC</td> </tr> <tr> <td>R.P.M. : 1800</td> <td>Frame : 184T</td> </tr> <tr> <td>Motor Elect. Box : F1</td> <td>Position : DIRECT_DRIVE</td> </tr> <tr> <td>Isolators : INGM 2</td> <td>Pulleys C/C : N/A</td> </tr> <tr> <td>DMP-3 : Damper</td> <td>Manufacturer : Tamco</td> </tr> <tr> <td>Model : 1000</td> <td>Blade Orientation : Horizontal</td> </tr> <tr> <td>Blade Configuration : Parallel blades</td> <td>Blade Orientation : Horizontal</td> </tr> <tr> <td></td> <td>Blade Orientation : Horizontal</td> </tr> <tr> <td>Door Opening Width : 24"</td> <td>Door Opening Height : 28"</td> </tr> </table>	Manufacturer : TWIN CITY	Quantity of blowers : 2	Arr. : A04	Class : II	Size : 182	Width (%) : 100%	Discharge : HORIZONTAL	Rotation : CW	Base type : Isolators		Motor : 5 HP	Enclosure type : TEFC	R.P.M. : 1800	Frame : 184T	Motor Elect. Box : F1	Position : DIRECT_DRIVE	Isolators : INGM 2	Pulleys C/C : N/A	DMP-3 : Damper	Manufacturer : Tamco	Model : 1000	Blade Orientation : Horizontal	Blade Configuration : Parallel blades	Blade Orientation : Horizontal		Blade Orientation : Horizontal	Door Opening Width : 24"	Door Opening Height : 28"
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(J) FRESH AIR PLENUM SECTION LENGTH : 30"	<table border="0"> <tr> <td>Door Opening Width : 18"</td> <td>Door Opening Height : 60"</td> </tr> </table>	Door Opening Width : 18"	Door Opening Height : 60"																										
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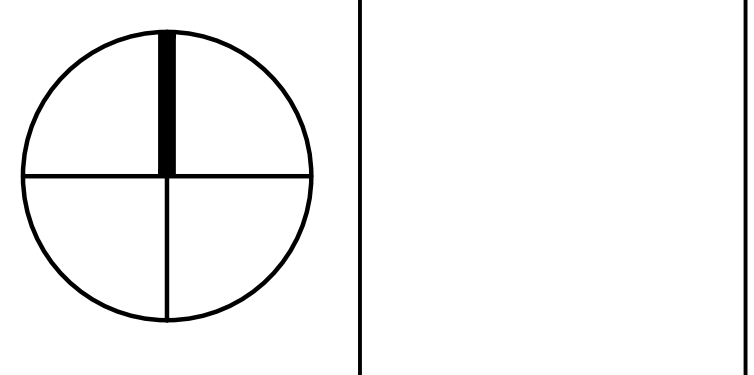


GENERAL NOTES

- CONTRACTORS TO CHECK AND VERIFY ALL DIMENSIONS ON SITE PRIOR TO DEMOLITION OR CONSTRUCTION AND REPORT ANY ERRORS OR OMISSIONS TO DEPARTMENTAL REPRESENTATIVE.
- CONTRACTORS MUST VISIT THE SITE & FULLY FAMILIARIZE THEMSELVES WITH THE SCOPE OF WORK.
- PREVENT THE SPREAD OF DUST & DEBRIS BEYOND THE WORK AREA AND CLEAN ALL SURFACES AT COMPLETION.
- MAKE GOOD ALL SURFACES AFFECTED BY THIS WORK.
- COORDINATE ALL SHUTDOWNS WITH THE DEPARTMENTAL REPRESENTATIVE.
- PROVIDE ALL LABOUR AND MATERIAL REQUIRED TO FORM A COMPLETE, FUNCTIONAL SYSTEM AS DESCRIBED ON DRAWINGS AND SPECIFICATIONS.
- ALL LOW VOLTAGE WIRING SHALL BE IN EMT CONDUIT, UNLESS OTHERWISE NOTED.
- MECHANICAL CONTRACTOR SHALL PROVIDE VENTING TO ALL FIXTURES AS PER NATIONAL BUILDING AND PLUMBING CODE.
- ALL DRAWINGS SHALL BE READ IN CONJUNCTION WITH DETAILS ON DRAWINGS M09, M13 & M18.

THIS DOCUMENT MUST NOT BE USED FOR CONSTRUCTION PURPOSES

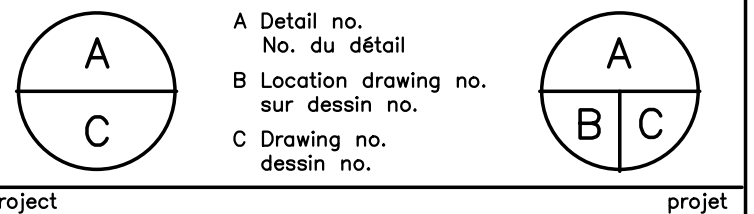
PROJECT NORTH SEAL



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No.	Date	Revision	By	Per
1	2016-11-02	FOR ADDENDUM 3		M.L.
0	2016-09-13	FOR TENDER		M.L.

Verify all dimensions and site conditions and be responsible for same
Vérifier toutes les dimensions et l'état des lieux et en assumer la responsabilité



NATIONAL RESEARCH COUNCIL CANADA
BUILDING (M-58) GROUND FLOOR LEVEL
EAST AND WEST WINGS RENOVATION

MONTREAL ROAD CAMPUS

MECHANICAL VENTILATION DETAILS

designed	conçu	date	date
M.V. J.B.		04/2016	
drawn	dessiné	scale	échelle
LL. A.C.		1:20	
checked	vérifié	sheet	feuille
ML. J.B.		19 of 26	
approved	approuvé	W.O.no.	D.T.no.
ML. F.A.		A1-009908-01-58	
dwg.no.	dessin no.		

5189-M19

