555 Oak Street East
North Bay, Ontario
P1B 8L3

555, rue Oak Est
North Bay (Ontario)
P1B 8L3

Tel: 1-800-363-7512
www.ontarionorthland.ca

December 03, 2025

Addendum No. 02

File Reference Number: RFP 2025 105

Title: Installation of an Industrial Safety Vacuum System

RE: Clarifications/Questions

QUESTIONS/CLARIFICATIONS:

Item 1: Please confirm responses to the below questions:

a) **Appendix B – Point #1 – Hopper Installation and Structural Work:** For the installation of the hopper, please confirm that all materials (painted structural steel, bin, enclosure, stairs, grating, chute, chevron bracing, fasteners, etc.) will be supplied by ONTC. Proponent will only be responsible for the installation of the hopper and associated supports & structure on the existed platform. No additional structural material or fabrication is required beyond the supplied components. Kindly confirm.

b) **Appendix B – Point #2 – Mechanical Work:** Supply, fabrication & installation of pipelines is under the contractor's responsibility. Please confirm that the VAC and compressed air pipelines are carbon steel material.

We understand that existing Unistrut wall supports are to be used. However, new pipe supports on the roof (clevis hangers and Unistrut) shall be provided. Kindly confirm.

c) **Installation of Hopper and Structural Work**

ONTC is responsible for supplying the hopper and all required materials.

Proponent will be responsible for:

a. Installation of the hopper
b. Arranging lifting equipment
c. Supply, fabrication & installation of stairs
d. Supply and installation of the enclosure
e. Connection to the VAC-U-Max system

d) **Mechanical Work**

ONTC is responsible for supplying all materials, including pipe fittings and pipe supports (wall supports) inside the building.

Respondent will be responsible for:

a. Supply, fabrication, and installation of piping (excluding all fittings & fasteners – supplied by ONTC) and pipe supports on the roof.
b. Heat tracing
c. Insulating and jacketing exterior piping
d. Sealing and waterproofing all penetrations
e. Terminating piping inside the building
f. Providing lifting equipment for the installation

e) **Electrical Work**

ONTC is responsible for supplying all materials.
Respondent is responsible solely for the installation.

Answer: Please find below the details outlining the roles:

Piping Material Requirements

- Both vacuum piping and compressed air piping shall be Schedule 40 black steel pipe. (Confirmed by Piotrowski Consultants.)

Pipe Support

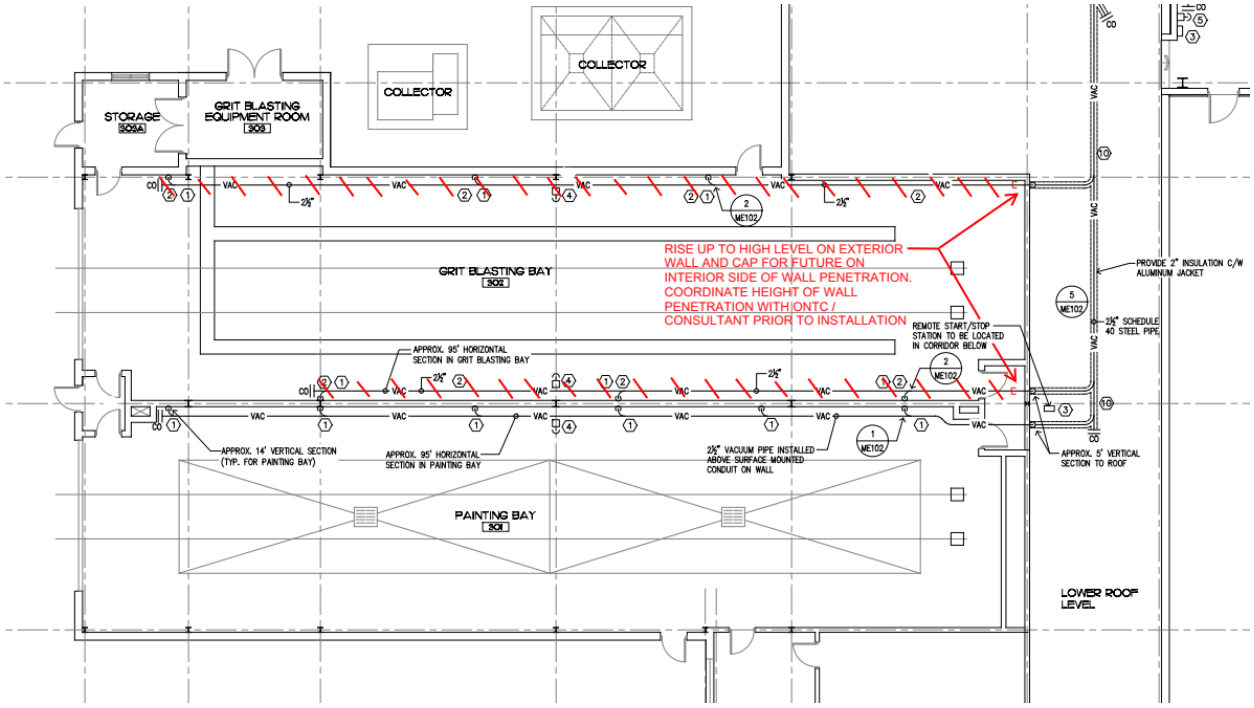
- All pipe supports are to be supplied and installed by the Contractor, unless otherwise existing listed on the materials list provided through Addendum No. 01.
- New pipe supports on the roof (clevis hangers, Unistrut, etc.) must be supplied and installed by the Contractor.

Fabrication Requirement (Not limited to**)**

- Anything already welded/fabricated and sitting with the structure is included and supplied by ONTC. (refer to the Picture attached)
- ONTC will supply 9 sheets of ¼" × 48" × 96" steel checker plate.
- Temporary bolts used for transportation must be replaced with proper A325 bolts as shown on the drawings.
- Roof access stair and walkway platform and railings from hopper platform to the paint shop roof need to be supplied and installed by successful contractor
- HSS bumper frame that bolts to the concrete pad around the bin need to be supplied and installed by successful contractor
- Two (2) 6" diameter SCH40 steel bollards, surface-mounted to slab need to be supplied and installed by successful contractor
- ¼" checker plate floor plate (beyond the 9 sheets ONTC is providing)
- Grating for equipment platform needs to be supplied and installed by successful contractor
- Railings and ladder around the equipment platform need to be supplied and installed by successful contractor
- Materials NOT Fabricated (Contractor to Supply & Install)
- All the cladding materials need to be supplied and installed by the contractor
- Contractor is responsible for the entire Installation following the drawing packages provided

- Piotrowski's specification was included in the tender package and forms part of the installation and material requirements.

Please follow the sketch and instructions for vacuum pipe to be capped off inside the Grit Blast Bay in order to avoid interference with another ongoing project.



Please find attached Industrial Vacuum Design Specifications provided by Piotrowski Consultants Ltd. attached at the end of this Addendum.

Item 2: Would ONTC agree to extend the submission deadline by one-week?

Answer: ONTC will be able to revise the submission deadline to **Wednesday, December 10, 2025 at 2:00:00 p.m.**

Please be advised that ***Section 1.6.1 - Key Dates*** of the RFP has been updated. The revised table is provided below for your reference.

1.6.1 Key Dates

Issue Date of RFP	Thursday, November 13, 2025
Mandatory Site Visit	Monday, November 24, 2025 at 11:00:00 a.m. local time
Deadline for Questions	Thursday, December 04, 2025 at 2:00:00 p.m. local time
Deadline for Issuing Addenda	Monday, December 08, 2025 at 2:00:00 p.m. local time
Submission Deadline	Wednesday, December 10, 2025 at 2:00:00 local time
Irrevocability Period	Ninety (90) calendar days

The RFP timetable is tentative only and may be changed by ONTC at any time.

Appendix B – RFP Particulars – A. Deliverables – Schedule of Services

Please be advised that the timeline for Substantial Completion and Final Completion has been to the below:

- Substantial Completion Date: March 23, 2026
- Final Completion Date: April 01, 2026

Proponents are advised to consider these dates when developing their schedules and proposed approach.

This Addendum hereby forms part of the RFP.

Regards,

Brinda Ranpura
Procurement Contracts Specialist
brinda.ranpura@ontarionorthland.ca

ONTARIO NORTHLAND PAINT SHOP
INDUSTRIAL VACUUM DESIGN
NORTH BAY, ON
PROJECT NO. 6044G
MARCH 2024

Piotrowski Consultants Ltd.
1820 Bond Street
North Bay, ON P1B 4V6

I N D E X

PART 1- GENERAL

1.1. GENERAL

1. This section covers items common to all sections of Division 15 and is supplementary to requirements of Division 1.

2. Division 1, General Requirements is part of this Section and shall apply as if repeated here.

3. Coordinate all requirements with General Contractor.

1.2. CODE OF STANDARDS

1. Do complete installation in compliance with latest editions and all amendments of the following Codes and Standards. Where conflicts in requirements occur, the higher standard shall apply:

    1. ASHRAE

    2. SMACNA

    3. CSA

    4. Ontario Building Code

    5. All governing municipal requirements

    6. ULC

    7. LEED Canada for New Construction and Major Renovations 2009.

1.3. DEFINITIONS

1. “Provide” means supply and install.

2. “Approved” means approved in writing by Consultant.

3. “Consultant” means designated qualified professional engineer acting as representative of Owner for monitoring of work.

4. “Manual” means Operations and Maintenance manual.

1.4. CARE, OPERATION, START-UP AND INSTRUCTION TO OWNERS

1. Provide certified personnel to instruct Owner of operation mechanical equipment. Provide maintenance specialist personnel to instruct on maintenance and adjustment of mechanical equipment and any changes or modification equipment must be under terms of guarantee.

2. Provide instruction during regular work hours prior to acceptance and turn over to Owner's staff for regular operation.

3. Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

4. Use operation and maintenance data manual for instruction purposes. On completion of instruction, turn three manuals over to the Owner.

5. Operation and maintenance manual to be approved by and final copies deposited with Consultant before final inspection.

6. Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

1.5. PERMITS, CERTIFICATES, FEES AND INSPECTIONS

1. Submit to the Building Department the necessary number of drawings and specifications for examination prior to commencement of work to obtain a building/plumbing permit. Obtain and pay for all building/plumbing permits. Include all costs in the tender price.

2. Submit Notice of Project to Ministry of Labour.

3. Submit all applicable forms, registrations, documents, etc to TSSA (piping, boilers, refrigeration piping, etc) and other authorities having jurisdiction. Obtain TSSA registration and submit final certifications to consultant and include in close out documents. Cost of application fees to TSSA to be paid by Owner or cash allowance.

4. Contractor shall be responsible to pay associated fees.

5. Notify Consultant of changes required by Building Department prior to making changes.

6. Notify Consultant upon completion of work.

1.6. COORDINATION WITH EXISTING UTILITIES

1. Before commencing any Work, the Contractor shall determine the locations of all underground utilities and structures indicated in or inferable from the Contract Documents, or that are inferable from an inspection of the Place of the Work.

2. All existing utilities are to be maintained and protected for the length of construction.

3. Contractor to notify consultant if any conflicts arise and allow for minimum 48 hours for consultants review.

1.7. EQUIPMENT REQUIREMENTS AND INSTALLATION

1. Permit equipment maintenance and disassembly by use of unions or flanges to minimize

disturbance to connecting piping and duct systems and without interference from building structure or other equipment.

2. Provide accessible means for lubricating equipment including permanent lubricated "lifetime" bearings.

3. Pipe drain lines to drains.

4. Line-up equipment, rectangular cleanouts and similar items with building walls wherever possible.

5. Provide equipment commissioning and preliminary balancing and confirm the proper operation of all equipment and related systems.

1.8. RESPONSIBILITY FOR TRIAL USAGE

1. Obtain written permission to start and test permanent equipment and systems prior to acceptance by Consultant.

2. Consultant may use ventilating equipment and systems for testing.

3. Protect equipment and systems' openings from dirt, dust and other foreign materials during test usage.

1.9. ELECTRICAL

1. Division 15 shall supply and install motors, controls and control wiring, supply starters, switches and relays, for all motor driven equipment under Division 15. Starters, switches and relays shall be handed over to Division 16 for installation and wiring.

2. Electrical equipment not supplied by Division 15 is listed on the drawings or elsewhere in the Specification for quality of material and workmanship.

3. Safety disconnect switches shall be supplied for each rotating equipment unless within viewing distance for motor control but max 6 m (20') supplied by Division 15 and installed by Division 16.

4. Wiring and controls for connections below 50 V, which are related to control systems are the responsibility of Division 15. Refer to Division 16 for quality of materials and workmanship.

    1. Control cables, type LVT, soft annealed copper conductors with thermoplastic insulation and colour coding. Installation in EMT conduit.

    2. Two conductors parallel with an overall thermoplastic jacket; three or more conductors twisted with an overall thermoplastic jacket.

    3. Cable to be installed in EMT conduit or to be plenum rated FT6 type.

1.10. THERMOSTATS AND SENSORS

1. All thermostats, sensors etc to be mounted at 1200mm (47”) above finished floor to centre line of device. Any interference with other devices such as switches, etc to be coordinated with Consultant.

1.11. MOTORS

1. Provide motors for mechanical equipment as specified.

2. If delivery of specified motor will delay delivery of installation of any equipment, install an acceptable motor for temporary use. Final acceptance of equipment will not occur until specified motor is installed.

3. Motors under 373 W (1/2 HP) speed as indicated, continuous duty high efficiency, built in overload protection, resilient mount, single phase, 120 V unless otherwise specified or indicated.

4. Motors 373 W (1/2 HP) to 150 kW (200 HP) T frame, to or exceeding the current Ontario Hydro Motor Efficiency Levels and be listed in the current Ontario Hydro Motor Efficiency Levels Guide as tested to CSA C390M 1985 or IEEE 112B and approved under the Canadian Safety Code, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise 40°C (72°F), 3 phase, 208 V or 600 V unless otherwise specified or indicated.

5. Provide a suitable manual or magnetic starter for each piece of equipment supplied under this Division.

6. Provide safety disconnect switches for the above equipment.

7. Division 16 will install all starters, disconnects and line voltage control devices and perform all wiring under supervision of this Division.

1.12. PIPE HANGERS AND SUPPORTS

1. See Section 15140 – Hangers and Supports.

1.13. BELT DRIVES

1. Fit reinforced belts in sheaves matched to drive. Multiple belts to be matched set.

2. Use cast iron or steel sheaves secured to shafts with removable keys unless otherwise specified.

3. For motors up to 7.5 kW (10 HP) standard adjustable pitch drive sheaves, having plus or minus 10% range. Use mid position of range for specified r/min. Use fixed sheaves for motors 7.6 kW (10 HP) and over. Replace sheaves during balancing if required.

4. Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturers design requirements on prime mover shafts.

5. Motor slide rail adjustment plates to allow for centre line adjustment.

1.14. GUARDS

1. Provide guards for unprotected drives.

2. Guards for belt drives:

    1. Expanded metal screen welded to steel frame.

    2. Minimum 1.3 mm (18 GA) galvanized sheet metal tops and bottoms.

    3. 40 mm (1 1/2") dia holes on both shaft centres for insertion of tachometer.

    4. Removable for servicing.

3. Provide means to permit lubrication and use of test instruments with guards in place.

4. Install belt guards to permit movement of motors for adjusting belt tension.

1.15. BUILDING PERMIT

1. Prepare permit application and apply for building permit at local Building Department. Include all costs in tender price. Consultant will provide contract documents in PDF format, contractor responsible to produce hard copies.

1.16. DRAIN VALVES

1. Locate at low points and at section isolating valves unless otherwise specified.

2. Minimum NPS 3/4 unless otherwise specified: bronze, with hose end male thread and complete with cap and chain.

1.17. PENETRATIONS

1. Where pipes pass through fire rated walls, floors or partitions, maintain fire rating of assembly in compliance with OBC. Submit shop drawings and details on all products.

2. Provide pipe sleeves at penetrations where pipes pass through masonry or concrete, or where protection is required from galvanic action or physical abrasion.

    1. Coat exposed exterior surfaces of ferrous sleeves with heavy application of zinc-rich paint.

    2. Where sleeves pass through masonry or concrete: backfill space around sleeve with masonry or concrete.

    3. Where sleeves pass through walls or floors: caulk space between insulation and sleeve or between pipe and sleeve with waterproof fire retardant non-hardening mastic.

4. In foundation walls and below grade floors: pipe sleeve to be 1.25x pipe outside diameter or minimum 50mm. Fill space between pipe and sleeve with soft foam insulation.

3. Ensure no contact between copper tube or pipe and ferrous material or sleeve.

4. Continue insulation through penetrations where pipe is required to be insulated.

5. Temporarily plug all openings during construction.

1.18. SLEEVES

1. Size:

    1. Provide 5 mm (1/4") clearance between sleeve and pipe or between sleeve and insulation.

    2. Where piping passes below footings, provide min clearance of 50 mm (2") between sleeve and pipe. Fill void with elastic, water proof material. Backfill up to underside of footing with concrete of same strength as footing.

2. Provide sleeves of minimum 1.0 mm (20 GA) galvanized sheet steel with lock seam joints or use PVC pipe in non rated walls.

3. Use cast iron or steel pipe sleeves with annular fin continuously welded at mid-point through foundation walls.

1.19. ESCUTCHEONS AND PLATES

1. Provide on pipes passing through finished walls, partitions, floors and ceilings.

2. Use split type chrome plated brass, with set screws for ceiling or wall mounting.

3. Inside diameter shall fit around finished pipe. Outside diameter shall cover opening or sleeve.

4. Where sleeve extends above finished floor, escutcheons or plates shall clear sleeve extension.

5. Secure to pipe or finished surface but not insulation.

1.20. TESTS

1. Provide the following supplementary requirements to tests specified:

    1. Give 48 h notice of date when tests will be made.

    2. Do not insulate or conceal work until tested and approved.

    3. Conduct tests in presence of Consultant.

4. Bear costs including retesting and make good.

5. Pipe pressure:

    1. Hydraulically test water supply systems at 1-1/2 times system operating pressure or minimum 1050 kPa (150 psig).

    2. Maintain test pressures without loss of 4 h unless otherwise specified.

    3. Record pressure test results, indicating:

        1. Portion of piping tested.

        2. Test pressure.

        3. Test duration.

        4. Results/Comments.

        5. Type of pipe.

        6. Type of system.

        7. Size of pipe.

    4. Submit results to Consultant.

1.21. PAINTING

1. Apply at least one coat of corrosion resistant primer paint to supports, and equipment fabricated from ferrous metals.

2. Restore to new condition, finishes which have been damaged too extensively to be merely primed and touched up.

1.22. SPECIAL TOOLS

1. Provide one set of special tools required to service equipment as recommended by manufacturers.

1.23. ACCESS DOORS

1. Supply access doors to concealed mechanical equipment for operating, inspecting, adjusting and servicing.

2. Flush mounted 600 mm x 600 mm for body entry and 300 mm x 300 mm for hand entry unless otherwise noted. Doors to open 180°, have rounded safety corners, concealed hinges, screwdriver latches and anchor straps.

3. Material:

1. Special areas such as tiled or marble surfaces: use stainless steel with brushed satin or polished finish as directed by Consultant.

2. Remaining areas: use prime coated steel.

4. Installation:

1. Locate so that concealed items are accessible.

2. Locate so that hand or body entry (as applicable) is achieved.

3. Installation is specified in applicable sections.

5. Acceptable Material: Nailor 0900 or approved equal.

1.24. DIELECTRIC COUPLINGS

1. Provide wherever pipes of dissimilar metals are joined.

2. Provide felt or rubber gaskets to prevent dissimilar metal contact.

1.25. CUTTING AND PATCHING

1. All cutting and patching shall be by Division 15. Coordinate with other trades. Notify Structural Engineer before cutting any structural members and obtain written permission.

1.26. EXISTING SYSTEMS

1. Before submitting tender price verify on job site location of all accessible existing systems affecting execution of this contract. Difficulties arising during construction will not be considered as grounds for additional payment.

2. Where work involves breaking into or connecting to existing systems, carry out work at times directed by governing authorities, with minimum of disturbance to pedestrian traffic.

3. Submit schedule to and obtain approval from Consultant for any shut down or closure of active service or facility. Adhere to approved schedule and provide notice to affected parties.

4. Where unknown services are encountered, immediately advise Consultant and confirm findings in writing.

1.27. INSTRUCTIONS TO OWNERS

1. Provide certified personnel to instruct Owner of operation mechanical equipment. Provide maintenance specialist personnel to instruct on maintenance and adjustment of mechanical equipment and any changes or modification equipment must be under terms of guarantee.

2. Training plans to be submitted prior to the execution of the training. At a minimum, training plans to include the list of systems and equipment which are to be trained on. Instructor’s

name and qualifications and allotted time for training. Training plans to be reviewed and approved by Owner and Consultant prior to commencement of training.

3. Provide instruction during regular work hours prior to acceptance and turn over to Owner's staff for regular operation.

4. Use operation and maintenance data manual for instruction purposes. On completion of instruction, turn three manuals over to the Owner.

5. Operation and maintenance manual to be approved by and final copies deposited with Consultant before final inspection.

1.28. OPERATION & MAINTENANCE MANUALS

1. Provide one (1) paper copy and one “PDF” format on USB stick of Mechanical Operation and Maintenance Manuals complete with As-built Drawings, in accordance to the following and Section 01300 - Submittals.

2. Mechanical Operation and Maintenance Manuals to be delivered to the Engineer’s office in accordance with Section 01300 - Submittals.

3. Manuals to be bound in hard cover neatly labeled: “OPERATING AND MAINTENANCE INSTRUCTIONS”.

4. The Operation and Maintenance Manuals shall be divided into sections with neatly labeled and tabbed dividers between each section. The sections to be included in the manual are:

    1. Section I – General

    2. Section II – Piping and Pump Systems

    3. Section III – Heating, Air Conditioning and Ventilation

    4. Section IV – Automatic Controls

    5. Section V – Sprinkler System

    6. Section VI – Air and Hydronic Balancing Report

    7. Section VII – Extended Warranties

5. The following information shall be contained within the sections:

    1. SECTION I: A list giving name, address and telephone number of the Consultant, Engineers, Construction Manager, Mechanical Trade and Controls Trade. Written guarantees for the Mechanical Systems. A copy of the Valve directory giving number, valve location, normal valve position, and purpose of valve. A framed copy of valve directory to be hung in Mechanical Room. Equipment lists and certificates shall be provided. Certificates shall be signed and sealed by the appropriate suppliers. All major equipment including but not limited to boilers, cooling towers, chillers, air handling units, isolators, silencers, pumps and humidifiers are to be inspected by the manufacturer to ensure the equipment has been installed in

accordance with their recommendations.

2. SECTION II, III and IV: A copy of all pressure tests and operational tests for pumping system. A copy of Gas Operational Tests for gas fired equipment. A list giving name, address and telephone number of all suppliers. A copy of all approved Shop Drawings. Copies of warranties.

3. SECTION IV: Complete Control Diagrams, Wiring Diagrams and description of Control system and the functioning of the system. A copy of all shop drawings and all calibration certificates. Shop drawings shall be the updated record drawings.

4. SECTION V: A copy of all shop drawings. Copies of all warranties. Maintenance information.

5. SECTION VI: Provide complete air balance report including pump and fan curves, measured values and floor plans showing location of all traverse readings and grille measurements. Provide copies of all pressure tests completed on the systems.

6. SECTION VII: Provide a list of equipment with description of extended warranties.

6. MAINTENANCE MATRIX

1. A maintenance matrix is to be provided in the Operation and Maintenance Manuals. The matrix shall indicate each piece of equipment and the required maintenance tasks and the frequency at which they are to be carried out.

1.29. OWNER OCCUPANCY SCHEDULE

1. The existing building will remain occupied during normal occupancy hours.

2. Provide temporary protection for all finishes, appliances or equipment in the existing building.

3. Protect and maintain existing boiler room and electrical room operations during the work.

1.30. AS-BUILT DRAWINGS

1. Site records:

1. One set to be kept on site and all changes to be recorded on daily basis. At the completion of the project, all changes shall be transferred to clean set, signed and passed to the Consultant. Provide “PDF” format of As-Built Drawings on USB stick with Maintenance Manuals at completion of project.

2. Make these drawings available for reference purposes and to inspection at all times.

2. Submit 2 copies of as-built marked up prints with final TAB report.

3. As-built drawings must be delivered before system acceptance.

1.31. BUILDING SERVICE CONNECTIONS

1. Make arrangements with all Utilities for building service connections and include all costs in tender price.

1.32. TRAINING

1. Provide minimum of two 6 hour training sessions on systems.

END OF SECTION 15010

PART 1 - GENERAL

1.1. GENERAL

1. Division 1, General Requirements is part of this Section and shall apply as if repeated here.

1.2. SHOP DRAWINGS AND PRODUCT DATA

1. Submit shop drawings and product data in accordance with Section 01300 - Submittals.
2. Indicate on manufacturer's catalogue literature the following:
    1. Thermometers.
    2. Pressure gauges.
    3. Stop cocks.
    4. Wells.

1.3. MAINTENANCE DATA

1. Provide maintenance data for incorporation into manual specified.

PART 2- PRODUCTS

2.1. GENERAL

1. Thermometers and pressure gauges to operate at mid point of scale or range.

2.2. DIRECT READING THERMOMETERS

1. Industrial, variable angle type, liquid in glass, cast aluminum case, lens front, 225 mm (9”) scale length, dual °F and °C range. Stem lengths to be 50% of pipe i.d. Thermometers to meet: CAN/CGSB 14.4, ASME B40.4.

2.3. REMOTE READING THERMOMETERS

1. 100 mm diameter activated dial type, accuracy within one scale division, brass movement, stainless steel capillary, stainless steel spiral armour, stainless steel bulb and polished brass or stainless steel case for wall mounting. Capillary to have an extra length of at least 5 ft. Thermometers to meet: CAN/CGSB 14.4, ASME B40.

2.4. THERMOMETER WELLS

1. Copper pipe: copper or bronze.
2. Steel pipe: brass or stainless steel.
3. Provide extension necks where insulation is present.
4. Acceptable Product: WIKA TI.901; Winters TIM.

2.5. PRESSURE GAUGES

1. 112 mm, dial type, grade A, 1% accuracy full scale unless otherwise specified. Wetted parts to be of phosphor bronze bourdon tube. Dual scale PSI/Kpa.
2. Acceptable Material: WIKA 213.53.
3. Provide liquid fill on all pump systems
4. Provide siphons for steam service
5. Provide bronze stop cocks for isolation
6. Provide diaphragm seals for corrosive services.

PART 3- EXECUTION

3.1. GENERAL

1. Install so they can be easily read from floor or platform. If this cannot be accomplished, install remote reading units.
2. Install engraved lamicoid nameplates as specified in Section 15190 - Identification, identifying medium.
3. Install between equipment and first fitting or valve.

3.2. THERMOMETERS

1. Install in wells on all piping. Provide heat conductive material for inside of well.
2. Install in locations as indicated and on:
    1. Common return to boilers.
    2. Outlet of every boiler.
    3. On each return and supply.

4. On every heating coil.

5. Outlets of heat exchanger.

3. Use extensions where thermometers are installed through insulation.

4. Provide well in supply pipe header for indoor/outdoor controller temp. sensor.

3.3. PRESSURE GAUGES

1. Install in following locations:

    1. Suction and discharge of pumps.

    2. In other locations as indicated.

2. Use extensions where pressure gauges are installed through insulation.

END OF SECTION 15130

PART 1 - GENERAL

1.1. GENERAL

1. Division 1, General Requirements is part of this Section and shall apply as if repeated here.

1.2. REFERENCES

1. ASME B31.1-2012, (SI), Power Piping, (SI Edition).
2. MSS-SP-58-2009, Pipe Hangers and Supports - Materials, Design and Manufacture.

1.3. SHOP DRAWINGS AND PRODUCT DATA

1. Submit shop drawings and product data in accordance with Section 01300 - Submittals.
2. Indicate on manufacturer's catalogue literature the following:
    1. Upper attachment.
    2. Middle attachment.
    3. Pipe attachment.
    4. Riser clamps.
    5. Shields and saddles.
    6. Sway braces.

1.4. MAINTENANCE DATA

1. Provide maintenance data for incorporation into manual specified in Section 01300 - Submittals.

PART 2- PRODUCTS

2.1. GENERAL

1. Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS-SP-58.
2. Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

2.2. UPPER ATTACHMENTS

1. Concrete:
    1. Anchors for existing concrete roof structure, heavy duty anchors Hilti HSL.
2. Steel beam (bottom flange):
    1. Cold piping NPS 2 and under: malleable iron C clamp to MSS-SP-58, type 19. ULC listed.
    2. Cold piping NPS 2-1/2 and larger and all hot piping: malleable iron beam clamp to MSS-SP-58, type 28 or 29. ULC listed.
3. Steel beam (top):
    1. Cold piping NPS 2 and under: malleable iron "top of beam" C clamp to MSS-SP-58, type 19. ULC listed.
    2. Cold piping NPS 2-1/2 and larger and all hot piping: steel jaw, hook rod with nut, spring washer and plain washer, to MSS-SP-58, type 25. ULC listed.
4. Steel joist:
    1. Cold piping NPS 2 and under: steel washer plate with double locking nuts.
    2. Cold piping NPS 2-1/2 and larger and all hot piping: steel washer plates with double locking nut, carbon steel clevis and malleable iron socket.
5. Steel channel or angle (bottom):
    1. Cold piping NPS 2 and under; malleable iron C clamp to MSS-SP-58, type 23. ULC listed.
    2. Cold piping NPS 2-1/2 and larger and all hot piping; universal channel clamp. ULC listed.
6. Wood trusses and joists.
    1. Hold piping NPS2 and under. Secure angle iron 32 x 32 x 3 mm (1 1/2" x 1 1/2" x 3/16") on top of joist or bottom chord trusses. Space min. 2 joints. Use rod hanger with locking nut and clevis hanger.
    2. Cold piping NPS 2 1/2 and larger. Secure angle iron 50 x 50 x 4 mm on top of joists or bottom chord of trusses. Span min. 4 members. Use rod hangers with locking nut and clevis hanger.

2.3. MIDDLE ATTACHMENT (ROD)

1. Carbon steel threaded rod black finish, galvanized in mechanical rooms.

2.4. PIPE ATTACHMENT

1. Cold piping, steel or cast iron: hot piping steel, with less than 25 mm, 1" horizontal movement; hot piping, steel, with more than 300 mm, 12" middle attachment rod length: adjustable clevis to MSS-SP-58, type 1. ULC listed.

2. Cold copper piping; hot copper piping with less than 25 mm, 1" horizontal movement; hot copper piping with more than 300 mm, 12" middle attachment rod length: adjustable clevis to MSS-SP-58, type 1. Copper plated.

3. Suspended hot piping, steel and copper, with horizontal movement in excess of 25 mm, 1"; hot steel piping with middle attachment rod 300 mm, 12" or less; pipe roller to MSS-SP-58, type 43.

4. Bottom supported hot piping, steel and copper: pipe roller stand to MSS-SP-58, type 45.

2.5. RISER CLAMPS

1. Steel or cast iron pipe: black carbon steel to MSS-SP-58, type 42. ULC listed.

2. Copper pipe: carbon steel copper finished to MSS-SP-58, type 42.

2.6. SADDLES AND SHIELDS

1. Hot and Cold piping NPS 1-1/4 and over: protection shield with high density insulation under shield with uninterrupted vapour barrier.

PART 3- EXECUTION

3.1. HANGER SPACING

1. Spacing and middle attachment rod diameter as specified in paragraphs below or as in table below, whichever is more stringent.

    1. Plumbing piping: most stringent requirements of Ontario Building Code, or authority having jurisdiction.

    2. Fire protection: to applicable fire code.

    3. Gas piping: up to NPS 1/2: every 6', 1.8 m

    4. Copper piping: up to NPS 1/2: every 5' 1.5 m

    5. Flexible joint roll groove pipe: in accordance with table below, but not less than one hanger at joints.

    6. Within 12" of each horizontal elbow.

Pipe Size (Nominal)	Rod Diameter	Maximum Steel	Spacing Cooper
NPS 1/2	10 mm 3/8"	1.8m 6'	5' 1.5m
NPS 3/4, 1	10 mm 3/8"	2.1m 7'	6' 1.8m
NPS 1-1/4	10 mm 3/8"	2.1m 7'	8' 2.4m
NPS 1-1/2	10 mm 3/8"	2.7m 9'	8' 2.4m
NPS 2	10 mm 3/8"	3.0m 10'	9' 2.7m
NPS 2-1/2	10 mm 3/8"	3.0m 10'	10' 3.0m
NPS 3 to 4	10 mm 3/8"	4.6m 15'	12' 3.6m
NPS 6	19 mm 3/4"	5.1 m 17'	--

3.2. HANGER INSTALLATION

1. Offset hanger so that rod is vertical in operating position.

2. Adjust hangers to equalize load.

3. Loads suspended from steel structure to be reviewed and analyzed with structural engineer/general contractor.

END OF SECTION 15140

PART 1- GENERAL

1.1. GENERAL

1. Division 1, General Requirements is part of this Section and shall apply as if repeated here.

1.2. REFERENCES

1. Do thermal insulation in accordance with ACNBC, ASTM E96-66(1972) and ASTM C411-61 (1975).

2. Fire hazard rating:

    1. Meet NFPA 90A-2002, NFPA 225-1984 and CAN4-S102-M83 for all components of insulation system.

3. LEED Canada for New Construction and Major Renovations 2009.

1.3. DEFINITIONS

1. “CONCEALED” - insulated mechanical services in chases, furred spaces, pipe shafts or hung ceilings.

2. “EXPOSED” - will mean “not concealed” as defined herein.

PART 2- PRODUCTS

2.1. FORMED FIBROUS GLASS WITH V.B.

1. Application: insulation system for vacuum piping.

Line Size Nominal	Thickness Nominal
NPS 1 1/2 and over	50 mm (2")

2.2. FASTENINGS

1. Self-adhesive tape and 100% coverage lagging adhesives.

    1. Self-adhesive tape rated under 25 for flame spread and under 50 for smoke development.

2. For vapour barrier:

1. Quick-setting adhesive for joints and lamps sealing of vapour barriers. Flame spread 10 smoke development 0.

2.3. JACKETS

1. Aluminum Outer Jacket:

    1. Fabricated weather resistant coating, gauge as manufacturer's recommendation.

    2. Apply to piping exposed to weather.

PART 3- EXECUTION

3.1. APPLICATION

1. Apply insulation after required tests have been completed and approved by Consultant. Insulation and surfaces shall be clean and dry when installed and during application of any finish. Apply insulation materials, accessories and finishes in accordance with manufacturer's recommendations and as specified herein.

2. On piping with insulation and vapour barrier, install high density calcium silicate block under hanger shield and metal saddle. Maintain integrity of vapour barrier over full length of pipe without interruption at sleeves, fittings and supports.

3.2. INSTALLATION

1. Install in accordance with ANSI/NFPA 90A and ANSI/NFPA 90B.

2. Perform insulation work using qualified insulation applicators, in accordance with latest trade application methods and to the Consultant’s approval.

3. Work to begin only when building is enclosed preventing insulation from getting wet due to elements such as rain, snow, construction, etc. All damaged or wet insulation to be replaced.

4. Preformed: sectional up to NPS 12, sectional or curved segmented above NPS 12.

5. Multi-layered: staggered butt joint construction.

6. Vertical pipe over NPS 3: insulation supports welded or bolted to pipe directly above lowest pipe fitting. Thereafter, locate on 3 m, 15' centres.

7. Expansion joints in insulation: terminate single layer and each layer of multiple layers in straight cut at intervals recommended by manufacturer. Leave void of 25 mm, 1" between terminations. Pack void lightly with flexible mineral insulation.

8. Seal and finish exposed ends and other terminations with insulating cement.

9. Expansion joints in piping: provide for adequate movement of expansion joint without

damage to insulation or finishes.

10. Orifice plate mounting flanges, flanges and unions at equipment, expansion joints, valves, other components requiring regular maintenance.

3.3. FASTENINGS

1. Secure pipe insulation by tape at each end and centre of each section, but not greater than 1 m (36") on centres.

END OF SECTION 15260

PART 1- GENERAL

1.1. GENERAL

1. Division 1, General Requirements is part of this Section and shall apply as if repeated here.

1.2. REFERENCES

1. ANSI/ASME Boiler and Pressure Vessel Code, Section VIII Pressure Vessels - 1992.
2. ASTM A53-90a, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
3. ASTM A181/181M-87, Specification for Forgings, Carbon Steel, for General Purpose Piping.
4. ANSI/ASME B16.5-1988, Pipe Flanges and Flanged Fittings.
5. ANSI/ASME B16.11-1991, Forged Steel Fittings, Socket-Welded and Threaded.
6. CSA B51-03 - Boiler, Pressure Vessel, and Pressure Piping Code.

1.3. SHOP DRAWINGS

1. Submit shop drawings and product data in accordance with Section 01300 - Submittals.
2. Indicate:
    1. Equipment including connections, piping and fittings, valves, strainers, control assemblies and ancillaries, identifying factory and field assembled.
    2. Complete wiring diagrams including schematics.
    3. Dimensions, construction details, materials, recommended installation and support, mounting bolt holes, sizes and locations, and point loads.

1.4. MAINTENANCE DATA

1. Provide maintenance data for incorporation into manual specified in Section 01300 - Submittals.
2. Data to include:
    1. Description of equipment giving manufacturer's name, type, model year, capacity and serial numbers.
    2. Details of operation, servicing and maintenance.

3. Recommended spare parts list.

1.5. PIPING

1. Piping: to ASTM A53, schedule 40 welded black steel.

2. Fittings:

    1. NPS 3" and smaller: to ANSI/ASME B16.11, schedule 40 steel, screwed, or to ANSI/ASME B16.3, malleable iron, screwed.

    2. NPS 2 1/2 and larger: to ANSI/ASME B16.11, schedule 40 steel, butt or socket welded.

3. Couplings: to ANSI/ASME B16.11, socket welded or threaded half coupling type.

4. Unions: 3447 kPA malleable iron with brass-to-iron ground seat.

5. Dissimilar metal junctions: use dielectric unions.

6. Flanges:

    1. NPS 2 and smaller: to ANSI/ASME B16.5, forged steel, raised face and socket welded.

    2. NPS 2 1/2 and larger: to ANSI/ASME B16.5, forged steel, raised face and slip-on or weld neck.

7. Joints:

    1. NPS 2 and smaller: screwed.

    2. NPS 2 1/2 and larger: welded.

1.6. BALL VALVES

1. Three piece design or top entry for ease of in-line maintenance.

    1. To ASTM A181/A181M, Class 70, carbon steel body, screwed ends, carbon steel ball and associated trim suitable for compressed air application.

    2. To withstand 1034 kPa maximum pressure.

2. Acceptable Material: Jamesbury style BWS 2277, Worcester Valve Fig. 4404466TT-SW, Newman Hattersley Fig. 1969; MAS (MA Stewart) #CSS-F-3-N.

1.7. COUPLERS/CONNECTORS

1. Industrial interchange series, full-bore.

2. Maximum inlet pressure: 1700 kPa.

3. Valve seat: moulded nylon.

4. Body: zinc plated steel.

5. Threads: NPT.

6. Acceptable Material: ARO

PART 2- EXECUTION

2.1. COMPRESSED AIR PIPING INSTALLATION

1. Apply and coordinate for TSSA approval. Submit all required documentation, pay all costs and submit certification to Consultant.

2. Install shut-off valves at outlets, major branch lines and elsewhere as indicated.

3. Install quick-coupler chucks and pressure gauges on drop pipes.

4. Install unions to permit removal or replacement of equipment.

5. Install tees in lieu of elbows at all changes in direction of piping. Install plug in all open ends of tees.

6. Grade piping at 1% slope minimum.

7. Install compressed air trap and pressure equalizing pipe at each moisture collecting point. Drain pipe to nearest floor drain.

8. Make branch connections from top of main.

9. Install compressed air trap at bottom of each riser and at low points in mains, piped to nearest drain. Distance between drain points to be 30 m maximum.

10. Welded steel piping.

    1. To ASME Code and requirements of authority having jurisdiction.

    2. Weld all concealed and inaccessible piping regardless of pipe size.

11. Cleaning:

    1. Blow out all piping to clean interior thoroughly of all oil and foreign matter.

12. Testing:

    1. Pressure test in accordance with requirements of Section 15010 - Mechanical General Requirements, for 4 h minimum, to 1100 kPa, with outlets closed and with

compressor isolated from system. Pressure drop not to exceed 10 kPa.

13. Commissioning:

1. Commission system and demonstrate operation to satisfaction of Consultant.

END OF SECTION 15486

PART 1 - GENERAL

1.1. GENERAL

1. Division 1, General Requirements is part of this Section and shall apply as if repeated here.

2. This Section covers items common to Sections of Division 16. This Section supplements requirements of Division 1.

3. Coordinate all requirements with general contractor.

1.2. CODES AND STANDARDS

1. In this document, all references to Code numbers shall mean “Latest Edition”.

2. Do complete installation in accordance with Ontario Electrical Safety Code.

3. Do complete installation in accordance with CSA C22.1-12 except where specified otherwise.

4. Comply with all CSA and inspection Authority Bulletins in force at time of Tender.

5. Abbreviations for electrical terms: to CSA Z85-1983.

6. Where requirements of this specification exceed those of above mentioned standards, this specification shall govern.

1.3. DEFINITIONS

1. “Provide” means supply and install.

2. “Approved” means approved in writing by Consultant.

3. “Inspection Authority” means Electrical Safety Authority.

4. “Consultant” means designated qualified professional engineer acting as representative of Owner for monitoring of work.

5. “Manual” means Operations and Maintenance manual.

6. “OESC” means latest edition of Ontario Electrical Safety Code

1.4. CARE, OPERATION, START-UP AND INSTRUCTION TO OWNERS

1. Provide certified personnel to instruct Owner of operation of electrical equipment. Provide maintenance specialist personnel to instruct on maintenance and adjustment of electrical equipment and any changes or modification of equipment must be under terms of guarantee.

2. Provide instruction during regular work hours prior to acceptance and turn over to Owner's staff for regular operation.

3. Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

4. Use operation and maintenance data manual for instruction purposes. On completion of instruction, turn three manuals over to the Owner.

5. Operation and maintenance manual to be approved by and final copies deposited with Consultant before final inspection.

1.5. AS-BUILT DRAWINGS

1. Site records:

    1. One set to be kept on site and all changes to be recorded on daily basis. At the completion of the project, all changes shall be transferred to clean set, signed and passed to the Consultant.

    2. Make these drawings available for reference purposes and to inspection at all times.

2. As-built drawings must be delivered before system acceptance.

1.6. VOLTAGE RATINGS

1. Operating voltages: to CAN3-C235-83 (R2006).

2. Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.7. PERMITS, FEES AND INSPECTION

1. Submit to Inspection Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.

2. Consultant will provide drawings and specifications required by Inspection Authority at no cost.

3. Pay associated fees and obtain all permits required for the performance of the work.

4. Notify Consultant of changes required by Inspection Authority or Building Department prior to making changes.

5. Furnish Certificates of Acceptance from Inspection Authority on completion of work to Consultant.

1.8. MATERIALS AND EQUIPMENT

1. Provide materials and equipment in accordance with Division 1.

2. Equipment and material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Inspection Authority.

3. Factory assemble control panels and component assemblies.

1.9. ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

1. Verify installation and co-ordination responsibilities related to motors, equipment and controls with other trades and as indicated.

2. Mechanical contractor shall supply and install all motors, controls and control wiring. Mechanical contractor shall supply all disconnect switches, starters, motor rated switches and relays, for all motor driven equipment under mechanical contract. All disconnect switches, starters, motor rated switches and relays shall be handed over to electrical contractor for installation and wiring. Both mechanical and electrical contractors to coordinate to ensure proper protection and equipment is provided and included in contract.

3. Control wiring and conduit to be installed in accordance with Section 16111 and 16122, except for connections below 50V which are related to control systems specified in mechanical sections and as shown on mechanical drawings.

4. Electrical equipment not supplied by mechanical contractor is listed on the drawings or elsewhere in the specifications. Electrical contractor to coordinate with mechanical contractor to ensure proper protection and equipment is provided for all equipment and is included in Contract.

1.10. EQUIPMENT IDENTIFICATION

1. Identify electrical equipment with nameplates and labels as follows:

2. Nameplates:

    1. Lamacoid 3 mm (1/8") thick plastic engraving sheet, white face, black core, mechanically attached with self tapping screws. For emergency power circuits, use a red face and black core.

NAMEPLATE SIZES

Size 1	10 x 50 mm (3/8 x 2")	1 line	3 mm (1/8") high letters
Size 2	12 x 70 mm (1/2 x 3")	1 line	5 mm (1/4") high letters
Size 3	12 x 70 mm (1/2 x 3")	2 lines	3 mm (1/8") high letters
Size 4	20 x 90 mm (3/4 x 4")	1 line	8 mm (3/8") high letters
Size 5	20 x 90 mm (3/4 x 4")	2 lines	5 mm (1/4") high letters
Size 6	25 x 100 mm (1" x 4")	1 line	12 mm (1/2") high letters
Size 7	25 x 100 mm (1" x 4")	2 lines	6 mm (1/4") high letters

3. Labels:

    1. Embossed plastic labels with 6 mm (1/4") high letters unless specified otherwise.

4. Wording on nameplates and labels to be approved by Consultant prior to manufacture.

5. Allow for average of twenty-five (25) letters per nameplate and label.

6. Identification to be English.

7. Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

8. Disconnects, starters and contactors: indicate equipment being controlled and voltage.

9. Terminal cabinets and pull boxes: indicate system and voltage.

10. Transformers: indicate capacity, primary and secondary voltages.

11. Coordinate names of equipment and systems with Division 15 to ensure that identical names are used.

1.11. WIRING IDENTIFICATION

1. Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

2. Maintain phase sequence and colour coding throughout.

3. Colour code: to CSA C22.1.

4. Use colour coded wires in communication cables, matched throughout system.

1.12. CONDUIT AND CABLE IDENTIFICATION

1. Colour code conduits, boxes and metallic sheathed cables.

2. Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

3. Colours: 25 mm (1") wide prime colour and 20 mm (3/4") wide auxiliary colour.

	PRIME	AUXILIARY
up to 250 V	yellow	
up to 600 V	yellow	green
up to 5 kV	yellow	blue
up to 15 kV	yellow	red
Telephone	green	
Other communication systems	green	blue
Fire alarm	red	

Emergency	red	blue
Voice		
Other security systems	red	yellow

1.13. WIRING TERMINATIONS

1. Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

1.14. MANUFACTURERS AND CSA LABELS

1. Ensure that manufacturer's registration plates are properly affixed to all apparatus showing the size, name of equipment, serial number, and all information usually provided, including voltage, cycle, phase and the name and address of the manufacturer.

2. Do not paint over registration plates or approved labels. Leave openings through insulation for viewing the plates. Contractors or sub-contractors nameplate not acceptable.

1.15. WARNING SIGNS

1. As specified and to meet requirements of Inspection Authority and Consultant.

1.16. FIELD QUALITY CONTROL

1. All electrical work to be carried out by qualified, licensed electricians or apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentices program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform specific tasks – the activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.

2. Conduct and pay for following tests:

    1. Power distribution system including phasing, voltage, grounding.

    2. Circuits originating from branch distribution panels.

3. Furnish manufacturer's certificate or letter confirming the entire installation as it pertains to each system has been installed to manufacturer's instructions.

4. Insulation resistance testing.

    1. Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.

    2. Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.

    3. Check resistance to ground before energizing.

5. Carry out tests in presence of Consultant.

6. Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

7. Submit test results for Consultant's review.

1.17. FIREPROOFING

1. Where cables or conduits pass through floors and fire rated walls, pack space between wiring and sleeve full with firestopping system to CAN 4-S115.

END OF SECTION 16010

PART 1- GENERAL

1.1. GENERAL

1. Division 1, General Requirements is part of this Section and shall apply as if repeated here.

1.2. REFERENCES

1. Canadian Standards Association (CSA)
    1. CSA C22.2 No. 18-98 (R2003), Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware.
    2. CSA C22.2 No. 45.2-08, Rigid Metal Conduit.
    3. CSA C22.2 No. 56-04 (R2009), Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
    4. CSA C22.2 No. 83-M1985(R2013), Electrical Metallic Tubing.
    5. CSA C22.2 No. 211.2-06 (R2011), Rigid PVC (Unplasticized) Conduit.
    6. CSA C22.2 No. 227.3-05 (R2010), Flexible Non-metallic Tubing.

1.3. WASTE MANAGEMENT AND DISPOSAL

1. Separate and recycle waste materials in accordance with Division 1.
2. Place materials defined as hazardous or toxic waste in designated containers.
3. Ensure emptied containers are sealed and stored safely for disposal away from children.
4. Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Division 1.

PART 2- PRODUCTS

2.1. CONDUITS

1. Electrical metallic tubing (EMT): with steel couplings, sized as indicated.
2. Rigid PVC conduit, sized as indicated.
3. Rigid metal conduit: galvanized steel threaded conduit, sized as indicated.

4. Epoxy coated conduit: with zinc coating and corrosion resistant epoxy finish inside and outside.

5. Flexible metal conduit and liquid-tight flexible metal conduit, sized as indicated.

6. Flexible PVC conduit, sized as indicated.

2.2. CONDUIT FASTENINGS

1. One hole steel straps to secure surface conduits 50 mm (2") and smaller. Two hole steel straps for conduits larger than 50 mm (2").

2. Beam clamps to secure conduits to exposed steel work.

3. Channel type supports for two or more conduits at 3 m (9') o/c.

4. 6 mm dia threaded rods to support suspended channels.

2.3. CONDUIT FITTINGS

1. Fittings: manufactured for use with conduit specified. Coating: same as conduit.

2. Fittings to be suitable sized for conduit used.

3. Fittings used for EMT to be steel, not cast.

4. Factory "ells" where 90° bends are required for 25 mm (1") and larger conduits.

2.4. EXPANSION FITTINGS FOR RIGID CONDUIT

1. Weatherproof expansion fittings with internal bonding assembly suitable for 100 or 200 mm linear expansion.

2. Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection in all directions.

3. Weatherproof expansion fittings for linear expansion at entry to panel.

2.5. FISH CORD

1. Polypropylene.

PART 3- EXECUTION

3.1. INSTALLATION

1. Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

2. Use rigid galvanized steel threaded conduit in areas subject to mechanical injury.

3. Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

4. Use electrical metallic tubing (EMT) above 2.4 m not subject to mechanical injury.

5. Use flexible metal conduit for final connection to devices in ceiling space max. length 3 m.

6. Use liquid tight flexible metal conduit for final connection to a vibrating piece of equipment.

7. Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

8. Mechanically bend steel conduit over 21 mm diameter.

9. All unterminated conduit ends to be reamed and protected by insulating bushings.

10. Install fish cord in empty conduits and all conduits 53 mm and greater.

11. Where conduits become blocked, remove and replace blocked section. Do not use liquids to clean out conduits.

12. Dry conduits out before installing wire.

13. Use water tight fittings at connections to taps or sides of sprinkler proof equipment or seal with approved sealant.

3.2. SURFACE CONDUITS

1. Run parallel or perpendicular to building lines.

2. Locate conduits behind infrared or gas fired heaters with 1500 mm clearance.

3. Run conduits in flanged portion of structural steel.

4. Group conduits wherever possible on suspended channels.

5. Do not pass conduits through structural members except as indicated.

6. Do not locate conduits less than 75 mm (3") parallel to steam or hot water lines with minimum of 25 mm (1") at crossovers.

7. All exposed conduits in areas other than service spaces are to be painted to match existing finishes.

3.3. CONCEALED CONDUITS

1. Run parallel or perpendicular to building lines.

END OF SECTION 16111

PART 1- GENERAL

1.1. RELATED SECTIONS

1. Division 1, General Requirements is part of this Section and shall apply as if repeated here.
2. Section 16151 – Wire and Box Connections – 0 – 1000V.

1.2. REFERENCES

1. CSA C22.2 No. 0.3-09, Test Methods for Electrical Wires and Cables.
2. CAN/CSA-C22.2 No. 131-07 (R2012), Type TECK 90 cable.

1.3. PRODUCT DATA

1. Submit product data in accordance with Division 1.

1.4. WASTE MANAGEMENT AND DISPOSAL

1. Separate and recycle waste materials in accordance with Division 1.
2. Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Division 1.
3. Fold up metal banding, flatten and place in designated area for recycling.

PART 2- PRODUCTS

2.1. GENERAL

1. All conductors to be copper, unless otherwise noted.

2.2. BUILDING WIRES

1. All conductors to be copper, unless otherwise noted.
2. Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG for power and # 16 AWG for controls and fire alarm.
3. Copper conductors: size as indicated, with insulation of chemically cross-linked thermosetting polyethylene material type RW90, or with thermoplastic insulation and nylon jacket, type T-90 nylon.

4. 600V rating for nominal 208V system voltage; 1000V rating for nominal 600V system voltage.

5. Wire and conduit sizes shown are based on RW75 XLPE and are minimum sizes. Contractor is responsible for wire and conduit sized for other approved wires.

6. Conductors shall be colour coded. Conductors size 10 AWG and smaller shall have colour impregnated into insulation at time of manufacture.

    1. Colour code wiring for 120 / 208 Volt equipment as follows

        1. Phase conductors: Red, Black, Blue

        2. Neutral conductors: White

        3. Bonding to ground: Green

    2. Colour code wiring for 277 / 480 Volt equipment as follows

        1. Phase conductors: Red, Black, Blue

        2. Neutral conductors: White

        3. Bonding to ground: Green

2.3. TECK CABLE

1. Cable: to CAN/CSA C22.2 No. 131.

2. Conductors:

    1. Grounding conductor: copper.

    2. Circuit conductors: copper, size as indicated.

3. Type: TECK 90.

4. Type: TECK 90 HL for hazardous locations

5. Insulation:

    1. Chemically cross-linked thermosetting polyethylene rated type RW90, 600V.

6. Inner jacket: polyvinyl chloride (PVC) material.

7. Armour: interlocking aluminum.

8. Overall covering: thermoplastic PVC material with improved LFS/LGE jacket for fire protection and low acid gas evolution, with required cable flammability rating identification on jacket.

9. Fastenings:

    1. One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.

    2. Channel type supports for two or more cables at 1500 mm centres.

    3. Threaded rods: 6 mm diameter to support suspended channels.

    4. For single conductor cables, provide fastenings without ferrous loop around cables, to satisfaction of consultant.

10. Connectors:

    1. Approved for TECK cable.

2.4. CONTROL CABLES

1. Type LVT: 2 soft annealed copper conductors sized as indicated with thermoplastic insulation and outer covering thermoplastic jacket.

PART 3- EXECUTION

3.1. INSTALLATION OF BUILDING WIRES

1. Install wiring in conduit in accordance with Section 16111, unless otherwise noted.

2. Use type RW90 where required by Ontario Electrical Safety Code, for all panelboard feeders and for all conductors sized 250 MCM and larger.

3. Use type RW90 or T-90 for branch circuit wiring unless otherwise indicated.

4. Minimum wire size shall be No. 12 AWG. For 15A, 120V branch circuit home runs which exceed 23 m length shall be minimum No. 10 AWG, and minimum No. 8 AWG for runs which exceed 36 m. For 20A, 120V branch circuit home runs which exceed 17 m in length shall be minimum No. 10 AWG, and minimum No. 8 AWG for runs which exceed 27 m. Where existing wiring is re-used, minimum wire sizes shall apply and wiring shall be replaced when it does not meet the minimum size.

5. Existing wiring may only be re-used if permitted by Engineer.

3.2. INSTALLATION OF TECK CABLE 0 – 1000V

1. Install cables only where shown on drawings.

2. Group cables whenever possible on channels.

3. Terminate cables in accordance with Section 16151 – Wire and Box Connectors – 0 –

1000V.

3.3. INSTALLATION OF CONTROL CABLES

1. Install control cables in conduit in accordance with Section 16111.

2. Ground control cable shield.

END OF SECTION 16122

PART 1- GENERAL

1.1. GENERAL

1. Division 1, General Requirements is part of this Section and shall apply as if repeated here.

1.2. REFERENCES

1. CSA C22.1-12 Canadian Electrical Code, Part 1.

1.3. WASTE MANAGEMENT AND DISPOSAL

1. Separate and recycle waste materials in accordance with Division 1, and with the Waste Reduction Workplan.

2. Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Division 1.

PART 2- PRODUCTS

2.1. OUTLET AND CONDUIT BOXES - GENERAL

1. Size boxes in accordance with CSA C22.1.

2. 102 mm (4") square or larger outlet boxes as required for special devices.

3. Gang boxes where wiring devices are grouped.

4. Blank cover plates for boxes without wiring devices.

5. Combination boxes with barriers where outlets for more than one system are grouped.

2.2. SHEET STEEL OUTLET BOXES

1. Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm (4") square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.

2. Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm

2.3. CONDUIT BOXES

1. Cast FS or FD feraloy boxes with factory-threaded hubs and mounting feet for surface wiring

of switches and receptacle.

2. Electro-galvanized utility tape for indoor surface wiring.

2.4. FITTINGS - GENERAL

1. Bushing and connectors with nylon insulated throats.

2. Knock-out fillers to prevent entry of debris.

3. Conduit outlet bodies for conduit up to 35 mm and pull boxes for larger conduits.

4. Double locknuts and insulated bushings on sheet metal boxes.

PART 3- EXECUTION

3.1. INSTALLATION

1. Support boxes independently of connecting conduits.

2. Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

3. Provide correct size of openings in boxes for conduit and armoured cable connections. Reducing washers are not allowed.

END OF SECTION 16132

PART 1 - GENERAL

1.1. GENERAL

1. Division 1, General Requirements is part of this Section and shall apply as if repeated here.

1.2. REFERENCES

1. CSA C22.2 No. 65-13 Wire Connectors.
2. EEMAC 1Y-2, 1961 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

PART 2 - PRODUCTS

2.1. MATERIALS

1. Pressure type wire connectors: with current carrying parts of copper sized to fit copper conductors as required.
2. Fixture type splicing connectors: with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
3. Bushing stud connectors: to EEMAC 1Y-2 to consist of:
    1. Connector body and stud clamp for stranded copper conductors.
    2. Clamp for stranded copper conductors
    3. Stud clamp bolts.
    4. Bolts for copper conductors
    5. Sized for conductors as indicated.
4. Clamps or connectors for armoured cable, flexible conduit, as required.

PART 3 - EXECUTION

3.1. INSTALLATION

1. Remove insulation carefully from ends of conductors and:
    1. Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.

2. Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.

3. Install fixture type connectors and tighten. Replace insulating cap.

4. Install bushing stud connectors in accordance with EEMAC 1Y-2.

END OF SECTION 16151

PART 1 - GENERAL

1.1. RELATED WORK

1. Division 1, General Requirements is part of this Section and shall apply as if repeated here.

2. Fastenings and supports: Section 01600 Material and Equipment.

PART 2 - PRODUCTS

2.1. SUPPORT CHANNELS

1. U shape, size 41 x 41 x 2.5 mm thick, surface mounted or suspended.

2. Smaller sections subject to Consultant's approval.

PART 3 - EXECUTION

3.1. INSTALLATION

1. Secure equipment to tile and plaster surfaces with nylon anchors, with independent grip protrusions.

2. Secure equipment to poured concrete with expandable inserts.

3. Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

4. Secure equipment to Siporex ceiling with Aircrete anchors equal to Fischer p/n:GB14.

5. Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

6. Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

7. Fasten exposed conduit or cables to building construction or support system using straps.

    1. One-hole steel straps to secure surface conduits and cables 50 mm and smaller.

    2. Two-hole steel straps for conduits and cables larger than 50 mm.

    3. Beam clamps to secure conduit to exposed steel work.

8. Suspended support systems.

    1. Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.

    2. Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.

9. For surface mounting of two or more conduits use channels at 3 m oc spacing.

10. Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

11. Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

12. Do not use wire lashing or perforated strap to support or secure raceways or cables.

13. Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Consultant.

14. Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

15. Provide minimum 2400 mm support channel on each suspended fixture in open areas, with rigid stem supports from structure to channel, and fixture secured to channel.

16. All fastenings and supports to be hot dipped galvanized. All cut ends exposing base material to be completely sealed with field applied coating to give equivalent protection prior to installation. Following complete installation, all damage to protective layer to be carefully and completely touched up with same field applied coating.

END OF SECTION 16191

PART 1- GENERAL

1.1. GENERAL

1. Division 1, General Requirements is part of this Section and shall apply as if repeated here.

1.2. PRODUCT DATA

1. Submit product data in accordance with Division 1.

PART 2- PRODUCTS

2.1. DISCONNECT SWITCHES

1. Enclosed manual air break switches in non-hazardous locations to CSA C22.2 No. 4-04 (2009).
2. Fuse holder assemblies to CSA C22.2 No. 39-13.
3. Fusible and non-fusible disconnect switch in CSA Enclosure size as indicated.
4. Provision for padlocking in on-off switch position by three locks.
5. Mechanically interlocked door to prevent opening when handle in ON position.
6. Fuses: size as indicated, to Section 16478 - Fuses - Low Voltage.
7. Fuse holders: suitable without adaptors, for type and size of fuse indicated.
8. Quick-make, quick-break action.
9. ON-OFF switch position indication on switch enclosure cover.

2.2. EQUIPMENT IDENTIFICATION

1. Provide equipment identification in accordance with Section 16010 - Electrical General Requirements.
2. Indicate name of load controlled on size 4 nameplate.

2.3. ACCEPTABLE MATERIALS

1. Square D

2. Cutler-Hammer

PART 3- EXECUTION

3.1. INSTALLATION

1. Install disconnect switches complete with fuses, if applicable.

2. For all disconnects where fuse and wire sizes have a lower rating than the disconnect, a lamacoid label is to be applied indicating “MAX FUSE SIZE TO BE ____ AMPS”. To be filled in with the value of the specific fuse size.

END OF SECTION 16440

PART 1- GENERAL

1.1. GENERAL

1. Division 1, General Requirements is part of this Section and shall apply as if repeated here.

1.2. REFERENCES

1. OESC Section 10, Bonding and Grounding.

PART 2 - PRODUCTS

2.1. EQUIPMENT

1. Insulated grounding conductors: green, type TWH.
2. Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
    1. Grounding and bonding bushings.
    2. Protective type clamps.
    3. Bolted type conductor connectors.
    4. Thermit welded type conductor connectors.
    5. Bonding jumpers, straps.
    6. Pressure wire connectors.

PART 3- EXECUTION

3.1. EQUIPMENT GROUNDING

1. Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels and outdoor lighting.

3.2. FIELD QUALITY CONTROL

1. Perform tests in accordance with Section 16010 - Electrical General Requirements.

2. Perform ground continuity tests using method appropriate to site conditions and to approval of Consultant and Inspection Authority.

    1. Ground continuity: Ensure, through ground loop resistance measurement, that the grounding for the new equipment is tied in satisfactorily to the existing ground grid. Continuity measurements should be made between new equipment and system grounds of existing 600V services.

    2. Perform tests before energizing electrical system.

3. Coordinate scheduling of tests with testing agency. Provide all test results to consultant.

END OF SECTION 16450


DANGER
STOP