

SUPPLEMENTARY CONDITIONS

SC 1 Working Hours for the Construction Contract

The Contractor shall only perform work at the Site between the hours of:

- 5:00 p.m. on Sunday to 6:00 a.m. on Monday
- 5:00 p.m. on Monday to 6:00 a.m. on Tuesday
- 5:00 p.m. on Tuesday to 6:00 a.m. on Wednesday
- 5:00 p.m. on Wednesday to 6:00 a.m. on Thursday
- 5:00 p.m. on Thursday to 6:00 a.m. on Friday
- 5:00 p.m. on Friday to 6:00 a.m. on Saturday

(the “**Working Hours**”). If the Contractor is required to work outside of the Working Hours, it shall obtain prior written approval from the Commissioner.

SC 2 Working Hours for the Maintenance Contract

The Contractor shall only perform work at the Site between the hours of 8:00 a.m. to 5:00 p.m. Monday to Friday.

SC 3 Schedule of Work

The Contractor shall furnish all necessary machinery, equipment and other means of labour, perform all of the Work, and furnish all of the materials except as otherwise specified in the Contract Documents, and to complete the Work herein described in strict accordance with the Contract Documents.

The Contractor shall submit a construction schedule to the Region for approval prior to the start of construction. The schedule must reflect the requirement that the Work must be completed with only one elevator out of operation at a time in order to minimize disruption of operation of the facility. The Contractor shall give the Region a minimum of five (5) Business Days’ prior notice of any changes to the schedule.

Once the Work commences, the Contractor shall work on a continuous basis until the Work is completed.

SC 4 Provision for Traffic

Harry Walker Parkway shall be kept open to through traffic at all times.

The Contractor shall not reduce the number of through lanes or otherwise restrict traffic on Harry Walker Parkway without the prior written approval of the Owner and without first obtaining a road occupancy permit from the Region.

Access shall be maintained at all times to all businesses and residences presently having access to the road.

SC 5 Other Contractors

Other work may be in progress within, and/or adjacent to, the Site, including the following:

- Service Work Contracts

The Contractor shall keep itself informed of any current, or new, local development projects which may impact construction activities and services, and shall coordinate its activities with the developers.

The Contractor shall coordinate its work with the work of Other Contractors and shall not restrict access to the working areas or operations of the Other Contractors.

The Contractor shall maintain a separation of time and space from Other Contractors to ensure that the Owner is not placed in the position of “Constructor” within the meaning prescribed in the *Occupational Health and Safety Act*, RSO 1990, c O.1 and shall comply with all other requirements stipulated in [GC 9 – Other Contractors](#). No extension of Contract Time and/or an Increase to the Contract Price will be granted for delays resulting from this construction coordination.

SC 6 Operational Constraints

The Contractor shall undertake the Work in accordance with the following operational constraints:

Operating Facility

The Contractor shall coordinate its Work so as not to interfere with the daily operations of 145 Harry Walker Parkway. The Contractor shall keep all areas of work clean, safe and useable for the staff, residents and visitors of the facilities at all times.

All parking and fire route areas shall be accessible at all times.

The facility shall remain operational during equipment installation and commissioning. The Contractor shall coordinate this work to ensure uninterrupted operations.

The Contractor shall notify the Region a minimum of five (5) Business Days prior to any shutdown of services or equipment in order to coordinate an acceptable date and time for the shutdown. Any changes to the agreed upon date and time of the shutdown must be approved by the Region. Any other disruptions to facility services must be approved, in advance, by the Region.

Noise

The Contractor shall comply with all local bylaws regarding noise. These bylaws are under the jurisdiction of the Town of Newmarket and the Region has no authority to grant exemptions from them.

SC 7 Permits and Approvals

The Contractor shall adhere to all requirements, conditions and restrictions as specified in the permits and approvals required for the Work.

Permits/Approvals

The Contractor is advised that the following permits/approvals have been obtained for the Work:

- Town of Newmarket Permit # 2020-00299 for New Elevator and AODA washroom Second Floor

SC 8 Substantial Performance of the Contract (Construction Contract Only)

The Work will not be deemed to be ready for use or being used for the purposes intended pursuant to section 2 of the Construction Act until the following conditions have been met at a minimum:

- each mechanical, electrical, instrumentation, piping and HVAC system installed or modified under this Contract has been tested in accordance with the specified requirements;
- the Work has satisfactorily passed all required inspections by Central York Fire Services and Town of Newmarket Building Department, along with proof that occupancy has been granted.
- the Work has satisfactorily passed all required inspection and performance testing and can be used for the purposes intended;
- all test results have been submitted to the Owner;
- all operating manuals, maintenance manuals, and "As-Built" drawings have been completed and submitted to the satisfaction of the Owner;
- all training required under the Contract has been completed and instructions have been provided to the Owner's staff to enable the Owner to operate the facility; and
- all spare parts and materials have been supplied; and
- all warranty certificates have been submitted

No deviations from these requirements will be permitted.

SC 9 Temporary Facilities

The Contractor shall furnish, install, and maintain temporary sanitary, wash-up and lunch room facilities for its employee use during the performance of the Work. Remove upon completion of the Work. Place all temporary facilities in conformance with all Town of Newmarket, Ministry of Labour and Ministry of Health applicable laws, codes, and regulations.

SC 10 Cash Allowances

The purpose of the Cash Allowances in the Bid Form is to cover the cost of extra work approved by the Region at its sole discretion, if required.

If the Region requests that a Cash Allowance be expended, the Contractor shall consult with the Consultant and/or Region in the selection of the Products, services and/or vendors required to carry out the work under the Cash Allowance, and shall obtain the Region's approval for the selection of Products, services and/or vendor(s) in relation to the Cash Allowance.

If required by the Region, the Contractor shall obtain bids from a minimum of three vendors in relation to a Cash Allowance item, and submit the bids received to the Region and/or Consultant for approval.

The Contractor shall submit, with the application for payment, an invoice showing the date of purchase, the vendor from which the purchase was made, the date of delivery of the Product or service, and the price, including delivery to the Site and all applicable taxes.

Cash Allowance payments will only be made with the written authorization of the Region, and shall not include any markups whatsoever. The Contractor shall have no claim on any unused portion of any Cash Allowance item.

The following Cash Allowances are included in this Contract:

CA1 – Building Automation – This Cash Allowance is for Building Automation System updates for Mechanical equipment.

CA2 – Data – This Cash Allowance is for new or relocated Voice and Data installations.

CA3 – Door Hardware – This Cash Allowance is for new Door hardware.

CA4 – Security and Monitoring – This Cash Allowance is for Security and Monitoring updates. The work must be performed by Honeywell Limited; Contact person is Malinski Rafal, 416-797-3139.

CA5 – Inspection and Testing – This Cash Allowance is for third party inspection and testing where required in the Contract Documents.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1. The Contractors shall ensure that Subcontractors and trades doing work in this Section read and become familiar with those portions of the Sections relating to their own work.

1.2 WORK SUMMARY

- 1.2.1. This Section includes:

- 1.2.1.1. Provide all Birch Casework and accessory items as specified herein. Refer to plans for specific details and requirements.

1. Counter, lower cabinets in Washrooms.
2. Include all filler panels, scribe pieces as necessary for a complete installation.
3. Relocate existing millwork in existing kitchenette as noted on drawings for re-use.

- 1.2.2. Related work in other Sections:

1. 09 10 00 – Wood blocking in partitions for support of millwork.
2. 22 42 00 – Plumbing Fixtures and Fittings

1.3 MILLWORK STANDARDS

- 1.3.1. In general, work shall conform to details given on Drawings. If not shown or specified, work shall be in accordance with the Architectural Woodwork Manufacturers Association of Canada standards, custom grade quality for painted work, and premium grade for clear finish.

- 1.3.2. The standards manual of Architectural Woodwork Manufacturers Association of Canada shall be the guide for work whether on Site or at mill.

1.4 SHOP DRAWINGS

- 1.4.1. Prepare Shop Drawings to show case work items regardless of the extent to which Work is specified and detailed on the Contract Documents. Shop Drawings shall show surrounding conditions verified by field dimensions; materials to be used; locations of joints and surfaces to be covered in plastic laminate; paint and other finish materials; method of attachment; and where applicable, cut outs and other work to be done to accommodate work of other trades.

- 1.4.2. Do NOT commence fabrication until Shop Drawings have been stamped 'Reviewed', 'Reviewed as noted' or "Revise and Resubmit work may proceed" by the Consultant.

- 1.4.3. Shop Drawings submission shall be in accordance with General Conditions.

1.5 FIELD DIMENSIONS

- 1.5.1. Prior to fabrication and preparing Shop Drawings, take field dimensions to verify clearance, squareness of walls, etc. and location of plumbing and electrical work which must be accommodated in, or concealed by, work of this Section.

1.6 PROTECTION

- 1.6.1. Protect finished work by cartooning for shipment or with heavy craft paper seal. Protect installed work with heavy craft paper or cardboard until finish is applied. Ship material and millwork to Site when installation can take place in clean, dry conditions.

PART 2 - MATERIALS

2.1 GENERAL CONDITIONS

2.1.1. All Cabinets

- 2.1.1.1. All end panels, cabinet bottoms, wall and tall cabinet tops, vertical dividers, vertical rails, exposed finished back panels, toe kicks, drawer fronts, drawer bodies, and doors, to be 20mm birch panels. Refer to Drawings for details.
- 2.1.1.2. All base cabinet horizontal rails, adjustable shelves, and wall cabinet hanging cleats to be 20mm birch panels as described in this section.
- 2.1.1.3. All removable and fixed backs to be 6mm birch ply on wood rails as detailed.

2.1.2. Base Cabinets

- 2.1.2.1. Cabinet and panels to be secured to cabinet bottom and to horizontal and vertical rails with a minimum of 10 interlocking mechanical fasteners.
- 2.1.2.2. Cabinet base to be integral with cabinet and end panels as a standard feature unless a separate base unit is specifically called for and indicated on plans. Standard integral base to have toe-kick attached to cabinet end panels by means of steel angles and screws.
- 2.1.2.3. Cabinet end panels to be secured at top of base cabinet by means of 2 – 19mm x 89mm horizontal rails and 1 – 12mm x 196mm upper back panel which also serves as wall attachment cleat. Cabinet end panels to be secured at bottom of base cabinet with a solid 12mm thick cabinet bottom and 12mm thick integral toe-kick panel.
- 2.1.2.4. Removable cabinet backs to be 6mm thick birch ply. Backs to be removed from inside of cabinet without the use of tools or mechanical fasteners. Cabinets with only banks of drawers do not receive removable backs.
- 2.1.2.5. Drawer body sides, sub-fronts, and backs to be 12mm thick birch panels. Drawer body bottoms to be 6mm birch ply. Attachments of drawer body sides to drawer body fronts and backs to be a screwed butt joint.
- 2.1.2.6. Base cabinet toe kicks to birch panels.
- 2.1.2.7. Color of exposed end panels to match color selection of drawer fronts, doors, knee space panels, and fillers. Construction fasteners used for attachment of cabinet end panels to vertical cabinet members to be concealed. Visible construction fasteners or hole-covers shall not be acceptable.
- 2.1.2.8. All base fillers to be 12mm birch.

2.1.3. Counters

- 2.1.3.1. 20mm quartz countertop by Ceasarstone or Equivalent. Colour to be 6011 Intense White. Refer to Drawings for details.
- 2.1.3.2. Laminated to ¾" plywood.
- 2.1.3.3. Accessories

1. Installation Materials: Provide joint adhesive as required to suit project conditions.

2.1.3.4. Fabrication

2. Fabricated tops and accessories in accordance with manufacturer's recommendations, Shop Drawings approved by the Consultant, and Scientific Equipment and Furniture Association (SEFA) 8.

2.2 GENERAL WORKMANSHIP

- 2.2.1. Fabricate and install work in accordance with best practice by skilled craftsmen of companies specializing in work specified, and to requirements of other trades.

2.2.1.1. Include in place mock – up of selected casework.

- 2.2.2. Use running members in greatest lengths obtainable.

2.2.2.1. Machine-sand exposed surfaces in shop and hand sand on job to even smooth surfaces, free from scratches, ready for finishing.

2.2.2.2. Machine dressed work shall be slow fed using sharp cutters and shall be free from drag, feathers, slivers, and roughness. Remove machine marks by sanding.

- 2.2.3. Assemble work in shop as far as practicable and deliver to Site ready for installation. Leave ample allowance for fitting and scribing on job.

2.2.3.1. Joints made on Site shall be equal in quality and workmanship to joints made in shop: glue and pin joints.

2.2.3.2. Take care to prevent opening of glue lines in finished work.

2.2.3.3. Edge band exposed work to match adjacent facing unless otherwise shown on Drawings.

2.2.3.4. Glue, blind screw or blind nail work. Set surface nails and plug surface screws with wood plugs of material to match surface. Fastenings shall be concealed.

- 2.2.4. Erect work plumb, level, square and to required lines. Accurately scribe, cope and mitre members.

- 2.2.5. Be responsible for methods of construction and for ensuring that material, grounds, nailers and blocking are securely fastened and true.

2.3 CASEWORK

- 2.3.1. All cabinet body component shall be secured utilizing concealed interlocking mechanical fasteners as approved by AW1400B.S.8-A, AW1600B-S-4.A, sections 14 and 25 of the Architectural Woodwork Manufacturers Association of Canada standards, and shall be especially designed for use in joining flat panels.

- 2.3.2. All joints to be tight fitting and shall not rupture or loosen due to:

2.3.2.1. Racking of casework during shipment and installation.

2.3.2.2. Normal use.

2.3.2.3. Seismic shock as tested and approved by the Architectural Woodwork Manufacturers Association of Canada standards for casework used in schools and hospitals.

- 2.3.3. All fastening devices and screws shall be treated to deter or resist corrosion. Unless specified by otherwise by the Region, all screws shall be stainless steel.

2.4 INSTALLATION OF HARDWARE FOR CABINETS

- 2.4.1. Hinges to be heavy duty, five-knuckle institutional-tip, fixed pin feature with all edges eased. Hinge to be full wrap-around type of tempered steel .095" thick. Each hinge to have a minimum of nine screw attachment holes. Hinges to accommodate door thickness of 12mm. Hinge to be black epoxy powder finish.
- 2.4.2. Hinges: one pair per door to 1200mm height. One and one-half pair over 1200mm in height. Hinge to allow 270 degrees of swing.
- 2.4.3. Pulls to be stainless steel.
- 2.4.4. Pulls: Drawers under 760mm in width to receive one pull. Drawers over 760mm in width to receive two pulls. All doors to receive one pull.
- 2.4.5. Catches: Steel zinc finish polyethylene roller type heavy duty catch with adjustable tension feature.
- 2.4.6. Drawer slides: As shown below:
 - 2.4.6.1. Standard Drawers: Self closing epoxy coated steel bottom corner mounted with 80% extension. Rollers to be nylon with tempered steel axles. Drawer slides to have captive profiles to provide stable tracking and positive pullout stop with a secondary lock-out position. Load capacity to be 100 lbs. Standard drawer slides to have lifetime guarantee.
 - 2.4.6.2. File Drawers: Self closing epoxy coated steel bottom corner mounted with 100% extension. Drawer slides to have captive profiles to provide stable tracking and positive stop with a secondary lock-out position. Load capacity to be 150 lbs.
- 2.4.7. Adjustable shelf supports: Shelves to be supported by plated metal shelf rests which fit into pre-bored 5mm holes. Shelf rest holes to be bored by automatic computer controlled boring machine.
- 2.4.8. Locks: Drawer and hinged door locks to be disc tumbler cam locks in stainless steel finish, keyed alike and master keyed, with removable lock core for changing lock arrangements. Drawer cabinets which have locks that are keyed differently are to receive security panels located between drawers.
- 2.4.9. Wardrobe rod: 1-1/16" chrome plate steel rod supported by flanges.
- 2.4.10. Cabinet levelers: 3/8" Stem levelers attached to 4-hole steel mounting brace containing a strengthening rib for added reinforcement.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- 3.1.1. Employ only skilled and experienced workers under supervision of a competent foreman to install carpentry and millwork items.
- 3.1.2. Do all cutting and drilling of holes to accommodate work of the mechanical and electrical trades.
- 3.1.3. Provide metal nailing plugs to masonry division for fastenings to be built-in. Install wood strips and grounds, to true line and level.
- 3.1.4. Adequately fasten units together and secure with concealed fixings wherever possible. Install fitments level, plumb and true in all respects.

3.1.5. Install finish hardware for hollow metal doors.

3.2 INSTALLATION OF ACCESSORIES

3.2.1. Receive items from supplier and install in accordance with details and instructions. Protect from damage until final clean-up. Refer to Drawings to determine the quantity and types of items to be installed. Be responsible for locating and sizing recesses for recessed items.

3.2.2. Do all cutting, fitting and drilling of holes in woodwork for fitting of sinks, wash basins, faucets, pipes, ducts, vents, grilles and other items relating to plumbing and mechanical work.

END OF SECTION 06 20 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1. The Contractor shall ensure it, Subcontractors and trades doing work in this Section read and become familiar with those portions of the aforementioned Sections relating to their own work.

1.2 WORK SUMMARY

- 1.2.1. This Section includes the supply of:

1. Hollow metal doors for interior use (normal detail)
2. Reinforcing and preparation of hollow metal doors and frames for specified hardware.
3. Supply all necessary fastening and anchoring devices for above items.

- 1.2.2. Related work in other Sections:

1. 06 20 00 – Finish Carpentry.
2. 09 91 00 – Painting.

- 1.2.3. Refer to the Door Schedule and floor plans and details on the Drawings for the locations and quantities of the various types of doors and frames.

1.3 ULC REQUIREMENTS

- 1.3.1 Where fire doors are indicated in Door Schedule, both door and frame shall have attached labels indicating testing in accordance with American Society for Testing and Materials (ASTM) E-152 and manufactured according to Underwriters Laboratories of Canada (ULC) procedures under the Underwriters Laboratory factory inspection and labelling service.

- 1.3.2 Fire door installation shall comply with ULC requirements including metal gauge, core material, listed fire door hardware, overlapping steel astragals on pairs of doors (provided under this Section) within size limitations for glass, anchoring.

1.4 ACCEPTABLE MANUFACTURERS

- 1.4.1. Provided their materials and workmanship are in accordance with this Section and the detail Drawings, the following are acceptable fabricators of steel doors and frames:

1. Fleming Door Products Ltd.
2. Mar-Mat Door and Hardware Inc.
3. Commercial Doors and Hardware Inc.
4. Or Equivalent manufacturers who are members of the Canadian Steel Door and Frame Manufacturers' Association or an Equivalent association.

1.5 DESIGN AND PERFORMANCE REQUIREMENTS

- 1.5.1 Provide hospital stops and base, seamless door and frame construction, fully welded top galvanized steel top cap and airtight sealed inverted channel at bottom of door as shown on drawings for all doors and frames noted with Clean Details on Door Schedule.

- 1.5.2 Astragals at double doors only required at fire rated locations to be ULC requirements.

1.5.3 Provide temperature rise roods as noted on door schedule meeting the ULC requirements.

1.6 SUBMITTALS

1.6.1 Prepare and submit Shop Drawings in accordance with general conditions, and show the following:

1. Door and frame schedule.
2. Typical and special details.
3. Materials and finishes including each type of frame material, core thickness, reinforcements, glazing stops, glazing stop fasteners, exposed fastenings, finishes and fire ratings.
4. Hardware preparation including mounting heights, door swing.
5. Frame anchorage details.

1.6.2 Fire ratings indicated on the door schedule are the minimum required. If door design cannot be satisfied as specified, supply door and frame with higher rating.

1.7 PRODUCT HANDLING

1.7.1. Matchmark doors, panels, frames and screens. In no case will felt pen mark-up be acceptable unless in hinge reinforcement.

1.7.2. Deliver, store and handle components so as to prevent damage, distortion and corrosion. Store components off the ground and under cover in a dry, protected area. Stack doors and frames to prevent twisting. Do not enclose components in unvented plastic covers.

1.7.3. Remove damaged units, installed or not, and install new units. Replace or make good adjacent work damaged due to such replacement at no cost to Owner.

1.8 SCHEDULING

1.8.1. Schedule work so that metal frames are built in as walls and partitions are built. When this is not possible, substitute 'existing wall' type anchors for specified anchors, and where wrap around frame is required, substitute a three piece knocked-down frame with mechanical locking. Substitutions shall be made without additional cost to Owner.

1.9 WARRANTY

1.9.1. The Contractor shall submit a warranty as specified under Articles of Agreement and General Conditions of the Contract stating metal doors, frames and screens will remain free from all defects for a period of 2 years from Total Performance of the Contract.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1. Pressed steel door frames (NORMAL DETAIL):

1. Of 16 gauge (ga.) zinc coated steel for single exterior and all interior doors.
2. Of 14 ga. zinc coated steel for double exterior and interior doors.
3. Size and section as shown on Door Schedule and details.
4. Reinforcing of 10 ga. rolled steel, except 7 ga. for hinge reinforcement.

5. With adjustable metal jamb anchors at each jamb as follows:
 - a. One base type at floor plus three for frames to 7'-0" high.
 - b. One base type plus four for frames over 7'-0" high.
6. With rubber bumpers or mutes, three per strike jambs of single doors to 7'-0" high and 4 for doors over 7'-0" high, two at centre of head for double doors.

2.1.2. Interior hollow metal doors (NORMAL DETAIL):

1. Faces of 18 gauge wipe coat galvanized steel, minimum zinc coating .28 oz/ sq. ft. or 18 gauge cold rolled steel, commercial quality to ASTM A366-68.
2. 7 gauge reinforcing for hinges.
3. Steel stiffened.
4. Prepare doors and reinforce for hardware specified (minimum of 3 hinges per door).
5. Fitted with openings for glass with snap-in stops when shown.

2.2 METAL FABRICATION

2.2.1. Hollow metal doors of flush type:

1. Of mirror flat metal face construction with core laminated under pressure to face sheets without seams.
2. When insulated shall be of hollow steel construction with vertical stiffeners at 150 mm (6") centres, all voids filled solid with insulation.
3. Vertical edges bevelled and mechanically interlocked.
4. Top and bottom closures welded in place.
5. Refer to the hardware schedule on architectural Drawings and reinforce as required and according to templates supplied.

2.2.2. Pressed steel frames:

1. Double rebated type clean and normal details, refer to Drawings.
2. Jamb and head members having accurately cut mitres welded together.
3. Fitted with a channel or angle spreader bar at bottom.
4. Frames shall be full-profile welded.

2.2.3. Welded joints shall be ground flush and smooth.

1. Cut, reinforce, drill and tap, and provide metal guard boxes for hardware in accordance with templates and information provided by the hardware supplier. Install rubber bumpers on frames.
2. Maintain clearances between doors and frames as recommended by the Canadian Steel Door and Frame Manufacturers' Association.
3. Edge Clearances
 - a. For Normal Detail locations, unless otherwise specified or noted on Drawings, allow edge clearances as follows:
 - 1) Between door and frame 1/8" (1/4" for doors with Stainless Steel Guards)
 - 2) Between meeting edges of doors 7/16" (9/16" for doors with Stainless Steel Guard)

- | | | |
|----|---------------------------------|------------------------------------|
| 3) | At door sills without threshold | 1/2" between door and finish floor |
| 4) | At door sill with threshold | 3/8" between door and finish floor |

- b. Where hardware items are to be attached to, or mortised into, bottom edges of doors, provide proper clearance between door and floor or threshold to accommodate such hardware.

2.2.4. Hardware Preparation

1. Template hardware: prepare work in accordance with templates.
2. Reinforce doors and frames for concealed, mortised and surface mounted hardware. Steel reinforcing shall be positioned by welding and meet the minimum thickness requirements listed in Table 1, "Thickness for Steel Doors and Frames", published by the Canadian Steel Door and Frame Manufacturers' Association.
3. Drill and tap doors and frames for templated hardware.
4. Provide door closure reinforcement at exterior doors and frames whether closure is required by Hardware list or not.
5. Doors shall be prepared to receive hardware as listed on door schedule. Including preparation for concealed vertical rods where noted.
6. Prepare doors and frames for installation of hardware at the following heights:
 - a. Finish floor to centre of latchsets 42 inches
 - b. Finish floor to centre of locksets 42 inches
 - c. Finish floor to centre of strike 40 inches
 - d. Finish floor to centre of deadlocks 40 inches
 - e. Finish floor to centre of bottom butt 13 inches
 - f. Framehead rabbet to centre of top butt 10 inches
 - g. Middle butt(s) equal distance between top and bottom butts.

- 2.2.5. Prepare double doors as required where astragals are not used.

2.3 FINISHING

- 2.3.1. Cold rolled steel components, after assembly, shall be thoroughly cleaned and given factory coat of rust inhibitive zinc chromate primer.
- 2.3.2. Zinc coated components shall have coating touch up with zinc chromate primer where damaged by welding or fabrication.
- 2.3.3. Ensure finish coats of paint, will be applied at Site by painting Subcontractor.

PART 3 - EXECUTION

3.1 EXAMINATION

- 3.3.1. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- 3.3.2. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

3.3.3. Prepare written report, endorsed by installer, listing conditions detrimental to performance of the Work.

3.3.4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

3.2.1. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

3.2.2. Drill and tap doors and frames to receive non templated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

3.3.1. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.

3.3.2. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with Steel Door Institute (SDI) A250.11 or National Association of Architectural Metal Manufacturers (NAAMM) HMMA 840 as required by standards specified.

3.3.2.1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

1. At fire-rated openings, install frames according to National Fire Protection Association (NFPA) 80.
2. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
3. Install frames with removable stops located on secure side of opening.
4. Install door silencers in frames before grouting.
5. Remove temporary braces necessary for installation only after frames have been properly set and secured.
6. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
7. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.

3.3.2.1. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

1. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3.3.2.2. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.

3.3.2.3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.

3.3.2.4. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.

- 3.3.2.5. In-Place Concrete or Masonry Construction: Secure frames in place with post-installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
- 3.3.2.6. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
- 3.3.2.7. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - 1. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - 2. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - 3. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - 4. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

3.3.3. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

3.3.3.1. Non-Fire-Rated Steel Doors:

- 1. Between Door and Frame Jambs and Head: 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).
- 2. Between Edges of Pairs of Doors: 1/8 inch (3.2 mm) to 1/4 inch (6.3 mm) plus or minus 1/32 inch (0.8 mm).
- 3. At Bottom of Door: [3/4 inch (19.1 mm)] [5/8 inch (15.8 mm)] plus or minus 1/32 inch (0.8 mm).
- 4. Between Door Face and Stop: 1/16 inch (1.6 mm) to 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).

3.4 ADJUSTING AND CLEANING

3.4.1. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

3.4.2. Remove grout and other bonding material from hollow-metal work immediately after installation.

3.4.3. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in Section 09 91 00.

END OF SECTION 08 20 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1. The Contractor shall ensure that it, Subcontractors and trades doing work in this Section read and become familiar with those portions of the aforementioned Sections relating to their own work.

1.2 WORK SUMMARY

- 1.2.1. This Section includes:

1.2.1.1. Gypsum Wallboard (regular drywall, fire-rated drywall and Fiberock Aqua Tough or Equivalent board installed:

1. For partitions over metal studs.
2. For wall facings on metal furring over masonry walls.
3. For gypsum board ceilings.

1.2.1.2. 12 gauge metal stud reinforcement for wall hung items typical.

1.2.1.3. Install metal door frames and interior hollow metal window frames in gypsum board partitions.

1.2.1.4. Related work in other Sections:

1. 09 51 23 – Lay-In Panel Ceiling.

1.3 DESIGN AND PERFORMANCE CHARACTERISTICS

- 1.3.1. Examine the Drawings to determine if, and where, fire resistance ratings are required for the building construction. Comply in all respects to the specified Underwriters' Laboratories of Canada (ULC) Design Numbers on the Drawings, particularly in regard to the manufacture size, thickness and installation of gypsum wallboard sheets, the finishing and backing of joints and the size, gauge, spacing and fastening of steel furring channels & other supports. Fire rated construction shall conform to all requirements of Underwriters' Laboratories designs to provide the required fire resistance ratings. Submit written proof of construction meeting ULC design.

- 1.3.2. Sound rated assemblies: Sound Transmission Coefficient (STC) rating tested in accordance with American Society for Testing and Materials (ASTM) E90-83 and classified according to ASTM E 413 by an independent testing agency.

- 1.3.3. Metal furring and gypsum wallboard shall comply with the requirements of Canadian Standards Association (CSA) A82.27-M1977, A82.30-M1980 and A82.31-M77 unless otherwise specified herein. Where notes in italics occur in CSA and are recommendations to this work, they shall be followed, but notes suggesting substitutes may not be followed unless approved by the Consultant.

1.4 DELIVERY, STORAGE AND HANDLING

- 1.4.1. Gypsum board and cementitious materials shall be kept under cover and free from dampness and temperature extremes.

- 1.4.2. Deliver and store corner beads, casing beads and similar items in crates to prevent damage to the material.

1.5 PROTECTION

- 1.5.1 Protect surrounding surfaces against damage. Use York Region approved means as required to ensure adequate protection.

1.6 ENVIRONMENTAL CONDITIONS

- 1.6.1. Install gypsum board and cement board when temperature of surrounding area is between 13 Celsius and 21 Celsius continuously from 24 hours before installation until 48 hours after filling of joints is complete.
- 1.6.2. Maintain ventilation and air circulation to eliminate excessive moisture.
- 1.6.3. Report unsatisfactory conditions to the Consultant and do no work until proper conditions are established.

PART 2 - PRODUCTS

2.1 ALTERNATIVES

- 2.1.1. Providing their products comply with the requirements of this Section: Acceptable manufacturers or suppliers of gypsum wallboard, cement board and related accessories are:

1. Canadian Gypsum Co. Ltd.
2. Domtar Construction Materials Ltd.
3. Westroc Industries Limited.
4. Unifix Inc. (cement board).
5. Or Equivalent.

- 2.1.2. Acceptable manufacturers or suppliers of metal studs and metal framing components are:

1. Any of the companies specified above.
2. Preston Metal and Roofing Products Ltd.
3. Or Equivalent.

- 2.1.3. Where a fire resistance rating with a design number is required, manufacturers must show that their products are acceptable for that particular design.

- 2.1.4. The various types of gypsum wallboard, joint compound, tape and other drywall accessories used throughout shall be by one manufacturer.

2.2 MATERIALS – GYPSUM BOARD SYSTEM

- 2.2.1 Anchors for Hangers: 'KWIK-BOLT' tie wire anchors, 1 ¼" x ¼" manufactured by Hilti Fastening Systems Limited or Equivalent. Neither Drive-Pin or similar type nor power actuated fasteners are to be used.

- 2.2.2 Hangers: galvanized mild steel pencil rods, 3/16" dia. For support of one layer of gypsum board and ¼" dia. where more than one layer of gypsum board is to be supported. Maximum spacing of all rods is 5'-0" o.c.

- 2.2.3 Runner channels: 1 ½" deep x ¾" wide x 0.057" thick cold rolled steel channels by Bailey Metal Products

Ltd., or Equivalent.

- 2.2.4 Furring channels: screw type, 7/8" deep x 2 3/4" wide x 0.035" thick cold rolled steel channels by Bailey Metal Products Ltd., or Equivalent.
- 2.2.5 Tie wire: 0.048" annealed and galvanized steel.
- 2.2.6 Steel Studs for regular drywall and Aqua Tough: 3 5/8" wide unless otherwise noted, 22 gauge, 18 gauge for exterior applications, hot dipped galvanized steel sheet, for self-drilling screws, by Bailey Metal Products Ltd., or Equivalent.
- 2.2.7 Reinforce jambs, header of doors, and locations required for wall reinforcement due to wall hung items within the partitions with 12 gauge metal jambs, studs and headers as detailed.
- 2.2.8 Steel partition runners: channel 0.03" thick, hot dipped galvanized steel, by Bailey Metal Products Ltd.
- 2.2.9 Corner Beads: 1 1/4" x 1 1/4" expanded flanges, 0.021" thick, galvanized steel by Bailey Metal Products Ltd., or Equivalent.
- 2.2.10 Casing beads: channel type casing, galvanized steel, size to suit thicknesses of drywall, by Bailey Metal Products Ltd. or Equivalent
- 2.2.11 Control joints: Sheetrock zinc control joint #093 by Canadian Gypsum Company or Equivalent.
- 2.2.12 Drywall and accessories: Paperless moisture-resistant gypsum board with tapered edges, conforming to CSA A82.27-M1977, and as specified in the paragraphs below. Sizes: 4'-0" wide and in lengths to minimize the number of joints.
- 2.2.13 Gypsum board: for walls 1/2" thick wallboard, unless otherwise noted. Provide mold resistant Aqua Tough or Equivalent gypsum board in all washroom locations or walls ready to receive wall tile.
- 2.2.14 Screws: type 'S' self-drilling, self tapping steel drywall screws for use with power operated driver.
- 2.2.15 Joint tape and joint treatment materials: Fibre Tape as recommended by manufacturer of the gypsum board.
- 2.2.16 Sealant (fire resistant): PRC Chemicals PR 855 or Equivalent.
- 2.2.17 Foam tape: foamed vinyl, self adhesive, 1/8" thick.
- 2.2.18 Laminating Adhesive: as recommended by the manufacturer.

2.3 LOCATION

- 2.3.1. Refer to finish schedule and the drawings for location of drywall walls.

2.4 VERIFICATION

- 2.4.1. Examine site for compatibility of execution of work under this section. Commencement of work shall be considered as acceptance of conditions.
- 2.4.2. Preparation of surfaces to be done in accordance with manufacturer's specifications. Surfaces must be

clean, free of all deleterious substances that would affect the adhesion of compounds. If conditions are not met, a written report shall be immediately submitted to the Consultant and the work shall be stopped until conditions are rectified.

2.5 COORDINATION

2.5.1. Prior to commencing installation, check that all overhead architectural, mechanical and electrical work is complete and that work area is free from excessive moisture.

2.5.2. After installation of light fixtures, diffusers etc., check ceiling and make good ceiling deficiencies.

2.6 STEEL STUD PARTITIONS

2.6.1. Refer to Drawings for extent and location of steel stud partitions.

2.6.2. Install steel studs in strict accordance with the manufacturer's printed instructions.

2.6.3. Where metal studs extend to underside of structure above provide minimum 3/8" clearance between top of studs and channel runners to avoid transmission of structural loads to studs and fill with firestop.

2.6.4. Provide control joints in wallboard surfaces at maximum 20'-0" as per Shop Drawings approved by the Consultant. Provide 6 mil thick polyethylene strip 4" wide continuous behind control joints. Provide double studs at joints. Attach polyethylene strips and control joints on both flanges of studs along entire length of joints.

2.6.5. Align and secure channel runners at floor and at underside of structure or suspended ceiling over, set plumb and true to line vertically and horizontally, according to partition layout indicated on drawings. Secure in place with suitable fasteners located 2" from each end and spaced 16" on center (o.c.) or to suspended ceilings with toggle bolts or molly bolts spaced 16" o.c.

2.6.6. Position and secure steel studs vertically into runner channels at 16" o.c., and not more than 2" from abutting walls, openings and each side of corners.

2.6.7. Supply accessories required to complete the installation including, extension, reinforcing channels and anchors.

2.6.8. Provide double studs at each side of openings and at corners. Reinforce at 24" centres with 24" long horizontal reinforcing channels.

2.6.9. Install continuous double studs, on both sides of all door frames extending from floor to ceiling runner.

2.6.10. Build into stud framing pressed metal door frames and pressed metal screens using anchors furnished with frames. Set true and plumb and leave ready for hanging of doors and glazing.

2.6.11. At all locations where wall mounted fitments, fixtures, grab bars and other accessories occur set double 1½" steel channels between studs at proper height for securing of units.

2.6.12. Where noted install thermal insulation batts and vapour barrier in partitions between studs full height of all partitions whether extending to underside of structure above or to underside of ceiling. Secure in place with staples at 18" o.c. along vertical edges and at quarter points along vertical centre line.

2.7 INSTALLATION – (GENERAL)

- 2.7.1. Apply drywall with screws spaced at 12" o.c. at mid panel and at edges, staggered, no closer than 3/8" from edges and ends driven slightly below the surface leaving a shallow dimple.
- 2.7.2. Cut all openings with saw leaving square edges.
- 2.7.3. Loosely butt all joints to be taped.
- 2.7.4. Stagger all end joints and the joints between panels to achieve a maximum of bridging and a minimum of continued joints. Stagger joints on opposite sides of partitions.
- 2.7.5. Stiffen partitions over 8'-4" in height at maximum 5'-0" o.c. with at least a 1 3/4" horizontal bracing channel extending the full length of partition.
- 2.7.6. Adhesive bonded gypsum board: apply 1/2" x 1/2" ribbons of laminating adhesive to back side of board, parallel to long dimension. Space adhesive ribbons at maximum 6" o.c. Temporarily brace boards until complete adhesive bond develops.
- 2.7.7. Where double layer gypsum board is required, screw fasten second layer through first, into framing, offset joints.

2.8 INSTALLATION – METAL TRIM

- 2.8.1. The Drawings do not purport to show all metal trim required; verify with the Consultant the precise locations and types of trim to be used.
- 2.8.2. Carefully inspect the drawings and verify location of all metal trim required.
- 2.8.3. Install all trim in strict accordance with the manufacturer's recommendations paying particular attention to make all trim installation plumb, level and true to line with firm attachment to supporting members.
- 2.8.4. Reinforce all vertical projecting angles, vertical and horizontal exterior corners with metal corner beads fastened with staples 9" o.c. on both flanges along entire length of beads. All vertical reinforcing to be in one piece full height.
- 2.8.5. Where gypsum wallboard assembly terminates against concrete, masonry, windows, hollow metal screens, door frames or other dissimilar material, install metal casing bead to stop the wallboard and form proper junction. Secure at 12" o.c. along entire length of beads. Beads shall be in one length up to 10'-0" and no lengths shall be less than 6'-0". Mitre and fit corners and junctions accurately and free from rough edges, suitable for taping and finishing.

2.9 TAPING AND FINISHING

2.9.1. Environmental Conditions:

- 1. Control heating and ventilating during finishing operations to ensure the maintenance of 13 deg. C minimum temperature.

2.9.2. First Coat:

- 1. Spread compound evenly over all joints, using suitable tools designed for the purpose.
- 2. Fill all joint recesses and metal trim.

3. Centre the reinforcing fibre tape on the joint and press into the fresh compound, wiping down with sufficient pressure to remove excess compound but leaving sufficient compound under the tape for proper bond.
4. Feather all edges and leave the surface free from blisters and tape wrinkles.
5. Apply compound to all fastener recesses, metal trim and control joints, leaving flush with the adjacent surfaces.
6. Fold reinforcing tape along its centreline and apply to all interior angles, following the same procedure as for joints

2.9.3. Second Coat:

1. Lightly sand the dry compound with fine sandpaper to remove all irregularities.
2. Apply a second coat of compound to all joints, feathering approximately 3" beyond edges of tape.
3. Apply second coat to all fastener recesses, metal trim and control joints; allow to dry.

2.9.4. Third Coat:

1. Lightly sand the dry compound with fine sandpaper to remove all irregularities.
2. Apply final skim coat, feathering out approximately 2" beyond second coat.
3. Third coat all fastener recesses, metal trim, control joints and all interior angles; allow to dry.
4. Carefully sand the third coat to a uniform smooth surface completely free from irregularities visible to the unaided eye at a distance of 5'-0".

2.10 INSTALLATION – HOLLOW METALWORK

- 2.10.1. Install hollow metal frames in drywall partitions.

2.11 INSTALLATION – EXPANSION JOINTS

- 2.11.1. Install expansion joints, supplied by others, as indicated on the Drawings.

PART 3 - CLEANING

3.1 GENERAL

- 3.1.1. Remove debris and surplus materials from Site upon completion of work and as required during installation.
- 3.1.2. Clean all spilled or misplaced material.

END OF SECTION 09 10 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- 1.1 The Contractors shall ensure that it, Subcontractors and trades doing work in this Section read and become familiar with those portions of the Sections relating to their own work.

1.2 WORK SUMMARY

- 1.2.1 This Section includes:

1. Porcelain floor tiles and base.
2. Tile accessories and trims.
3. Materials relating to the installation.

- 1.2.2 Related work in other Sections:

1. 09 68 13 – Carpet Tile Flooring and Base

1.3 SUBMITALS

- 1.3.1. Submit manufacturer's Product Data sheets for Product data sheets for Products proposed for use in the work of this section.
- 1.3.2. Submit samples of each pattern and colour of porcelain tile proposed for use in the work of this section.
- 1.3.3. Submit Shop Drawings to show layout treatment at walls, floor drains and other objects. Indicate details of proposed treatment, where flooring materials meet other floor materials.
- 1.3.4. Provide data sheets for maintenance of flooring for incorporation into maintenance manual.

1.4 MAINTENANCE

- 1.4.1. Supply to York Region:

1. In addition to tile to be installed under this Contract, supply 25 uncut tiles. Pack in clean cartons, with contents marked on affixed labels, and give to York Region at completion of work.
2. Maintenance material to be same production run as installed materials.

1.5 ENVIRONMENTAL REQUIREMENTS

- 1.5.1. When air temperature is close to, or below, 13 degrees Celsius, arrange for the Contractor to provide heat to maintain a minimum 13 degrees Celsius temperature continuously from 72 hours prior to beginning installation until 7 Days have elapsed following completion of installation.
- 1.5.2. Concrete shall be prepared utilizing American Society for Testing and Materials (ASTM) F710, Practice for Preparing Concrete Floors and other Monolithic Floors to Receive Resilient Flooring.

1.6 DELIVERY, STORAGE AND HANDLING

- 1.6.1. Ship all materials to Site in sealed, labelled containers. Compounds shall have instructions for use and mixing.

1.6.2. Store in dry location within the building until opened for use.

1.6.3. Lock room or otherwise prevent traffic over newly completed tile floors for 72 hours.

1.7 WARRANTY

1.7.1 Warrant work of this section for a period of 2 years commencing on Total Performance of the Contract.

PART 2 - PRODUCT

2.1 MATERIALS - TILE

2.1.1 Porcelain Floor Tile – General Area – Cert “A”

1. Tiles shall comply with requirements of Canadian General Standards Board (CGSB) 75-GP-1 current edition and be of type and class suitable for various parts of the work
2. Porcelain floor tile and base shall be Nustone 305mm x 610mm #GMR 81M 1224N; or GMR 88M 1224N (Light Colour) or Equivalent. Grout to be TEC #931, Standard White (Off White) or Equivalent. Refer to room finish schedule on the Drawings for location.
3. Provide zinc terminating strip at edges of ceramic tile meeting change of finish and top of wall base.

2.1.2 Porcelain Wall Tile – Washroom Area W-1:

1. Tiles shall comply with requirements of CGSB 75-GP-1 current edition and be of type and class suitable for various parts of the work
2. Ceramic Wall tile to be Dark Grey Mote by Olympia Tile – Stack Bond or Equivalent. Grout – TEC #927 Light Pewter (Grey) or Equivalent. Refer to room finish schedule for location.

2.1.3 Porcelain Wall Tile – Accent Wall W-3:

1. Tiles shall comply with requirements of CGSB 75-GP-1 current edition and be of type and class suitable for various parts of the work
2. Porcelain wall tile shall be 72mm X 150 mm Arctic White Matte by Olympia Tile – Stack Bond or Equivalent. Grout – Mapei #38 Avalanche or Equivalent. Refer to room finish schedule for location.

2.2 MATERIALS – GROUND AND ADHESIVES

2.2.1 Acceptable Manufacturers:

1. Ardex.
2. Flextile Ltd.
3. LATICRETE International, Inc.
4. MAPEI Corp.
5. TEC Specialty Products, Inc.
6. Or Equivalent

2.2.2 Setting Adhesives: Interior Applications:

1. Portland cement/sand/latex mixture, to American National Standards Institute (ANSI) A118.4 and with minimum shear bond (porcelain tile, immersion and dry 28 day cure tests) of 2.3 MPa (340 psi) when tested to ANSI A118.4 (ANSI A108/A118/A136.1-2013)
2. Acceptable products:
 - a. Ardex Group X77 Microtex Fibre Reinforced.
 - b. Flextile Ltd. '51' mixed with Flextile '44'.
 - c. Laticrete International Inc. 'Laticrete 4237 Latex Thin Set Liquid' with 'Portland 211 Crete Filler Powder'.
 - d. MAPEI Corp. 'KERALASTIC' mixed with 'KERABOND'.
 - e. Tec Specialty Products, Inc. 'Super Flex Latex-Modified Thin Set Mortar'.
 - f. Or equivalent

2.2.3 Grout:

1. Sanded polymer-modified, latex modified, non-shrink, ANSI A118.6 and ANSI A118.7.
 - g. Ardex 'FL Rapid Set, Flexible Sanded'.
 - h. Flextile '600'.
 - i. Laticrete '1500 Series' mixed with '1776 Grout Admix'.
 - j. Mapei 'Keracolor S'.
 - k. TEC Specialty Products, Inc. 'AccuColour Premium Sanded'.
 - l. Or Equivalent
2. Unsanded, polymer-modified, latex-modified, non-shrink, ANSI A118.6 (ANSI A108/A118/A136.1-2013) and ANSI A118.7 (ANSI A108/A118/A136.1-2013).
 - m. Ardex 'FG-C Microtec (unsanded)'.
 - n. Flextile '500'.
 - o. Laticrete '1600 Series' mixed with '1776 Grout Admix'.
 - p. Mapei 'Keracolor U'.
 - q. TEC Specialty Products, Inc. 'AccuColour Premium Unsanded'.
 - r. Or Equivalent
3. Epoxy to ANSI A108/A118/A136.1-2013
 - s. Ardex 'WA Epoxy Grout and Adhesive'.
 - t. Flextile '100 Flex-Epoxy 100% Solids Epoxy Grout'.
 - u. Laticrete 'SpectraLOCK™ PRO Grout'.
 - v. Mapei 'Kerapoxy' and Kerapoxy CQ'.
 - w. TEC Specialty Products, Inc. '100% Solids Epoxy Mortar and Grout'.
 - x. Or Equivalent
4. Scratch coat (by volume): 1 part Portland cement, 4 parts sand, and latex additive where required by Terazzo Tile and Marble Association of Canada (TTMAC) Detail. Premixed mortar may be used in accordance with manufacturer's instructions. Adjust water volume depending on moisture content of sand to obtain consistency and workability.
5. Slurry bond coat: mix Portland cement and water to a creamy paste consistency. Include latex additive where required by TTMAC Detail.
6. Mortar bed for walls (by volume): 1 part Portland cement, 4 parts sand, and latex additive where required by TTMAC Detail. Premixed mortar may be used in accordance with manufacturer's instructions. Adjust water volume depending on moisture content of sand to obtain consistency and workability.
7. Levelling coat (by volume): 1 part Portland cement, 4 parts sand, and latex additive where required by TTMAC Detail. Premixed mortar may be used in accordance with manufacturer's instructions.
8. Mortar bed for floors; where applicable: 1 part cement, 4 parts sand, 1 part water. Water volume may be adjusted depending on water content of sand.

2.3 MATERIALS – ACCESSORIES

- 2.3.1 Waterproofing membrane per manufacturers recommendations.
- 2.3.2 Cleavage membrane: 0.11 mm (0.004") thick polyethylene film, to CAN/CGSB 51.34- M86 (amended 1988).
- 2.3.3 Reinforcing wire fabric: galvanized welded wire fabric, 50 mm (2") x 50 mm (2"), WO.3 x WO.3 (16 ASW gauge or 1.6 mm (0.0625") diameter, to ASTM A1064/A1064M-15 and ASTM A1064/A1064M-15, except for minimum wire size.
- 2.3.4 Sealant: to CAN/CGSB 25.20-95 and tile and grout manufacturers' recommendations, colour selected by the Consultant.
- 2.3.5 Shower Thresholds: white carrera, 19 mm (3/4") thick, bevelled edges two sides, honed finish on exposed surfaces, size to suit opening and frame width.
- 2.3.6 Transition strips: purpose made metal extrusion, anodized aluminum.
- 2.3.7 Reducer strips: purpose made extrusions, anodized aluminum, maximum slope of 1:2.
- 2.3.8 Prefabricated movement joints: purpose made, having a Shore A Hardness of not less than 60 and elasticity of $\pm 40\%$ when used in accordance with TTMAC Detail 301EJ- 2002.
- 2.3.9 Floor sealer and protective coating: to tile and grout manufacturers' recommendations.
- 2.3.10 Water vapour reduction system:
 - 1. 100% solids epoxy one coat system, 0 Volatile Organic Compounds (VOC), suitable for application to 100% Relative Humidity (RH) floors per ASTM F2170-11, designed to protect moisture sensitive adhered flooring systems from elevated moisture and alkalinity levels, warranted by manufacturer to cover subsequent flooring materials and labour, compatible with finish flooring products.
 - 2. ASTM E96/E96M-10 water vapour transmission (wet methods) performance shall be documented by independent testing laboratory at a minimum 97% for water vapour transmission reduction compared to untreated concrete.
 - 3. ASTM E96/E96M-10 perm rating shall not exceed a 0.10 Perm rating.
 - 4. ASTM D1308-02(2013) insensitivity to alkaline environment up to, and including, pH 14 in a 14 day bath test.
 - 5. Manufacturer certifies acceptance and exposure to continuous topical water exposure after final cure.
 - 6. Water vapour reduction system shall be a single coat, stand-alone system with no requirements for additional components such as sand broadcast for adhesion of flooring systems.
 - 7. System shall reduce Calcium Chloride readings of up to 25lbs/1000 ft²/24 hours by 97% in one coat. System must be able to perform as required with RH Probe readings of 100%.

PART 3 - EXECUTION

3.1 EXAMINATION

- 3.1.1. Examine surfaces over which tile is to be installed and report to the consultant any surfaces not suitable as a backing, irregularities in line and discrepancies from consultants' drawings. Do not proceed with installation until faulty work is corrected.
- 3.1.2. Installation of tile work shall be only by contractors who are active Members of the Terrazzo, Tile and

Marble Association of Canada, familiar with standard details and installations recommended by the T.T.M.A.C.

3.2 TILE LAYOUT

- 3.2.1. Neatly cut tiles at fitments, fixtures, pipes and drains. Form intersections, corners and returns accurately. Grind edges of quarry tiles adjoining control joints.
- 3.2.2. Keep joints between tiles to uniform width, subject to normal variance in tile size. Do grouting neatly without cracks, voids and excess grout.
- 3.2.3. Plan layout of tile before setting to give symmetrical pattern with joints lining in both directions unless otherwise shown on drawings. Patterns shall be uninterrupted at doorways, windows, other openings and obstructions.
- 3.2.4. Sound tile after setting and remove and replace hollow backed tile. Replace broken or damaged tile.
- 3.2.5. In floors, locate control joints 1/8" wide.

3.3 CLEANING AND POLISHING

- 3.3.1 Clean excess grout off tiles as work progresses.
- 3.3.2 For final clean-up, refer to General Requirements.

3.4 PROTECTION

- 3.4.1 Prohibit traffic on floor for 48 hours after installation.
- 3.4.2 Install floor protection in areas where other work, repairs and installation of equipment, and foot traffic will occur.

3.5 PREPARATION

- 3.5.1 Water vapour reduction system:
 - 3.5.1.1 Where concrete substrate exhibits higher than permitted moisture and alkalinity levels, provide water vapour reduction system to protect moisture sensitive flooring system from elevated moisture and alkalinity levels.
 - 3.5.1.2 Shot blast floors to the International Concrete Repair Institute (ICRI) Concrete Surface Profile (CSP) #3 or #4 and clean surfaces with an industrial vacuum cleaner and remove residues from the substrate. Grinding is allowed only in areas not accessible by shot blasting. Remove defective materials, and foreign matter such as dust, adhesives, levelling compounds, paint, dirt, floor hardeners, bond breakers, oil, grease, curing agents, form release agents, efflorescence, laitance, and other deleterious substances. Repair cracks, expansion joints, control joints, and open surface honeycombs and fill in accordance with water vapour reduction system manufacturer's recommendations.
 - 3.5.1.3 Reinforcing fibres, if applicable, that are visible after shot blasting shall be removed and vacuumed leaving no fibres left on the concrete surfaces.
 - 3.5.1.4 Repair concrete prior to moisture vapour reduction system installation by using water vapour reduction system manufacturer's recommended

bonding emulsion with approved concrete repair materials. Comply with requirements as listed in water vapour reduction system manufacturer's technical data information. Consult with vapour reduction manufacturer.

3.5.1.5 Shot blast a small test area and review surface profile with the finished flooring applicator. As the water vapour reduction system is not a levelling material, provide feather finish or levelling material to "flatten" or level the water vapour reduction system treated concrete prior to the flooring installation.

3.5.1.6 Apply moisture vapour reduction system monolithically to manufacturer's recommended spreading rate in number of coats to achieve manufacturer's recommended thickness.

3.5.1.7 Consult with vapour reduction manufacturer and comply with requirements as listed in water vapour reduction system manufacturer's technical data information.

3.5.1.8 Review surface profile with the finished flooring applicator. As the water vapour reduction system is not a levelling material, provide feather finish or levelling material to "flatten" or level the water vapour reduction system treated concrete prior to the flooring installation. Flooring installation shall not show telegraphing of substrate. Flooring installation shall be homogenous free of substrate lines, pockets, bumps and unevenness.

3.5.1.9 Verify proper adhesion of flooring adhesives, coatings, and levelling compounds to the final vapour reduction coating system for acceptability.

3.5.1.10 Do not proceed with finished flooring installation if moisture vapour Transmission exceeds maximum permitted rates.

3.5.2 Wall surfaces:

3.5.2.1 Roughen surfaces with previously painted glossy finishes by sandpaper or other abrasive medium, and completely remove finishes which are not compatible with products specified under this section.

3.5.2.2 Completely remove contaminants and deleterious substances and debris which may prevent, reduce, and affect adhesion or performance or may act as bond breaker.

3.5.2.3 Prime gypsum, wood or porous concrete with primer, brush or roller applied at full strength in accordance with adhesive manufacturer's recommendations.

3.5.3 Floor surfaces:

3.5.3.1 Completely remove contaminants and deleterious substances and debris which may prevent, reduce, and affect adhesion or performance or may act as bond breaker.

3.5.3.2 Concrete shall be minimum of 120 days old or cured to the satisfaction of TTMAC substrate standards.

3.5.3.3 Wire brush steel substrates to remove deleterious substances and rust, to promote full adhesion to steel.

3.6 MIXING

- 3.6.1 Mix mortars, additives and grouts in accordance with manufacturer's requirements.
- 3.6.2 Rotating blade mechanical mixer: Pour latex additive, start mixer and add sand first, followed by Portland cement. Mix no mortar in same mixer as a dissimilar type of mortar unless the mixer is first thoroughly washed clean.
- 3.6.3 Pail batch mixing with low revolution drill mixers as follows:
 - 1. Premix separately prior to adding to the latex additive.
 - 2. Pour latex additive into clean mixing vessel and add dry materials slowly while mixing into a homogeneous and smooth consistency.

3.7 INSTALLATION - GENERAL

- 3.7.1 Install Products in accordance with manufacturer's specifications and as indicated in this Section.
- 3.7.2 Install in accordance with TTMAC Tile Installation Manual 2012-2014, except where specified otherwise in the Contract Documents.
- 3.7.3 Install in accordance with ANSI A108.5 (ANSI A108/A118/A136.1-2013) and ANSI A108.10 (ANSI A108/A118/A136.1-2013).
- 3.7.4 Lay out tile work as indicated on the Drawings, and where lay-out not indicated, lay-out tiles so tiles less than 1/2 the least dimension do not occur and with minimum amount of cutting.
- 3.7.5 Make joints even, straight, plumb and of uniform width.
- 3.7.6 Provide uniform positive slope to floor drains, to minimum allowable slope of 20 mm/m (1/4 inch/ft).
- 3.7.7 Provide edge protection at tile edges and corners, unless otherwise indicated, using maximum length pieces.
- 3.7.8 Provide edge protection and transition strips at tile transitions, unless otherwise indicated in the Contract Documents, using maximum length pieces.
- 3.7.9 Lap tile at inside corners and seal around doors. Apply sealant in accordance with Section 07 92 00 and manufacturer's instructions. Sealant colour to later selection by the Consultant.
- 3.7.10 Install flooring to entire area indicated or scheduled in the Contract Documents, including cover plates occurring within finished floor areas. Maintain overall continuity of colour and pattern with pieces of flooring installed on cover plates. Tightly butt edges to perimeter of floor around cover plates and to cover plates. Do not install flooring to floor drains occurring within finished floor areas.
- 3.7.11 Review locations of tile accessories with the Consultant prior to setting tile and comply with directions of the Consultant.

3.8 SETTING

- 3.8.1 Using a damp towel, wipe off the back side of floor tile to remove any dust or other residue that may be left over from the manufacturing process.

- 3.8.2 Place as much tile as possible in one operation before setting bed reaches initial set. Clean back and remove bed when it has set before tile is laid.
- 3.8.3 Prime materials and by methods specified by manufacturer of bond coat.
- 3.8.4 Line up joints between tile installed on stairs from tread to tread.
- 3.8.5 Except where tiles have setting tabs, and except for expansion, control and isolation joints, maintain joint widths as selected by the Consultant.
- 3.8.6 Back up tile coves, curbs and other shaped pieces solid with mortar. Rigidly set, reinforce or otherwise make firm and secure such pieces.
- 3.8.7 Beat tiles in thoroughly and sufficiently to cause mortar ribs or notches to come together into a continuous void free bed and allow the mortar to flow up partially into the joint space to maximum of 1/3 the thickness of the tile. Sound floor tiles by tapping and reset all tiles with voids in setting bed.
- 3.8.8 Tile shall contact setting materials for minimum of 95% coverage.
- 3.8.9 Obtain 100% mortar coverage with applicable requirements for back buttering of tile in referenced TTMAC and ANSI A108/A118/A136.1-2013 series of tile installation standards for the following:
 - 1. Tile in wet areas:
 - 2. Tile installed with chemical resistant mortars and grouts.
 - 3. Tile having tiles 300 mm (12") or larger in any direction.
 - 4. Tile having tiles with raised or textured backs.
 - 5. Tile having tile installation rated for Heavy or Extra Heavy Duty.
 - 6. Porcelain tiles with more than 20% of the tile backs covered with firing release dust back buttered so that 100% of the back is covered with adhesive mortar rated for C627, Extra Heavy Duty rating.
- 3.8.10 Remove any excess setting material from the joint area so that 2/3 of the depth of the tile is available for grouting.
- 3.8.11 Remove smudges or smears of setting material from the tile surface with a damp sponge or cloth immediately after final adjustment and beat-in while the mortar is fresh.
- 3.8.12 Do necessary cutting and drilling of fixtures, fittings, and built-in or penetrating units without marring the tile. Replace all cracked or damaged tile.
- 3.8.13 Form external angles with round edge tile extending over edge of square edge adjacent tile. Internal angles shall be formed square, carrying 1 flat tile past edge of other.
- 3.8.14 Extend tile into recesses at windows, doors, or other openings.
- 3.8.15 Extend tiles 100 mm (4") behind mirrors, and fully behind cabinets, cupboards and other fixed objects at walls.
- 3.8.16 Cut tiles to conform to irregularities in wall lines and vertical planes along outer edges. Smooth cut edges with carborundum block or by other means to provide clean straight edge.
- 3.8.17 At floor drains in mortar bed: Provide minimum setting bed of 10 mm (3/8"), sloped to drain at 6 mm (1/4") in 305 mm (12").

3.9 WATERPROOFING INSTALLATION

3.9.1 Install waterproofing membrane in shower areas in accordance with manufacturer's instructions.

3.10 CRACK SUPPRESSION MEMBRANE (CRACK ISOLATION MEMBRANE) INSTALLATION

3.10.1 Install membrane in accordance with manufacturer's instructions.

3.10.2 Prepare substrate in accordance with manufacturer's instructions.

3.10.3 Install crack suppression membrane to substrates for tile flooring installations located on suspended structural floor assemblies. Treat substrate with full coverage of crack isolation membrane and reinforcement in accordance with crack isolation membrane manufacturer's installation instructions.

3.11 MORTAR-BED TILING

3.11.1 Verify 25 mm (1") nominal bed thickness has been allowed. Apply latex-Portland cement thin bed mortar with flat trowel as a slurry bond coat approximately 1.5 mm (1/16") thick over clean concrete slab in compliance with current revision of ANSI A108.1 (ANSI A108/A118/A136.1-2013) (A-1 through A-3; A-4.1a.5.2).

3.11.2 Place latex-Portland cement thick bed mortar over slurry bond coat while bond coat is wet and tacky. Omit reinforcing wire fabric and fully compact bed by tamping.

3.11.3 Spread latex-Portland cement thin bed mortar with flat trowel over surface of "green"/fresh mortar bed as a slurry bond coat approximately 1.5 mm (1/16") thick.

3.11.4 Apply latex-Portland cement thin bed mortar slurry bond coat to back of tile or threshold and place each piece/sheet while slurry bond coats are wet and tacky. Beat with a hardwood block or rubber mallet to level/imbed pieces before mortar bed takes initial set.

3.11.5 Clean excess mortar/adhesive from finished surfaces.

3.11.6 For installation of tile over cured (pre-floated) latex-Portland cement thick bed mortar, follow Thin Bed Method.

3.12 THIN SET METHOD

3.12.1 Install thin-set mortar in compliance with current revisions of ANSI A108.1 (ANSI A108/A118/A136.1-2013) (A-1 through A-3) and ANSI A108.5 (ANSI A108/A118/A136.1-2013) (A-4.3).

3.12.2 Use the appropriate trowel notch size to ensure full bedding of the tile.

3.12.3 Work thin-set mortar into good contact with the substrate and comb with notched side of trowel.

3.12.4 Beat each piece/sheet into the thin-set mortar with a beating block or rubber mallet to insure full bedding and flatness.

3.12.5 Allow installation to set until firm.

3.12.6 Clean excess thin-set mortar from tile face and joints between pieces.

3.12.7 Do not cover, bridge or fill tile joints located over expansion joints with adhesive.

3.13 CONTROL JOINTS

- 3.13.1 Carry substrate control and movements joints through to tile work.
- 3.13.2 Install control joints around the perimeter of tiled areas, around columns and where tile abuts other hard materials, also incorporate control joints over all building expansion joints.
- 3.13.3 Cut tiles or stones on both sides along the edges of control or expansion joints.
- 3.13.4 Provide control joints equal to width of interior tile joints in floors and walls at perimeters of floor and within 4800 mm to 6100 mm (16 ft to 20 ft) centre to centre by raking out joints to full depth of tile and cleaning joints for application of sealant in accordance with Section 07 92 00. In areas subject to sunlight or exposed to exterior provide control joints within 2400 mm to 3500 mm (8 ft to 12 ft) centre to centre.
- 3.13.5 Review locations with the Consultant prior to setting tile and comply with instruction given by the Consultant.

3.14 GROUTING OR POINTING

- 3.14.1 Install grout to comply with ANSI A108.1 (ANSI A108/A118/A136.1-2013) and ANSI A108.10 (ANSI A108/A118/A136.1-2013) unless otherwise specified and in accordance with manufacturer's printed instructions.
- 3.14.2 Allow tile installation to cure a minimum of 24 hours at ambient temperature of 21°C prior to grouting.
- 3.14.3 Verify grout joints are free of dirt, debris, water or tile spacers and face of tiles are clean.
- 3.14.4 Apply grout release to face of absorptive, abrasive, non-slip or rough textured tile units that are not hot paraffin coated to facilitate cleaning.
- 3.14.5 Spread using a sharp edged, hard rubber float and work grout into joints using 45° diagonal strokes.
- 3.14.6 Pack joints full and free of voids/pits. Stroke diagonally to remove excess grout and to avoid pulling grout out of filled joints.
- 3.14.7 Once excess grout is removed, begin cleaning grout haze before grout is fully cured. Using a circular motion, lightly scrub grouted surfaces with the damp sponge to dissolve grout film/haze. Drag sponge diagonally over scrubbed surfaces to remove froth. Rinse sponge frequently and change rinse water at least every 2 m² (200 ft²). Repeat cleaning sequence again if grout haze is still present.
- 3.14.8 Allow grout joints to become firm. Buff surface of grout with clean coarse cloth. Inspect joint for pinholes/voids and repair them with freshly mixed grout. Within 24 hours, check for remaining haze and remove it with warm soapy water and a nylon scrubbing pad, using a circular motion, to lightly scrub surfaces and dissolve haze/film.
- 3.14.9 Chemical resistant, water cleanable tile-grouting epoxy (ANSI A118.3 (ANSI A108/A118/A136.1-2013)):
 - 1. Install chemical epoxy resistant grout in compliance with current revisions of ANSI A108.1 (ANSI A108/A118/A136.1-2013) and ANSI A108.10 (ANSI A108/A118/A136.1-2013).
 - 2. Once excess grout is removed, begin cleaning grout haze approximately 20-30 minutes after grouting depending on temperature. Using a circular motion, lightly scrub grouted surfaces with the damp sponge to dissolve grout film/haze. Drag sponge diagonally over scrubbed surfaces to remove froth. Rinse sponge frequently and change cleaning solution at least every 4.7 m² (50 ft²).

3. Within 1 hour of finishing first cleaning, clean the same area again following the same procedure but utilizing a clean white scrub pad and fresh cleaning solution. Rinse scrub pad frequently. Drag a clean sponge diagonally over scrubbed surfaces to remove froth. Use each side of sponge only once before rinsing and change cleaning solution at least every 4.7 m² (50 ft²). Allow cleaned areas to dry and inspect tile surface. Rinse with clean water and allow surface to dry. Inspect grout joint for pinholes/voids and repair them with freshly mixed grout.

3.14.10 Grout joint width to be 1.5 mm (1/16") unless otherwise indicated in the Contract Documents.

3.14.11 Grout joint width to be 3.2 mm (1/8") unless otherwise indicated in the Contract Documents.

3.14.12 Use caution when using sanded grouts to prevent scratching of tile or other material surfaces.

3.14.13 Do not cover, bridge or fill any expansion joints in tile with grout.

3.15 INSTALLATION TOLERANCES

3.15.1 Maximum allowable lippage:

1. Tile up to 152 mm x 152 mm (6" x 6") in size: 0.79 mm (1/32").
2. Tile greater than 152 mm x 152 mm (6" x 6") in size: 1.5 mm (1/16").

3.15.2 Finish planes shall be straight and plumb to within 6 mm in 3 m (1/4" in 10 feet).

3.16 ADJUSTING AND CLEANING

3.16.1 Clean installed tile surfaces after grouting has cured.

3.16.2 Re-point joints after cleaning to eliminate imperfections. Avoid scratching tile surfaces.

3.16.3 Prohibit traffic during installation and for minimum 48 hours after installation.

3.16.4 Protect floors from impact and vibration for a minimum of 48 hours after installation.

3.16.5 Install floor protection in areas where other work, repairs and installation of equipment, and foot traffic will occur.

END OF SECTION 09 30 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1. The Contractor shall ensure that it, Subcontractors and trades doing work in this Section read and become familiar with those portions of the aforementioned Sections relating to their own work.

1.2 WORK SUMMARY

- 1.2.1. This Section includes:
1. Acoustic panel ceiling system Type 'A' (2'-0" x 4'-0" general use).
- 1.2.2. Related work in other Sections:
1. 09 10 00 - Gypsum wallboard and cement board.

1.3 ULC REQUIREMENTS

- 1.3.1 Examine the Drawings to determine if, and where, fire resistance ratings are required for the building construction. Comply in all respects to the specified Underwriters' Laboratories of Canada (ULC) Design Number on the Drawings particularly in regard to the plenum depth, the size and spacing of the supporting steel framing members (tees and perimeter support), the acoustical material of specified size and the material and spacing of hold-down clips. Where the design requires it, build protection boxes of the acoustical material, gypsum board, or mineral wool batts, nailed or wired over ceiling penetrations.

1.4 SUBMITTALS

- 1.4.1. Before commencing work under this Section, submit to the Consultant for acceptance:
1. Samples of acoustic tiles and panels of each type and pattern specified.
 2. Printed literature, test reports, or other confirmation that fire ratings and noise reduction ratings comply with this Section.

1.5 MAINTENANCE MATERIALS

- 1.5.1 For each type of acoustic ceiling panel installed, supply to the Region for replacement 15 uncut ceiling tiles.

1.6 ENVIRONMENTAL CONDITIONS

- 1.6.1 Install acoustical materials when temperature is between 16 degrees Celsius and 30 degrees Celsius and relative humidity is under 70%.
- 1.6.2 Contractor shall ensure installation conditions are met during and after installation.

1.7 ALTERNATIVES

- 1.7.1 Providing their products comply with this Section, acceptable manufacturers of acoustic panels and tiles are:
1. Armstrong World Industries Canada Ltd.

2. Canoxel Acoustical Products.
3. Capaul Ceilings, Division of Acoustiflex Corporation.
4. CWECO Canada Ltd.
5. Domtar Construction Materials2.1 E.
6. CGC Inc.
7. Fiberglas Canada Inc.
8. Goldbond Building Products.
9. Manville Canada Inc.
10. United States Gypsum.
11. Or Equivalent.

1.7.2 Providing their products comply with this Section, acceptable manufacturers of the grid support system for acoustic panels are:

1. Any of the manufacturers listed in Part 1 of this Subsection 07.
2. Bailey Metal Products Ltd.
3. Donn Canada Ltd.
4. Flangeklamp of Canada Ltd.
5. Or Equivalent.

1.7.3 Where a specific manufacturer is mentioned in this Section, that manufacturer's product is to set the standard that other manufacturers must match. The Consultant, acting reasonably, will be the sole judge as to whether one product is the match of another.

1.7.4 New panels to be installed in existing tbar grid must be compatible with existing grid system.

PART 2 - PRODUCTS

2.1 MATERIALS - ACOUSTIC CEILING PANELS

2.1.1. See the Reflected Ceiling Plan on the Drawings for the layout of ceiling panels, and where lights, diffusers, grilles, sprinklers and other electrical and mechanical items are recessed in, or mounted on the ceiling.

2.1.2. See the Room Finish Schedule for the type of acoustic panel, or other ceiling materials, to be installed in each room.

2.1.3. Acoustical Panels Type 'A'

1. Product: CertainTeed – Symphony F Lay-in 1320-IOF-1F or Equivalent; 610mmX1220mmX19mm.
2. Classification: Type III, Form 2, Pattern C E in accordance with ASTM E1264-14.
3. Material: Fibreglass
4. Surface Texture: Overtone Finish
5. Edge: Square.
6. Colour: White.
7. Flame Spread: Class A flame Spread 25 or under, to CAN/ULC S102.
8. Noise reduction coefficient (NRC) – 0.50
9. Sound transmissions class (STC) range 40 to 44 or better.

2.2 MATERIAL - SUSPENSION GRID

2.2.1. For all acoustic and gypsum panels, use an exposed T bar grid, intermediate duty system of steel

construction with baked on white enamel finish on all visible exposed surfaces.

2.2.2. Main Tees:

1. Double web, bulb top, exposed capping plate flange design.
2. Minimum 25 gauge, zinc-coated or electro-galvanized cold rolled steel.
3. Size 38mm (1 1/2") high x 24mm (15/16") to 25mm (1") exposed flange.
4. Capping plate to have baked-on white satin enamel finish.
5. Holes punched in bulb at maximum of 75mm centres for hanger wires.
6. Holes punched in web at 150mm (6") centres for cross Tees.
7. Do not use Tees with camber, bow, twist or deflection in excess of 3 mm in 1200 (1/8" in 4'-0").

2.2.3. Cross Tees:

1. Fabricated similar to main Tees but with web 25mm (1") to 32mm (1 1/4") high.

2.2.4. Wall mouldings:

1. Angle or channel sections of minimum 25 ga. zinc coated steel.
2. Baked on white satin enamel finish.
3. Exposed leg 19mm (3/4").

2.2.5. Wire hangers:

1. 12 ga. annealed galvanized steel wire for support of 150 lbs. per hanger maximum.

2.2.6. Splicers, connectors, clips, assembly devices, inserts, structural attachments, and other components of grid and suspension system, shall be zinc coated or galvanized.

PART 3 – EXECUTION

3.1 GRID SYSTEM INSTALLATION

- 3.1.1. Refer to reflected ceiling plans. Generally layout ceiling grid for equal border panels on opposite sides of room for minimum border of 1/4 panel unless otherwise shown.
- 3.1.2. Install main and cross Tees at right angles to each other and parallel to walls. Run main Tees either the length or width of the room to suit the lighting fixture layout.
- 3.1.3. Contractor to work with the mechanical and electrical sub trades in locating diffusers, grilles, sprinklers, light fixtures and other items penetrating ceiling. Frame openings as required.
- 3.1.4. Install wall mouldings so that maximum deviation from dead level is 1:1000. Suspend the grid with maximum deflection 1/360 of span.
- 3.1.5. Install hangers at 1200 mm (4'-0") along main Tees. Locate hangers at 4 corners of light fixtures, diffusers and other items which may place extra loading on Tees.
- 3.1.6. Provide the Ontario Hydro with a signed statement that grid system, including the hangers, will support the loads placed upon it.
- 3.1.7. Lay in specified ceiling panels, cutting and trimming panels to fit border and other reduced panels.

3.2 DAMAGED WORK

- 3.2.1. At time of final clean-up, clean soiled panels, reset displaced panels, remove, and replace damaged panels. Replacement panels shall be the same as the original. Panels must be supplied to York Region for replacement. Stock shall not be used for replacement at the time of final clean-up.

3.3 CLEANUP

- 3.3.1. Replace uneven, defective or damaged materials and finishes, eliminate waves, remove soiled or stained areas.
- 3.3.2. Clean dirty and discoloured surfaces of acoustical units and suspension system according to manufacturer's recommendations.

END OF SECTION 09 51 23

PART 1 - GENERAL

1.1 Summary

1.1 Section Includes

1.1.1 Resilient base.

1.2 Submittals

1.2.1 Submit required submittals in accordance with the requirements of York Region.

1.2.2 Product data sheets:

1.2.2.1 Submit manufacturer's Product data sheets for Products proposed for use in the work of this section.

1.2.2.3 Samples:

.1 Submit 3 - 305 mm (12") long samples of each colour and type of base material. Include outside corner of base.

1.3 Closeout Submittals

1.3.1 Submit closeout submittals in accordance with subsection 1.2.2.1 above.

1.3.2 Operation and maintenance data:

1.3.2.1 Submit manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.

1.3.3 Maintenance materials:

1.3.3.1 Deliver 2% of each colour, pattern and type of resilient accessory required for this project.

1.3.3.2 Suitably package for protection and storage, each identified with name of manufacturer and with its type, colour. Note date.

1.3.3.3 Tag and store where instructed by York Region.

1.3.3.4 Maintenance materials to be same production run as installed materials.

1.4 Quality Assurance

1.4.1 Qualifications:

1.4.1.1 Installers / applicators / erectors:

.1 Provide work of this section, executed by competent installers with minimum 5 years' experience in application of Products, systems and assemblies specified and with approval and training of Product manufacturers.

.2 Products installed as part of the work of this section shall be from same production run.

1.5 Field Conditions

- 1.5.1 Temperature of room and materials shall be at least 18°Celsius and 21°Celsius for 48 hours before, during and 7 Days after the installation of resilient accessories.
- 1.5.2 Applications exposed to intense or direct sunlight, protect Products during the conditioning, installation, and adhesive curing periods, by covering the light source.
- 1.5.3 Allow coiled wall base to lay flat for at least 24 hours at 18°Celsius prior to installation, and maintain this temperature during installation.
- 1.6 Warranty
 - 1.6.1 Warrant work of this section for a period of 2 years commencing on Total Performance of the Contract.

PART 2 – PRODUCTS

2.1 LEED Requirements

- 2.1.1 Not Applicable.

2.2 Manufacturers

- 2.2.1 Forbo Holding AG.
- 2.2.2 Johnsonite Canada Inc.
- 2.2.3 Roppe Corporation.
- 2.2.4 Or Equivalent

2.3 Materials

2.3.1 Resilient base types:

- 2.3.1.1 Rubber base: Rubber Wall Base, as manufactured by Johnsonite, 3.2 mm (1/8") thick, 100 mm (4") high, angled profile, complete with preformed inside and outside corners with 100 mm (4") returns.
- 2.3.1.2 Colour: to later selection by the Consultant from manufacturer's full range.
- 2.3.2 Rubber base (for carpet): TightLock Carpet Wall Base, as manufactured by Johnsonite, 114.3 mm (4-1/2") high with a 108 mm (4-1/4") face surface, in a 6.3 mm (1/4") tapered wedge thickness, complete with preformed corners.
 - 2.3.2.1 Colour: to later selection by the Consultant from manufacturer's full range.
 - 2.3.2.2 Resilient leveller strip and level strip extension system: LS Series, as manufactured by Johnsonite or Equivalent, sized to suit condition.
 - 2.3.2.3 Block wall filler: Latex filler, "Planicrete AC" by Mapei Canada Ltd., "43 Thin-Set Mortar Additive and 53 Floor Mix" by Flextile Ltd., waterproof filler recommended by the flooring manufacturer or Equivalent.
 - 2.3.2.4 Adhesive: Types as recommended by the manufacturer to suit substrate types and compatible with materials.
 - .1 Porous wall surfaces: Johnsonite #960 Wall Base adhesive
 - .2 Non-porous wall surfaces (i.e.: metal, epoxy paint, ceramics): Johnsonite #945 Contact Bond adhesive.

- 2.3.2.5 Sealant: clear silicone, as manufactured by Tremco, Momentive, Dow Corning or Equivalent.

PART 3 - EXECUTION

3.1 Examination

- 3.1.1 Substrate shall be solid, dry, clean, smooth, free of deleterious materials and free of voids, gaps, cracks, ridges, or other defects which will preclude adequate adhesion, or will ghost or telegraph through finished base installation.
- 3.1.2 Examine walls to ensure that surfaces are protected against entry of water and moisture.

3.2 Preparation

- 3.2.1 Clean and remove deleterious materials which will preclude adequate adhesion.
- 3.2.2 Fill gaps, voids, and cracks, and remove ridges, or other defects which will ghost or telegraph through finished base installation.
- 3.2.3 Perform compatibility test with primer/adhesive and substrate.

3.3 Installation of Resilient Base

- 3.3.1 Spread adhesive to ribbed surface (back) of wall base with a 3 mm (1/8") square- notched trowel; allow slight set-up, then bring base into contact with substrate. Ensure full adhesion of base to substrate. Adhesive should cover 80% of back surface. Leave a 6 mm (1/4") uncovered space at the top of the wall base to prevent the adhesive from oozing onto the wall above the base when installed.
- 3.3.2 Position wall base on wall surface and roll with hand roller. Always roll back to starting point to prevent stretching the wall base.
- 3.3.3 Set base to ensure installation over finished flooring material is free of gaps.
- 3.3.4 Install base in longest lengths possible, minimum 2440 mm (8'). Adhere toe of base to substrate and ensure edge of toe is straight.
- 3.3.5 Scribe and fit to door frames and other obstructions.
- 3.3.6 Joints shall be tightly fitted, straight and vertical, and not less than 610 mm (24") from corners.
- 3.3.7 Provide joints in base over substrate control joints.
- 3.3.8 Install factory preformed inside corners.
- 3.3.9 Install factory preformed outside corners.

3.4 Installation Tolerances

- 3.4.1 Install straight and level to variation of 3 mm (1/8") over 3 m (10'-0").

3.5 Adjusting and Cleaning

- 3.5.1 Remove adhesive from surfaces as work progresses in manner described by manufacturer. Remove wet adhesive with a water dampened cloth. If adhesive has dried, use a cloth dampened with mineral spirits.
- 3.5.2 Wash surfaces using non-phosphate detergent to remove silicone, wax, dirt and dust using rotary scrubbing machines fitted with nylon brushes. Wash with neutral mild detergent and water, thoroughly buff dry with smooth wool pad. Do not apply any other compounds.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1. The Contractor shall ensure that it, Subcontractor and trades doing work in this Section read and become familiar with those portions of the Sections relating to their own work.

1.2 WORK SUMMARY

- 1.2.1. This Section includes:
1. Modular carpet tile flooring patch at elevator entrance on second level.
- 1.2.2. Related work in other Sections:
1. 09 31 00 – Tiling
 2. 09 65 13 – Resilient Base

1.3 REFERENCES

- 1.3.1 The standards referenced in this section are to the following editions:
1. Canadian General Standards Board (CGSB) 4.2 No.27.6, Textile Test Methods - Flame Resistance - Methemine Tablet Test for Textile Floor Coverings.
 2. CAN/CGSB-4.2 No.77.1/ISO 4919, Textile Test Methods - Carpets - Determination of Tuft Withdrawal Force.
 3. CGSB 4-GP-36M, Carpet Underlay, Fibre Type.
 4. CAN/CGSB-4.129, Carpets for Commercial Use.
 5. CAN/CGSB-25.20, Surface Sealer Floors.
 6. Underwriters' Laboratories of Canada (ULC) S102, Surface Burning Characteristics of Building Materials and Assemblies.
 7. CAN/ULC-S102.2, Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials and Assemblies.
 8. American Society for Testing and Materials (ASTM) F710-05 – Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
 9. ASTM F1869-04 – Standard Test Method for Measuring Moisture Vapour Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

1.4 SUBMITTALS

- 1.4.1. Before commencing work, submit to the consultant for acceptance:
1. Submit verification to demonstrate compliance with CAN/ULCS102 and CAN/ULCS102.2.
 2. Submit report verifying that tuft bind meets requirements of CAN/CGSB-4.129 when tested to CAN/CGSB-4.2 No.77.1.
 3. Submit carpet schedule using same room designations indicated on Drawings.
 4. Submit carpet manufacturer's installation instructions: Indicate special procedures and perimeter conditions requiring special attention.
 5. Submit product data sheet for each carpet, underlay, adhesive, carpet protection and subfloor filler.
 6. Submit Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) acceptable to Labour Canada and Health Canada for carpet adhesive and seam adhesive. Indicate Volatile Organic Compound (VOC) content.

7. Submit data on specified products, describing physical and performance characteristics, sizes, patterns, colours, and methods of installation.
8. Submit duplicate 675 x 900 mm pieces of each type carpet specified, duplicate 225 x 225 mm pieces for each colour selected, 300 mm square pieces of under cushion, 150 mm lengths of carpet gripper and binder bars, base, divider strips.

1.5 MAINTENANCE MATERIALS

- 1.5.1 For each type of carpet tile installed, supply to the Region for replacement 15 uncut carpet tiles.

1.6 ENVIRONMENTAL CONDITIONS

- 1.6.1 Store packaged materials in original containers or wrapping with manufacturers seals and labels intact.
- 1.6.2 Store carpeting and accessories in location as directed by York Region. Store carpet and adhesive at minimum temperature of 18 degrees Celsius and relative humidity of maximum 60% for minimum 48 hours before and after installation.
- 1.6.3 Provide continuous ventilation during and after carpet installation. Run ventilation system 24 hours per day during installation and provide continuous ventilation 3 days after completion of carpet installation.
- 1.6.4 Do not install carpet until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete.
- 1.6.5 Replace defective or damaged materials with new.

1.7 ALTERNATIVES

- 1.7.1 Providing their products comply with this Section, acceptable manufacturers of carpet tiles are:

1. Interface Inc.
2. Centura Tile
3. Flor
4. Beaulieu Canada
5. Or Equivalent

- 1.7.2 Where a specific manufacturer is mentioned in this Section, that manufacturer's product is to set the standard that other manufacturers must match. The Consultant, acting reasonably, will be the sole judge as to whether one product is the match of another.

1.8 QUALIFICATIONS

1.8.1. Installer qualifications:

1. Specialty contractor normally engaged in this type of work, with not less than 5 years' experience in installation of these types of materials.
2. Certified by carpet manufacturer prior to tender submission.
3. Must not sub-contract labour without written approval of York Region.

- 1.8.2. Be responsible for proper product installation, including floor testing and preparation as specified and in accordance with carpet manufacturers written instructions.

1.9 WARRANTY

- 1.9.1. Provide two year warranty against defects in material and workmanship from the date of Total Performance of the Contract.
- 1.9.2. Provide certificate of quality compliance from tile installer upon satisfactory completion of installation.

PART 2 - PRODUCTS

2.1 MATERIALS – MODULAR CARPET TILE

- 2.1.1 See the architectural floor finish plan for the layout of carpet tile panels.
- 2.1.2 See the Room Finish Schedule on Drawings for the type of carpet tile flooring and base to be installed in each room.
- 2.1.3 Carpet Tile
 - 1. Product: Tandus – 457mmx457mm Custom Applause #03064 or Equivalent
 - 2. Colour: #86353 Custom
 - 3. Adhere to CAN/CGSB-4.129.
 - 4. Performance rating to ASTM D5252 or ATM D5417.
 - 5. Pipe fibre to CAN/CGSB-4.129.
 - 6. Colourfastness to light: CAN/CGSB-4.2 No. 18.3.

2.2 MATERIALS – CARPET TILE BASE

- 2.2.1 See the architectural floor finish plan on Drawings for the layout of carpet tile panels.
- 2.2.2 See the Room Finish Schedule for the type of carpet tile flooring and base to be installed in each room.
- 2.2.3 Carpet Tile Base
 - 1. Product: Tandus – 457mmx457mm Custom Applause #03064 or Equivalent
 - 2. Colour: #86353 Custom
 - 3. Adhere to CAN/CGSB-4.129.
 - 4. Performance rating to ASTM D5252 or ATM D5417.
 - 5. Pipe fibre to CAN/CGSB-4.129.
 - 6. Colourfastness to light: CAN/CGSB-4.2 No. 18.3.

2.3 MATERIALS – SPECIAL REQUIREMENTS

- 2.3.1. Soil resistance: Drop oil and soil resistance to American Association of Textile Chemists and Colorists (AATCC) 118.
- 2.3.2. Permanent static control: to AATCC 134, 3000V maximum at 20% RH and 22°Celsius.
- 2.3.3. Anti-microbial: to AATCC 174, 99% reduction, 0% growth.
- 2.3.4. Stain resistance: to AATCC 175, 8.

2.4 MATERIALS – ACCESSORIES

- 2.4.1. Carpet tack strips – as recommended by manufacturer.
- 2.4.2. Seaming tape: types recommended by carpet manufacturer for purpose intended.
- 2.4.3. Seaming sealer adhesive: types recommended by carpet manufacturer for purpose intended.

- 2.4.4. Binder bars: aluminium of type recommended by carpet manufacturer.
- 2.4.5. Adhesive: multi-purpose adhesive type: recommended by carpet manufacturer for direct glue down installation, low odour, low Volatile Organic Compound (VOC), free of volatile hydrocarbons such as toluene and mineral spirits.
- 2.4.6. Carpet protection: non-staining heavy duty kraft paper.
- 2.4.7. Concrete floor sealer: to CAN/CGSB-25-20, type 1.
- 2.4.8. Subfloor patching compound: Portland cement base filler, mix with water to form a cementitious paste.

PART 3 – EXECUTION

3.1 SUB FLOOR TREATMENT

- 3.1.1. Concrete shall be inspected to determine special care required to make it a suitable foundation for carpet. Cracks 3.0 mm wide or protrusions over 0.8 mm will be filled and levelled with appropriate and compatible patching compound.
- 3.1.2. Do not exceed manufacturer's recommendations for patch thickness.
- 3.1.3. Large patch areas are to be primed with a compatible primer.
- 3.1.4. Concrete substrates shall be cured, clean and dry.
- 3.1.5. Concrete substrates shall be free of paint, dirt, grease, oil, curing or parting agents, and other contaminants, including sealers, that may interfere with the bonding of the adhesive.
- 3.1.6. Wherever a powdery or porous concrete surface is encountered, a primer compatible with the adhesive shall be used to provide a suitable surface for glue-down installation.

3.2 PREPARATION

- 3.2.1 Prepare floor surfaces in accordance with Carpet and Rug Institute (CRI) 104 Standard for Installation of Commercial Carpet.
- 3.2.2 Pre-condition carpeting following manufacturer's printed instructions.

3.3 INSTALLATION

- 3.3.1. Install in accordance with manufacturer's printed instructions and in accordance with Carpet and Rug Institute Standard for Installation of Commercial Carpet, CRI 104.
- 3.3.2. Co-ordinate tile carpeting work with work of other trades, for proper time and sequence to complete work within Contract Time.
- 3.3.3. Install carpet after finishing work is completed but before demountable office partitions and telephone and electrical pedestal outlets are installed.
- 3.3.4. Install carpet tile as per manufacturer's recommendation. This can include quarter-turn 90 degree format, monolithic, random, quarter turn ashlar, horizontal, herringbone or vertical ashlar.
- 3.3.5. Finish installation to present smooth wearing surface free from conspicuous seams, burring and other faults.
- 3.3.6. Use material from same dye lot. Ensure colour, pattern and texture match within any one visual area. Maintain constant pile direction.
- 3.3.7. Hot melt adhesive seams and cross-joints.
- 3.3.8. Fit neatly around architectural, mechanical, electrical and telephone outlets, and furniture fitments, around perimeter of rooms into recesses, and around projections.
- 3.3.9. Install carpeting in pan type floor access covers.
- 3.3.10. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- 3.3.11. Install carpet smooth and free of bubbles, puckers, and other defects.

3.4 CARPET TACKSTRIPS AND BINDER BARS

- 3.4.1. Install carpet grippers at junctions of walls and vertical surfaces. Secure gripper to prevent movement.
- 3.4.2. Install binder bars at exposed carpet edges and centre under doors in door openings.

3.5 DIRECT GLUE DOWN CARPET

- 3.5.1. Apply adhesive and install carpeting in accordance with the manufacturers written instructions, by direct glue-down method.

3.6 SEAMS

- 3.6.1. Seal edges of cut-outs with latex, binding method.
- 3.6.2. Carpet visibility of seams and joints to acceptable industry standards.

3.7 PROTECTION OF FINISHED WORK

- 3.7.1. Vacuum carpets clean immediately after completion of installation. Protect traffic areas.
- 3.7.2. Prohibit traffic on carpet for a period of 24 hours until adhesive is cured.
- 3.7.3. Install carpet protection to satisfaction of York Region.

3.8 COMISSIONING

- 3.8.1. Acceptance will be made when maintenance material is turned over to York Region per Section 1.5 above.

END OF SECTION 09 68 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1. The Contractor shall ensure that it, Subcontractors and trades doing work in this Section read and become familiar with those portions of the aforementioned Sections relating to their own work.

1.2 WORK SUMMARY

- 1.2.1. This Section includes:

- 1.2.1.1 On-Site brush, roller and spray applications of oil paints, latex paint, block filler and primers together with preparatory work including inspection, testing, filling, sanding, cleaning, etching, masking and supplying samples. Generally 'paint' and 'painting' applies to the application of all the finishes mentioned herein.
- 1.2.1.2 Paint all edges and faces of hollow metal doors, door frames, door glazing frames and screen frames.
- 1.2.1.3 Paint exposed face and door of all recessed electrical panels in finish spaces. Paint only pipes, conduit, junction boxes, etc. in direct contact with support surfaces, in all locations where Drawings call for paint on walls and/or ceilings, in accordance with manufacturer's recommendations.
- 1.2.1.4 Do not paint pipe, conduit, ducts, insulation and the like where concealed above ceilings or in service shafts.
- 1.2.1.5 Provide sealant to receive paint finish (acrylic latex caulking).
 - 1. Wall control joints.
 - 2. Doors and windows frames.

- 1.2.1.6 Examine contract drawings and specification to determine full extent of work to be painted.

1.2.2. Related work in other Sections:

- 1.2.2.1. 09 30 13 – Porcelain Tile

1.2.3. Work not included:

- 1.2.3.1. Except where colour coding of piping is hereafter specified, painting is not required on pipes, conduits and ductwork concealed in ceiling spaces, enclosures or exposed.
- 1.2.3.2. No paint or other finish shall be applied on-site to
 - 1. Items with factory applied finish.
 - 2. Items of aluminum, stainless steel, copper, brass, bronze, chrome, nickel, plastic and rubber, (includes hardware).
 - 3. Acoustic ceiling panels.
 - 4. Surfaces specified to have a finish of plastic laminate.
 - 5. Items embedded in concrete, enclosed in partitions, walls, and ceiling spaces, and otherwise concealed from view, but with exceptions as hereafter specified.

1.2.3.3. Work not included in this Section:

- 1. Shop applied primers on metal work.
- 2. Factory applied finishes and treatments.
- 3. Backpainting of aluminum in contact with masonry and concrete.
- 4. Painting of surfaces of dissimilar metals in contact.
- 5. Taping, filling and sanding of joints in gypsum board.

- 1.2.4. Cleaning of block masonry work, removal of mortar spatter and removal of efflorescence, after cleaning has been completed to Consultant's satisfaction, subsequent soiling and efflorescence on surfaces to be painted shall be removed by painting subcontractor.
- 1.2.5. On-Site touch-up of primer paint on metal work after installation is the work of installer. Subsequent touch-up of primer paint on metal shall be done by painting subcontractor.
- 1.2.6. Supply and installation of identification tags and plates on pipes, valves and mechanical equipment is not included in this section.

1.3 INSPECTION AND TESTING

- 1.3.1. Do inspecting and testing in conjunction with Paint Manufacturer's qualified representative. Pay charges for services of the Paint Manufacturer's representative and include in total Contract Price submitted with Bid.
- 1.3.2. Examine all surfaces to be painted, take moisture readings and test for alkalinity. Then report to Consultant all defects and conditions preventing satisfactory execution of the work of this trade.
- 1.3.3. Paint manufacturer's representative shall visit the site during course of painting work to ensure compliance with this specification and shall promptly report any variances to the Contractor.
- 1.3.4. Take moisture readings using approved electronic moisture meter for surfaces to be painted. Paint when meter readings are 8 or less, 12 or less for wood. When moisture readings exceed these levels, arrange for Contractor to provide ventilation and heat in area until moisture readings drop below maximum reading.
- 1.3.5. Test concrete and block to determine extent of alkalinity by method approved by Paint Manufacturer. Where alkalinity is present, use alkali resistant primer sealer. In cases of extreme alkalinity, wash surface with chemical solution to neutralize alkalinity as recommended by Paint Manufacturer as suitable for type of paint to be applied.
- 1.3.6. At time of final clean up (refer to General Requirements) inspect painted surfaces and repaint areas with minor surface damage, however caused to satisfaction of Consultant.

1.4 COLOUR SCHEDULE AND SAMPLES

- 1.4.1. Colour coding and banding of pipes is hereinafter specified.
- 1.4.2. When requested by the Consultant, prepare samples of paint on block, paint on plaster, paint on metal and other finishes on substrates to match conditions on the job.

1.5 STORAGE AND HANDLING

- 1.5.1. Arrange with Contractor for the use of:
 - 1. Lockable, well-ventilated room for storage of materials.
 - 2. Dust free, well-ventilated area for prime painting and final coats.
- 1.5.2. Store materials away from excessive heat and out of direct rays of sun. Keep containers tightly closed when not in use.
- 1.5.3. Take precautions against spontaneous combustion. Remove used cloths from building at end of working day.

- 1.5.4. Keep 20 pound, carbon dioxide fire extinguisher by door in paint storage room.
- 1.5.5. Protect floor and walls of storage room from spatter, spillage and other soiling. Upon completion of other work, remove rubbish, containers and tools, clean room, and paint room as required.

1.6 ENVIRONMENTAL CONDITIONS

- 1.6.1. Do not apply paint when surrounding air temperature is below 10 degrees Celsius or to surfaces, which are wet or damp and where humidity is likely to condense.
- 1.6.2. Arrange for Contractor to provide ventilation and heat as required, 24 hours before painting starts and while paint is drying.
- 1.6.3. Rooms shall be swept out and dust settled before painting commences.
- 1.6.4. Do not apply paint finishes in areas where dust is being generated.
- 1.6.5. Comply with requirements of Workplace Hazardous Materials information System (WHIMIS) regarding the use, handling, storage and disposal of hazardous materials.
- 1.6.6. Submit procedure for providing work area isolation and ventilation during application and curing of each coat to maintain acceptable levels of air quality to permit all other trades work and York Region's abutting activities to proceed unhampered for approval to the Region and the Consultant. Provide a written procedure within 5 Business Days of issuance of notice to commence the Work describing the method and means of providing adequate protection of the existing facility to ensure that there is no contamination of manufactured product, employees or the facility itself.

1.7 PROTECTION

- 1.7.1. Post-legible signs throughout the Work reading "WET PAINT" in prominent positions during painting and while paint is drying. Use 3" high letters on white card or board.
- 1.7.2. Erect suitable barriers to prevent traffic and other trades from working in areas during application of paint.
- 1.7.3. Protect floors and other surfaces with temporary covers such as dust sheets, polyethylene film or tarpaulins. Contractor shall be responsible for remedial work necessary in consequence of not providing adequate protection.
- 1.7.4. Mask identification plates occurring on equipment, switch boxes, and fire rating labels, etc. which require painting.
- 1.7.5. Mask using "non-run" tape around all adjacent surfaces, including panels and mechanical and electrical fixtures and at transitions to other finishes, to provide neat, clean, true juncture lines.
- 1.7.6. Keep oily rags, waste and other similar combustible materials in closed metal containers; take every precaution to avoid spontaneous combustion, remove waste and combustible materials at the end of each work shift.
- 1.7.7. Clean surfaces soiled by spillage of paint, paint spattering and the like. If such cleaning operations damage the surface, repair and replace damaged work at no cost to York Region.

1.8 MAINTENANCE MATERIALS

- 1.8.1. Provide one sealed can, four liters capacity, of each product in each colour used in the Work for York Region's use in maintenance work.
- 1.8.2. Container to be new fully labeled with manufacturer's name, type of paint, and colour.

1.9 RETOUCHING

- 1.9.1. Do all retouching, etc. to ensure that the building may be handed over to York Region in perfect condition, free of spatter, finger prints, rust, watermarks, scratches, blemishes of other disfiguration.

1.10 WARRANTY

- 1.10.1. Submit a warranty stating that the painting system will remain free from all failures for a period of 2 years from Total Performance of the Contract. Warranty to state that all faulty materials to be replaced or repaired at no cost to York Region.
- 1.10.2. The manufacturer shall issue a document in the name of York Region, certifying the products delivered to the site meet all of the physical characteristics published by the manufacturer and that the installation of the products is in conformance with the manufacturer's recommendations.

PART 2 - MATERIALS

2.1 MANUFACTURERS

- 2.1.1. Paints, enamels, fillers, primers to be ready mixed products as listed in the Formulae Section of this Specification of the one manufacturer below. Products from acceptable alternate manufacturers listed below will be entertained only if the specific product names and numbers are included with the Tender submission and are proven by the Consultant to be considered as equal to the manufacturer specified.

2.1.1.1. Acceptable alternate manufacturers are:

- 1. Benjamin Moore Co.
- 2. Para Paints Ltd.
- 3. Sherwin Williams
- 4. Pratt and Lambert Inc.
- 5. Or Equivalent.

- 2.1.2. Thinners, cleaners – type and brand recommended by the paint manufacturer.

- 2.1.3. Only products manufactured by paint manufacturer stated at time of submission of samples will be allowed on Site unless other materials specifically specified herein. No painting to be performed until paint manufacturer identified and acceptance received from the Consultant.

- 2.1.4. Deliver materials to Site in original unbroken containers bearing brand and maker's name. The presence of any unauthorized material or containers for such, on Site shall be of sufficient cause for rejection of ALL paint materials on site at that time.

2.2 VERIFICATION

- 2.2.1. Before commencing work of this Section, examine the Site and the substrate on which work in this section depends. Ensure that environmental and site conditions are suitable for application and curing. Inspect

surfaces for acceptability of levelness, moisture content and other critical factors at the time of installation.

- 2.2.2. The execution of work in this section constitutes acceptance by the applicator of the existing surface and environmental conditions as suitable for proper application of the paint and sealant systems.

2.3 SURFACE PREPARATION

- 2.3.1. Paint clean dry surfaces and factory primed surfaces. Remove dust, grease, rust and extraneous matter from surfaces immediately before painting.

- 2.3.2. Preparation of various materials prior to painting is as follows:

1. Concrete - Remove form oil with Xylol or Equivalent. Consult paint manufacturer regarding removal of, or primer sealer for use over, other form release agents. Etch concrete with solution of one part of commercial muriatic acid to two parts of water by volume applied at rate of one to two square meters per litre of solution. When solution stops bubbling, flush with clear water under pressure. Allow to dry. Test for moisture before applying paint.
2. Block Masonry - Remove minor efflorescence by dry brushing. For severe efflorescence, wash with solution of one part commercial muriatic acid to 20 parts of water by volume followed by complete rinsing with clear water. Allow to dry. Test for moisture before applying paint.
3. Ferrous Metals - Remove surface rust and loose mill scale. Remove oil and grease by washing with solvent such as pure mineral spirits or naphtha. Prime paint base metal and welds.
4. Galvanized Metal - Remove oil and grease with mineral spirits or naphtha.
5. Prepare plaster and wallboard surfaces to CGSB 85-GD-33. Fill minor cracks with plaster patching compound.
6. Apply acrylic latex caulking and request inspection for approval by York Region and consultant prior to applying finish.

2.4 WORKMANSHIP

- 2.4.1. Paint shall be applied by skilled tradespeople working under direction of capable foreman over prepared surfaces and under conditions hereinbefore specified.
- 2.4.2. Apply materials for a uniform finish free from brush and roller marks, sags, crawls, runs, brush bristles and other defects detrimental to appearance.
- 2.4.3. Allow each coat to dry and harden before applying succeeding coats.
- 2.4.4. Sand lightly with No. 00 sandpaper between coats of gloss and semi-gloss finishes on doors and frames.
- 2.4.5. Apply finishes to new work in two coats – base coat and top coat - Add one additional primer/sealer coat and/or a filler application when required by Paint Manufacturer for proper bonding of paint to surface of substrate.
- 2.4.6. Painting coats are intended to cover surfaces perfectly; if in painter's opinion, formula specified is inadequate to provide a first class finished surface, report to the Consultant before commencing work. Surfaces imperfectly covered shall receive additional coats at no additional cost.
- 2.4.7. Paint finish shall be applied by roller except in the case of door frames and similar work of small surface area which shall be painted by brush. Do not use roller for applying finish other than paint.
- 2.4.8. Spray painting will not be permitted unless specifically approved in writing by the Consultant in each instance. Consultant may withdraw approval at any time and prohibit spray painting for reasons such as

carelessness, poor masking or protection measures drifting paint fog, disturbance to other Trades or failure to obtain a dense, even, opaque finish. Spray painting shall be full double coat, i.e. at least two passes for each coat. Do not use spray or roller on metal surfaces, brush only unless approved in writing by Consultant.

2.4.9. Remove rust, oil, grease and loose shop paint from metal work by brushing or with wire brushes and make good shop coat before proceeding with final finish. Feather out edges to make touch up patches inconspicuous.

2.4.10. After first coat, fill scratches, etc., using putty coloured to match finish.

2.4.11. Clean castings with wire brush before application of first paint coat.

2.4.12. Do not etch galvanized metal. Use zinc rich primer. This includes metal door frames and the like with wiped zinc coating.

2.4.13. Remove form oil or parting compounds from concrete surfaces. Use Xylol or Equivalent compound.

2.4.14. Conform with Consultant's colour schedule and exactly match approved samples.

2.4.15. Mechanical and Electrical Pipes, Canvas Insulation Wrap and Conduits:

1. Commence Work when piping installation complete in the area concerned.
2. Do not paint plated or other pre-finished surfaces, unless otherwise noted.
3. Paint conduit in same colour as background paint, except gas piping in unpainted areas which must be gas company orange.
4. Apply formulae specified even though surface prime painted at shop prior to delivery. Touch up shop priming where damaged.
5. Use heat resistant epoxy paint on pipes and surfaces where operating surface temperature exceeds 65 degrees Celsius.

2.4.16. Do not paint exterior work (materials) when temperature is below 10 degrees Celsius and/or damp weather conditions.

2.5 DESIGN PERFORMANCE REQUIREMENTS

2.5.1. Do painting and finishing to CGSB-85-GP series standards and to material manufacturer's instructions and/or to Canadian Painting Contractor's Association except where specifically specified otherwise.

2.5.2. Paint materials to meet all Physical/Chemical Characteristics published in Manufacturer's literature.

2.5.3. Compatibility between components of paint, sealant and substrate is essential. Do not mix products from various suppliers.

2.5.4. System must meet requirements of CAN4-S114-M80 Standard Test Method for determination of Non-Combustibility in Building Materials.

2.5.5. Second coat of block filler where called for, is to be tinted to match the finish colour coat.

2.6 FINISHES – INTERIOR COLORS

2.6.1 For general use in interior wall applications – PT-1:

1. Simply white oc – 117 by Benjamin Moore or Equivalent (all walls unless otherwise noted).

2.6.2 For accent wall applications – PT-2:

1. Smoky Blue 7604 by Benjamin Moore or Equivalent.

2.6.3 For doors and frames – PT-3:

1. Forest black 30yy 10/038 (hollow metal doors, frame)

2.6.4 FINISHES

2.6.4.1. INTERIOR WORK

SURFACE		MATERIAL
Drywall And Wood Backboards	(Acrylic System)	2 coats Ultra hide 3210 Primer or Equivalent Minimum 2 mils dry film thickness per coat. 2 coats Devflex 4206 Acrylic Semi Gloss Enamel or Equivalent, Minimum 2 mils dry film thickness per coat.
Concrete, Plaster And Masonry	(Acrylic System)	2 coats Bloxfil 4000 Primer or Equivalent Minimum 7 mils dry film thickness per coat. 2 coats Devflex 4206 or Equivalent Acrylic Semi Gloss Enamel, Minimum 2 mils dry film thickness per coat.
Hollow Metal Doors, Door Frames, Screen Frames		1 coat Devguard 4120 Primer or Equivalent Minimum 2 mils dry film thickness per coat. 2 coats Devguard 4308 or Equivalent Alkyd Gloss Enamel, Minimum 2 mils dry film thickness per coat.
Ferrous Metal Door Frames, Screen Frames		1 coat Devguard 4120 Primer or Equivalent Minimum 2 mils dry film thickness per coat. 2 coats Devguard 4308 or Equivalent Alkyd Gloss Enamel, Minimum 2 mils dry film thickness per coat. OR Touch up coat where finish damaged 1 coat Devguard or Equivalent 4160-6120, grey primer, Minimum 5 mils dry film thickness per coat where prime finish called for.
Canvas Wrap on Piping and Ductwork		1 coat Ultra hide 3210 Primer or Equivalent Minimum 2 mils dry film thickness per coat.

1 coat Devflex 4206 or Equivalent Acrylic Semi Gloss Enamel, Minimum 2 mils dry film thickness per coat.

3. EXECUTION

3.1. CLEANUP

- 3.1.1. Remove debris and surplus materials from Site upon completion of work and as required during installation.
- 3.1.2. Clean all spilled or misplaced material.
- 3.1.3. Upon completion, remove masking and clean adjacent surfaces to satisfaction of Consultant and York Region.

END OF SECTION 09 91 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1. The Contractor shall ensure that it, Subcontractors and trades doing work in this Section read and become familiar with those portions of the aforementioned Sections relating to their own work.

1.2 WORK SUMMARY

- 1.2.1. This Section includes:
1. Toilet paper dispenser shall be provided by owner.
 2. Hand Soap dispenser shall be provided by owner.
 3. Paper towel dispenser
 4. Disposal Bin
 5. Grab Bars

- 1.2.2. Related work in other Sections:

1. 10 21 13 - Washroom Partitions.

1.3 SUBMITTALS

- 1.3.1 Shop Drawings including anchor bolt locations and verification of specified sizes. Copies of related standard literature accepted.
- 1.3.2 Printed Maintenance Instructions.
- 1.3.3 Samples material and colours.

1.4 SITE INSPECTION

- 1.4.1. Verify Site dimensions with Contract Drawings before starting work under this Section. Report discrepancies and conditions which will interfere with operation or installation of the equipment. Do not proceed until corrections have been made.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- 2.1.1. Where a manufacturer's product is specified, it is to set a standard that other manufacturers must match for use, general design, materials and finish. Size need not be exactly the same but should be close.
- 2.1.2. Providing they can comply with the minimum requirements of this Specification, acceptable manufacturers and suppliers are:
- 2.1.2.1 Bobrick Washroom Equipment of Canada.
 - 2.1.2.2 Frost.
 - 2.1.2.3 Swish Maintenance Ltd.
 - 2.1.2.4 ASI Watrous Inc.
 - 2.1.2.5 Uline Corporation.
 - 2.1.2.6 Kimberly-Clark of Canada Ltd.
 - 2.1.2.7 Or Equivalent

2.2 PRODUCTS AND MATERIALS

- 2.2.1. Toilet paper dispenser – Wausau #88900 or Equivalent
Hand Soap Dispenser –Model #9330 by Swish or Equivalent
- 2.2.2. Paper Towel Dispenser –868 Black Swish / AGI 11" or Equivalent w x 15.5"h x 9.5"d
- 2.2.3. Grab bars – 30mm diameter stainless steel grab bars with concealed mounting and peened gripping surface, Model B-5806. 99X24 as manufactured by Bobrick or Equivalent.
- 2.2.4. 90 degree grab bars:
 - 1. Model B-816722.99 as manufactured by Bobrick Washroom Equipment of Canada Ltd.
 - 2. ASI 3707-5P, 900 mm x 900 mm 90 degree grab bar.
 - 3. Or Equivalent
- 2.2.5. Disposal bin –304 NLS Stainless Steel Frost 48" x 21.75" x 4" deep or Equivalent.

PART 3 - EXECUTION

3.1 INSTALLATION

- 3.1.1. Install materials in this Section, plumb, level and square, tightly fitted to adjoining work.
- 3.1.2. Installation shall be by workmen familiar with manufacturer's installation procedures. Install components plumb and level with bolts and nuts tightened for maximum rigidity. Touch up scratches on paint work in matching colour supplied by partition manufacturer. Replace parts otherwise damaged. Test moving parts for ease of operation.
- 3.1.3. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- 3.2.1. Remove all cartons, debris and dispose off-Site.
- 3.2.2. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- 3.2.3. Remove temporary labels and protective coatings.
- 3.2.4. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 10 20 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1. The Contractors shall ensure that it, Subcontractors and trades doing work in this Section read and become familiar with those portions of the aforementioned Sections relating to their own work.

1.2 WORK SUMMARY

- 1.2.1 This Section includes:

- 1.2.1.1. Floor mounted toilet partitions and wall mounted urinal screens for Washrooms.

- 1.2.2 Related work in other Sections:

- 1.2.2.1. 10 20 00 - Washroom Accessories.

1.3 SUBMITTALS

- 1.3.1. Shop Drawings including anchor bolt locations and verification of specified sizes. Copies of related standard literature accepted.
- 1.3.2. Printed Maintenance Instructions.
- 1.3.3. Samples material and colours.

1.4 SITE INSPECTION

- 1.4.1. Verify site dimensions with Drawings before starting work of this Section. Report discrepancies and conditions which will interfere with operation or installation of the equipment. Do not proceed until corrections have been made.

PART 2 - PRODUCTS

2.1 ALTERNATIVES

- 2.1.1. Where a manufacturer's product is specified, it is to set a standard that other manufacturers must match for use, general design, materials and finish.
- 2.1.2. Providing they can comply with the minimum requirements of this Specification, acceptable manufacturers and suppliers are:
1. Bobrick Washroom Equipment of Canada
 2. Shanahan's
 3. Ampco Products, Inc.
 4. General Storage Systems
 5. Hadrian
 6. Or Equivalent

2.2 PRODUCTS AND MATERIALS

- 2.2.1. Toilet partitions shall be headrail braced metal toilet partition.

- 2.2.1.1. Colour as selected by Consultant from manufacturer's standard colour charts.
- 2.2.1.2. Panels, doors, pilasters – sheet steel: zinc coated steel, Galcanneal to ASTM A653/A653M-11 GR33, in following base steel thickness: doors and panels – 0.8mm, urinal screens – 0.8mm, pilasters – 1.2mm.
- 2.2.1.3. Standard hardware consisting of hinges, latch, door-stop, combined coat hook and door bumper of stainless steel 316 finish.
- 2.2.1.4. Headrail; for floor mounted headrail braced partitions: 25 mm x 41 mm (1" x 1.625") extruded anodized aluminum with anti-grip design. Wall thickness to be 1.5 mm (0.060") and shall be securely attached to wall and pilasters with manufacturer's fittings. Make joints at pilaster location.
- 2.2.1.5. Pilasters: 32 mm (1-1/4") die formed stainless steel.
- 2.2.1.6. Fastenings: Chrome plated type.
- 2.2.1.7. Core: Honeycomb type, minimum compressive strength 213 kPa (31 psi), minimum cell size 25 mm (1").
- 2.2.1.8. Hardware:
 - General: Hardware shall be heavy duty, chrome plated, non-ferrous metal castings in a high gloss finish. Chrome finish shall be high gloss uniform finish without discolourations, pits, marks or any other visual defects.
 - Hinges: concealed casting, adjustable 15° door-open angle, self-lubricating, non- rising return movement.
 - Latch set: Emergency entry built in, combination latch, door stop, keeper and bumper. Provide lever type thumbturn at barrier free stalls.
 - Wall and connecting brackets: Either continuous formed type or patch type metal to match finish of hinges.
 - Coat hook: Combination coat hook and door keeper matching design of hinges with a neoprene rubber bumper.
 - Provide style and material matching door pulls for out-swinging doors.
 - Exposed fasteners: Chrome plated screws and bolts of same material as hardware item being secured. Threaded inserts and T-nuts are acceptable for composite core construction.
 - Concealed fasteners: Corrosion resistant zinc plated screws or bolts.
 - Steel finish: Epoxy powder or enamel coated, alkali resistant paint finish shall have successfully assed ASTM B117-11. Colour of finish to later selection by t h e Consultant from the manufacturer's full range of colours.

2.2.2. Urinal Dividers partitions shall be wall hung, 18" wide, 42" high, mounted 18" above finish floor.

2.3 FABRICATION

- 2.3.1. Fabricate toilet partitions doors, urinal screens and compartments to layout dimensions shown.
- 2.3.2. At headrail braced floor mounted partitions, construct partitions to measure 1780 mm (70") to top of doors and side panels, and approximately 318 mm (12.5") between finished floor and bottoms of doors and side panels.
- 2.3.3. Fabricate doors, panels, urinal screens and pilasters of sheet steel cemented under pressure to core material. Make pilasters 32 mm (1-1/4") thick; all other doors and panels, 25 mm (1") thick. Use only plywood cores for pilasters and panels on which grab bars are mounted.
- 2.3.4. Provide formed edges on doors, panels and pilasters. Weld edges together and seal with continuous oval crown locking strips with corners mitred, welded and ground smooth.

- 2.3.5. Provide heavy duty adjustable anchoring device at floor of each pilaster to rigidly secure in place. Anchoring device shall permit vertical adjustment of pilaster. Use minimum 10 mm x 178 mm (0.375" x 7") stud with expansion insert anchoring system.
- 2.3.6. Conceal and protect floor fastening with die formed stainless steel pilaster shoe cap, complete with concealed hold-in-place clips. Exposed screws are not to be permitted.
- 2.3.7. Reinforce doors, panels and pilasters to accept hardware, tissue holders and fittings.
- 2.3.8. Reinforce pilasters and doors of barrier free cubicles to support the wider door without deformation.
- 2.3.9. Shop Finishing:
 - 1. Clean and phosphatize steel components.
 - 2. Continuously finish coat to manufacturer's standards, to smooth hard finish.

PART 3 - EXECUTION

3.1 INSTALLATION

- 3.1.1. Install materials in this Section, plumb, level and square, tightly fitted to adjoining work.
- 3.1.2. Installation shall be by workmen familiar with manufacturer's installation procedures. Install components plumb and level with bolts and nuts tightened for maximum rigidity. Touch up scratches on paint work in matching colour supplied by partition manufacturer. Replace parts otherwise damaged. Test moving parts for ease of operation.
- 3.1.3. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.
- 3.1.4. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
- 3.1.5. Maximum Clearances:
 - 1. Pilasters and Panels: 12.7 mm (1/2").
 - 2. Panels and Walls: 25.4 mm (1").
- 3.1.6. Stirrup brackets:
 - 1. Secure panels to walls and to pilasters with no fewer than two brackets attached near top and bottom of panel.
 - 2. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
 - 3. Align brackets at pilasters with brackets at walls.
- 3.1.7. Overhead-braced units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 45 mm (1-3/4") into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- 3.1.8. Urinal screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.
- 3.1.9. Install hardware components and enclosures with fastenings and screws to manufacturer's standard. Attach panel and pilasters to brackets with through type sleeve bolt and nut.
- 3.1.10. Erect enclosures accurately to dimensions shown, plumbing securely, and anchoring in position. Hang doors, adjust hinges to perform as specified. Re-check doors for emergency feature. Tighten pilaster shoes.
- 3.1.11. Make good finished surfaces damaged during shipment or installation.
- 3.1.12. Install system to be free of rattles and reverberations during normal usage.

3.2 ADJUSTING AND CLEANING

- 3.2.1. Remove all cartons, debris and dispose off-Site.
- 3.2.2. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- 3.2.3. Remove temporary labels and protective coatings.
- 3.2.4. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 10 21 13

1. GENERAL

1.1 RELATED DOCUMENTS

1.1.1 The Contractor shall ensure that it and the Subcontractor and trades doing work in this Section read and become familiar with those portions of the aforementioned Sections relating to their own work.

1.2 WORK SUMMARY

1.2.1 This Section includes:

- 1.2.1.1 On-site Partial demolition in preparations for alterations and additions.
- 1.2.1.2 Remove existing lay-in-panel ceilings, gypsum board ceilings, gypsum board partitions, toilet partitions complete with steel supports, vanities, accessories etc.
- 1.2.1.3 Remove ceramic wall tiles.
- 1.2.1.4 Remove vinyl floor tiles.
- 1.2.1.5 Remove plumbing fixture where shown and as required for the removal of ceramic tiles and installation of new
- 1.2.1.6 Remove concrete block walls for new elevator door openings.
- 1.2.1.7 Removal of rubble and rubbish to a dumpsite.
- 1.2.1.8 Remove existing door and screen and hand over to owner.
- 1.2.1.9 Drawings for structural elements shall bear stamp of qualified Professional Engineer legally qualified to practice Professional Engineering in the Province of Ontario.

1.3 Related work in other Sections:

- 1.2.2.1 09 30 13 – Porcelain Tile

1.4 PROTECTION

- 1.3.1 Protect adjoining areas from damage where there is existing work to be retained. Provide hoarding enclosing the construction area as required.
- 1.3.2 Provide protection for passing pedestrians and traffic and for adjoining trees and shrubbery.
- 1.3.3 Prevent movement, settlement or damage of adjacent structures, services, walks, landscaping, fences, adjacent grades. Provide bracing and shoring required. Make good damage and be liable for injury caused by demolition.
- 1.3.4 Take precautions to support structures and, if safety of building being demolished or adjacent structures appears to be endangered, cease operations and notify the Consultant.
- 1.3.5 Prevent debris from blocking surface drainage system.

2 MATERIALS

2.1 PREPARATION WORK

- 2.1.1 Confirm the disconnection of all services as noted under scope of work or as shown on Drawings. Confirm that all disconnection is done in accordance with rules and regulations of Authorities Having Jurisdiction. Post warning signs on electrical lines and equipment which must remain energized to serve other properties during period of demolition.

2.1.2 Do not disrupt active or energized utilities designated to remain undisturbed.

2.1.3 Employ rodent and vermin exterminators to comply with health regulations.

2.2 PRECAUTIONS

2.2.1. Do not stack or pile materials and debris in the building so as to overload any part of the structure or block passageways.

2.2.2. Remove or flatten protruding nails or immediately remove from the building to a waste container.

2.2.3. Do not burn any waste material or debris.

2.2.4. Prohibit the public from entering the work area and post 'DANGER' signs.

2.2.5. The Contractor shall ensure that its mechanical Subcontractor removes sprinkler heads and piping, other piping and duct work above the ceilings, when such is required. Take precautions to protect piping, duct work and related hangers and supports when removing ceilings.

2.3 REGULATIONS

2.3.1. Comply with all municipal and provincial by-laws, regulations and safety codes relating to demolition work.

2 EXECUTION

2.2 CLEANUP AND REPAIR

2.2.1. At the end of the work, leave Site free of debris and repair all surfaces damaged by work. Lawns shall also be replaced or repaired as required except when site clearing and earthwork are to take place. Clean all spilled or misplaced material.

2.2.2. Arrange for a waste container to be located outside, accessible to trucking and near the work area. Make good any damage done to the Site at the waste container location. Remove demolished concrete work from the Site immediately.

END OF SECTION 02 41 19

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1. The Contractor shall ensure that it and the Subcontractors and trade doing work in this Section read and become familiar with those portions of the aforementioned Sections relating to their own work.

1.2 WORK SUMMARY

- 1.2.1 Supply and provide formworks for:

- 1.2.1.1. Footings, foundation walls.
1.2.1.1. Second floor elevator sill.

1.3 RELATED WORK

- 1.3.1 Cast-in-place Concrete Section 03 30 00
1.3.2 Concrete Floor Finishing Section 03 40 00

1.4 REFERENCE STANDARDS

- 1.4.1. Do concrete formwork in accordance with latest revised editions of Canadian Standards Association A23.1-14, and Canadian Standards Association A23.3-14.
1.4.2. Conform to the Ontario Building Code.
1.4.3. Falsework, where required, shall conform to Canadian Standards Association S269.1-16.
1.4.4. Scaffolding, where required, shall conform to Canadian Standards Association S269.2-16.
1.4.5. Formwork shall conform to Canadian Standards Association S269.3-M98 (R2013)

1.5 SHOP DRAWINGS

- 1.5.1. Submittals:
1.5.1.1 Submit Shop Drawings for shoring and falsework, where required, in accordance with details and Drawings provided.
1.5.1.2 Provide copies for review by the Consultant with sufficient lead time to allow minimum 10 Days for the review process. Prior to submission to the Consultant, copies shall be checked in detail by the Contractor and shall bear the checker's initials.
1.5.1.3 Proposed shoring of forms and location of all re-shores shall be designed to allow access by other trades as directed by the Contractor and shall be approved by the Consultant and the Region prior to implementation.

PART 2 - PRODUCTS

2.1 ERECTION

- 2.1.1 Verify lines, levels and columns centers before proceeding with formwork and ensure dimensions agree with drawings.
- 2.1.2 Construct forms to produce finished concrete confirming to shape, dimensions, locations and levels indicated within tolerances required by Canadian Standards Association A23.1-14.
- 2.1.3 Obtain Consultant's approval:
 - 1. For use of earth forms.
 - 2. Before forming openings not indicated in concrete walls, slabs, beams or columns.
- 2.1.4 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- 2.1.5 Align form joints and make watertight. Keep form joints to minimum. Locate horizontal form joints for exposed columns 2400 mm minimum above finished floor elevation.
- 2.1.6 Form and cast all floor openings as shown on the Formwork and Mechanical/Electrical Drawings and as required for process work. Openings not shown on the Structural formwork Drawings will be provided and set by other trades. Provide access as required by other trades and co-ordinate all work required for setting of all openings and recesses.
- 2.1.7 Provide recesses and depressions in floor slabs as shown.
- 2.1.8 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- 2.1.9 Clean formwork in accordance with Canadian Standards Association A23.1-14 before placing concrete.
- 2.1.10 Leave formwork in place for following minimum periods of time after placing concrete, or as recommended by the Consultant:
 - 3. 7 Days for beam soffits, slabs, decks and other structural members, with shoring replaced immediately with adequate re-shoring to standard specified for shoring.
 - 4. 4 Days for columns.
 - 5. 3 Days for footings.
 - 6. Re-use of formwork is subject to requirements of Canadian Standards Association A23.1-14.
 - 7. Install anchors or other cast-in materials supplied by or required by others.
 - 8. Fill all depressions resulting from tie breaks or other deficiencies as directed by the Consultant.

2.2 PRODUCTS

- 2.2.1. Provide new material equal in all respects to specified material.
- 2.2.2. Formwork lumber: plywood and wood formwork materials to Canadian Standards Association A23.1-14.

- 2.2.3. Falsework Materials: to Canadian Standards Association S269.1-16.
- 2.2.4. Form: New "Plyform" Grade Douglas Fir edge sealed and factory treated with form sealer. Thickness as required to support concrete at rate placed. If forms are not new, obtain approval before using. Forms shall be to Canadian Standards Association 0121-08(R2013), tongue and groove square edge, 20 mm thick minimum.
- 2.2.5. Form release agent: non-staining chemically active release agents containing compounds that react with free lime present in concrete to provide water insoluble soaps, preventing concrete from sticking to forms.
- 2.2.6. Form stripping agent: colourless non-staining mineral oil, free of kerosene. Plywood with factory coating of synthetic resin may be used.
- 2.2.7. Form ties: removable or snap-off metal ties, fixed or adjustable length as required, free of devices leaving holes larger than 25 mm dia. in concrete surface.
- .1 Ties to have break back ends for removing the tie end for a minimum of 1" from the concrete surface after form removal.
 - .2 Space ties at maximum 24" (610 mm) c/c each way. Wire ties and wood spacers are not permitted. Fill holes with dry cement mortar and ram solid. Finish in accordance with Section 03 40 00, Concrete Finishing.
- 2.2.8. Dovetail anchor slots: minimum 24" (610mm) c/c each way. Wire ties and wood spacers are not permitted. Fill holes with dry cement mortar and ram solid.

PART 3 - EXECUTION

3.1 CO-ORDINATION:

- 3.1.1 Compare Civil, Structural, Mechanical and Electrical Drawings to ensure correct and complete installation of embedded items. Allow other trades necessary time and facilities. Bring all discrepancies to the attention of the Consultant prior to commencing formwork.
- 3.1.2 Cast no concrete prior to receipt of survey of opening sizes and locations, column locations and dimensions and approval of same by Construction Manager.
- 3.1.3 All slabs on grade shall be poured over a vapour barrier.

3.2 INSPECTION AND TESTING

- 3.2.1. Inspection and testing of materials and workmanship will be carried out by an independent Inspection and Testing company approved by the Consultant. Testing company shall be certified by the Canadian Standards Association.
- 3.2.2. Payment for inspection and testing will be made under the cash allowance for Inspection and Testing (Item No. CA5 in the Bid Form).
- 3.2.3. Inspections shall cover the following:

- 3.2.3.1 General inspection of work required by other trades.
 - 3.2.3.2 Written reports covering materials, workmanship and progress of work.
 - 3.2.4. The Inspection and Testing Company is responsible only for sampling, testing and reporting as described elsewhere in this Section and shall not be required to supervise the work or to instruct the Contractor. The Inspection and Testing Company shall advise the Contractor's Superintendent and the Consultant by telephone and subsequent report.
 - 3.2.5. The Contractor shall co-operate with the representatives of the Inspection and Testing Company and shall advise the Inspection and Testing Company a minimum of twenty-four (24) hours in advance of each erection sequence.
- 3.3 CLEAN-UP
- 3.3.1. Upon satisfactory completion of the work, clear away from the building and Site all excess or waste materials and debris and leave the premises in a condition acceptable to the Consultant, within the Contract Time.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1. The Contractors shall ensure that it and Subcontractors and trades doing work in this Section read and become familiar with those portions of the aforementioned Sections relating to their own work.

1.2 WORK SUMMARY

1.2.1. Reinforcement for:

1. Footings, foundation walls.
2. Second floor concrete sill.
3. Floor slabs on fill.
4. Dowels for new slab.

1.3 RELATED WORK

- | | | |
|--------|-------------------------|------------------|
| 1.3.1. | Cast-in-place Concrete | Section 03 30 00 |
| 1.3.2. | Concrete Slab Finishing | Section 03 40 00 |

1.4 REFERENCE STANDARDS

- 1.4.1. Do reinforcing work in accordance with latest revised editions of Canadian Standards Association A23.1-14, ACI-315-1985 and the Reinforcing Steel Institute of Canada Manual of Standard Practice, except where specified otherwise.
- 1.4.2. Conform to the following Canadian Standards Association Standards:
- 1.4.2.1 Canadian Standards Association G30.5-M1988/ASTM185, Welded Steel Wire Fabric for Concrete Reinforcement.
 - 1.4.2.2 Canadian Standards Association G30.18-09(R2014), Billet Steel Bars for Concrete Reinforcement.
 - 1.4.2.3 Canadian Standards Association A23.1-14/A23.2-14, Concrete Materials and Methods of Construction/Methods of Test for Concrete.
 - 1.4.2.4 Canadian Standards Association Standard A23.3-14, Design of Concrete Structures for Buildings.
 - 1.4.2.5 Canadian Standards Association Standard A283-06, Qualification Code for Concrete Testing Laboratories.
 - 1.4.2.6 Do welding of reinforcing with the latest revised edition of Canadian Standards Association W186-M1990(R2016), except where specified otherwise.

1.5 SOURCE QUALITY CONTROL

- 1.5.1 Upon request, provide Consultant with certified copy of mill test report of reinforcing steel supplied, showing physical and chemical analysis, minimum 10 Working Days prior to commencing reinforcing work.
- 1.5.2 Upon request, inform Consultant of source of material to be supplied.

1.6. SHOP DRAWINGS

- 1.6.1. Submit Shop Drawings for consultant review and approval.
- 1.6.2. Provide copies for review by the Consultant with sufficient lead time to allow minimum 10 Days for the review process. Prior to submission to the Consultant, copies shall be checked in detail by the Contractor and shall bear the checker's initials.
- 1.6.3. Indicate bar sizes, spacing, location and quantities of reinforcement, mesh, mechanical splices, chairs, spacers and hangers with identifying code marks to permit correct placement without reference to structural Drawings. Do Shop Drawings in accordance with Reinforcing Steel Manual of Standard Practice – by Reinforcing Steel Institute of Canada.
- 1.6.4. Detail placement of reinforcing where special conditions occur.
- 1.6.5. Design and detail lap lengths and bar development lengths to Canadian Standards Association - A23.1-14, unless otherwise indicated.
- 1.6.6. Shop drawings kept at the site shall bear the review stamps and initials of all parties.
- 1.6.7. Copies of structural drawings utilized as erection drawings are not permitted.

1.7 SUBSTITUTES

- 1.7.1. Substitution of different size bars permitted only upon written approval of the Consultant.

PART 2 - PRODUCTS

2.1 MATERIALS

- 2.1.1 Reinforcing steel: carbon steel, Grade 400, plain deformed bars to Canadian Standards Association G30.18-09(R2014) unless otherwise indicated.
- 2.1.2 Epoxy Coating: to meet specified requirements of American Society for Testing and Materials specification A775M and Ministry of Transportation and Communication form 1442 for all bars.
- 2.1.3 Smooth wire: to Canadian Standards Association G30.3-M1983/ASTM-A82 “cold-drawn steel wire for concrete reinforcement”.
- 2.1.4 Deformed wire: to Canadian Standards Association G30.14-M1988/ASTM –A496 “deformed steel wire for concrete reinforcement”.

- 2.1.5 Smooth wire fabric: to Canadian Standards Association G30.5-M1988-ASTM-A185 "welded steel wire fabric for concrete reinforcement". Provide in flat sheets only.
- 2.1.6 Deformed wire fabric to Canadian Standards Association G30.15-M1988(R2002) or American Society for Testing and Materials 497 "welded deformed steel wire fabric for concrete reinforcement".
- 2.1.7 Chairs, Bolsters, bar supports, spacers: to Canadian Standards Association A23.1-14.
- 2.1.8 Mechanical splices: subject to the approval of the Consultant.
- 2.2 FABRICATION
 - 2.2.1 Fabricate reinforcing in accordance with Canadian Standards Association -A23.1-14, and the Reinforcing Steel Institute of Canada Manual of Standard Practice.
 - 2.2.2 Obtain Consultant's approval for locations of reinforcement splices other than shown on steel placing Drawings.
 - 2.2.3 Fabricate steel bar or rod mats clipped together in accordance with Canadian Standards Association G30.5-M1998 or Canadian Standards Association G30.15-M1988 using bars to Canadian Standards Association G30.18-09(R2014), Grade 400.
 - 2.2.4 Ship bundles of bar reinforcement clearly identified in accordance with the manufacturer's bar list.

PART 3 - EXECUTION

- 3.1 FIELD BENDING
 - 3.1.1 Do not field bend reinforcement except where indicated or authorized by the Consultant.
 - 3.1.2 When field bending is authorized, bend without heat, applying a slow and steady pressure.
 - 3.1.3 Replace bars which develop cracks or splits.
- 3.2 PLACING REINFORCEMENT
 - 3.2.1 Place reinforcement steel as indicated on reviewed shop drawings and in accordance with Canadian Standards Association A23.1-14.
 - 3.2.2 Paint portion of dowel intended to move within hardened concrete with one coat of lead or asphalt paint. When paint is dry, apply a thick even film of mineral lubricating grease.
 - 3.2.3 Notify the Testing Agency at least 24 hours in advance of placing concrete to allow time for checking of reinforcing placing.
- 3.3 INSPECTION & TESTING
 - 3.3.1 Inspection and testing of materials and workmanship will be carried out by an independent Inspection and Testing Company approved by the Consultant. Inspection and Testing company shall be certified by the Canadian Standards Association.

3.3.2 Costs for the Inspection and Testing covered under the Cash Allowance Item No. CA5 in the Bid Form.

3.3.3 Inspections shall cover the following:

3.3.3.1 Field inspection of placing, including size, spacing and cover for reinforcing.

3.3.3.2 Written reports covering materials, workmanship and progress of work.

3.3.3.3 Welding of reinforcing where required.

3.3.4 The Inspection and Testing Company is responsible only for sampling, testing and reporting as described elsewhere in this Section and shall not be required to supervise the work or to instruct the Contractor. The Inspection and Testing Company shall advise the Contractor's Superintendent and the Consultant by telephone and subsequent report.

3.3.5 The Contractor shall co-operate with the representatives of the Inspection and Testing Company and shall advise the Inspection and Testing Company a minimum of twenty-four (24) hours in advance of each erection sequence.

3.4 CLEAN-UP

3.4.1. Upon satisfactory completion of the work, clear away from the building and Site all excess or waste materials and debris and leave the premises in a condition acceptable to the Consultant, within the Contract Time.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1. The General Conditions and Supplementary Conditions are integral parts of this Section. The Contractor shall ensure that it and Subcontractor and trades doing work in this Section read and become familiar with those portions of the aforementioned Sections relating to their own work.

1.2 WORK SUMMARY

- 1.2.1. Supply and place concrete for:

- 1.2.1.1. Footings, foundation walls.
- 1.2.1.2. Second floor concrete sill.
- 1.2.1.3. Slab on grade.
- 1.2.1.4. Saw-cut, removal, excavate and new floor slab in existing floor area.

1.3 RELATED WORK

- 1.3.1 Concrete Reinforcement Section 03 20 00
- 1.3.2 Concrete Floor Finishing Section 03 40 00

1.4 REFERENCE STANDARDS

- 1.4.1. Do cast-in-place concrete work and testing in accordance with latest revised editions of the Ontario Building Code and Canadian Standards Association A23.1-14 except where specified otherwise.
- 1.4.2. Conform to the Ontario Building Code.
- 1.4.3. Conform to the following Canadian Standards Association Standards:
 - 1.4.3.1 Canadian Standards Association -A23.1/A23.2-14, Concrete Materials and Methods of Construction/Methods of Test For Concrete.
 - 1.4.3.2 Canadian Standards Association Standard A23.3-14, Design of Concrete Structures for Buildings.
 - 1.4.3.3 Canadian Standards Association A23.5-98, Supplementary Cementing Materials.
 - 1.4.3.4 Canadian Standards Association A5/A8/A362-98, Portland Cement/Masonry Cement/Blended Hydraulic Cement
 - 1.4.3.5 Canadian Standards Association A283-06(R2016), Qualification Code for Concrete Testing Laboratories.

1.5 CERTIFICATES

- 1.5.1 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of Canadian Standards Association A23.14.
- 1.5.2 Provide certification that mix proportions selected will produce concrete of specified quality and yield and that strength will comply with Canadian Standards Association -A23.14.

1.6 QUALITY CONTROL

- 1.6.1 Submit proposed quality control procedures for Consultant's approval.

1.7 WEATHER REQUIREMENTS

1.7.1 Hot Weather

When the temperature is above 25 degrees Celsius or, in the opinion of the Consultant, there is a probability of it rising above that limit during the placing period, take precautions in accordance with Canadian Standards Association A23.1-14.

PART 2 - PRODUCTS

2.1 MATERIALS

- 2.1.1 Portland Cement: to Canadian Standards Association A3001-13
- 2.1.2 Blended Hydraulic Cement: Canadian Standards Association A3001-13
- 2.1.3 Supplementary Cementing Materials: to Canadian Standards Association A3001-13.
- 2.1.4 Water: to Canadian Standards Association -A23.1-14.
- 2.1.5 Aggregates: to Canadian Standards Association -A23.1-14. Coarse aggregates to be normal density.
- 2.1.6 Chemical Admixtures: to American Society for Testing and Materials C 494 or C 1017. Consultant to approve accelerating or set retarding admixtures during cold and hot weather placing.
- 2.1.7 Air entraining admixture: to American Society for Testing and Materials C 260.

2.2 CONCRETE MIXES

- 2.2.1 Proportion Normal concrete in accordance with Canadian Standards Association -A23.1-14, Alternative 1 to give ultimate compressive strengths as required by the Consultant for various components of the work.
- 2.2.2 Submit mix designs for review by the Consultant. Do not change concrete without prior approval of the Consultant. Should change in material source be proposed, new mix design to be reviewed by the Consultant.

2.3 CONCRETE STRENGTH

- 2.3.1 Compressive strength of concrete at 28 days shall be as noted on Drawings and elsewhere in this Specification. Concrete not noted shall have a minimum compressive strength of 35 MPa at 28 Days.
- 2.3.2 Design Concrete in accordance with Canadian Standards Association Standard CAN3-A23.1-14 to produce required strength taking into account the addition of admixtures specified. Mix concrete with aggregates graded and proportioned to produce a plastic mass of consistency to flow slowly under its own weight and capable of being worked into corners of forms and around reinforcing and inserts without forming any serious honeycomb and voids, and with particles coated with cement.
- 2.3.3 Minimum compressive strengths:
- 2.3.3.1 Pile caps 25 MPa
 - 2.3.3.2 Foundation walls and piers 25 MPa
 - 2.3.3.3 Slab on grade 30 MPa
 - 2.3.3.4 Slab on metal deck 30 MPa
 - 2.3.3.5 Concrete as Fill 15 MPa
 - 2.3.3.6 Exterior concrete 32 MPa.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- 3.1.1 Obtain Consultant's approval before placing concrete. Provide 24 hours notice prior to placing concrete.
- 3.1.2 Pumping of concrete is permitted only after approval of equipment and mix.
- 3.1.3 Ensure reinforcement and inserts are not disturbed during concrete placement.
- 3.1.4 Prior to placing of concrete obtain Consultant's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- 3.1.5 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- 3.1.6 In locations where new concrete is dowelled to existing work, drill holes in existing concrete. Place steel dowels of deformed steel reinforcing bars and pack solidly with non-shrink grout to positively position and anchor dowels.
- 3.1.7 Do not load new concrete structures until authorized by the Consultant.

3.2 JOINTING

- 3.2.1 Provide Shop Drawings showing location of all pour and control joints. Include signatures of acceptance by all trades whose work depend on proper coordination of joints in concrete slabs and finished flooring.
- 3.2.2 Locate additional control joints in general where cracking of concrete would be anticipated.

- 3.2.3 Construct joints in accordance with Canadian Standards Association A23.1-14, and/or as described below.
- 3.2.4 Incorporate keys as shown and/or as required to prevent any movement of adjoining concrete from different pours.
- 3.2.5 All slabs on grade to receive epoxy finish, shall be dowelled and keyed to foundation wall. Expansion joint filler is not permitted.
- 3.2.6 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by the Consultant. When more than one piece is required for a joint, fasten abutted ends and hold securely to shape by stapling or other positive fastening.
- 3.2.7 Make ½" x 1 ¼" deep saw cuts centered on construction Joints, not less than 24 hours after the slab has been poured, at locations indicated on drawings.
- 3.2.8 Seal all control and expansion joints by epoxy flooring division and not part of this section.

3.3 FINISHING

- 3.3.1 Finish concrete in accordance with Canadian Standards Association -A23.1-14 and Section 03400, Concrete Finishing.
- 3.3.2 Cure concrete in accordance with Canadian Standards Association A23.1-14 except where specified otherwise.

3.4 FIELD QUALITY CONTROL

- 3.4.1 Inspection and testing of materials and workmanship will be carried out by an Inspection and Testing Laboratory approved by the Consultant in accordance with Canadian Standards Association -A23.1-14/A23.2-14 and A283-06(R2016).
- 3.4.2 Inspection and Testing shall be paid under the 'CASH ALLOWANCE' for Inspection and Testing in Item CA5 of the Bid Form.
- 3.4.3 The Consultant will require additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- 3.4.4 Non-destructive Methods for Testing Concrete shall be in accordance with Canadian Standards Association A23.2-14.
- 3.4.5 Inspection or testing by Consultant will not augment or replace Contractor quality control nor relieve him of its contractual responsibility.

3.5 CLEAN-UP

- 3.5.1 Upon satisfactory completion of the work, clear away from the building and Site all excess or waste materials and debris and leave the premises in a condition acceptable to the Consultant, within the contract time.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1. The Contractor shall ensure that it and the Subcontractors and trades doing work in this Section read and become familiar with those portions of the aforementioned Sections relating to their own work.

1.2 WORK SUMMARY

- 1.2.1 Finish of slab on grade.
1.2.2 Finish of second level concrete sill.

1.3 RELATED WORK

- 1.3.1. Concrete Reinforcement Section 03 20 00
1.3.2. Cast-in-Place Concrete Section 03 30 00

1.4 REFERENCE STANDARDS

- 1.4.1. Do concrete slab finishing work in accordance with the latest revised editions of the Ontario Building Code, Canadian Standards Association A23.1-14 except where specified otherwise.

1.5 WARRANTY

- 1.5.1. Provide written warranty of work in this section against cracks which may develop for a period of two (2) years from date of Total Performance of the Contract. Crack identification and the repair method shall be in accordance with Canadian Standards Association A23.1-14, or as specified otherwise.

PART 2 - PRODUCTS

2.1 MATERIALS

- 2.1.1 Concrete materials to section 03 30 00 and reinforcement to Section 03 20 00.
2.1.2 Use compatible additives, admixtures and hardeners.

2.2 Curing Materials:

- 2.2.1 Use 20-30 % solids curing compound. No solvent-based curing compounds permitted:
2.2.2 Acceptable products include:

- 2.2.2.1 Super Aqua Cure by Euclid Chemical Canada Inc.
2.2.2.2 Cure-N-Seal Hs by Master Builders Technologies Limited.
2.2.2.3 Or Equivalent.

2.3 Expansion Joint Filler:

- 2.3.1. In floor slabs on fill, for use in column isolation joints and where slabs and sidewalks adjoin building walls and for other expansion joints in walls and curbs – pre-molded fiber filler 'RODOFILL' by Sternson Limited' or Equivalent.

2.4 Saw Cut Joint Filler:

- 2.4.1. Loadflex by Sternson Ltd. or Equivalent

PART 3 - EXECUTION

3.1 EXECUTION

3.1.1. FINISHES

- 3.1.1.1 Finish concrete in accordance with Canadian Standards Association A23.1-14.
1. All interior concrete shall receive steel trowel finish. Finish floating and trowelling shall result in a hard, dense, shiny uniform, "burned" finish free of pinholes, trowel marks or similar imperfections.
2. All exterior concrete shall receive a non-skid float finish.
- 3.1.1.2 Do not sprinkle dry cement or dry cement and sand mixture over concrete surfaces.
- 3.1.1.3 Cure concrete in accordance with Canadian Standards Association A23.1-14 using minimum one coat of curing and sealing liquid following the final finishing operation when concrete is sufficiently hard to resist marking and before drying.
- 3.1.1.4 Provide saw-cuts to all un-reinforced slabs on grade to a minimum depth of 1/3 slab thickness or 1 ½" whichever is greater. Saw-cuts are to be spaced at not more than 30 x slab thickness apart in any direction.
- 3.1.1.5 Exterior concrete shall be float finish using a spin trowel motion.

3.2 CLEAN UP

- 3.2.1. Upon satisfactory completion of the work, clear away from the building and Site all excess or waste materials and debris and leave the premises in a condition acceptable to the Consultant, within the Contract Time.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1. The Contractor shall ensure that it and Subcontractors and trades doing work in this Section read and become familiar with those portions of the aforementioned Sections relating to their own work.

1.2 WORK SUMMARY

- 1.2.1. This Section includes:
- a. Concrete units.
 - b. Mortar.
 - c. Deflection space fillers.
 - d. Control joints.
 - e. Dove tail anchors.
 - f. Masonry lintels including reinforcing steel bars.
 - g. Masonry reinforcing as shown on structural drawings
 - h. Cooperate with mechanical and electrical trades for built in items, refer to interior elevations.
 - i. Setting of loose steel lintels for doors, windows and mechanical openings (refer to structural drawings for size and mechanical drawings for mechanical openings), lintels supplied by others.
 - j. Cleaning masonry.
 - k. Setting all types of door frames anchored and built into masonry walls.
 - l. Fire barriers in masonry fire separations
 - m. Anchor bolts at top of walls for wood blocking with concrete filled block course.
 - n. Setting of hollow metal frames in masonry walls.
 - o. Horizontal joint reinforcing "BLOK-LOK" or Equivalent.

1.2.2. Related work in other Sections:

03 20 00	Base plate grout, vertical reinforcing for masonry walls.
05 40 00	Cast-in steel plates, anchors and ties relating to structural steel and lateral support angles at top of walls and loose lintels.
08 20 00	Hollow metal doors and window frames for building into masonry walls.

1.3 NOT USED

1.4 DESIGN AND PERFORMANCE REQUIREMENTS

- 1.4.1. Build masonry work in accordance with the Ontario Building Code Act, 1992, S.O. 1992, c. 23, Canadian Standards Association standard A371-14 "Masonry Construction for Buildings" and the Ontario Building Code latest revisions, using masonry, mortar, and connections complying with Canadian Standards Association Standards.
- 1.4.2. Build masonry fire separations and enclosures of specified rating, in accordance with specifications for fire tested assemblies published by Underwriters Laboratories of Canada.
- 1.4.3. Comply with Canadian Standards Association A371-14, CAN3-S304-14, the Ontario Building Code, and these Specifications. Should conflict occur, the more strict shall govern.

- 1.4.4. Comply with Canadian Standards Association A371-14 for construction tolerances. Tolerances shall not accumulate. Surface of masonry exposed to view, including surfaces scheduled to receive plaster shall be accurate, plumb and within a tolerance of 1/8" in any have zero tolerance for location and plumb.
- 1.4.5. Brace walls during construction until the structure provides sufficient lateral support. This is a mandatory requirement. Brace exterior walls for wind load until structural supported.

1.5 QUALITY ASSURANCE

- 1.5.1. Work of this section shall be executed under the continuous supervision and direction of a competent foreperson for each class of work.
- 1.5.2. One thoroughly experienced, reliable and competent person shall be in charge of mortar mixing.
- 1.5.3. In addition to non-compliance with specification with specified requirements or other contract requirements, the following will be considered defects:
 - 1.5.3.1. Shrinkage in individual units as erected.
 - 1.5.3.2. Spalling.
 - 1.5.3.3. Poor Colour or texture blending of units.
 - 1.5.3.4. Surface deterioration dusting.
 - 1.5.3.5. Discolouration, crumbling and similar deterioration of mortar
 - 1.5.3.6. Failure of built in items to remain anchored.
 - 1.5.3.7. Excessive cracking of mortar joints on block faces.
- 1.5.4. A pre-construction meeting will be required, with the Region, Contractor and Consultant in attendance, in which the following items shall be discussed:
 - 1.5.4.1. Analysis of job conditions.
 - 1.5.4.2. Materials to be applied.
 - 1.5.4.3. Installation methods.
 - 1.5.4.4. Project schedule.
 - 1.5.4.5. Construction details.
 - 1.5.4.6. Schedule for inspections.
 - 1.5.4.7. Sample walls.
- 1.5.5. Prior to commencement of work, construct a sample wall for each type of masonry wall construction, approximately 5' high x 10' long, at a location approved by the Consultant. The sample wall will show all materials to be used in wall section including panel installation. The approved sample wall may form part of the completed work. All work shall match the approved sample.

1.6 WARRANTY

- 1.6.1. Submit a warranty as specified under General Conditions of the Contract stating that the unit masonry installation will remain free from all failure for a period of two years from Total Performance of the Contract,. Any remedial work required shall be completed at no cost to York Region.

1.7 SUBMITTALS, SHOP DRAWINGS AND BUILT-IN ITEMS

- 1.7.1. Refer to the Room Elevation Drawings, to be issued prior to masonry construction, to determine the exact location of items to be built into masonry. Items shown on plan and preliminary wall elevations included with the Contract Documents.
- 1.7.2. Submit for approval clearly labeled samples of masonry materials to be used in the work. Submit for approval of alternative materials if required by the Consultant.
- 1.7.3. Submit shop drawings showing proposed locations of control joints for approval by consultant.
- 1.7.4. Submit shop drawings for wind bracing required at exterior walls. Shop Drawings shall bear the seal and signature of a Professional Engineer legally qualified to practice professional engineering in the Province of Ontario.

1.8 ENVIRONMENTAL CONDITIONS

- 1.8.1. Winter work shall be governed by recommended practices and guide specifications for cold weather masonry construction by the International Masonry Industry All-Weather Council and Canadian Standards Association standard. When the temperature falls below 4C°, heat mixing water, sand, masonry units, and work behind wind breaks and within heated enclosures as recommended.
- 1.8.2. Keep ice and snow off unlaid and newly laid masonry units. Maintain temperature above freezing point, around newly built walls for 48 hours. Protect work with insulating blankets as required.
- 1.8.3. In extremely hot, dry weather, keep mixed mortar and masonry units in shade until placed in work. Pre-wet faces of block before laying. Do not soak block. Spray walls with water to prevent premature hardening of mortar.

1.9 PROTECTION

- 1.9.1. Until covered by other construction, cover tops of masonry walls when work stops at end of day or because of inclement weather. Cover with non-staining waterproof material to overhang top edges by 2 ft minimum. Secure to prevent dislodgement by wind.
- 1.9.2. Protect:
 - 1.9.2.1. Masonry wall faces from mortar droppings and smears as work proceeds. Keep mortar droppings out of cavities.
 - 1.9.2.2. External corners with planks to prevent damage.
 - 1.9.2.3. Adjoining work from damage while cleaning masonry.
- 1.9.3. Provide bracing for walls higher than 10 times their thickness until braced by permanent building structure.

1.10 ALTERNATIVES

- 1.10.1. Masonry units and manufacturers are named herein to set a standard to which other manufacturers must comply if not otherwise specified.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Concrete masonry units:

- 2.1.1.1 Masonry Cement - Canadian Standards Association A3000-13
- 2.1.1.2 Portland Cement – Canadian Standards Association A 3000-13
- 2.1.1.3 Hydrated Lime - Canadian Standards Association A82-14.
- 2.1.1.4 Sand (aggregate) Canadian Standards Association A82-14.
- 2.1.1.5 Concrete Block
 - .1 To Canadian Standards Association A165 Series-14
 - .2 Type H/15/A/M lightweight block.
 - .3 Type S/15/A/M 75% solid block to be used behind all recesses in fire rated walls.
 - .4 Size metric
 - .5 Special Shapes - Supply corner block, ashlar block, bullnose block, lintel block and the like as specified, and as required. Bullnose block to be installed at all exterior corners including door jambs and window jambs/sill, unless otherwise noted.
 - .6 All masonry units shall be "Ultra Light Weight" as manufactured by Rich Vale York Block Inc. or Equivalent.
 - .7 All external corners including door jambs shall be bull nose.

Note: Notwithstanding the visual inspection requirements of Canadian Standards Association Standard A165, masonry units for paint or special paint finish shall be free of surface indentations, surface cracks or chipping.

2.1.2 Masonry Horizontal Joint Reinforcement (Truss or Ladder Type):

- 2.1.2.1. This Specification is based on products manufactured by Blok-Lok Limited. Products by Dur-O-Wal Ltd. or Fero Building Products Ltd. or Equivalent. Only new product to be used.
- 2.1.2.2. Finish-Brite Basic or Equivalent in interior walls and partitions. Hot dipped galvanized after fabrication for exterior walls.
- 2.1.2.3. Size – Wall thickness less 2".
- 2.1.2.4. Weight – Standard 9 ga. Welded rods.
- 2.1.2.5. Construction – Provide factory welded tee and corner sections and provide sufficient lap length for continuity of reinforcing. All work to comply with Canadian Standards Association standard A370-94 "Connectors for Masonry".

2.1.3 Reinforcing Steel: Conforming to Canadian Standards Association G-30.18-09(R2014) Minimum yield strength = 400 Mpa. Located in center of block cores. Lap 40 bar diameters as required.

2.1.4 Premoulded Joint Filler for non-fire rated locations:

- 2.1.4.1. Closed cell vinyl foam, compressed 25% when in joint. One of the following:
 - .1 Unifoam R 1009 – Flexible by Goodco Ltd.
 - .2 Rodofam PR by Sternson Ltd.
 - .3 Or Equivalent

2.1.5 Masonry Anchors and Ties:

- 2.1.5.1. Non-bearing walls and partitions to bearing walls: corrugated wall ties minimum 22 ga thick, 22 mm x 177 mm BLOK-LOK BLT7A or Equivalent @ 16" o/c.
- 2.1.5.2. Masonry walls, partitions and veneer to concrete elements: Flexible wire tie, 4.8 mm thick, length to suit wall condition, and dovetail anchor slot: BLOCK-LOK BLT8, or POS-I-TIE NWTC - TAPCON or Equivalent screw anchors by National Wire Products Industries Inc.

- 2.1.5.3. Masonry to concrete walls and columns: Flexible triangular 4.8 mm thick dove tail anchors by National Wire Products Indus or Equivalent
- 2.1.5.4. Strap anchors: Galvanized, 14 ga thick, crimped, 50 mm x 150 mm.
- 2.1.6 MORTAR
 - 2.1.6.1. Use same manufacturer's product for the entire project to ensure uniformity of mix and colouration.
 - 2.1.6.2. Mortar Type shall conform to Canadian Standards Association A179, Table 2: Type "N" for non load bearing partitions.
Type "S" for load bearing walls.
 - 2.1.6.3. Mix mortar ingredients thoroughly in quantities needed for immediate use.
 - 2.1.6.4. Mix mortar in mechanical mixer (except) for small quantities where hand mixing is permitted) until materials are homogeneously blended – not less than five minutes after all materials are in the mixer. Keep mixer clean.
 - 2.1.6.5. Use mortar within 2-1/2 hrs. of mixing when temperature is 25 degrees C. or higher and within 3-1/2 hrs. when temperatures are below 25 degrees C.
 - 2.1.6.6. Mortar joints for architectural block shall include water-repellent and colour admixture supplied by concrete block manufacture.
 - 2.1.6.7. Solid blocks means hollow block filled with 25 Mpa pea gravel concrete.
- 2.1.7 Lateral restraint Connectors (ties)
 - 2.1.7.1. To vertical concrete walls & columns - Dovetail Flex-O-Lok or Equivalent @ 24"o/c max vert.
 - 2.1.7.2. To steel - beams and joists - 3/16" steel angles refer to structural Drawings and Section 05400.
 - 2.1.7.3. To top of walls connected to underside concrete slab or structural steel shall be steel angles in accordance with Section 05400.
 - 2.1.7.4. To concrete columns @ 24"o/c max vert.
- 2.1.8 Architectural face block – split face block, DRY-Block or Equivalent system (water-repellent and colour) Provide smooth phase of different colour. Colours of block to be selected by architect from standard colour charts and match existing. Block manufacturer to supply DRY-BLOCK or Equivalent mortar admixture and instructions to masonry contractor for mixing on site (mortar joints to match block colour).
- 2.1.9 Deflection spacer- 1" to 2 7/8" (as shown on drawings) Ceramar flexible foam expansion joint filler, W.R. Meadows or Equivalent
- 2.1.10 Adjustable rectangular ties.
- 2.1.11 Expansion joints between the existing building and the new masonry walls shall be Emseal or Equivalent exterior color seal.
- 2.2 JOINTS
 - 2.2.1. Make joints a uniform 3/8", tooled concave joints where exposed, trowel point joints in contact with earth, struck flush joints for other concealed work. Rake out control joints 3/4".
 - 2.2.2. Fill joints solidly with mortar in both bed and vertical joints, including joints between facing and backup units. For blocks, cover end areas and face shells fully with mortar. Apply mortar to webs also to first course laying on footings, concrete foundation walls and to blocks in piers and pilasters. Solid masonry units shall be fully bedded in mortar. Do not butter corners of units, allow mortar scrapings in joints, slush joints, furrow bed

joints excessively or shift and tap units after mortar has initially set. Cut out defective joints and tuckpoint. Plug nail and other holes with fresh mortar.

- 2.2.3. Mortar joints at walls to receive plaster finish to be struck flush with wall surface, refer to Room Schedule.
- 2.2.4. All joints in masonry forming a substrate for vapor/ air barrier material, shall be struck flush so as to present a smooth as possible surface for adhering the barrier membrane.

2.3 CONNECTORS (BONDING, TIES, JOINT REINFORCEMENT)

- 2.3.1. Lay block in running bond unless stack bond is indicated on Drawings.
- 2.3.2. Install bonding connectors and horizontal joint reinforcement in every second horizontal block course. Immediately above and below openings install one additional row of reinforcement extending a minimum of 2'-0" beyond each side of opening.
- 2.3.3. Do not run bonding connectors and joint reinforcement:
 - 2.3.3.1. Through control and expansion joints.
 - 2.3.3.2. In foundation walls with earth on both sides.
 - 2.3.3.3. Through solid piers providing lateral support. Tooth walls to piers.
- 2.3.4. Install joint reinforcement in walls whether reinforced horizontally or not at reductions in wall thickness as at recesses and chases not full height of wall:
 - 2.3.4.1. Sized for reduced wall thickness.
 - 2.3.4.2. In every second horizontal joint.
 - 2.3.4.3. Extending 18" beyond end of reduced wall.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

- 3.1.1. Provide general lines and levels. Be responsible for accurate dimensions, lines and levels of work of this section. Make work plumb and true. Exact dimensions, as noted on Drawings, will have zero tolerance level for location and plumpness.
- 3.1.2. As work progresses, the Region's representative will verify the dimensional layout and wall plumpness, through a third party.
- 3.1.3. Contractor shall be responsible for plumpness of wall through full height of wall. If Contractor realizes that the wall or any device installed in the wall is out of plumb, Contractor to immediately inform the Contractor.
- 3.1.4. Contractor shall be responsible for true and plumb installation of all Mechanical and Electrical built-in devices/process panels.
- 3.1.5. Masonry units required to be cut to fit abutments, to fit around built in items and the like, shall be neatly cut with a carborundum or diamond saw. No breaking of blocks will be allowed.
- 3.1.6. Reinforce masonry as required to support wall mounted or built in equipment, mechanical and electrical wall mounted devices/process panels, building components and fixtures provided under other Sections.

- 3.1.7. Contractor shall ensure that all Mechanical and Electrical devices are installed as per the Architectural Drawings. Room Elevations will be provided, prior to construction, to show all electrical and mechanical devices and all panels on a room by room basis.

3.2 INSTALLATION PROCEDURE

- 3.2.1. Co-ordinate the following procedure on a room by room basis.
- 3.2.2. Lay-out location of wall on floor slab. Allow other trades to indicate on the floor required rough-ins and height of devices to be roughed in.
- 3.2.3. Contractor must co-ordinate the work of other trades to complete work on both sides of the section of wall. Contractor to verify layout including exact dimensions.
- 3.2.4. Determine the location and size of openings to be left in masonry walls for heating, ventilating, plumbing, electrical features, ducts, boxes, panels and other items. Pass conduits and piping through hollow cells of blocks or build around them by cutting cores but not face of block. Build chases and openings as required that are neatly finished, as the work progresses. Cut block for electrical boxed and recessed equipment accurately using a Carborundum saw. Provide square clean edges.
- 3.2.5. Construct wall to below the panel level (typically 4'). Build in the process panels the following day. Panels to be installed with glazing tape backer (supplied by Contractor). Ensure panels are installed securely, with outer face of panel in required location, level, plumb and in line with future painted and plastered surface of block (3/16" plaster plus 20 mil epoxy coating). Grout solid with mortar all spaces around built in items.
- 3.2.6. Allow mechanical and electrical trades to fix and extend piping and conduit to half height of the wall. Contractor will verify layout including exact dimensions.
- 3.2.7. Contractor shall co-ordinate with its masonry Subcontractor regarding continuation of Mechanical and Electrical work on the rest of the wall.
- 3.2.8. Subcontractor shall obtain acceptance of work from General Contractor on a room by room basis who will in turn obtain acceptance from the Region and Consultant on a of the work on a room by room basis.
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3.3 GENERAL WORKMANSHIP

- 3.3.1. Employ properly qualified masons for laying up masonry units per Section 1.5 above.
- 3.3.2. Distribute exposed masonry units of varying colours, tones and textures evenly over wall surface to avoid patches and streaks and to produce a pleasing appearance.
- 3.3.3. Leaving courses uneven or with visibly thicker mortar joints will not be acceptable. Any such work must be removed and rebuilt to approval of Consultant.
- 3.3.4. Construct masonry evenly in maximum lifts of 5'-0". Shallow concave joint back ends of unfinished walls, do not tooth and bond new masonry. Mortar joints at walls to receive plaster finish to be struck flush with wall surface.
- 3.3.5. Chases must be built – not cut.

- 3.3.6. Chipped or blemished units may be used where concealed. Defective and broken units must be removed.
- 3.3.7. Build masonry with accurately plumbed faces, truly horizontal bed joints and accurately aligned vertical joints.
- 3.3.8. Notwithstanding current trade practice in this regard, fill all vertical collar and bed joints through the entire wall thickness solidly with mortar.
- 3.3.9. Cut masonry neatly with Carborundum saw where it comes in contact with the structure and where else required and build tightly against the structure except where expansion control and deflection joints are required. Build masonry up and neatly fit to all openings. Anchors for frames for such openings shall be built securely into joints.
- 3.3.10. Do all cutting, fitting and patching in masonry work to receive work of other trades. Install items supplied by other trades to be built into masonry walls, plumb, level, rigid, properly aligned and secure. Build in all miscellaneous metal work, loose lintels, bearing plates, sleeves, anchor bolts, panels, mechanical and electrical devices and all other items which require building in to masonry.
- 3.3.11. Set access doors, panels, mechanical and electrical devices with front face flush with final wall finish (typically 3/16" plaster with 20 mil epoxy coating). Such fittings shall be located precisely as shown on drawings.
- 3.3.12. All exposed interior outside corners including sills shall be formed using bullnose corner block, unless otherwise noted.
- 3.3.13. Grout in voids in metal deck at top of masonry load bearing walls.
- 3.3.14. Layout of control joints to be provided prior to commencement of work.
- 3.3.15. Mortar joints in concrete block walls shall be 3/8". Tool joints in exposed masonry to a neat concave finish using non-staining tool. Before tooling, ensure that surface of mortar is thumb print hard and has water sheen. Strike joints flush in concealed locations, and where wall will receive plaster finish or air barrier.
- 3.3.16. Do not shift or tap masonry units after mortar has taken its initial set.
- 3.3.17. Provide masonry knock out panels where indicated on the drawings.

3.4 BLOCKWORK

- 3.4.1. Lay concrete block in running bond, with thicker end of face shell upward. Coursing to be 7 7/8" for one block and one joint.
- 3.4.2. Concrete masonry units to have face shells and their ends fully filled with mortar, and joints squeezed tight. Also fill webs at cores and strike flush at core taking care to prevent mortar from falling into core.
- 3.4.3. Do not wet block before laying.
- 3.4.4. Exposed faces should be full units laid out to minimize cutting with not less than 4".

- 3.4.5. Provide minimum 1'-4", or as noted on drawings, solid or grouted block for jambs of openings and at ends of walls.
- 3.4.6. Install access doors occurring in masonry elements, required by mechanical and electrical divisions. Install access door plumb, level, properly aligned and securely anchored, in locations in accordance with mechanical and electrical divisions of Contract Documents.

3.5 ANCHORING, BONDING AND REINFORCEMENT

- 3.5.1. Anchor or bond walls and partitions at points where they intersect.
- 3.5.2. Bond each wythe of masonry walls and partitions at corners by alternately bonding 50% of units of each wall and partition at corner intersection.
- 3.5.3. Bond non-load bearing walls and partitions to load bearing walls with ties spaced at 8" o.c. vertically. Provide one tie for each 4" thickness, or part thereof, of wall or partition. Tie intersecting non-bearing walls together with masonry reinforcing every second course.
- 3.5.4. Do not tie intersecting bearing walls together in masonry bond, except at corners.
- 3.5.5. Anchor masonry walls and partitions to concrete elements with anchors spaced at 16" vertically.
- 3.5.6. Unless otherwise indicated, reinforce all walls and partitions with continuous horizontal metal reinforcement, installed at 16" o.c. vertically.
- 3.5.7. At wall openings place continuous reinforcement in first and second mortar joints above and below openings. Additional reinforcement at openings shall extend 24" beyond both sides of the opening.
- 3.5.8. Install prefabricated corner assemblies at corners.
- 3.5.9. Lap continuous reinforcement 150 mm at splices. Cut reinforcement at control joints.
- 3.5.10. Provide and install vertical and horizontal reinforcing steel and concrete fill at power door locations as detailed on drawings.

3.6 LINTELS

- 3.6.1. Set loose lintels supplied under section 05 40 00 for bridging openings in masonry walls.
- 3.6.2. Where lintels require attachment to the structure, they will be supplied and installed in accordance with requirements of Section 05 40 00.
- 3.6.3. Supply and install block lintels as shown on Drawings with reinforcing steel and fill with 20 Mpa concrete.

3.7 GROUTED MASONRY

- 3.7.1. Provide grouted masonry at load bearing walls in accordance with requirements shown on drawings.

- 3.7.2. Meet requirements of Canadian Standards Association -S304-14 and Canadian Standards Association -A371-14 "Grouted Masonry", except where indicated otherwise.

3.8 LATERAL SUPPORTS

- 3.8.1. Lateral support for masonry walls and partitions shall be supplied and installed by Section 05 40 00.

3.9 DEFLECTION JOINTS

- 3.9.1. Construct deflection joints between top of partition and structural slab as detailed. If not detailed proceed as follows:

- 3.9.1.1 Ascertain amount of deflection to be provided for and terminate top of partition accordingly.
- 3.9.1.2 Fill joints between top of partition and structural slab using pre-molded joint filler, leaving no voids.

3.10 CONTROL JOINTS (interior and exterior)

- 3.10.1. Control joints shall be located at maximum spacing of 20'-0" centers and be located at the intersection of masonry walls and at dissimilar materials and spaced at equal distant intervals and as shown on drawings.
- 3.10.2. If control joint is in vicinity of a door, locate at one side of door.
- 3.10.3. Control joints to be 1/8" in width.

3.11 STEEL DOOR AND WINDOW FRAMES

- 3.11.1. Install steel frames in masonry walls. Build in frames rigid, true and plumb. Fill voids between frame and masonry with grout. Jambs and window sills shall be bullnose.
- 3.11.2. Brace frames solidly in position while being built in. Provide temporary horizontal wood spreader at mid-height of frame to ensure maintenance of required frame width until masonry work is complete. For frames over 4 feet in width, provide temporary vertical support at centre of the head.
- 3.11.3. Keep frames free of mortar stains. Ensure door bumper holes remain free of mortar.

3.12 WIND BRACING

- 3.12.1. Ensure external wall is fully anchored to intermediate building columns as specified.
- 3.12.2. Where horizontal span of wall is greater than 10'-0" between columns, design and provide temporary bracing at exterior wall for wind loading prior to installation of exterior cladding. Locate bracing evenly between columns at no more than 10'-0" on center.
- 3.12.3. The following is a suggested method for wind bracing:
- 3.12.3.1. Install stud shear connectors by Fero Products Limited or Equivalent at 32" maximum centers at brace locations.

- 3.12.3.2. Install vertical braces at required locations consisting of one of the following:
 - .1- Two S.P.F. (spruce-pine-fir) No. 1, 2 x 12's.
 - .2- One C8 x 11.5 steel channel.
 - .3 - Three 8" x 0.06" Light Gauge Steel Studs.
- 3.12.3.3. Ensure that vertical braces are anchored securely to top and bottom of structure.

3.13 PATCHING AND CLEAN UP

- 3.13.1. Keep masonry clean and free of mortar droppings.
- 3.13.2. Clean mortar off daily before it has time to set. Dry brush masonry surfaces.
- 3.13.3. At completion of work, holes and other defects in masonry shall be repaired, and masonry surfaces shall be thoroughly cleaned.
- 3.13.4. Remove efflorescence from masonry surfaces by wet cleaning in accordance with Manufacturer's recommendations.
- 3.13.5. Upon completion of work, clean block work by brushing and washing.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE

- .1 Conform to all requirements contained herein inclusive of Section 14 01 20 Maintenance of Elevator.
- .2 The Contractor shall provide all labour, materials, equipment, and services that are necessary to supply and install one (1) Limited-Use/Limited-Application Elevator (LULA) in accordance with this Specification and all Architectural Drawings. Any site conditions requiring special attention or deviations from standard product line as outlined herein shall be calculated and included in the total contract price submitted in the Contractor's Bid.
- .3 Where Drawings, site conditions, and Specification are not conclusive or differing, the Contractor shall inform the Region and the Consultant, but in no way shall it relieve the Contractor of the obligation under the intent of the Specification, to install one (1) complete, fitting, and functional LULA elevator system to full code compliance. Contractor to verify all measurements and conditions as well as any Drawings and Specifications before providing Shop Drawings and manufacturing.
- .4 Where a device or part of equipment is referred to in the singular, it shall apply to as many as are required to complete the installation in the intent of the Specification.
- .5 This section of the specifications covers one (1) 1,400 lbs., holeless hydraulic LULA elevator designated as E1 and based on a Delta Elevator LULA.
- .6 The elevating device installation and associated maintenance referred to herein for the 145 Harry Walker Drive Parkway Project in Newmarket is referred to as the "Specification", and the term "Elevator Subcontractor" refers to the LULA elevator Subcontractor.

1.2 REGULATIONS AND STANDARDS

- .1 The Contractor shall complete work in compliance with the latest edition of the Standards as noted below at the bid closing date, including all supplements and appendices as a minimum.
 - a./ ASME A17.1-2010/CSA B44-10: Safety Code Elevators and Appendix "E".
 - b./ Technical Standards and Safety Act 2000, Statutes of Ontario, 2000, Chapter 16.
 - c./ Ontario Building Code, Latest Edition
 - d./ C22.1 Part 1, Canadian Electrical Code, latest edition.
 - e./ Certification of Elevating Device Mechanics, Ontario Reg. 222/01.
 - f./ Codes and Standards Adopted by Reference, Ontario Re. 223/01.
 - g./ Ontario Regulation 209/01, Elevating Devices.
 - h./ Ontario Electrical Safety Code, Latest Edition.
 - i./ B44.2-13 Maintenance requirements and intervals for elevators, dumbwaiters, escalators, and moving walks and Section 14 01 20.
 - j./ Ontario Regulation 851, including Sections 24, 25, 75, and 76.
 - k./ Technical Standards and Safety Authority, Code Adoption Document Amendment 277-19.
- .2 All work performed and material supplied by the Contractor shall be in accordance with all applicable building codes and local by-laws, and the requirements of Provincial and Federal Legislation. Conform to governing Municipal and Provincial Codes, Rules and Regulations and the requirements of Authorities Having Jurisdiction.
- .3 In regards to the use, handling, storage, and disposal of hazardous material, the Contractor shall comply with the requirements as outlined by the WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (W.H.M.I.S.).

1.3 QUALITY ASSURANCE

- .1 Work shall be undertaken by certified and licensed elevator personnel with Elevating Device Mechanic "A" (EDMA) accreditation as certified by the Technical Standards and Safety Authority.
- .2 Do all work and supply all equipment in accordance with the requirements and recommendations of the latest issue of the applicable standards and codes of the:
 - National Standards of Canada (NS Can)
 - Canadian General Standards Board (CGSB)
 - Canadian Standards Association (CSA)
 - American National Standards Institute (ANSI)
 - American Society for Testing and Materials (ASTM)
 - Ontario Building Code O.Reg. 403/97, as amended
 - Environmental Protection Act O. Reg. 189/94 as amended to O.Reg. 238/01
 - Ontario Fire Code and Ontario Ministry of Labour

1.4 PERMITS AND FEES

- .1 Obtain, submit, and pay for necessary local and/or provincial permits and inspections. Submit to the Technical Standard Safety Authority (TSSA) registration of elevating device and also pay all costs in connection therewith, including costs associated with any and all tests to be performed by the TSSA in order to lawfully license the elevator for use by the general public. Submit all TSSA submission documents, test results, and approval certificates to the Consultant prior to Date of Substantial Performance of the Contract.

1.5 WORK SCHEDULE

- .1 The Contractor shall submit a proposed work schedule including lead time required for approval drawings, manufacturing lead time after approvals, and time to complete on Site activities within 5 Business Days of the date of issuance of the notice to commence the Work.
- .2 Elevator portion of this Project is to commence on the date(s) established in strict accordance with the Owner's requirements.

1.6 MATERIAL AND EQUIPMENT

- .1 Specifications on the make and model of all major components to be used in completing the Contract shall be submitted as part of the Shop Drawing review process including controller type, valve type, door operator type, detector edge brand, and fixture brand.
- .2 Brand names, trademarks, logos, or company name on any exposed elevating equipment to the public will not be permitted.
- .3 All samples for all exposed surfaces relating the cab interiors are to be submitted to the Consultant for approval prior to any work being undertaken.
- .4 Install all equipment in a professional and tidy manner. Secure all wiring in a neat and orderly fashion and label all components.
- .5 Provide only new material and equipment designed specifically for elevator usage.

1.7 RELATED WORK BY General Contractor

1. **Construction Facilities and Temporary Controls:** protection of floor openings and personnel barriers; temporary power and lighting; grid lines at each elevator lobby for setting of elevator door frames.
2. **Cast-In-Place Concrete:** elevator pit, elevator machine room, hoistway walls where applicable, hoistway enclosure within +/- 25 mm from top to bottom and measured in both x and y axis, grouting of thresholds, necessary hoistway wall support for rail bracket fastening.
3. **Unit Masonry:** Building-in and grouting of hoistway door frames. Knockouts in wall between machine room and hoistway to suit elevator contractor requirements for oil line and electrical wiring.
4. **Metal Fabrications:** Support for sill entrances where required, lintels above all entrances.
5. **Sheet Waterproofing:** Waterproofing of elevator pit.
6. **Doors and Frames:** Self-closing, self-locking machine room access door and metal frame.
7. **Painting:** Painting of elevator entrances and doors where provided in primed finish only, painting of elevator machine room walls in white.
8. **Heating, Ventilating, and Air Conditioning:** Ventilation and temperature control of elevator equipment room to maintain ambient temperatures between 10 to 30 degrees Celsius, less than 95% non-condensing, to suit Contractor's heat emission output of equipment of approximately 3,000 BTU/hour.
9. **Electrical:** General – Power requirements and location of all disconnects, switches, auxiliary contacts, and GFCI (Ground Fault Circuit Interrupter) receptacles, to satisfy Contractor power characteristics and requirements as identified on General layouts and shall include not less than the following:
 - 208 volts, 3 phase electrical service including feeder and conduit to main disconnect in elevator machine room for normal power.
 - Conduit, wiring, and ground wire from disconnect to the elevator controller.
 - Provide dedicated ground in machine room to elevator controller.
 - Provide auxiliary normally open contact in disconnect in accordance with CSA C22.1, Section 38-091(5).
 - Electrical power for elevator installation and testing;
 - 120 volt, 15 amp, single phase with fused Single Pole Single Throw (SPST) electrical disconnect in machine room for cab lighting, including conduit and wiring to controller.
 - Pit receptacle with GFCI protection. Provide 120 volt GFCI outlet in machine room also.
 - 120 volt receptacle, 15 amp, in the machine room for elevator contractor supplied elevator communication device.
 - Suitable overhead lighting in machine room over controller with dedicated switch to provide not less than 200 lux at floor.
 - Guarded pit lighting with dedicated switch to provide not less than 100 lux at pit floor.
 - Smoke detector in machine room, top of hoistway, bottom of hoistway, and with all recall signal wiring to the elevator controller.
 - Building fire recall signals for main floor and general alarm. Note: pull stations cannot recall the elevator, only smoke alarms for the LULA elevator.
 - Wiring for telephone service in elevator to elevator machine room.

1.8 SPECIFICATIONS AND DRAWINGS

- .1 Within four (4) weeks of date of issuance of notice to commence the Work, submit electronic set of detailed Shop Drawings showing complete layout of all elevator equipment as required including the following as minimum:
 - Location of machinery and all components in machine room.
 - Location of piping and wiring run to the elevator hoistway.
 - Loads to be carried on the building and reaction loading in the pit.
 - Horsepower rating of motor and all electrical characteristics including recommended fuse sizes, ratings, and types, starting and running current, and a voltage confirmation sheet. Machine room equipment heat emission rates.
 - Disconnects, switches, and all outlet locations.
 - Design of elevator cab enclosure including car fixtures, walls finishes, ceiling, and car sill threshold height.
 - Fixture layouts to reflect all hall position indicators and hall stations where required by specification.
 - Design of hoistway entrances showing location of all signals.
 - Hoistway sizing, overhead, and pit depth.
 - Guide rails, buffers, elevator cab, traveling cable location.
- .2 Submit with detailed Shop Drawings all required work by the Contractor and the Elevator Subcontractor indicating sizes, quantities, and locations of ancillary equipment and all other relative data to suit a complete elevator installation. Failure to provide a complete and comprehensive listing of work by others will result in Contractor being held responsible for said omitted work, including all labour and material costs incurred by other trades to complete same.

1.9 WARRANTY & WARRANTY MAINTENANCE

- .1 The Contractor shall warranty and guarantee materials and workmanship as outlined in these specifications from *date of* Total Performance of the Contract for a period of twenty four (24) months thereafter. The Contractor shall make good any defects not due to ordinary wear and tear, vandalism, or improper use. In the event a defect exists as determined and confirmed by the Consultant, the Contractor shall absorb both material and labour cost to replace this defective component in all elevators on the project at no cost to the Contract. The Contractor shall submit with Shop Drawings, a copy of their warranty certificate covering both material and labour for defective components.
- .2 Contractor shall provide a comprehensive, all-inclusive monthly warranty service and maintenance program in strict accordance with Specifications 14 01 20 for a 24 month period during the warranty commencing on the date of Total Performance of the Contract. All costs associated with maintenance commencing on the date of the Total Performance of the Contract shall be included in the price for Item B1 – Elevator Maintenance in the Bid Form. .Maintenance Service includes all callbacks including Emergency, 24 hours a day, 7 days a week at no cost to the Owner.

1.10 CHANGES IN THE SCOPE OF WORK

- .1 Changes in the scope of work will be governed by the General Conditions including GC – 14 – Changes in the Work, GC 15 – Change Order and GC 16 Change Directive.

1.11 NON-PROPRIETARY EQUIPMENT AND TOOLS

- .1 Only non-proprietary equipment will be accepted by the Owner and installed. This will include but not be limited to controller, drive, motor, door operator, fixtures, and any inspection tools. Contractor to provide at the time of Tender a letter stating all equipment being installed is non-proprietary to the satisfaction of the Owner.
- .2 Provide prior to date of Substantial Performance of the Contract all maintenance, repair, adjusting, and diagnostic or inspection tools.

1.12 MAINTENANCE AND OPERATING MANUALS

- .1 Prior to the date of Substantial Performance of the Contract, provide to the Owner one (1) set + searchable memory stick of Maintenance and Operating Manual information, amended site specific, and to include the following;
 - a. Description of all features and operational equipment including adjusting and testing procedures.
 - b. Complete guide on Emergency Communication System including programming of system.
 - c. Diagnostic instructions and equipment troubleshooting guide for controller and door operator complete with error fault codes and comprehensive description of all codes.
 - d. Parts listing and diagrams of all controller, door operator, detector edge, fixture, motor, and travelling cable components as a minimum, complete with original manufacturers equipment corresponding part numbers.
 - e. Complete set of "As-built" approval drawings, latest revision, including main layout, entrance, fixture, and cab drawings neatly folded and inserted into the manual.
 - f. Complete set of As-Built Wiring diagrams.
 - g. Complete description of Uninterrupted Power Supply (UPS) Emergency Battery Rescue Feature Lowering operation and sequencing.
 - h. Copy of TSSA Registration documentation for elevator car and most recent TSSA Inspection Certificate.

1.13 SEPARATE PRICES – NOT USED

1.14 ITEMIZED PRICES – NOT USED

1.15 BARRIER FREE REQUIREMENTS

- .1 Equipment shall be designed and installed to suit ASME A17.1-2010/ CSA B44-10, Appendix "E" Elevator Requirements for Persons with Physical Disabilities. In addition to all other Barrier Free requirements described herein, as a minimum provide or meet with the following;
 - .1 Car Button Height: Car buttons with floor designations shall be located a maximum of 1220 mm above the floor or ground when measured to the centre-line of the buttons, Emergency controls, including the emergency alarm, shall be grouped at the bottom of the panel. Emergency control buttons shall have their centre-lines 890 mm minimum above the floor or ground.
 - .2 Car Button Dimensions: Buttons shall be 19 mm minimum in their smallest dimension. Buttons or surrounding button collars shall be raised a minimum of 1.5 mm. Button Arrangement: Buttons shall be arranged with numbers in ascending order. When two or more columns of

buttons are provided, they shall read from left to right.

- .3 Car Button Designations: Control buttons shall be identified by tactile characters and visual characters complying with Clause E-20 of the ASME A17.1-2010 / CSA B44-10 Appendix "E" Code. Tactile plates shall be mounted using hidden fasteners.
- .4 Control Button: The control button for the main entry floor and control buttons other than remaining buttons with floor designations, shall be identified with tactile and visual symbols as shown in Table 2.26.12.1. of the ASME A17.1-2010 / CSA B44-10 Appendix "E" Code.
- .5 Visible indicators: Buttons with floor designations shall be provided with visible indicators to show that a call has been registered. The visible indication shall extinguish when the car arrives at the designated floor.
- .6 Handrails on 1 non-access wall shall be provided. Handrail shall be mounted at a height of 800 mm to 920 mm with a space of 35 mm to 45 mm clearance from the cab wall. Provide sufficient amount of wall spacers to ensure handrail is firmly secured.
- .7 Hall buttons shall be located vertically between 890 mm and 1220 mm above the floor to the center-line of the respective button. Hall button fixtures shall match in every way, those of the car operating panels, and shall be 19 mm minimum in the smallest dimension. Hall buttons shall have visual signals to indicate when each call is registered and when each call is answered. Buttons or surrounding button collars shall be raised a minimum of 1.5 mm.
- .8 Provide at the Ground floor jamb plates on both sides of the entrance complete with designation and "star" symbol combined on same plate. Provide for all other floors, jamb plates with corresponding Braille on both sides of the elevator entrance. Raised star and all characters shall be 50 mm high and shall comply with Clause E- 20.2 of the ASME A17.1-2010 / CSA B44-10 Appendix "E" Code.

PART 2 PRODUCT

2.1 DESCRIPTION

	ELEVATOR E1
Number:	One (1)
Machine Type:	LULA
Elevator Type:	Passenger, Class "A" Loading
Control Room:	@ Ground Floor, Adjacent to Hoistway
Control Room (minimum size):	1220 mm w X 1830 mm w x 2134 mm h clear
Contract Speed (minimum):	0.15 m/s (30 FPM)
Capacity:	635 kg (1400 lbs.)
Rise:	3609 mm (11'10")
Overhead to U/S Hoist beam or Roof:	3400 mm (11'2")
Pit:	356 mm (14")
Number of Stops, Openings:	2 stops, 2F/0R
Landing Designations:	G, 2
Operation:	Selective Collective
Controller:	Microprocessor, Non-Proprietary
Building Power Supply:	208 volts, 3 phase, 60 Hz
Type of Drive:	Hydraulic
Motor HP (estimated):	5 HP
Approximate Impact at Car Jack:	60 kN
Hoistway Clear:	1676 mm w x 2010 mm d (5'6" w x 6'7.13 d)
Hall Risers (Group):	(1) One per floor at all levels
Cab Clear Inside (approximately):	1067 mm w x 1524 mm d (3'6" w x 5'0" d)
Cab Height, Floor to Canopy:	2134 mm h (7'0" h)
Door Type:	Two Speed Side Opening (2SSO)
Door Dimensions:	914 mm w x 2032 mm h (3'0" w x 6'8" h)
Door Rough Opening Both Floors:	1676 mm w x 2340 mm h (5'6" w x 7'8" h)
Door Operators:	Closed Loop Heavy Duty
Door Protection:	Infrared Detector
Car Guides:	Slipper Guide Shoes
Car Stations:	One
Car Position Indicator:	In Car Station
Arrival Signal:	In-Car Riding Lanterns, LED
Hall Position Indicators:	None
Emergency Communication:	Alarm Bell and Hands-free Phone
Emergency Service:	Phase I Only
Emergency Power:	None
Security Card Reader:	Yes – Future Provisions Only
Central Alarm Control Facility Panel:	No
CCTV Camera	Yes - Future Provisions Only

2.2 VERTICAL TRANSPORTATION BUILDING REFERENCE

145 Harry Walker Parkway

Construction Levels	Floor to Floor	E1
2	-	F
1	3609 mm	F (MR)
Pit	356 mm	P

MR = Machine Room

2.3 ARCHITECTURAL FINISHES

LULA - ENTRANCE, HALL DOOR, FIXTURE, HALL SILL FINISH				
Floor Level Designation	ENTRANCE	HALL DOOR	FIXTURE	HALL SILL
2	SS	SS	SS	AL
1	SS	SS	SS	AL

SS = #4 Brushed Stainless Steel, AL = Aluminum

PR = Primed Only for Painting on Site By Others

2.4 CAB FINISHES

LULA - CAB FINISHES: E1	
CAR DOOR (S)	SS
FRONT RETURNS AND TRANSOMS	SS
SIDE WALLS	Laminate
CEILING	Min 2 Pot Lights Recessed, LED
HANDRAIL	SS, 1.5" Tubular
FLOORING	Resilient Flooring
CANOPY	White
CAR STATION (S)	SS
CAR SILL THRESHOLD	Aluminum

SS = #4 BRUSHED STAINLESS STEEL

PART 3 PRODUCTS, DESCRIPTION & EXECUTION

3.1 CONTROLLER

- .1 Supply and install CSA approved microprocessor based controller meeting all of the latest CAN/B44 Safety Code for Elevators requirements and providing full automatic operation suitable for building power supply.
- .2 The elevator shall offer Independent Service Operation, Emergency Operation Phase I only, and Emergency Battery Lowering. Elevator shall return to the Ground floor and open its doors upon activation of building emergency recall signal.
- .3 Components to be installed in metal cabinet completely enclosed with covers and either be wall mountable or floor standing type and isolated from building structure.

- .4 Controller cabinet shall have either fans or alternate means to dissipate heat to ensure drive components as a minimum are maintained at a reasonable operating temperature with the controller cabinet doors closed.
- .5 Only non-proprietary equipment with parts and software readily available will be accepted. Supply at time of tender on company letterhead confirmation the equipment meets with this requirement with no shut down timers or any other proprietary features.
- .6 All components within the controller including fuses, relays, contactors and printed circuit boards are to be clearly identified.
- .7 Controller wiring to be installed in a professional and neat manner with proper connecting devices and terminal blocks permanently labeled. Labels shall correspond with electrical wiring diagrams.
- .8 Ground controller and all equipment to building ground brought to machine room by others. The occurrence of a single accidental ground or short shall not defeat any safety device and shall not permit the elevator to start or run if the hoistway door or gate interlock is unlocked or if any hoistway door or car door gate contact is not made.
- .9 The microprocessor shall include permanent on-board diagnostics and status indicators for trouble-shooting, adjusting, and maintenance purposes. On-board diagnostics shall include event and fault log, real time clock, and method of displaying the status of all inputs and outputs. Provide switches, displays, push buttons, and instructions to view diagnostic information. Indicators shall provide as minimum a means to determine or indicate;
 - Position of the elevator cab in the hoistway.
 - Safety Circuit and Door Locks.
 - Inspection and Normal operation.
 - Emergency Lowering.
 - Independent Service.
- .10 The operation of the system is to be selective collective.
- .11 Ensure controller will restart after loss of normal power.
- .12 Provide in hoistway, top to bottom, car position feedback device to accurately feedback the exact position of the cab with an accuracy of +/- 6 mm at any point in the hoistway. Car position feedback system to integrate with controller to provide consistent and accurate leveling at all landings regardless of direction of travel and from no load to full rated capacity. Absolute floor number encoding shall be provided at each floor level to establish exact floor position and shall be store in a non-volatile memory location so that in the event of power loss, normal operation of elevator may resume without having to perform a learn trip or travel to a terminal landing.
- .13 Store all on site field adjustable parameters in Electrically Erasable Programmable Read-Only Memory (EEPROMS) and as a minimum allow the following to be readily programmed at the controller without the use of a handheld device or portable laptop computer; car and hall dwell times, door open and door close times, parking floor, and acceleration and deceleration rates.

3.2 POWER UNIT

- .1 Provide an oil tank with a minimum additional twenty-gallon capacity above the maximum normal oil level. Provide an oil level gauge, drain, and filter-screen over the inlet. Supply and install isolation pads between the tank unit and the floor.

- .2 Provide pump and motor suitable for building power supply. Provide a 5 Horsepower minimum submersible type motor inside the oil tank in the machine room. Provide a submersible type pump allowing sufficient oil flow to move the cab in UP direction easily within 2% of contract speed with full load. Install pump in the oil reservoir. Use flexible fittings only.
- .3 Provide a muffler in the oil line between the pump unit and the jack. The muffler is to contain pulsation-absorbing materials to minimize hydraulic pulsation and ensure quiet operation.
- .4 Provide master control EV100 valve assembly. The valve shall be equipped with an adjustable pressure relief system, a manually operating down system to lower elevator if emergency and a system to isolate the cylinder from the pump unit plus a check valve for down control operation.
- .5 Provide a negative pressure switch that will be activated when negative pressure is sensed in the hydraulic system. The check valve will close and stop the hydraulic jack from descending immediately on sensing negative pressure.
- .6 To prevent debris from entering the control valve, provide self-cleaning strainers. Provide system that includes a solid state means to ensure reduced current starting.
- .7 The starting current is not to exceed 300 percent of the current utilized during operation at full load. The equipment is to continue providing normal elevator operation during line voltage fluctuations of (\pm) 10%.
- .8 A means to prevent the motor or pump from overheating during phase rotation or reversal is to be provided. To prevent the motor from starting when phase reversal or lost phase conditions occur, provide reverse phase relays at the control panel.
- .9 Permanent gauges to measure the temperature of the oil in the tank and the pressure of oil in the to/from lines are to be provided. The system is to be designed to ensure the hydraulic oil never exceeds 80% of the maximum temperature rating of the valve manufacturer.

3.3 CYLINDER

- .1 The hydraulic system shall include a cylinder, plunger, hydraulic hoses, motor, pump, and valve.
- .2 The cylinder shall be manufactured from steel pipe of a sufficient thickness and suitable safety margin by CSA B44-10 Code. The top of the cylinder shall be equipped with a cylinder head with an internal guide-ring and self-adjusting packing.
- .3 Provide a plunger manufactured from a steel shaft of a proper diameter machined true and smooth. The plunger shall be provided with a stop electrically welded to the bottom to prevent it to leave the cylinder. Provide $\frac{3}{4}$ " (19 mm) hydraulic rubber hoses with all equipment and fittings.

3.4 HYDRAULIC PIPING

- .1 Provide piping for elevator, complete with necessary fitting and valves (including relief and two shutoff valves) for complete installation and proper operation of the elevator.
- .2 Piping between the jack unit and the power unit is to be groove-end seamless or electric resistance welded steel pipe and shall be run overhead. Ensure that all connections are rated to withstand the pressure of the system and prevent any leakage of oil.
- .3 All piping in the machine room and pit shall be resiliently supported by isolators. Where piping penetrates wall constructions, provide a resilient sleeve to prevent direct contact with

wall.

3.5 CAR GUIDE RAILS

- .1 Provide machined steel standard type "T" section guide rails with tongued and grooved joints in the ends of the rails to form matching joints between successive rails. Size rails appropriately to achieve a maximum rail bracket spacing between guide rail supports and show on approval shop drawings.
- .2 Substantially machined fishplates will be fitted to each rail joint with not less than four through bolts with lock washers. Backs of all rails shall be machined where contact is made with fishplate. Rail joints shall be filed smooth.
- .3 Guide rails shall be supported and placed so as not to become distorted by eccentric loading. Additional brackets with sliding rails clips between floor beams shall be provided as necessary to obtain proper rail rigidity and maintain alignment for car rails. All rail joints shall be located so fishplates will not interfere with respective motion of the rail with respect to rail clips and brackets.
- .4 Guide rail brackets shall be fastened into structural core walls, at the side of the shaft and/or to the divider beams between adjacent shafts to suit architectural drawings and building design. Include for extension brackets as required to suit hoistway dimensions.
- .5 Provide necessary brackets as required to accommodate loading classification given rated cab capacity.
- .6 Provide all necessary rail backing and channel stiffeners required to accommodate car capacity and loading classification.
- .7 Locations of all rail bracket fastening points shall be communicated and reflected on elevator shop drawings.
- .8 Provide rail bracket inserts prior to elevator shaft construction for placement of these inserts into shaft wall by others.
- .9 Clean and file smooth all rail running surfaces which make contact with roller guide or slipper assemblies.
- .10 Align and install rails plumb and parallel to achieve a premium ride quality with no objectionable concerns in either the X or Y axis.
- .11 Rail ends at the top of the shaft shall be terminated not less than 6" from the underside of the hoistway.

3.6 CAR FRAME AND PLATFORM

- .1 A suitable car frame shall be provided with adequate bracing to support the platform and car enclosure including weight of all in-car finishing materials.
- .2 The platform shall be recessed sufficiently to accommodate flooring and coordinate at the time of shop drawing approval. Provide as a minimum 1 sheet of 3/4" Douglas Fir plywood securely fastened to 1/2" Douglas Fir Plywood glued together.
- .3 Provide a cab with sound isolated platform and car enclosure. Provide isolation to prevent the transfer of noise and vibration from the car frame to the platform or enclosure.
- .4 Provide a black baked enamel toe guard full width of the car sill exposed to landing sides in accordance with ASME A17.1-2010 / CSA B44-10.

3.7 CAR TOP RAILING

- .1 Car top railing shall be installed in accordance with CSA B44-10 Code at a height of not

less than 1070 mm from car top to the top handrail. Car top railing shall be either fixed or collapsible. Provide a secondary horizontal or intermediate rail located at near centre from the top rail to the working surface. Supply and install a toe-board securely fastened not less than 125 mm from the working surface. Strength of railings shall meet 2.12.2.4 of the CSA B44-10 Code and TSSA Directors Order 245/10.

3.8 CAR TOP INSPECTION AND OPERATION

- .1 Provide on car top, maintenance inspection station complete with UP, DOWN, common running buttons, emergency stop button, inspection/normal button, guarded light with switch, and a duplex receptacle. Mount car top inspection from side of car when accessing car top from second lowest landing.
- .2 Upon activation of in-car maintenance switch located in the service cabinet, and/or the activation of top of car inspection/normal button, car shall be removed from normal service. Car shall be operated from car top within the guidelines of Section 2.26.1.4.1 of the ASME A17.1-2010 / CSA B44-10 Safety Code.

3.9 CAR GUIDES

- .1 Provide manufacturer's standard slipper guide assemblies.

3.10 CABLES AND FASTENING DEVICES

- .1 Provide not less than steel two (2) aviation type (7 x 19) 3/8" (9 mm) diameter galvanized steel cables. They shall be fixed at cylinder base and at the car sling passing by a 10 3/4" (273 mm) diameter pulley attached at the top of the cylinder.
- .2 Where steel hoistway cables are used, connect steel cables to elevator hitch points utilizing wedge type shackles or Code CSA B44-10 approved method. Prevent shackles from spinning.

3.11 PIT EQUIPMENT, BUFFERS, GOVERNOR

- .1 Provide all necessary pit equipment to effect a complete elevator installation suitable for car speed, capacity, and building design.
- .2 Supply and install all car buffers, springs, buffer supports and channels, guarding as per CSA B44-10 Code and to 381 mm (15") deep pit.
- .3 Reflect location of all equipment on hoistway approval drawing.
- .4 Provide pit stop switch in accordance with CSA B44-10 Code.
- .5 Where a governor is provided in the hoistway, ensure governor is of the self-resetting type as no access panel from the hoistway will be provided.

3.12 ENTRANCE FRAMES, HALL DOORS, AND CAR DOORS

- .1 Provide typical 3 piece bolted suitable for finished wall thickness as per Architectural Drawings. No additional cost for the entrance frames will be entertained to meet requirements in Contract Documents including but not limited to Architectural Drawings..
- .2 All frames shall be provided in finishes as per Section 2.3, Architectural finish.
- .3 Entrances to be manufactured in accordance with ULC / UL procedures for testing and labeling to suit 1.5-hour fire rating. All frames shall be securely fastened to fixing angles in the hoistway and shall be of 14-gauge sheet steel.

- .4 Securely fasten all landing sills to the building structure and provide necessary steel supports, grout angles and grout to seal openings between the sill and structure allowing floor finishes. Sills finishes at each floor shall be as per Section 2.3 Architectural Finishes.
- .5 Entrance jambs shall be marked with 102 mm x 102 mm (4" x 4") stainless steel plates having raised black floor markings with Braille. Markings shall be provided on both sides of the entrance and securely fastened with fasteners.
- .6 Two Speed Side opening entrance door shall be 16-gauge minimum sandwich type with reinforced steel members and sight guards on the leading panel provided in primed finish.
- .7 Each door to have a minimum of two guides, exclusive of fire angles and retainer clips.
- .8 Landing side of hall door panels having ULC labeling of 1.5 hours, to be finished as per Section 2.3, Architectural finishes. Hoistway side of hall door panels and hoistway side of car panels shall be painted with rust inhibiting paint. Stencil floor identification on hoistway side of all hall door panels.
- .9 Each car and hall door shall be furnished with a two-point suspension hanger and track. Rollers shall be a heavy-duty type designed to operate on non-lubricated surfaces. Hangers shall be provided with a means to withstand up thrust.
- .10 Each hall door to have a heavy-duty type self-closer, approved interlock and related assembly, and is to be designed for smooth operation with a minimum amount of noise.
- .11 Provide fascia extending from top of hall door hanger to sill above for every floor served. Provide a toe guard at the lowest landing sill made from 14-gauge steel and beveled to the wall.

3.13 HOISTWAY ACCESS

- .1 Provide hoistway access to comply with CSA B44-10 Code requirements. Provide a switch in the car locking service cabinet that when enabled shall render all car and halls inoperative and permit operation of the elevator via the hoistway access switch described herein. Prior to hoistway access operation, both top of car operation and in-car inspection cannot be in effect.
- .2 Hoistway access switch shall be installed in either the hall door sight guard or in the elevator entrance frame and not as a separate plate in the hall.

3.14 FINAL SLOWDOWN AND TERMINAL SWITCHES

- .1 Normal terminal landings shall be provided in the hoistway to slow and stop the car automatically at the terminal landings and to automatically cut off power, should the car travel beyond the terminal landings.
- .2 Dowel all final limit switches.

3.15 DOOR OPERATORS AND RELATED DOOR EQUIPMENT

- .1 Supply and install (GAL Canada Elevator Products) GAL door operator or Equivalent capable of automatically providing smooth and consistent door operation for both the velocity and position of the doors and will cause the door to adhere to a pre-defined opening and closing profile.
- .2 All controls for adjusting and regulating the operation of the door are to be located on top of the elevator adjacent to the door operator.
- .3 Door operation to be capable of opening fully in a time from 2.5 to 3.0 seconds, and close

fully in a time from 3.5 to 4.0 seconds.

- .4 Supply and install one electronic door re-opening device (safety detector) on elevator car opening.
- .5 The device is to be constructed to provide long-term reliability and include no moving parts and having silent operation.
- .6 The device is to be installed behind the door jamb, so as to provide a clear opening and present a clean architectural appearance.
- .7 The protection device shall initiate door reversal at any point of travel, when any object is in the path of the closing door without engaging the object.
- .8 Ensure that the operation of the re-opening device includes "nudging" and is set-up to operate as per the requirements of the CSA B44-10 Code.
- .9 Provide a device that includes visible diagnostics for either verification of proper operation or provide direction on cause of malfunction.
- .10 Doors are to operate smoothly and quietly in both the open and the close directions.

3.16 TRAVELLING CABLES

- .1 Provide wiring to connect all equipment in compliance with CSA-C22.1 Code.
- .2 All wire is to be insulated and have a flame retarding cover. All wires are to be either colour coded or clearly numbered to ensure easy identification.
- .3 Supply and install travelling cables designed for elevator use. The traveling cables are to be waterproof with a flame retarding protective cover and include a minimum of 10% extra wires as spares. The travelling cables must include at minimum, an additional four extra pairs of #18 gauge stranded shielded wire and one extra coaxial cable.
- .4 Install the travelling cables continuously without splices from the car top to the under car junction box and to the elevator machine room. No halfway junction boxes will be permitted.
- .5 Hang travelling cables to ensure all wiring and conductors are not under strain. Hang travelling cables properly from car top and throughout hoistway without twisting to avoid cables coming into contact with any other hoistway equipment.
- .6 Run travelling cables directly into controller without splices. Ensure travelling cables in controller are neatly tied off, all wiring is protected from any chaffing from the controller openings, and all spares are terminated and identified.

3.17 HALL STATIONS

- .1 Provide riser of hall call button at each level served.
- .2 All hall buttons to be installed at a height 1070 mm above the floor, measured to the center-line of the respective button.
- .3 Hall landing buttons shall match car panel fixtures complete with mechanical action and illumination upon activation.
- .4 Button face-plates to be finished as noted in Architectural Finish Schedule as shown in Section 2.3 and rectangular in design.
- .5 Main recall hall station shall conform to 2.27.1.1.6 of the CSA B44-10 Code.

3.18 SIMPLEX OPERATION

- .1 Elevator E1 shall respond automatically to all hall calls and or car calls. The car shall stop for the first car or hall call registered for the direction of travel. Stops shall be made in order in the direction of travel as the respective landing is reached, regardless of the order in which they were registered.

3.19 CAR CAB

- .1 Provide cab interior and car cab shell finishes as specified in Section 2.4 Architectural Finishes.
- .2 Side walls shall be finished in Laminate finish.
- .3 Cab shell shall measure 2134 mm from finished floor to the canopy.
- .4 Coordinate car sill height to suit resilient flooring. Owner to select colour from Contractor's range of standard flooring.
- .5 One speed exhaust fan shall be located in car canopy, sized appropriately for given area of cab, securely fastened, and isolated from car top to minimize vibration into cab. Fan shall be controlled by a switch in locking service cabinet.
- .6 Provide one set of pad hooks and protective blanket covering all side walls and front returns including transoms. Provide cutout in protective blanket for car station, car digital indicator, and locking service cabinet.
- .7 Provide and recess in the car canopy, not less than two (2) LED (or as many as required to meet with in-car lighting levels as mandated by CSA B44-10 Code). Provide for energy saving feature to have lights turned off in the cab after a pre-determined set time when elevator is not in demand and program in-car lights to come on without delay at any time upon the activation of a hall call.

3.20 IN CAR DIRECTIONAL INDICATORS

- .1 Provide on strike jamb, flushed mounted in car directional indicators of LED type.
- .2 Provide indicator flush mounted with in car directional cover. Provide indicator arrow type for both UP and DOWN.
- .3 Indicators shall be a minimum of 50 mm in height.
- .4 Provide dual stroke gongs with adjustable electronic audible and duration features.
- .5 UP gong shall sound once for UP direction and twice for DOWN direction.
- .6 Indicators shall activate in response to all hall calls, car direction reversal, and to car calls.

3.21 CAR OPERATING PANEL

- .1 Provide one (1) flush mounted car station securely fastened with a series of vandal resistant screws. Car station shall be finished in #4 brushed stainless steel mounted to a car station back box. Comply with Section 1.15 Barrier Free requirements.
- .2 Provide at the bottom of car operating panel, a series of two (2) position keyed switches including but not limited to a light switch, independent service switch, fan switch, maintenance inspection and emergency light test spring return switch. Provide GFCI receptacle in locking service cabinet also.
- .3 Provide not less than 6 keys at the time of turnover for each type of switch installed.

- .4 Ensure car panel is laser cut and made flush with car operating panel surface. Securely fasten service cabinet door with no less than two internal hinges to ensure no movement of door during car movement.
- .5 Provide at the top of the panel, an emergency light fixture providing a lighting level of a minimum of 5 lux illumination of the car operating panel. Ensure emergency lighting is maintained at this lighting level for a period of not less than four hours.
- .6 Emergency light shall be immediately energized upon loss of normal power to cab lights. Connect emergency lighting unit to rechargeable batteries with a life expectancy of not less than three years.
- .7 Connect emergency lighting unit to switch located in locking service cabinet as a means to check for operation.
- .8 Provide at the top of car operating panel a dot matrix indicator. Locate this indicator not less than 1830 mm above the cab floor. Characters shall be a minimum of 50 mm in height and continuously show relative position of car. Indicator shall be housed behind lexan lens, laser cut, and flush with face of car operating panel.
- .9 Incorporate and engrave on car panel TSSA identification numbers, building designated car number. Apply to TSSA on behalf of the owner to locate license in machine room and not in the elevator.
- .10 Provide one communication device in car as described in Section 3.22.

3.22 EMERGENCY COMMUNICATION SYSTEM

- .1 Provide on car operating panel, emergency communication system complete with speaker, indicator, and alarm button. Next to indicator engrave "Call Answered When Light Flashing". Locate alarm button at a maximum height of 890 mm from the floor to the centre of the button. Provide next to alarm button in both visual and tactile form essential instructions and information.
- .2 The telephone must not shut off if the activation button is pushed more than once. The telephone shall transmit a prerecorded location message only when requested by the operator and be provided with an adjustable call time which can be extended on demand by the operator.
- .3 Once two-way communication has been established, voice prompts shall be provided which instruct the operator on how to activate these functions as well as alerting the operator when a call is being attempted from another elevator in the building.
- .4 Provide in the machine room a communication device and connect to the communication device in the elevator.

3.23 UPS EMERGENCY BATTERY LOWERING OPERATION

- .1 Provide UPS Battery Lowering Device to lower the elevator to the lowest landing (Ground floor) in the event of normal building power loss.
- .2 Upon arrival of lowest landing, open elevator hall and car doors to allow occupant(s) to exit.
- .3 Elevator shall remain inoperative until normal power is restored.

3.24 PAINTING AND WRAPPING REMOVAL

- .1 Prior to date of Substantial Performance of the Contract broom sweep machine room and

elevator pit, vacuum thoroughly, and apply 2 coats of grey enamel paint to machine room, pit floor, and buffer stand.

- .2 Remove all protective wrapping from all finishes including but not limited to surfaces all around car station, handrails, car door jambs, transom, car door, hall doors, and sight guards.

END OF SECTION 14 26 00

PART 1 GENERAL

1.1 SCOPE

- .1 The Contractor shall ensure that the Subcontractor responsible for the elevator component of the Work (the "Elevator Subcontractor") shall provide all labour, materials, and equipment necessary to provide Warranty services as described herein inclusive of Section 14 26 00 LULA Elevator for the 145 Harry Walker Parkway Project in Newmarket.
- .2 All costs associated with Warranty Maintenance services shall be included in Item No. B1 – Elevator Maintenance in the Bid Form.
- .3 Cost for two (2) year equipment warranty as specified herein shall be included in Item A.6 New Elevator/Lift in the Bid Form.

1.2 INTERIM MAINTENANCE – NOT USED

1.3 WARRANTY MAINTENANCE

- .1 Prior to handing over of elevating device for Warranty services, the Contractor shall ensure the Elevator Subcontractor carries out a complete hoistway clean down and all elevator protective materials where installed are removed as verified by the Consultant or its designate. Cost of initial hoistway clean down shall be included in Item No. A-6 New Elevator/Lift in the Bid For.
- .2 Warranty Maintenance shall commence upon date of Total Performance of the Contract.
- .3 All costs associated with Warranty Maintenance shall be included in Item No. B1 Maintenance in the Bid Form.
- .4 Warranty Maintenance documentation and services shall include as a minimum 1.5 hours per quarter for elevator E1 for maintenance services. Contractor shall ensure Elevator Subcontractor provides field time tickets for all Warranty Maintenance services reflecting all work performed.
- .5 Warranty Maintenance shall be in accordance with the requirements outlined in Section 1.4.

1.4 WARRANTY MAINTENANCE REQUIREMENTS

- .1 Contractor shall ensure the Elevator Subcontractor includes 1.5 hours per quarter for the purpose of performing elevator maintenance services.
- .2 Work Hours are as follows: maintenance shall be performed during the regular hours of work which are considered to be from 8:00 am until 5:00 pm Monday to Friday, excluding statutory holidays.
- .3 The Contractor shall ensure the Elevator Subcontractor provides callback service 24 hours a day, every day of the year, at no additional cost to York Region.
- .4 Callback service shall include for non-operational elevator other than scheduled maintenance procedures or scheduled service repairs.
- .5 Subject to Section 1.4.4, callback service shall be provided within (45) minutes during regular working hours as specified in Section 1.4.2, and within (90) minutes during weekends and statutory holidays.

- .6 Emergency callback service in response to a passenger entrapment shall be a maximum of (30) minutes during regular working hours as specified in Section 1.4.2, and (45) minutes during weekends and statutory holidays.
- .7 An emergency situation shall be considered as a passenger entrapment or a report of personal injury.
- .8 Contractor shall ensure the elevator telephone will be monitored by the Elevator Subcontractor 24 hours a day, every day of the year at no cost to York Region.
- .9 **Exclusions:** With exception to work required to complete the elevator installation portion of the Contract, the Contractor, through its Elevator Subcontractor shall not be responsible under this Contract to repair or maintain;
 - .1 Damage resulting from misuse of equipment or vandalism.
 - .2 Elevator cab enclosure materials; ceiling lights, handrails, and floor coverings except where ceiling or handrail in cab require tightening or an adjustment.
 - .3 Hoistway entrance frames.
 - .4 Door sills.
 - .5 Machine room heating and ventilation.
 - .6 Main line or auxiliary disconnects in the machine room and any provisions of fuses. However, labour to replace fuses provided by York Region shall be covered in maintenance agreement.
 - .7 Components related to the building structure that form part of the elevator installation. If repair or replacement of components under subsection 1.4.9 is required, the Trade Subcontractor shall immediately notify York Region and submit to York Region a quotation to complete such work.
- .10 **Termination:** In addition to the termination provisions outlined in the Terms and Conditions of the Maintenance Contract, York Region may terminate the Maintenance Contract for the Part B Maintenance Work if;
 - .1 The Contractor fails to obtain and maintain insurance as required during the Part B Maintenance Work under Schedule A Insurance of the Contract.
 - .2 If the Contractor fails to remedy such breach within five (5) Business Days after notice by York Region, the Contractor will be liable for any and all costs, liabilities, damages, and penalties resulting to York Region from such termination, unless a written waiver of the specific insurance requirements is provided to the Contractor by York Region.
 - .3 In addition to the termination provisions outlined in the Terms and Conditions of the Maintenance Contract, York Region may terminate the Maintenance Contract for the Part B Maintenance Work at any time prior to term of the Maintenance Contract upon providing thirty (30) Days written notice, for any of the following reasons:
 - .1 If there is a significant change in the circumstances of the Maintenance Contract as determined by York Region, including but not limited to, an ownership change in regards to the elevator, the Contractor or the Elevator Subcontractor, or a major equipment modernization project;

- .2 If maintenance is not executed in strict accordance with this Specification according to a report of National Elevator Consulting Limited (the Elevator Consultant) or any other so qualified independent third party, and deficiencies in such maintenance are not rectified in the time allotted by the said report;
 - .3 If deficiencies that are the Contractor's responsibility through its Elevator Subcontractor) as listed in a Technical Standards and Safety Authority (T.S.S.A.) report are not completed in the time allotted in the T.S.S.A. report. As a minimum, the Contractor through its Elevator Subcontractor will assume responsibility for payment of any T.S.S.A. follow-up inspections that are required due to the Contractor through its Elevator Subcontractor not fulfilling its duties as per the ASME A17.1-2010/CSA B44-10 Code requirements;
 - .4 If the Contractor fails to remedy any grievance with respect to the performance of the Maintenance Contract that would not be subject to a report described herein, to the satisfaction of York Region within the thirty (30) Days following York Region's written notice of such grievance.
- .11 **Time Tickets and Log Books:**
- .1 The Contractor shall ensure that the Elevator Subcontractor shall supply and administer a maintenance log for each elevator in accordance with 8.6.12.2.5 of the ASME A17.1-2007/CSA B44-10 Code and Section 34 of the Ontario Elevating Device Regulation 209/01 and all maintenance control program (MCP) minimum Code requirements. The log shall be kept in the elevator machine room and affixed on the exterior panel of the controller door. Copies of all time tickets for each visit including maintenance, callbacks and repairs are to be left on Site as directed by York Region or sent to York Region electronically within 5 Business Days. In the event that a service call is answered after hours, within 5 Business Days, a copy of the time ticket is to electronically sent to York Region.
- .12 **Elevator Subcontractor's Employees:** The Contractor shall ensure that the Elevator Subcontractor ensures that;
- .1 All work is performed by licensed, skilled, experienced, elevator service and repair people, directly employed by and under the supervision of the Elevator Subcontractor;
 - .2 All personnel working on York Region's premises are to be dressed in a uniform with clear identification and neat in appearance.
- .13 **Housekeeping:** The Contractor shall ensure that the Elevator Subcontractor;
- .1 Maintains the machinery in clean condition, and keeps the machine room, hoistways, and pit areas free from accumulation of dirt and debris.
 - .2 All lubricants and replacement parts are to be neatly stored by the Elevator Subcontractor in metal parts cabinet in each machine room in metal parts cabinets in a location on Site as directed by York Region. Dispose of used wipers in accordance with all Codes.
- .14 **Coverage:** The Contractor shall ensure the Elevator Subcontractor maintains, repairs, or replaces all elevator equipment, excluding items as noted in Section 1.4.9, including, but not limited to:

- .1 Controller, motor, hoist ropes or drive belt, brake, governor, governor cable, slippers, valves, pumps, mufflers, jack and cylinder units, packings, all door equipment, door operator, hoistway equipment, traveling cables, emergency cab lighting, exhaust fans, pit lights, emergency recall circuitry and fixtures.
- .15 **Performance:** The Contractor shall ensure the Elevator Subcontractor maintains and adjusts the elevator equipment to provide for:
 - .1 Original contract speed, operating times, door open times, door close times and dwell times.
 - .2 A smooth ride with no harsh movements during acceleration, deceleration, leveling or stopping.
 - .3 Smooth and quiet door operation.
 - .4 Consistent leveling at all floors regardless of the load.
- .16 **Electrical Diagrams:**
 - .1 The Contractor shall ensure the Elevator Subcontractor supplies two (2) sets of "as-built" electrical diagrams, one of which is to be in a memory stick and given to York Region prior to the of Date of Substantial Performance of the Contract and the other set laminated in plastic, bound and hung in a convenient location in the elevator machine room for the use of servicing the equipment. Ensure the said diagrams are maintained in good condition at all times. Alternate means for consolidation of the second set of laminated drawings in the machine room could be placed in a binder format.
 - .2 All diagrams and drawings are the property of York Region and are to be left on site and in the appropriate elevator controller room.
 - .3 If changes to the electrical circuitry or software upgrades of the elevator are made at any time during the course of the Contract, the Contractor shall ensure the Elevator Subcontractor updates the diagrams in a neat and professional manner to reflect those changes
- .17 **Replacement Parts:** The Contractor shall ensure that;
 - .1 Only brand-new original manufacturer's equipment is supplied by the Elevator Subcontractor.
 - .2 Where original manufacturer's equipment is not available, parts of the same or better quality are substituted.
 - .3 Replacement of any defective component and/or repairs is undertaken without delay or an independent third party repairs any damage that results from any such defective component that the Elevator Subcontractor has installed at no cost to the Contract.
 - .4 Maintenance items that are stored in the elevator machine room are placed inside a metal parts cabinet supplied by the Elevator Subcontractor.
- .18 **Repair:** The Contractor shall ensure that;
 - .1 All scheduled repairs are to be coordinated by the Elevator Subcontractor with building management 10 Business Days in advance.

- .2 In the event that a repair cannot be completed during an emergency callback situation, the Elevator Subcontractor commences the repair the morning of the following Business Day with immediate notice provided to building management.

- .19 **Inspections:** The Contractor shall ensure in addition to the maintenance requirements of Article 8.6 of the CSA B44.2-17 Code for Elevators and all MCP requirements, the following checks are to be completed by the Elevator Subcontractor according to the schedule listed below and, where required, the Elevator Subcontractor takes immediate corrective action for remedial work to repair, replace or readjust any component found to be worn, defective, or out of adjustment:

Quarterly

- Check elevator ride quality including acceleration, deceleration, speed, leveling and noises
- Check elevator controller room including cleanliness, temperature, and ventilation.
- Check controller
- Check motor.
- Check operation of the door operator and protective devices.
- Check hall and door gibs, pick-up rollers, door locks, and door closers.
- Check car guides and guide rail lubrication where applicable.
- Check all position indicators, signal devices, and call buttons.
- Check all emergency communication devices.
- Check emergency lighting in the elevator cab.
- Check hoist cables for proper tensioning.
- Check cables for stretch and shorten as required
- Check cab ventilation fan.
- Check entire hoistway including pit.
- Clean car top and pit.
- Test Firefighter Emergency Operation where required by Code.

Annual

- Check all safety devices (mechanical and electrical).
- Clean down hoistway including rails, all header tracks, and sills.
- With respect to fire alarm testing, assist as required with the inspection of all hoistway fire alarms / detectors.

- .20 **Invoicing:** The Contractor shall submit a maintenance service invoice based on the work completed by the Elevator Subcontractor the during the previous 3 months ("quarter") after the end of the quarter, for payment . Payment will be due 60 days from receipt of invoice. Refer to Article A7 of the Articles of Agreement and TC 6 – Fees and Disbursements of the Terms and Conditions of the Maintenance Contract.

- .21 **Codes and Regulations:** The Contractor shall ensure the Elevator Subcontractor completes work in compliance with the Elevating Devices Act and the latest edition of the ASME A17.1-2010 / CSA B44-10 Code, including all supplements and appendices as a minimum standard.
- .1 The Contractor shall ensure all work performed and material supplied by the Elevator Subcontractor is in accordance with all building codes and local by-laws and also as per the requirements of Ontario and federal legislation.
- .2 In regards to the use, handling, storage, and disposal of hazardous material, the Contractor shall ensure the Elevator Subcontractor complies with the requirements as outlined by the WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (W.H.M.I.S.).
- .22 **Work Place Safety:**
- .1 The Contractor shall ensure that it and the Elevator Subcontractor comply with the Occupational Health and Safety Act of the Province of Ontario.
- .2 Worker's Compensation coverage shall be provided by the Contractor in accordance with TC 23 – Workplace Safety and Insurance Board of the Terms and Conditions of the Maintenance Contract.
- .3 The Contractor shall ensure the Elevator Subcontractor exercises caution to avoid injury to persons and property while working in the building.
- .4 The Contractor shall ensure the Elevator Subcontractor erects proper barricades and signage indicating that work is in progress and shall be situated in areas where work is being performed without obstructing pathways and especially fire exits. The barricades shall be of a construction and design that is suitable for use in an occupied public building
- .5 The Contractor shall ensure that an active workplace safety program is in place by the Elevator Subcontractor and understood by all employees providing services under the Contract.
- .6 All accidents must be immediately reported to the appropriate authorities and the Owner.
- .23 **Indemnity:**
- .1 See TC 21 of the Terms and Conditions of the Maintenance Contract..
- .24 **Insurance:**
- .1 See TC 22 of the Terms and Conditions of the Maintenance Contract.
- .25 **Non-Performance:** If the Contractor fails to ensure that it or the Elevator Subcontractor performs any work required by this Specification, the Owner reserves the right to have such deficiencies corrected by an independent third party at the cost of the Contractor by deducting the said cost from quarterly maintenance payments by the Owner to the Contractor or to withhold quarterly maintenance payments from the Contractor until the Contractor remedies such default.

END OF SECTION 14 01 20

PART 1 - GENERAL

1.1 Related Sections

- .1 Section 26 05 00 – Common Work Results for Electrical.
- .2 Section 26 05 10 – Wiring Methods.
- .3 Section 26 05 21 – Wires and Cables (0-1000V).
- .4 Section 26 05 31 – Splitters, Junction, Pull Boxes and Cabinets.
- .5 Section 26 05 32 – Outlet Boxes, Conduit Boxes and Fittings.
- .6 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

1.2 References

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA C22.2 No.26-1952 (R2009), Construction and Test of Wireways, Auxiliary Gutters and Associated Fittings.

1.3 Manufacturers

- .1 Acceptable manufacturers are:
 - .1 ABB Installation Products - Thomas & Betts Canada.
 - .2 Legrand Canada - Wiremold.
 - .3 Eaton - Cooper B-Line.
 - .4 Canadian Electrical Raceways Inc.
 - .5 Or Equivalent

PART 2 - PRODUCTS

2.1 Wireways

- .1 Wireways and fittings: to CAN/CSA C22.2 No.26.
- .2 Sheet steel with hinged cover to give uninterrupted access.
- .3 Cross section dimensions: and 4" x 4" (100 mm x 100 mm) and 6" x 6" (152 mm x 152 mm) or as otherwise noted.
- .4 Finish: baked grey enamel.
- .5 Elbows, tees, couplings and hanger fittings manufactured as accessories to

wireway supplied.

PART 3 - EXECUTION

3.1 Installation

- .1 Install wireways and auxiliary gutters.
- .2 Keep number of elbows, offsets, connections to minimum.
- .3 Install supports, elbows, tees, connectors, fittings.
- .4 Manufactured fittings only shall be utilized for changes in direction or elevation. Butt joints are not permitted for tees and elbows.
- .5 Install barriers where required.
- .6 Install gutter to full length of equipment.

END OF SECTION

PART 1 - GENERAL

1.1 General

- .1 Comply with the requirements of Section 26 05 00: Common Work Results for Electrical.

PART 2 - PRODUCTS

2.1 Materials

- .1 Construct all equipment nameplates from laminated plastic having a black core with a white top lamination such that engraving through the top lamination will reveal black lettering on a white background.
- .2 Construct all warning nameplates from laminated plastic having a red core with a white top lamination such that engraving through the top lamination will reveal red lettering on a white background.

2.2 Sizes and Locations

- .1 Provide nameplates of the sizes indicated. Where a size is not given, provide a standard size nameplate of sufficient size to contain the text indicated.
- .2 Provide lettering of the height indicated below unless another size is indicated.

Size	Width in. (mm)	Height in. (mm)	First Line Lettering Height in. (mm)	Following Lines Lettering Height in. (mm)
1	2" (50)	1" (25)	.5" (13)	-
2	3" (75)	2" (50)	.5" (13)	.3/8" (10)
3	4" (100)	2" (50)	1" (25)	.3/8" (10)
4	8" (200)	4" (100)	1" (25)	.3/8" (10)

.3 Locations:

- .1 Switchgear, switchboards, ATS units, distribution panels, splitters, transformers, lighting panels, power panels, disconnect switches and starters.
- .2 Lighting control dimming panels and relay panels.
- .3 Communications cabinets and computer cabinets.
- .4 Security panels.
- .5 Fire alarm panels and annunciators.
- .6 Other electrical equipment.

2.3 Specific Nameplates

- .1 For each switchgear and motor control center assembly, provide a nameplate to indicate the following information.
 - .1 Line 1: Equipment tag number 1" (25mm);
 - .2 Line 2: Rated voltage, current, phase, wires and fault current interrupting rating, 3/8" (10mm);
 - .3 Line 3: Power source, 3/8" (10mm);
 - .4 Example: MCC-6A35 600V, 1000A, 3-phase, 4-wire, 65kA IC, fed from MS-6A31.
- .2 For each power transformer, provide a nameplate to indicate the following information.
 - .1 Line 1: Equipment tag number, 1" (25mm);
 - .2 Line 2: Rated KVA, 3/8" (10mm);
 - .3 Line 3: Rated voltage, phase, wires and frequency, 3/8" (10mm);
 - .4 Line 4: Power source 3/8" (10mm);
 - .5 Example: TX-44A31 4500/6000 kVa, 13.8 kV-347/600V, 3-phase, 4W, 60HZ, fed from HV-44A31.
- .3 For each distribution transformer, provide a nameplate to indicate the following information.
 - .1 Line 1: Equipment tag number, 1" (25mm);
 - .2 Line 2: Rated voltage, kVA, phase, wires and frequency, 3/8" (10mm);
 - .3 Line 3: Power source, 3/8" (10mm);
 - .4 Example: TX-6A54, 600V-120/208V, 112.5 kVA, 3-phase, 4-wire, 60 Hz, fed from DP-6A54.
- .4 For each panelboard, provide a nameplate to indicate the following information.
 - .1 Line 1: Equipment tag number, 1" (25mm);
 - .2 Line 2: Rated voltage, current, phase and wires, fault current interrupting rating, 3/8" (10mm);
 - .3 Line 3: Power Source, 3/8" (10mm);
 - .4 Example: LP-6A52, 347/600V, 200A, 3-phase, 4-wire, 22kA IC, fed from DP-6A52.
- .5 For each disconnect switch, contactor and individual starter, provide a nameplate to indicate the following information.
 - .1 Line 1: Equipment tag number, 1" (25mm);
 - .2 Line 2: Rated voltage, current, phase and wires, 3/8" (10mm);

- .3 Line 3: Power source, 3/8" (10mm);
- .4 Example: DS-2B31, 208/120V, 100A, 3-phase, 4-wire, fed from SP-2B51.
- .6 For each fan control switch, provide a nameplate to indicate the following information. The number in brackets indicates the lettering height in millimeters:
 - .1 Line 1: "FAN SWITCH" + Equipment tag number .4" (10);
 - .2 Example: FAN SWITCH EF-15.
- .7 For each transfer switch, provide a nameplate to indicate the following information.
 - .1 Line 1: Equipment tag number, 1" (25mm);
 - .2 Line 2: Rated voltage, current, phase and wires, 3/8" (10mm);
 - .3 Line 3: Normal power source, 3/8" (10mm);
 - .4 Line 4: Emergency power source, 3/8" (10mm);
 - .5 Example: ATS-3, 347/600V, 800A, 3-phase, 4-wire, normal feed from MS-6C51, emergency feed from MS-6H51.

2.4 Warning Nameplates

- .1 Type "A", width = 4" (100mm), height = 4" (100mm).
 - .1 Text: DANGER 1" (25mm)
MORE THAN ONE (1) POWER SOURCE 3/8" (10mm)
CONTAINED WITHIN, 3/8" (10mm)
DISCONNECT ALL POWER 3/8" (10mm)
SOURCES BEFORE SERVICING 3/8" (10mm)
THIS EQUIPMENT 3/8" (10mm)
- .2 Type "B", width = 4" (100mm), height = 4" (100mm)
 - .1 Text: DANGER 1" (25mm)
THIS EQUIPMENT IS UNDER 3/8" (10mm)
AUTOMATIC CONTROL AND 3/8" (10mm)
MAY START AT ANY TIME 3/8" (10mm)
- .3 Type "C", width = 4" (100mm), height = 4" (100mm)
 - .1 Text: DANGER 1" (25mm)
CAPACITORS WITHIN 3/8" (10mm)
DISCHARGE THE 3/8" (10mm)
CAPACITORS BEFORE 3/8" (10mm)
SERVICING 3/8" (10mm)

- .4 Type "D", width = 4" (100mm), height = 4" (100mm)
 - .1 Text: HIGH NOISE AREA 1" (25mm)
 - HEARING PROTECTION 3/8" (10mm)
 - MUST BE WORN IN 3/8" (10mm)
 - THIS AREA 3/8" (10mm)

2.5 Wire/Conduit/Box Labels and Markers

- .1 Clearly identify all conduit systems carrying feeder cables by stenciling the voltage of the system, feeder and circuit identification and any other wording that may be required at regular intervals on the conduits, on all splicing and pull boxes, on both sides of sleeves and at each floor on vertical risers. The actual wording and size of the letters and spacing of each inscription shall be to meet the requirements of the Electrical Safety Authority Inspector. The paint used shall be durable and resistant of chipping.
- .2 In pull boxes, junction boxes and at terminations, feeders shall be identified by plastic plates indicating system voltage and circuit designations, and individual conductors shall be identified with coloured tape or covering to show phase, neutral or ground connection. The plates shall be 1" (25mm) in diameter and have letter stamped ½" (13 mm) high, and colour coded.
- .3 Conductor Color Code
 - .1 Branch circuit and feeder conductors shall be color coded by furnishing conductors with colored tape where exposed in panelboards, junction boxes, pullboxes and cabinets. Color coding shall be as follows:
 - .2 208Y/120 Volt, 1-Phase/3-Wire, 3-Phase/4-Wire systems:
 - .1 Phase Conductors – Phase A-Black, Phase B-Red, Phase C-Blue.
 - .2 Grounded System Neutral – White.
 - .3 Equipment Ground – Green.
 - .3 600Y/347 Volt, 1-Phase/3-Wire or 3-Phase/4-Wire:
 - .1 Phase Conductors – Phase A-Brown, Phase B-Orange, Phase C-Yellow.
 - .2 Grounded System Neutral – Gray/Buf.
 - .3 Equipment Ground – Green.
 - .4 The outer covering of branch circuit wiring shall be color coded throughout all 600, 208/120 Volt.
- .4 Conductor Labeling
 - .1 Each branch circuit conductor shall be labeled with wire markers to identify its circuit number. Each control wire shall be labeled to identify the wire number as shown on the schematics/and shall identify the equipment with which it is associated.
 - .2 Labels shall be applied to all wiring as follows:

- .1 at power supply or point of origin;
- .2 any terminal or splice box;
- .3 point of destination motor, limit switch, sensing device, outlet, lighting fixture, etc.
- .3 Wire markers shall be oil-resistant, adhesive backed vinyl film with legends etched into surface. Markers shall be Brady or Equivalent by ABB Installation Products Inc. or Equivalent.
- .5 All receptacles shall be identified by type of P-Touch label on the coverplate and handwritten with marker on inside of backbox to indicate circuit number.
- .6 Motors shall be identified as to their source of power in addition to the information shown on the motor's standard nameplate.
- .7 All electrical system junction boxes shall have the type of system and circuit numbers within them marked on both the front and the reverse side of covers with a permanent marker.
- .8 Paint the coverplates of all boxes (pull, junction etc.) with a durable paint of a color which identifies the system function. The applicable colors are as follows:

SYSTEM	COLOUR
Lighting & Power - 120/208V	Black
Emergency Life Safety - 120/208V	Black, Red
Emergency Standby - 120/208V	Black, Orange
Uninterruptible Power Supply (UPS) - 120/208V	Black, Blue
Lighting and Power - 347/600V	Yellow
Emergency Life Safety - 347/600V	Yellow, Red
Emergency Standby - 347/600V	Yellow, Orange
UPS - 347/600V	Yellow, Blue
Fire Alarm	Red
Telephone	Green
Data	Brown
Cable TV	White
Public Address	Purple
Nurse Call & Patient Wandering	Pink
Security & Surveillance	Grey
Indicate all circuit numbers on box cover plates.	

- .9 All high voltage raceways shall be labelled "DANGER xxx kV", at 10' (3 m) intervals along raceway.

PART 3 - EXECUTION

- 3.1 Installation
- .1 Install nameplates on the front of the equipment on a prominent flat surface. Attach the nameplates with screws or rivets.
 - .2 Identify underground conduits using underground warning tape. Install a minimum of one tape per trench at 12 inches (300mm) below finish grade.

END OF SECTION

PART 1 - GENERAL

1.1 Related Sections

- .1 Section 26 05 00 - Common Work Results – Electrical.
- .2 Section 26 05 10 – Wiring Methods.
- .3 Section 26 05 20 – Wire and Box Connectors 0-1000V.
- .4 Section 26 05 21 – Wires and Cables (0-1000V).
- .5 Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.

1.2 References

- .1 CAN/CSA-C22.2 No.42-10, General Use Receptacles, Attachment Plugs and Similar Devices.
- .2 CAN/CSA-C22.2 No.42.1-00 (R2009), Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
- .3 CAN/CSA-C22.2 No.55-M1986 (R2012), Special Use Switches.
- .4 CAN/CSA-C22.2 No.111-10, General-Use Snap Switches (Bi-national standard, with UL 20).

1.3 Shop Drawings and Product Data

- .1 Submit Shop Drawings and product data in accordance with Section 26 05 00 - Common Work Results for Electrical.

1.4 Wiring Devices

- .1 Acceptable Materials
 - .1 Legrand Canada - Pass & Seymour;
 - .2 Hubbell Inc. Wiring Device-Kellems;
 - .3 Legrand Canada - Wattstopper;
 - .4 Acuity Brands Lighting - Sensorswitch;
 - .5 Lutron Electronics Company Inc.
 - .6 Or Equivalent

PART 2 - PRODUCTS

2.1 Switches

- .1 20A, 125 V, or 347V, specification grade light switches to CSA Standard C22.2 NO. 55 and C22.2 No. 111.
- .2 Manually-operated general-purpose ac switches with following features:
 - .1 "Decorator" type.
 - .2 Yoke insulated from the operating mechanism.
 - .3 Binding screws and terminal holes, suitable for #10 AWG wire for back and side wiring.
 - .4 Operating mechanism totally enclosed in a strong phenolic colour coded (with respect to current rating) housing.
 - .5 Silver alloy contacts and use urea or melamine for those housing parts subject to carbon tracking.
 - .6 Finish and colour to be selected by Consultant.
 - .7 Single pole: Pass & Seymour 2621 or Equivalent.
 - .8 Three way: Pass & Seymour 2623 or Equivalent.
 - .9 Single pole illuminated: Pass & Seymour 2625 or Equivalent.

2.2 Dimmer Switches

- .1 Dimmer switches shall be rated 600 watts minimum, specification grade, heavy duty, with ivory handles and radio noise filter and suitable for use in a single gang box, type to suit loads (incandescent, magnetic low-voltage, electronic low-voltage, LED with 0-10V, etc.). Lutron Diva series, Leviton or Lithonia or Equivalent.

2.3 Receptacles – 15/20A, 125V Straight Blade - General

- .1 Receptacles, CSA configuration 5-20R, 125 V, 20 A, U ground, specification grade, with the following features:
 - .1 Urea moulded housing.
 - .2 Suitable for #10 AWG wire for back and side wiring.
 - .3 Break-off links for use as split receptacles.
 - .4 Eight back wired entrances and four (4) side wired binding screws.

- .5 Triple wipe contacts and riveted, grounding contacts.
- .6 Pass & Seymour: 26352 or Equivalent.
- .7 Finish and colour to be selected by Consultant.

2.4 Receptacles – Isolated Ground 15/20A 125V

- .1 Receptacles, CSA configuration 5-20R, 125 V, 20 A, isolated ground, specification grade, with the following features:
 - .1 Urea moulded housing.
 - .2 Suitable for #10 AWG wire for back and side wiring.
 - .3 Eight back wired entrances and four (4) side wired binding screws.
 - .4 Triple wipe contacts and riveted, grounding contacts.
 - .5 Pass & Seymour: IG26362 or Equivalent.
 - .6 Finish and colour to be selected by the Consultant.

2.5 Receptacles – 15/20A, 125/250V GFCI

- .1 Receptacles, CSA configuration 5-20R, 125 V, 20 A, grounded, specification grade, with the following features:
 - .1 Urea moulded housing.
 - .2 Suitable for #10 AWG wire for back and side wiring.
 - .3 Double wipe contacts and rivetted grounding contacts.
 - .4 Pass & Seymour: 2094 Series or Equivalent.
 - .5 Finish and colour to be selected by Consultant.

2.6 Receptacles – Other

- .1 Provide other configurations of receptacles as indicated on drawings.
- .2 Receptacles shall be of same quality as those specified above.

2.7 Coverplates

- .1 Coverplates for all wiring devices to: C22.2 NO. 42.1.
- .2 Coverplates shall have openings to suit device.
- .3 Stainless steel 302, non-magnetic, brushed finish for all flush mount devices in finished areas.
- .4 Sheet metal cover plates for wiring devices mounted in surface-mounted utility, FS or FD type boxes.
- .5 Provide "While-in-use" weatherproof covers for all exterior receptacle locations.
- .6 Provide circuit number label, permanent type written self-adhesive, on all coverplates for each device. Refer to Section 26 05 53 – Identification of Electrical Systems.
- .7 Refer to York Region Corporate ITS Cabling & Wiring Standard dated April 21, 2020 for telephone, data and AV device coverplate requirements.

PART 3 - EXECUTION

3.1 Installation

.1 Switches

- .1 Install single throw switches with the handle in the "UP" position when the switch is closed.
- .2 Install switches in ganged outlet boxes when more than one switch is required in one (1) location.
- .3 Refer to the Architectural drawings for additional information with respect to mounting. Confirm with the Consultant prior to roughing in the outlet.

.2 Receptacles

- .1 Install receptacles in ganged outlet boxes when more than one receptacle is required in one location.
- .2 Mount receptacles with the long dimension vertically, ground down.
- .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
- .4 Refer to the Architectural drawings for additional information with respect to mounting. Confirm with the Consultant prior to roughing in the outlet.

- .3 Coverplates
 - .1 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.
 - .2 Install suitable common cover plates where wiring devices are grouped.

END OF SECTION

PART 1 - GENERAL

1.1 Related Sections

- .1 Section 26 05 00 – Common Work Results for Electrical.
- .2 Section 26 28 23 – Disconnect Switches – Fused and Non-Fused.
- .3 Section 26 29 01 – Contactors.

1.2 References

- .1 CAN/CSA C22.1 12, Canadian Electrical Code.
- .2 CAN/CSA Standard C22.2 No. 106-05 (R2010): HRC - Miscellaneous Fuses.
- .3 UL 512 -FUSE HOLDERS.

1.3 Submittals

- .1 Provide submittals in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Product data:
 - .1 Provide fuse performance data characteristics for each fuse type and size. Performance data to include average melting time-current characteristics.
- .3 Shop Drawings:
 - .1 Provide Shop Drawings in accordance with Section 26 05 00 - Common Work Results for Electrical.

1.4 Delivery, Storage and Handling

- .1 Ship fuses in original containers.
- .2 Do not ship fuses installed in distribution equipment.
- .3 Store fuses in original containers in moisture free location.

1.5 Maintenance Materials

- .1 Provide maintenance materials in accordance with Section 26 05 00 - Common Work Results for Electrical Six spare fuses of each type and size installed above 600 A.
- .2 Six spare fuses of each type and size installed up to and including 600 A.

PART 2 - PRODUCTS

2.1 Fuses General

- .1 Fuse type references L1, L2, J1, R1, etc. have been adopted for use in this specification.
- .2 Fuses: product of one manufacturer.
- .3 Provide only HRC fuses having an interrupting rating of 200,000. A symmetrical and a voltage rating of 600 V, unless otherwise indicated.
- .4 Time delay fuses must carry 500% of their rated current for a minimum of 10s and be marked "Time Delay".
- .5 Specific equipment will require the rating to be coordinated with manufacturer's recommendation.

2.2 Fuse Types

- .1 Class J fuses:
 - .1 CSA designation HRCI-J2, fast acting fuses for lighting and general loads without inrush, 600 A and lower.
 - .2 CSA designation HRCI-J1, time Delay fuses for motors, transformers and other loads with an inrush, 600 A and lower.
- .2 Class L fuses:
 - .1 CSA designation HRC-L1, time Delay fuses for motors, transformers and other loads above 600 A with an inrush.
- .3 CSA designation HRCI-JY fuses are not permitted.

2.3 Fuse Storage Cabinet

- .1 Fuse storage cabinet, 750 mm high, 610 mm wide, 310 mm deep, hinged, lockable front access door. Locate in the Main Electrical Room.

PART 3 - EXECUTION

3.1 Installation

- .1 Install the fuses in the mounting devices immediately before energizing the circuit.
- .2 Ensure correct fuses are fitted to physically matched mounting devices.
- .3 Ensure correct fuses are fitted to the assigned electrical circuits.
- .4 Install spare fuses in fuse storage cabinet.

END OF SECTION

PART 1 - GENERAL

1.1 References

- .1 CAN/CSA-C22.2 No. 5-09, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard, with UL 489 and NMX-J-266-ANCE-2010).
- .2 CAN/CSA-C22.2 No. 144-M91 (R2011): Ground Fault Circuit Interrupters.
- .3 CAN/CSA-C22.2 No. 144.1- 06 (R2011): Ground-Fault Circuit-Interrupters (Tri-National standard, with UL 943 and NMX-J-520-ANCE).

1.2 Submittals

- .1 Submit product data in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Include time-current characteristic curves for breakers with ampacity of 200A and over or with interrupting capacity of 22,000A symmetrical (rms) and over at system voltage.

1.3 Acceptable Materials

- .1 Schneider Electric Canada;
- .2 Siemens Canada;
- .3 Eaton Electric;
- .4 ABB Group/GE Industrial Solutions.
- .5 Or Equivalent

PART 2 - PRODUCTS

2.1 Breakers General

- .1 Molded case circuit breakers and Ground-fault circuit interrupters: to C22.2 No. 5.
- .2 Bolt-on moulded case circuit breakers: quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.
- .3 Common-trip breakers: with single handle for multi-pole applications.
- .4 Magnetic instantaneous trip elements in circuit breakers to operate only when the value of the current reaches the setting.

- .1 Trip settings on breakers with adjustable trips to range of 3 to 8 times the rated current.
 - .5 Provide pad locking devices where indicated on breakers to lock the handle of a breaker in the "on" or "off" position with the trip units to remain free to function and protect the circuit from both overload and short circuit conditions.
 - .6 All breaker terminals shall be suitable for a minimum conductor termination temperature rating for 75 degrees C. Termination temperature ratings shall be marked on breaker nameplates.
- 2.2 Thermal Magnetic Breakers (TMB)
 - .1 Molded case circuit breakers to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.
- 2.3 Solid State Trip Breakers (LSI)
 - .1 Moulded case circuit breakers to operate by means of solid-state trip unit with associated current monitors and self-powered shunt trip to provide inverse time current trip under overload condition, and long time, short time, instantaneous tripping for circuit protection.
- 2.4 Solid State Trip Breakers (LSIG)
 - .1 Moulded case circuit breaker to operate by means of solid-state trip unit with associated current monitors and self-powered shunt trip to provide inverse time current trip under overload condition, and long time, short time, instantaneous tripping for ground fault short circuit protection.

PART 3 - EXECUTION

- 3.1 Installation
 - .1 Circuit breakers in panelboards shall be factory installed.
 - .2 Install individual breakers where indicated.

END OF SECTION

PART 1 - GENERAL

1.1 Related Sections

- .1 Section 26 05 00 - Common Work Results – Electrical.
- .2 Section 26 05 10 – Wiring Methods.
- .3 Section 26 05 21 – Wires and Cables (0-1000V).
- .4 Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .5 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.
- .6 Section 26 28 13.01 - Fuses - Low Voltage.

1.2 References

- .1 CAN/CSA-C22.2 No. 4-04 (R2009), Enclosed Switches.
- .2 CAN/CSA C22.2 NO.39-M1987 (R2007) Fuseholder Assemblies.

1.3 Submittals

- .1 Submit product data in accordance with Section 26 05 00 - Common Work Results for Electrical.

PART 2 - PRODUCTS

2.1 Disconnect Switches

- .1 Fusible and non-fusible disconnect switches in CSA Enclosure to suit the environment where the switch is located, to C22.2 NO. 4.
- .2 Provision for padlocking the switch in the ON and OFF switch position by three locks.
- .3 Mechanically interlocked door with a voidable interlock to prevent the door opening when the switch handle is in the ON position.
- .4 Fuseholders, suitable without adaptors, for the type and size of fuses as indicated, to C22.2 NO. 39. Class R fuseholders on circuits in excess of 10kA of available fault current equipped with fuse rejecters to prevent non-Class R fuses from being installed.
- .5 Quick-make, quick-break switching action with arc chutes or arc snuffer.
- .6 Disconnect switches to be provided with copper lugs.
- .7 Disconnect switches integrated rating must be rated to handle the design

interrupting capacity for this project.

- .8 Provide auxiliary contacts for elevator disconnect switches.
- .9 Fuses: size as indicated, in accordance with Section 26 28 13.01 - Fuses - Low Voltage.
- .10 ON-OFF switch position indication on switch enclosure cover.

2.2 Equipment Identification

- .1 Provide equipment identification in accordance with Section 26 05 53 – Identification of Electrical Systems.
- .2 Indicate name of load controlled on size 4 nameplate.

2.3 Acceptable Materials

- .1 Schneider Electric;
- .2 Siemens Canada;
- .3 ABB/GE;
- .4 Eaton Electric.
- .5 Or Equivalent

PART 3 - EXECUTION

3.1 Installation

- .1 Install disconnect switches complete with fuses as indicated.
- .2 Disconnect switches are to be connected so that the blades or moving contacts will be dead when the device is in the open position.

END OF SECTION

PART 1 - GENERAL

1.1 Summary

.1 Section includes:

- .1 Light, sources, ballasts, LED drivers, power supplies, luminaire construction, installation and descriptive schedule.

1.2 References and Related Work

.1 Related sections:

- .1 Please refer to Section 26 05 00: Common Work Results for Electrical.

.2 References:

- .1 Canadian Standards Association (CSA International) CAN/CSA – C22.2 No. 74-96 (R2000), Equipment for Use with Electric Discharge Lamps.
- .2 CAN/CSA – C22.2 No. 9 (R2002) General Requirements for Luminaires.
- .3 CAN/CSA Energy Efficiency Standards.
- .4 CAN/CSA-C654-M91 (Amended 2001) Fluorescent Lamp Ballast Efficacy Measurements.
- .5 CAN/CSA - C22.1 & C22.2 Canadian Electrical Code (LED lighting fixtures shall meet the requirements of CAN/CSA - C22.2 NO. 250.13-12 "Light emitting diode (LED) equipment for lighting applications").
- .6 All references listed above are to be to the latest editions and revisions of each document, regardless of any specific revision that may be identified above.

1.3 Performance Requirement

- .1 All luminaires are to be commercial specification grade.
- .2 Light sources, power supplies, drivers, ballasts and luminaires are to be supplied by reputable manufacturers with a minimum of ten (10) years' experience.

1.4 Submittals

- .1 Shop Drawings and product data:
 - .1 Submit shop drawings in accordance with the Design Quality Assurance Plan.
 - .2 Submit complete photometric data prepared by independent testing laboratory for luminaires for review by Consultant. Include lamp, LED, Driver and ballast data where applicable.
 - .3 Photometric data to include luminance data, CPD, CU table and spacing criterion.

PART 2 - PRODUCTS

2.1 Lamps

- .1 Only LED may be used. No other lamps or light sources will be permitted.
- .2 Colour
 - .1 All lamps and LED of a particular type are to have the same colour temperature and colour rendering index.
 - .2 Unless noted otherwise, the following colour features must be provided for lamps:
 - .1 White light LED is to have a colour temperature of 3000K or 4000K as required with a minimum CRI of 80 for interior luminaires.
 - .2 White light LED is to have a colour temperature of 3000K with a minimum CRI of 80 for exterior luminaires.
- .3 Life
 - .1 LED sources are to have a minimum life of 50000 hrs at L70.
- .4 All four (4) foot, LED retrofit substitutes for T8 fluorescent lamps shall:
 - .1 have no mercury content;
 - .2 be shatterproof,
 - .3 beam angle of at least 150 degrees,
 - .4 be compatible with instant start ballasts,
 - .5 Be Osram Sylvania SubstiTUBE IS LED T8, or Phillips LED InstantFit T8 High Output or Equivalent.
- .5 LED systems

- .1 LEDs to be selected from same colour bin size for consistency in chromaticity and meet ANSI C78 377A as a minimum.
- .2 Colour temperature range to be from 3000 K to 4000 K.
- .3 Colour temperature consistency to be specified CCT ± 175 K.
- .4 The change in chromaticity over the lifetime of the product are to be within 0.007 on the CIE 1976 (u',v') diagram.
- .5 Luminaire photometric report published by manufacturer will be based on LM- 79-08 (IESNA).
- .6 Data pertaining to the temperature (such as solder joint temperature) for the LEDs when operated inside the luminaire in the intended application; and information about how the measured temperature relates to expected life of the system will be provided.
- .7 Any test data available about longer term performance of the LED luminaire, such as DOE CALiPER testing, manufacturer in-house testing, or field tests conducted by DOE, utilities, or other parties will be provided.
- .8 Life Rating will be based on LM-80-08 (IESNA). It will be defined as number of hours of operation where at least 70% of initial lumens for LEDs is maintained.
- .9 Power supplies and control interfaces should be suitable / compatible with the LED modules/luminaires.
- .10 Input voltage for power supply will be 120v interior and exterior building and 347V exterior site or as noted.
- .11 Ambient temperature -20 deg C to +50 deg C. interior and -40 deg C to +50 deg C. exterior.
- .12 FCC 47CFR Part 15 compliant.
- .13 LED systems to be RoHS compliant.
- .14 Wiring to be as per the manufacturer's data sheet and to comply with Ontario Electrical Safety Code.

2.2 Power Supply/Drivers/Ballasts Devices

.1 LED

.1 Driver/Power Supply

- .1 Input voltage will be 120v AC or 347V as required and output will be suitable for the LED modules typically 10v DC or 24v DC or as specified for the given LED module.
- .2 The power supply will have protection features against open circuit, short circuit, overload and overheating.
- .3 The power supply will be rated for damp locations.
- .4 It will be suitable for Class 2 output.
- .5 The Power supply should be suitable for input voltage variation of +/- 10% with no damage to the driver.
- .6 The input frequency will be 50/60Hz.
- .7 The max case temperature will not exceed 70 deg C.
- .8 The Power Supply will be suitable for ambient temperature between -20 deg C and + 50 deg C (interior), and will be suitable for ambient temperature between -40 deg C and + 50 deg C (exterior).
- .9 It will comply with FCC 47 CFR Part 15 and RoHS.
- .10 The power supply/its components will be UL/ CSA/ ETL listed or recognized as applicable.
- .11 Warranty will be 5 years minimum commencing on Total Performance of the Contract.

.2 LED Dimming Units

- .1 The dimming units will conform to specifications as listed above for Power Supply and will be compatible with the Power Supply and the system used to drive the LEDs.
- .2 They will have PWM (Pulse Width Modulation) as basis for dimming the LEDs.
- .3 The dimming of LEDs will be flicker-less and ensure that there is no colour shift.
- .4 The dimming will be linear.

- .5 The dimming unit will be suitable for use with 1-10v DC controllers and shall have a dimming range of 1% through to 100%.
- .6 Any control interface or potentiometers used will be compatible as a system and also conform to relevant standards such as those mentioned above.
- .7 RGB mixing or DMX controls used should be compatible.

2.3 Finishes

- .1 Baked enamel finish:
 - .1 Conditioning of metal before painting:
 - .1 For corrosion resistance conversion coating to ASTM F1137.
 - .2 For paint base, conversion coating to ASTM F1137.
 - .2 Metal surfaces of luminaire housing and reflectors finished with high gloss (baked enamel, polyester powdercoat, or alzak aluminum) to give smooth, uniform appearance, free from pinholes or defects. Before finishing, all metal is to be chemically degreased and neutralized. Finish is to not be less than two coats of enamel, sprayed and baked on. Certain luminaires for certain applications may have alternate finishes and shall be specified in the lighting schedule.
- .3 Reflector and other inside surfaces finished as follows:
 - .1 White, minimum reflection factor 85%.
 - .2 Colour fastness: yellowness factor not above 0.02 and after 250 hours exposure in Atlas or Equivalent fade-ometer not to exceed 0.05.
 - .3 Film thickness, not less than 0.03 mm average and in no areas less than 0.025 mm.
 - .4 Gloss not less than 80 units as measured with Gardner or Equivalent 60 degree gloss meter.
 - .5 Flexibility: withstand bending over 12 mm mandrel without showing signs of cracking or flaking under 10 times magnification.
 - .6 Adhesion: 24 mm square lattice made of 3 mm squares cut through film to metal with sharp razor blade. Adhesive cellulose tape applied over lattice and pulled. Adhesion satisfactory if no coating removed.
- .4 Alzak finish:
 - .1 Aluminum sheet fabricated from special aluminum alloys and chemically brightened, subsequently anodically treated to

specifications established by Alcoa, to produce:

- .1 Finish for mild commercial service, minimum density of coating 7.8 g/m², minimum reflectivity 83% for specular, 80.5% for semi-specular and 75% for diffuse.
- .2 Finish for regular industrial service, minimum density of coating 14.8 g/m², minimum reflectivity 82% for specular and 73% for diffuse.
- .3 Finish for heavy duty service, minimum density of coating 21.8 g/m², minimum reflectivity 85% for specular, 65% for diffuse.
- .4 No noticeable iridescence when used with tri-phosphor lamps.

2.4 Light Optical Control Devices

.1 Lenses:

- .1 Unless noted otherwise, lenses are to be manufactured from injection-molded clear virgin acrylic.
- .2 Generally, lenses are to be 0.125" (3.18 mm) thick overall with 0.084" (2.13 mm) maximum penetration in a K-12 pattern unless otherwise noted.
- .3 Provide ultraviolet inhibited lenses and shields over lamps as indicated.

2.5 Luminaire Construction

- .1 Unless otherwise indicated, luminaire bodies are to be of minimum 20 gauge, cold rolled prime steel of rigid construction with knockouts as required.
- .2 Fixture rigidity is to permit any suspension method without sag. Luminaires are to be suitable for either individual or continuous mounting as required.
- .3 Unless noted otherwise, fixtures are to be finished in baked white enamel with exposed surfaces matching the exposed tee-bars specified in other sections and are to resist chipping, corrosion, and discolouration

- .4 Fixture lenses and diffusers are to be rigid enough to be self-supporting without sag, easily removable but not loose. Provide additional thickness of lens to prevent sag at no extra cost to the Region.
- .5 Where fixtures are specified to have two separate power sources within, provide all necessary barriers, etc., to isolate the two power sources as per the requirements of the Town of Newmarket Building Department.
- .6 Where fixtures are specified to be ip65 or other IP designation rated, rating is to be tested to IEC 60598 by a recognized independent testing authority.
- .7 Where fixtures are specified to be NSF rated, rating is to be tested by a recognized testing authority.
- .8 Interior Led luminaires are to be designed to allow for the replacement of LEDs and driver(s) without removing the luminaire from the ceiling from below or above as required.

2.6 Luminaire Warranty

- .1 All materials shall bear standard manufacturer's warranty, transferrable to the Region and the designated facility maintenance service provider.
- .2 Written warranty to cover luminaire, ballast, driver and led module repair or replacement from the date of purchase.

PART 3 - EXECUTION

3.1 Installation

- .1 Lamps and LED modules:
 - .1 Install all lamps in luminaires specified.
 - .2 Replace all lamps with new if there is any rapid deterioration of lamps which the Consultant views as excessive in terms of the project warranty at no cost to the Region.
 - .3 Replace all lamps exhibiting a colour shift which does not correlate to manufacturers published data.

- .2 Ballasts and LED drivers:
 - .1 Ballasts are to be integral with the luminaire unless otherwise noted.
 - .2 Remote ballasts and drivers are to be installed in ventilated steel enclosures.
 - .3 Provide racks for all remote ballasts.
 - .4 Locate remote ballasts as close as possible to their luminaries. (Verify with the lamp manufacturer as to the appropriate distance).
 - .5 Install remote ballasts in vertical orientation with capacitors at the bottom of the ballast.
 - .6 Identify all ballast secondary wiring.
 - .7 Provide ballasts suitable for the environment in which they are located.
 - .8 Where remote electronic ballasts are used, the maximum length of wiring between the ballasts and socket are to be 4 metres (13 feet).
- .3 Temperature
 - .1 Provide ballasts which are suitable to operate in the environment where located.
- .4 Aiming and adjustment
 - .1 Aiming and adjustment(s) of luminaires are to be included in the scope of this contract.
- .5 Dimming ballast - installation
 - .1 Ballasts are to be installed in accordance with luminaire manufacturer's Shop Drawings and these specifications.
 - .2 Ballast manufacturer is to provide a toll-free phone number, with 24 hour access to service technical and application questions.
 - .3 Lead length from ballast to lamp socket is to not exceed 7' for T-8, 3' for T-5 lamps, 5' for LED.
 - .4 Ensure that new fluorescent lamps are operated (aged) at full intensity for 100 hours.
 - .5 All wiring from the dimming control to the ballast is to be Class 1 and run together in the same conduit.

.6 Luminaire supports

- .1 Luminaires and accessories are to not be fixed to or suspended in any way from mechanical pipes, ducts or other components. If necessary, additional supports are to be installed to bridge the equipment.
- .2 Where the ceiling system is not rated to carry a maximum fixture and boot load, all luminaires are to be supported by approved wires or chains which will allow the luminaire to be supported properly and independent of the ceiling system.
- .3 All supports are to be provided under this Contract.

.7 Luminaire alignment

- .1 Align luminaires mounted in continuous rows to form straight uninterrupted line.
- .2 Align luminaires mounted individually parallel or perpendicular to building grid lines.
- .3 All luminaires are to be installed accurately in line and level. Co-ordinate this work with other trades to ensure that their work is not held up by the work of this contract and that the luminaires are installed on schedule.
- .4 All luminaires are to be installed in the standard manner for the type of luminaire and in accordance with the manufacturer's instructions. Luminaire studs or other equally secure methods of attachment are to be used throughout or as called for in the Luminaire Schedule on the Drawings.
- .5 Contractor shall check the ceiling finishes in all areas where recessed luminaires are being installed to ensure that the luminaires which are ordered for these areas are purchased with suitable ceiling trim for the particular ceiling finish. Luminaires which are sent to the site with wrong ceiling trim or flanges is to be replaced with luminaires having the correct trims without additional cost to the Contract . I Contractor shall notify the Consultant if the ceilings are improperly installed and is to be guided by his decisions before proceeding with the luminaire installation.
- .6 Plaster frames and rings are to be provided for luminaires recessed in plaster ceilings. The installation of the plaster ring is to be done by a Lathing Trade Installer under the supervision of Contractor to ensure that they are located correctly.

- .7 Luminaires are to be properly cleaned at the time of installation. Any luminaires showing marks or scratches due to handling or tool marks are to be replaced.
- .8 Luminaires in service areas, mechanical and electrical rooms are to be installed after the mechanical and electrical equipment is in place. The luminaires are to be located on Site to clear all obstructions, and to facilitate lamp removal, to the approval of Contractor
- .9 Install reflector in coves per manufacturer's instructions.

END OF SECTION

PART 1 - GENERAL

- 1.1 Not Used

PART 2 - PRODUCTS

2.1 Service Areas (Type X##) – Stencil Face

- .1 Universal type with a maximum depth of 60mm (2.375"), either surface, single or double face, end or ceiling mounted.
- .2 Housing to be of rugged steel construction with white baked enamel finish.
- .3 Faceplate to be white finished aluminum, 2.5mm (.1") thick, with 150 mm (6") high stencil cut, Green running man, and edge located direction arrows as required.
- .4 Lamps to be end mounted LED, vertically aligned, and parallel proprietary lateral, fibre-optical acrylic lensed, such that they are fully contained and not be visible or protruding.
- .5 Input voltage to be 120 volt, unless noted otherwise.
- .6 Stencil Ceiling Mounted
 - .1 X20 Single Face - Running Man Right
 - .2 X21 Double Face - Running Man Right
 - .3 X22 Single Face - Running Man Left
 - .4 X23 Double Face - Running Man Left
- .7 Stencil Pendant Ceiling Mounted
 - .1 X24 Single Face - Running Man Right
 - .2 X25 Double Face - Running Man Right
 - .3 X26 Single Face - Running Man Left
 - .4 X27 Double Face - Running Man Left
- .8 Stencil Wall Mounted
 - .1 X28 Single Face - Running Man Right
 - .2 X29 Single Face - Running Man Left
- .9 Stencil End-Wall Mounted
 - .1 X30 Single Face - Running Man Right
 - .2 X31 Double Face - Running Man Right
 - .3 X32 Single Face - Running Man Left
 - .4 X33 Double Face - Running Man Left

2.2 General

- .1 All exit lights shall:
 - .1 Have no light leakage from joints and fittings.
 - .2 Have canopy and/or stem hangers to match housing.
 - .3 Meet the requirements of Standard CSA C860.

2.3 Manufacturers

- .1 Exit light shall be the product of one of the following:
 - .1 Beghelli Canada Inc.
 - .2 ABB Installation Product – Emergi-Lite.
 - .3 Or Equivalent.

PART 3 - EXECUTION

3.1 Installation

- .1 Install exit lights where shown, with arrows pointing in locations as indicated on drawing.
- .2 Connect exit lights to circuits as indicated.
- .3 Ensure that exit light circuit breaker is locked in "ON" position.
- .4 Ensure that nowhere, are exit lights mounted less than 2m (6'-6") between underside of unit and finished floor.
- .5 For ceiling mounting in areas with unfinished ceiling, mount unit alongside junction box, with or without canopy, and supply unit laterally with conduit (or with buried conduit, where allowed or specified, or by using the exit light canopy as a junction box where approved).
- .6 Include in the Bid, for the installation of 10 (ten) additional exit lights of any type where directed on site. Turn over any unused units to the Region.

END OF SECTION

PART 1 - GENERAL

1.1 Related Requirements

- .1 Sections of Division 21 as applicable.
- .2 Sections of Division 23 as applicable.
- .3 Sections of Division 25 as applicable.
- .4 Section 26 05 00 – Common Work Results for Electrical.
- .5 Section 26 05 10 – Wiring Methods.

1.2 References

- .1 Treasury Board of Canada Secretariat (TBS), Occupational Safety and Health (OSH).
 - .1 Fire Protection Standard, April 1, 2010.
- .2 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S524-14, Standard for the Installation of Fire Alarm Systems.
 - .2 CAN/ULC-S525-07, Audible Signal Devices for Fire Alarm Systems.
 - .3 CAN/ULC-S526-07, Visual Signal Devices for Fire Alarm Systems.
 - .4 CAN/ULC-S527-11, Standard for Control Units for Fire Alarm Systems.
 - .5 CAN/ULC-S528-14, Manual Pull Stations for Fire Alarm Systems.
 - .6 CAN/ULC-S529-09, Smoke Detectors for Fire Alarm Systems.
 - .7 CAN/ULC-S530-M91, Heat Actuated Fire Detectors.
 - .8 CAN/ULC-S531-14, Standard for Smoke Alarms.
 - .9 CAN/ULC-S536-04, Inspection and Testing of Fire Alarm Systems.
 - .10 CAN/ULC-S537-13, Verification of Fire Alarm Systems.
 - .11 CAN/ULC-S533-08, Egress Door Securing and Releasing Devices.
 - .12 CAN/ULC-S541-07, Speakers for Fire Alarm Systems, Including Accessories.
 - .13 CAN/ULC-S548-08, Devices and Accessories for Water Type Extinguishing Systems.

.14 CAN/ULC-S102.4-10, Standard Method of Test for Fire and Smoke Characteristics of Electrical Wiring, Cables and Non-Metallic Raceways.

.15 ULC/ORD-C386-90 Flame Detectors.

.3 National Building Code of Canada 2010.

.4 National Fire Code of Canada 2010.

.5 Ontario Building Code 2012 (OBC).

.6 Ontario Fire Code 2015.

.7 Canadian Electrical Code 2015.

.8 Ontario Electrical Safety Code 2015.

.9 CAN/ULC-S1001-11 Integrated Systems Testing of Fire Protection and Life Safety Systems.

1.3 Action and Informational Submittals

.1 Submit in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for multiplex fire alarm system and voice communication systems and include product characteristics, performance criteria, physical size, finish and limitations.

- .3 Shop Drawings, indicate:
 - .1 Detail assembly and internal wiring diagrams for control unit(s), Consoles and Auxiliary cabinets.
 - .2 Complete system riser (wiring diagram) identifying Fire Alarm System control equipment, smoke management, control equipment, initiating zones, signaling circuits; identifying terminations, terminal numbers, conductors and raceways.
 - .3 Details for devices. Product data sheets for system components highlighted to indicate the specific products, features, or functions with item by item cross reference to specification for compliance.
 - .4 System Power and battery charts with performance graphs and voltage drop calculations to assure that the system will operate per the prescribed backup time periods and under all voltage conditions per ULC and OBC standards.
 - .5 System operation description including method of operation and supervision of each type of circuit and sequence of operations for all manually and automatically initiated system inputs and outputs. A list of all input and output points in the system shall be provided with a label indicating location or use of IDC, NAC, relay, Sensor, and auxiliary control circuits. Cross reference to logic flow diagram.

1.4 Closeout Submittals

- .1 Submit in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Operation and Maintenance Data: submit operation and maintenance data for fire alarm and voice communication systems for incorporation into manual.
- .3 Include:
 - .1 Instructions for complete Fire Alarm System and Smoke Management System to permit effective operation and maintenance.
 - .2 Technical data - illustrated parts lists with parts catalogue numbers.
 - .3 Copy of Shop Drawings approved by the Consultant with corrections completed and marks removed except review stamps.
 - .4 Product certification signed by the manufacturer of the fire alarm system components certifying that their products comply with indicated requirements.
 - .5 List of recommended spare parts for system.

.6 Record of field tests of system.

1.5 Maintenance Material Submittals

.1 Submit maintenance materials in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Extra Stock Materials:

.1 Break Rods for Manual Stations: Furnish quantity equal to 15 percent of the number of manual stations installed; minimum of 6 rods.

.2 Strobe Units: Furnish quantity equal to 10 percent of the number of units installed, but not less than one.

.3 Smoke Detectors or Sensors, Fire Detectors, and Flame Detectors: Furnish quantity equal to 10 percent of the number of units of each type installed but not less than one of each type.

.4 Detector or Sensor Bases: Furnish quantity equal to 2 percent of the number of units of each type installed but not less than one of each type.

.5 Line Isolator Modules: 10 spare including installation, such that there is no extra cost to the Consultant at time of installation.

1.6 Quality Assurance

.1 Installer Qualifications: A factory authorized installer is to perform the work of this section.

.2 Each and all items of the Fire Alarm System to be listed as a product of a single fire alarm system manufacturer under the appropriate category by Underwriters Laboratories of Canada, Inc. (ULC), and shall bear the "ULC" label.

.3 Inspection tests to conform to: CAN/ULC-S536.

.4 Submit inspection report to the Consultant.

1.7 Delivery, Storage and Handling

.1 Deliver, store and handle materials in accordance with Section 26 05 00 - Common Work Results for Electrical and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labeled with manufacturer's name and address.

- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, indoors and in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect materials from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- 1.8 Waste Management and Disposal
 - .1 Separate waste materials for reuse, recycling and disposal in accordance with York Region Waste Depot Guidelines
- 1.9 Acceptable Materials
 - .1 To match existing;

PART 2 - PRODUCTS

- 2.1 System Description
 - .1 General: Contractor shall provide new programmable initiating devices, speakers and new annunciator system. Contractor shall **provide new** fire alarm devices as noted in the Contract Documents and as required by the Ontario Building Code. The existing fire alarm system is to remain and be updated including all reprogramming and testing as specified within the drawings and specifications. Provide new initiating devices, notification appliances, and monitoring and control devices as indicated on the Drawings and as specified herein. All user interfaces and components such as readouts, printouts, annunciation, data gathering panels, etc. are to be English. Battery calculations will be required to determine if batteries need to be replaced with a higher Ah type. Provide any firmware updates as part of this project.
 - .2 Software: The fire alarm system shall allow for loading and editing instructions and operating sequences as necessary. The system shall be capable of on-Site programming to accommodate system expansion and facilitate changes in operation. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control unit. Loss of primary and secondary power shall not erase the instructions stored in memory. System shall be capable of storing dual configuration programs with one active and one in reserve. Panel shall be capable of full system operation during a new configuration download. To accommodate this capability, the download of a new Node program will be transferred to a "secondary" configuration memory bank, while the Node continues to function on the "primary" configuration memory bank.
 - .3 System to carry out fire alarm , protection functions; including receiving alarm signals; initiating alarms; supervising components and wiring; actuating annunciators and auxiliary functions; initiating trouble signals and signaling to monitoring agency.

- .4 Management Mode
 - .1 The Annunciators and graphics to be updated to provide indication of trouble and alarm zones listed on the fire alarm zone schedule with a 20% spare capacity. In addition, other requirements as deemed by the Town of Newmarket Building Department.
 - .2 Provide the required modules, firmware, software and programming to permit the complete operation of the fire alarm system. The modules will provide manual control of the smoke/fire doors.
 - .3 Annunciation: Operation of alarm and supervisory initiating devices shall be annunciated at the FACP and the remote annunciator, indicating the location and type of device.
 - .4 Selective Alarm: A system alarm shall include:
 - .1 Existing indication of alarm condition at the FACP, annunciator(s) and at the Fire Security Facility to remain.
 - .2 Initiation of elevator recall homing and alternate floor in accordance with applicable building code and the Town of Newmarket Building Department requirements when specified detectors or sensors are activated.
 - .3 If first stage alarm is not acknowledged within 5 minutes, system to automatically go into second stage. In a single stage system, enter directly into alarm state.
 - .5 Supervisory Operations: Existing operations to remain.
 - .6 Trouble Operations: Existing operations to remain.
 - .7 Alarm Silencing:
 - .1 If the "Alarm Silence" button is pressed, all audible and visible alarm signals shall cease operation after silencing inhibit timer has timed out.
 - .2 Subsequent alarm, received after previous alarm has been silenced, to re activate signals.

.8 System Reset

- .1 The "System Reset" button shall be used to return the system to its normal state. Display messages shall provide operator assurance of the sequential steps ("IN PROGRESS", "RESET COMPLETED") as they occur. The system shall verify all circuits or devices are restored prior to resetting the system to avoid the potential for re-arming the system. The display message shall indicate "ALARM PRESENT, SYSTEM RESET ABORTED."
- .2 Should an alarm condition continue, the system will remain in an alarmed state.

.9 A manual evacuation (drill) switch shall be provided to operate the notification appliances without causing other control circuits to be activated.

.10 WALKTEST: The system shall have the capacity of 8 programmable passcode protected one-person testing groups, such that only a portion of the system need be disabled during testing. The actuation of the "enable one-person test" program at the control unit shall activate the "One Person Testing" mode of the system as follows:

- .1 The city circuit connection and any suppression release circuits shall be bypassed for the testing group.
- .2 Control relay functions associated to one of the 8 testing groups shall be bypassed.
- .3 The control unit shall indicate a trouble condition.
- .4 The alarm activation of any initiation device in the testing group shall cause the audible notification appliances assigned only to that group to sound a code to identify the device or zone.
- .5 The unit shall automatically reset itself after signaling is complete.
- .6 Any opening of an initiating or notification appliance circuit wiring shall cause the audible signals to sound for 4 seconds indicating the trouble condition.

.5 Analog Smoke Sensors:

- .1 Monitoring: FACP shall individually monitor sensors for calibration, sensitivity, and alarm condition, and shall individually adjust for sensitivity. The control unit shall determine the condition of each sensor by comparing the sensor value to the stored values.
- .2 Environmental Compensation: The FACP shall maintain a moving average of the sensor's smoke chamber value to automatically compensate for dust, dirt, and other conditions that could affect

detection operations.

- .3 Programmable Sensitivity: Photoelectric Smoke Sensors shall have 9 selectable sensitivity levels ranging from 0.2% to 3.7%, programmed and monitored from the FACP.
- .4 Sensitivity Testing Reports: The FACP shall provide sensor reports that meet CAN/ULC-S537 and CAN/ULC-S536 calibrated test method requirements. The reports shall be viewed on a computer display or printed for annual recording and logging of the calibration maintenance schedule.
- .5 The FACP shall automatically indicate when an individual sensor needs cleaning. The system shall provide a means to automatically indicate when a sensor requires cleaning. When a sensor's average value reaches a predetermined value, (3) progressive levels of reporting are provided. The first level shall indicate if a sensor is close to a trouble reporting condition and will be indicated on the FACP as "ALMOST DIRTY." This condition provides a means to alert maintenance staff of a sensor approaching dirty without creating a trouble in the system. If this indicator is ignored and the second level is reached, a "DIRTY SENSOR" condition shall be indicated at the FACP and subsequently a system trouble is reported [to the Central Monitoring Station]. The sensor base LED shall glow steady giving a visible indication at the sensor location. The "DIRTY SENSOR" condition shall not affect the sensitivity level required to alarm the sensor. If a "DIRTY SENSOR" is left unattended, and its average value increases to a third predetermined value, an "EXCESSIVELY DIRTY SENSOR" trouble condition shall be indicated at the control unit.
- .6 The FACP shall continuously perform an automatic self-test on each sensor that will check sensor electronics and ensure the accuracy of the values being transmitted. Any sensor that fails this test shall indicate a "SELF TEST ABNORMAL" trouble condition.
- .7 Multi-Sensors shall combine photoelectric smoke sensing and heat sensing technologies. An alarm shall be determined by either smoke detection, with selectable sensitivity from 0.2 to 3.7 %/m obscuration; or heat detection, selectable as fixed temperature or fixed with selectable rate-of-rise; or based on an analysis of the combination of smoke and heat activity.
- .8 Programmable bases. It shall be possible to program relay and sounder bases to operate independently of their associated sensor.
- .9 Magnet test activation of smoke sensors shall be distinguished by its label and history log entry as being activated by a magnet.

- .6 Audible Alarm Notification: By voice evacuation and tone signals on loudspeakers in areas as indicated on drawings.
 - .1 Automatic Voice Evacuation Sequence:
 - .1 The audio alarm signal shall consist of an alarm tone for a maximum of five seconds followed by an automatic digital voice message. At the end of the voice message, the alarm tone shall resume. This sequence shall sound continuously until the "Alarm Silence" switch is activated.
 - .2 All audio operations shall be activated by the system software so that any required future changes can be facilitated by authorized personnel without any component rewiring or hardware additions.
 - .3 The alarm tone to be utilized is the Temporal (3T) alarm signal.
 - .4 The alert tone to be utilized is a bell tone with frequency of 20 strokes per second.
 - .2 Pre-recorded Voice Messages:
 - .1 Pre-recorded voice messages are to be provided in both English and French. These messages and their content will be finalized during the construction period of the Project.
- .7 Speaker: Speaker notification appliances shall be listed to ULC-S541.
 - .1 The speaker shall operate on a standard 25VRMS or 70.7VRMS NAC using twisted/shielded wire.
 - .2 The following taps are available: 0.25W, 0.50W, 1.0W and 2.0W. At the 1.0W tap, the speaker has minimum ULC rated sound pressure level of 84dBA at 3m.
 - .3 The speaker shall have a frequency response of 400 to 4000 Hz for Fire Alarm and 125 to 12kHz for General Signaling.
- .8 Bell: Speaker notification appliances shall be listed to ULC-S525.
 - .1 The speaker shall operate on a standard 20 to 24VDC.
 - .2 The bell has minimum ULC rated sound pressure level of 92dBA at 3m.

- .9 Strobes: Visual notification appliances shall be listed to ULC-S526.
 - .1 Strobes shall provide synchronized flash outputs. Strobe output shall be determined as required by its specific location and application from a family of 15cd, 30cd, 60cd, 75cd, or 110cd devices. The light output shall be an even "Full Light" pattern throughout the strobes protected area. Strobes utilizing a traditional specular reflector with uneven light distribution are not acceptable.
 - .2 The strobe shall be selectable for a continuous or temporal synchronized flash rate to match the audible signal.
 - .3 The strobes shall be a low-profile single gang design, finished in UV stable neutral white or textured red. The strobe shall use a mask and cavity ultra-low-profile design. All mounting hardware shall be captive and there shall be no mounting screws visible after the device is installed. The devices shall mount to a standard single gang electrical box and have an optional trim ring for 2-gang, octagonal or 4" square boxes. All signaling devices installed shall share a common single gang appearance and be available in a speaker, strobe or combination speaker/strobe unit as listed on the plans.
- .10 Fire Suppression Monitoring:
 - .1 Water flow: Activation of a water flow switch shall initiate general alarm operations.
 - .2 Sprinkler valve tamper switch: The activation of any valve tamper switch shall activate system supervisory operations.
 - .3 Pressure switches.
- .11 Power Requirements
 - .1 The control unit existing AC power via a dedicated fused disconnect circuit to remain.
 - .2 The system shall be provided with updated sufficient battery capacity to operate the entire system upon loss of normal AC power in a normal supervisory mode for a period of 24 hours with 30 minutes of alarm operation at the end of this period. The system shall automatically transfer to battery standby upon power failure. All battery charging and recharging operations shall be automatic.
 - .3 All circuits requiring system-operating power shall be 24 VDC and shall be individually fused at the control unit.
 - .4 The incoming power to the system shall be supervised so that any power failure will be indicated at the control unit. A green "power on" LED shall be displayed continuously at the user interface while incoming power is present.

- .5 The system batteries shall be supervised so that a low battery or a depleted battery condition, or disconnection of the battery shall be indicated at the control unit and displayed for the specific fault type.
- .6 The system shall support NAC Lockout feature to prevent subsequent activation of Notification Appliance Circuits after a Depleted Battery condition occurs in order to make use of battery reserve for front panel annunciation and control.
- .7 The system shall support 100% of addressable devices in alarm or operated at the same time, under both primary (AC) and secondary (battery) power conditions.
- .8 Loss of primary power shall sound a trouble signal at the FACP. FACP shall indicate when the system is operating on an alternate power supply.
- .12 System to include but not limited to:
 - .1 Fire Alarm Control Panel in separate enclosure with power supply, stand-by batteries, central processor with microprocessor and logic interface, main system memory, input-output interfaces for alarm receiving, annunciation/display, and program control/signaling; master telephone with necessary switches and controls.
 - .2 Central Alarm Control Facility in separate enclosure with power supply, stand by batteries, annunciation/display, and smoke management control/switching; master telephone with necessary switches and controls.
 - .3 Data Gathering Panels/Transponders with stand-alone capabilities.
 - .4 LED Graphic displays.
 - .5 Power supplies.
 - .6 Initiating/input circuits.
 - .7 Output circuits.
 - .8 Telephone circuits.
 - .9 Auxiliary circuits.
 - .10 Amplifiers.
 - .11 Wiring.
 - .12 Manual and automatic initiating devices.
 - .13 Audible and visual signaling devices with voice reproducing capability.

- .14 End-of-line resistors.
- .15 Local and Remote annunciators.
- .16 Printer and Event log memory chip.
- .17 Historic event recorder.
- .13 Equipment and devices: ULC listed and labeled and supplied by single manufacturer.
- .14 Power supply: to CAN/ULC-S524.
- .15 Audible signal devices: to CAN/ULC-S525.
- .16 Control unit: to CAN/ULC-S527.
- .17 Manual pull stations: to CAN/ULC-S528.
- .18 Thermal detectors: to CAN/ULC-S530.
- .19 Smoke detectors: to CAN/ULC-S529.
- .20 Smoke alarms: to CAN/ULC-S531.
- .21 Speakers: to CAN/ULC-S541.
- .22 Regulatory requirements:
 - .1 System:
 - .1 Subject to Fire Commissioner of Canada (FC) approval.
 - .2 Subject to FC inspection for final acceptance.
 - .2 System components: listed by ULC and comply with applicable provisions of NBC and Ontario Building Code and meet requirements of local authority having jurisdiction.

2.2 Graphic Annunciator - Passive Type

- .1 Provide updated passive graphics at the main FACP and remote annunciator, for fire department and facilities personnel use.
- .2 The graphics shall be surface mounted framed plexiglass covered floor plans of the facility to a scale of approximately 1:200 with following features:
 - .1 Black building outlines.
 - .2 Stair, elevator and exit locations in blue.

- .3 Light coloured floor plans.
 - .4 Major fire alarm zones identified in red lines.
 - .5 Notation "You Are Here".
 - .3 Graphic's to be submitted to the Town of Newmarket Building Department for review. Once comments have been received they are to be incorporated and the updated graphic's resubmitted for final review and acceptance by the Fire Department.
- 2.3 Supply
- .1 General: Components include battery, charger, and an automatic transfer switch.
 - .2 Battery: Sealed lead-acid or nickel cadmium type. Provide sufficient capacity to operate the complete alarm system in normal or supervisory (non-alarm) mode for a period of 24 hours. Following this period of operation on battery power, the battery shall have sufficient capacity to operate all components of the system, including all alarm indicating devices in alarm or supervisory mode for a period of 120 minutes.
- 2.4 Addressable Manual Pull Stations
- .1 Description: Addressable single action type, 2 Stage, red polycarbonate plastic with molded, raised-letter operating instructions of contrasting color. Station will mechanically latch upon operation and remain so until manually reset by opening with a key common with the control units.
- 2.5 Smoke Sensors
- .1 General: Comply with ULC-S5529, "Smoke Detectors for Fire Alarm Systems." Include the following features:
 - .1 Factory Nameplate: Serial number and type identification.
 - .2 Operating Voltage: 24 VDC, nominal.
 - .3 Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore normal operation.
 - .4 Plug-In Arrangement: Sensor and associated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug connection. Base shall provide break-off plastic tab that can be removed to engage the head/base locking mechanism. No special tools shall be required to remove head once it has been locked. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control unit.
 - .5 Each sensor base shall contain an LED that will flash each time it is scanned by the Control Unit (once every 4 seconds). In alarm

condition, the sensor base LED shall be on steady.

- .6 Each sensor base shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.
- .7 Each sensor shall be scanned by the Control Unit for its type identification to prevent inadvertent substitution of another sensor type. Upon detection of a "wrong device", the control unit shall operate with the installed device at the default alarm settings for that sensor; 2.5% obscuration for photoelectric sensor, 85°C and 20°C rate-of-rise for the heat sensor, but shall indicate a "Wrong Device" trouble condition.
- .8 The sensor's electronics shall be immune from false alarms caused by EMI and RFI.
- .9 Sensors include a communication transmitter and receiver in the mounting base having a unique identification and capability for status reporting to the FACP. Sensor address shall be located in base to eliminate false addressing when replacing sensors.
- .10 Removal of the sensor head for cleaning shall not require the setting of addresses.
- .2 Type: Smoke sensors shall be of the photoelectric or combination photoelectric / heat type. Where acceptable per manufacturer specifications, ionization type sensors may be used.
- .3 Bases: Relay output, sounder and isolator bases shall be supported alternatives to the standard base.
- .4 Duct Smoke Sensor: Photoelectric type, with sampling tube of design and dimensions as recommended by the manufacturer for the specific duct size and installation conditions where applied. Sensor includes relay required for fan shutdown.
 - .1 Environmental compensation, programmable sensitivity settings, status testing, and monitoring of sensor dirt accumulation for the duct sensor shall be provided by the FACP.
 - .2 The Duct Housing shall provide a supervised relay driver circuit for driving up to 15 relays with a single "Form C" contact rated at 7A@ 28VDC or 10A@ 120VAC. This auxiliary relay output shall be fully programmable. Relay shall be mounted within 3 feet of HVAC control circuit.
 - .3 Duct Housing shall provide a relay control trouble indicator Yellow LED.

- .4 Compact Duct Housing shall have a transparent cover to monitor for the presence of smoke. Cover shall secure to housing by means of four (4) captive fastening screws.
- .5 Duct Housing shall provide two (2) Test Ports for measuring airflow and for testing. These ports will allow aerosol injection in order to test the activation of the duct smoke sensor.
- .6 Duct Housing shall provide a magnetic test area and Red sensor status LED.
- .7 For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housing front cover.
- .8 Each duct sensor shall have a Remote Test Station with an alarm LED and test switch.
- .9 Where indicated provide NEMA 4X weatherproof duct housing enclosure shall provide for the circulation of conditioned air around the internally mounted addressable duct sensor housing to maintain the sensor housing at its rated temperature range. The housing shall be UL Listed to Standard 268A.

2.6 Heat Sensors

- .1 Thermal Sensor: Combination fixed-temperature and rate-of-rise unit with plug-in base and alarm indication lamp; 85°C fixed-temperature setting except as indicated.
- .2 Thermal sensor shall be of the epoxy encapsulated electronic design. It shall be thermistor-based, rate-compensated, self-restoring and shall not be affected by thermal lag.
- .3 Sensor fixed temperature sensing shall be independent of rate-of-rise sensing and] programmable to operate at 85°C or 98°C. Sensor rate-of-rise temperature detection shall be selectable at the FACP for either 20°C per minute.
- .4 Sensor shall have the capability to be programmed as a utility monitoring device to monitor for temperature extremes in the range from 30°C to 98°C.

2.7 Addressable Circuit Interface Modules

- .1 Addressable Circuit Interface Modules: Arrange to monitor one or more system components that are not otherwise equipped for addressable communication. Modules shall be used for monitoring of waterflow, valve tamper, non-addressable devices, and for control of evacuation indicating appliances and AHU systems.
- .2 Addressable Circuit Interface Modules will be capable of mounting in a

standard electric outlet box. Modules will include cover plates to allow surface or flush mounting. Modules will receive their operating power from the signaling line or a separate two wire pair running from an appropriate power supply as required to meet the design and installation requirements.

.3 There shall be the following types of modules:

.1 Type 2: Line Powered Monitor Circuit Interface Module

.1 This type of module is an individually addressable module that has both its power and its communications supplied by the two-wire multiplexing signaling line circuit. It provides location specific addressability to an initiating device by monitoring normally open dry contacts. This module shall have the capability of communicating four zone status conditions (normal, alarm, current limited, trouble) to the FACP.

.2 This module shall provide location specific addressability for up to five initiating devices by monitoring normally closed or normally open dry contact security devices. The module shall communicate four zone status conditions (open, normal, abnormal, and short). The two-wire signaling line circuit shall supply power and communications to the module.

.2 Type 4: Line Powered Control Circuit Interface Module

.1 This module shall provide control and status tracking of a Form "C" contact. The two-wire signaling line circuit shall supply power and communications to the module.

.4 All Circuit Interface Modules shall be supervised and uniquely identified by the control unit. Module identification shall be transmitted to the control unit for processing according to the program instructions. Modules shall have an on-board LED to provide an indication that the module is powered and communicating with the FACP. The LEDs shall provide a troubleshooting aid since the LED blinks on poll whenever the peripheral is powered and communicating.

2.8 Standard Alarm Notification Appliances

.1 Visible/Only (V/O): Strobe shall be listed to ULC-S526. The V/O shall consist of a xenon flash tube and associated lens/reflector system. The V/O enclosure shall mount directly to standard single gang, double gang or 103 mm square electrical box, without the use of special adapters or trim rings. V/O appliances shall be provided with different minimum flash intensities of 15cd, 75cd and 110cd. Provide a label inside the strobe lens to indicate the listed candela rating of the specific Visible/Only appliance.

- .2 Speaker/Visible: Combination Speaker/Visible (S/V) units combine the speaker and visible functions into a common housing. The S/V shall be listed to ULC-S526 and ULC-S541.
 - .1 Twisted/shielded wire is required for speaker connections on a standard 25VRMS or 70.7VRMS NAC using and UTP conductors, having a minimum of 3 twists per foot is required for addressable strobe connections.
 - .2 The following taps are available: 0.25W, 0.50W, 1.0W and 2.0W. At the 1.0W tap, the speaker has minimum UL rated sound pressure level of 84dBA at 3m.
 - .3 The S/V shall have a frequency response of 400 to 4000 Hz for Fire Alarm and 125 to 12kHz for General Signaling.
 - .4 The S/V installs directly to a 103 mm square, 37.5 mm deep electrical box with 12.5 mm extension.
- .3 Speaker: Speaker notification appliances shall be listed to ULC-S541.
 - .1 The speaker shall operate on a standard 25VRMS or 70.7VRMS NAC using twisted / shielded wire.
 - .2 The following taps are available: 0.25W, 0.50W, 1.0W and 2.0W. At the 1.0W tap, the speaker has minimum ULC rated sound pressure level of 84dBA at 3 m.
 - .3 The S/V shall have a frequency response of 400 to 4000 Hz for Fire Alarm and 125 to 12kHz for General Signaling.
 - .4 The S/V installs directly to a 103 mm square, 37.5 mm deep electrical box with 12.5 mm extension.
- .4 Notification Appliance Circuit provides synchronization of strobes at a rate of 1Hz.

2.9 Initiating/ Input Circuits

- .1 Receiving circuits for alarm initiating devices such as manual pull stations, smoke detectors, heat detectors and water flow switches,
- .2 Alarm receiving circuits (active and spare): compatible with smoke detectors and open contact devices.
- .3 Actuation of alarm initiating device: cause system to operate as specified in "System Operation".
- .4 Receiving circuits for supervisory, N/O devices.
- .5 Actuation of supervisory initiating device: cause system to operate as specified in "System Operation".

2.10 Alarm Output Circuits

- .1 Alarm output circuit: connected to signals and speakers.
 - .1 Signal circuits' operation to follow system programming; capable of sounding ALERT tone at 20 spm utilizing a BELL generated tone and temporal (3T) ALARM tone.
 - .2 Manual alarm silence, automatic alarm silence and alarm silence inhibit to be provided by system's common control.
 - .3 Speaker circuits operation: follow system programming; capable of reproducing tones and voice fed by audio channels.
 - .4 Audio channel available to each speaker circuit to be automatically and dynamically selected by system's microprocessor.
 - .5 Manual selection and operation of alarm tones to be provided on area-by-area basis.
 - .6 Manual selection for emergency paging to be provided on area-by-area basis.
 - .7 Proprietary evacuation control switch to be provided to override automatic system programming once manual control of system has been assumed by authorized personnel.

2.11 Emergency Telephone Circuits

- .1 Telephone circuits for connection of remote emergency telephones.
- .2 Two-way communication via telephone voice circuits between master telephone handset and remote telephones.
- .3 Field wiring of telephone circuits between remote handsets, FACP and annunciator: supervised for open circuits and grounds.

2.12 Auxiliary Circuits

- .1 Auxiliary contacts for control functions.
- .2 Actual status indication (positive feedback) from controlled device.
- .3 Alarm, supervisory and trouble on system to cause operation of programmed auxiliary output circuits.
- .4 Two sets of separate contacts for elevator capture (to main floor of egress and to alternate floor of egress).
- .5 Upon resetting system, auxiliary contacts to return to normal or to operate as pre-programmed.
- .6 Auxiliary circuits: rated minimum 2 A, 24 V dc or 120 V ac, fuse-protected.

2.13 Amplifiers

- .1 Modular in construction, solid state in design, with power output of required voltage, for constant voltage distribution to speaker circuits.
- .2 Continuously supervised for proper operation. Loss of power, open or short circuit on input or output of amplifier, or total amplifier failure, to activate trouble sequence at central control unit with visual indication.
- .3 Housed in CACF and supported by standby batteries in case of power failure.
- .4 Riser amplifiers: housed in central control unit, with outputs connected to voice communication risers.
- .5 Standby amplifiers: at every amplifier location; sized to meet requirements of largest amplifier in that location, with automatic transfer to be on priority basis.
- .6 Amplifiers: 25% spare capacity for future expansion.

2.14 Wiring

- .1 Copper conductors. Fire alarm addressable data loop wiring shall be rated FAS 300V and 105°C at minimum.
- .2 To initiating circuits: 18 AWG minimum, and in accordance with manufacturer's requirements.
- .3 To signal circuits: 16 AWG minimum, and in accordance with manufacturer's requirements.
- .4 To speaker circuits: twisted, shielded pairs, and in accordance with manufacturer's requirements.
- .5 To telephone circuits: twisted, shielded pairs, and in accordance with manufacturer's requirements.
- .6 To control circuits: 14 AWG minimum, and in accordance with manufacturer's requirements.
- .7 Risers: twisted, shielded pairs, 1 h fire-rated configured to eliminate interference and cross-talk.

2.15 Special Signs

- .1 "FIRE DO NOT ENTER" custom, illuminated, flashing, 24 volt D.C., ULC listed and labeled warning sign with slimline satin aluminum housing and with black face and red letters. Fixtures shall be equipped with long life LED illuminators rated at 131,000-hour life, flasher and Lexan guard. Minimum letter size shall be "FIRE" –53 mm high, "DO NOT ENTER"– 37.5 mm high. Lettering shall not be visible until sign is energized.

- .2 At each location provide one "FIRE DO NOT ENTER" sign.

2.16 End-Of-Line Devices

- .1 End-of-line devices to control supervisory current, sized to ensure correct supervisory current for each circuit. Open, short or ground fault in any circuit will alter supervisory current in that circuit, producing audible and visible alarm as indicated.
- .2 End-of-line devices shall be grouped in service spaces and not mounted higher than 2100 mm off.

2.17 Isolator Modules

- .1 Isolator modules shall be provided to automatically isolate wire to wire short circuits on an addressable loop. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the Loop. At least one isolator module shall be provided for each floor or protected zone of the building.
- .2 If a wire to wire short occurs, the isolator module shall automatically open circuit (disconnect) the loop. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.
- .3 The isolator module shall not require any address setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
- .4 The isolator module shall mount in a standard electrical box or in a surface mounted backbox. It shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

PART 3 - EXECUTION

3.1 Examination

- .1 Verification of Conditions: verify existing conditions are acceptable for fire alarm and communication systems installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of the Consultant.
 - .2 Inform the Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Consultant.

3.4 Wiring Installation

- .1 System Wiring: Wire and cable shall be a type listed for its intended use by an approval agency acceptable to the Town of Newmarket Building Department and shall be installed in accordance with the appropriate articles from the current approved edition of the Canadian Electric Code.
- .2 Contractor shall obtain from the Fire Alarm System Manufacturer written instruction regarding the appropriate wire/cable to be used for this installation. No deviation from the written instruction shall be made by the Contractor without the prior written approval of the Fire Alarm System Manufacturer.
- .3 Color Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm initiating device circuits wiring and a different color code for supervisory circuits. Color-code notification appliance circuits differently from alarm-initiating circuits. Paint fire alarm system junction boxes and covers red.
- .4 Splices are not permitted.
- .5 Provide necessary raceways, cable and wiring to make interconnections to terminal boxes, annunciator equipment and FACP, as required by equipment manufacturer.
- .6 Ensure that wiring is free of opens, shorts or grounds, before system testing and handing over.
- .7 Identify circuits and other related wiring at central control unit, annunciators, and terminal boxes.

3.5 Field Quality Control

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and to CAN/ULC-S537.
- .2 Fire alarm system:
 - .1 Test device and alarm circuit to ensure manual stations, thermal and smoke detectors, sprinkler system transmit alarm to control panel and actuate alarms and ancillary devices.
 - .2 Check annunciator panels to ensure zones are shown correctly.
 - .3 Simulate grounds and breaks on alarm and signaling circuits to ensure proper operation of system.
 - .4 Addressable circuits:
 - .1 Test each conductor addressable links for capability of providing 3 or more subsequent alarm signals on each side of single open-circuit fault condition. Operate Acknowledge/Silence switch after reception of each of 3 signals. Correct imposed fault after completion of each series of tests.
 - .2 Test each conductor on addressable links for capability of providing 3 or more subsequent alarm signals during ground-fault condition. Operate Acknowledge/Silence switch after reception of

each of the signals. Correct imposed fault after completion of each series of tests.

- .3 Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.
- .4 Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log.
- .5 Final Test, Certificate of Completion, and Certificate of Occupancy:
 - .1 Test the system as required by the Town of Newmarket Building Department in order to obtain a certificate of occupancy.
- .6 Audibility and intelligibility will be tested and checked for each room / space within the building and the fire alarm vendor to provide a letter stating that it meets code requirements.
- .7 The Fire Alarm System will be one element that will be tested as part of the Building Integrated Testing Program.

3.6 Cleaning

- .1 Progress Cleaning: clean in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Waste Management: separate waste materials for reuse and recycling. (in accordance with Section 26 05 00 - Common Work Results for Electrical.)

3.7 Maintenance

- .1 Provide one year's free maintenance with two inspections by manufacturer during warranty period.

3.8 Training

- .1 Provide the services of a factory-authorized service representative to demonstrate the system and train Consultant's maintenance personnel as specified below.
- .2 Train Consultant's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventive maintaining of the system. Provide a minimum of 8-hours' training.
- .3 Schedule training with the Consultant at least seven days in advance.

3.9 Sequence of Operations

- .1 Fire Alarm Sequence of Operations is to be reviewed prior to programing by the client's fire commissioner. The existing operations are to remain and are only to be updated to include the new elevator sequence of

operations.

.2 System Description:

.1 The existing system is to remain and is to be updated to include the new elevator sequencing and associated devices.

.1 Operation of any alarm in the complex will cause the following:

.1 The Elevators will be homed to Level 1.

.2 Operation of an alarm on Level 1 will home all elevators to Level 2.

.3 All other existing operations to remain.

.2 Elevator Homing Bypass Switch: (All Elevators)

.1 A new Elevator Homing Bypass switch is provided at the FACP on Level 1:

.2 The Elevator Homing Bypass switch is a momentary toggle switch. When the Elevator Homing Bypass switch is activated it will cause the following:

.1 Prevent the operation of all Elevator Homing relays.

.2 The yellow Elevator Recall Bypass Active LED's will flash.

.3 A Bypass Trouble condition will be activated on the system.

.4 Message will display on the LCD(s) identifying the Bypass and trouble condition.

.5 The yellow TROUBLE LED will flash and the internal TROUBLE buzzer will sound at all LCD display locations. The LED will flash & the buzzer will sound until all messages have been acknowledged.

.6 The Trouble Relay will be activated.

.7 To deactivate the Elevator Homing Bypass function, activate the Elevator Recall Bypass switch again to toggle the operation.

END OF SECTION

PART 1 - GENERAL

1.1 Codes and Standards

- .1 CAN/CSA C22.1-018, Canadian Electrical Code Part 1 (24th Edition), Safety Standard for Electrical Installations.
- .2 Ontario Electrical Safety Code 27th Edition / 2018.
- .3 CAN3-C235-83 (R2010), Preferred Voltage Levels for AC Systems, 0 to 50,000V.
- .4 National Building Code of Canada.
- .5 National Fire Code of Canada.
- .6 Ontario Building Code 2012.
- .7 CAN/CSA-S832-06 (R2011) – Seismic Risk Reduction of Operational and Functional Components (OFCs) of Buildings
- .8 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
- .9 EEMAC Y1-2, Standard for Performance Specification for Finishing Systems for Outdoor Electrical Equipment.
- .10 Ontario Regulation 278/05.
- .11 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.2 Definitions

- .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

1.3 Intent

- .1 Include all labour, equipment and incidentals to provide the complete electrical work specified in these specifications and shown on the electrical Drawings.
- .2 Where work shown or specified in the documentation for other divisions of the contract appears to duplicate the work shown or specified in this division, obtain clarification of the scope of work prior to submitting a bid for the work. Do not exclude work shown or specified in this division of the work without direction from the Consultant.

1.4 Region's Site Requirements

- .1 The Contractor shall comply with all of the requirements outlined in Division 1 for accessing the Site. There restrictions include but are not limited to the following:
 - .1 The Contractor shall ensure that it and its Subcontractors and the work force assigned to this Site will attend the required site safety training. The Electrical work force on an individual basis will be required to have a paper copy of the following documentation that will be submitted and retained by the Region's Safety Training Team:
 - .1 WHMIS;
 - .2 Shock and Arc Flash Safety Training;
 - .3 Working at Heights Training;
 - .4 Mechanical Lift Training;
 - .5 Special Tools Training and
 - .6 Other Documentation as requested by the Region.
 - .2 The Contractor and the work force assigned to this Site will complete the required process in order to obtain the mandated security passes. At present the process consists of Safety Training, and obtaining the required security pass.
 - .3 The Contractor shall confirm in writing that their and their Subcontractor's staff who will work on the project have been trained and are fully conversance with requirements for Shock and Arc Flash Safety Requirements.
 - .4 Parking and speed on Site is very strictly controlled and infractions will not be tolerated.
- 1.5 Health and Safety
 - .1 Refer to Contract Documents and meet all general requirements.
 - .2 Be responsible for providing scaffolds, access ladders, fall arrest systems and other safeties required to complete the installation of the electrical system that includes but not limited to installation of electrical devices, luminaires, conduit, junction boxes, raceways, or cabling.
 - .3 Be responsible for providing necessary safety training to all construction staff as per Region's training procedures.
- 1.6 Design Requirements
 - .1 Operating voltages to CAN3-C235-83 (R2010).
 - .2 Language operating requirements: provide identification nameplates,

signage, warning labels, labels for control items and electrical apparatuses, in both English and French. This refers to all electrical specification sections that require identification nameplates, signage, warning labels, labels for control items and electrical equipment.

- .1 Use one nameplate or label for each language.

1.7 Codes, Permits, Fees and Inspection

- .1 All work to meet or exceed the latest requirements of the Codes and Standards as listed in PART 1, supplements, local inspection bulletins and all authorities having jurisdiction.
- .2 Arrange for inspection of all work and pay all fees in this regard. On completion of the work, deliver the final unconditional certificate of approval of the Electrical Safety Authority (ESA) to the Departmental Representative.
- .3 It is hereby agreed that all requirements meet CAN/CSA requirements and a complete installation in accordance with these requirements to be provided.
- .4 Keep a permanent record of each inspection made by the Electrical Safety Authority showing the date, inspector's name, scope of the inspection and statement of special decisions or permissions granted. Make these records available to the Consultant at any time, and turn them over at completion of the work.

1.8 Submittals

- .1 Shop Drawings:
 - .1 Submit one (1) electronic copy (PDF format) including table of contents and tabbed sections, of Shop Drawings for all equipment prior to ordering. All Shop Drawings shall include scaled elevation/profile and plan views of equipment, equipment performance and operational specifications. Clearly indicate proposed equipment selection. Submit each Shop Drawing with a completed Shop Drawing transmittal sheet including signed Contractors stamp (with date) indicating that the Contractor has reviewed each shop drawing for contractual compliance and verified field measurements and construction criteria prior to forwarding shop drawings for the Consultant's review. Attach a cover letter clearly indicating any deviation from the specifications.
 - .2 The review by the Consultant is for the sole purpose of ascertaining conformance with the general design concept, and does not mean approval of the design details inherent in the Shop Drawings, responsibility for which shall remain with the Contractor. Such review shall not relieve the Contractor of responsibility for errors or omissions in the Shop Drawings or of his responsibility for meeting all requirements of the Contract Documents. Do not commence manufacture or order materials before shop drawings are reviewed.

- .3 Consultant will notify Contractor in writing, listing review comments. Contractor shall re-submit corrected Shop Drawings if re-submission is requested.
 - .2 Quality Control:
 - .1 Provide CAN/CSA certified equipment and material.
 - .2 Where CAN/CSA certified equipment and material is not available, submit such equipment and material to the authority having jurisdiction and inspection authorities for special approval before delivery to the site.
 - .3 Submit test results of installed electrical systems and instrumentation.
 - .4 Permits and fees: in accordance with General Conditions of the contract.
 - .5 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to the Consultant.
 - .3 Manufacturer's Field Reports: submit to the Consultant manufacturer's written report, within three (3) Business Days of review, verifying compliance of Work and electrical system and instrumentation testing.
- 1.9 Quality Assurance
 - .1 Site Meetings:
 - .1 In accordance with Section 26 05 00.
 - .2 Site Meetings: as part of Manufacturer's Field Services described in Part 3 - FIELD QUALITY CONTROL, schedule Site visits, to review Work, at stages as indicated.
 - .1 After delivery and storage of products, and when preparatory Work is complete but before installation begins.
 - .2 During progress of Work at 33% and 66% complete stages.
 - .3 Upon completion of Work, after cleaning is carried out.
 - .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Division 01.
- 1.10 Delivery, Storage and Handling
 - .1 Material Delivery Schedule: provide the Consultant with the schedule within ten (10) Business Days after issuance of notice to commence the Work.
 - .2 Waste Management and Disposal: separate waste packing materials for

reuse and recycling and disposal in accordance with York Region Waste Depot Guidelines.

- .3 Comply with Health Canada/Workplace Hazardous Materials Information System (WHMIS).
- .4 Equipment Shipped to Site
 - .1 Equipment shipped to Site in sections to be reassembled.
 - .2 To include the provision of all interconnecting power and control wiring, assembly of the various sections of equipment and components.
 - .3 Testing and commissioning of the equipment in order to provide a complete and operational system or piece of equipment as specified by the manufacturer.
 - .4 The Contractor shall be responsible for shipping and receiving of electrical equipment and materials in order to complete this project. Coordinate shipping and receiving of electrical equipment with site security and the Consultant.

1.11 Hazardous Materials

- .1 If at any time during course of work hazardous materials are encountered or suspected, cease work in the area in question and immediately report, in accordance with Ontario regulation 654/85 (Section 7) to the Consultant. Do not resume work in the affected area without approval from the Consultant.
- .2 Comply with Health Canada/Workplace Hazardous Materials Information System (WHMIS).

1.12 Coordination and Interference MEP Revit Drawings

- .1 Provide information and cooperate with the Consultant for the preparation of MEP Revit interference and coordination drawings.
- .2 Interference and coordination drawings to be prepared in MEP Revit Version 2019. These drawings to be submitted to the Consultant for review both in hard copy and electronic file format.
- .3 Interference and coordination drawings to be provided in order to make clear the Work intended or to show how it affects other trades.
- .4 Interference and coordination drawings to be provided for:
 - .1 Electrical, Communications Rooms;
 - .2 Service corridors and tunnels;
 - .3 Corridor, lobbies and all public spaces;

- .4 Crawl spaces;
- .5 Attic spaces;
- .6 Underground Trenches;
- .7 Raised floor spaces;
- .8 Routing of electrical services.
- .5 Interference and coordination drawings to be provided for areas where there are potential conflicts in positioning the mechanical and electrical equipment, piping, cable trays/conduits and electrical services.
- .6 Coordinate with all other trades and work under all divisions before interference and coordination drawings are prepared. Installed or fabricated electrical services to be modified, replaced, removed or relocated to suit the field conditions at no extra cost to the Region due to the lack of coordination prior to fabrication or installation.
- .7 For equipment substitutions provide a complete interference and coordination drawing of the area affected by the revision .
- .8 Interference and coordination drawings to be provided showing plans, sections and elevation wiring and to incorporate all services including ductwork, HVAC piping, plumbing and drainage, electrical conduits and cable trays.
- .9 Submit dimensioned sleeving drawings showing the location and dimension of sleeves through all floors and structural walls for review by the Consultant.
- .10 Dimensioned drawings to be provided for all roof and slab penetrations for review by the Consultant.
- .11 Submit plan layouts showing all of the equipment to be provided with the actual weights of the equipment for review as soon as possible after contract award. The drawings to also show areas where there are concentrated loads due to equipment suspended from the roof or slab above.
- .12 Installation of the electrical work not to proceed until final interference and coordination drawings have been submitted, reviewed and accepted.
- .13 Should there be interference or coordination issues between the mechanical and electrical work, a meeting is to be called by the Contractor within five (5) days of the discovery of the interference to allow prompt remedial action to take place. The Contractor shall inform the Consultant of the relevant disciplines that are required to attend the meeting.

1.13 Record Drawings

- .1 The Consultant will provide to Contractor one set of Revit computer files based on MEP Revit Version 2019, and one set of white prints of all

drawings relating to the work of this Contract, for the purpose of preparing record drawings. As the job progresses, mark up the white prints to accurately indicate installed work, i.e. location and elevations, etc. On completion of the work, the Contractor to transfer the information neatly onto the computer files based on MEP Revit Version 2019, and submit the electronic files and one set of prints for review and comment. Correct the files as directed by the Consultant and hand these over to the Region, together with a set of white prints, on completion.

- .2 Record, as the job progresses, all approved changes and deviations made to any work shown on the original Contract Drawings whether by addenda, requested changes, job instructions, and changes due to job conditions.
- .3 Indicate on the Drawings all conduits, pull boxes, junction boxes, empty conduits, concealed main and sub-feeder conduits and any other equipment not clearly in view, with exact dimensions for future reference. Tie dimensions by measurement to existing topographical features, and include changes in directions as well as at least three points on straight runs of conduits on raceways.
- .4 All conduits in slabs, under slab and direct buried are to be shown on the Record drawings.
- .5 The Hex Addresses for the addressable Fire Alarm System devices to be reflected on the record drawings.
- .6 Record drawings to be kept up to date and be available for checking at any time by the Region and Consultant. Progress draws will not be reviewed unless the record drawing set is up to date.
- .7 All equipment schedules, panel schedules, system schedules, riser diagrams, details, etc. to be updated to reflect the as installed condition and included as part of the record drawing submission.
- .8 Branch circuiting, lighting zoning, switching, etc. methodology to be the same as that indicated on the electrical contract documents that are issued for construction.
- .9 Electrical record drawings to be submitted in both MEP Revit Version 2019 and PDF format.
- .10 Record drawings will not be reviewed for acceptance until project substantial completion has been issued.

1.14 Closeout Requirements and Submittals

- .1 Warranty:
 - .1 Warranty duration: the warranty period under the Contract is 24 month from the date of Total Performance of the Contract, except that in the case of extended Product warranties as described in below.

- .2 Extended Product warranty: in the case of Product warranties, such warranties shall be for a period as specified in the applicable Contract Documents to be offered by the product warrantor, from the date of Total Performance of the Contract.
- .3 Coverage: warrant against failure to proper performance or the Work to the extent as specified in the Contract Documents.
- .4 Manufacturer's warranty: submit notarized manufacturer's warranty, for Consultant's acceptance.
- .2 Operating instructions:
 - .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
 - .2 Operating instructions to include following:
 - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
 - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
 - .3 Safety precautions.
 - .4 Procedures to be followed in event of equipment failure.
 - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
 - .3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
 - .4 Post instructions where directed.
 - .5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
 - .6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.
- .3 The following are the occupancy requirements for full and partial occupancy of areas:
 - .1 Partial occupancy and occupancy will be provided as requirement for turnover of each phase or partial phase of work that has been completed and areas as required by the Region in order to maintain function of the building. Warranties for each phase to begin once the area has been turned over to the Region.

- .2 The requirements below to be completed 10 Business Days prior to the scheduled turn over date and all required documentation to be submitted to the Consultant for review and comments at a minimum of two week prior to the scheduled turn-over date.
- .3 Provide ESA Hydro Completion and Final Clearance Certificate.
- .4 Provide a letter confirming that fire proofing has been installed in area(s) that are to be occupied.
- .5 Equipment labeling completed.
- .6 Staff training and required Practical training have been completed to the Region's requirements. Provide a list of Names of the Attendees.
- .7 Labeling of emergency power fixtures.
- .8 Submission of the Project Field Working and Record Drawings for the area(s) to be occupied.
- .9 Recording and provision of Fire Alarm System Hex address are shown on the record drawings.
- .10 Panel schedules are typed and installed within the panels.
- .11 Emergency lighting has been tested and data of light levels provided.
- .12 Exit lighting testing completed.
- .13 Provision of record single distribution diagram(s) in main electrical and secondary electrical rooms that reflect the Normal, UPS, Emergency and Stand-by Power distribution systems.
- .14 Short Circuit Protection & Coordination and Arc Flash Studies have been completed and submitted and been reviewed by the Consultant.
- .15 Provide letter confirming that the power distribution for Normal, UPS, Emergency and Stand-by Power - protection equipment has been adjusted to the setting as recommended in the coordination study.
- .16 Arc Flash Labels have been installed on all equipment distribution equipment.
- .17 Lighting test reports for battery packs (Areas covered by Battery Units).
- .18 Provide completed Fire alarm verification report with no deficiencies. Should there be recommendations put forth by the Fire Alarm Vendor and they do not affect the fire alarm verification they to be submitted on a separate document and not noted on the fire alarm verification documentation.

- .19 Test fire alarm connection to dimming and lighting control systems.
- .20 Test fire alarm connection to Audio Visual Systems.
- .21 Test fire alarm connection to Elevator Controller(s)/Recall System.
- .22 Test fire alarm connection to Security Systems.
- .23 Conduct Audibility Test's and provide separate letter that audibility requirements have been met as per Code requirements.
- .24 Provide a letter confirming that the Fire Alarm System has be connected to a CAN/CSA monitoring station in accordance with Ontario Building Code requirements.
- .25 Provide a letter confirming that interface of fire alarm system to dimming and lighting control systems completed and tested.
- .26 Provide a letter confirming interface of the fire alarm system to Audio Visual Systems completed and tested.
- .27 Provide a letter confirming interface of fire alarm system to Security system completed and tested.
- .28 Provide a letter confirming interface fire alarm system to Mechanical equipment completed and tested.
- .29 Provide a letter confirming that the Smoke Control and Smoke Management System has been completed, tested and is operational.
- .30 Provide a letter confirming interface of fire alarm system to the Building Management System (BMS).
- .31 Fire Alarm Graphic – Reviewed by Fire Department and accepted.
- .32 Provision of Temporary Fire Alarm Graphic as required to meeting any Phasing requirements of the Project.
- .33 Temporary exit signage has been installed and is operating as required to support the phase of work being turned over.
- .4 Commissioning
 - .1 Performance testing of equipment in accordance with the requirements of the project specification and manufacturer's recommendations.
 - .2 All commissioning forms have been completed for the equipment that serves the area(s) to be occupied and submitted.
 - .3 Provide a letter confirming that the Region has received any spare part

such as fuses etc.

1.15 Lighting Design and Installation

- .1 Ensure that all labour and materials relating to the following sections have been included.

- .1 Fixtures;
- .2 Lamps;
- .3 Ballasts;
- .4 Drivers and LEDs;
- .5 Controls;
- .6 Installation;
- .7 Testing;
- .8 Commissioning.
- .9 Aiming;

Contractor shall return to site post substantial completion to correct light fixture aiming deficiencies.

- .2 Review specific sections written by all of the designers and provide a complete and operable lighting system which is fully tested and commissioned.

1.16 Contract Drawings and Specifications

- .1 Wherever differences occur between plans and riser diagrams or schematics, and between specifications and drawings, the maximum conditions to govern.
- .2 Make field verifications of dimensions on plans since actual locations, distances, and levels will be governed by actual field conditions.
- .3 Bring discrepancies between different plans, or between plans and actual field conditions, or between plans and specifications promptly to the attention of the Consultant for clarification.
- .4 As the work progresses and before installing apparatus, equipment, fixtures and devices which may interfere with the interior treatment and use of the building, obtain from the Consultant detailed drawings or instructions for the exact location of all electrical raceways, equipment, fixtures and wiring devices.
- .5 Install all conduits, wireways, etc., to conserve headroom and interfere as

little as possible with the free use of the space through which they pass. Install conduits, wireways, etc., particularly those which may interfere with the inside treatment of the building, or conflicting with other trades, only after the locations have been fully coordinated with other trades. Take special care in the installation of conduits, wireways, etc., which are to be concealed to see that they come within the finished lines of floors, walls and ceilings. Where such conduits, wireways, etc., have been installed in such a manner as to cause interference, remove and reinstall in suitable locations without extra cost to the Contract or delay in the performance of the work. Do not remove or damage any structural firestopping. Leave space to permit the firestopping to be inspected and/or repaired.

- .6 Before commencing work, check and verify with the Consultant all grade and invert elevations, levels, dimensions etc. to ensure proper and correct installation of the work.
- .7 In addition to the work specifically mentioned in the specifications and shown on the Drawings, provide all other items that are required by the Town of Newmarket Building Department and the Electrical Safety Authority.
- .8 Install all ceiling mounted components (luminaires, speakers, etc.) in strict accordance with the architectural reflected ceiling plans on the Drawings.

PART 2 - PRODUCTS

2.1 Plywood Backboard

- .1 Plywood backboards for electrical and communications equipment shall meet the following requirements:
 - .1 Measure 1219MM wide by 2438MM long and 19MM thick unless stated or shown otherwise.
 - .2 Plywood shall be Good One Side (G1S)
 - .3 Install plywood with smooth side facing out.
 - .4 Plywood shall be fire-rated or covered with two coats of fire-retardant paint. If fire-rated plywood is installed, the plywood must be painted a white colour.
 - .5 The fire-rated paint shall be light in colour.
 - .6 The plywood is to be mounted on the wall, or unistruts from 152MM above the finish floor and extend the length of the plywood, 2438MM.
 - .7 Ensure no nails or screws rise above the surface of the wood.
 - .8 Provide openings in the backboard as required for access to and use of electrical outlets and any other equipment already in place on walls.

2.2 Materials And Equipment

- .1 All materials and equipment to be new and free from defects.
- .2 All material and equipment to be CAN/CSA certified. Where CAN/CSA certified material and equipment is not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.
- .3 Where materials, equipment, apparatus, or other products are specified by the manufacturer, brand name, type or catalogue number, such designation is to establish the standards of desired quality, style or dimensions and to be the basis of the total Contract Price submitted with the Bid. Furnish materials so specified under this Contract unless changed in accordance with the requirements of the Contract. Where two or more manufacturers are listed, the Electrical Contractor to choose one of those listed or request an Equivalent be used by submitting a request to the Consultant in accordance with the process outlined below.
- .4 Where the use of equivalent, alternate or substitute equipment alters the design or space requirements indicated on the plans, the Contractor shall include all items of cost for the revised design and construction, including the cost of all the other trades involved.

- .5 Acceptance of the proposed equivalents, alternates or substitutions to be subject to the review by the Consultant, and if requested, the Contractor to submit for inspection, samples of both the specified and the proposed alternate items.
- .6 In all cases where the use of equivalents, alternates or substitutions is permitted, the Contractor to bear any extra costs of evaluating the quality of materials and the equipment to be installed.

2.3 Equivalents and Alternates

- .1 Should the Contractor propose to furnish material and equipment other than those specified, the Contractor shall apply in writing to the Consultant for approval of equivalents after Contract award, submitting with its request for approval, complete descriptive and technical data on the item or items he proposes to furnish. Approval for changes in the base bid specifications will be considered only upon the individual requests of the Contractor. No blanket approval for equipment will be given to suppliers, distributors or contractors.
- .2 Unless requests for changes in base bid specifications are received and approved , as defined above, the Contractor shall furnish all items as specified in the Contract Documents.
- .3 Replace unspecified materials or rejected equivalents and alternates built into the work with specified or accepted materials at no additional cost to the Region or delay in the performance of the Work.
- .4 If any material or equipment being considered for substitution involves additional design, architectural or engineering fees or other costs in checking whether or not the substitute material or equipment is suitable for the project, such fees or costs to be paid for by the Contractor. There is no guarantee that the reviewed product will be accepted by Region or the Consultant.

2.4 Material Substitution

- .1 After award of the Contract, requests for substitution of materials or makes other than those specifically named in the Contract Documents may be considered by the Consultant subject to the following:
 - .1 The specified material cannot be delivered to the Site in time to complete the work in proper sequence to work of other trades, due to conditions beyond the control of the Contractor.
 - .2 Requests for substitutions to be accompanied by documentary proof of equality, difference in price and delivery, if any, in the form of certified quotations from suppliers of both specified and proposed equipment.
 - .3 In case of difference in price, the Region is to receive all benefit of the difference in cost involved in any substitution and the Contract altered

by change order to credit the Region with any savings so obtained.

- .4 Materials and equipment substituted or offered as alternatives to have spare parts and servicing available and to fit into the space allocation shown on the drawings.
- .5 If any material or equipment being considered for substitution involves additional design, architectural or engineering fees or other costs in checking whether or not the substitute material or equipment is suitable for the project, such fees or costs to be paid for by the Contractor. There is no guarantee that the reviewed product will be accepted by Region or the Consultant.

2.5 Warning Signs

- .1 Warning Signs: in accordance with requirements of Town of Newmarket Building Department, the Electrical Safety Authority and the Consultant.
- .2 Comply with Health Canada/Workplace Hazardous Materials Information System (WHMIS).
- .3 Provide warning labels in English where project requires.

2.6 Finishes

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and two coats of finish enamel.
 - .1 Paint outdoor electrical distribution equipment green finish to EEMAC Y1-2.
 - .2 Paint indoor normal power distribution equipment enclosures light grey to EEMAC 2Y-1.
 - .3 Paint indoor emergency power "Life Safety" distribution equipment enclosures Red.
 - .4 Paint indoor emergency power "Non-life Safety" distribution equipment enclosures International Orange, RAL #2009.
 - .5 Paint indoor UPS power distribution equipment enclosures Blue, RAL #5017.

2.7 CAN/CSA/NEMA Rating

- .1 All electrical equipment provided for this project to be CAN/CSA/NEMA Rated only. IEC Rated equipment is not acceptable and will not be accepted.

PART 3 - EXECUTION

3.1 Installation

- .1 Comply with all Codes and Standards listed in PART 1 – GENERAL.
- .2 Comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, product carton installation instructions, Safety Data Sheets (SDS), and product datasheets.
- .3 Protect electrical equipment from dust and dirt. Plug or cap openings of conduits, fixtures and equipment during construction with approved materials for such use.
- .4 Be responsible for the layout of the work of this Contract, and for any damage caused to Site or existing building, or to work of Other Contractors by improper location or carrying out of this work.
- .5 Ensure the prompt installation of the work of this contract in advance of concrete pouring or similar work.
- .6 No conduits for any power or systems to be permitted to be installed within the concrete slabs or concrete walls for this project except in select identified areas as per the drawings and specifications.
- .7 Furnish items to be "built-in" in ample time and give any necessary information and assistance in connection with the building-in of the same.
- .8 Manufactured products supplied with instructions for their use to be used in strict accordance with those instructions.
- .9 Ensure that all equipment and material is ordered in time to meet the building schedule. Provide a schedule of equipment deliveries to the Project Manager within the time limit stipulated.

3.2 Site Services

- .1 Site services: acquire a full working knowledge of the building Site, services and any existing conditions thereon that may impact the project implementation. Review and examine the Contract Drawings and schedules of all trades prior to bid submittal to ensure full knowledge of the contract scope of work is ascertained.
- .2 The location of equipment indicated or specified is considered approximate.

Review proposed locations with CM prior to installation.

- .3 Locate equipment, piping, duct and/or conduit to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .4 Inform the Consultant of impending installation and obtain the Consultants approval for actual location prior to installation. Obtain the Consultants approval as follows:
 - .1 Prior to equipment/device installation.
 - .2 Prior to piping/ductwork/conduit installation.
 - .3 Provide written notification of completion of conduit installation prior to installation of wiring into conduit.
- .5 Correct equipment/conduit/device locations to approval of the Consultant. There shall be no impact to cost or schedule for such relocations.
- .6 Submit field layout drawings to indicate exact position of various services and equipment when required by the Consultant.

3.3 Temporary Services

- .1 All temporary services must be coordinated with the Region. Do not use the permanent service of new or existing building for temporary power for construction unless specific written approval is obtained from the Consultant and coordinated with the Region.
- .2 Refer to General Conditions for requirements on temporary power, sanitary facilities, temporary heat and potable water.

3.4 Access to Electrical Equipment, Junction Boxes and Pull Boxes

- .1 Clear access of a minimum of 1 meter must be provided for all electrical equipment, junction boxes and pull boxes.
- .2 All junction boxes and pull boxes to be within 600mm of an access panel or access luminaire and be easily accessed.
- .3 All electrical boxes that have free sides (IE: no conduits entering or leaving a side) to be kept clear in order to permit installation of conduits at a later date. Hence free sides of all electrical boxes to be clear of other conduits and services.

3.5 Nameplates

- .1 Ensure manufacturer's nameplates, CAN/CSA labels and identification nameplates are visible and legible after equipment is installed.

3.6 Lock Off Tabs

- .1 Provide lock off tabs on all panel boards for circuits that serve:

- .1 Emergency lighting;
- .2 Exit lighting;
- .3 Fire alarm equipment and
- .4 Security equipment.

3.7 Firestopping

- .1 Where cables, sleeves or conduits, pass through floors and fire rated walls pack space between wiring and sleeve or opening and seal with Hilti fire stopping system that is appropriate. The fire stopping installation must meet one of the Underwriter's Laboratories assemblies in order to meet the required fire rating on the Contract Drawings. Hilti or equivalent.
- .2 Care must be taken to keep integrity of all assemblies and maintain good finishes of surrounding areas, use tape for finish at edges when apply fire stopping materials. Provide at the end of the project a letter from manufacturer's representative indicating that the installation meets all requirements.
- .3 Meet all requirements of the codes and fire proofing requirements as specified within the Contract Documents.
- .4 Provide Shop Drawings for the various fire stopping assemblies that will be utilized on the project to achieve the fire rating for construction assemblies or methods.
- .5 Refer to architectural Drawings for fire separation diagrams. Drawings are not issued as part of the electrical documents.

3.8 Expansion Joints

- .1 Refer to structural Drawings for all expansion joint locations.
- .2 Provide required electrical materials and installation in order to meet expansion joint requirements.

3.9 Bases And Supports

- .1 Where conduit and equipment is located on walls or slabs which will not permit the support of equipment, provide suitable supports to the building structure. Supports to be constructed of steel members or of steel pipe and fittings designed to safely support the equipment.
- .2 All equipment bases to be set on pads of kinetic pre-compressed fiberglass or vibration isolators sized to suit the equipment which they ought to support.

3.10 Inserts, Sleeves And Curbs

- .1 Provide all inserts, sleeves and curbs required for the work of this Contract.
- .2 Use only factory made threaded or toggle type inserts as required for support and anchors, properly sized for the load to be carried. Place inserts only in portions of the main structure and not in any finishing material.
- .3 Use factory made expansion shields where inserts cannot be placed, but only where approved by the Consultant and only for loads of 50 kg or less.
- .4 Do not use powder activated tools unless with written permission of the Consultant.
- .5 Supply and locate all inserts, holes, anchor bolts and sleeves in time when walls, floors and roof are erected.
- .6 Size sleeves to provide 25 mm clearance all around.

- .7 Use the following sleeving materials:
 - .1 Through all interior walls use Schedule 40 steel pipes, machine cut, flush with finished structure. Check room finish schedules.
 - .2 Through all exterior walls above grade use Schedule 40 steel pipes, machine cut, flush with finished structure inside and to suit flashing on outside.
 - .3 Through all exterior walls below grade and all other waterproof walls use wrought iron pipes. Check flashing details for further information.
 - .4 Through all waterproof floors, through washrooms, janitor's closets, boiler rooms, mechanical rooms, kitchen and through roofs use wrought iron sleeves, machine cut. Extend sleeves 100 mm above finished floor upwards and cut flush with underside of floor.
 - .5 Underwriter's Laboratories of Canada approved type plastic sleeves, conduit sleeves or 18-gauge galvanized steel sleeves may be used as an alternative for schedule 40 steel sleeves in interior areas.
 - .6 Extra heavy weight cast iron sleeves or transit sleeves may be used as an alternative for wrought iron sleeves.
 - .7 Provide 100 mm high, 100 mm wide watertight concrete curbs with 20 mm chamfered edges around all sleeves passing through waterproof floors except where furred in.
 - .8 Sleeves are not required in walls and dry area floors, where conduit is installed ahead of construction of those walls and floors.
 - .9 Pack all sleeves between the conduit or cable passing through the sleeve and the sleeve and all spare sleeves with loose fiberglass insulation. Seal the annular space both sides as follows:
 - .1 For all horizontal sleeves in exposed areas, use a seal of equal or better fire rating than the wall to be sealed.
 - .2 For all horizontal concealed sleeves through fire walls and through walls separating areas of different air pressure, use a permanently resilient silicone base or equal sealing compound.
 - .3 For all vertical sleeves through roofs, washrooms, janitor closets, equipment rooms, use permanently resilient silicone base or equal compound, non- flammable and waterproof. Ensure that the seal is compatible with floor and ceiling finishes. Check the room finishes schedules for further information.

- .8 The Contractor shall provide sleeving diagrams/drawings to the Project Manager for review and approval prior to any work commencing.

3.11 Cut Patch and Make Good

- .1 All drilling, cutting, patching, concrete curbs, housekeeping pads and similar work required for installation of the specified systems shall be done under this Contract as approved by the Consultant unless indicated otherwise.
- .2 Do not use powder actuated tools using explosives, unless permitted expressly by the Consultant in writing.
- .3 All cutting of steel shall be by mechanical cutters or saws. Torches and abrasives will only be permitted if there is no alternative. Prior to using torches or abrasives obtain approval from the Region.
- .4 Obtain Consultant's approval before making any openings. Scan the walls/floor slabs using ground penetrating radar (GPR) technology prior to making openings to determine the presence and location of embedded conduits or rebar. Clean the floors/walls immediately after core drilling/saw cutting is complete. All core drilling and loud and/or prolonged drilling shall be done during the hours of 6:00pm and 7:00am or as permitted by the "hammer drilling" schedule and 48 hour lead notice is to be provided to the Region to confirm contractor has met all mandatory conditions.
- .5 Core drilling through floors and walls shall be done with diamond drills only. The use of pneumatic hammers will not be permitted.
- .6 Patch and make good all surfaces cut, damaged or disturbed to the building Region's approval. Match existing material, colour, finish and texture.
- .7 Welding and cutting: conform to Ontario Health and Safety Act O.Reg. 213/91 amended to O.Reg. 628/05 Construction Projects. Obtain approval from the Region prior to welding and cutting operations.
- .8 Do not dispose of cement, mortar, plaster or other similar materials into drainage system. Contractor shall be liable for all costs associated with cleanup and reinstatement to original condition after doing so.
- .9 Dispose of sediment-containing liquids such as those resulting from core drilling or concrete cutting into designated drains. Flush drain with sufficient quantity of clean water to ensure that drain is free-flowing and unobstructed. Be liable for all costs associated with cleanup and reinstatement of drain and piping to original condition if found to be blocked by sediment.

- .10 Firestop all penetrations through wall and floor assemblies with Hilti Firestop or Equivalent solutions having a fire resistance rating not less than the assembly penetrated, colour: red. Unless otherwise noted, use the following assembly ratings: floors - 2-hours; walls except around stairways – 1½ hours; walls around stairways: 2 – hours. Submit to Consultant for approval the proposed system detail sheets bearing the UL/CUL system number. Provide specified firestopping compound on both sides of assembly penetrated regardless of UL/CUL detail requirements.

3.12 Number And Location Of Outlets

- .1 Provide outlets for power and systems of the number and in the locations shown on the Drawings. Locate all outlets accurately with respect to building lines and in centering outlets due allowance to be made for overhead pipes, ducts, equipment and for variations in wall or ceiling finishes, window trim, paneling, etc. When necessary, make adjustments to ensure that all outlets are properly centered.
- .2 The location of any outlet may be changed without extra cost or credit to the Contract providing that the new location is within 6 metres of that originally shown on the Drawings and that instructions for the change are issued before installation of the outlet.
- .3 Do not mount outlet boxes in walls and partitions back-to-back and provide a minimum of 150 mm between boxes. Provide acoustic insulating medium in conduits which join boxes on opposite sides of same wall or partition. Acoustic properties of the wall to be matched or exceeded. For acoustically sensitive/critical rooms, more spacing separation and acoustic box seal is required. Refer to acoustic specifications and electrical drawings for detailed requirements.

3.13 Mounting Heights

- .1 The mounting height of equipment is measured from the finished floor to the centerline of the equipment unless specified or otherwise indicated.
- .2 If the mounting height of any equipment is not indicated, verify the mounting height before proceeding with the installation.
- .3 Install electrical equipment at the following mounting heights unless otherwise detailed or indicated. Refer to architectural reflected ceiling plans on the Drawings, elevations, sections and details for final device location and to confirm all mounting heights.
 - .1 All device mounting heights and orientation to be coordinated and confirmed by the Consultant prior to installation.
 - .2 Local switches and control devices: 1100 mm

- .3 Wall receptacles:
 - .1 General: 400 mm
 - .2 Above top of counters or backsplash: 175 mm
 - .3 In mechanical rooms: 1400 mm.
- .4 Panelboards:
 - .1 1800 mm to the top except that the panelboard not to be lower than 150 mm above the floor.
 - .2 Where multiple panelboards are mounted together, align the tops of all the panelboards or trims with the highest panelboard determining the height.
- .5 Fire alarm system pullstations: 1200 mm
- .6 Fire alarm system speakers/strobes: 2300 mm and at least 150 mm below the ceiling measured to the top of device, or on ceiling.
- .7 Fire Alarm System end of line resistors as per code requirements. EOL resistors to be grouped in service spaces.
- .8 Fire fighter's phone: 1400 mm measured to the centerline of the enclosure.
- .9 Individual starters:
 - .1 1500 mm to the top.
 - .2 Where multiple starters are mounted together, align the tops of all the starters or trims with the highest starter determining the height.
- .10 Splitters: 100 mm below the lowest equipment connected to the splitter.

3.14 Mechanical and Electrical Co-Ordination of Responsibilities

- .1 The following is a list of mechanical and electrical responsibilities for the above-mentioned project.
 - .1 The Contractor shall provide all starters for Mechanical Motors along with Line and Load side power wiring with the exception of Packaged Mechanical Equipment or Units.
 - .2 Packaged Mechanical Equipment or Units shall be provided with their own integral starters(s) or unit mounted VFD . With respect to Packaged Mechanical Equipment or Units the Contractor to provide the

Line Side power wiring and connection(s) only.

- .3 The Contractor shall provide Unit isolation disconnect switches for all remote mechanical equipment unless otherwise indicated within the Mechanical Sections in the Contract Documents.
- .4 The Contractor shall provide all control wiring, BAS wiring, and 120 volt control wiring for Mechanical Equipment or Units.
- .5 The Contractor shall provide all motors.
 - .1 The following voltages to be utilized:
 - .1 Motors ½ HP and larger to be 600V 3-phase.
 - .2 Motors less than ½ HP or smaller to be 208 volts 1 phase or 3-phase or 120 volts 1 phase.
 - .2 All multi-speed (2 speed motors) motors are to be consequent pole type and must be coordinated with the Subcontractors and trades..
- .6 The Contractor shall provide all fire alarm interface wiring to the Mechanical Equipment or Units for fire alarm Fan Shut Down, Fan Start-up as and for fire alarm Smoke Control.
- .7 The Contractor shall provide all fire alarm wiring.
- .8 The Contractor shall provide all relays for interface to control wiring for fan shutdown and fan start up for air handling units used as part of the smoke control system(s).
- .9 The Contractor shall wire Smoke Motorized Dampers (SMD) and Fire Smoke Dampers (FSD) and their associated end switches as part of the Fire Alarm System for the Smoke Control System. The purpose of this interconnection is to verify the status (dampers are in the Open position or Closed position) of the Smoke Control System, SMDs and FSDs. Refer to Division 23 for type of Smoke Motorized Damper and Fire Smoke Dampers specified in order to coordinate the required connections and wiring.
- .10 The Contractor shall provide the Smoke Motorized Dampers (SMDs) and the Fire Smoke Dampers (FSDs) with the required end switches in order that the Damper position can be confirmed as part of the smoke control system.
- .11 The Contractor shall provide all sprinkler and standpipe; pressure switches, supervisory valves, flow switches, dry pipe alarm valves, etc. for interface to Fire Alarm System. The Electrical Contractor to wire and connect all of the devices into the fire alarm system.
- .12 The Contractor shall provide all relays as required by the Mechanical Equipment or Units to connect to the various building

systems.

- .13 The Contractor shall provide electric pipe heat tracing which to be based upon the self-limited type and be at 208 volts 1 Phase. The Electrical Contractor to provide 208 volts 1 Phase power connection(s) for the electric pipe heat tracing system(s). The Contractor shall provide loads requirements of the heat tracing to the Subcontractors and trades as required prior to final power connection.
- .14 The Contractor shall provide power connections for electric heat tracing associated with walk-in fridges, cold rooms and freezers.
- .15 The Contractor shall provide electric heating, associated controls and control wiring. The Contractor shall provide the Line Side power connection to the electric heating. The Contractor shall provide any framing required for recessed electric heating.
- .16 The Contractor shall provide and wire level switches for sump pumps. The Contractor shall provide a Line Side power connection to the Sump Control panel.
- .17 Variable Frequency Drives (VFDs) shall be provided by the Contractor.
 - .1 There are three different VFD arrangements:
 - .1 VFD mounted on Mechanical Equipment or Unit.
 - .2 VFD remote mounted from Mechanical Equipment or Unit.
 - .3 VFD mounted on Mechanical Equipment or Unit and VFD serves multiple motors.
- .18 The Contractor shall provide Surge Protective Device (SPD) for their microprocessor-based equipment such as the BAS field panels etc.
- .19 Should the Contractor change or modify motor sizes from what is specified within the Contract Documents during any stage of this project the Contractor shall be responsible to cover all associated electrical costs, such as revised motor starter and feeds, etc.
- .20 The Contractors shall coordinate field installations of TSP (Trap Seal Primer) and associated power supplies beyond TSP shown on Drawings. The Contractor shall provide 120V, 20A normal power connections to each TSP identified by the Contractor on Site during construction.

3.15 Electric and Hydraulic Elevators and Electrical Contractor Coordination

- .1 The related works described in this section are required in parallel with the construction of elevator and are to be done by the Contractor. They are not part of the work provided by the elevators Subcontractor. The Contractor shall provide, as a minimum, the following:
 - .1 Fire-stop seals and / or acoustic filler for the various electrical conduits.

- .2 All wiring and conduit connected to elevator disconnect switches. All disconnect switches should be installed near the entrance door of the control room on the door lock side.
- .3 Protected light fixtures in the elevator machine room, elevator pit and top of the elevator hoistway.
- .4 Light switch for elevator pit lighting to be located beside the pit ladder.
- .5 Light switch for top of the elevator hoistway lighting to be located beside the top landing hall door.
- .6 Only the equipment related to the function or use of the elevator is allowed in the machine room. No unrelated electrical equipment or parts will be accepted in this room.
- .7 The 2,440 mm headroom of the control room must be respected; it is important to ensure that the electrical components are installed so as not to obstruct this headroom.
- .8 Refer to the electrical drawings for additional information and requirements.

3.16 Finishing Hardware and Electrical Contractor Coordination

- .1 The Contractor shall coordinate with the Hardware Vendor / Subcontractor to ensure that all electrical requirements for power, wiring, interconnection to the Fire alarm and Security systems are provided.
- .2 Meet all requirements as specified within the specification and reflected on the Drawings and details for the Security and Hardware Systems.
- .3 Provide all power and fire alarm wiring and connections for "Door Hold Open Devices".
- .4 Provide a conduit complete with wiring from the door operator to a location as coordinated with the Security and Hardware Vendors/Subcontractor.
- .5 Ensure the Hardware Vendor / Subcontractor will supply and install required terminal strips in junction boxes provided by the Electrical Contractor.
- .6 Provide all 120 volt (AC) power connections. The control transformers complete with housing to transform from 120 volt down to low voltage are to be supplied by the Security and Hardware Vendors / Contractors. Install the control transformers and terminate 120 volt wiring.
- .7 In many cases back boxes required to be installed in door frames to be provided already mounted in the door frame when it arrives on Site. Contractor must carefully review the door frame schedule and provide all other boxes that are not provided.

- .8 Provide all conduits down to all boxes that are provided with the door frames as well as the connections to those boxes.

3.17 System Startup

- .1 Inform Consultant and operating personnel in operation, care and maintenance of systems, system equipment and components.
- .2 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.
- .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 aspects of its care and operation.

3.18 Cleaning

- .1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.
- .3 During the performance of the work and on the completion, remove from the site and premises all debris, rubbish and waste materials caused by the performance of the work for this contract. Remove all tools and surplus materials after completion and acceptance of the work.
- .4 Vacuum all equipment thoroughly at the time of final acceptance of the work. Clean plastic components and exposed components of luminaires in accordance with the manufacturer's recommendation.

END OF SECTION

PART 1 - GENERAL

1.1 Related Work

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

1.2 General

- .1 Coordinate all work with the current use of the buildings.
- .2 Maintain all electrical services to all parts of the building which are to remain in use. Contractor shall schedule all work and inform the Region in writing at least 5 Business Days in advance for permission if power shutdown is necessary and state time(s) and duration(s) of interruptions. Contractor to consult with the Consultant and determine the equipment required to be on line 24 hours per day and provide temporary services and wiring as necessary. Reschedule work accordingly when requested by the Consultant.
- .3 The Drawings indicate the general scope of electrical removals only. Verify on Site the exact requirements and extent of removals.

1.3 Scope of Demolition

- .1 Work shall include for removal, relocation and reinstallation of electrical devices, feeders and equipment in the areas noted on the drawings. This shall include, but not necessarily be limited to:
 - .1 Disconnecting, removal and/or reinstallation of all electrical devices, feeders, conduit and wiring to accommodate new work. Refer to relevant architectural, structural and mechanical Drawings to determine exact scope of work.
 - .2 Remove electrical equipment as required complete with wiring up to associated panel. Remove all electrical components to be demolished or to be relocated and make safe all wiring.
 - .3 Rework of conduits, wiring and cables in space associated with the areas of work.
 - .4 Relocate any existing electrical equipment and/or wiring that will interfere with new construction.
 - .5 Removal of all existing light fixtures unless noted as existing to remain and/or re-use, and dispose of same as instructed.
 - .6 All work and material disposal shall be done in accordance with the established schedule and General Conditions.
 - .7 All services passing through the area of work, but servicing other areas of the building, shall be identified, protected and left in place,

unless otherwise noted.

- .8 All service conduits not directly associated with area lighting, small power, local systems, etc., shall be traced and identified for review by the Project Manager in order to determine if services are to remain or to be removed. Once identified, the Contractor shall remove those identified by the Consultant.
- .9 Remove all conduit work which is abandoned except cut flush where embedded in structure.
- .10 Remove all redundant outdoor electrical works (duct banks, conduit and wiring, etc.).
- .11 Disconnect and remove all existing services, devices and wiring materials which are abandoned.
- .12 Repair all damages inside and outside of the renovated areas caused by the demolition/construction without extra cost to the Region or delay in the performance of the work.
- .2 Disposal of Materials
 - .1 All material removed from the Site shall be disposed of in accordance with all applicable environmental legislation and regulations and as noted elsewhere in Section 26 05 00.
 - .2 Separate and recycle materials to be disposed to the maximum extent possible.
 - .3 Remove electrical transformers, capacitors and lighting ballasts containing PCB's and store on site where directed by the Project Manager for removal and disposal unless otherwise noted. Removal and transportation of equipment containing PCB's must follow the requirements of the MECP. Storage on Site must comply with the MECP PCB storage regulations.
 - .4 If at any time during course of work hazardous materials are encountered or suspected, cease work in area in question and immediately report, in accordance with Occupational Health and Safety Act to the Consultant. Do not resume work in affected area without approval from the Consultant.

PART 2 - PRODUCTS

- 2.1 Not used.

PART 3 - EXECUTION

3.1 Removal of Materials

- .1 Turn over all existing equipment that is no longer required to the Region. Remove from Site any equipment that the Region may decide upon. All material to be removed shall become the property of the Contractor.
- .2 Under no circumstances is the Contractor to use the building Region's refuse containers for disposal.
- .3 No equipment may be burned on Site or sold on Site.
- .4 The building structures and exteriors are to be maintained. The Contractor shall remove material in a manner so as to not destroy the structure or exterior.
- .5 Protect all removed (to be retained) equipment from damage. Repair or replace without adjustment to the Contract Price or delay to the performance of the Work all existing equipment which is damaged in process of relocation.

3.2 Systems to Remain

- .1 All systems and components which are affected by the renovation shall remain operational subsequent to project completion. Reinstate immediately any services disrupted during demolition not intended to be removed as part of this contract at no extra cost. The Contractor shall be required to provide new conduit and wiring for all existing systems to remain so that the existing conduit and devices do not interfere with new work. The Contractor shall remove existing devices and reconnect to new services accordingly.
- .2 Where feeders, branch circuits and cabling (power, voice, data, communications, etc.) which are to be demolished are fed from panels outside of the area, remove wiring back to panel and make safe circuits.
- .3 All existing panel directories on all panels affected by this Contract shall be retyped to indicate existing services remaining, spares, spaces and new services connected to same.
- .4 Maintain operation of all systems outside of the renovated area which may be affected by the renovation.

- .5 Any circuits which have been made inoperative as a result of this work but are not in an area to be demolished shall be reactivated at no cost to the Region.
- .6 Trace out and catalogue all circuits within the renovated area and adjacent areas. Mark this information on a set of Drawings prior to any work commencing as these circuits will be reused as part of this work as noted on the drawings or called for in the contract documents.
- .7 Clean and test existing equipment which is to remain, and equipment being reinstalled in areas being renovated for proper operation and repair as necessary before being put back into service.
- .8 Contractor shall verify operation of all existing devices and report any discrepancies to the Consultant prior to proceeding with the work.
- .9 Unless noted otherwise provide additional equipment of the same type and manufacture where required to supplement existing equipment.
- .10 Maintain fire alarm and life safety systems to all existing building area at all times during construction. The Contractor shall advise the Consultant in the event that fire alarm or life safety system continuity is disrupted such that a fire watch can commence immediately.
- .11 Clean and inspect all existing panels to be reused and report any defects to the Consultant prior to starting the work. Perform thermographic survey of all existing panels to be reused and/or modified.
- .12 Where existing services are abandoned, but outlet boxes are to remain, remove wiring and provide blank cover plates of material as specified under Section 26 27 26.

3.3 Interface with Existing Systems

- .1 Provide interfacing components between new and existing systems as necessary for proper performance and operation.
- .2 Check and coordinate all systems in the renovated area which are extended to existing systems to ensure their proper operation.

3.4 Underground Services

- .1 Existing redundant underground services shall be removed or abandoned as noted on Drawings.
- .2 Where existing duct banks and conduits are abandoned, pull out existing cables and seal existing duct openings in buildings and tunnels.
- .3 Where existing duct banks and conduits are to be retained as spare for future use, provide pull ropes in existing ducts after existing cabling is removed.

END OF SECTION

PART 1 - GENERAL

1.1 Related Sections

- .1 Section 26 05 00 - Common Work Results for Electrical.
- .2 Section 26 05 20 - Wire and Box Connectors (0 - 1000V).
- .3 Section 26 05 21 - Wires and Cables (0 - 1000V).
- .4 Section 26 05 29 - Hangers and Supports for Electrical Systems.
- .5 Section 26 05 31 - Splitters, Junction Boxes, Pull Boxes and Cabinets.
- .6 Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .7 Section 26 05 34 - Conduits, Conduit Fastenings and Fittings.
- .8 Section 26 05 36 - Cable Trays for Electrical Systems.
- .9 Section 26 05 37 - Wireways and Auxiliary Gutters.

PART 2 - PRODUCTS

2.1 Not Used

- .1 Not used.

PART 3 - EXECUTION

3.1 General:

- .1 All wiring shall be recessed when located in finished areas. Surface mounted wiring may be used in mechanical rooms and service spaces. Provide protection to conduits which may be subject to mechanical damage.
- .2 A maximum of a 3% voltage drop is acceptable on branch circuits from power and lighting panelboards.
- .3 A maximum of a 2% voltage drop is acceptable on feeders.
- .4 With respect to items 4 and 5 above a maximum voltage drop from point of incoming electrical service to the end point of a branch circuit shall not exceed a maximum of 5% as per the Ontario Electrical Safety Code.
- .5 The Contractor shall up size feeder and branch circuit wiring and associated conduit as required to meet the requirements of the Ontario Electrical Safety code with respect to acceptable voltage drop.

- 3.2 High Voltage Feeders: Wire in conduit.
- 3.3 600/347V Distribution And 600/347V Lighting
 - .1 Copper RW90 wires in EMT conduit for general indoor installation unless otherwise noted.
 - .2 Copper wires in rigid steel conduit or TECK90 cables for all exterior exposed feeders.
 - .3 Copper RWU90 wires for under slab feeders in rigid PVC conduit.
 - .4 Wire in conduit or approved flexible conduit with wiring for interior circuits where not subject to possible damage.
 - .5 Wire in approved flexible conduit or cable for interior circuits where required for vibration control, i.e: to all air handling units, motors, generators, transformers and VFDs.
 - .6 Provide a separate minimum No. 12 AWG green insulated copper ground wire in all conduits and raceways.
 - .7 Provide a separate neutral wire for all branch and feeder circuits.
- 3.4 120/208V Distribution And 120/208V Lighting
 - .1 Lighting and power panels are specified as sequence copper bussed and all branch circuit wiring for these panels shall be such that, where a common neutral is used for two or three circuits these circuits shall be fed from adjacent breakers so that single pole breakers may be replaced with two or three pole breakers should this be so required in the future. All circuits shall be balanced. Each branch conduit shall be provided with a separate copper #12 AWG green insulated ground wire minimum.
 - .2 All power feeders and lighting branch circuits shall have separate neutrals per circuit.

- .3 The following guidance shall be used with respect to 120V, 20A branch circuit wire sizing for voltage drop from the circuits associated panel board to the furthest outlet used for general purposes:
 - .1 Copper #12 AWG to be used from 0 to 18M, maximum length of branch circuit run from panel board.
 - .2 Copper #10 AWG to be used from 18 to 30M, maximum length of branch circuit run from panel board.
 - .3 Copper #8 AWG to be used from 30 to 46M, maximum length of branch circuit run from panel board.
- .4 Copper RW90 wires in EMT conduit for general indoor installation.
- .5 Copper RWU90 for under slab wires in PVC conduit.
- .6 Wires in rigid steel conduit or TECK90 cables for all exterior exposed feeders.
- .7 Wire in conduit or approved flexible conduit with wiring for interior circuits where not subject to possible damage.
- .8 Wire in approved flexible conduit or cable for interior circuits where required for vibration control, ie: to all air handling units, motors, transformers and VFDs.
- .9 Wire in rigid galvanized steel conduit or TECK90 cable where subject to possible damage.
- .10 Provide a separate minimum No. 12 AWG green insulated copper ground wire in all conduit and raceway runs.

3.5 Emergency Power Feeder and Feeds

- .1 All emergency (life safety) feeders and branch circuits and fire alarm system wiring shall obtain the required fire rating as per the Ontario Building Code (OBC).
- .2 Emergency circuits and fire alarm system wiring (excluding addressable data loops for fire alarm system) run in ceiling spaces or walls to achieve the required fire rating as per Ontario Building Code by means of use of fire-rated cable (MICC).
- .3 Wire in conduit with approved fire rating per the Town of Newmarket Building Department or MICC cables.

3.6 BX (AC90) Cabling

- .1 BX shall only be used for final drops to light fixtures in accessible ceiling spaces and suspended fixtures in service spaces only and the drop shall not exceed 3 meters.

.2 BX is not to be permitted for any other use on this project.

3.7 Motor, generator and Equipment Wiring

- .1 Wire in conduit or MICC cable.
- .2 Flexible connection shall be made between all non-flexible conduit/cable assemblies and vibrating parts (eg. between motors and conduits).

3.8 All Variable Frequency (VFD) And Variable Speed Drives (VSD) Applications

- .1 All Variable Frequency or Speed Drives both unit and remote mounted shall use VFD type cable cables between the VFD unit and the motor served by the VFD.
- .2 VFD type cabling shall comply with C.S.A. Standard C22.2 No. 123-08 (R2012).

3.9 Fire Alarm System

- .1 Wire in conduit.
- .2 Fire rated cables (MICC) as indicated and required.
- .3 Fire rated cables (MICC) for the Fire Alarm System back bone communications.
- .4 Wiring sized as per selected manufacturer's requirements.
- .5 Flexible connections to supervised valves, pressure switches, flow switches, fire smoke dampers, and smoke motorized dampers.

3.10 Communications Systems

- .1 Conduit, cable tray, underfloor duct, and box systems.
- .2 Provide pull cords in all systems.
- .3 Refer to York Region Corporate ITS Cabling & Wiring Standard Dated April 21, 2020.
- .4 Security Systems
- .5 Conduit and box systems.
- .6 Provide pull cords in all conduit systems.
- .7 These systems include door monitoring, doorbell, chime card access and closed-circuit TV.

3.11 Site Lighting

- .1 Wires in rigid steel conduits when exposed to the exterior and rigid PVC conduits for buried installation.

3.12 Low Voltage Switching: Wire in conduit.

3.13 Hazardous Locations

- .1 Refer to Drawings for classification of hazardous areas.
- .2 Provide all devices, fitting conduit and materials suitable for the environment. Install all conduit, wire and devices in accordance with Ontario Electrical Safety Code Section 18 and manufacturers recommendations.
- .3 In hazardous locations, run wire in rigid galvanized steel conduit with all necessary seals and fittings.

3.14 Clean rooms:

- .1 Wire in conduit.
- .2 The conduit, wiring and devices shall be installed so as to prevent the infiltration of air from the ceiling space into the clean rooms through the conduit.
- .3 Device boxes shall be sealed and gasketed.

END OF SECTION

PART 1 - GENERAL

1.1 Related Sections

- .1 Section 26 05 00 – Common Work Results for Electrical.
- .2 Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .3 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
- .4 Section 26 05 48 – Noise and Vibration Control for Electrical Systems.

1.2 References

- .1 CAN/CSA C22.2 NO.18.1-04 (R2009), Metallic Outlet Boxes (Tri-National standard with ANCE NMX-J-023/1 and UL 514A).
- .2 C22.2 NO.18.2-06, Nonmetallic Outlet Boxes.
- .3 CAN/CSA C22.2 NO.65-03 (R2008), Wire Connectors (Tri-National standard, with UL 486A-486B and NMX-J-543-ANCE-03).
- .4 EEMAC 1Y-2, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .5 National Electrical Manufacturers Association (NEMA).

PART 2 - PRODUCTS

2.1 Materials

- .1 Provide pressure type tinned copper wire connectors to CAN/CSA C22.2 No.65 with current carrying parts sized to fit copper conductors as required.
- .2 Provide fixture type splicing connectors to CAN/CSA C22.2 No.65 with current carrying parts of copper sized to fit copper conductors #10 AWG or less.
- .3 Provide bushing stud connectors in accordance with EEMAC 1Y-2 to consist of:
 - .1 A connector body and a stud clamp for stranded copper conductors.
 - .2 A clamp for stranded copper conductors.
 - .3 Stud clamp bolts as required.
 - .4 Bolts for the copper conductors.
 - .5 Sized for the conductors as required.
- .4 Provide clamps or connectors for armoured cable, mineral insulated cable,

flexible conduit, as required, to CAN/CSA C22.2 No.18.

PART 3 - EXECUTION

3.1 Installation

- .1 Remove the insulation carefully from the ends of the copper conductors, and
- .2 Install the mechanical pressure type connectors and tighten the screws with an appropriate compression tool recommended by the manufacturer. The installation must meet the secureness tests in accordance with CAN/CSA C22.2 No.65.
- .3 Install fixture type connectors and tighten. Replace insulating cap.
- .4 Install the bushing stud connectors in accordance with EEMAC 1Y-2.

END OF SECTION

PART 1 - GENERAL

1.1 Related Sections

- .1 Section 26 05 00 - Common Work Results for Electrical.
- .2 Section 26 05 20 - Wire and Box Connectors (0 - 1000 V).
- .3 Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.
- .4 Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .5 Section 26 05 34 - Conduit, Conduit Fastenings and Conduit Fittings.
- .6 Section 26 05 37 - Wireways and Auxiliary Gutters.
- .7 Section 26 05 39 - Underfloor Raceway for Electrical Systems.

1.2 References

- .1 CAN/CSA-C22.2 NO.38-10, Thermoset-Insulated Wire and Cables (Tri-national standard, with UL 44 and ANCE NMX-J-451).
- .2 CAN/CSA C22.2 NO.51-09, Armored Cables.
- .3 CAN/CSA C22.2 NO.75-08, Thermoplastic-Insulated Wires and Cables (Tri-national standard, with UL 83 and NMX-J-010-ANCE-2008).
- .4 CAN/CSA C22.2 NO.124-04 (R2009), Mineral-Insulated Cable.
- .5 CAN/CSA C22.2 NO.131-07, Type TECK 90 Cable.
- .6 CAN/CSA C22.2 NO. 239-09, Control and Instrumentation Cables.

1.3 Product Data

- .1 Submit product data in accordance with Section 26 05 00 - Common Work Results for Electrical.

1.4 Acceptable Materials

- .1 Nexans;
- .2 Phillips Cables Limited;
- .3 General Cable.
- .4 Southwire.
- .5 Or Equivalent

PART 2 - PRODUCTS

2.1 Building Branch Circuit Wires

- .1 Conductors: stranded for wire sizes No. 8 AWG and larger.
- .2 Copper conductors, of the size as indicated, having a minimum conductivity of 98 percent.
- .3 No Aluminum or Nual wiring to be used on this project, unless noted otherwise.
- .4 Conductors to be minimum No. 12 AWG. Size conductor for maximum 3% voltage drop to the furthest outlet on a fully loaded branch circuit.
- .5 Insulation RW90:
 - .1 Chemically cross-linked thermosetting polyethylene insulation (XLPE) rated at 600V.

2.2 Building 600V and 208V Feeders RW90 And RWU90

- .1 Conductors: stranded conductors for wires sizes No. 8 AWG and larger.
- .2 Copper conductors, of the size as indicated, having a minimum conductivity of 98 percent.
- .3 No Aluminum or Nual wiring permitted on this project.
- .4 Insulation RW90 or RWU90:
 - .1 Chemically cross-linked thermosetting polyethylene insulation (XLPE) rated at 600V.
- .5 RW90 shall be utilized for all electrical feeders except as otherwise indicated.
- .6 RWU90 shall be utilized for all electrical feeders and branch wiring located outdoor, below grade or slab on grade except as otherwise indicated.
- .7 Building feeders conductors sized for a maximum of 2% voltage drop from the point where power is derived for the feeder to the connection or termination point at the electrical distribution equipment.

2.3 TECK 90 Cable

- .1 Conductors: copper.
- .2 Each cable shall have a copper grounding conductor.
- .3 Insulation: Chemically cross-linked thermosetting polyethylene rated type

XLPE.

- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: interlocking aluminum.
- .6 Overall covering: Thermoplastic polyvinyl chloride LFS/LGE jacket for fire protection and low acid gas evolution, meeting the requirements of the Vertical Tray Fire Test to CSA C22.2 No. 3 with a maximum flame travel of 4 ft. (FT4) outer jacket.
- .7 Connectors: Watertight, approved for TECK cable.

2.4 Flexible Armoured Cables

- .1 Conductors: Copper conductors, of the sizes as indicated, having a minimum conductivity of 98%.
- .2 Insulation: Chemically cross-linked thermosetting polyethylene insulation rated at a minimum of 600 V.
- .3 Armour: Interlocking armour fabricated from aluminum strip.
- .4 To be provided with an integral insulated ground wire.
- .5 Insulation RW90:
 - .1 Chemically cross-linked thermosetting polyethylene insulation (XLPE) rated at a minimum of 600 V.
- .6 Type ACWU90 - flame retardant jacket over armour to be utilized in damp or wet locations.

2.5 Variable Frequency Drive Type Cable

- .1 Conductors:
 - .1 Copper conductors shall be of the sizes indicated, having a minimum conductivity of 98 percent.
 - .2 Each cable shall have a grounding conductor.
- .2 Insulation:
 - .1 Chemically cross-linked thermosetting polyethylene insulation rated at a minimum of 1000V.
- .3 Armour: Interlocking aluminum armour.
- .4 Overall jacket: PVC jacket, FT4 rated and sunlight resistant.

- .5 Acceptable manufacturers are:
 - .1 Nexans DriveRx
 - .2 Belden
 - .3 General Cable
 - .4 Or Equivalent
 - .6 Variable Frequency Drive cable shall be utilized for output wiring to motors from all variable frequency drives.
- 2.6 Mineral Insulated Cables (MICC)
- .1 Conductors: solid bare soft annealed copper, size as indicated.
 - .2 Insulation: compressed powdered magnesium oxide or silicon dioxide to form compact homogeneous mass throughout entire length of cable.
 - .3 Outer covering: annealed seamless copper sheath, Type MI rated 600 V, 250 degrees C.
 - .4 Overall jacket: protective jacket where applicable for outdoor installation.
 - .5 Two (2) hour fire rating.
 - .6 Connectors: field installed, approved for MI cable.
 - .7 Termination kits: field installed, approved for MI cable.
 - .8 Manufacturer: nVent Pyrotenax or Equivalent
 - .9 Acceptable alternative cable type: VITALink or Equivalent 2-hour fire rated cable
- 2.7 Control Cables
- .1 300 V control cable: Stranded annealed copper conductors sized as indicated, with TWH thermoplastic insulation with a shielding of 100% coverage of aluminum polyester tape and drain wire over each group and over all conductors and an overall jacket of PVC.
 - .2 Control cables to conform to CAN/CSA-C22.2 No. 239.

PART 3 - EXECUTION

3.1 Field Quality Control

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests using method appropriate to site conditions and to approval of local authority having jurisdiction.
- .3 Perform tests before energizing electrical systems.

3.2 General Cable Installation

- .1 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).
- .2 Cable Colour Coding: to Section 26 05 53 - Identification of Electrical Systems.
- .3 Conductor length for parallel feeders to be identical.
- .4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
- .5 Install grounding, grounded and neutral conductors without any fuses, switches or breakers of any kind unless otherwise indicated.
- .6 Bond the ground or neutral conductor at the source of supply as required by Ontario Electrical Safety Code.
- .7 Do not use any grounded or neutral conductors as grounding or bonding conductor.
- .8 Do not splice any wiring in any raceway. Make splices only at junction boxes only.
- .9 Provide sufficient slack at the connection points of the conductors to permit proper connections and terminations to be made.
- .10 Do not install any conductors in any raceway until the raceway is complete and cleared of all obstructions.
- .11 Install all conductors in any one conduit at the same time taking care not to twist the conductors.
- .12 Use wire pulling lubricants that will not shorten the life of the insulation of the conductors.
- .13 Do not install any wires or cables at temperatures above or below those

which will cause damage to the wires or cables.

- .14 Provide vertical supports and strain relief for electrical and communications cabling as per code requirements.

3.3 Installation of TECK90 Cable (0 - 1000V)

- .1 Group cables wherever possible on channels.
- .2 Install cable exposed, securely supported by hangers.
- .3 Terminate cables in accordance with Section 26 05 20.

3.4 Installation of Armoured Cables (AC90)

- .1 Group cables wherever possible.
- .2 Armoured cable shall be supported every 1500 mm and within 300 mm of every box and fitting.
- .3 Terminate cables in accordance with Section 26 05 20.

3.5 Installation of Mineral Insulated Cables (MICC)

- .1 Install cable exposed, securely supported by hangers.
- .2 Support 2 hour fire rated cables at 1 m intervals.
- .3 Make cable terminations by using factory made kits.
- .4 Cable terminations: use thermoplastic sleeving over bare conductors.
- .5 Do not bury in cast concrete or masonry.
- .6 Do not splice cables unless indicated.

3.6 Installation of Control Cables

- .1 Ground control cable shield.
- .2 Terminate cables in accordance with Section 26 05 20.

END OF SECTION

PART 1 - GENERAL

1.1 Related Sections

- .1 Section 26 05 00 - Common Work Results – Electrical.
- .2 Section 26 05 20 – Wire and Box Connectors (0-1000 V).
- .3 Section 26 05 21 – Wires and Cables (0 - 1000V).
- .4 York Region Corporate ITS Cabling & Wiring Standard dated April 21, 2020.

1.2 References

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA Standard C22.2 No.0.4-04(R2009) - Bonding of Electrical Equipment.
 - .2 CAN/CSA Standard C22.2 No.41-07 - Grounding and Bonding Equipment (Bi-national standard, with UL 467).
- .2 Canadian and Ontario Electrical Safety Codes. (Latest Edition).
- .3 ANSI/TIA/EIA-607.
- .4 (CAN/CSA TS27) Best Practices for Ground and Bonding of Devices in Telecommunication Spaces.
- .5 Latest edition of IEEE Standard No. 80.

1.3 System Requirements

- .1 Provide a complete, permanent and continuous system circuit grounding system and an equipment grounding system including electrodes, conductors, connectors, accessories as indicated to conform to the requirements of these specifications and the Electrical Safety Authority over the installation.
- .2 Each ground rod shall have a maximum resistance to ground of 10 ohms before connection to the other ground rods. If reading is above 10 ohms, drive one extension. Further testing of that individual rod is not needed.
- .3 The total grounding system with all connections completed shall have a maximum resistance to ground of 1 ohm for primary services or 5 ohms for secondary services.

PART 2 - PRODUCTS

2.1 Materials

- .1 Ground Electrodes: Unless shown otherwise, provide ground rods. Ground rods shall be 19mm diameter by 3m long, solid copper or copper clad steel. Ground rods shall be capable of being extended when additional length is required.
- .2 Grounding Conductors:
 - .1 Bare, stranded, untinned soft annealed copper wire, size as indicated on the drawings or as required by Ontario Electrical Safety Code for ground bus, electrode interconnections, building metal structures, primary transformers, primary switchgear, electrical substation and ground connections.
 - .2 Extra flexible copper conductor for connection of metal doors and non-current carrying metal components in electrical substation room.
 - .3 Bare, stranded, soft annealed copper wire, size as required for systems circuit grounding and equipment grounding.
- .3 Ground Connections:
 - .1 Ground connections shall be Burndy Hyground, Cadweld, Thermo-weld Thomas & Betts Blackburn or Equivalent .
 - .2 Exposed ground connections (except connections to structural steel and main electrical room ground bus bars) may be made with copper compression ground fittings.
 - .3 Provide exothermic weld type, or Burndy Hyground or Equivalent ground connections for splices and taps of grounding conductors. Exposed splices and taps shall be taped.
- .4 Ground Bus: copper, 6mm thick x 50mm, length and routing as indicated on the drawings.
- .5 Accessories: non-corroding, necessary for complete grounding system, type, size, material as required, including:
 - .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 Installation General

- .1 Install connectors in accordance with the manufacturer's instructions.
- .2 Protect all exposed grounding conductors from mechanical injury. Run all vertical and horizontal main runs in Schedule 40 PVC conduit.
- .3 Provide connections to electrically conductive water mains.
- .4 Provide grounding clamps for grounding conductors, of the sizes as required, on all electrically conductive underground and above ground water pipes.
- .5 Connect the building structural steel and metal siding to ground.
- .6 Use compression connectors for all grounding and bonding connections to equipment provided with lugs.
- .7 Soldered joints are not permitted.
- .8 Make the grounding connections in a radial configuration only with the connections terminating at a single grounding point. Do not make loop connections.
- .9 Provide **separate green insulated** bonding conductors in all services, feeders, armoured cables, and branch circuits for connection of load devices to the power source ground. Raceways shall not be used as equipment bonding conductors. Bond the bonding conductors to boxes and enclosures where the bonding conductors are terminated or spliced. Size the bonding conductors as required by Ontario Electrical Safety Code and where indicated on drawings.
- .10 Bond single conductor, metallic armoured cables to the cabinet at the supply end and provide a non-magnetic entry plate at the load end.
- .11 Bond conduits, cable trays, wireways, surface raceways, boxes, and enclosures together and to the building grounding system. Provide bonding bushings and bonding jumpers to bond conduits where they enter a box or enclosure.
- .12 Install separate ground conductor to outdoor lighting standards and in exterior underground conduits and feeders.

- .13 Ground the lightning protection system with separate ground rods. The building grounding system ground rods shall not be used. After completion of both systems, the lightning protection system shall be connected to the building grounding system.
- .14 Refer to Grounding Riser Drawing for additional information.

3.2 Electrodes Installation

- .1 Install ground rod electrodes at locations as indicated on the drawings.
- .2 Make special provision for installing electrodes that will give acceptable resistance to ground value, where rock or sand terrain prevails.
- .3 Interconnect separate, multiple electrodes together, using minimum #4/0 copper conductors buried 600mm below the finished station grade.
- .4 Connect ground rods to ground bus using minimum #4/0 copper conductors.

3.3 Ground Bus Installation

- .1 Provide copper ground bus 6mm x 50mm, complete with insulated supports, fastenings and connectors. Wall mount ground bus 150mm above the floor and spaced from the wall so as to allow the fastening of electrical connectors to the ground bus with a minimum of 6mm bolts with lock washers and nuts. Mount the ground bus with phenolic insulating spacers 1200 mm on centers.
- .2 Provide copper ground bus around perimeter walls in the main electrical room and substation room(s) where indicated.
- .3 Provide copper ground bus bars in electrical rooms/closets, communications rooms, mechanical rooms, generator room and other locations where indicated. Length to be 300 mm or as shown on Drawings.
- .4 Ground items of electrical equipment to ground bus.

3.4 Electrical Substation Grounding

- .1 Install minimum #4/0 grounding connections as indicated to all station equipment including non-current carrying parts of primary switchgear, power transformers, secondary switchgear, distribution equipment, metal raceways, ductwork, piping, metal door frames, supports, screen guards, metering, exposed building metal structures.
- .2 Use min. #250MCM bare copper cables for grounding ground bus of primary switchgear.

- .3 Ground hinged doors with flexible jumper.
- .4 Make connections to main water metallic pipes.

3.5 System and Circuit Grounding

- .1 Install system and circuit grounding connections to the primary 13.8 kV system, secondary 347/600 V system and secondary 120/208 V system.
- .2 Connect power transformer neutral and distribution neutral together using 1000V insulated conductor to one (1) side of ground test link, the other side of the test link being connected directly to main station ground. Ensure distribution neutral and neutrals of potential transformers and service banks are bonded directly to transformer neutral and not to main station ground.
- .3 Connect neutral of service transformer to main neutral bus with tap of same size as secondary neutral.
- .4 Ground transformer tank with continuous conductor from tank ground lug through connector on ground bus to primary neutral. Connect neutral bushing at transformer to primary neutral in same manner.
- .5 Interconnect electrodes, ground buses and transformer neutrals at each grounding installation.
- .6 Ground the generator neutral via a minimum #4/0 AWG insulated grounding conductor where indicated.

3.6 Equipment Bonding

- .1 Install bonding connections from exposed non-current carrying metal parts of equipment including, but not necessarily limited to the following:
 - .1 Frames of all motors.
 - .2 All Starters.
 - .3 Main Electrical Switchboards.
 - .4 Medium Voltage Load Interrupter Switches.
 - .5 Panelboards and Distribution Panels.
 - .6 Isolations Switch(es).
 - .7 Exterior mounted cable trays.
 - .8 Raised floor pedestals.
 - .9 Conductive Flooring.

- .10 Communication Rooms.
- .11 Transformers.
- .12 Transfer Switches.
- .13 Power Raceway System.
- .14 Generating equipment.

3.7 Communications Systems

- .1 Provide and connect the technical isolated copper ground system.
- .2 Install grounding connections for communications system in accordance with York Region Corporate ITS Cabling & Wiring Standard Dated April 21, 2020.

3.8 Field Quality Control

- .1 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of local authority having jurisdiction over installation.
- .2 Once the grounding electrodes are installed and before the floor is poured, conduct ground resistance measurements.
- .3 Perform tests before energizing electrical system.
- .4 Disconnect ground fault indicator during tests.
- .5 Disconnect SPD units during tests.

END OF SECTION

PART 1 - GENERAL

1.1 Related Sections

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

PART 2 - PRODUCTS

2.1 Support Channels

- .1 U-shaped, steel channel, accurately cold rolled formed from 12 gauge, low carbon steel with finished dimensions of 40 mm x 40 mm, intumed clamping ridges and a continuous slot along one side for the insertion of slotted nuts. Hot dip galvanize the channel after fabrication with zinc.
- .2 Nuts with 2 serrated grooves to engage the clamping ridges of the channel, a spring to hold the nut in place during installation. Case harden and electrogalvanize after fabrication.
- .3 Electrogalvanized bolts, threaded rod, flat and lockwashers as required.
- .4 Angle, U, Z and special fittings, brackets, bases, clamps, hangers, couplings and other fittings as required and galvanized unless otherwise indicated.
- .5 Provide channel and fittings of one manufacturer.

2.2 Concrete Anchors

- .1 Drilled expansion anchors for anchors set in concrete block or poured concrete after the concrete has set. Size the insert and number of anchors so that the maximum load per anchor does not exceed 25% of the manufacturer's published maximum loading.
- .2 U-channel concrete inserts shall be 12 gauge steel 40 mm square with insert anchors 35 mm long and 100 mm on centre.

PART 3 - EXECUTION

3.1 Installation

- .1 Secure equipment to masonry, tile and plaster surfaces with lead anchors.
- .2 Secure equipment and concrete inserts to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 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.

- .5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to the basic channel members.
- .6 Fasten exposed conduit or cables to the building construction or support system using straps.
 - .1 One-hole steel straps to secure surface conduits and cables 53mm and smaller.
 - .2 Two-hole steel straps for conduits and cables larger than 53mm.
 - .3 Beam clamps to secure the conduit to the exposed steel work.
- .7 Suspended support systems
 - .1 Support individual cable or conduit runs with 6 mm diameter threaded rods and spring clips. Larger threaded rods shall be used for mounting heavy equipment such as transformers or large group of conduits as per manufacturer recommendation and code requirements.
 - .2 Seal all rod penetrations of drywall ceiling membranes.
- .8 For surface mounting of two or more conduits use channels spaced as required. At locations where slab is coffered, secure to bottom of coffer webs, approximate spacing of webs is 750 mm.
- .9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support the conduit and cable runs.
- .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .11 Do not use wire lashing or perforated strap to support or secure raceways or cables.

- .12 Do not use supports or equipment installed for other trades for conduit or cable support except with the permission of the other trade and the approval of the Consultant.
- .13 Install fastenings and supports as required for each type of equipment systems cables and conduits, and in accordance with the manufacturer's installation recommendations.
- .14 When installing fastenings and supports to surfaces with vapour barriers confer with responsible subcontractors and refer to details in the Contract Documents. If details are not available bring this to the attention of the Consultant.
- .15 Where conduit and equipment are located on walls or slabs which will not permit the support of equipment, provide suitable supports to the building structure. Supports shall be constructed of steel members or of steel pipe and fittings designed to safely support the equipment.

END OF SECTION

PART 1 - GENERAL

1.1 Related Sections

- .1 Section 26 05 00 – Common Work Results for Electrical.
- .2 Section 26 05 21 – Wires and Cables (0-1000V).
- .3 Section 26 05 26 – Grounding and Bonding for Electrical.
- .4 Section 26 05 29 – Hangers and Supports for Electrical Systems.
- .5 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
- .6 York Region Corporate ITS Cabling & Wiring Standard Dated April 21, 2020.

1.2 References

- .1 CAN/CSA C22.2 No.40-M1989 (R2009), Cutout, Junction and Pull Boxes.
- .2 CAN/CSA-C22.2 NO.76-M92 (R2012), Splitters.
- .3 TIA Standards:
 - .1 TIA-569 Revision C and amendments, Telecommunications Pathways and Spaces
 - .2 TIA-568-C.1, Commercial Building Telecommunications Cabling Standard.

1.3 Submittals

- .1 Submit Shop Drawings and product data for cabinets in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Provide shop drawings: in accordance with Section 26 05 00 - Common Work Results for Electrical Closeout Submittals
- .4 Provide maintenance materials in accordance with Section 26 05 00 - Common Work Results for Electrical.

PART 2 - PRODUCTS

2.1 General

- .1 Provide weatherproof and watertight splitters, junction and pull boxes and cabinets as indicated.

2.2 Splitters – Electrical Systems

- .1 Construction: sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2 Terminations: copper mains, copper branch lugs, and copper connection blocks to match required size and number of incoming and outgoing conductors as indicated.
- .3 Spare terminals: minimum three spare terminals on each set of copper lugs in all splitters.
- .4 Splitters shall be complete with copper bus bars the length of the trough.

2.3 Junction and Pull Boxes

- .1 Welded 14 Ga. steel construction, with formed hinged single door suitable for locking in closed position for surface mounting, painted gray polyester ASA61 epoxy textured powder coating inside and out. Minimum size 6" x 6" x 4" and as indicated. Standard of acceptance: Bell product CKO series or Equivalent.
- .2 Covers with 25mm minimum extension all around for flush-mounted, and screw-on turned edge covers for surface mounted pull and junction boxes:
 - .1 NEMA 1 for indoor installations.
 - .2 NEMA 4 for outdoor installations.
- .3 Cast FS boxes with factory-threaded hubs and mounting feet for surface exposed electrical raceways and wiring devices.

2.4 Cabinets

- .1 Type E: 14 Ga. sheet steel, piano hinged door and return flange overlapping sides, handle, lock and catch, for surface mounting, sprinkler proof.
- .2 Type T: 14 Ga. sheet steel cabinet, with hinged door, latch, lock, two (2) keys, containing 19mm G1S fire plywood backboard for flush mounting in finished areas and surface mounting in service and mechanical spaces, sprinkler proof.
- .3 Covers with 25 mm minimum extension all around, for flush-mounted

cabinets.

PART 3 - EXECUTION

3.1 Splitter Installation

- .1 Install splitters as indicated and mount plumb, true and square.
- .2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 Junction Boxes, Pull Boxes and Cabinet Installation

- .1 Install junction boxes and pull boxes in inconspicuous but accessible locations.
- .2 Junction boxes and pull boxes shall be readily accessible such that there are no obstructions below or in front of any boxes. Boxes shall not be installed above or behind any existing or new equipment.
- .3 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.
- .4 Provide lockable pull boxes as indicated complete with a padlock and three (3) keys. Coordinate the padlock type with the Region doing the construction phase.
- .5 Mount cabinets with top not higher than 2000 mm above finished floor.
- .6 Install terminal block as required in Type T cabinets.

3.3 Identification

- .1 Equipment Identification: to Section 26 05 53 – Identification of Electrical Systems.

END OF SECTION

PART 1 - GENERAL

1.1 Related Sections

- .1 Section 26 05 00 – Common Work Results for Electrical.
- .2 Section 26 05 20 - Wire and Box Connectors 0-1000V.
- .3 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.2 References

- .1 CAN/CSA C22.2 NO.18.1-04 (R2009), Metallic Outlet Boxes (Tri-National standard with ANCE NMX-J-023/1 and UL 514A).
- .2 CAN/CSA C22.2 NO.18.2-06, Nonmetallic Outlet Boxes.
- .3 CAN/CSA C22.2 NO.18.3-12, Conduit, Tubing and Cable Fittings (Tri-national standard, with ANCE NMX-J-017 and UL 514B).
- .4 Canadian Electrical Code.
- .5 Ontario Electrical Safety Code.

PART 2 - PRODUCTS

2.1 Outlet and Conduit Boxes General

- .1 Size boxes in accordance with CAN/CSA C22.1.
- .2 All sheet steel boxes shall have pre punched 3/4" (19 mm) knockouts unless otherwise noted.
- .3 Do not use boxes with cable clamps.
- .4 Provide 4" (103 mm) square or larger outlet boxes as required for special devices.
- .5 Provide gang boxes where wiring devices are grouped.
- .6 Provide 347 V outlet boxes for 347 V switching devices. Do not gang.
- .7 Provide minimum 4" (103mm) x 4" (103mm) x 2 1/8" (54mm) minimum boxes for data communications outlets in dry wall partitions, complete with the required support brackets, clips and single or two gang plaster rings.

- .8 Provide blank cover plates for boxes without wiring devices. Boxes in finished areas shall be provided with cover plates with brushed stainless-steel finish.

- .9 Do NOT group systems in common boxes.

2.2 Galvanized Steel Outlet Boxes

- .1 Provide single and multi-gang one-piece electro-galvanized steel construction flush device boxes as required for flush installation.
- .2 Provide 4" (103 mm) square outlet boxes with extension and plaster rings as required.
- .3 Provide 4" (103 mm) square or octagonal outlet boxes for lighting fixture outlets.
- .4 Provide extension and plaster rings for flush mounting devices in finished plaster, drywall or tile walls.

2.3 Device Boxes for Clean Areas

- .1 Device back boxes for all devices in clean areas shall be sealed (no open screw holes or knockouts) so as to prevent the infiltration of air from the wall cavity into the clean space.

2.4 Masonry Boxes

- .1 Provide electro-galvanized steel masonry single and multi-gang boxes for devices flush mounted in exposed block walls.

2.5 Concrete Boxes

- .1 Electro-galvanized steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.6 Surface Boxes

- .1 Cast FS boxes with factory-threaded hubs and mounting feet for surface wiring and switches and receptacles.

2.7 PVC Boxes

- .1 All PVC boxes to have approved ground straps and shall be compatible with PVC conduit used.

2.8 Fittings – General

- .1 Provide bushing and connectors with nylon insulated throats.
- .2 Provide knock-out fillers to prevent entry of debris.

- .3 Provide conduit outlet bodies for conduit up to 1 1/4" (35 mm) and pull boxes for larger conduits.
- .4 Provide 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 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .4 Provide correct size of openings in boxes for conduit, mineral insulated cable (MICC) and armoured cable connections. Do not install reducing washers.
- .5 Vacuum clean interior of outlet boxes before installation of wiring devices.
- .6 Identify systems for outlet boxes as indicated within the Contract Documents.
- .7 When using PVC conduit, use approved boxes.

END OF SECTION

PART 1 - GENERAL

1.1 Related Sections

- .1 Section 26 05 00 – Common Work Results – Electrical.
- .2 Section 26 05 10 – Wiring Methods.
- .3 Section 26 05 20 – Wire and Box Connectors 0-1000V.
- .4 Section 26 05 29 – Hangers and Supports for Electrical Systems.
- .5 Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.

1.2 References

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA C22.2 No. 18.3-12, Conduit, Tubing, and Cable Fittings (Tri-National standard, with ANCE NMX-J-017 and UL 514B).
 - .2 CAN/CSA C22.2 No. 18.4-04 (R2009), Hardware for the Support of Conduit, Tubing, and Cable (Bi-National standard, with UL 2239).
 - .3 CAN/CSA C22.2 No. 18.5-02 (R2012), Positioning Devices (Bi-National standard, with UL 1565).
 - .4 C22.2 NO.45.1-07, Electrical Rigid Metal Conduit – Steel (Tri-national standard, with UL 6 and NMX-J-534-ANCE-2007).
 - .5 C22.2 No.56-04 (R2009) Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .6 C22.2 NO.83-M1985 (R2008), Electrical Metallic Tubing.
 - .7 C22.2 No.211.2-06 (R2011) Rigid PVC (Unplasticized) Conduit.
 - .8 CAN/CSA C22.2 NO.227.1-06 (R2011), Electrical Nonmetallic Tubing (Bi-National standard, with UL 1653).
 - .9 CAN/CSA C22.2 NO.227.2.1-04 (R2009), Liquid-Tight Flexible Nonmetallic Conduit (Bi-National standard, with UL 1660).
 - .10 CAN/CSA C22.2 No. 227.3-05 (R2010), Nonmetallic Mechanical Protection Tubing (NMPT), (Bi-national standard, with UL 1696).

1.3 General

- .1 The Drawings do not show all conduits. Those shown are in diagrammatic form only. Conduits are to be provided to create complete raceway systems.

PART 2 - PRODUCTS

2.1 Conduits

- .1 Electrical Rigid Metal Conduit – Steel to CSA C22.2 NO.45.1, galvanized steel threaded.
- .2 Electrical Metallic Tubing to CAN/CSA C22.2 NO.83, with rain tight couplings.
- .3 Rigid PVC (Unplasticized) Conduit to CAN/CSA C22.2 No.211.2.
- .4 Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit to CAN/CSA C22.2 No.56.
- .5 Electrical Nonmetallic Tubing to CAN/CSA C22.2 NO.227.1-06.
- .6 Liquid-Tight Flexible Nonmetallic Conduit to CAN/CSA C22.2 NO.227.2.1.
- .7 Nonmetallic Mechanical Protection Tubing to CAN/CSA C22.2 No. 227.3.

2.2 Conduit Fastenings

- .1 One-hole malleable iron, hot dipped galvanized straps to secure surface mounted conduits 53 mm and smaller. Two-hole steel straps for conduits larger than 53 mm.
- .2 Beam clamps to secure conduits to exposed steel members.
- .3 12-gauge galvanized steel "U" channel type supports for conduits on a maximum 1500 mm centres. Use suitable conduit clamps in channel. Provide additional supports for liquid-tight flexible conduit within 300 mm of every outlet box, junction box, cabinet, or fitting.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.
- .5 Supporting of conduits with tie wires, perforated strips, etc., will not be permitted.

2.3 Conduit Fittings

- .1 Fittings: to CAN/CSA C22.2 No. 18.3, manufactured for use with conduit specified. Coating: same as conduit.
- .2 Provide insulated bushings on all rigid, threaded conduits.
- .3 Provide insulated steel rain tight connectors and couplings for all steel conduits installed outdoors and in cast-in-place concrete.

- .4 Provide nylon insulated steel set screw coupling and connectors for all EMT conduits installed in interior spaces.
 - .5 Provide double locknuts and a nylon insulated bushing for Schedule 40 conduit connections to sheet steel boxes and enclosures.
- 2.4 Expansion Fittings for Rigid Conduit
- .1 Weatherproof expansion fittings with an integral bonding assembly suitable for a 100 mm linear expansion.
 - .2 Rigid rain tight expansion joint fittings with an integral bonding jumper suitable for linear expansion and a 20 mm deflection in all directions.
 - .3 Provide expansion fittings required for expansion where conduits cross building expansion joints.
- 2.5 Explosion Proof Conduit Fittings
- .1 EYS Series fittings complete with Eaton - Chico X Fire Dam or Equivalent and Eaton - Chico 'A' or Equivalent sealing compound.
- 2.6 Fish Cord
- .1 Fish lines to be minimum 6 mm polypropylene. For conduits over 50 mm in diameter, use minimum 10 mm fish line.
 - .2 Install fish cord in all empty conduits, including telecom, security and audio/visual conduits.

PART 3 - EXECUTION

- 3.1 Do not use conduits smaller than 3/4" (21 mm).
- 3.2 Manufacturer's Instructions
- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.
- 3.3 Installation
- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
 - .2 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas unless indicated otherwise.
 - .3 Do not surface mount conduits on building exterior surfaces unless otherwise indicated.

- .4 Do not fasten conduits to metal roof decks.
- .5 Use rigid, threaded Schedule 40, galvanized steel conduit except where specified otherwise.
- .6 Use rigid Schedule 40 PVC conduit for installation underground and in slabs-on-grade.
- .7 Use electrical metallic tubing (EMT) in general interior areas not subject to mechanical injury, except in cast concrete.
- .8 Use liquid tight flexible metal conduit for connection to motors, transformers, or vibrating equipment.
- .9 Use flexible metal conduit for final connection to surface or recessed lighting fixtures, and work in movable metal partitions.
- .10 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .11 Mechanically bend steel conduit over 21 mm diameter.
- .12 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .13 Install fish cord in empty conduits and raceway systems.
- .14 Run 2- 27 mm spare conduits up to ceiling space and 2- 27 mm spare conduits down to ceiling space from each flush panel. Terminate these conduits in 153 mm x 153 mm x 103 mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in flush concrete or surface type box.
- .15 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .16 Dry conduits out before installing wire.
- .17 No FT4 rated electrical nonmetallic tubing, liquid-tight flexible nonmetallic conduit or non-metallic mechanical protection tubing shall be permitted for use within any interior partitions.
- .18 Provide expansion fittings when crossing building structural expansion joints.
- .19 Do not place conduits in slabs unless approved by the Consultant.
- .20 Install sleeves where conduits pass through slab or wall. Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed. Use cold mastic between sleeve and conduit.

- .21 No conduit shall be installed above the roof deck, between the roof membrane and the metal roof deck.

3.4 Surface Conduits

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on suspended or surface channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with a minimum of 25 mm at crossovers.
- .7 Conduits shall not be run over heat generating source equipment.

3.5 Concealed Conduits

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings unless otherwise indicated.
- .4 Protect conduits from damage where they stub out of concrete.

3.6 Conduits in Cast-In-Place Concrete

- .1 Locate to suit reinforcing steel. Install in centre one-third (1/3) of slab.
- .2 Protect conduits from damage where they stub out of concrete.
- .3 Encase conduits completely in concrete. Minimum concrete thickness over or around the conduit shall be 75 mm.
- .4 Where PVC conduits are installed in concrete floor slab, use PVC to steel conduit adapter fittings for conduits emerging from the floor slab (this also applies to PVC conduits terminating in junction boxes in the slab, where a steel adapter is also required).
- .5 Submit detailed conduit layouts, well in advance of construction to structural engineer for review and approval prior to installation. Make necessary modifications to conduit layouts.
- .6 Run maximum 25 mm conduit in slabs on grade.

- .7 Run conduits 25 mm and larger below slab and encased in 75 mm envelope of pea gravel.
 - .8 Conduit joints shall be watertight.
- 3.7 Conduits Underground
- .1 Slope conduits to provide drainage.
 - .2 Conduit joints shall be watertight for conduits installed underground, in concrete slabs and in concrete duct banks.
 - .3 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.
- 3.8 Exterior
- .1 All conduits to run to site lighting, power, security and receptacles, etc. located on the exterior of the building shall be rigid galvanized steel.
 - .2 All conduit runs to outdoor lighting poles can be rigid Schedule 40 PVC conduit buried underground.
 - .3 Provide minimum 1 m cover on top of all conduits feeding site lighting. Locate a fluorescent plastic strip tap 500 mm above feeders. Provide a 150 mm envelope of granular 'B' fill around feeder and backfill with native materials.
 - .4 Conduits exposed to the weather shall be rigid Schedule 40 galvanized steel.
- 3.9 PVC Conduits
- .1 PVC conduits may be bent in the field using approved electrical heating devices or by using the appropriate bends. Damaged or improper bends shall be replaced. All joints shall be made using an approved coupling with solvent welds. Clean all joints with solvent cleaner prior to applying the solvent. Liberally apply the solvent to the conduit fitting, force the conduit into the fitting and rotate the conduit 45 degrees within the flange to form a tight bond. Allow proper curing time.
 - .2 All scorched PVC conduit shall be removed.
 - .3 PVC conduit exposed to direct sun rays shall be sunlight resistant type.

3.10 Hazardous Locations

- .1 All conduit runs in hazardous location shall be rigid Schedule 40 galvanized steel.
- .2 Install EYS fitting within 450 mm of the device being isolated, and where the conduit run leaves the hazardous area.
- .3 Seal the EYS fitting with the fire dam and sealing compound.

3.11 Cleaning

- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

- .1 Submit Shop Drawings/product data sheets to regulatory authority for review and approval prior to submitting to Consultant. Conform to following requirements:
 - .1 submit Shop Drawings/product data sheets for all products specified in this Section except pipe and fittings;
 - .2 submit complete CAD layout drawings indicating source of water supply with test flow and pressure, "head-end" equipment piping schematic, pipe routing and sizing, and zones, all signed and sealed by a qualified professional mechanical engineer registered in jurisdiction of the work as specified below;
 - .3 submit copies of all calculations, including hydraulic calculations, stamped and signed by same engineer who signs layout drawings, and a listing of all design data used in preparing the calculations, system layout and sizing, including occupancy-hazard design requirements;
- .2 Submit a complete sprinkler system test certificate as specified in Part 3 of this Section.
- .3 Sprinklers are to be identified on drawings and product submittals, and be specifically identified by manufacturer's listed model or series designation. Trade names and other abbreviated listings are unacceptable.

1.02 QUALITY ASSURANCE

- .1 Fire protection sprinkler system work is to be in accordance with following Codes and Standards:
 - .1 NFPA 13, Standard for the Installation of Sprinkler Systems;
 - .2 CSA B137.2, Polyvinylchloride (PVC) Injection-Moulded Gasketed Fittings for Pressure Applications;
 - .3 CSA B137.3, Rigid Polyvinylchloride (PVC) Pipe for Pressure Applications;
 - .4 ASTM A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless;
 - .5 ASTM A135, Standard Specification for Electric-Resistance-Welded Steel Pipe;
 - .6 ASTM A234, Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service;
 - .7 ASTM A536, Standard Specification for Ductile Castings;
 - .8 ASTM A795, Standard Specification for Black and Hot-Dipped Zinc Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use;
 - .9 ANSI/ASME B16.4, Grey Iron Threaded Fittings (Classes 125 and 250);
 - .10 CAN/CSA B64.10, Backflow Preventers and Vacuum Breakers.

- .2 Fire protection sprinkler work is to be performed by a sprinkler company who is a member in good standing of the Canadian Automatic Sprinkler Association. Site personnel are to be licensed in jurisdiction of the work and under the continuous supervision of a foreman who is an experienced fire protection system installer and a journeyman pipe fitter licensed in jurisdiction of the work.
- .3 Check and verify dimensions and conditions at Site and ensure work can be performed as indicated. Coordinate work with trades at site and accept responsibility for and cost of making adjustments to piping and/or spacing to avoid interference with other building components.
- .4 Verify working condition of existing sprinkler system equipment which has direct interface with project work and is to remain. Replace with new equipment where necessary.
- .5 System components must be ULC listed and labelled.
- .6 Grooved couplings, and fittings, valves and specialties are to be products of a single manufacturer. Grooving tools are to be of same manufacturer as grooved components.
- .7 Castings used for coupling housings, fittings, valve bodies, etc., are to be date stamped for quality assurance and traceability.

1.03 DESIGN REQUIREMENTS

- .1 Fire protection sprinkler work is to be designed in accordance with NFPA 13 and Ontario Building Code, Ontario Fire Code and, where required, local building and fire department requirements. If water supply flow and pressure test data is not available, conduct Municipal main water flow and pressure tests at nearest fire hydrant to obtain criteria to be used in system design. Include hydrant location and flow and pressure test data with system design calculations.
- .2 Include for a qualified mechanical Professional Engineer legally qualified to practice professional engineering in the Province of Ontario to design the fire protection standpipe work. Refer to Section 20 05 05 entitled Mechanical Work General Instructions for requirements regarding Contractor retained engineers.
- .3 Sprinkler /System Occupancy – Hazard Design requirements: In accordance with NFPA 13 occupancy-hazard density requirements, unless otherwise specified.

2 PRODUCTS

2.01 PIPE, FITTINGS AND JOINTS

- .1 Pipe, fittings and joints are to be as follows, with exceptions as specified in Part 3 of this Section:
 - .1 Schedule 40 Steel – Grooved Coupling Joints
 - .1 Schedule 40 mild black carbon steel, ASTM A53, Grade B, complete with grooved ends and mechanical fittings and couplings equivalent to Victaulic "FireLock" fittings and Victaulic Style 009N, 107H, and 107N QuickVic and 005 rigid coupling joints. Strap type outlet fittings such as Victaulic "Snap-Let" are not acceptable.

.2 Schedule 40 Steel – Screwed and Welded Joints

- .1 Schedule 40 mild black carbon steel, ASTM A53, Grade B. Screwed piping complete with Class 125 cast iron screwed fittings to ANSI/ASME B16.4. Welded piping complete with factory made seamless carbon steel butt welding fittings to ASTM A234, Grade WPB, long sweep pattern wherever possible.

.3 Flexible Pipe – Equivalent to Victaulic "VicFlex"

- .1 Drop system is to consist of a braided type 304 stainless steel flexible tube, zinc plated steel 25 mm (1") NPT (national pipe thread) male threaded nipple for connection to branch-line piping, and a zinc plated steel reducer with a 12 mm (1/2") or 20 mm (3/4") NPT female thread for connection to sprinkler head.
- .2 Drop is to include a cULus/FM approved Series AH2 braided hose with a bend radius to 50 mm (2") to allow for proper installation in confined spaces.
- .3 Hose is to be listed for following number of 50 mm (2") radius 90° bends:
- .1 4 bends at 0.79 m (31") length;
- .2 5 bends at 0.91 m (36") length;
- .3 8 bends at 1.2 m (48") length;
- .4 10 bends at 1.5 m (60") length;
- .5 12 bends at 1.8 m (72") length.
- .4 Union joints are to be provided for ease of installation, prevention of hose torque stresses and on site changing of factory 146 mm (5.75") straight reducing nipple in reduced spaces under obstructions.
- .5 On T-bar ceiling grid with drop in tile application, flexible drop is to attach to ceiling grid using a one-piece open gate Series AB1 bracket. Bracket is to allow installation before ceiling tile is in place.
- .6 On T-bar ceiling grid designed for hard lid drywall application, flexible drop is to attach to ceiling grid using a one-piece open gate Series AB2 bracket. Bracket is to allow for vertical adjustment of reducer/head from below drywall, post-drywall installation.
- .7 On hat furring channel grid with hard lid drywall application, flexible drop is to attach to ceiling grid using a one-piece open gate Series AB4 bracket. Bracket is to allow for vertical adjustment of reducer/head from below drywall, post-drywall installation.
- .8 Braided drop system is to be cULus listed for sprinkler services to 1206 kPa (175 psi).

.4 Standard Mechanical Couplings: Equivalent to Victaulic

- .1 Manufactured in two segments of cast ductile iron, conforming to ASTM A-536, Grade 65-45-12. Gaskets are to be pressure-responsive synthetic rubber, grade to suit intended service, conforming to ASTM D-2000. Mechanical coupling bolts are to be zinc plated (ASTM B-633) heat treated carbon steel track head conforming to ASTM A-449 and ASTM A-183. Couplings are to comply with ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.
- .2 Rigid Type: Coupling housings with offsetting, angle-pattern bolt pads are to be used to provide system rigidity and support and hanging in accordance NFPA-13. Couplings are to be fully installed at visual pad-to-pad offset contact. Couplings that require exact gapping of bolt pads at specific torque ratings are not permitted.
- .3 Flexible Type: Use in locations where vibration attenuation and stress relief are required; Victaulic Style 177 (Quick-Vic™) or Equivalent flexible coupling.

2.02 SHUT-OFF VALVES

- .1 Minimum 2070 kPa (300 psi) rated full port brass or bronze body screwed ball valves and lug body or grooved end type butterfly valves.
 - .1 Butterfly valves are to include a pressure responsive seat, and stem is to be offset from disc centreline to provide complete 360° circumferential seating.
 - .2 Standard of Acceptance: Victaulic Style 705 or Equivalent.
 - .3 Supervised closed applications standard of acceptance Victaulic Series 707C or Equivalent supervised closed butterfly valve.
- .2 OS&Y (outside stem and yoke) Gate Valves: 1725 kPa (250 psi), grooved ends with ductile iron body, yoke, and handwheel conforming to ASTM A-536, EPDM (ethylene propylene diene monomer) coated ASTM A-126-B cast iron disc, ASTM B16 brass rising stem, flanged and epoxy coated ductile iron bonnet, EPDM O-ring stem seals and body gasket. Equal to Victaulic Series 771H (Grooved ends) and Series 771F (Grooved x Flanged).

2.03 BALL DRIPS

- .1 Equivalent to National Fire Equipment Ltd. Model #A58, 20 mm (¾") diameter automatic ball drip.

2.04 SPRINKLER HEADS

- .1 Sprinkler heads, unless otherwise specified, are to be as scheduled in Part 3 of this Section.
- .2 Sprinkler body is to be die-cast, with a hex-shaped wrench boss integrally cast into sprinkler body to reduce risk of damage during installation. Wrenches are to be provided by sprinkler manufacturer that directly engages wrench boss.
- .3 For locations where corrosive resistant coatings are required, body is to be coated with ULC listed and FM approved anti-corrosion VC-250 coating (silver colouring).

- .4 Recessed sprinkler heads in finished areas are to be chrome plated unless otherwise specified. Concealed sprinkler head ceiling plates are to match ceiling colour.
- .5 Where exposed pendent heads occurs in areas with suspended ceilings, they are to be complete with chrome plated escutcheon plates. Similarly, sidewall heads with concealed piping are to be complete with chrome plated escutcheon plates.
- .6 Sprinkler heads which are exposed in areas where they may be subject to damage are to be complete with wire guards, chrome plated where in finished areas.
- .7 Escutcheons and guards are to be listed, supplied, and approved for use with sprinkler by sprinkler manufacturer.
- .8 Sprinkler heads located in areas or over equipment where high ambient temperature is present are to be, unless otherwise specified, 74°C (165°F) heads. All other heads, unless otherwise specified or required, are to be 57°C (135°F) rated.
- .9 Acceptable manufacturers are:
 - .1 Victaulic Co.;
 - .2 Tyco Fire Suppression & Building Products;
 - .3 The Viking Corporation;
 - .4 The Reliable Automatic Sprinkler Co.
 - .5 Or Equivalent

3 EXECUTION

3.01 MONITORING OF SYSTEMS

- .1 Daily monitor and supervise existing sprinkler system serving renovated areas to ensure that each respective system is left in proper operating condition at end of each working day. Include for but not be limited to performing following:
 - .1 Under presence of York Region's representative, check each morning and evening (start and end of work) of each day, sprinkler system to ensure that it is in proper working condition;
 - .2 If portions of sprinkler system is not in proper working order, provide temporary provisions subject to approval of local fire authority or local governing authority, to ensure that proper sprinkler coverage is provided and/or provide supervisory personnel to monitor areas where sprinkler system is not operational;
 - .3 Document and sign off with York Region's representative signing off also, each respective daily check condition;
 - .4 Ensure that work to sprinkler system does not affect portion of system serving areas outside of renovation areas.

3.02 DEMOLITION

- .1 Refer to demolition requirements specified in Section 20 05 35 entitled Demolition and Revision Work.

3.03 PIPING INSTALLATION REQUIREMENTS

- .1 Provide required sprinkler system piping.
- .2 Perform piping work in accordance with requirements of NFPA 13, governing regulations, and "Reviewed" shop drawings.
- .3 Piping, unless otherwise specified, is as follows:
 - .1 for piping inside building and above ground except as noted below – Schedule 40 grooved end black steel with Victaulic or equal fittings and coupling joints, or, for piping to and including 50 mm (2") diameter, screwed fittings and joints, or, for piping 65 mm (2-½") diameter and larger, welding fittings and welded joints;
 - .2 for branch piping to heads in suspended ceilings, etc. – at your option, flexible piping installed in accordance with manufacturer's instructions;
- .4 Pipe sizes, pipe routing, sprinkler head quantities and locations, and layout of work shown on drawings are to assist during tendering period. Ensure adequate head coverage, head quantities and pipe sizing as specified in Part 1 of this Section. Do not reduce size of sprinkler main or re-route main unless reviewed with and approved by Consultant.
- .5 Install grooved joints in accordance with manufacturer's latest installation instructions. Grooved ends are to be clean and free from indentations, projections and roll marks. Gaskets are to be moulded and produced by coupling manufacturer, and verified as suitable for intended service. Have factory-trained representative from mechanical joint manufacturer provide on-Site training in proper use of grooving tools and installation of grooved piping products. Have factory-trained representative periodically review product installation and ensure best practices are being followed. Remove and replace any improperly installed products.
- .6 Clean pipe, fittings, couplings, flanges and similar components after erection is complete. Wire brush clean any ferrous pipe, fitting, coupling, flange, hanger, support and similar component which exhibit rust and carefully coat with suitably coloured primer.
- .7 When sprinkler work is complete, test system components and overall system(s) and submit completed test certificate and other documentation in accordance with Chapter 8 of NFPA 13.

3.04 INSTALLATION OF SPRINKLER HEADS

- .1 Provide required sprinkler heads in accordance with following schedule:

APPLICATION	SPRINKLER HEAD TYPE
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APPLICATION	SPRINKLER HEAD TYPE
Rooms/areas with a suspended ceiling	Victaulic V38/V39 or Tyco Series RFII "Royal Flush II" concealed pendent or Equivalent Victaulic V27 or Tyco Series TY-FRB recessed pendent or Equivalent Victaulic V27 or Tyco Series TY-FRB pendent with escutcheon plates or Equivalent
Rooms/areas without a suspended ceiling	Victaulic V27 or Tyco Series TY-FRB pendent or Equivalent
Elevator shafts	Victaulic V27 or Tyco Series TY-FRB horizontal sidewall or Equivalent

- .2 Sprinkler head manufacturers indicated on schedule are for type indication purposes. Acceptable manufacturers are listed in Part 2 of this Section.
- .3 Coordinate sprinkler head locations with all Drawings, including architectural reflected ceiling plan Drawings, and, where applicable, electrical Drawings. Coordinate sprinkler head locations in areas with suspended ceilings with the location of lighting, grilles, diffusers, and similar items recessed in or surface mounted on the ceiling as per the reflected ceiling plans. In areas with lay-in tile, centre the sprinkler head both ways in the lay-in tile wherever possible. Confirm locations prior to roughing-in.
- .4 Maintain maximum headroom in areas with no ceilings.
- .5 Provide guards for heads where they are subject to damage.
- .6 Provide high temperature heads in equipment rooms and similar areas over heat producing or generating equipment.

3.05 INSTALLATION OF INDICATOR POST VALVE

- .1 Provide a shut-off valve in underground sprinkler main piping outside building. Equip valve with a valve box and an indicator post assembly.
- .2 Confirm valve box length and steel shaft length prior to ordering and confirm exact location prior to roughing-in.
- .3 When installation is complete, check and test operation of assembly and adjust as required.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

- .1 Submit product data sheets for all products specified in this Section.

1.02 QUALITY ASSURANCE

- .1 Fire extinguishers are to be in accordance with following Codes and Standards:
 - .1 National Fire Code of Canada;
 - .2 NFPA 10, Standard for Portable Fire Extinguishers;
 - .3 CAN/ULC S508, Standard for the Rating and Testing of Fire Extinguishers.

2 PRODUCTS

2.01 GENERAL

- .1 Fire extinguishers are to be pressurized (stored pressure) rechargeable type, in accordance with NFPA 10, and UL and/or ULC listed and labelled for the class of fires and hazard locations for which they are specified.
- .2 Each extinguisher is to be complete with:
 - .1 manufacturer's identification label indicating extinguisher model number, rating, and operating instructions;
 - .2 anodized aluminum or chrome plated forged brass valve with positive squeeze grip on-off operation and a pull-pin safety lock;
 - .3 discharge hose with nozzle or horn and hose securing clip;
 - .4 for wall mounting extinguishers, a wall mounting bracket.

2.02 2A RATED WATER EXTINGUISHERS

- .1 Water extinguishers rated 2A are to be 175 mm (6-½") dia., 9.5 L (2 gallon) capacity, each complete with a polished stainless steel cylinder with tire valve for pressuring and a waterproof stainless steel pressure gauge.

2.03 10B:C. RATED CARBON DIOXIDE EXTINGUISHERS

- .1 10B:C carbon dioxide extinguishers are to be 175 mm (6-½") dia., 6.8 kg (15 lb.), each complete with a steel cylinder with a safety red baked enamel finish.

2.04 3A10B:C RATED DRY CHEMICAL EXTINGUISHERS

- .1 Multi-purpose 3A10B:C dry chemical extinguishers are to be 100 mm (4") dia., 2.27 kg (5 lb.), each complete with a steel cylinder with a safety red baked enamel finish and a waterproof stainless steel pressure gauge.

2.05 4A60B:C AND 4A80B:C RATED DRY CHEMICAL EXTINGUISHERS

- .1 Multi-purpose 4A60B:C dry chemical extinguishers are to be 125 mm (5") dia., 4.5 kg (10 lb.), each complete with a steel cylinder with a safety red baked enamel finish and a waterproof stainless steel pressure gauge.
- .2 Multi-purpose 4A80B:C dry chemical extinguishers are to be as above but 175 mm (7") dia., 9 kg (20 lb.).

2.06 FIRE EXTINGUISHER CABINETS

- .1 Surface Mounted: Rectangular break-glass type enclosures sized to suit the extinguishers to be housed, constructed of #18 gauge corrosion resistant steel with a baked white enamel finish, front glass panel, break-glass mechanism, and keyed alike cylinder lock.

3 EXECUTION

3.01 INSTALLATION OF FIRE EXTINGUISHERS

- .1 Provide fire extinguishers of type(s) in accordance with requirements of NFPA 10.
- .2 Unless otherwise shown or specified, wall mount extinguishers using wall brackets supplied with extinguishers.
- .3 Do not install extinguishers until after wall finishing work is complete.
- .4 Be responsible for maintaining fire extinguishers until Substantial Completion of the Work.
- .5 If extinguishers are indicated adjacent to a door, locate extinguishers at the strike side of the door.

3.02 INSTALLATION OF FIRE EXTINGUISHER CABINETS

- .1 Provide wall cabinets for fire extinguishers where required.
- .2 Unless otherwise shown or specified, locate cabinets so centreline is approximately 1.2 m (4') above finished floor.
- .3 Confirm exact locations prior to installation.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

- .1 Submit Shop Drawings/product data sheets for all products specified in Part 2 of this Section except for pipe, fittings, and chlorine.
- .2 Submit laboratory water purity test results indicating chlorine residual prior to application for Substantial Performance of the Contract.
- .3 As specified in Part 3 of this Section, submit a letter from anchor design engineer stating anchor installation has been examined at Site and anchors are properly fabricated and installed.

1.02 QUALITY ASSURANCE

- .1 Domestic water piping and valves are to comply with following codes, regulations and standards (as applicable):
 - .1 Ontario Building Code and regulations;
 - .2 ASTM F1960, Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) Tubing;
 - .3 CAN/CSA B125.1, Plumbing Supply Fittings;
 - .4 CAN/CSA B125.3, Plumbing Fittings;
 - .5 CAN/CSA B137 Series, Thermoplastic Pressure Piping Compendium;
 - .6 CAN/ULC S102.2, Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies;
 - .7 CAN/ULC S101, Fire Endurance Tests of Building Construction and Materials;
 - .8 NSF/ANSI 14, Plastics Piping System Components and Related Materials;
 - .9 NSF/ANSI 61, Drinking Water System Components – Health Effects;
 - .10 NSF/ANSI 372, Drinking Water System Components – Lead Content.

2 PRODUCTS

2.01 PIPE, FITTINGS AND JOINTS

- .1 Hard Copper - Solder Joint
 - .1 Type "L" hard drawn seamless copper to ASTM B88, complete with copper solder type fittings to ASME/ANSI B16.18 and soldered joints using The Canada Metal Co. Ltd. "SILVABRITE 100" or Equivalent lead-free solder for cold water pipe, and 95% tin/ 5% Antimony or "SILVABRITE 100" solder for other services.

.2 Copper Pressure Coupled Joint

- .1 Type "L" hard drawn seamless copper to ASTM B88 with Viega "ProPress with Smart Connect feature" copper fittings with EDPM (ethylene propylene diene monomer) seals, and pressure type crimped joints made by use of manufacturer recommended tool.

.3 Semi-Rigid Polyethylene Tubing

- .1 Versa Fittings and Mfg. Inc. or Equivalent 12 mm (½") dia., high density, semi-rigid polyethylene tubing, 1380 kPa (200 psi) rated.

2.02 SHUT-OFF VALVES

.1 Ball Valves

- .1 Class 600, 4140 kPa (600 psi) WOG rated, lead-free, full port ball type valves, each complete with a forged brass body with solder ends, forged brass cap, blowout-proof stem, solid forged brass chrome plated ball, "Teflon" or "PTFE"(Polytetrafluoroethylene) seat, and a removable lever handle. Valves in insulated piping are to be complete with stem extensions.

.2 Acceptable products are:

- .1 Toyo Valve Co. Fig. 5049A-LF;
.2 Milwaukee Valve Co. #UPBA485B;
.3 Kitz Corporation Code 859;
.4 Apollo Valves #77LF-200;
.5 Watts Industries (Canada) Inc. #LFFBVS-3C.
.6 Or Equivalent

2.03 CHECK VALVES

.1 Horizontal

- .1 Lead-free, Class 125, bronze, 1380 kPa (200 psi) WOG rated horizontal swing type check valves with solder ends.

.2 Acceptable products are:

- .1 Toyo Valve Co. Fig. 237A-LF;
.2 Milwaukee Valve Co. #UP1509;
.3 Kitz Corporation Code 823;
.4 Apollo Valves #61LF Series.
.5 Or Equivalent

.2 Vertical

- .1 Equivalent to Kitz Corp. Code 826, lead-free, 1725 kPa (250 psi) WOG rated vertical lift check valve with soldering ends.

2.04 DRAIN VALVES

- .1 Minimum 2070 kPa (300 psi) water rated, 20 mm ($\frac{3}{4}$ ") dia., straight pattern full port bronze ball valves, each complete with a threaded outlet suitable for coupling connection of 20 mm ($\frac{3}{4}$ ") dia. garden hose, and a cap and chain.
- .2 Acceptable products are:
- .1 Toyo Valve Co. Fig. 5046;
- .2 Dahl Brothers Canada Ltd. Fig. No. 50. 430;
- .3 Kitz Corporation Code 58CC;
- .4 Apollo Valves #78-104-01;
- .5 Watts Industries (Canada) Inc. #B6000.
- .6 Or Equivalent

2.05 PARTITION STOPS

- .1 Equivalent to Dahl Brothers Canada Ltd. Fig. E2300 Series or equal lead-free partition stops with EDPM packing, slotted spindles, extension tubes, stainless steel access plates, and 3 identified keys.

2.06 CHLORINE

- .1 Sodium hypochlorite to AWWA B300.

2.07 FLOOR DRAIN TRAP SEAL PRIMERS

- .1 Primer Valve Type
- .1 Precision Plumbing Products Inc. Model P2-500 trap primer valve, constructed of brass, adjustable to high or low water pressures and complete with "O" ring seals, 12 mm ($\frac{1}{2}$ ") threaded inlet and outlet connections, and, for priming two traps from the same primer, a DU-2 dual outlet distribution unit.

2.08 WATER HAMMER ARRESTORS

- .1 Piston type, sealed, pressurized water hammer arrestors suitable for either horizontal or vertical installation, each complete with a hard drawn copper body, "O"-ring piston seals, an air charge, and an inlet opening equal to diameter of pipe in which arrestor is required.
- .2 Acceptable products are:
- .1 Watts Industries (Canada) Inc.;
- .2 Zurn #Z1705;

- .3 Precision Plumbing Products Inc. #SC;
- .4 Mifab MWH Series.
- .5 Or Equivalent

2.09 LAVATORY SUPPLY FITTING TEMPERING VALVES

- .1 Equivalent to Powers "HydroGuard" Series 490, model LM490 12 mm (1/2") dia. or model LM491 20 mm (3/4") dia. as required, each CSA B125 certified, forged brass, tamper-proof thermostatic mixing valves, adjustable for water supply between 29°C and 49°C (85°F and 120°F), sized to suit number of lavatories in grouping, and complete with a stop and check valve and a lockable handle.
- .2 Each mixing valve is to be complete with a stainless steel flush wall mounting cabinet with vandal-proof hinged door.

2.10 AIR VENTS

- .1 Equivalent to ITT Hoffman Specialty No. 78 cast brass, 1035 kPa (150 psi) rated, 20 mm (3/4") straight water main vent valves, each tapped at the top for a 3.2 mm (1/8") safety drain connection.

3 EXECUTION

3.01 DEMOLITION

- .1 Refer to demolition requirements specified in Section 20 05 35 entitled Demolition and Revision Work.

3.02 PIPING INSTALLATION REQUIREMENTS

- .1 Provide required domestic water piping.
- .2 Piping, unless otherwise specified, is as follows:
 - .1 for 12 mm (1/2") dia. trap seal primer tubing located underground or in concrete or masonry construction – semi-rigid polyethylene;
 - .2 for pipe inside building and aboveground in sizes to 100 mm (4") dia. – Type "L" hard copper with solder joints or Type "L" hard copper with pressure coupled mechanical joints.
- .3 Lay pipes true to line and grade with bells up/grade. Fit sections together so that, when complete, pipe has a smooth and uniform invert. Keep pipe thoroughly clean so jointed compound will adhere. Inspect pipe for defects before being lowered into trench.
- .4 Slope piping so it can be completely drained.
- .5 Provide cast brass dielectric type adapters/unions at connections between ferrous and copper pipe or equipment.

3.03 INSTALLATION OF SHUT-OFF AND CHECK VALVES

- .1 Refer to Part 3 of Section 20 05 10 entitled Basic Mechanical Materials and Methods.

- .2 For shut off valves installed on solder joint copper piping up to and including 75 mm (3") diameter, provide ball type valves, and for flanged joints copper or stainless steel piping larger than 75 mm (3") diameter provide butterfly type valves.

3.04 INSTALLATION OF DRAIN VALVES

- .1 Provide a drain valve at the bottom of domestic water piping risers, at other piping low points, and wherever else shown.
- .2 Locate drain valves so they are easily accessible.

3.05 INSTALLATION OF PARTITION STOPS

- .1 Provide partition stops in domestic water piping to each group of suite washroom plumbing fixtures. Locate partition stops in piping near floor level in inconspicuous but accessible locations. Confirm exact locations prior to roughing-in.

3.06 INSTALLATION OF TRAP SEAL PRIMERS

- .1 Provide required accessible trap seal primers to automatically maintain a water seal in floor drain traps, whether shown on drawings or not.
- .2 Water closet flush valves may be used for priming washroom floor drain traps if flush tube is properly tapped and primer tubing exposed in washroom is chrome plated.
- .3 Ensure trap primer piping is secured to floor drain primer tapings and not terminated through the tapping in the throat of the drain.

3.07 INSTALLATION OF SHOCK ABSORBERS

- .1 Provide accessible shock absorbers in domestic water piping.
- .2 Ensure size of each shock absorber is properly selected to suit size of domestic water pipe and equipment pipe is connected to.

3.08 INSTALLATION OF WATER HAMMER ARRESTORS

- .1 Provide accessible water hammer arrestors in domestic water piping in locations as follows:
 - .1 in headers at groups of plumbing fixtures;
 - .2 at top of risers;
 - .3 at ends of long horizontal runs of piping;
 - .4 in piping connecting solenoid valves or equipment with integral solenoid valves;
 - .5 wherever else shown or required by the Ontario Building Code.
- .2 Install each unit in a piping tee either horizontally or vertically in the path of potential water shock in accordance with manufacturer's instructions and details.

3.09 INSTALLATION OF LAVATORY SUPPLY FITTING TEMPERING VALVES

- .1 Provide thermostatic water tempering valves for hot water supply to public washroom lavatory supply fittings. Conceal valves and piping.
- .2 Provide a flush wall mount panel for each valve. Confirm exact location prior to roughing-in.
- .3 Install in accordance with manufacturer's instructions and set mixing valves to deliver 32°C (90°F) tempered water.

3.10 INSTALLATION OF AIR VENTS

- .1 Provide accessible air vents in domestic water piping to prevent air binding.
- .2 Extend copper indirect drain piping from top drain connection of each vent to nearest suitable drain.
- .3 Locate exact vent locations on as-built record drawings.

3.11 FLUSHING AND DISINFECTING PIPING

- .1 Flush and disinfect all new and/or reworked domestic water piping after leakage testing is complete.
- .2 Isolate new piping from existing piping prior to flushing and disinfecting procedures.
- .3 Flush piping until all foreign materials have been removed and flushed water is clear. Provide connections and pumps as required. Open and close valves, faucets, hose outlets, and service connections to ensure thorough flushing.
- .4 When flushing is complete, disinfect the piping with a solution of chlorine in accordance with AWWA C601.
- .5 When disinfecting is complete, submit water samples to a certified laboratory for purity testing and, when testing indicates pure water in accordance with governing standards, submit a copy of test results and fill the systems.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

- .1 Submit Shop Drawings/product data sheets for all products specified in this Section except pipe and fittings.
- .2 Submit a copy of plumbing inspection certificate prior to application for Substantial Performance of the Contract.

2 PRODUCTS

2.01 PIPE, FITTINGS AND JOINTS

- .1 PVC Sewer
 - .1 DR35 rigid, green PVC hub and spigot pattern sewer pipe and fittings to CAN/CSA B182.2, with gasket joints assembled with pipe lubricant.
 - .2 DR35 rigid, PVC sewer pipe and fittings, with solvent weld joints, all certified to CSA B182.1 and colour-coded as per local governing codes, regulations and standards.
- .2 PVC - DWV (Drain, Waste, and Vent)
 - .1 Equivalent to Ipex System XFR 15-50 rigid PVC drain, waste and vent pipe and fittings to CAN/CSA B181.2, complete with a flame spread rating less than 25 and a smoke developed rating less than 50 when tested to CAN/ULC S102.2, solvent weld joints, and, for fire barrier penetration, approved firestop conforming to CAN/ULC S115.
- .3 Copper - Solder Joint
 - .1 Type DWV hard temper to ASTM B306, with forged copper solder type drainage fittings and 50% lead - 50% tin solder joints.
- .4 Cast Iron
 - .1 Class 4000 cast iron pipe, fittings, and mechanical coupling joints to CAN/CSA B70.
- .5 Copper - Victaulic Coupling Joint
 - .1 Type DWV hard temper to ASTM B306, with factory or site rolled grooved ends (with grooving rolls designed for copper) and Victaulic "Copper Connection" or Equivalent wrought copper or cast bronze fittings and Style 606 gasket type couplings.

2.02 CLEANOUTS

- .1 Horizontal Piping
 - .1 TY (tee-wye) pipe fitting with an extra heavy brass plug screwed into the fitting.

.2 Vertical Piping

- .1 Bronze or copper cleanout tees in copper piping, each complete with a bronze ferrule, and, for cast iron piping, "BARRETT" type cast iron cleanout tees, each gas and water-tight and complete with a bolted cover.

.3 Urinal(s)

- .1 Wall access cleanout assemblies, each complete with a tapered plug, threaded brass insert, urethane rubber seal, and polished stainless steel access cover with vandal-proof stainless steel securing screw.
- .2 Acceptable products are:
 - .1 Watts Industries (Canada) Ltd. #CO-590-RD;
 - .2 Jay R. Smith #SQ4-1819;
 - .3 Zurn #ZSS-1666-1;
 - .4 Mifab #C1440-RD.
 - .5 Or Equivalent

2.03 FLOOR CLEANOUT TERMINATIONS

- .1 Factory finished cast iron terminations, each adjustable and complete with a cast iron body with neoprene sleeve, solid, gasketed, polished nickel-bronze scoriated top access cover to suit floor finish, a seal plug, and captive, vandal-proof, stainless steel securing hardware.
- .2 Acceptable products are:
 - .1 Watts Industries (Canada) Ltd. # CO-200-R-1;
 - .2 Jay R. Smith #4020-F-C Series;
 - .3 Zurn # ZN-1602-SP Series;
 - .4 Mifab # C1100-XR-1 or #C1000-R-3.
 - .5 Or Equivalent
- .3 Cleanout terminations in areas with a tile or sheet vinyl floor finish are to be as above but with a square top in lieu of a round top.

2.04 FLOOR DRAINS, FUNNEL FLOOR DRAINS AND HUB DRAINS

- .1 Unless otherwise specified or indicated, floor drains are to be vandal-proof drains in accordance with drawing symbol list, each complete with a cast iron body and a trap seal primer connection. Cast iron components are to be factory finished with latex based paint coating.
- .2 Floor drains in areas with a tile or sheet vinyl floor finish are to be as above but with a square grate in lieu of a round grate.

.3 Acceptable manufacturers are:

- .1 Watts Industries (Canada) Ltd.;
- .2 Jay R. Smith Manufacturing Co.;
- .3 Zurn Industries Ltd.;
- .4 Mifab Inc.
- .5 Or Equivalent

3 EXECUTION

3.01 DEMOLITION

- .1 Refer to demolition requirements specified in Section 20 05 35 entitled Demolition and Revision Work.

3.02 DRAIN AND VENT PIPING INSTALLATION REQUIREMENTS

- .1 Provide required drainage and vent piping. Pipe, unless otherwise specified, as follows:
 - .1 for pipe inside building and aboveground in sizes less than or equal to 65 mm (2-½") dia. – type DWV copper;
 - .2 for pipe inside building and aboveground in sizes greater than or equal to 75 mm (3") dia. – Class 4000 cast iron;
 - .3 for pipe inside building and aboveground in lieu of type DWV copper and cast iron, at your option and where permitted by the Town of Newmarket building department and the Ontario Building Code – rigid PVC DWV;
- .2 Unless otherwise specified, slope horizontal drainage piping aboveground in sizes to and including 75 mm (3") dia. 25 mm (1") in 1.2 m (4'), and pipe 100 mm (4") dia. and larger 25 mm (1") in 2.4 m (8').
- .3 Install and slope underground drainage piping to inverts or slopes indicated on drawings to facilitate straight and true gradients between points shown. Verify available slopes before installing pipes.
- .4 Unless otherwise specified, slope horizontal branches of vent piping down to fixture or pipe to which they connect with a minimum pitch of 25 mm (1") in 1.2 m (4').
- .5 Extend vent stacks up through roof generally where shown but with exact locations to suit site conditions and in any case a minimum of 3 m (10') from fresh air intakes. Terminate vent stacks a minimum of 330 mm (13") above roof (including roof parapets) in vent stack covers. Where not shown on drawings, route vent piping from source to building exterior as required in order to satisfy local governing codes and authority. Coordinate vent routing with other building services and ensure there is no architectural impact.
- .6 Provide cast brass dielectric unions at connections between copper pipe and ferrous pipe or equipment.

3.03 INSTALLATION OF CLEANOUTS

- .1 Provide cleanouts in drainage piping in locations as follows:
 - .1 in building drain or drains as close as possible to inner face of outside wall, and, if a building trap is installed, locate cleanout on downstream side of building trap;
 - .2 at or as close as practicable to the foot of each drainage stack;
 - .3 at maximum 15 m (50') intervals in horizontal pipe 100 mm (4") dia. and smaller;
 - .4 at maximum 30 m (100') intervals in horizontal pipe larger than 100 mm (4") dia.;
 - .5 in the wall at each new urinal or bank of urinals in a washroom;
 - .6 wherever else shown on Drawings.
- .2 Cleanouts are to be same diameter as pipe in piping to 100 mm (4") dia., and not less than 100 mm (4") dia. in piping larger than 100 mm (4") dia.
- .3 Where cleanouts in vertical piping are concealed behind walls or partitions, install cleanouts near floor and so cover is within 25 mm (1") of the finished face of the wall or partition.

3.04 INSTALLATION OF FLOOR CLEANOUT TERMINATIONS

- .1 Where cleanouts occur in horizontal inaccessible underground piping, extend cleanout TY fitting up to floor, and provide a cleanout termination set flush with finished floor.
- .2 In waterproof floors, ensure each cleanout termination is equipped with a flashing clamp device. Cleanout terminations are to suit floor finish.
- .3 Where cleanout terminations occur in finished areas, confirm locations prior to rough-in and arrange piping to suit.
- .4 Ensure cleanout termination covers in tiled floor are square in lieu of round.

3.05 INSTALLATION OF FLOOR DRAINS, FUNNEL FLOOR DRAINS AND HUB DRAINS

- .1 Provide floor drains, funnel floor drains and hub drains.
- .2 Coordinate location of floor drains, funnel floor drains and hub drains with equipment provided under Mechanical Division. Install in accordance with manufacturer's instructions.
- .3 Equip each drain with a trap.
- .4 In equipment rooms and similar areas, exactly locate floor drains to suit location of mechanical equipment and equipment indirect drainage piping. In washrooms, exactly locate floor drains to avoid interference with toilet partitions.
- .5 Confirm exact location of drains prior to roughing in. Where floor drains occur in washrooms coordinate locations with toilet partition installations.

- .6 Temporarily plug and cover floor drains during construction procedures. Remove plugs and covers during final clean-up work and when requested, demonstrate free and clear operation of each drain. Replace any damaged grates, and refinish any areas of the drain where cast iron finish has been damaged or removed, including rusted areas.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

- .1 Submit product data sheets (fixture cuts) for all plumbing fixtures and fittings.

2 PRODUCTS

2.01 GENERAL RE: PLUMBING FIXTURES AND FITTINGS

- .1 Fixtures and fittings, where applicable, are to be in accordance with requirements of CAN/CSA B45 Series, General Requirements for Plumbing Fixtures, including supplements, ASME A112.1.18.1/CSA B125.1, Plumbing Supply Fittings, and CSA B125.3, Plumbing Fittings.
- .2 Barrier-free fixtures and fittings are to be in accordance with the Ontario Building Code requirements.
- .3 Unless otherwise specified, vitreous china, porcelain enamelled, and acrylic finished fixtures are to be white.
- .4 Unless otherwise specified, fittings and piping exposed to view are to be chrome plated and polished.
- .5 Fittings located in areas other than private washrooms are to be vandal-proof.
- .6 Fixture carriers are to be suitable in all respects for the fixture they support and construction in which they are located.
- .7 Floor flanges for floor mounted water closets are to be cast iron or brass, secured to floor to prevent movement and complete with a wax seal and brass or stainless steel bolts, nuts, and washers. Plastic floor flanges will not be acceptable.
- .8 Proper seal to mate with fixture carrier flange and produce a water-tight installation.
- .9 Exposed traps for fixtures not equipped with integral traps, such as lavatories, are to be adjustable chrome plated cast brass "P" traps with cleanouts, minimum #17 gauge chrome plated tubular extensions, and chrome plated escutcheons, all to suit fixture type and drain connection.
- .10 Concealed traps for fixtures not equipped with integral traps, such as counter sinks, are to be adjustable cast brass with cleanout plugs, all to suit fixture type and drain connection.
- .11 Exposed supplies for fixtures which do not have supply trim/fittings with integral stops, i.e. lavatories, are to be solid chrome plated brass angle vales with screwdriver stops for public areas, wheel handle stops for private areas, flexible stainless steel risers, and stainless steel or chrome plated steel escutcheons, all arranged and sized to suit fixture.
- .12 Water piping as specified, complete with ball type shut-off valves as specified with water piping, or Dahl Bros. Canada Ltd. or Equivalent ¼ turn Mini Ball Valves.

2.02 PLUMBING FIXTURES AND FITTINGS

- .1 Refer to mechanical Drawings for plumbing fixture schedules.

2.03 ACCEPTABLE MANUFACTURERS

- .1 Subject to compliance with requirements, manufacturers that may be incorporated into the Work include, but are not limited to, following:

.1 Flush Valves:

- .1 Sloan;
- .2 Delta Commercial;
- .3 Zurn Industries;
- .4 Moen Commercial.
- .5 Or Equivalent

.2 Plumbing Brass:

- .1 Sloan;
- .2 Acorn Engineering;
- .3 American Standard;
- .4 Delta Commercial;
- .5 Chicago Faucet;
- .6 Moen Commercial.
- .7 Or Equivalent

.3 Drain Fittings, Angle Supplies, and Traps:

- .1 McGuire;
- .2 American Standard;
- .3 Delta Commercial;
- .4 Zurn Industries.
- .5 Or Equivalent

.4 Fixture Carriers:

- .1 Watts Industries;
- .2 Jay R. Smith;
- .3 Zurn Industries.
- .4 Or Equivalent

.5 Water Closets, Lavatories, and Urinal:

- .1 American Standard;
- .2 Zurn Industries;
- .3 Kohler.
- .4 Or Equivalent

.6 Thermostatic Mixing Valves:

- .1 Lawler;
- .2 Delta Commercial;
- .3 Leonard.
- .4 Or Equivalent

.7 Toilet Seats:

- .1 Centoco;
- .2 Bemis Commercial.
- .3 Or Equivalent

.8 Electronic "No Touch" Faucets:

- .1 Sloan;
- .2 Delta Commercial;
- .3 Zurn Industries;
- .4 Moen Commercial.
- .5 Or Equivalent

2.04 CAULKING

- .1 General Electric Series SCS-1200 Silicone Construction Sealant or Dow Corning 780 or Equivalent silicone rubber sealant with primers as recommended by sealant manufacturer. Caulking colour(s) for coloured fixtures other than white, if any, will be selected by Consultant from sealant manufacturer's standard colour range.

3 EXECUTION

3.01 DEMOLITION

- .1 Refer to demolition requirements specified in Section 20 05 35 - Demolition and Revision Work.

3.02 INSTALLATION OF PLUMBING FIXTURES AND FITTINGS

- .1 Provide required plumbing fixtures and fittings.
- .2 Where new fixtures and fittings are to be connected to existing piping, include for required piping revisions.
- .3 Connect plumbing fixtures and fittings with piping sized in accordance with drawing schedule. Refer to manufacturer's published connection (rough-in) requirements. Where manufacturer requires piping connection larger than shown below, provide piping accordingly:

FIXTURE AND/OR FITTING	DRAIN SIZE MM (IN.)	VENT SIZE MM (IN.)	DHW SIZE MM (IN.)	DCW SIZE MM (IN.)	TEMP WATER SIZE MM (IN.)
Water Closets Flush Valve Type	100 (4)	38 (1-½)	-----	25 (1)	-----
Urinals	75 (3)	38 (1-½)	-----	25 (1)	-----
Lavatories	32 (1-¼)	32 (1-¼)	12 (½)	12 (½)	-----
Lavatories (Electronic Faucet)	32 (1-¼)	32 (1-¼)	12 (½)	12 (½)	12 (½)
Counter Sinks	38 (1-½)	32 (1-¼)	12 (½)	12 (½)	-----
Shower Valves and Heads	-----	-----	12 (½)	12 (½)	12 (½)
Shower Stalls	50 (2)	38 (1-½)	12 (½)	12 (½)	12 (½)
Prefab. Mop Sinks with Drain	75 (3)	38 (1-½)	20 (¾)	20 (¾)	-----
Emergency Eye Wash	-----	-----	-----	-----	12 (½)
Emergency Shower	-----	-----	-----	-----	25 (1)

- .4 Confirm exact location of plumbing fixtures and trim prior to roughing-in. Refer to architectural plan and elevation Drawings.
- .5 When installation is complete, check, and test operation of each fixture and fitting. Adjust or repair as required.
- .6 For barrier-free fixtures, comply with mounting height and other requirements of governing Code(s).
- .7 Supply templates for counter mounted fixtures and trim and hand to trades who will cut the counter. Ensure openings in counter are properly located.

- .8 Locate control panels for electronic faucets under lavatories and recessed into wall. Coordinate panel installations with electrical trade who will provide 115 volt power wiring to panels. Install flexible conduit (supplied with box) and extend cord from faucet through the flexible conduit to control box. Connect hot and cold water piping to mixing valve in each box, and tempered water piping from each mixing valve to faucet. Set mixing valve maximum temperature limit stops to 43°C (110°F) after domestic water systems (hot and cold) are complete. Ensure each programmable controller is properly programmed and water off after deactivation is set for 3 seconds.
- .9 For electronic flush valves, locate transformer in ceiling space above electronic units to be served. Coordinate locations with electrical trade who will provide 120 volt line supply to transformers. Provide low voltage wiring from transformers to each electronic flush valve terminal point. Electrical line supply and low voltage wiring is to be concealed and access to transformer must be provided for servicing.

3.03 CAULKING AT PLUMBING FIXTURES AND FITTINGS

- .1 Caulk around plumbing fixtures and fittings where they contact walls, floors, and any other building surface.
- .2 Clean areas/surfaces to be caulked and prime in accordance with sealant manufacturer's instructions. Where damage to a building surface may occur, mask surface to prevent damage and ensure a clean exact edge to the caulking bead.
- .3 Apply caulking using a gun with proper size and shape of nozzle and force sealant into joints to ensure good surface contact and a smooth and even finished bead of sealant.
- .4 If joints have been masked sealant may be tooled in a continuous stroke to obtain complete void filling. Remove masking tape immediately after tooling and before sealant begins to skin.

3.04 DISHWASHER CONNECTIONS

- .1 Provide roughed-in water and drain connections for York Region supplied dishwasher consisting of:
 - .1 15 mm (½") dia. domestic hot water connection with a Dahl "Mini-Ball" or Equivalent valve with hose end and water hammer arrestor;
 - .2 40 mm (1-½") dia. DWV (Drain, Waste, and Vent) copper drain connection with "P" trap and cleanout plug.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

- .1 Submit Shop Drawings/product data sheets for all products specified in this Section except shop fabricated ductwork and fittings.
- .2 Include capacity, throw and terminal velocity, noise criteria, and pressure drops with grille and diffuser shop drawing/product data sheet submission.
- .3 Submit proper installation certification from fire rated duct manufacturer as specified in Part 3 of this Section.
- .4 Supply and hand to York Region at Substantial Performance of the Contract, a minimum of 10 identified (with tags) grille/diffuser volume control damper adjustment keys.

1.02 QUALITY ASSURANCE

- .1 Grilles and diffusers are to be tested and performance certified to ANSI/ASHRAE 70, Method of Testing the Performance of Air Outlets and Air Inlets.

2 PRODUCTS

2.01 GALVANIZED STEEL DUCTWORK

- .1 Galvanized steel sheet is to be hot dipped in accordance with requirements of ASTM A653. G60 galvanizing for bare uncovered duct to be finish painted. G90 for all other galvanizing.
- .2 Rectangular
 - .1 Lock forming grade hot dip galvanized steel, ASTM A653, shop fabricated, minimum #26 gauge.
- .3 Round
 - .1 Factory machine fabricated, spiral, mechanically locked flat seam, single wall duct, fittings and couplings.
- .4 Flat Oval
 - .1 Factory machine fabricated, single wall, 4-ply spiral lock seam duct, fittings and couplings.

2.02 FLEXIBLE METALLIC DUCTWORK

- .1 Bare
 - .1 Spirally wound, semi-rigid, self-supporting corrugated aluminum duct with continuous triple lock seams, SMACNA Form "M-UN", ULC S110 listed and labelled as a Class 1 Air Duct, constructed of dead soft aluminum strip, and supplied in 3 m (10') lengths.

.2 Insulated

- .1 Spirally wound, semi-rigid, self-supporting corrugated aluminum duct with continuous triple lock seams, SMACNA Form "M-I", ULC S110 listed and labelled as a Class 1 Air Duct, constructed of dead soft aluminum strip, supplied in 3 m (10') lengths and factory covered with 40 mm (1-½") thick, 12 kg/m³ (0.75 lb/ft³) density fibreglass insulation with a vinyl jacket meeting 25/50 flame spread and smoke developed requirements tested in accordance with CAN/ULC S102.

2.03 FLEXIBLE CONNECTION MATERIAL

- .1 Waterproof, indoor-outdoor type flexible connection material meeting requirements of NFPA 90A, consisting of woven glass fibre fabric coated on both sides with synthetic rubber. Acceptable products are:
 - .1 Duro Dyne Canada Inc. "DUROLON";
 - .2 Dyn Air Inc. "HYPALON".
 - .3 Or Equivalent

2.04 METAL DUCT SYSTEM JOINT SEALANT

- .1 ULC listed and labelled, premium grade, grey colour, water base, non-flammable duct sealer, brush, or gun applied, with a CAN/ULC S102 tested maximum flame spread rating of 5 and smoke developed rating of 0.
- .2 Acceptable manufacturers are:
 - .1 Johns Manville;
 - .2 Manson Insulation;
 - .3 Knauf Insulation.
 - .4 Or Equivalent

2.05 ACOUSTIC LINING

- .1 Minimum 25 mm (1") thick acoustic lining material meeting 25/50 flame spread and smoke developed ratings tested in accordance with CAN/ULC S102, meeting NFPA 90A, ASTM C1071, and ASTM G21 requirements, not supporting microbial growth, flexible for round ducts, board type for rectangular ducts, consisting of a bonded fiberglass mat coated on inside (airside) face with a black fire-resistant coating.
- .2 Acceptable manufacturers are:
 - .1 Johns Manville;
 - .2 Manson Insulation;
 - .3 Knauf Insulation.
 - .4 Or Equivalent

2.06 ROUND TO RECTANGULAR DUCT CONNECTIONS

- .1 Equivalent to Flexmaster Canada Ltd. galvanized steel, flared, flanged or notched "Spin-On" round duct take-off collars with locking dampers in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible.

2.07 SPLITTER DAMPERS

- .1 Minimum #20 gauge damper blade constructed of same material as duct, reinforced as required to suit blade size, system velocity, and to prevent "chatter", and complete with operating hardware equivalent to DynAir Inc. #Q-50 "DYN-A-QUAD S-S" quadrant regulator with RW-50 backup washers to prevent leakage, long square bearing pin, and slide pin.

2.08 MANUAL BALANCING (VOLUME) DAMPERS

- .1 Flanged and drilled, single or parallel blade (depending on damper size) manual balancing dampers, each constructed of same material as connecting ductwork unless otherwise specified, each designed to maintain internal free area of connecting duct, and each complete with:
 - .1 hexagonal or square shaft extension through frame;
 - .2 non-stick, non-corrosive synthetic bearings for rectangular dampers, flange stainless steel bearings for round dampers;
 - .3 blade stops for single blade dampers, designed to prevent blade from moving more than 90°;
 - .4 linkage for multiple blade dampers;
 - .5 locking hand quadrant damper operator with, for insulated ducts 50 mm (2") standoff mounting.
- .2 Rectangular Dampers: Nailor Industries Inc. 1800 Series, maximum size 1.2 m x 1.2 m (4' x 4') for a single damper.
- .3 Round Dampers: Nailor Industries Inc. Model 1890, maximum 600 mm (24") diameter, equipped with a minimum 200 mm (8") deep frame, and blade stiffeners where required.
- .4 Multiple Rectangular Damper Section Assembly: Rectangular assembly supplied with the dampers or site constructed, of same material as damper and designed for tight and secure mounting of individual dampers.
- .5 Acceptable manufacturers are:
 - .1 Nailor Industries Inc.;
 - .2 T.A. Morrison & Co. Inc. "TAMCO";
 - .3 NCA Manufacturing Ltd.;
 - .4 Greenheck Fan Corp.;
 - .5 Ruskin Co.

- .6 Or Equivalent

2.09 BACKDRAFT DAMPERS

- .1 Nailor Industries Model 1370CB or Equivalent counterbalanced backdraft dampers, vertical or horizontal mounting, 50 mm (2") wide, sized as shown and complete with:
 - .1 extruded 6063-T5 aluminum frame, 2.3 mm (0.090") nominal wall thickness, with mitred corners;
 - .2 extruded 6063-T5 aluminum blades, 1.3 mm (0.050") nominal wall thickness on 92 mm (3-5/8") centres, and with extruded PVC blade seals;
 - .3 corrosion-resistant synthetic bearings;
 - .4 adjustable plated steel counterweights mounted internally in the airstream;
 - .5 concealed blade linkage located out of the airstream.
- .2 Acceptable manufacturers are:
 - .1 Nailor Industries Inc.;
 - .2 T.A. Morrison & Co. Inc. "TAMCO";
 - .3 NCA Manufacturing Ltd.;
 - .4 Greenheck Fan Corp.;
 - .5 Ruskin Co.
 - .6 Or Equivalent

2.10 FUSIBLE LINK DAMPERS

- .1 Curtain blade type, dynamic, galvanized steel (unless otherwise specified) fusible link dampers, ULC classified to CAN/ULC S112 and in accordance with NFPA 90A requirements, factory tested for closure under airflow, 1-1/2 hour or 3 hour rated as required, and complete with a constant force type 301 stainless steel closure spring, a blade lock assembly, a steel sleeve, retaining angles, and, unless otherwise specified, a 74°C (165°F) rated standard fusible link.
- .2 Fusible link dampers are to be Type "B" or Type "C" (as required) with folded curtain blade out of air stream except where damper size or location requires use of type "A" dampers with curtain blade in air stream.
- .3 Acceptable manufacturers are:
 - .1 Nailor Industries Inc.;
 - .2 Greenheck Fan Corp.;
 - .3 NCA Manufacturing Ltd.;
 - .4 Ruskin Co.;

.5 Price Industries (E.H. Price).

.6 Or Equivalent

2.11 DUCT ACCESS DOORS

- .1 In accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible, with sizes suitable in all respects for purpose for which they are provided, and, unless otherwise specified, constructed of same material as duct they are associated with.

2.12 WIRE MESH (BIRDSCREEN)

- .1 Heavy-gauge galvanized steel or aluminum mesh, 12 mm x 12 mm ($\frac{1}{2}$ " x $\frac{1}{2}$ ") secured in a rigid galvanized steel or aluminum framework, sized as indicated on Drawings, and constructed to be removable.

2.13 FIRE STOP FLAPS AND THERMAL BLANKET MATERIAL

- .1 Rectangular or round, ULC listed and labelled, blade type galvanized steel fire stop flaps in accordance with CAN/ULC S112, Standard Methods of Fire Test of Fire-Damper Assemblies and CAN/ULC S112.2, Standard Method of Fire Test of Ceiling Firestop Flap Assemblies, each complete with #22 gauge G60 galvanized steel blade(s) and frame, a 74°C (165°F) fusible link, and, for dampers 300 mm (12") and larger, ceramic fibre insulation on both sides of the blades.
- .2 Ceramic fibre material in accordance with 25/50 flame spread/smoke developed ratings when tested to CAN/ULC S102 and of a thickness to suit required fire rating.

2.14 GRILLES AND DIFFUSERS

- .1 Grilles and diffusers of type, size, capacity, finish, and arrangement as shown on Drawings and in accordance with drawing schedule, each equipped with all required mounting and connection accessories to suit mounting location and application.
- .2 Acceptable manufacturers are:
 - .1 Price Industries Inc.;
 - .2 Anemostat;
 - .3 Krueger Division of Air System Components Inc.;
 - .4 Titus;
 - .5 Nailor Industries Inc.;
 - .6 Tuttle & Bailey.
 - .7 Or Equivalent

3 EXECUTION

3.01 CLEANLINESS REQUIREMENTS FOR HANDLING AND INSTALLATION OF DUCTWORK

- .1 Handle and install ductwork in accordance with SMACNA's Duct Cleanliness for New Construction Guidelines at the Advanced Level.

3.02 FABRICATION AND INSTALLATION OF GALVANIZED STEEL DUCTWORK

- .1 Provide required ductwork, rectangular, round and/or flat oval. Where rectangular ductwork is shown, round or flat oval ductwork of equivalent cross-sectional area is acceptable.
- .2 All duct dimensions shown on Drawings are clear internal dimensions.
- .3 Variable air volume ductwork from supply fans to boxes is as above but rectangular duct take-offs are double side straight taper type with a take-off length equal to 0.5 times the branch duct width but minimum 150 mm (6") length, and double taper side is to have an included angle of minimum 60°.
- .4 Confirm routing of all ductwork at site and site measure ductwork prior to fabrication. Duct dimensions may be revised to suit site routing and building element requirements, if dimension revisions are reviewed with and approved by Consultant. Duct routing and/or dimension revisions to suit conditions at site are not grounds for a claim for an extra cost.
- .5 Refer to structural Drawings. Where ductwork is to be run within or through open web steel joists, ductwork shown on mechanical drawings is schematic only and is to be altered as required to suit steel joist configuration, spacing, panel points, and cross-bridging at no additional cost.
- .6 Wherever ductwork is required at locations where sprayed fireproofing is applied to building construction, install ductwork only after fireproofing work is complete and do not compromise fire rating of sprayed fireproofing.
- .7 Install (but do not connect) duct system mounted automatic control components supplied as part of the automatic control work.
- .8 Where indicated, provide duct connections to fan powered heat transfer equipment with integral coils.
- .9 Flange connect ductwork to hot water reheat coils in accordance with requirements of ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible. Coils will be suspended independent of connecting ductwork as part of the heat transfer work.
- .10 Support horizontal rectangular ducts inside building in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible, but use trapeze hangers with, unless otherwise specified, galvanized steel channels, and galvanized steel hanger rods for exposed ducts and concealed ducts wider than 500 mm (20"). Support hardware constructed of same material as duct for metal duct, and, unless otherwise specified, type 316 stainless steel for non-metal duct. Supports for "heavy" duct such as cementitious core duct is to be suitable in all respects for the application and approved by Consultant.

- .11 Support round and flat oval ducts inside building in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible, but, unless otherwise specified, for both uninsulated and insulated ducts exposed in finished areas, use bands and secure at top of duct to a hanger rod, all similar or Equivalent to Ductmate Canada Ltd. type "BA". If duct is insulated, size strap to suit diameter of insulated duct. Unless otherwise specified, duct support hardware for metal duct is constructed of same material as duct, and for non-metal duct, type 316 stainless steel.
- .12 Where flanged duct joints are used, do not locate joints in wall or slab openings, or immediately at wall or slab openings. Do not use flanged joints for exposed uninsulated ducts in finished areas.
- .13 Seal all ductwork in accordance with SMACNA Seal Class "A", except for round duct with self-sealing gasketed fittings and couplings which does not require site applied sealant. Apply sealants by brush or gun to cleaned metal surfaces. Where bare ductwork is exposed apply neat uniform lines of sealant. Randomly brushed, sloppy looking sealant applications will be rejected and must be repaired or replaced with a neat application of sealant.
- .14 Apply sealants by brush or gun to cleaned metal surfaces. Where bare ductwork is exposed apply neat uniform lines of sealant. Randomly brushed, sloppy looking sealant applications will be rejected and must be repaired or replaced with a neat application of sealant.

3.03 INSTALLATION OF FLEXIBLE DUCTWORK

- .1 Provide maximum 3 m (10') long lengths of flexible ductwork for connections between galvanized steel duct mains and branches, and necks of ceiling grilles and diffusers. Do not install flexible ductwork through walls, even if shown on Drawings.
- .2 At rectangular galvanized steel duct, accurately cut holes and provide flanged or "Spin-in" round flexible duct connection collars. Seal joints with duct sealer.
- .3 Install flexible ducts as straight as possible and support in accordance with requirements of ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible, and secure at each end with nylon or stainless steel gear type clamps, and seal joints. Provide long radius duct bends where they are required.
- .4 Do not penetrate fire barriers with flexible duct.

3.04 INSTALLATION OF ACOUSTIC LINING

- .1 Provide acoustic lining in ductwork in locations as follows:
 - .1 wherever shown and/or specified on drawings;
 - .2 supply ductwork downstream of air terminal boxes for a distance of 2.4 m (8') measured along duct and outward from box in all directions;
 - .3 all transfer air ducts.

- .2 Install lining in accordance with requirements of ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible, however, for all installations regardless of velocity, at leading and trailing edges of duct liner sections, provide galvanized steel nosing channel in accordance with detail entitled Flexible Duct Liner Installation found in the ANSI/SMACNA manual referred to above.

3.05 INSTALLATION OF ROUND TO RECTANGULAR DUCT CONNECTIONS

- .1 Cut round holes in rectangular ducts and provide round to rectangular lock-in fittings with dampers for connection of flexible round ductwork.

3.06 INSTALLATION OF SPLITTER DAMPERS

- .1 Provide splitter dampers in supply ductwork at branch duct connections off supply air mains, and wherever else shown and/or specified on drawings. Install splitter dampers so they cannot vibrate and rattle and so damper operation mechanisms are in an easily accessible and operable location. Ensure operators for dampers in insulated ducts are equipped with stand-off mounting brackets.

3.07 INSTALLATION OF MANUAL BALANCING (VOLUME) DAMPERS

- .1 Provide manual balancing dampers as required to provide a fully balanced system, including but not limited to in all open end ductwork, in all duct mains, and wherever else shown and/or specified.
- .2 Install dampers so operating mechanism is accessible and positioned for easy operation, and so dampers cannot move or rattle. Ensure operating mechanisms for dampers in insulated ducts are complete with stand-off mounting brackets.
- .3 Confirm exact damper locations with personnel doing air quantity balancing testing work and install dampers to suit. Include for providing 5 additional dampers at no additional cost.

3.08 INSTALLATION OF BACKDRAFT DAMPERS

- .1 Provide backdraft dampers.
- .2 Install and secure dampers so they cannot move or rattle.

3.09 INSTALLATION OF FUSIBLE LINK DAMPERS

- .1 Provide fusible link dampers. Ensure damper rating (1-½ or 3 hr.) is suitable for fire barrier it is associated with.
- .2 Install dampers with retaining angles on all 4 sides of sleeve on both sides of damper and connect with ductwork in accordance with damper manufacturer's instructions and details, and Code requirements.
- .3 Provide expansion clearance between damper or damper sleeve and opening in which damper is required. Ensure openings are properly sized and located, and all voids between damper sleeve and opening are properly sealed to maintain rating of fire barrier.

3.10 INSTALLATION OF FLEXIBLE CONNECTION MATERIAL

- .1 Provide a minimum of 100 mm (4") of flexible connection material where ducts, plenums, and/or easings connect to fans, and wherever else shown or specified.
- .2 Rigidly secure a minimum of 75 mm (3") of duct material (minimum #24 gauge) to each edge of flexible fabric and to fan, duct, plenum, etc., in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible. Ensure connections to flexible fabric material are arranged and supported so as to not impose any external forces on the fabric.

3.11 INSTALLATION OF DUCT ACCESS DOORS

- .1 Provide access doors in ductwork for access to all components which will or may need maintenance and/or repair, including reheat coils. Install in accordance with requirements of ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible.
- .2 Identify access doors provided for fusible link damper maintenance with "FLD" stencil painted or marker type red lettering and ensure doors are properly located for damper maintenance.
- .3 When requested, submit a sample of proposed duct access doors for review.
- .4 Where sectionalized fusible link dampers and/or balancing dampers are provided in large ducts, provide a plenum type access door to suit, and adequately reinforce ductwork to suit access door installed.

3.12 INSTALLATION OF WIRE MESH (BIRDSCREEN)

- .1 Provide framed, removable wire mesh panels over openings in ducts and/or walls where shown and/or specified on drawings. Rigidly secure in place but ensure panels are removable.
- .2 Provide wire mesh panels for open-end return air ducts in ceiling spaces whether shown on drawings or not.

3.13 INSTALLATION OF FIRE STOP FLAPS AND THERMAL BLANKETS

- .1 Provide fire stop flaps in duct connection necks of grilles and diffusers installed in ULC fire rated suspended ceiling systems where shown on drawings.
- .2 Provide thermal blanket material to completely cover grille and/or diffuser pans above suspended ULC fire rated ceilings. Cut, install, and secure in place in accordance with manufacturer's instructions and ULC requirements.

3.14 INSTALLATION OF GRILLES AND DIFFUSERS

- .1 Provide grilles and diffusers. Wherever possible, grilles and diffusers are to be product of same manufacturer.
- .2 Unless otherwise specified connect grilles and diffusers in accordance with requirements of SMACNA HVAC Duct Construction Standards Metal and Flexible.

- .3 Exactly locate grilles and diffusers to conform to final architectural reflected ceiling plans and detailed wall elevations, and to conform to final lighting arrangement, ceiling layout, ornamental and other wall treatment.
- .4 Equip supply diffusers having a basic 4-way or all round air pattern for operation in 1-, 2-, or 3-way pattern where indicated on drawings.
- .5 Confirm grille and diffuser finishes prior to ordering.

3.15 DUCT SYSTEM PROTECTION, CLEANING AND START-UP

- .1 Temporarily cover all open ends of ducts during construction.
- .2 Remove all dirt and foreign matter from entire duct systems and clean duct system terminals and interior of air handling units prior to operating fans.
- .3 Prior to starting any supply air handling system provide 50 mm (2") thick glass fibre construction filters at fan equipment in place of permanent filters.
- .4 Provide cheesecloth over duct system inlets and outlets and run system for 24 hours, after which remove cheesecloth and construction filters, and install new permanent filters.
- .5 Include all labour for a complete Site walk-through with testing and balancing personnel following route of all duct systems to be tested, adjusted and balanced for the purpose of confirming proper position and attitude of dampers, location of pitot tube openings, and any other work affecting testing and balancing procedures. Perform corrective work required as a result of this walk-through.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

- .1 Submit Shop Drawings/product data sheets for fans and accessories. Include following:
 - .1 certified fan performance curves at specified operating point with flow, static pressure and horsepower (HP) clearly plotted;
 - .2 certified sound power data that conforms to specified levels;
 - .3 product data sheets for all accessories;
 - .4 product data sheets for fan motors.
- .2 Submit with delivery of each unit a copy of the factory inspection report, and include a copy of each report with Operations and Maintenance (O & M) Manual project close-out data.
- .3 Submit a Site inspection and start-up report from manufacturer's representative as specified in Part 3 of this Section.

1.02 QUALITY ASSURANCE

- .1 Fan manufacturers, as applicable, are to be current members of the Air Movement and Control Association International Inc. (AMCA), and fans are to be rated (capacity and sound performance) and certified in accordance with requirements of following standards:
 - .1 ANSI/AMCA Standard 210, Laboratory Method of Testing Fans for Certified Aerodynamic Performance Rating;
 - .2 AMCA Standard 211, Product Rating Manual for Fan Air Performance;
 - .3 ANSI/AMCA Standard 300, Reverberant Room Method for Sound Testing of Fans;
 - .4 AMCA Standard 311, Product Rating Manual for Fan Sound Performance;
 - .5 AMCA Standard 99-2408, Operating Limits for Centrifugal Fans.

2 PRODUCTS

2.01 CEILING MOUNTED FANS

- .1 ULC listed and labelled ceiling mounted centrifugal, AMCA rated and certified (capacity and sound to AMCA Standards 211 and 311), exhaust fans in accordance with drawing schedule, complete with:
 - .1 minimum #20 gauge galvanized steel housing equipped with duct connection collar(s), integral spring loaded aluminum backdraft damper, 12 mm (½") thick acoustic insulation meeting 25/50 flame spread/smoke developed ratings when tested in accordance with CAN/ULC S102, multi-position mounting brackets, and an integral CSA certified electrical receptacle in an outlet box for plug-in connection of fan motor;

- .2 low RPM, resiliently mounted, direct connected fan wheel and motor assembly with a forward curved, statically and dynamically balanced galvanized steel or calcium carbonate filled polypropylene centrifugal wheel direct connected to a 1-phase motor conforming to requirements specified in Section entitled Basic Mechanical Materials and Methods and equipped with a length of power cord and plug;
- .3 for fans as indicated and/or scheduled, a white calcium carbonate exhaust grille;
- .4 factory supplied accessories in accordance with drawing schedule, as follows:
 - .1 rectangular to round duct transitions;
 - .2 roof cap with backdraft damper and birdscreen;
 - .3 wall cap with backdraft damper and birdscreen.
- .2 Acceptable manufacturers are:
 - .1 Twin City Fan and Blower;
 - .2 Loren Cook Co.;
 - .3 Greenheck Fan Corp.;
 - .4 CML Northern Blower;
 - .5 PennBarry.
 - .6 Or Equivalent

3 EXECUTION

3.01 INSTALLATION OF CEILING FANS

- .1 Provide ceiling exhaust fans.
- .2 Secure suspended units in place from structure, level, and plumb, by means of vibration isolation spring hangers and galvanized steel hanger rods.
- .3 Plug fan motors into housing receptacles.
- .4 Supply exterior wall/roof discharge caps as indicated.
- .5 Hand roof caps to roof trade for installation and flashing into roof construction as part of roofing work.
- .6 Connect fan housings and discharges with ductwork.
- .7 Refer to Section 20 05 10 entitled Basic Mechanical Materials and Methods for equipment/system start-up requirements.

END OF SECTION

1 GENERAL

- .1 Engage base building controls provider to provide all wiring, programming, equipment, etc. as required to connect new equipment to the existing building automation system.

1.02 SUBMITTALS

- .1 Submit Shop Drawings/product data sheets for following:
 - .1 all control system components;
 - .2 identified schematic control diagrams with component identification, catalogue numbers, and sequence of operation for all systems;
 - .3 certified wiring diagrams for all systems.
- .2 Submit following samples for review:
 - .1 control damper section with linkage, operator, and certified flow and leakage data;
 - .2 wall mounting control system flow diagram as specified in Part 2 of this Section;
 - .3 each type of thermostat to be used, each identified as to intended use.
- .3 Submit a Site inspection and start-up report from manufacturer's representative as specified in Part 3 of this Section.
- .4 Submit written confirmation from control component manufacturer that site installation personnel are qualified and experienced in installation of components, and have parts and service availability on a 24/7 basis.

1.03 QUALITY ASSURANCE

- .1 Control systems are to be installed by control component manufacturer or by licensed personnel authorized by control component manufacturer. Submit written confirmation from control component manufacturer.
- .2 Control system installation company is to have local parts and service availability on a 24/7 basis.
- .3 Control wiring work is to be performed by licensed journeyman electricians, or under direct daily supervision of journeyman electricians.

2 PRODUCTS

2.01 LOCAL CONTROL PANELS

- .1 NEMA 1 (NEMA 2 in sprinklered areas) wall mounting, enamelled steel barriered enclosures sized to suit the application with 20% spare capacity, a perforated sub-panel, numbered terminal strips for all low and line voltage wiring, hinged door, and slotted flush latch.

2.02 CONTROL SYSTEM COMPONENTS

- .1 Components specified below are required for control of equipment and systems in accordance with drawing control diagrams and sequences of operation. Not all required components may be specified.
- .2 Sensor/transmitter input devices must be suitable in all respects for the application and mounting location. Devices are as follows:
 - .1 unless otherwise specified, temperature sensors are to be resistance type, either 2-wire 1000 ohm nickel RTD or 2-wire 1000 ohm platinum resistance temperature detector (RTD) with accuracy (includes errors associated with sensor, lead wire, and A to D conversion), equipped with type 316 stainless steel thermowells for pipe mounting applications, as follows:
 - .1 chilled water, room temperature, and duct temperature points, $\pm 1^{\circ}\text{C}$ ($\pm 0.5^{\circ}\text{F}$);
 - .2 all other points, $\pm 0.75^{\circ}\text{C}$ ($\pm 1.3^{\circ}\text{F}$).
 - .2 room temperature sensors constructed for surface or recessed wall box mounting, complete with an adjustable set-point reset slide switch with a $\pm 1.66^{\circ}\text{C}$ ($\pm 3^{\circ}\text{F}$) range, individual heating/cooling set-point slide switches as required, a momentary override request pushbutton for activation of after-hours operation, an analogue thermometer;
 - .3 outside air sensors designed and constructed for ambient temperatures and to withstand environmental conditions to which they are exposed, complete with a NEMA 3R enclosure, solar shield, and a perforated plate surrounding sensor element where exposed to wind velocity pressure;
 - .4 insertion duct mounting sensors type with lock nut and mounting plate, designed to mount in an electrical box (weather-proof with gasket and cover where outside) through a hole in duct;
 - .5 for ducts greater than 1.2 m (4') or for ducts where air temperature stratification occurs, averaging type sensors with multiple sensing points, and for plenums for applications such as mixed air temperature measurement to account for air turbulence and/or stratification, an averaging string of sensors with capillary supports on the sides of duct/plenum;
- .3 Thermostats:
 - .1 Match existing base building thermostats.
 - .2 Wall mounting adjustable set-point thermostats, each suitable in all respects for equipment (and operating sequence) they are provided for, equipped with a thermometer, a cover and any required mounting and connection accessories.
 - .3 Line voltage thermostats are to be 115 volt.
 - .4 Low voltage thermostats are to be 24 volt electronic type.

- .4 Hardware to permit building automation system control and monitoring of input/output points to the existing Building Automation System. All such hardware is to be suitable in all respects for interface with the existing building automation system.

2.03 SYSTEM WIRING MATERIALS

- .1 System wiring, conduit, boxes, and similar materials are to be in accordance with requirements specified in appropriate Section(s) of Electrical Work specification.

3 EXECUTION

3.01 DEMOLITION

- .1 Perform required control system demolition work.
- .2 Refer to demolition requirements specified in Section 20 05 35 entitled Demolition and Revision Work.

3.02 GENERAL RE: INSTALLATION OF CONTROLS

- .1 Provide complete systems of control and instrumentation to control and supervise building equipment and systems in accordance with this Section and drawings.
- .2 Control systems are to generally be as indicated on Drawing control diagrams and are to have all the elements therein indicated or implied.
- .3 Control diagrams show only the principal components controlling the equipment and systems. Supplement each control system with all relays, transformers, sensors, etc., required to enable each system to perform as specified and to permit proper operation and supervision.

3.03 INSTALLATION OF THERMOSTATS

- .1 Unless otherwise noted, provide required thermostats.
- .2 Provide a ventilated clear polycarbonate cover for each thermostat located in finished areas, and a wire type guard for each thermostat located in unfinished areas and in areas such as mechanical rooms where thermostat is subject to damage.
- .3 Unless otherwise indicated, mount room thermostats in accordance with requirements of local governing authority and, where applicable, barrier-free requirements. Review exact location of thermostats with Consultant prior to roughing-in.
- .4 Provide stand-off mounting and an insulated sub-base for thermostats on outside walls.
- .5 Perform control wiring associated with installation of electric or electric-electronic thermostats.

3.04 INSTALLATION OF CONTROL SYSTEM COMPONENTS

- .1 Provide required control system components and related hardware. Refer to Drawing control diagrams and sequences.

- .2 Where components are pipe, duct, or equipment mounted supply components at proper time, coordinate installation with appropriate trade, and ensure components are properly located and mounted.

3.05 CONTROL WIRING

- .1 Perform required control wiring work for control systems except:
 - .1 power wiring connections to equipment and panels, except as noted below;
 - .2 control wiring associated with mechanical plant equipment and systems whose control is not part of work specified in this Section;
 - .3 starter interlock wiring.
- .2 Except as specified below, install wiring in conduit. Unless otherwise specified, final 600 mm (2') connections to sensors and transmitters, and wherever conduit extends across flexible duct connections is to be liquid-tight flexible conduit.
- .3 Control wiring in ceiling spaces and wall cavities may be plenum rated cable installed without conduit but neatly harnessed, secured, and identified.
- .4 Wiring work is to be in accordance with certified wiring schematics and instructions, and wiring standards specified in appropriate Sections of Electrical Work Specification.

3.06 IDENTIFICATION AND LABELLING OF EQUIPMENT AND CIRCUITS

- .1 Refer to identification requirements specified in Section 20 05 10 entitled Basic Mechanical Materials and Methods.
- .2 Identify equipment as follows:
 - .1 enclosures and components: engraved laminated nameplates with wording listed and approved prior to manufacture of nameplates;
 - .2 wiring: numbered sleeves or plastic rings at both ends of conductor, with numbering corresponding to conductor identification on shop drawings and "as-built" record drawings.

3.07 TESTING, ADJUSTING, CERTIFICATION, START-UP, AND TRAINING

- .1 When control work is complete, check installation of components and wiring connections, make any required adjustments, and coordinate adjustments with personnel doing HVAC testing, adjusting and balancing work.
- .2 Refer to Section entitled Basic Mechanical Materials and Methods for equipment/system manufacturer certification requirements.
- .3 Refer to Section entitled Basic Mechanical Materials and Methods for equipment/system start-up requirements.
- .4 Include for 2 full, 8 hour days on-Site operation demonstration and training sessions. Training is to be a full review of all components including but not limited to a full operation and maintenance demonstration, with abnormal events.

- .5 Include for 2 follow-up Site training and troubleshooting visits, one 6 months after Substantial Completion and other at end of warranty period, both when arranged by York Region and for a full, 8 hour day to provide additional system training as required, and to demonstrate troubleshooting procedures.

END OF SECTION

1 GENERAL

1.01 REFERENCES

- .1 Division 00 and Division 01 apply to and are a part of this Section.

1.02 APPLICATION

- .1 This Section specifies requirements that are common to Mechanical Divisions work Sections and it is a supplement to each Section and is to be read accordingly. Where requirements of this Section contradict requirements of Divisions 00 or 01, conditions of Division 00 or 01 to take precedence.
- .2 Be responsible for advising product vendors of requirements of this Section.

1.03 DEFINITIONS

- .1 "concealed" – means hidden from normal sight in furred spaces, shafts, ceiling spaces, walls and partitions.
- .2 "exposed" – means work normally visible, including work in equipment rooms, service tunnels, and similar spaces.
- .3 "finished" - means when in description of any area or part of an area or a product which receives a finish such as paint, or in case of a product may be factory finished.
- .4 "provision" or "provide" (and tenses of "provide") – means supply and install complete.
- .5 "install" (and tenses of "install") – means secure in position, connect complete, test, adjust, verify and certify.
- .6 "supply" – means to procure, arrange for delivery to site, inspect, accept delivery and administer supply of products; distribute to areas; and include manufacturer's supply of any special materials, standard on site testing, initial start-up, programming, basic commissioning, warranties and manufacturers' assistance to Contractor.
- .7 "delete" or "remove" (and tenses of "delete" or "remove") – means to disconnect, make safe, and remove obsolete materials; patch and repair/finish surfaces to match adjoining similar construction; include for associated re-programming of systems and/or change of documentation identifications to suit deletions, and properly dispose of deleted products off Site unless otherwise instructed by York Region and reviewed with Consultant.
- .8 "barrier-free" – means when applied to a building and its facilities, that building and its facilities can be approached, entered and used by persons with physical or sensory disabilities in accordance with requirements of local governing building code.
- .9 "BAS" – means building automation system; "BMS" – means building management system; "FMS" – means facility management system; and "DDC" means direct digital controls; references to "BAS", "BMS", "FMS" and "DDC" generally mean same.
- .10 "governing authority" and/or "authority having jurisdiction" and/or "regulatory authority" and/or "Municipal authority" – means government departments, agencies, standards, rules and regulations that apply to and govern work and to which work must adhere.

- .11 "Mechanical Divisions" – refers to Divisions 20, 21, 22, 23, 25 and other Divisions as specifically noted, and which work as defined in Specifications and/or on drawings is responsibility of Mechanical Contractor, unless otherwise noted.
- .12 "Electrical Divisions" – refers to Divisions 26, 28 and other Divisions as specifically noted, and which work as defined in Specifications and/or on drawings is responsibility of Electrical Contractor, unless otherwise noted.
- .13 "Consultant" – as defined in the Definitions Section of the Contract Documents.
- .14 Wherever words "indicated", "shown", "noted", "listed", or similar words or phrases are used in Contract Documents they are understood, unless otherwise defined, to mean product referred to is "indicated", "shown", "listed", or "noted" on Contract Documents.
- .15 Wherever words "reviewed", "satisfactory", "as directed", "submit", or similar words or phrases are used in Contract Documents they are understood, unless otherwise defined, to mean that work or product referred to is "reviewed by", "to the satisfaction of", "submitted to", etc., Consultant.

1.04 DOCUMENTS

- .1 Specifications are arranged in accordance with the Construction Specifications Institute / Construction Specifications Canada (CSI/CSC) 50 Division Sections MasterFormat.
- .2 Drawings and Specifications are portions of Contract Documents and identify labour, products and services necessary for performance of work and form a basis for determining pricing. They are intended to be cooperative. Perform work that is shown, specified, or reasonably implied on the Drawings but not mentioned in Specification, or vice-versa, as though fully covered by both.
- .3 Review Drawings and Specifications in conjunction with documents of other Divisions and, where applicable, Code Consultant's report.
- .4 Unless otherwise specifically noted in Specifications and/or on Drawings, Sections of Mechanical Divisions are not intended to delegate functions nor to delegate work and supply of materials to any specific trade, but rather to generally designate a basic unit of work, and Sections are to be read as a whole.
- .5 Drawings are performance drawings, diagrammatic, and show approximate locations of equipment and connecting services. Any information regarding accurate measurement of building is to be taken on site. Do not scale Drawings, and do not use Drawings for prefabrication work.
- .6 Drawings are intended to convey the scope of work and do not show architectural and structural details. Provide, at Contractor's cost, offsets, fittings, transformations and similar products required as a result of obstructions and other architectural and/or structural details but not shown on Drawings.
- .7 Locations of equipment and materials shown may be altered, when reviewed by Consultant, to meet requirements of equipment and/or materials, other equipment or systems being installed, and of building, all at no additional cost to Contract.

- .8 Specification does not generally indicate specific number of items or amounts of material required. Specification is intended to provide product data and installation requirements. Refer to schedules, Drawings (layouts, riser diagrams, schematics, details) and Specification to provide correct quantities. Singular may be read as plural and vice versa.
- .9 Starter/motor control centre (MCC)/variable frequency drive (VFD) schedule drawings are both mechanical and electrical, and apply to work of Mechanical Divisions and Electrical Divisions. Be responsible for reviewing starter, MCC, VFD, and motor specification requirements prior to Bid submission. Confirm and coordinate exact scope of work and responsibility of work between Mechanical Divisions and Electrical Divisions.
- .10 When scale and date of Drawings are the same, or when discrepancy exists within Specification, include most costly arrangement to take precedence.

1.05 METRIC AND IMPERIAL MEASUREMENTS

- .1 Generally, both metric and imperial units of measurement are given in Sections of Specification governed by this section. Measurement conversions may be generally "soft" and rounded off. Confirm exact measurements based on application. Where measurements are related to installation and onsite applications, confirm issued document measurements with applicable local code requirements, and/or as applicable, make accurate measurements onsite. Where significant discrepancies are found, immediately notify Consultant for direction.

1.06 EXAMINATION OF DOCUMENTS AND SITE

- .1 Carefully examine Documents and visit Site to determine and review existing site conditions that will or may affect work, and include for such conditions in Bid Price.
- .2 Report to Region, prior to Bid Submittal, any existing site condition that will or may affect performance of work as per Documents. Failure to do so will not be grounds for additional costs.
- .3 Upon finding discrepancies in, or omissions from Documents, or having doubt as to their meaning or intent, immediately notify Region (if discovered during tendering period) and Consultant if discovered after award of Contract, in writing.

1.07 WORK STANDARDS

- .1 Where regulatory codes, standards and regulations are at variance with Drawings and Specification, more stringent requirement will apply unless otherwise directed by York Region and reviewed with Consultant.
- .2 Supplementary mandatory specification and requirements to be used in conjunction with project include but are not limited to following:
 - .1 Air-Conditioning, Heating and Refrigeration Institute (AHRI);
 - .2 Air Movement and Control Association (AMCA);
 - .3 American Iron and Steel Institute (AISI);
 - .4 American National Standards Institute (ANSI);

- .5 American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc., (ASHRAE);
- .6 American Society of Mechanical Engineers (ASME);
- .7 American Society of Testing and Materials (ASTM);
- .8 American Water Works Association (AWWA);
- .9 Associated Air Balance Council (AABC);
- .10 Building Industry Consulting Services, International (BICSI);
- .11 Canadian Gas Association (CGA);
- .12 Canadian General Standards Board (CGSB);
- .13 Canadian Standards Association (CSA);
- .14 Electrical and Electronic Manufacturers Association of Canada (EEMAC);
- .15 Electrical Safety Authority (ESA);
- .16 Electronic Industries Association (EIA);
- .17 Factory Mutual Systems (FM);
- .18 Illuminating Engineering Society (IES);
- .19 Institute of Electrical and Electronic Engineers (IEEE);
- .20 International Standards Organization (ISO);
- .21 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS);
- .22 National Building Code of Canada (NBC);
- .23 National Electrical Manufacturers Association (NEMA);
- .24 National Environmental Balancing Bureau (NEBB);
- .25 National Fire Protection Association (NFPA);
- .26 National Standards of Canada;
- .27 NSF International;
- .28 Occupational Health and Safety Act (OHSA);
- .29 Ontario Building Code (OBC);
- .30 Ontario Electrical Safety Code (OESC);
- .31 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA);

- .32 Technical Standards and Safety Authority (TSSA);
- .33 Thermal Insulation Association of Canada (TIAC);
- .34 Underwriters' Laboratories of Canada (ULC);
- .35 Workplace Hazardous Materials Information System (WHMIS);
- .36 Material Safety Data Sheets by product manufacturers;
- .37 local utility inspection permits;
- .38 Codes, standards, and regulations of local governing authorities having jurisdiction;
- .39 additional codes and standards listed in Trade Sections;
- .3 Provide applicable requirements for barrier free access in accordance with latest edition of the Ontario Building Code.
- .4 Where any governing Code, Regulation, or Standard requires preparation and submission of special details or drawings for review they are to be prepared and submitted to appropriate authorities. Be responsible for costs associated with these submittals.
- .5 Unless otherwise specified, install equipment in accordance with equipment manufacturer's recommendations and instructions, and requirements of governing Codes, Standards, and Regulations. Governing Codes, Standards, and Regulations take precedence over manufacturer's instructions. Notify Consultant in writing of conflicts between Contract Documents and manufacturer's instructions.
- .6 Work is to be performed by journeyperson tradesmen who perform only work that their certificates permit, or by apprentice tradesmen under direct on site supervision of experienced journeyperson tradesman. Journeyperson to apprentice ratio is not to exceed ratio determined by the Board as stated in Ontario College of Trades and Apprenticeship Act or local equivalent governing body in Place of the Work.
- .7 Journeyperson tradesmen are to have a copy of valid trade certificates available at Site for review with Consultant at any time.
- .8 Experienced and qualified superintendent is to be on-site at times when work is being performed.
- .9 Protect existing areas above, below and adjacent areas of Work from any debris, noise, or interruptions to existing services to satisfaction of York Region and reviewed with Consultant. Maintain in operation existing services to these areas to allow York Region to continue use of these areas. If services that are required to be maintained run through areas of renovations, provide necessary protection to services or reroute, in coordination with York Region and Consultant. Include for required premium time work to meet these requirements.

- .10 Work being performed within occupied spaces and work affecting surfaces adjacent to occupied spaces may need to be performed after regular business hours. For areas where spaces are used by York Region on a 24 hours basis or over various hours, coordinate hours of work with York Region on a regular basis to suit York Region's schedule. Execute work at times confirmed with and agreed to by York Region and reviewed with Consultant, so as not to inconvenience York Region's occupation or in any way hinder York Region's use of building. Include for required premium time work to meet these requirements.
- .11 Coordinate work inspection reviews and approvals with governing inspection department to ensure construction schedule is not delayed. Be responsible for prompt notification of deficiencies to Consultant and submission of reports and certificates to Consultant.
- .12 Properly protect equipment and materials on site from damage and defacement due to elements and work of trades, to satisfaction of York Region and reviewed with Consultant. Equipment and materials are to be in new condition upon Substantial Performance of the Work.
- .13 Mechanical piping system work, including equipment, must comply in all respects with requirements of local technical standards authorities and CSA B51, Boiler, Pressure Vessels and Pressure Piping Code. Where required, mechanical work products are to bear a Canadian Registration Number (CRN) number.
- .14 Electrical items associated with mechanical equipment are to be certified and bear stamp or seal of a recognized testing agency such as CSA, UL, ULC, Electrical Testing Laboratories (ETL), etc., or bear a stamp to indicate special electrical utility approval.

1.08 PERMITS, CERTIFICATES, APPROVALS AND FEES

- .1 Contact and confirm with local Authorities Having Jurisdiction including utility providers, requirements for approvals from such authorities. Obtain and pay for permits, certificates, and approvals required to complete Work.
- .2 Be responsible for ensuring that authorities having jurisdiction which require on-Site inspection of work, have ample notification to perform inspection, with sufficient lead time to correct deficiencies in a manner that will not impede schedule of completion of Work. If any defect, deficiency or non-compliant is found in work by inspection, be responsible for costs of such inspection, including any related expenses, making good and return to Site, until work is passed by governing authorities.
- .3 Obtain and submit to Consultant, approval/inspection certificates issued by governing authorities to confirm that Work as installed is in accordance with rules and regulations of local governing authorities and are acceptable.
- .4 Include in each copy of operating and maintenance instruction manuals, copies of approvals and inspection certificates issued by regulatory authorities.

1.09 NOT USED

1.10 WORKPLACE SAFETY

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous materials. Submit WHMIS SDS (Safety Data Sheets) for products where required, and maintain one copy at Site in a visible and accessible location available to personnel.

- .2 Comply with requirements of Occupational Health and Safety Act and other regulations pertaining to health and safety, including worker's compensation/insurance board and fall protection regulations. When working in confined spaces, comply with requirements of Occupational Health and Safety Act - Ontario Regulation 632, "Confined Spaces" and any other applicable Ministry of Labour requirements.
- .3 If at any time during course of existing building work, hazardous materials other than those identified in Documents and pertaining to Project Scope of Work, are encountered or suspected that were not identified as being present and which specific instructions in handling of such materials were not given, cease work in area in question and immediately notify Consultant. Comply with local governing regulations with regards to working in areas suspected of containing hazardous materials. Do not resume work in affected area without approval from York Region and reviewed with Consultant.

1.11 PLANNING AND LAYOUT OF WORK

- .1 Base installation layout, design, terminations, and supply of accessories, on Contract Documents with specific coordination with reviewed Shop Drawings.
- .2 Plan, coordinate, and establish exact locations and routing of services with affected trades prior to installation such that services clear each other as well as other obstructions. Generally, order of right of way for services to be as follows:
 - .1 piping requiring uniform pitch;
 - .2 piping 100 mm (4") dia. and larger;
 - .3 large ducts (main runs);
 - .4 cable tray and bus duct;
 - .5 conduit 100 mm (4") dia. and larger;
 - .6 piping less than 100 mm (4") dia.;
 - .7 smaller branch ductwork;
 - .8 conduit less than 100 mm (4") dia..
- .3 Unless otherwise shown or specified, conceal work in finished areas, and conceal work in partially finished and/or unfinished areas to extent made possible by the area construction. Install services as high as possible to conserve headroom and/or ceiling space. Notify Consultant where headroom or ceiling space appears to be inadequate prior to installation of work.
- .4 Do not use Contract Drawing measurements for prefabrication and layout of piping, sheet metal work and such other work. Locations and routing are to generally be in accordance with Contract Drawings, however, prepare layout drawings for such work. Use established bench marks for both horizontal and vertical measurements. Confirm inverts, coordinate with and make allowances for work of other trades. Accurately layout work, and be entirely responsible for work installed in accordance with layout drawings. Where any invert, grade, or size is at variance with Contract Drawings, notify Consultant prior to proceeding with work.

- .5 Prepare plan and interference drawings (at a minimum drawing scale of 1:50 or 1/4"=1' 0") of work for coordination with each trade Contractor. Arrange for preparation of detailed section drawings of ceiling spaces of corridors and any other congested areas. Sections are to be cross referenced with plan drawings so that trades may make use of section drawings. Section drawings to indicate lateral and elevation dimensions of major services within ceiling space. Lateral dimensions are to be from grid lines and elevations from top of floor slab. Obtain from Consultant, engineering drawings for this use. Contractors' interference drawings are to be distributed among other trades and Subcontractors. Submit drawings to Consultant for review. Failure of Contractor to prepare and coordinate overall interface drawings of trades does not relieve Contractor of responsibility to ensure that work is properly planned and coordinated.
- .6 Carry out alterations in arrangement of work that has been installed without proper coordination, study, and review, even if in accordance with Contract Documents, in order to conceal work behind finishes, or to allow installation of other work, without additional cost. In addition, make necessary alterations in other work required by such alterations, without additional cost.
- .7 Shut-off valves, balancing devices, air vents, equipment and similar products, particularly such products located above suspended ceilings must be located for easy access for servicing and/or removal. Products which do not meet this location requirement are to be relocated to an accessible location at no additional cost.
- .8 Be responsible for making necessary changes, at no additional cost, to accommodate structural and building conditions that were missed due to lack of coordination.

1.12 PHASING

- .1 Phasing and scheduling of Work is required in order to maintain existing building operations. Include costs (including costs for "off hours" work) for scheduling, co-ordination, and construction phasing to suit this project as specified in Supplementary Conditions, Division 01 and on Drawings. Review phasing requirements with Consultant prior to start of Work.
- .2 Project partial occupancy permits shall be required throughout project. Provide for each partial permit required by Town of Newmarket building department and any other testing/verification certificates for systems.

1.13 COORDINATION OF WORK

- .1 Review Contract Documents and coordinate work with work of each trade. Coordination requirements are to include but not be limited to following:
 - .1 requirements for openings, sleeves, inserts and other hardware necessary for installation of work;
 - .2 concrete work such as housekeeping pads, sumps, bases, etc., required for work, and including required dimensions, operating weight of equipment, location, etc.;
 - .3 depth and routing of excavation required for work, and requirements for bedding and backfill;
 - .4 wiring work required for equipment and systems but not specified to be done as part of mechanical work, including termination points, wiring type and size, and any other requirements.

- .2 Ensure materials and equipment are delivered to Site at proper time and in such assemblies and sizes so as to enter into building and be moved into spaces where they are to be located without difficulty.
- .3 Wherever possible, coordinate equipment deliveries with manufacturers and/or suppliers so equipment is delivered to Site when it is required, or so it can be stored within building, subject to available space as confirmed with York Region and reviewed with York Region, and protected from elements.
- .4 Ensure proper access and service clearances are maintained around equipment, and, where applicable, access space for future equipment removal or replacement is not impeded. Comply with code requirements with regards to access space provision around equipment. Remove and replace any equipment which does not meet this requirement.
- .5 Where work is to be integrated, or is to be installed in close proximity with work of other trades, coordinate work prior to and during installation.

1.14 PRODUCTS

- .1 Be responsible for ordering of products (equipment and materials) in a timely manner in order to meet project-scheduling timelines. Failure to order products to allow manufacturers sufficient production/delivery time to meet project-scheduling timelines is an unacceptable reason to request for other suppliers or substitutions.
- .2 Unless otherwise specified, products are to be new and are to comply with applicable respective Canadian standards. References to UL listings of products to include requirements that products are to be also Underwriters Laboratories of Canada (ULC) listed for use in Canada. Products are to meet or exceed latest ANSI/ASHRAE/IES 90.1 standards, as applicable. Do not supply any products containing asbestos materials or PCB materials.
- .3 Systems and equipment of this Project are to be "State of the Art" and be most recent and up to date series/version of product that is available at time of Shop Drawing review process. Products that have been stored or "on shelf" for an extended period of time will not be accepted. Software is to be of latest version available and be provided with updates available at time of shop drawing review process. Systems are to be designed such that its software is backwards compatible. Future upgrades are not to require any hardware replacements or additions to utilize latest software.
- .4 Products scheduled and/or specified have been selected to establish a performance and quality standard, and, in some instances, a dimensional standard. In most cases, base specified manufacturers are stated for any product specified by manufacturer's name and model number. Where acceptable manufacturers are listed, first name listed is base specified company. Bid price may be based on products supplied by any of manufacturers' base specified or named as acceptable for particular product. If acceptable manufacturers are not stated for a particular product, base Bid Price on product supplied by base specified manufacturer.

- .5 Documents have been prepared based on product available at time of bidding. If, after award of Contract, and if successful manufacturer can no longer supply a product that meets base specifications, notify Consultant immediately. Be responsible for obtaining other manufacturers product that complies with base specified performance and criteria and meets project timelines. Proposed products are subject to review and consideration by Consultant and are considered as substitutions which may subject to a credit to Contract. In addition, if such products require modifications to room spaces, mechanical systems, electrical systems, etc., include required changes. Such changes are to be submitted in detail to Consultant for review and consideration for acceptance. There will be no increase in Contract Price for revisions. Above conditions supplement and are not to supersede any specification conditions with regards to substitutions or failure to supply product as per issued documents.
- .6 Listing of a product as "acceptable" does not imply automatic acceptance by Consultant and/or York Region. It is responsibility of Contractor to ensure that any price quotations received and submittals made are for products that meet or exceed specifications included herein.
- .7 If products supplied by a manufacturer named as acceptable are used in lieu of base specified manufacturer, be responsible for ensuring that they are equivalent in performance and operating characteristics (including energy consumption if applicable) to base specified products. It is understood that any additional costs (i.e. for larger starters, larger feeders, additional spaces, etc.), and changes to associated or adjacent work resulting from provision of product supplied by a manufacturer other than base specified manufacturer, is included in Bid price. In addition, in equipment spaces where equipment named as acceptable is used in lieu of base specified equipment and dimensions of such equipment differs from base specified equipment, prepare and submit for review accurately dimensioned layouts of rooms affected, identifying architectural and structural elements, systems and equipment to prove that equipment in room will fit properly meeting design intent. There will be no increase in Contract Price for revisions.
- .8 In addition to manufacturer's products base specified or named as acceptable, other manufacturers of products may be proposed as substitutions to Consultant for review and consideration for acceptance after the award of the Contract,. However, base Bid price on products base specified or named as acceptable. Certify in writing to Consultant that proposed substitution meets space, power, design, energy consumption, and other requirements of base specified or acceptable product. It is understood that there will be no increase in Contract Price by reason of any changes to associated equipment, mechanically, electrically, structurally or architecturally, required by acceptance of proposed substitution. Consultant has sole discretion in accepting any such proposed substitution of product Do not order such products until they are accepted in writing by Consultant.
- .9 Where products are listed as "or Equivalent", certify in writing that product to be used in lieu of base specified product, at least meets space, power, design, energy consumption, and other requirements of base specified product and is equivalent or better than base specified product. When requested by Consultant, provide full design detail drawings and specifications of proposed products. Acceptance of these "or equivalent" products is at sole discretion of Consultant or Region acting reasonably. It is understood that there will be no increase in Contract Price by reason of any changes to associated equipment, mechanically, electrically, structurally or architecturally, required by acceptance of approved equal product. There must be no increase in Contract price due to Consultant's or Region's rejection of proposed equivalent product.

- .10 Whenever use of product other than base specified product is being supplied, ensure corresponding certifications and product information (detailed catalogue and engineering data, fabrication information and performance characteristics) are submitted to Consultant for review. Failure of submission of these documents to Consultant in a timely manner to allow for review will result in base specified product to be supplied at Consultant's discretion, at no additional cost to Contract.
- .11 Products supplied by a manufacturer/supplier other than a manufacturer listed as acceptable may be considered for acceptance by Consultant if requested in writing with full product documentation submitted.
- .12 Any proposed changes initiated by Contractor after award of Contract may be considered by Consultant at Consultant's discretion acting reasonably, with any additional costs for such changes if accepted by York Region and reviewed with Consultant, and costs for review, to be borne by Contractor.
- .13 Whenever use of product other than based specified products or named as acceptable is being supplied, time for process of submission of other products and Consultant's review of products will not alter Contract Time or delay work schedule.

1.15 SHOP DRAWINGS

- .1 At start-up meeting, review with Consultant products to be included in Shop Drawing submission. Prepare and submit list of products to Consultant for review.
- .2 Submit electronic copies of shop drawings unless otherwise directed by Consultant. Coordinate exact requirements with Consultant.
- .3 Submit for review, drawings showing detail design, construction, and performance of equipment and materials as requested in Specification. Submit Shop Drawings to Consultant for review prior to ordering and delivery of product to site. Include minimally for preparation and submission of following, as applicable:
 - .1 product literature cuts;
 - .2 equipment data sheets;
 - .3 equipment dimension drawings;
 - .4 system block diagrams;
 - .5 sequence of operation;
 - .6 connection wiring schematic diagrams;
 - .7 functionality with integrated systems.
- .4 Each Shop Drawing or product data sheet is to be properly identified with project name and product drawing or specification reference. Shop Drawing or product data sheet dimensions are to match dimension type on Drawings.
- .5 Where any item of equipment is required by code or standard or by-law to meet a specific energy efficiency level, or any other specific requirement, ensure this requirement is clearly indicated on submission.

- .6 Ensure proposed products meet each requirement of Project. Endorse each shop drawing copy "CERTIFIED TO BE IN ACCORDANCE WITH ALL REQUIREMENTS". Include company name, submittal date, and sign each copy. Shop Drawings that are received and are not endorsed, dated and signed will be returned to be resubmitted.
- .7 Consultant to review Shop Drawings and indicate review status by stamping Shop Drawing copies as follows:
 - .1 "REVIEWED" or "REVIEWED AS NOTED" (appropriately marked) – If Consultant's review of shop drawing is final, Consultant to stamp shop drawing;
 - .2 "RETURNED FOR CORRECTION" – If Consultant's review of shop drawing is not final, Consultant to stamp shop drawing as stated above, mark submission with comments, and return submission. Revise Shop Drawing in accordance with Consultant's notations and resubmit.
- .8 Following is to be read in conjunction with wording on Consultant's Shop Drawing review stamp applied to each and every shop drawing or product data sheet submitted:

"THIS REVIEW BY CONSULTANT IS FOR SOLE PURPOSE OF ASCERTAINING CONFORMANCE WITH GENERAL DESIGN CONCEPT. THIS REVIEW DOES NOT MEAN THAT CONSULTANT APPROVES DETAILED DESIGN INHERENT IN SHOP DRAWINGS, RESPONSIBILITY FOR WHICH REMAINS WITH CONTRACTOR. CONSULTANT'S REVIEW DOES NOT RELIEVE CONTRACTOR OF RESPONSIBILITY FOR ERRORS OR OMISSIONS IN SHOP DRAWINGS OR OF CONTRACTOR'S RESPONSIBILITY FOR MEETING REQUIREMENTS OF CONTRACT DOCUMENTS. BE RESPONSIBLE FOR DIMENSIONS TO BE CONFIRMED AND CORRELATED AT JOB SITE, FOR INFORMATION THAT PERTAINS SOLELY TO FABRICATION PROCESSES OR TO TECHNIQUES OF CONSTRUCTION AND INSTALLATION, AND FOR COORDINATION OF WORK OF SUB-TRADES."
- .9 Submit each system and each major component as separate Shop Drawing submissions. Submit together, Shop drawings for common devices such as devices of each system are to be submitted together.
- .10 Obtain Shop Drawings for submission from product manufacturer's authorized representatives and supplemented with additional items specified herein.
- .11 Do not order product until respective Shop Drawing review process has been properly reviewed with Consultant.
- .12 Where extended warranties are specified for equipment items, submit specified extended warranty with Shop Drawing submittal.

1.16 EQUIPMENT LOADS

- .1 Supply equipment loads (self-weight, operating weight, housekeeping pad, inertia pads, etc.) to Consultant, via shop drawing submissions, prior to construction.
- .2 Where given choice of specific equipment, actual weight, location and method of support of equipment may differ from those assumed by Consultant for base design. Back-check equipment loads, location, and supports, and include necessary accommodations.

- .3 Where supporting structure consists of structural steel framing, it is imperative that equipment loads, location, and method of support be confirmed prior to fabrication of structural steel. Review locations of equipment with Consultant prior to construction.

1.17 OPENINGS

- .1 Supply opening sizes and locations to Consultant to allow verification of their effect on design, and for inclusion on structural drawings where appropriate.
- .2 No openings are permitted through completed structure without written approval from York Region and reviewed with Consultant. Show required openings on a copy of structural drawings. Identify exact locations, elevations, and size of proposed openings and submit to Consultant for review, well in advance of doing work.
- .3 Prior to leaving Site at end of each day, walk through areas of work and check for any openings, penetrations, holes, and/or voids created under scope of work of project, and ensure that any openings created under scope of work have been closed off, fire-stopped and smoke-sealed. Unless otherwise directed by York Region and reviewed with Consultant, do not leave any openings unprotected and unfinished overnight.

1.18 SCAFFOLDING, HOISTING AND RIGGING

- .1 Unless otherwise specified or directed, supply, erect and operate scaffolding, rigging, hoisting equipment and associated hardware required for work, and subject to approval from York Region and reviewed with Consultant.
- .2 Use scaffolds in such a manner as to interfere as little as possible with work of other trades.
- .3 Do not place major scaffolding/hoisting equipment loads on any portion of structure without approval from York Region and reviewed with Consultant. No supports, clips, brackets or similar devices are to be welded, bolted or otherwise affixed to any finished member or surface without approval from York Region and review with Consultant.
- .4 Immediately remove from site scaffolding, rigging and hoisting equipment when no longer required.

1.19 PROGRESS PAYMENT BREAKDOWN

- .1 Prior to submittal of first progress payment draw, submit a detailed breakdown of work cost to assist Consultant in reviewing and approving progress payment claims.
- .2 Payment breakdown is subject to York Region's approval and Consultant's review. Progress payments will not be processed until an approved breakdown is in place. Breakdown is to include one-time claim items such as mobilization and demobilization, insurance, bonds (if applicable), shop drawings and product data sheets, commissioning including testing, adjusting and balancing, system testing and verification, and project closeout submittals.
- .3 Indicate equipment, material and labour costs for site services (if applicable) and indicate work of each trade in same manner as indicated on progress draw.

1.20 NOTICE FOR REQUIRED FIELD REVIEWS

- .1 Whenever there is a requirement for Consultant to perform a field review prior to concealment of any work, to inspect/re-inspect work for deficiencies prior to Substantial Performance of the Contract, for commissioning demonstrations, and any other such field review, give minimum 5 Business Days' notice in writing to Consultant.
- .2 If Consultant is unable to attend a field review when requested, arrange an alternative date and time.
- .3 Do not conceal work until Consultant advises that it may be concealed.
- .4 When Consultant is requested to perform a field review and work is not ready to be reviewed, reimburse Consultant for time and travel expenses.

1.21 PRELIMINARY TESTING

- .1 When directed by Consultant, promptly arrange, pay for, and perform site tests on any piece of equipment or any system for such reasonable lengths of time and at such times as may be required to prove compliance with Specification and governing Codes and Regulations, prior to Substantial Performance of the Contract.
- .2 When, in Consultant's opinion, tests are required to be performed by a certified testing laboratory, arrange and pay for such tests.
- .3 These tests are not to be construed as evidence of acceptance of work, and it is agreed and understood that no claim for delays or damage will be made for injury or breakage to any part or parts of equipment or system due to test where such injuries or breakage were caused by faulty parts and/or workmanship of any kind.
- .4 When, in Consultant's opinion, tests indicate that equipment, products, etc., are defective or deficient, immediately remove such equipment and/or products from Site and replace them with acceptable equipment and/or products, at no additional cost to the Contract or delay in performance of the work.

1.22 PROVISIONS FOR SYSTEMS/EQUIPMENT USED DURING CONSTRUCTION

- .1 Permanent mechanical systems in building may be used for temporary heating or cooling during construction subject to following conditions:
 - .1 each entire system is complete, pressure tested, cleaned, and flushed out;
 - .2 specified water treatment system has been commissioned, and treatment is being continuously monitored;
 - .3 building has been closed in and areas to be heated/ventilated are clean and will not thereafter be subjected to dust-producing processes;
 - .4 there is no possibility of damage from any cause;
 - .5 supply ventilation systems are protected by 60% filters, which are to be inspected daily, and changed every 2 weeks, or more frequently as required;
 - .6 return air systems have approved construction filters over openings, inlets, and outlets;

- .7 systems are operated in accordance with manufacturer's recommendations or instructions, and are monitored on a regular and frequent basis;
 - .8 warranties are not affected in any way;
 - .9 regular preventive and other manufacturer's recommended maintenance routines are performed;
 - .10 before application for Certificate of Substantial Performance, each entire system is to be refurbished, cleaned internally and externally, restored to "as-new" condition, and filters in air systems replaced;
 - .11 energy costs are to be paid by Contractor.
- .2 Confirm with Consultant what equipment can be used during construction.
 - .3 Any system or piece of equipment that is specified to be provided under requirements of Documents and is required to be used during construction stages of work prior to issuing of Certificate of Substantial Performance of the Contract, are to be provided with special interim maintenance and service to cover systems/equipment during time of use during construction period of project until project has been certified as substantially performed and such systems/equipment are turned over to York Region.
 - .4 During this period of construction, such systems/equipment to not become property of York Region or be York Region's responsibility for maintenance or service. Systems/equipment are to remain property of respective manufacturers/suppliers or Contractor, who are responsible for full maintenance and servicing of systems/equipment in order to maintain validity of warranties after turn over to York Region.
 - .5 Prior to application for a Certificate of Substantial Performance of the Contract and turn over to York Region, such systems/equipment to be cleaned, restored to "new" condition, paint finishes "touched-up", filters cleaned or replaced, etc.

1.23 TEMPORARY SERVICES

- .1 Coordinate requirements for temporary services including but not limited to temporary heating, cooling and water. Unless otherwise noted, provide required services in compliance with requirements of local governing building code and local governing inspection authorities.
- .2 Maintain fire protection of areas which may include fire watch during temporary shutdowns of existing systems, in accordance with requirements of local governing code and local governing authorities.

1.24 MAINTAINING EQUIPMENT PRIOR TO ACCEPTANCE

- .1 Maintain equipment in accordance with manufacturer's instructions prior to start-up, testing and commissioning.
- .2 Employ a qualified millwright to check and align shafts, drives, and couplings on all base mounted split coupled motor driven equipment.
- .3 Where equipment lubrication fittings are not easily accessible, extend the fittings to accessible locations using copper or aluminium tubing.

- .4 All filters are to be new upon Substantial Performance of the Contract. This is in addition to any spare filters specified.

1.25 CLEANING

- .1 During construction, keep site reasonably clear of rubbish and waste material resulting from work on a daily basis to the satisfaction of York Region and Consultant. Before applying for a Certificate of Substantial Performance of the Contract, remove rubbish and debris, and be responsible for repair of any damage caused as a result of work.
- .2 Clean equipment and devices installed as part of this project.

1.26 RECORD AS-BUILT DRAWINGS

- .1 Drawings for this project have been prepared on a CAD system using AutoCAD software of release version reviewed with Consultant. For purpose of producing record "as built" drawings, copies of Contract Drawings can be obtained from Consultant,. Drawings may also to be used for preparation of layouts and interference drawings.
- .2 As work progresses at Site, clearly mark in red in a neat and legible manner on a set of bound white prints of Contract Drawings, changes and deviations from routing of services and locations of equipment shown on Contract Drawings, on a daily basis. Changes and deviations include those made by addenda, change orders, and site instructions. Use notes marked in red as required. Maintain white print red line as-built set at site for exclusive use of recording as-built conditions, keep set up-to-date at all times, and ensure set is always available for periodic review. As-built set is also to include the following:
 - .1 dimensioned location of inaccessible concealed work;
 - .2 locations of control devices with identification for each;
 - .3 for underground piping and ducts, record dimensions, invert elevations, offsets, fittings, cathodic protection and accessories if applicable, and locate dimensions from benchmarks to be preserved after construction is complete;
 - .4 for fire protection systems, record actual locations of equipment, sprinkler heads, and valves, drains, and test locations, and deviations of pipe routing and sizing from that shown on the drawings;
 - .5 location of piping system air vents;
 - .6 location of concealed services terminated for future extension and work concealed within building in inaccessible locations.
- .3 Before applying for a Certificate of Substantial Performance of the Contract, update a clean copy of Contract Drawing set in accordance with marked up set of "as-built" white prints including deviations from original Contract Drawings, thus forming an "as-built" drawing set. Submit "as-built" site drawing prints to Consultant for review. Make necessary revisions to drawings as per Consultant's comments, to satisfaction of Consultant.
- .4 Use final reviewed "as-built" drawing set to provide CAD files of drawings thus forming true "as-built" set of Contract Drawings. Identify set as "Project Record Copy". Load digital copies of final reviewed by Consultant as-built drawings onto USB type flash drive. Provide 2 complete sets of "as-built" drawings on separate USBs. Submit "as-built" sets of white prints and USBs to Consultant.

- .5 Submitted drawings are to be of same quality as original Contract Drawings. CAD drawing files are to be compatible with AutoCAD software release version confirmed with Consultant.

1.27 OPERATING AND MAINTENANCE MANUALS

- .1 For each item of equipment for which a shop drawing is required (except for simple equipment), supply minimum 3, project specific, indexed copies of equipment manufacturers' operating and maintenance (O&M) instruction data manuals. Review exact quantity of manuals with Consultant. Consolidate each copy of data in an identified hard cover three "D" ring binder. Each binder to include:
 - .1 front cover: project name; wording – "Mechanical Systems Operating and Maintenance Manual"; and date;
 - .2 introduction sheet listing Consultant, Contractor, and Subcontractor names, street addresses, telephone and fax numbers, and e-mail addresses;
 - .3 equipment manufacturer's authorized contact person name, telephone number and company website;
 - .4 Table of Contents sheet, and corresponding index tab sheets;
 - .5 copy of each "REVIEWED" or clean, updated "REVIEWED AS NOTED" shop drawing or product data sheet, with manufacturer's/supplier's name, telephone and fax numbers, email address, company website address, and email address for local source of parts and service; when shop drawings are returned marked "Reviewed As Noted" with revisions marked on shop drawing copies, they are to be revised by equipment supplier to incorporate comments marked on "Reviewed" shop drawings and a clean updated copy is to be included in operating and maintenance manuals;
 - .6 operating data as follows:
 - .1 pressure test reports, and certificates issued by governing authorities;
 - .2 description of each system and its controls;
 - .3 control schematics for equipment/systems including building environmental controls;
 - .4 wiring and connection diagrams;
 - .5 if applicable, BAS architecture and all required operating data;
 - .6 description of operation of each system at various loads together with reset schedules and seasonal variances;
 - .7 operation instruction for each system and each component;
 - .8 description of actions to be taken in event of emergencies and/or equipment failure;
 - .9 valve tag schedule, and flow diagrams to indicate valve locations.
 - .7 maintenance data as follows:

- .1 operation and trouble-shooting instructions for each item of equipment and each system;
- .2 schedules of tasks, frequency, tools required, and estimated task time;
- .3 recommended maintenance practices and precautions including warnings of any maintenance practice that will damage or disfigure equipment/systems;
- .4 complete parts lists with numbers.
- .8 performance data as follows:
 - .1 equipment and system start-up data sheets;
 - .2 equipment performance verification test results, and final commissioning report;
 - .3 final testing, adjusting and balancing reports.
- .9 copies of warranties;
- .10 items requested specifically in Section Articles.
- .2 Generally, binders are not to exceed 75 mm (3") thick and not to be more than 2/3 full.
- .3 Operating and maintenance instructions are to relate to job specific equipment supplied under this project and related to York Region's building. Language used in manuals is to contain simple practical operating terms and language easy for in-house maintenance staff to understand how to operate and maintain each system.
- .4 Before applying for a Certificate of Substantial Performance of the Contract, assemble one copy of O & M Manual and submit to Consultant for review prior to assembling remaining copies. Incorporate Consultant's comments into final submission.
- .5 Provide 2 digital copies of contents of operating and maintenance manuals and load onto separate USB type flash drives and submit to Consultant. Prepare digital copies using version of Adobe Acrobat Portable Document Format or equal as reviewed with Consultant and enhanced with bookmarks and internal document links.

1.28 COMMISSIONING

- .1 After successful start-up and prior to Substantial Performance of the Contract, commission the mechanical work. Commissioning work is the process of Contractor demonstrating to York Region and Consultant, for purpose of final acceptance, by means of successful and documented functional performance testing, that systems and/or subsystems are capable of being operated and maintained to perform in accordance with requirements of Contract Documents, as further described below.
 - .1 Retain services of a testing, adjusting, and balancing agency to perform testing and balancing of mechanical system air/fluid flows and capacities, prior to operational performance testing. Refer to Section 20 05 50 entitled Testing, Adjusting and Balancing.

- .2 Test, adjust and operate equipment and systems after start-up but before functional performance testing, to confirm operations are in accordance with requirements of Contract Documents. Verify modes and sequences of control and monitoring, interlocks, and responses to emergency conditions. Complete commissioning data sheets to document successful operational performance testing.
- .3 Repeat successful operational performance testing with completed commissioning data sheet documentation in the presence of Consultant and York Region to validate and verify equipment and systems are complete in all respects, function correctly, and are ready for acceptance.
- .4 Submit final commissioning data sheets, TAB reports as specified in Section 20 05 50 entitled Testing, Adjusting and Balancing, project closeout documents, and other required submittals.

1.29 WARRANTY

- .1 Unless otherwise specified in Divisions 00 and 01, warrant mechanical work to be in accordance with Contract Documents and free from defects for a period of 1 year from date of issue of a Certificate of Substantial Performance of the Work.
- .2 Where equipment includes extended warranty period, e.g., 5 years, first year of warranty period is to be governed by terms and conditions of warranty in Contract Documents, and remaining years of warranty are to be direct from equipment manufacturer and/or supplier to York Region. Submit signed and dated copies of extended warranties to Consultant.
- .3 Warranty to include parts, labour, travel costs and living expenses incurred by manufacturer's authorized technician to provide factory authorized on-site service.
- .4 Repair and/or replace any defects that appear in Work within warranty period without additional expense to York Region. Be responsible for costs incurred in making defective work good, including repair or replacement of building finishes, other materials, and damage to other equipment. Ordinary wear and tear and damage caused wilfully or due to carelessness of York Region's staff or agents is exempted.
- .5 Do not include York Region deductible amounts in warranties.
- .6 Visit building during warranty period with York Region representatives. York Region to organize these visits. At these meetings, York Region representatives are to review performance of systems. If performance is satisfactory, then no further action needs to be taken. If unsatisfactory, then correct deficiencies, as directed by York Region representatives, to satisfaction of York Region's representatives. These Site visits to occur:
 - .1 once during 1st month of building operation;
 - .2 once during 3rd month of building operation;
 - .3 once between 4th and 10th month in a season opposite to 1st and 3rd month visits.

1.30 PROJECT CLOSEOUT SUBMITTALS

- .1 Prior to application for Substantial Performance of the Contract, submit required items and documentation specified, including following:

- .1 Operating and Maintenance Manuals;
- .2 as-built record drawings and associated data;
- .3 extended warranties for equipment as specified;
- .4 operating test certificates, i.e. Sprinkler Test Certificate;
- .5 final commissioning report and TAB report;
- .6 identified keys for equipment and/or panels for which keys are required, and other items required to be submitted;
- .7 other data or products specified.

1.31 INSTRUCTIONS TO YORK REGION

- .1 Refer to equipment and system operational and maintenance training requirements specified in Division 01.
- .2 Train York Region's designated personnel in aspects of operation and maintenance of equipment and systems as specified. Demonstrations and training are to be performed by qualified technicians employed by equipment/system manufacturer/supplier. Supply hard copies of training materials to each attendee.
- .3 Unless where specified otherwise in Contract Documents, minimum requirements are for manufacturer/suppliers of each system and major equipment, to provide minimum two separate sessions each consisting of minimum 4 hours on Site or in factory training (at York Region's choice), of York Region's designated personnel (for up to 6 people each session), on operation and maintenance procedures of system.
- .4 For each item of equipment and for each system for which training is specified, prepare training modules as specified below. Use Operating and Maintenance Manuals during training sessions. Training modules include but are not limited to:
 - .1 Operational Requirements and Criteria – equipment function, stopping and starting, safeties, operating standards, operating characteristics, performance curves, and limitations;
 - .2 Troubleshooting – diagnostic instructions, test and inspection procedures;
 - .3 Documentation – equipment/system warranties, and manufacturer's/supplier's parts and service facilities, telephone numbers, email addresses, and the like;
 - .4 Maintenance – inspection instructions, types of cleaning agents to be used as well as cleaning methods, preventive maintenance procedures, and use of any special tools;
 - .5 Repairs – diagnostic instructions, disassembly, component removal and repair instructions, instructions for identifying parts and components, and review of any spare parts inventory.
- .5 Before instructing York Region's designated personnel, submit to Consultant for review preliminary copy of training manual and proposed schedule of demonstration and training dates and times. Incorporate Consultant's comments in final copy.

- .6 Obtain in writing from Consultant list of York Region's representatives to receive instructions. Submit to Consultant prior to application for Certificate of Substantial Performance of the Contract, complete list of systems for which instructions were given, stating for each system:
 - .1 date instructions were given to York Region's staff;
 - .2 duration of instruction;
 - .3 names of persons instructed;
 - .4 other parties present (manufacturer's representative, consultants, etc.).
- .7 Obtain signatures of York Region's staff to verify they properly understood system installation, operation and maintenance requirements, and have received operating and maintenance instruction manuals and "as-built" record drawings.
- .8 Submit to Consultant, copy of electronic version of training materials loaded on USB flash drive. Include in operating and maintenance manuals submission.
- .9 Provide a custom video in DVD format that details on Site systems and equipment operations and includes following:
 - .1 professional videographer on site to capture training session; use wireless lavalier microphone to capture crystal clear audio of trainer in association with video footage; edit video to remove unnecessary footage;
 - .2 DVD to include custom Site specific system/equipment screens that outline key information about system/equipment and devices used on site only;
 - .3 DVD to also include custom site specific video that details programming procedures in conjunction with a voiceover from on-site technician;
 - .4 DVD created with a main menu screen and authored with chapters to allow operator to access specific areas of training instantly.
- .10 Supply minimum quantity of 3 copies of DVDs for each system/equipment.

1.32 FINAL INSPECTION

- .1 Submit to Consultant, written request for final inspection of systems. Include written certification that:
 - .1 deficiencies noted during job inspections have been completed;
 - .2 field quality control procedures have been completed;
 - .3 systems have been tested and verified, balanced and adjusted, and are ready for operation;
 - .4 maintenance and operating data have been completed and submitted to, reviewed with Consultant and accepted by York Region;
 - .5 tags and nameplates are in place and equipment identifications have been completed;

- .6 clean-up is complete;
- .7 spare parts and replacement parts specified have been provided and acknowledged by Consultant;
- .8 as-built and record drawings have been completed and submitted to and reviewed with Consultant and accepted by York Region;
- .9 York Region's staff has been instructed in operation and maintenance of systems;
- .10 commissioning procedures have been completed.

2 PRODUCTS

NOT USED

3 EXECUTION

NOT USED

END OF SECTION

1 GENERAL

1.01 REFERENCE

- .1 Division 00 and Division 01 apply to and are a part of each Mechanical Division Section.

1.02 APPLICATION

- .1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Mechanical Divisions. It is intended as a supplement to each Section and is to be read accordingly.

1.03 SUBMITTALS

- .1 Submit Shop Drawings/product data sheets for:
 - .1 pressure gauges and thermometers;
 - .2 electric motors (submit with equipment they are associated with).
- .2 Submit weight loads for selected equipment (upon request).
- .3 Submit copy of architectural reflected ceiling plan drawings and elevation drawings to indicate proposed access door locations.
- .4 Submit samples of materials and any other items as specified in Sections of Mechanical Divisions.
- .5 Submit a list of equipment identification nameplates indicating proposed wording and sizes.
- .6 Submit a list of pipe and duct identification colour coding and wording.
- .7 Submit a proposed valve tag chart and a list of proposed valve tag numbering and identification wording.
- .8 Submit drawings indicating size and location of required sleeves, recesses and formed openings in poured or precast concrete work.
- .9 Submit any other submittals specified in this Section or other Sections of Mechanical Divisions.

2 PRODUCTS

2.01 PIPE SLEEVES

- .1 Galvanized Steel or Cast Iron Pipe – Schedule 40 mild galvanized steel, or Class 4000 cast iron.

2.02 FIRESTOPPING AND SMOKE SEAL MATERIALS

- .1 Firestopping and smoke seal system materials for mechanical penetrations through fire rated construction are specified in Section entitled Firestopping and Smoke Seal Systems and work is to be included as part of mechanical work.

2.03 PIPE ESCUTCHEON PLATES

- .1 One-piece chrome plated brass or #4 finish type 302 stainless steel plates with matching screws for attachment to building surface, each plate sized to completely cover pipe sleeve or building surface opening, and to fit tightly around pipe or pipe insulation.

2.04 PIPING HANGERS AND SUPPORTS

- .1 Pipe hanger and support materials, including accessories, are to be, unless otherwise specified, in accordance with Manufacturers Standardization Society (MSS) Standard Practice Manual SP-58, Pipe hangers and Supports-Materials, Design and Manufacture, and where possible, MSS designations are indicated with each product specified below. Conform to following requirements:
 - .1 unless otherwise specified, ferrous hanger and support products are to be electro-galvanized;
 - .2 hangers and supports for insulated piping are to be sized to fit around insulation and insulation jacket.
- .2 Hangers and supports for horizontal suspended piping as follows:
 - .1 adjustable steel clevis hanger – MSS Type 1;
 - .2 adjustable swivel ring band hanger – MSS Type 10;
- .3 Supports for horizontal pipe on vertical surfaces as follows:
 - .1 steel offset pipe clamp – Anvil Fig. 103 or Myatt Fig. 170 or Equivalent;
 - .2 heavy-duty steel pipe clip – MSS Type 26;
 - .3 single steel pipe hook – Myatt Fig. 156 or Equivalent;
 - .4 epoxy coated steel pipe stays are not permitted.
- .4 Floor supports for vertical risers as follows:
 - .1 copper tubing riser clamp – MSS Type 8;
 - .2 heavy-duty steel riser clamp – MSS Type 8.
- .5 Supports for vertical piping on vertical surfaces as follows:
 - .1 steel offset pipe clamp – Anvil Fig. 103 or Myatt Fig. 170 or Equivalent;
 - .2 heavy-duty steel pipe bracket or soil pipe bracket – MSS Type 26;
 - .3 extension split pipe clamp – MSS Type 12;
 - .4 epoxy coated steel pipe stays are not permitted.
 - .5 for plastic piping – generally as specified above but in accordance with pipe manufacturer's recommendations;

- .6 for fire protection piping – generally as above but ULC listed and/or FM approved, and in accordance with Chapter requirements of NFPA Standard applicable to piping system;
 - .7 for bare horizontal copper piping – generally as above but factory vinyl coated to prevent direct copper/steel contact;
 - .8 for bare copper vertical piping – corrosion resistant ferrous clamps with flexible rubber gasket type material (not tape) to isolate pipe from clamp;
 - .9 insulation protection shields to and including 40 mm (1-½") dia. – MSS Type 40 galvanized steel shields with ribs to keep shield centred on hanger.
- .6 Hanger rods are to be electro-galvanized carbon steel (unless otherwise specified), round, threaded, to ASTM A36, complete with captive machine nuts with washers at hangers, sized to suit loading in accordance with Table 3 in MSS SP-58, but in any case minimum 9.5 mm (3/8") diameter.
- .7 Acceptable manufacturers are:
- .1 E. Myatt & Co. Inc.;
 - .2 Anvil International Inc.;
 - .3 Empire Industries Inc.;
 - .4 Hunt Manufacturing Ltd.;
 - .5 Unistrut Canada Ltd.;
 - .6 Nibco Inc. "Tolco";
 - .7 Taylor Pipe Supports.
 - .8 Or Equivalent.

2.05 ACCESS DOORS

- .1 Coordinate exact requirements and consistency of look and finish of access doors on project with each Division of Work. .
- .2 Access doors to be rust resistant steel door panels, with concealed hinges and positive locking and self-opening screwdriver operated lock. Wall type frame to be suitable for wall installation and have integral keys for plaster walls. Doors in tile wall to be stainless steel and in ceilings to be suitable for plaster covering with only frame joint showing. Other doors to be prime painted steel.
- .3 Size access doors to suit the concealed work for which they are supplied, and wherever possible they are to be of standard size for all applications, but in any case they are to be minimum 300 mm x 300 mm (12" x 12") for hand entry and 600 mm x 600 mm (24" x 24") for body entry.

- .4 Lay-in type tiles, properly marked, may serve as access panels. Coordinate marking of ceiling tiles with Consultant. Panels in glazed tile walls to be 12 gauge, 304 alloy stainless steel, No. 4 finish, with recessed frame secured with stainless steel counter-sunk flush head screws.
- .5 Panels in plaster surfaces to have dish-shaped door and welded metal lath, ready to take plaster. Provide a plastic grommet for door key access.
- .6 Other access doors to be welded 12 gauge steel, flush type with concealed hinges, lock and anchor straps, complete with factory prime coat. Submit to Consultant for review, details of non-standard door construction details.
- .7 Access doors in fire rated ceilings, walls, partitions, structures, etc., to be ULC listed and labelled and of a rating to maintain fire separation integrity.
- .8 Where access doors are located in surfaces where special finishes are required, they are to be of a recessed door type capable of accepting finish in which they are to be installed so as to maintain final building surface appearance throughout.
- .9 Acceptable manufacturers include Le Hage, SMS, Pedlar, Acudor or Equivalent.

2.06 PRESSURE GAUGES AND THERMOMETERS

- .1 Pressure gauges as follows:
 - .1 adjustable, glycerine filled, 100 mm or 115 mm (4" or 4-½") diameter and each accurate to within 1% of scale range;
 - .2 type 304 stainless steel case with relief valve and polished stainless steel bayonet;
 - .3 stainless steel rotary movement with stainless steel bushings and socket;
 - .4 clear acrylic window;
 - .5 dual scale white dial with a scale range such that working pressure of system is at approximate mid-point of scale;
 - .6 black pointer.
- .2 Pressure gauge accessories and additional requirements as follows:
 - .1 a bronze ball type shut-off valve is to be provided in the piping to each pressure gauge;
 - .2 each pressure gauge for piping and equipment with normal everyday flow is to be equipped with a brass pressure snubber;
- .3 Thermometers as follows:
 - .1 round, 125 mm (5") diameter, adjustable (90°) angle bimetal dial type thermometers, each accurate to within 1% of full scale;
 - .2 hermetically sealed stainless steel case with stainless steel ring;
 - .3 dampened bimetal coil;

- .4 calibration adjustment screw;
 - .5 white aluminum dual scale dial with black and blue markings and a range such that working temperature of system is approximate mid-point of the scale;
 - .6 black aluminum pointer;
 - .7 double strength glass window;
 - .8 12 mm (½") National Pipe Thread (NPT) connection with 6.4 mm (¼") diameter stainless steel stem;
 - .9 suitable thermowell.
- .4 Acceptable manufacturers are:
- .1 H.O. Trerice Co.;
 - .2 Weiss Instruments;
 - .3 Ashcroft.
 - .4 Or Equivalent

2.07 ELECTRIC MOTORS

- .1 Unless otherwise specified, motors are to conform to NEMA Standard MG1, applicable IEEE Standards, and applicable CSA C22.2 Standards, and are to meet NEMA standards for maximum sound level ratings under full load. Confirm motor voltages prior to ordering.
- .2 Vertically mounted and submersible motors are to be purposely designed for mounting in this attitude.
- .3 Efficiency of 1-phase motors to 1 HP is to be in accordance with CAN/CSA C747. Efficiency of 3-phase motors 1 HP and larger is to be in accordance with CAN/CSA C390 or IEEE 112B.
- .4 Unless otherwise specified, 1-phase motors smaller than ½ HP are to be 115 volt, continuous duty capacitor start type with an NEMA 48 or 56 frame size, solid base, heavy-gauge steel shell with solid die-cast end shields, dynamically balanced die-cast rotor, integral automatic reset thermal overload protection, Class "B" insulation, and a 1.15 service factor at 40°C (105°F) ambient temperature.
- .5 Explosion-proof 1-phase motors are to be totally enclosed, fan cooled, 115 volt continuous duty capacitor start type in accordance with CSA C22.2 No. 145, as specified for standard 1-phase motors but suitable for use in Class 1 Group D hazardous locations and complete with a rolled steel shell and a 1.0 service factor at 40°C (105°F) ambient temperature.
- .6 Acceptable manufacturers are:
 - .1 TECO-Westinghouse Motors (Canada) Inc.;
 - .2 Canadian General Electric;
 - .3 Baldor Electric Co.;

- .4 U.S. Electrical Motors;
- .5 Weg Electric Corp.;
- .6 Marathon Electric;
- .7 Toshiba Corp.;
- .8 Leeson Canada.
- .9 Or Equivalent

2.08 MOTOR STARTERS AND ACCESSORIES

- .1 Motor starters must be capable of starting associated motors under the imposed loads. Confirm starter voltage matches motor prior to ordering.
- .2 Unless otherwise specified, starters for 1-phase motors are to be 115 volt, thermal overload protected manual starting switches with a neon pilot light, a surface or recessed enclosure to suit the application, and, where automatic operation is required, a separate Hand-Off-Auto (H-O-A) switch in an enclosure to match starter enclosure.
- .3 Unless otherwise specified, motor starter enclosures are to be in accordance with following NEMA ratings:
 - .1 enclosures located in sprinklered areas – Type 2;
 - .2 enclosures exposed to the elements – Type 3R, constructed of stainless steel;
 - .3 enclosures inside the building in wet areas – Type 3R, constructed of stainless steel;
 - .4 enclosures in explosion rated area – Type 7 with exact requirements to suit the area and application;
 - .5 enclosures except as noted above – Type 1;
 - .6 enclosures located in finished areas – as above but recess type with brushed stainless steel faceplate.
- .4 Motor control centres are to be multi-unit, 2.28 m (9') high, NEMA Class 1, type "B", factory assembled, dead front, floor mounted, free-standing motor control centre with tin plated copper bus and an NEMA Type 1 or Type 2 enclosure as for loose starters specified above. Each motor control centre is to be complete with starters as specified above, load and control wiring terminal boards, and required facilities for line and load side power wiring connections.
- .5 Disconnect switches for motor control centres are to be heavy-duty, CSA certified, front operated switches as per motor starter schedule, each complete with a handle suitable for padlocking in "off" position and arranged so that door cannot be opened with handle in "on" position and an NEMA enclosure as specified for loose starters. Fusible units are to be complete with fuse clips to suit fuse types specified below.
- .6 Fuses are to be, unless otherwise scheduled or specified, English Electric Ltd. HRC fuses, Form I Class "J" for constant running equipment and Form II Class "C" for equipment that cycles on and off.

- .7 Acceptable manufacturers are:
 - .1 Rockwell Automation Inc. - Allen-Bradley;
 - .2 Eaton Corp. – Cutler-Hammer;
 - .3 Eaton Corp. – Moeller Electric;
 - .4 Siemens Canada;
 - .5 Schneider Electric.
 - .6 Or Equivalent

2.09 SPRINKLER PROOFING

- .1 Provide drip shields for protection of surface mounted equipment enclosures from water spray and dripping of liquids. Features of shields include:
 - .1 factory constructed by respective equipment manufacturers;
 - .2 constructed from non-combustible materials (sheet steel);
 - .3 enamel painted to match equipment;
 - .4 surfaces and edges filled/sanded smooth prior to painting;
 - .5 supported from equipment with structural steel rods/metal framing or other method approved by Consultant;
 - .6 structural support finish painted to match shield.
- .2 Include with equipment Shop Drawings, detailed dimensions of drip shields and methods of supporting.
- .3 Equipment with top cable/conduit entries to include additional sealing of entries with gasketting and/or waterproof sealant to prevent water from entering enclosure.
- .4 Design ventilation louvers such that live components are not exposed to water spray and dripping liquids.
- .5 Above requirements are additional minimum "sprinkler proof" standards for equipment specified as NEMA 1, 2 or 12.
- .6 Obtain CSA approval where required by the local Building Department.

2.10 MECHANICAL WORK IDENTIFICATION MATERIALS

- .1 Equipment nameplates are to be minimum 1.6 mm (1/16") thick 2-ply laminated coloured plastic plates, minimum 12 mm x 50 mm (½" x 2") for smaller items such as damper motors and control valves, minimum 25 mm x 65 mm (1" x 2-½") for equipment, and minimum 50 mm x 100 mm (2" x 4") for control panels and similar items. Additional requirements are as follows:

- .1 unless otherwise specified or required, each nameplate is to be white, complete with bevelled edges and black engraved wording to completely identify equipment and its use with no abbreviations;
 - .2 wording is generally to be as per drawings, i.e. Fan EF-1, and is to include equipment service and building area/zone served, but must be reviewed prior to engraving;
 - .3 supply stainless steel screws for securing nameplates in place;
 - .4 nameplates for equipment suspended above floor level or generally not within easy viewing from floor level are to be increased in size to be easily readable from floor level.
- .2 Valve tags are to be coloured, 40 mm (1-½") square, 2-ply laminated plastic with bevelled edges, red-white, green-white, yellow-black, etc., to match piping identification colour, each complete with a 3.2 mm (1/8") diameter by 100 mm (4") long brass plated steel bead chain, and four lines of engraved maximum size identification wording, i.e.:
- VALVE V12
200 mm (8")
CHILL. WATER
NORMALLY OPEN
- .3 Standard pipe identification is to be equal to Smillie McAdams Summerlin Ltd., Brady or Primark Manufacturing Inc. vinyl plastic with indoor/outdoor type vinyl ink lettering and directional arrows, as follows:
- .1 for pipe less than or equal to 150 mm (6") diameter, coiled type snap-on markers of a length to wrap completely around pipe or pipe insulation;
 - .2 for pipe larger than 150 mm (6") diameter, saddle type strap-on markers with 2 opposite identification locations and complete with nylon cable ties.

- .4 Identification wording and colours for pipe identification materials are to be as follows:

PIPE SERVICE	IDENTIFICATION COLOUR	LEGEND
domestic cold water	green	DOM. COLD WATER
domestic hot water supply	green	DOM. HW SUPPLY
domestic hot water recirculation	green	DOM. HW RECIRC.
sanitary drainage	green	SAN.
plumbing vent	green	SAN. VENT
fire protection sprinklers	red	F.P. SPRINKLER
natural gas	to Code	to Code, c/w pressure
heating water supply	yellow	HTG. WTR. SUPPLY
heating water return	yellow	HTG. WTR. RETURN
heating water drain	yellow	HTG. WTR. DRAIN
refrigerant suction	yellow	REFRIG. SUCTION
refrigerant liquid	yellow	REFRIG. LIQUID
refrigerant hot gas	yellow	REFRIG. HOT GAS

- .5 Colours for pipe identification legends and directional arrows are to be as follows:

IDENTIFICATION COLOUR	LEGEND & ARROW COLOUR
yellow	black
green	white
red	white

- .6 Duct identification is to be custom made Mylar stencils with 50 mm (2") high lettering to accurately describe duct service, i.e. "AHU-1 SUPPLY", complete with a directional arrow, and coloured ink with ink pads and roller applicators. Ink colour is generally to be black but must contrast with lettering background.

3 EXECUTION

3.01 GENERAL PIPING AND DUCTWORK INSTALLATION REQUIREMENTS

- .1 Unless otherwise specified, locate and arrange horizontal pipes and ducts above or at ceiling on floors, arranged so that under consideration of all other work in area, maximum ceiling height and/or usable space is maintained. If required to maintain ceiling heights, reroute and/or resize ductwork, with Consultant's approval.
- .2 Unless otherwise specified, install work concealed in finished spaces, and concealed to degree possible in partially finished and unfinished spaces. Refer to and examine Architectural drawings and room finish schedules to determine finished, partially finished, and unfinished areas. Walls which are painted are considered finished.

- .3 Install pipes and ducts parallel to building lines and to each other.
- .4 Neatly group and arrange exposed work.
- .5 Locate work to permit easy access for service or maintenance as required and/or applicable. Locate valves, dampers and any other equipment which will or may need maintenance or repairs and which are to be installed in accessible construction to be easily accessible from access doors. Where valves, dampers and similar piping or ductwork accessories occur in vertical services in shafts, pipe spaces or partitions, locate accessories at floor level.
- .6 Make connections between pipes of different materials using adapters suitable for application. Provide cast brass dielectric type adapters/unions at connections between ferrous and copper pipe.
- .7 Comply with equipment and material manufacturer's installation instructions unless otherwise specified herein or on drawings, and unless such instructions contradict governing codes and regulations.
- .8 Carefully clean ducts, pipe and fittings prior to installation. Temporarily cap or plug ends of pipe, ducts and equipment which are open and exposed during construction.
- .9 Install piping and ductwork which are to be insulated so that they have sufficient clearance to permit insulation and finish to be applied continuously and unbroken around pipe or duct, except for ductwork at fire barriers, in which case insulation will be terminated at each side of the duct fire damper.
- .10 Inspect surfaces and structure prepared by other trades before performing work. Verify surfaces or structure to receive work has no defects or discrepancies which could result in poor application or cause latent defects in installation and workmanship. Report defects in writing. Installation of work will constitute acceptance of such surfaces as being satisfactory.
- .11 Any ferrous piping that exhibits in excess of 5% surface rust, either inside or outside or both, is to be wire brush cleaned to bare metal and coated with suitable primer. Steel pipe, fittings and accessories are to be free of corrosion and dirt when work is complete or prior to being concealed from view. Where dirt is evident, clean piping prior to being concealed.
- .12 Provide continuous galvanized sheet metal drip pan under drain, water and water solution piping extending through rooms with electrical equipment such as electrical, elevator equipment and transformer rooms, and other spaces provided primarily for the installation of electrical equipment. Drip pans are to be complete with a drain pipe connection and drain piping is to be extended to closest drain.
- .13 For factory applied finishes, repaint or refinish surfaces damaged during shipment and installation. Quality of repair work is to match original finish. This requirement also applies to galvanized finishes.
- .14 Provide screwed unions or flanges in piping connections to equipment and in regular intervals in long (in excess of 12 m [40']) piping runs to permit removal of sections of piping.
- .15 Unless otherwise specified and except where space limitations do not permit, piping elbows are to be long radius. Eccentric reducers are to be installed with straight side at top of piping.

3.02 PIPE JOINT REQUIREMENTS

- .1 Do not make pipe joints in walls or slabs.
- .2 Ream piping ends prior to making joints.
- .3 Properly cut threads in screwed steel piping and coat male threads only with Teflon tape or paste, or an equivalent thread lubricant. After pipe has been screwed into fitting, valve, union, or piping accessory, not more than 2 pipe threads are to remain exposed.
- .4 Site bevel steel pipe to be welded or supply mill bevelled pipe. Remove scale and oxide from bevels and leave smooth and clean. Use factory made welding tees or welding outlet fittings for piping branches off mains. Do not use shop or site fabricated fittings unless written approval has been obtained.
- .5 Welded joints are to be made by Canadian Welding Bureau (CWB) certified licensed journeyman welders qualified in accordance with CSA B51, Boiler Pressure Vessel and Pressure Piping Code, and who are in possession of a proper certificate of qualification for each procedure to be performed. Each weld is to be identified with the welder's identification symbol, and welds are not to be concealed until they have been inspected and approved. Electrodes are to be in accordance with CSA W48 Series, Electrodes, and requirements of CAN/CSA W117.2, Safety in Welding, Cutting and Allied Processes are to be followed.
- .6 Unless otherwise specified, make flanged joints with Garlock 5500 or equivalent gasket materials to suit the application, and bolts and nuts. Bolts are not to be longer than length necessary to screw nut up flush to the end of bolt. Bolts used for flanged connections in piping with a working pressure of 690 kPa (100 psi) and greater are to be ASTM A-193 Grade B-7, with heavy hexagon nuts to ASTM A-194 CL-2H. Provide suitable washers between each bolt head and flange and between each nut and flange.
- .7 A random check of bolted flanged connections will be made to verify flanged connections are properly mated with no shear force acting on bolts. Supply labour to disconnect and reconnect selected flanged joints. If improperly mated joints are found, remove and reinstall affected piping so flanges mate properly. If improperly mated joints are found, additional joints will be checked, and you will be responsible for the repair of any other improper joints discovered.
- .8 Unless otherwise specified make soldered joints in copper piping using flux suitable for and compatible with type of solder being used. Clean the outside of pipe end and inside of fitting, valve, or similar accessory prior to soldering.
- .9 Install mechanical joint fittings and couplings in accordance with manufacturer's instructions.
- .10 Grooves are to be rolled. Make arrangements with coupling and fitting manufacturer for shop and/or site instructions and demonstrations as required, and adhere to manufacturer's instructions with respect to pipe grooving, support, type of gasket required, anchoring and guiding the grooved piping system.
- .11 If pressure crimped couplings and fittings are used, ensure gaskets are fully compatible with piping fluid, and valves and piping accessories are suitable. Use only fitting manufacturer supplied crimping equipment. Comply with manufacturer's latest published specification, instructions, and recommendations with respect to pipe, coupling, and fitting preparation and installation, and support, anchoring and guiding of the piping system.

- .12 Solvent weld polyvinyl (PVC) piping in 2 parts, primer stage and cementing stage, in accordance with manufacturer's recommendations, ASTM D2855, and CSA requirements.
- .13 Install PVC piping with gasketed joints in accordance with manufacturer's current published specifications, instructions and recommendations, and CSA requirements.

3.03 INSTALLATION OF PIPE SLEEVES

- .1 Where pipes pass through concrete and/or masonry surfaces provide pipe sleeves as follows:
 - .1 in poured concrete slabs – unless otherwise specified, minimum 16 gauge flanged galvanized steel or, where permitted by governing authorities, factory fabricated plastic sleeves;
 - .2 in concrete or masonry walls – Schedule 40 galvanized steel pipe or Class 4000 cast iron pipe.
- .2 Size sleeves, unless otherwise specified, to leave 12 mm (½") clearance around pipes, or where pipe is insulated, a 12 mm (½") clearance around pipe insulation.
- .3 Pack and seal void between pipe sleeves and pipe or pipe insulation in non-fire rated construction for the length of sleeves as follows:
 - .1 pack sleeves in interior construction with mineral wool and seal both ends of sleeves with non-hardening silicone base caulking compound;
 - .2 pack sleeves in exterior walls above grade with mineral wool and seal both ends of sleeves water-tight with approved non-hardening silicone base caulking compound unless mechanical type seals have been specified;
 - .3 seal sleeves in exterior walls below grade (and any other wall where water leakage may be a problem) with link type mechanical seals as specified.
- .4 Where sleeves are required in masonry work, accurately locate and mark sleeve location, and hand sleeves to mason for installation.
- .5 Terminate piping for sleeves that will be exposed so sleeve is flush at both ends with building surface concerned so sleeve may be completely covered by an escutcheon plate, except for sleeves in waterproof floors which are to terminate 100 mm (4") above finished floor.
- .6 "Gang" type sleeving will not be permitted.
- .7 Where sleeves are provided in non-fire rated construction for future piping, or where piping has been removed from existing sleeves, cap and seal both ends of sleeved opening.

3.04 SLEEVE AND FORMED OPENING LOCATION DRAWINGS

- .1 Prepare and submit for review, drawings indicating size and location of required sleeves, recesses and formed openings in poured or precast concrete work.

- .2 Such drawings are to be completely and accurately dimensioned and relate sleeve, recesses, and formed openings to suitable grid lines and elevation datum, and are to take into account structural items such as grade beams, column caps, and column drop slabs.
- .3 Begin to prepare such drawings immediately upon notice to commence the Work.

3.05 INSTALLATION OF PIPE ESCUTCHEON PLATES

- .1 Provide escutcheon plates suitably secured over exposed piping passing through finished building surfaces. A finished building surface is any surface with a factory finish or that receives a site applied finish.
- .2 Install plates so they are tight against building surface concerned, completely covering pipe sleeves and/or openings, except where waterproof sleeves extend above floors, in which case fit plate tightly around sleeve.

3.06 INSTALLATION OF FASTENING AND SECURING HARDWARE

- .1 Provide fastening and securing hardware required for mechanical work to maintain installations attached to structure or to finished floors, walls and ceilings in a secure and rigid manner capable of withstanding dead loads, live loads, superimposed dead loads, and any vibration of installed products.
- .2 Use fasteners compatible with structural requirements, finishes and types of products to be connected. Do not use materials subject to electrolytic action or corrosion where conditions are liable to cause such action.
- .3 Where floor, wall or ceiling construction is not suitable to support loads, provide additional framing or special fasteners to ensure proper securement to structure that is to support the products. Provide reinforcing or connecting supports where required to distribute loading to structural components.
- .4 Obtain written consent before using explosive actuated fastening devices. If consent is obtained, comply with requirements of CAN/CSA Z166.1 and CAN/CSA Z166.2.
- .5 Do not attach fasteners to steel deck without written consent from Consultant.

3.07 INSTALLATION OF PIPE HANGERS AND SUPPORTS

- .1 Provide required pipe hangers and supports.
- .2 Provide any additional structural steel channels, angles, inserts, beam champs and similar accessories required for hanging or supporting pipe. Unless otherwise shown or specified, hang or support pipes from structure only.
- .3 For insulated pipe, size hanger or support to suit diameter of insulated pipe and install hanger or support on outside of insulation and insulation finish.
- .4 Unless otherwise shown or specified, hang and/or support horizontal pipe above ground by means of hangers and/or supports specified in Part 2 of this Section. Unless otherwise shown or specified, hangers for suspended pipe less than or equal to 25 mm (1") dia. are to be clevis type or adjustable ring type, and hangers for suspended pipe greater than or equal to 40 mm (1-½") dia. are to be adjustable clevis type.
- .5 Space hangers and supports in accordance with following:

- .1 cast iron pipe – hang or support at every joint with maximum 2.4 m (8') spacing;
- .2 plastic pipe – conform to pipe manufacturer's recommended support spacing;
- .3 copper and steel pipe – hang or support at spacing in accordance with following schedule:

PIPE DIA.	MAX. SPACING STEEL (meters)	MAX. SPACING COPPER (meters)
to 25 mm (1")	2.4 m (8')	1.8 m (6')
40 mm (1-½")	2.7 m (9')	2.4 m (8')
50 mm (2")	3.0 m (10')	2.7 m (9')
65 mm (2-½")	3.6 m (12')	3.0 m (10')
75 mm (3")	3.6 m (12')	3.0 m (10')
90 mm (3-½")	3.6 m (12')	3.6 m (12')
100 mm (4")	4.2 m (14')	3.6 m (12')
250 mm (10")	6.0 m (20')	-
300 mm (12")	6.7 m (22')	-

- .4 flexible grooved pipe/coupling joint piping – as above but with not less than one hanger or support between joints.
- .6 Where pipes change direction, either horizontally or vertically, provide a hanger or support on horizontal pipe not more than 300 mm (12") from elbow, and where pipes drop from tee branches, support tees in both directions not more than 50 mm (2") on each side of tee.
- .7 When pipes with same slope are grouped and a common hanger or support is used, space hanger or support to suit spacing requirement of smallest pipe in group and secure pipes in place on common hanger or support.
- .8 Provide roller hangers or supports for heat transfer piping greater than or equal to 150 mm (6") diameter and conveying a material 75°C (170°F) or greater to facilitate pipe movement due to expansion and contraction, and at each hanger or support tack weld a steel protection saddle to pipe to protect piping insulation.
- .9 Unless otherwise shown or specified, support vertical piping by means of supports specified in Part 2 of this Section, spaced in accordance with following:
 - .1 support vertical pipes at maximum 3 m (10') intervals or at every floor, whichever is lesser;
 - .2 for sections of vertical piping with a length less than 3 m (10'), support pipe at least once;
 - .3 for vertical cast iron plain end pipe (mechanical joint type), secure riser or pipe clamp around pipe under a flange integral with pipe for vertical support purposes, or provide a length of hub and spigot pipe to facilitate proper support;

- .4 for vertical steel pipe risers in excess of 3 m (10'), weld shear lugs to pipe to carry load;
- .5 for vibration isolated piping risers, provide rubber-steel-rubber vibration isolation pads between riser clamps and floor.
- .10 Each hanger, support or securement for horizontal bare copper tubing is to be plastic coated to prevent direct contact between pipe and ferrous hanger. Each wall or floor clamp for vertical bare copper piping is to be isolated from pipe by means of strips of flexible rubber inserts. Use of painted ferrous hangers and supports, including those painted with copper coloured paint, is not acceptable. Site application of tape or other types of isolation is not acceptable.
- .11 For insulated horizontal piping less than or equal to 40 mm (1-½") diameter, provide galvanized steel insulation protection shields between insulation and hanger or support. Install shields immediately after pipe is insulated.
- .12 Do not support piping from steel deck without written consent from Consultant.

3.08 SUPPLY OF ACCESS DOORS

- .1 Supply access doors to give access to mechanical work which may need maintenance or repair but which is concealed in inaccessible construction, except as otherwise specified herein or on drawings.
- .2 Before commencing installation of mechanical work, coordinate with other trades and prepare on a set of reflected ceiling plans and wall elevations, complete layouts of access doors. Submit these layouts for Consultant's review and show exact sizes and locations of such access doors. Locate and arrange mechanical work to suit.
- .3 Access doors will be installed by trade responsible for particular type of construction in which doors are required. Supply access doors to trade installing same at proper time.
- .4 Wherever possible, access doors to be of a standard size for each application. Confirm exact dimensions and minimum size restrictions with Consultant prior to ordering.
- .5 Group piping and ductwork to ensure minimum number of access doors is required.
- .6 Submit a sample of each proposed access door for review prior to ordering.
- .7 Coordinate with Subcontractors and trades to ensure access doors on project are provided by the same manufacturer, installed in accordance with the Contract Documents and work involving both mechanical and electrical services should, where possible, be accessible from common access door. Coordinate work to ensure common location access doors are not supplied under both Mechanical Divisions and Electrical Divisions.

3.09 INSTALLATION OF VALVES

- .1 Generally, valve locations are indicated or specified on drawings or specified in Sections of the Specification where valves are specified, however, regardless of locations shown or specified, following requirements apply:
 - .1 provide shut-off valves to isolate systems, at base of vertical risers, in branch take-offs at mains and risers on floors, to isolate equipment, to permit work phasing as required, and wherever else required for proper system operation and maintenance;

- .2 install shut-off valves with handles upright or horizontal, not inverted, and located for easy access;
- .3 unless otherwise specified, provide a check valve in discharge piping of each pump;
- .4 valve sizes are to be same as connecting pipe size;
- .5 valves are to be permanently identified with size, manufacturer's name, valve model or figure number and pressure rating, and wherever possible, valves are to be product of same manufacturer;
- .6 for valves in insulated piping, design of valve stem, handle and operating mechanism is to be such that insulation does not have to be cut or altered in any manner to permit valve operation.

3.10 MECHANICAL WORK IDENTIFICATION

- .1 Identify new exposed piping and ductwork as per Part 2 of this Section in locations as follows:
 - .1 at every end of every piping or duct run;
 - .2 adjacent to each valve, strainer, damper and similar accessory;
 - .3 at each piece of connecting equipment;
 - .4 on both sides of every pipe and duct passing through a floor, wall or partition, unless otherwise specified;
 - .5 at 6 m (20') intervals on pipe and duct runs exceeding 6 m (20') in length;
 - .6 at least once in each room, and at least once on pipe and duct runs less than 6 m (20') in length.
- .2 Unless otherwise specified identify new concealed piping and ductwork as per Part 2 of this Section in locations as follows:
 - .1 at points where pipes or ducts enter and leave rooms, shafts, pipe chases, furred spaces, and similar areas;
 - .2 at maximum 6 m (20') intervals on piping and ductwork above suspended accessible ceilings, and at least once in each room;
 - .3 at each access door location;
 - .4 at each piece of connected equipment, automatic valve, etc.
- .3 Provide an identification nameplate for equipment provided as part of this project, including items such as control valves, motorized dampers, instruments, and similar products. Secure nameplates in place, approximately at eye level if possible, with stainless steel screws unless such a practice is prohibitive, in which case use epoxy cement applied to cleaned surfaces. Locate nameplates in the most conspicuous and readable location.

- .4 Paint new natural and/or propane gas piping with primer and 2 coats of yellow paint in accordance with the Ontario Building Code and CSA B149.1 and requirements of Painting Section in Division 09. Identify piping at intervals as specified above.
- .5 Provide an identification nameplate for each motor starter or disconnect switch located in a motor control centre or on a motor starter panel, and on each individually mounted starter provided as part of mechanical work, and on each disconnect switch provided as part of the electrical work for motorized equipment provided as part of mechanical work.
- .6 Where shut-off valves, control dampers, sensors, and similar items which will or may need maintenance and/or repair are located above accessible suspended ceilings, provide round coloured ceiling tacks in ceiling panel material, or stickers equal to Brady "Quick Dot" on ceiling grid material to indicate locations of items. Unless otherwise specified, ceiling tack or sticker colours are to be as follows:
 - .1 HVAC piping valves and equipment: yellow
 - .2 fire protection valves and equipment: red
 - .3 plumbing valves and equipment: green
 - .4 HVAC ductwork dampers and equipment: blue
 - .5 control system hardware and equipment: orange

3.11 FINISH PAINTING OF MECHANICAL WORK

- .1 Finish painting of exposed mechanical work is specified in Division 09 and is part of the work of Division 09.

3.12 PIPE LEAKAGE TESTING

- .1 Before piping has been insulated or concealed, and before equipment, fixtures and fittings have been connected, test piping for leakage.
- .2 Tests are to be witnessed by Consultant and/or York Region's representative, and, where required, representatives of governing authorities. Give ample notice of tests in writing and verify attendance. Have completed test report sheets dated and signed by those present to confirm proper test results.
- .3 When circumstances prevent scheduled tests from taking place, give immediate and adequate notice of cancellation to all who were scheduled to attend.
- .4 Gravity Drainage and Vent Piping
 - .1 Test piping in accordance with the Ontario Building Code.
 - .2 After fixtures and fittings are set and pipes are connected to building drain or drains, turn on water into pipe, fixtures, fittings and traps in order to detect any imperfect material or workmanship. Perform a smoke test if required by local governing authorities.
- .5 Pumped Drainage Piping

- .1 Test piping with cold water at a pressure of 1-½ times normal working pressure and maintain pressure for a minimum of 2 hours.
- .6 Domestic Water Piping
 - .1 Test piping with cold water at a pressure of 1-½ times normal working pressure and maintain pressure for a minimum of 2 hours.
- .7 Sprinkler System Piping
 - .1 Test system piping in accordance with requirements of NFPA No. 13, "Installation of Sprinkler Systems", and in accordance with any additional requirements of governing authorities.
- .8 Refrigerant Piping
 - .1 Test refrigerant piping for leakage and dehydrate in accordance with requirements of Chapter 18 of ASHRAE Handbook - Fundamentals.
- .9 Following requirements apply to all testing:
 - .1 ensure piping has been properly flushed, cleaned and is clear of foreign matter prior to pressure testing;
 - .2 temporarily remove or valve off piping system specialties or equipment which may be damaged by test pressures prior to pressure testing systems, and flush piping to remove foreign matter;
 - .3 when testing is carried out below highest level of the particular system, increase test pressure by the hydrostatic head of 7 kPa (1 psi) for every 600 mm (24") below the high point;
 - .4 include for temporary piping connections required to properly complete tests;
 - .5 piping under test pressure is to have zero pressure drop for length of test period;
 - .6 make tight leaks found during tests while piping is under pressure, and if this is impossible, remove and refit piping and reapply test until satisfactory results are obtained;
 - .7 where leaks occur in threaded joints in steel piping, no caulking of these joints will be allowed under any conditions;
 - .8 tests are to be done in reasonably sized sections so as to minimize number of tests required;
 - .9 in addition to leakage tests specified above, demonstrate proper flow throughout systems including mains, connections and equipment, as well as proper venting and drainage, and include for any necessary system adjustments to achieve proper conditions.

3.13 SUPPLY OF MOTOR STARTERS AND ACCESSORIES

- .1 Unless otherwise shown or specified, supply a starter for each item of motorized equipment.

- .2 Unless otherwise specified or shown on Drawings, 1-phase motor starters will be mounted adjacent to equipment they serve and connected complete as part of electrical work. Hand starters to electrical trade at site at the proper time.

3.14 ELECTRICAL WIRING WORK FOR MECHANICAL WORK

- .1 Unless otherwise specified or indicated, following electrical wiring work for mechanical equipment will be done as part of the electrical work:
 - .1 "line" side power wiring to motor starters or disconnect switches in motor control centres and starters or disconnects on motor starter panels, and "load" side wiring from starters or disconnects to equipment;
 - .2 "line" side power wiring to individual wall mounted starters, and "load" side wiring from starters to equipment;
 - .3 "line" side power wiring to pre-wired power and control panels and variable frequency drives (VFD), and "load" side power wiring from the panels and VFD's to equipment;
 - .4 provision of receptacles for plug-in equipment;
 - .5 provision of disconnect switches for motors in excess of 10 m (30') from starter location, or cannot be seen from starter location, and associated power wiring;
 - .6 motor starter interlocking in excess of 24 volts;
 - .7 wiring from motor winding thermistors in motors 30 HP and larger to motor starter contacts;
 - .8 120 volt power connections to electrical receptacles integral with small ceiling exhaust fans, including wiring through light switches or speed controllers;
 - .9 120 volt wiring connections to lighting fixture/switch combinations integral with air handling units;
 - .10 120 volt wiring connections to duplex receptacles integral with air handling unit control panels.
- .2 Mechanical wiring work not listed above or specified herein or on drawings to be done as part of electrical work is to be installed in conduit and is to be done as part of mechanical work in accordance with wiring requirements specified for electrical work.

3.15 EQUIPMENT BASES AND SUPPORTS

- .1 Unless otherwise specified or required, set floor mounted equipment on minimum 100 mm (4") high reinforced concrete housekeeping pads 200 mm (8") clear of equipment on each side and end, or a minimum of 200 mm (8") from centreline of equipment anchor bolts to edge of the base, whichever is larger. Conform to following requirements:
 - .1 supply dimensioned drawings and equipment base templates, and provide anchor bolts for proper setting and securing of equipment on pads;
 - .2 place anchor bolts during concrete pour and be responsible for required levelling, alignment, and grouting of equipment;
 - .3 as a minimum, use wire mesh reinforcement, however, for pads for large heavy equipment, use reinforcement as per structural drawing details.
- .2 For equipment not designed for base mounting, where required, provide welded, cleaned and prime coat painted structural steel stands or supports conforming to following requirements:
 - .1 provide stands and supports, except those for small equipment, designed by a structural engineer registered in jurisdiction of the work, and submit stamped and signed design drawings with calculations as Shop Drawings for review;
 - .2 flange bolt steel stands to concrete housekeeping pads;
 - .3 seismically restrained stands and supports in accordance with applicable requirements.

3.16 CUTTING, PATCHING AND CORE DRILLING

- .1 Unless otherwise performed under other Sections, perform cutting, patching, and core drilling of existing building required for installation of mechanical work. Perform cutting in a neat and true fashion, with proper tools and equipment to Consultant's approval. Patching is to exactly match existing finishes and be performed by tradesmen skilled in particular trade or application. Work is subject to review and acceptance by Consultant.
- .2 Criteria for cutting holes for additional services:
 - .1 cut holes through slabs only; no holes to be cut through beams;
 - .2 cut holes 150 mm (6") diameter or smaller only; obtain approval from Structural Consultant for larger holes;
 - .3 keep at least 100 mm (4") clear from beam faces;
 - .4 space at least 3 hole diameters on centre;
 - .5 for holes that are required closer than 25% of slab span from supporting beam face, use cover meter above slab to clear slab top bars;
 - .6 for holes that are required within 50% of slab span, use cover meter underside of slab to clear slab bottom bars;

- .7 submit sleeving drawings indicating holes and their locations for Structural Consultant's review.
- .3 Do not cut or drill any existing work without approval from York Region and Consultant. Be responsible for damage done to building and services caused by cutting or drilling.
- .4 Where pipes pass through existing construction, core drill an opening. Size openings to leave 12 mm (½") clearance around pipes or pipe insulation.
- .5 Prior to drilling or cutting an opening, determine, in consultation with Consultant and York Region, and by use of non-destructive radar scan (magnetic scan) of slab or wall, presence of any existing services and reinforcement bars concealed behind building surface to be cut and locate openings to suit. Coring is not permitted through concrete beams or girders.
- .6 Firestop and seal openings in fire rated construction in accordance with requirements of subsection 2.02 entitled Firestopping and Smoke Seal Materials in this Section. Do not leave openings open overnight unless approved by York Region and Consultant.

3.17 PACKING AND SEALING CORE DRILLED PIPE OPENINGS

- .1 Pack and seal void between pipe opening and pipe or pipe insulation for length of opening as follows:
 - .1 non-fire rated interior construction – pack with mineral wool and seal both ends of opening with non-hardening silicone base caulking compound to produce a water-tight seal;

3.18 CLEANING MECHANICAL WORK

- .1 Refer to cleaning requirements specified in Division 01.
- .2 Clean mechanical work prior to application for Substantial Performance of the Contract.
- .3 Include for vacuum cleaning interior of air handling units and ductwork systems.

3.19 CONNECTIONS TO OTHER EQUIPMENT

- .1 Carefully examine Contract Documents during bidding period and include for mechanical work piping and/or ductwork connections to equipment requiring such connections.

3.20 FAN NOISE LEVELS

- .1 Submit sound power levels with fan Shop Drawings/product data, with levels measured to AMCA 300 and calculated to AMCA 301.

3.21 EQUIPMENT AND SYSTEM MANUFACTURER'S CERTIFICATION

- .1 When equipment/system installation is complete, but prior to start-up procedures, arrange and pay for equipment/system manufacturer's authorized representative to visit site to examine installation, and after any required corrective measures have been made, to certify in writing to Consultant that equipment/system installation is complete and in accordance with equipment/system manufacturer's instructions.

3.22 EQUIPMENT AND SYSTEM START-UP

- .1 When installation of equipment/systems is complete but prior to commissioning, perform start-up for equipment/systems as specified in mechanical work Sections in accordance with following requirements:
 - .1 submit a copy of each equipment/system manufacturer's start-up report sheet to Consultant for review, and incorporate any comments made by Consultant;
 - .2 under direct on-Site supervision and involvement of equipment/system manufacturer's representative, start-up equipment/systems, make any required adjustments, document procedures, leave equipment/systems in proper operating condition, and submit to Consultant complete set of start-up documentation sheets signed by manufacturer and/or supplier and Contractor.

END OF SECTION

1 GENERAL

1.01 APPLICATION

- .1 This Section specifies vibration isolation product requirements that are common to mechanical work Sections of the Specification and it is a supplement to each Section and is to be read accordingly.

1.02 SUBMITTALS

- .1 Submit copies of manufacturer's product data sheets for products specified in this Section. Product data sheets are to include product characteristics, limitations, dimensions, finishes, and installation recommendations.
- .2 Submit a letter from vibration isolation manufacturer to certify correct installation of products, as specified in Part 3 of this Section.

2 PRODUCTS

2.01 GENERAL

- .1 Vibration isolation products are to be in accordance with drawing schedule and details, and as specified below.
- .2 Springs are to be stable, colour coded, selected to operate at no greater than $\frac{2}{3}$ solid load, designed in accordance with Society of Automotive Engineers Handbook Supplement 9 entitled Manual on Design and Application of Helical and Spiral Springs, and with spring diameters in accordance with manufacturer's recommendations to suit static deflection and maximum equipment load.
- .3 Steel components of isolation products not exposed to the weather or moisture are to be zinc plated. Steel components of isolation products exposed to the weather or in a damp, moist environment are to be factory painted with rust inhibiting primer and 2 coats of neoprene.
- .4 Where weight of isolated equipment may change significantly due to draining or filling with a liquid, vibration isolators are to be equipped with limit stops to limit spring extensions.
- .5 Flexible piping connections to vibration isolated equipment are specified in the appropriate piping sections of the Specification.

2.02 NEOPRENE HANGER ISOLATORS

- .1 Neoprene double deflection rod isolators with steel housing and hanger rod bushing, selected for a minimum 4 mm (0.15") static deflection unless otherwise specified.
- .2 Acceptable products are:
 - .1 Vibro-Acoustics Ltd. Type NH;
 - .2 The VMC Group Vibration Mounting & Controls (Korfund-Dynamics) Type HR;
 - .3 Kinetics Noise Control Vibron Products Group Type RH;
 - .4 Mason Industries Inc. Type HD or WHD;

.5 J. P. America Inc. Type TRH.

.6 Or Equivalent

3 EXECUTION

3.01 INSTALLATION OF VIBRATION ISOLATION MATERIALS

- .1 Provide vibration isolation products for mechanical work in accordance with Drawing schedule and details, and requirements specified herein and/or on drawings.
- .2 Supply to vibration isolation product manufacturer or supplier a copy of a "reviewed" Shop Drawing or product data sheet for each piece of equipment to be isolated and dimensioned pipe layouts of associated piping to be isolated.
- .3 Unless otherwise specified, vibration isolation products are to be product of the same manufacturer.
- .4 Ensure vibration isolation manufacturer coordinates material selections with equipment provided in order to ensure adherence to performance criteria. Allow for expansion and contraction when material is selected and installed.
- .5 Unless otherwise indicated, install isolation materials for base mounted equipment on concrete housekeeping pad bases which extend at least over the full base and isolated area of the isolated equipment. Additional requirements are as follows:
 - .1 block and shim bases level so ductwork and piping connections can be made to a rigid system at proper operating level, before isolated adjustment is made, and ensure there is no physical contact between isolated equipment and building structure;
- .6 Secure top of spring hanger frame rigidly to structure, and do not install spring hangers in concealed locations.
- .7 For control wiring connections to vibration isolated equipment ensure flexible metallic conduit with 90° bend is used for conduit 25 mm (1") dia. and smaller, and for conduit larger than 25 mm (1") dia., use Crouse Hinds EC couplings or Equivalent. Connections are to be long enough so that conduit will remain intact if equipment moves 300 mm (12") laterally from its installed position, and flexible enough to transmit less vibration to structure than is transmitted through vibration isolation. Coordinate these requirements with mechanical trades involved. If electrical power connections are not made in a similar manner as part of the electrical work, report this fact to Consultant.
- .8 Arrange and pay for vibration isolation product manufacturer to visit Site to inspect installation of his equipment. Perform revision work required as a result of improper installation. When vibration isolation equipment manufacturer is satisfied with the installation, obtain and submit a letter stating manufacturer has inspected the installation and equipment is properly installed.

END OF SECTION

1 GENERAL

1.01 APPLICATION

- .1 This Section specifies insulation requirements common to Mechanical Divisions work Sections and it is a supplement to each Section and is to be read accordingly.

1.02 DEFINITIONS

- .1 "concealed" – means mechanical services and equipment above suspended ceilings, in non-accessible chases, in accessible pipe spaces, and furred-in spaces.
- .2 "exposed" – means exposed to normal view during normal conditions and operations.
- .3 "mineral fibre" – includes glass fibre, rock wool, and slag wool.
- .4 "domestic water" or "potable water" – means piping extended from building Municipal supply main.

1.03 SUBMITTALS

- .1 At least 20 Business Days prior to insulation work commencing, submit a sample of each type of insulation (and insulation accessories and finish), in applied form, for review. Mount samples on a plywood board. Identify each product with manufacturer's name and insulation type, and proposed use of insulation. When sample board has been approved, mechanical insulation work is to conform to approved sample board.
- .2 Submit a product data sheet for each insulation system product.

1.04 QUALITY ASSURANCE

- .1 Mechanical insulation is to be applied by a licensed journeyman insulation mechanic, or by an apprentice under direct, daily, on-site supervision of a journeyman mechanic.
- .2 Do not apply insulation unless leakage tests have been satisfactorily completed.
- .3 Ensure surfaces to be insulated are clean and dry.
- .4 Ensure ambient temperature is minimum 13°C (55°F) for at least 1 Day prior to application of insulation, and for duration of insulation work, and relative humidity is and will be at a level such that mildew will not form on insulation materials.
- .5 Insulation materials must be stored on site in a proper and dry storage area. Any wet insulation material is to be removed from site.

2 PRODUCTS

2.01 FIRE HAZARD RATINGS

- .1 Unless otherwise specified, insulation system materials inside building must have a fire hazard rating of not more than 25 for flame spread and 50 for smoke developed when tested in accordance with ULC S102, Surface Burning Characteristics of Building Materials and Assemblies.

2.02 THERMAL PERFORMANCE

- .1 Unless otherwise specified, thermal performance of insulation is to meet or exceed values given in Tables entitled Minimum Piping Insulation Thickness Heating and Hot Water Systems and Minimum Piping Insulation Thickness Cooling Systems, as stated in ANSI/ASHRAE/IES Standard 90.1 version referenced in Ontario Building Code.

2.03 PIPE INSULATION MATERIALS

- .1 Flexible foam elastomeric is to be closed cell, sleeve type, longitudinally split self-seal, foamed plastic pipe insulation with a water vapour transmission rating of 0.10 in accordance with ASTM E96, Procedure B, and required installation accessories. Acceptable products are:
 - .1 Armacell AP/Armaflex SS;
 - .2 IK Insulation Group K-Flex "LS" Self-Seal Pipe Insulation.
 - .3 Or Equivalent
- .2 Fire rated pre-moulded mineral wool is to be non-combustible, fire-rated, rigid, sectional, longitudinally split mineral wool or basalt pipe insulation with a reinforced vapour barrier jacket and compatible with ULC S115 and ULC-S101 firestopping. Acceptable products are:
 - .1 Roxul "Techton 1200";
 - .2 IIG (Johns Manville Inc.) MinWool-1200;
 - .3 Paroc 1200.
 - .4 Or Equivalent
- .3 Pre-moulded mineral fibre is to be rigid, sectional, sleeve type insulation to ASTM C547, with a factory applied vapour barrier jacket. Acceptable products are:
 - .1 Johns Manville Inc. "Micro-Lok AP-T Plus";
 - .2 Knauf Fiber Glass "Pipe Insulation" with "ASJ-SSL" jacket;
 - .3 Manson Insulation Inc. "ALLEY K APT";
 - .4 Owens Corning "Fiberglas" Pipe Insulation.
 - .5 Or Equivalent

2.04 BARRIER-FREE LAVATORY PIPING INSULATION KITS

- .1 Removable, flexible, reusable, white moulded plastic insulation kits for barrier-free lavatory drain piping and potable water supplies exposed under lavatory.
- .2 Acceptable products are:
 - .1 Truebo "Lav-Guard 2" E-Z Series;
 - .2 Zeston "SNAP-TRAP";

.3 McGuire Manufacturing Co. Inc. "ProWrap".

.4 Or Equivalent

2.05 EQUIPMENT INSULATION MATERIALS

2.06 DUCTWORK SYSTEM INSULATION MATERIALS

.1 Blanket mineral fibre is to be blanket type roll form insulation to ASTM C553, 24 kg/m³ (1½ lb/ft³) density, 40 mm (1½") thick, with a factory applied vapour barrier facing. Acceptable products are:

.1 Johns Manville Inc. Microlite FSK Duct Wrap Type 150;

.2 Knauf Fiber Glass Blanket Insulation FSK Duct Wrap Type III;

.3 Manson Insulation Inc. ALLEY WRAP FSK Duct Wrap Type III;

.4 Certainteed Corporation Softtouch FSK Duct Wrap Type 150.

.5 Or Equivalent

2.07 INSULATING COATINGS

.1 Equivalent to Robson Thermal Manufacturing Ltd. insulating coatings as follows:

.1 anti-condensation coating, "No Sweat-FX";

.2 thermal insulating coating, "ThermaLite".

2.08 INSULATION FASTENINGS

.1 Wire – minimum #15 gauge galvanized annealed wire.

.2 Wire with Mesh – minimum #15 gauge galvanized annealed wire factory woven into 25 mm (1") hexagonal mesh.

.3 Duct Insulation Fasteners – weld-on 2 mm (3/32") diameter zinc coated steel spindles of suitable length, complete with minimum 40 mm (1½") square plastic or zinc plated steel self-locking washers.

.4 Tape Sealant – equivalent to MACtac Canada Ltd. self-adhesive insulation tapes, types PAF, FSK, ASJ, or SWV as required to match surface being sealed.

.5 Mineral Fibre Insulation Adhesive – clear, pressure sensitive, brush consistency adhesive, suitable for a temperature range of -20°C to 82°C (-4°F to 180°F), compatible with type of material to be secured, and WHMIS classified as non-hazardous.

.6 Flexible Elastomeric Insulation Adhesive – Armacell "Armaflex" #520 air-drying contact adhesive or Equivalent.

.7 Closed Cell Foamed Glass Insulation Adhesive – Pittsburgh Corning PC88 multi-purpose 2-component adhesive.

.8 Screws – No. 10 stainless steel sheet metal screws.

2.09 INSULATION JACKETS AND FINISHES

- .1 Canvas Jacket Material – ULC listed and labelled, 25/50 fire/smoke rated, roll form, minimum 170 g (6 oz.).
- .2 Roll Form Sheet and Fitting Covers – minimum 15 mm (1/2") thick white PVC, 25/50 fire/smoke rated tested in accordance with ULC S102, complete with installation and sealing accessories. Acceptable products are:
 - .1 Proto Corp. "LoSMOKE";
 - .2 The Sure-Fit System "SMOKE-LESS 25/50";
 - .3 Johns Manville Inc. "Zeston" 300.
 - .4 Or Equivalent
- .3 Foamed glass insulation protective coating is to be Pittsburgh Corning "PITTCOTE 404" flexible acrylic latex weather barrier coating, white unless otherwise specified.
- .4 Flexible foam elastomeric insulation protective coating equivalent to Armacell "WB Armaflex" weatherproof, water-based latex enamel finish.

3 EXECUTION

3.01 GENERAL INSULATION APPLICATION REQUIREMENTS

- .1 Unless otherwise specified, do not insulate following:
 - .1 factory insulated equipment and piping;
 - .2 heating piping within radiation unit enclosures, including blank filler sections of enclosures;
 - .3 heating piping in soffits and/or overhang spaces and connected to bare element radiation in spaces;
 - .4 branch potable water piping located under counters to serve counter mounted plumbing fixtures and fittings, except barrier-free lavatories;
 - .5 exposed chrome plated potable water angle supplies from concealed piping to plumbing fixtures and fittings, except barrier-free lavatories;
 - .6 heated liquid system pump casings, valves, strainers and similar accessories;
 - .7 heating system expansion tanks;
 - .8 fire protection pump casings;
 - .9 manufactured expansion joints and flexible connections;
 - .10 acoustically lined ductwork and/or equipment;
 - .11 factory insulated flexible branch ductwork;

- .12 fire protection system water storage tanks;
- .13 piping unions, except for unions in "cold" category piping.
- .2 Install insulation directly over pipes and ducts, not over hangers and supports.
- .3 Install piping insulation and jacket continuous through pipe openings and sleeves.
- .4 Install duct insulation continuous through walls, partitions, and similar surfaces except at fire dampers.
- .5 When insulating "cold" piping and equipment, extend insulation up valve bodies and other such projections as far as possible, and protect insulation jacketing from the action of condensation at its junction with metal.
- .6 When insulating vertical piping risers 75 mm (3") diameter and larger, use insulation support rings welded directly above lowest pipe fitting, and thereafter at 4.5 m (14.7') centres and at each valve and flange. Insulate as per Thermal Insulation Association of Canada National Insulation Standards, Figure No. 9.
- .7 Where existing insulation work is damaged as a result of mechanical work, repair damaged insulation work to Project work standards.
- .8 Where mineral fibre rigid sleeve type insulation is terminated at valves, equipment, unions, etc., neatly cover exposed end of insulation with a purpose made PVC cover on "cold" piping, and with canvas jacket material on "hot" piping.
- .9 Carefully and neatly gouge out insulation for proper fit where there is interference between weld bead, mechanical joints, etc., and insulation. Bevel away from studs and nuts to permit their removal without damage to insulation, and closely and neatly trim around extending parts of pipe saddles.
- .10 Where thermometers, gauges, and similar instruments occur in insulated piping, and where access to heat transfer piping balancing valve ports and similar items are required, create a neat, properly sized hole in insulation and provide a suitable grommet in the opening.

3.02 INSULATION FOR HORIZONTAL PIPE AT HANGERS AND SUPPORTS

- .1 At each hanger and support location for piping 50 mm (2") diameter and larger and scheduled to be insulated, except where roller hangers and/or supports are required, and unless otherwise specified, supply a factory fabricated section of phenolic foam pipe insulation with integral vapour barrier jacket and captive galvanized steel shield. Supply insulation sections to piping installers for installation as pipe is erected.

3.03 PIPE INSULATION REQUIREMENTS – MINERAL FIBRE

- .1 Insulate following pipe inside building and above ground with mineral fibre insulation of thickness indicated:
 - .1 domestic cold water piping, less than 100 mm (4") dia. – 25 mm (1") thick;
 - .2 domestic cold water piping, greater than or equal to 100 mm (4") dia. – 40 mm (1-½") thick;

- .3 domestic hot water piping, less than 40 mm (1-½") dia. – 25 mm (1") thick;
- .4 domestic hot water piping, greater than or equal to 40 mm (1½") dia. – 40 mm (1-½") thick;
- .5 hot water heating piping, supply and return, less than 40 mm (1-½") dia. – 40 mm (1-½") thick;
- .6 hot water heating piping, supply and return, greater than or equal to 40 mm (1-½") dia. – 50 mm (2") thick;
- .7 refrigerant suction piping (between compressor and evaporator coil) inside building – 25 mm (1") thick;
- .8 refrigerant hot gas piping (between compressor and condenser) inside building – 25 mm (1") thick;
- .9 refrigerant hot gas by-pass piping (between compressor discharge and evaporator coil) inside building – 25 mm (1") thick;
- .10 air compressor set fresh air intake piping – 25 mm (1") thick;
- .2 Secure overlap flap of the sectional insulation jacket tightly in place. Cover section to section butt joints with tape sealant.
- .3 Insulate fittings with sectional pipe insulation mitred to fit tightly, and cover butt joints with tape sealant, or, alternatively, wrap fittings with blanket mineral fibre insulation to a thickness and insulating value equal to the sectional insulation, secure in place with adhesive and/or wire, and cover with PVC fitting covers.
- .4 Terminate sectional insulation approximately 50 mm (2") from flange or coupling on each side of flange or coupling. Cover flange or coupling with a minimum 50 mm (2") thickness of blanket mineral fibre insulation wide enough to butt tightly to ends of adjacent sectional insulation. Secure blanket insulation in place and cover with a purpose made PVC coupling cover.
- .5 Take special care at concealed water rough-in piping at plumbing fixtures to ensure piping is properly insulated. If necessary due to space limitations, use 12 mm (½") thick sectional pipe insulation in lieu of 25 mm (1") thick insulation.

3.04 PIPE INSULATION REQUIREMENTS – FLEXIBLE FOAM ELASTOMERIC

- .1 Install flexible elastomeric pipe insulation in strict accordance with manufacturer's published instructions to suit the application, and using adhesive, joint sealants and finish to produce a water-tight installation. Insulate following pipe with flexible elastomeric pipe insulation of thickness indicated:
 - .1 refrigerant suction and hot gas piping outside building – 25 mm (1") thick.

3.05 INSTALLATION OF BARRIER FREE LAVATORY INSULATION KITS

- .1 Provide manufactured insulation kits to cover exposed drainage and water piping under barrier free lavatories.

3.06 DUCTWORK INSULATION REQUIREMENTS – MINERAL FIBRE

- .1 Insulate following ductwork systems inside building and above ground with mineral fibre insulation of thickness indicated:
 - .1 outside air intake ductwork, casings and plenums from fresh air intakes to and including mixing plenums or sections, or, if mixing plenums or sections are not provided, to first heating coil, or if both mixing plenums or sections and heating coil sections are not provided, and fresh air is not tempered, then the fresh air ductwork system complete – minimum 40 mm (1-½") thick as required;
 - .2 mixed supply air or preheated supply air casings, plenums and sections to and including the fan section where not factory insulated – minimum 25 mm (1") thick rigid board or minimum 40 mm (1-½") thick flexible blanket as required;
 - .3 supply air ductwork outward from fans, except for supply ductwork exposed in area it serves – minimum 25 mm (1") thick rigid board or minimum 40 mm (1-½") thick flexible blanket as required;
 - .4 exhaust discharge ductwork for a distance of 3 m (10') downstream (back) from exhaust openings to atmosphere, including any exhaust plenums within the 3 m (10') distance – minimum 25 mm (1") thick rigid board or minimum 40 mm (1-½") thick flexible blanket as required;
 - .5 any other ductwork, casings, plenums or sections specified or detailed on drawings to be insulated – thickness as specified.
- .2 Liberally apply adhesive to surfaces of concealed rectangular or oval ductwork, and wrap insulation around duct with a top butt joint and tight section to section butt joints. Provide pin and washer insulation fasteners at 300 mm (12") centres on bottom surfaces. Secure and seal joints with 75 mm (3") tape sealant. At each trapeze type duct hanger, provide a 100 mm (4") wide full length piece of rigid mineral fibre board insulation between duct and hanger.
- .3 Accurately cut sections of insulation to fit tightly and completely around exposed and concealed round or oval ductwork. Liberally apply adhesive to surfaces of duct, and wrap insulation around duct with a top butt joint and tight section to section butt joints. Seal joints with tape sealant. At duct hanger locations install insulation between duct and hanger. At each hanger location for concealed ductwork where flexible blanket insulation is used, provide a 100 mm (4") wide full circumference strip of semi-rigid board type duct insulation between duct and hanger.
- .4 Insulation application requirements common to all types of rigid ductwork are as follows:
 - .1 at duct connection flanges, insulate flanges with neatly cut strips of rigid insulation material secured with adhesive to side surfaces of flange with a top strip to cover exposed edges of the side strips, then butt the flat surface duct insulation up tight to flange insulation, or, alternatively, increase insulation thickness to depth of flange and cover top of flanges with tape sealant;
 - .2 installation of fastener pins and washers is to be concurrent with duct insulation application;
 - .3 cut insulation fastener pins almost flush to washer and cover with neatly cut pieces of tape sealant;

- .4 accurately and neatly cut and fit insulation at duct accessories such as damper operators (with standoff mounting) and pitot tube access covers;
- .5 prior to concealment of insulation by either construction finishes or canvas jacket material, patch vapour barrier damage by means of tape sealant.

3.07 DUCTWORK INSULATION REQUIREMENTS – FLEXIBLE ELASTOMERIC

- .1 Insulate exposed exterior ductwork (except fresh air intake ductwork) and associated plenums and/or casings outside building with minimum 40 mm (1-½") thick flexible elastomeric sheet insulation as required, applied in 2 minimum 20 mm (¾") thick layers with staggered tightly butted joints.
- .2 Install with adhesive in strict accordance with manufacturer's instructions to produce a weather-proof installation. Ensure sheet metal work joints are sealed watertight prior to applying insulation.

3.08 APPLICATION OF INSULATING COATINGS

- .1 Apply, in accordance with manufacturer's instruction, insulating coatings to following bare metal surfaces:
 - .1 paint bare metal surfaces clear of "cold" piping and/or equipment insulation for a distance of from 300 mm (12") to 600 mm (24") clear of pipe or equipment insulation, with "No Sweat-FX" anti-condensation coating or Equivalent;
 - .2 paint bare metal surfaces associated with mechanical systems with an operating temperature 60°C (140°F) with "ThermaLite" insulating coating or Equivalent.
- .2 Apply coatings with a brush. Remove any splatter or excess coating from adjacent surfaces.

3.09 INSULATION FINISH REQUIREMENTS

- .1 Unless otherwise shown and/or specified, jacket exposed mineral fibre insulation, and calcium silicate duct insulation work inside building with canvas secured in place with a full covering coat of lagging adhesive. Accurately cut canvas with scissors or a knife. Do not rip or tear canvas to size. Remove lagging adhesive splatter from adjacent uninsulated surfaces.
- .2 Jacket exposed pipe insulation work inside building with white sheet PVC and fitting covers. Install sheet PVC and fitting covers tightly in place with overlapped circumferential and longitudinal joints arranged to shed water. Seal joints to produce a neat water-tight installation. Provide slip-type expansion joints where required by manufacturer's instructions.
- .3 Apply 2 heavy coats of "PITTCOTE 404" coating or Equivalent with 24 hr. between coats to foamed glass insulation exposed above grade.
- .4 Apply 2 coats (with 24 hr. between coats) of specified coating to flexible elastomeric insulation outside building.

END OF SECTION

1 GENERAL

1.01 APPLICATION

- .1 This Section specifies requirements, criteria, methods and execution for mechanical demolition work that are common to one or more mechanical work Sections, and it is intended as a supplement to each Section and is to be read accordingly.

1.02 SUBMITTALS

- .1 Submit documentation to Consultant confirming reclaimed refrigerant has been properly removed and stored, recycled, or disposed of as applicable.

2 PRODUCTS

Not Used

3 EXECUTION

3.01 DISCONNECTION AND REMOVAL OF EXISTING MECHANICAL WORK

- .1 Where indicated on Drawings, disconnect and remove existing mechanical work, including hangers, supports, insulation, etc. Disconnect at point of supply, remove obsolete connecting services and make system safe. Cut back obsolete piping behind finishes and cap water-tight unless otherwise specified.
- .2 Scope and extent of demolition or revision work is only generally indicated on Drawings. Estimate scope, extent and cost of work at site during bidding period site visit(s). Claims for extra costs for demolition work not shown or specified but clearly visible or ascertainable at site during bidding period site visits will not be allowed.
- .3 If any re-design is required due to discrepancies between mechanical Drawings and Site conditions, notify Consultant who will issue a Site Instruction. If, in the opinion of Consultant, discrepancies between mechanical Drawings and actual site conditions are of a minor nature, required modifications are to be done at no additional cost.
- .4 Where existing mechanical services extend through or are in an area to serve items which are to remain, maintain services in operation. Include for rerouting existing services concealed behind existing finishes and which become exposed during renovation work, so as to be concealed behind new or existing finishes.

3.02 INTERRUPTION TO AND SHUT-DOWN OF MECHANICAL SERVICES AND SYSTEMS

- .1 Perform work associated with shut-downs and interruptions as continuous operations to minimize shut-down time and to reinstate systems as soon as possible, and, prior to any shut-down, ensure materials and labour required to complete the work for which shut-down is required are available at site.
- .2 Pipe freezing may be used to connect new piping to existing piping without draining existing piping. Pipe freeze equipment is to be equivalent to "NORDIC FREEZE" equipment supplied by Mag Tool Inc. or Rigid Tool Co. RIGID "SuperFreeze".

3.03 DECOMMISSIONING OR ALTERATIONS TO REFRIGERATION EQUIPMENT

- .1 Remove and reclaim refrigerant from applicable equipment to be decommissioned and/or altered. Refrigerant reclaim and recycling work is to be in accordance with Refrigerant Management Canada guidelines, and governing codes and regulations. Do not under any circumstances vent refrigerant from existing equipment to atmosphere.
- .2 Use refrigerant recovery equipment designed specifically to reclaim and recycle refrigerant, and use only skilled refrigeration mechanics to perform reclaim and recycle work.
- .3 Provide approved, properly sized and sealable refrigerant containers for reclaimed refrigerant.
- .4 Dispose of reclaimed refrigerant by engaging services of a licensed firm specializing in recycling of reclaimed refrigerant. Submit documentation to confirm refrigerant has been properly removed from Site and recycled or disposed.

END OF SECTION

1 GENERAL

1.01 APPLICATION

- .1 This Section specifies mechanical system testing, adjusting, and balancing requirements that are common to mechanical work Sections of the Specification and it is a supplement to each Section and is to be read accordingly.

1.02 DEFINITIONS

- .1 "Agency" – means agency to perform testing, adjusting and balancing work.
- .2 "TAB" – means testing, adjusting and balancing to determine and confirm quantitative performance of equipment and systems and to regulate specified fluid flow rate and air patterns at terminal equipment, e.g., reduce fan speed, throttling, etc.
- .3 "hydronic systems" – includes heating water, chilled water, glycol-water solution, condenser water, and any similar system.
- .4 "air systems" – includes outside air, supply air, return air, exhaust air, and relief air systems.
- .5 "flow rate tolerance" – means allowable percentage variation, minus to plus, of actual flow rate values in Contract Documents.
- .6 "report forms" – means test data sheets arranged for collecting test data in logical order for submission and review, and these forms, when reviewed and accepted, should also form permanent record to be used as basis for required future testing, adjusting and balancing.
- .7 "terminal" – means point where controlled fluid enters or leaves the distribution system, and these are supply inlets on water terminals, supply outlets on air terminals, return outlets on water terminals, and exhaust or return inlets on air terminals such as registers, grilles, diffusers, louvers, and hoods.
- .8 "main" – means duct or pipe containing system's major or entire fluid flow.
- .9 "submain" – means duct or pipe containing part of the systems' capacity and serving 2 or more branch mains.
- .10 "branch main" – means duct or pipe servicing 2 or more terminals.
- .11 "branch" – means duct or pipe serving a single terminal.

1.03 SUBMITTALS

- .1 Within 10 days of work commencing at Site, submit name and qualifications of proposed testing and balancing agency in accordance with requirements of article entitled Quality Assurance below.
- .2 Submit sample test forms, if other than those standard forms prepared by Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB), are proposed for use.

- .3 Submit a report by Agency to indicate Agency's evaluation of mechanical Drawings with respect to service routing and location or lack of balancing devices. Include set of drawings used and marked-up by Agency to prepare report.
- .4 Submit a report by Agency after each Site visit made by Agency during construction phase of this Project.
- .5 Submit a draft report, as specified in Part 3 of this Section.
- .6 Submit a final report, as specified in Part 3 of this Section.
- .7 Submit a testing and balancing warranty as specified in Part 3 of this Section.
- .8 Submit reports listing observations and results of post construction Site visits as specified in Part 3 of this Section.

1.04 QUALITY ASSURANCE

- .1 Employ services of an independent testing, adjusting, and balancing agency meeting qualifications specified below, to be single source of responsibility to test, adjust, and balance building mechanical systems to produce design objectives. Agency is to have successfully completed testing, adjusting and balancing of mechanical systems for a minimum of 5 projects similar to this project within past 3 years, and is to be certified as an independent agency in required categories by one of following:
 - .1 AABC - Associated Air Balance Council;
 - .2 NEBB - National Environmental Balancing Bureau.
- .2 Testing, adjusting and balancing of complete mechanical systems is to be performed over entire operating range of each system in accordance with 1 of following publications:
 - .1 National Standards for a Total System Balance published by Associated Air Balance Council;
 - .2 Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems published by National Environmental Balancing Bureau;
 - .3 Chapter 37, Testing, Adjusting, and Balancing of ASHRAE Handbook HVAC Applications.

2 PRODUCTS

Not Used

3 EXECUTION

3.01 SCOPE OF WORK

- .1 Perform total mechanical systems testing, adjusting, and balancing. Requirements include measurement and establishment of fluid quantities of mechanical systems as required to meet design specifications and comfort conditions, and recording and reporting results.
- .2 Mechanical systems to be tested, adjusted and balanced include:

- .1 TAB of heating systems is to include piping and equipment fluid temperatures, flows and control, and if TAB is not done during heating season, a follow-up site visit during heating season will be required to confirm proper flows and temperatures, and any required system "fine tuning".
- .2 TAB of cooling systems is also to include piping and equipment fluid temperatures, flows and control, and if TAB is not done during cooling season, a follow-up site visit during cooling season will be required to confirm proper flows and temperatures, and any required system "fine".
- .3 TAB of air handling systems is to include equipment and ductwork air temperatures, capacities and flows.

3.02 TESTING, ADJUSTING AND BALANCING

- .1 Conform to following requirements:
 - .1 as soon as possible after award of Contract, Agency is to carefully examine a white print set of mechanical Drawings with respect to routing of services and location of balancing devices, and is to issue a report listing results of the evaluation;
 - .2 set of Drawings examined by Agency is to be returned with evaluation report, with red line mark-ups to indicate locations for duct system test plugs, and required revision work such as relocation of balancing devices and locations for additional devices;
 - .3 after review of mechanical work drawings and specification, Agency is to visit Site at frequent, regular intervals during construction of mechanical systems, to observe routing of services, locations of testing and balancing devices, workmanship, and anything else that will affect testing, adjusting and balancing;
 - .4 after each Site visit, Agency is to report results of site visit indicating date and time of visit, and detailed recommendations for any corrective work required to ensure proper adjusting and balancing;
 - .5 testing, adjusting and balancing is not to begin until:
 - .1 building construction work is substantially complete and doors have been installed;
 - .2 mechanical systems are complete in all respects, and have been checked, started, adjusted, and then successfully performance tested.
 - .6 mechanical systems to be tested, adjusted and balanced are to be maintained in full, normal operation during each day of testing, adjusting and balancing;
 - .7 obtain copies of reviewed Shop Drawings of applicable mechanical plant equipment and terminals, and temperature control diagrams and sequences;
 - .8 Agency is to walk each system from system "head end" equipment to terminal units to determine variations of installation from design, and system installation trades will accompany Agency;
 - .9 Agency is to check valves and dampers for correct and locked position, and temperature control systems for completeness of installation before starting equipment;

- .10 wherever possible, Agency is to lock balancing devices in place at proper setting, and permanently mark settings on devices;
 - .11 Agency is to leak test ductwork as specified in Section entitled HVAC Air Distribution in accordance with requirements of SMACNA "HVAC Air Duct Leak Test Manual", coordinate work with work of aforementioned Sections, provide detailed sketch(es) to Sheet Metal Contractor and Consultant identifying ductwork not in accordance with acceptable leakage values specified in aforementioned Sections, and retest corrected ductwork;
 - .12 Agency is to balance systems with due regard to objectionable noise which is to be a factor when adjusting fan speeds and performing terminal work such as adjusting air quantities, and should objectionable noise occur at design conditions, Agency is to immediately report problem and submit data, including sound readings, to permit an accurate assessment of noise problem to be made;
 - .13 Agency is to check supply air handling system mixing plenums for stratification, and where variation of mixed air temperature across coils is found to be in excess of $\pm 5\%$ of design requirements, Agency is to report problem and issue a detail sketch of plenum baffle(s) required to eliminate stratification;
 - .14 Agency is to perform testing, adjusting and balancing to within $\pm 5\%$ of design values, and make and record measurements which are within $\pm 2\%$ of actual values;
 - .15 for air handling systems equipped with air filters, test and balance systems with simulated 50% loaded (dirty) filters by providing a false pressure drop;
 - .16 test, adjust and balance air conditioning systems during summer season and heating systems during winter season, including at least a period of operation at outside conditions within 2.8°C (5°F) wet bulb temperature of maximum summer design condition, and within 5.5°C (10°C) dry bulb temperature of minimum winter design condition, and take final temperature readings during seasonal operation.
- .2 Prepare reports as indicated below.
- .1 Upon completion of testing, adjusting, and balancing procedures, prepare draft reports on AABC or NEBB forms. Draft reports may be hand written, but must be complete, factual, accurate, and legible. Organize and format draft reports in same manner specified for final reports. Submit 2 complete sets of draft reports. Only 1 complete set of draft reports will be returned.
 - .2 Upon verification and approval of draft reports, prepare final reports, type written, and organized and formatted as specified below. Submit 2 complete sets of final reports. Use units of measurement (SI or Imperial) as used on Project Documents.
 - .3 Report forms are to be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced. Bind report forms complete with schematic systems diagrams and other data in reinforced, vinyl, 3-ring binders. Provide binding edge labels with project identification and a title descriptive of contents. Divide contents of binder into divisions listed below, separated by divider tabs:
 - .1 General Information and Summary;
 - .2 Air Systems;

- .3 Temperature Control Systems;
- .4 Special Systems.
- .4 Agency is to provide following minimum information, forms and data in report:
 - .1 inside cover sheet to identify Agency, Contractor, and Project, including addresses, and contact names and telephone numbers and a listing of instrumentation used for procedures along with proof of calibration;
 - .2 remainder of report is to contain appropriate forms containing as a minimum, information indicated on standard AABC or NEBB report forms prepared for each respective item and system;
 - .3 Agency is to include for each system to be tested, adjusted and balanced, a neatly drawn, identified (system designation, plant equipment location, and area served) schematic "as-built" diagram indicating and identifying equipment, terminals, and accessories;
 - .4 Agency is to include report sheets indicating building comfort test readings for all rooms.
- .3 After final testing and balancing report has been submitted, Agency is to visit site with Contractor and Consultant to spot check results indicated on balancing report. Agency is to supply labour, ladders, and instruments to complete spot checks. If results of spot checks do not, on a consistent basis, agree with final report, spot check procedures will stop and Agency is to then rebalance systems involved, resubmit final report, and again perform spot checks with Contractor and Consultant.
- .4 When final report has been accepted, Contractor is to submit to York Region, in name of York Region, a certificate equal to AABC National Guaranty Certification or a NEBB Quality Assurance Program Bond, and in addition, Contractor is to submit a written extended warranty from Agency covering one full heating season and one full cooling season, during which time any balancing problems which occur, with exception of minor revision work done during scheduled site visits, will, at no cost, be investigated by Agency and reported on to York Region, and if it is determined that problems are a result of improper testing, adjusting and balancing, they are to be immediately corrected without additional cost to York Region.
- .5 After acceptance of final report, Agency is to perform post testing and balancing site visits in accordance with following requirements:
 - .1 post testing and balancing site visits are to be made:
 - .1 once during first month of building operation;
 - .2 once during third month of building operation;
 - .3 once between fourth and tenth months in a season opposite to first and third month visit.
 - .2 during each return visit and accompanied by York Region's representative, Agency is to spot rebalance terminal units as required to suit building occupants and eliminate complaints;

- .3 Agency is to schedule each visit with Contractor and York Region, and inform Consultant;
- .4 after each follow-up Site visit, Agency is to issue to Contractor and Consultant a report indicating any corrective work performed during visit, abnormal conditions and complaints encountered, and recommended corrective action.

END OF SECTION

1 GENERAL

1.01 APPLICATION

- .1 This Section specifies material requirements for firestopping and smoke seal systems that are common to mechanical work Sections and it is a supplement to each Section and is to be read accordingly.

1.02 SUBMITTALS

- .1 Submit a product data sheet and Workplace Hazardous Materials Information System (WHMIS) sheet for each firestopping and smoke seal product.
- .2 Submit for review, full company name and experience of proposed firestopping and smoke seal system applicator.
- .3 Submit letter of proper firestopping and smoke seal certification as specified in Part 3 of this Section.

1.03 QUALITY ASSURANCE

- .1 Applicator is to have a minimum of 3 years of successful experience on projects of similar size and complexity, and applicator's qualifications are to be submitted to Consultant for review.
- .2 Comply with firestopping and smoke seal product manufacturer's recommendations regarding suitable environment conditions for product installation.

2 PRODUCTS

2.01 FIRESTOPPING AND SMOKE SEAL SYSTEM MATERIALS

- .1 Asbestos-free, elastomeric materials and intumescent materials, tested, listed and labelled by ULC in accordance with CAN/ULC S115, and CAN/ULC S101 for installation in ULC designated firestopping, and smoke seal systems to provide a positive fire, water and smoke seal and a fire resistance rating (flame, hose stream and temperature) no less than fire rating for surrounding construction.
- .2 Firestopping and smoke seal material system to be specifically ULC certified with designated reference number for its specific installation. As part of shop drawing submission, submit copies of firestopping drawings with ULC certificate and system number for each specific installation.
- .3 Materials are to be compatible with abutting dissimilar materials and finishes and complete with primers, damming and back-up materials, supports, and anchoring devices in accordance with firestopping manufacturer's recommendations and ULC tested assembly. Coordinate material requirements with trades supplying abutting areas of materials.
- .4 Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance ratings.

- .5 Typically, for openings of up to 250 mm (10") in diameter, provide putty pad type firestop materials equivalent to Specified Technologies Inc. "SpecSeal" intumescent, non-hardening, water resistant putties containing no solvents, inorganic fibres or silicone compounds.
- .6 Typically, for openings of greater than 250 mm (10") in diameter, and for rectangular openings, provide pillow type firestop materials equivalent to Specified Technologies Inc. "SpecSeal" re-enterable, non-curing, mineral fibre core encapsulated on six sides with intumescent coating contained in a flame retardant poly bag.
- .7 Pipe insulation forming part of a fire and smoke seal assembly is specified in Section entitled Mechanical Insulation.
- .8 Supply products of a single manufacturer for use on work of this Division.
- .9 Installer to be manufacturer trained and certified on specific product. Submit copy of certificate with shop drawings.
- .10 Include for manufacturer's authorized representative to inspect and verify each installation and application. Submit test report signed and verified by system installer's authorized representative and manufacturer's representative.
- .11 Acceptable certification to also include certification by Underwriters Laboratories of Northbrook IL, using tests conforming to ULC-S115 and given cUL listing published by UL in their "Products Certified for Canada (cUL) Directory".
- .12 Acceptable manufacturers are:
 - .1 Specified Technologies Inc.;
 - .2 3M Canada Inc.;
 - .3 Tremco;
 - .4 A/D Fire Protection Systems;
 - .5 Nelson;
 - .6 Hilti Canada.
 - .7 Or Equivalent

3 EXECUTION

3.01 INSTALLATION OF FIRESTOPPING AND SMOKE SEAL MATERIALS

- .1 Where work penetrates or punctures fire rated construction, provide ULC certified, listed and labelled firestopping and smoke sealing packing material systems to seal openings and voids around and within raceway and to ensure that continuity and integrity of fire separation is maintained. Openings not in immediate vicinity of working areas are to be firestopped and sealed same day as being opened.

- .2 Install firestopping and smoke seal materials for each installation in strict accordance with specific ULC certification number and manufacturer's instructions. Comply with the Ontario Building Code requirements and obtain approvals from local building inspection department. Ensure that openings through fire separations do not exceed maximum size wall opening, and maximum and minimum dimensions indicated in ULC Guide No. 40 U19 for Service Penetration Assemblies and firestopping materials.
- .3 Ensure that continuity and integrity of fire separation is maintained and conform to requirements of latest edition of ULC publication "List of Equipment and Materials, Volume II, Building Construction".
- .4 Comply with following requirements:
 - .1 Examine substrates, openings, voids, adjoining construction and conditions under which firestop and smoke seal system is to be installed. Confirm compatibility of surfaces.
 - .2 Verify penetrating items are securely fixed and properly located with proper space allowance between penetrations and surfaces of openings.
 - .3 Report any unsuitable or unsatisfactory conditions to Consultant in writing, prior to commencement of work. Commencement of work will mean acceptance of conditions and surfaces.
 - .4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces. Remove stains on adjacent surfaces.
 - .5 Prime substrates in accordance with product manufacturer's written instructions.
 - .6 Provide temporary forming as required and remove only after materials have gained sufficient strength and after initial curing.
 - .7 Tool or trowel exposed surfaces to a neat, smooth, and consistent finish.
 - .8 Remove excess compound promptly as work progresses and upon completion.
 - .9 At fusible link damper locations, seal perimeter of angle iron framing on both sides of wall or slab with ULC listed and labelled sealant materials to provide a positive smoke seal.
- .5 Notify Consultant when work is complete and ready for inspection, and prior to concealing or enclosing firestopping and smoke seal materials and service penetration assemblies. Arrange for final inspection of work by local governing authority inspector prior to concealing or enclosing work. Make any corrections required.
- .6 On completion of firestopping and smoke sealing installation, submit a Letter of Assurance to Consultant certifying the firestopping and smoke sealing installation has been carried out throughout the building to service penetrations and that installation has been performed in strict accordance with requirements of local governing building code, any applicable local municipal codes, ULC requirements, and manufacturer's instructions.
- .7 Manufacturer's authorized representative to inspect and verify each installation and provide a test report signed by installing trade and manufacturer's representative. Test report to list each installation and respective ULC certification and number.

- .8 Where work requires removal of existing firestopping materials and replacement of firestopping materials after cabling changes have been made, ensure that replacement material is same material and manufacturer of existing if any remains in place, or ensure that all existing material is removed before installation of replacement material.

END OF SECTION

SPECIFICATIONS LIST

SPECIFICATION NUMBER	DESCRIPTION
02 41 19	Interior Demolition
03 10 00	Concrete Formwork
03 20 00	Concrete Reinforcement
03 30 00	Cast-In-Place Concrete
03 40 00	Concrete Finishing
04 10 00	Masonry
05 40 00	Miscellaneous Metal
06 20 00	Finish Carpentry
08 20 00	Hollow Metal Door & Frame
09 10 00	Gypsum Board
09 30 13	Porcelain Tile
09 51 23	Lay in Panel Ceiling
09 65 13	Resilient Base
09 68 13	Carpet Tile Floor and Base
09 91 00	Painting
10 20 00	Washroom Accessories
10 21 13	Washroom Partitions
14 01 20	Maintenance of Elevator
14 26 00	Limited-Use Limited Application Elevator
20 05 05	Mechanical Work General Instructions
20 05 10	Basic Mechanical Materials and Methods
20 05 20	Mechanical Vibration Control
20 05 25	Mechanical Insulation
20 05 35	Demolition and Revision Work
20 05 50	Testing, Adjusting and Balancing
20 05 55	Firestopping and Smoke Seal Systems
21 13 00	Fire Protection Sprinkler System
21 20 05	Fire Extinguishers
22 11 00	Domestic Water Piping and Specialties
22 13 00	Drainage and Vent Piping and Specialties
22 42 00	Plumbing Fixtures and Fittings
23 30 00	HVAC Air Distribution
23 34 00	HVAC Fans
25 05 05	Automatic Control Systems

26 05 00	Common Work Results for Electrical
26 05 05	Selective Demolition for Electrical
26 05 10	Wiring Methods
26 05 20	Wire and Box Connectors 0-1000 V
26 05 21	Wires and Cables (0-1000 V)
26 05 26	Grounding and Bonding for Electrical
26 05 29	Hangers and Supports for Electrical Systems
26 05 31	Splitters, Junction, Pull Boxes and Cabinets
26 05 32	Outlet Boxes, Conduit Boxes and Fittings
26 05 34	Conduits, Conduit Fastenings and Conduit Fittings
26 05 37	Wireways and Auxiliary Gutters
26 05 53	Identification of Electrical Systems
26 27 26	Wiring Devices
26 28 13.01	Fuses – Low Voltage
26 28 16.02	Moulded Case Circuit Breakers
26 28 23	Disconnect Switches – Fused and Non-Fused
26 50 00	Lighting Equipment
26 53 00	Exit Lights
28 31 00	Multiplex Fire Alarm and Voice Communication System
	York Region Corporate Its Cabling & Wiring Standard Dated April 21, 2020

DESIGN AND REFERENCE DRAWING LIST

DRAWING NUMBER	DESCRIPTION
A101	New Site Plan
A201	Ground Floor Plan
A202	Existing & New Second Floor Plan
A301	Existing & New Ground Floor Reflected Ceiling Plan
A302	Existing & New Second Floor Reflected Ceiling Plan
A701	Washroom Details
A702	Washroom Details
A703	Kitchenette Details
A704	Elevator Details
A901	Schedules
M001	Drawing List, Symbol List, Key Plan
M101	Ground & Second Floor Demolition & New Work Plans - HVAC
M201	Ground & Second Floor Demolition & New Work Plans - Plumbing & Fire Protection
M301	Second Floor - Fire Protection
M401	Schedules, Details, Controls
E000	Electrical Drawing List
E001	Electrical Legend, Notes And Lighting Fixture Schedule
E100	Ground Floor - Lighting Layout
E101	Second Floor - Lighting Layout
E200	Ground Floor - Power And Systems Layout
E201	Second Floor - Power And Systems Layout
E300	Electrical Details(To Be Deleted)
E400	Electrical Details
E600	Electrical Details

When the following acronyms and abbreviations are used in Division 26 they shall have the meaning listed:

Acronym or Abbreviation	Definition or Full Form
A	Ampere
AC	Alternating Current
Ah	Ampere-hour
AHJ	Authorities Having Jurisdiction
AHU	Air Handling Unit
ATS	Automatic Transfer Switch
AV or A/V	Audio Video
AWG	American Wire Gauge
C	Celsius
CCT	Correlated Colour Temperature
cd	Candela
CFR	Code of Federal Regulations
CIE	International Commission of Illumination
CPD	Conceptual Point Design
CRI	Colour Rendering Index
CSA	Canadian Standards Association
CU	Coefficient of Utilization
dBA	Decibels, weighted in the audible frequency spectrum
DC	Direct Current
DMX	Digital Multiplex Signal
DOE	Department of Energy
EEMAC	Electrical Equipment Manufacturers Association of Canada
EIA	Electronic Industries Alliance
EMI	Electro-Magnetic Interference
EMT	Electrical Metallic Tubing
ESA	Electrical Safety Authority
ETL	Edison Testing Laboratories
FACP	Fire Alarm Control Panel
FAS	Fire Alarm Signal
FCC	Federal Communications Commission
HRC	High Rupturing Capacity
Hr or Hrs	Hour or Hours
HVAC	Heating, Ventilation, and Air Conditioning
Hz	Hertz
IDC	Insulation Displacement Contact
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IESNA	Illuminating Engineering Society of North America
IP	Ingress Protection
k	kilo
kHz	Kilo-Hertz
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LFS	Low Flame Spread

Acronym or Abbreviation	Definition or Full Form
LGE	Low Acid Gas Emissions
MEP	Mechanical, Electrical, and Plumbing
MICC	Mineral Insulated Copper Conductor
N/O	Notification Only
NAC	Notification Amplification Circuit
NEMA	National Electrical Manufacturers Association
NSF	National Science Foundation
OESC	Ontario Electrical Safety Code
OBC	Ontario Building Code
PCB	Polychlorinated Biphenyl
PVC	Polyvinyl Chloride
RFI	Radio Frequency Interference
RGB	Red, Green, Blue
RMS	Root Mean Square
RoHS	Restriction of Hazardous Substances Directive
SPD	Surge Protective Device
TIA	Telecommunications Industry Association
UL	Underwriters Laboratories Inc.
ULc, or cUL	Underwriters Laboratories of Canada
UTP	Unshielded Twisted Pair
UPS	Uninterruptible Power Supply
UV	Ultraviolet
V	Volt
VAC	Volt, in Alternating Current system
VDC	Volt, in Direct Current system
VFD	Variable Frequency Drive
VRMS	Volt, in Root Mean Square
VSD	Variable Speed Drive
W	Watt

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1. The Contractor shall ensure that it and Subcontractors and trades doing work in this Section read and become familiar with those portions of the aforementioned Sections relating to their work.

1.2 WORK SUMMARY

- 1.2.1. This Section includes:

- 1.2.1.1. Elevator Hoist beam.
- 1.2.1.2. Steel lintels for masonry walls supply to schedule refer to structural drawings.
- 1.2.1.3. Structural steel lateral supports for top of masonry walls as shown on structural drawings.

1.2.2. Related Work

- 1.2.2.1. Installation of anchors and bearing plates:
1.Section 03 30 00 Cast-in-Place Concrete
- 1.2.2.2. Installation of steel angle lintels:
2.Section 04 10 00 Masonry
- 1.2.2.3. Finish painting:
3.Section 09 91 00 Painting

1.2.3. References

- 1.2.3.1. American Society for Testing and Materials A53-[87b] Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
- 1.2.3.2. American Society for Testing and Materials A307-[87] Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.
- 1.2.3.3. Canadian General Standards Board 1-GP-40M-[79] Primer, Structural Steel, Oil Alkyd Type.
- 1.2.3.4. Canadian General Standards Board 1-GP-181M-[77] Coating, Zinc-Rich, Organic, Ready Mixed.
- 1.2.3.5. Canadian Standards Association -G40.20-13/G40.21-13 Structural Quality Steels.
- 1.2.3.6. Canadian Standards Association G164-[M1981] Hot Dip Galvanizing of Irregularly Shaped Articles.
- 1.2.3.7. Canadian Standards Association -S16.1-[M89] Limit States Design of Steel Structures.
- 1.2.3.8. Canadian Standards Association W47.1-[1983] Certification of Companies for Fusion Welding of Steel Structures.

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- 1.2.3.9. Canadian Standards Association W59-[1989] Welded Steel Construction (Metal Arc Welding).

1.3 DESIGN AND PERFORMANCE REQUIREMENTS

- 1.3.1. Design the work in this Section in accordance with the Ontario Building Code and the by-laws and requirements of the Local Municipality.
- 1.3.2. Design fabricate and erect structural steel members in accordance with Canadian Standards Association S-16-14 "Standard for Steel Structures for Buildings".
- 1.3.3. Conform to Canadian Standards Association W59-13 for welding; use fabricator fully approved by Canadian Welding Bureau in conformance with the requirements of Canadian Standards Association W47.1-09 (R2014).

1.4 SHOP DRAWINGS, SUBMITTALS

- 1.4.1. Submit Shop Drawings in accordance with the drawings provided. Show and describe detail work of this section including large scale details of members and materials, of connections, joining details, anchorage devices, dimensions, gauges, thicknesses, description of materials, metal finishing specifications, as well as all other pertinent data and information.
- 1.4.2. Submit Engineering calculations if required by local authorities substantiating the design loading of stairs and railings.
- 1.4.3. All Shop Drawings to be designed and stamped by a Professional Engineer legally qualified to practice professional engineering I in the Province of Ontario.

1.5 QUALITY ASSURANCE

- 1.5.1. Arrange to visit the Site prior to the commencement of work to meet with the Subcontractors and the Consultant.
- 1.5.2. The following items shall be discussed.
- 1.5.2.1 Analysis of job conditions.
 - 1.5.2.2 Materials to be applied.
 - 1.5.2.3 Installation methods
 - 1.5.2.4 Project schedule.
 - 1.5.2.5 Construction details.
 - 1.5.2.6 Schedule for inspection.
 - 1.5.2.7 Sample installations.
- 1.5.3. Workmanship will be inspected by the Region, Contractor and Consultant.

1.6 TESTING

- 1.6.1. Inspection and testing of materials and workmanship will be carried out by an independent Inspection and Testing Company approved by the Consultant. Inspection and Testing Company shall be certified by the Canadian Standards Association.
- 1.6.2. Inspections shall cover the following:
- 1.6.2.1 General inspection of work required by other trades.
 - 1.6.2.2 Written reports covering materials, workmanship and progress work.

- 1.6.3. The Inspection and Testing Company is responsible only for sampling, testing and reporting as described elsewhere in this Section and shall not be required to supervise the work or to instruct the Contractor. The Inspection Company shall advise the Contractor and the Consultant by written report.
- 1.6.4. The Contractor shall co-operate with the representatives of the Inspection and Testing Company and shall advise the Inspection Testing Company a minimum of twenty-four (24) hours in advance of each erection sequence.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- 1.7.1. Contractor shall label, tag or otherwise mark Work supplied for installation by Subtrades to indicate its function, location in building and Shop Drawing designation.
- 1.7.2. Deliver Work to location at building Site designated by Contractor and to meet requirements of the construction schedule.

PART 2 - PRODUCTS

2.1 Materials

- 2.1.1. Steel sections and plates: to Canadian Standards Association -G40.20-13/G4021-13, Grade 350 W
- 2.1.2. Steel pipe: to American Society for Testing and Materials A53
- 2.1.3. Welding materials: to Canadian Standards Association W48-14
- 2.1.3.1. Bolts and anchor bolts: to American Society for Testing and Materials A325 and American Society for Testing and Materials F 1554 A36
- 2.1.3.2. Galvanizing: hot dipped galvanizing with zinc coating to American Society for Testing and Materials A123M-15
- 2.1.3.3. Shop coat primer: to Canadian Institute of Steel Construction 1-73Q
- 2.1.3.4. Grout: non-shrink, non-metallic, flowable, 24h, MPa 15, pull-out strength 7.9 MPa.
- 2.1.3.5. Supply angles, bolts, anchors, sleeves and any other attachments to structure necessary for the installation of work under this section. Nuts and bolts shall be supplied in accordance with American Society for Testing and Materials A507, A325, A394 and A563 as applicable.

2.2 Fabrication

- 2.2.1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- 2.2.2 Use self-tapping shake-proof round headed screws on items requiring assembly by screws or as indicated.
- 2.2.3 Where possible, fit and shop assemble work, ready for erection.
- 2.2.4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

2.3 Shop Painting

- 2.3.1 After fabrication prepare steel for prime painting by cleaning, removing rust, scale, grease and extraneous matter in accordance with Society for Protective Coatings SPI and Society for Protective Coatings SP2.
- 2.3.2 In shop, apply one full smooth priming coat to steel. Work paint into corners and open spaces using brush application only.
- 2.3.3 Apply field touch-up of prime paint to welds, fastenings and damaged paint surfaces.
- 2.3.4 To steel, in addition to prime coat, and to aluminum, apply one heavy coat of bituminous paint to surface to be installed against masonry and concrete and to surfaces buried.

2.4 Galvanizing

- 2.4.1 After fabrication prepare steel for hot dipped galvanizing by cleaning, removing rust, scale, grease and extraneous matter in accordance with Society for Protective Coatings SPI and Society for Protective Coatings SP2.
- 2.4.2 Galvanizing zinc coating to meet specified requirements of American Society for Testing and Materials A123M-15, unless otherwise indicated.
- 2.4.3 Galvanize all materials shown on drawings and in addition galvanize all anchors for building into concrete and masonry.
- 2.4.4 Minimize field cutting and welding of galvanized items. Paint galvanized surfaces that are cut, welded or threaded with zinc rich paint to ensure a minimum coating of 4 mills, immediately following damage to galvanized protection.
- 2.4.5 All galvanized drain holes shall be sealed water tight.

2.5 Steel Lintels

- 2.5.1 Supply and install steel lintels bolted or welded to structure. Fabricate lintels as shown on the Structural Drawings. Refer to Lintel Schedule and Architectural Drawings.
- 2.5.2 Supply loose steel lintels to other trades where required for building into work. Fabricate lintels as shown on the Structural Drawings. Refer to lintel schedule. Co-ordinate supply with the Construction Manager.
- 2.5.3 All lintels for exterior walls shall be hot dipped galvanized.
- 2.5.4 Provide steel plates and anchors as required or shown to anchor lintels to reinforce concrete structure or structural steel where masonry bearing is not provided.

2.6 Lateral Supports for Masonry Walls

- 2.6.1 Supply and install steel lateral supports at top of masonry walls as shown or specified.
- 2.6.2 Installation shall be immediately following the erection of the walls.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- 3.1.1 Use only workmen skilled in the work of this Section. Do work to best standard practice and in accordance with the Ontario Building Code, municipal by-laws and the requirements of the Ministry of Labour which govern. Conform to the requirements of the Authorities.
- 3.1.2 Fit and assemble work in shop where possible. Execute work according to details and Shop Drawings approved by the Consultant. Where shop fabrication is not possible, make trial assembly in shop.
- 3.1.3 Take all measurements at the building before proceeding with fabrications. Execute work according to details and reviewed shop drawings.
- 3.1.4 Report discrepancies in dimensions to the Consultant who shall determine the adjustments to be made.
- 3.1.5 Welding: Canadian Standards Association W59-13. File or grind exposed welds smooth and flush, so as to be invisible after painting.
- 3.1.6 Fabricate all work square, true, straight, accurate and to required size.
- 3.1.7 Advise the Consultant if design details will not provide the specified design requirements and add suitable strengthening to approval of Consultant at no additional cost to York Region.
- 3.1.8 Make workmanship of best grade of modern shop and field practice known to recognized manufacturers specializing in this work. Fit joints and intersecting members accurately. make work in true plumb, true, square, straight, level and accurate to sizes and shapes detailed, free from distortion or defects detrimental to appearance or performance.
- 3.1.9 Isolate metals where necessary to prevent corrosion due to contact between dissimilar metals and between metals and masonry, concrete or plaster. Use bituminous paint, butyl tape, building paper or other approved means.
- 3.1.10 Supply all fastenings, anchors and accessories required for fabrication and erection of the work. Make exposed metal fastenings and accessories of same material, texture, colour and finish as base metal on which they occur unless otherwise shown or specified. Keep exposed fastenings to an absolute minimum and inconspicuous, spacing them evenly and setting them out neatly. Make fastenings of permanent type.
- 3.1.11 Draw mechanical joints to hairline tightness and seal countersunk screws and access holes for locking screws with metal filler where these occur on exposed surface.
- 3.1.12 Thoroughly clean all ferrous metals, by methods suitable to remove burrs, weld spatter, rust loose mill scale, oil, grease, dirt and other foreign matter.
- 3.1.13 Do not prime paint the following surfaces:
 - 3.1.13.1 steel to be encased in concrete
 - 3.1.13.2 non-ferrous metals
 - 3.1.13.3 surfaces and edges to be field welded. If painted, remove paint for field welding for a distance of at least 2" on all sides of paint.

- 3.1.14 After erection and installation, thoroughly clean the work and apply field touch up of same formula as shop coat to all damaged or unpainted surfaces. Work all paint well into all joints, crevices and open spaces.
- 3.1.15 Galvanizing – where specified. Do all galvanizing after welding.
- 3.1.16 Lateral Support Assemblies: Supply and installation as indicated on drawings. Supply quantity required for retaining tops of non-bearing partition where length 20'0" between intersecting walls or supports. Retainers shall occur at not more than 7'-0" o.c. or 7'-0" from an intersecting wall.
- 3.1.17 Supply all fixing bolts.
- 3.1.18 Anchor Bolts, Lag Screws, etc.: Supply anchor bolts, washers and nuts, lag screws, expansion shields, toggles, straps, sleeves, brackets, etc. where required or called for on Drawings for work of this Section. Such items occurring on or in exterior wall or slab shall be hot dipped galvanized. Thread dimensions shall be such that nuts and bolts fit without rethreading or chasing threads.
- 3.1.19 Supply items to be cast in concrete or embedded in masonry walls to appropriate trade. Provide setting templates and fully dimensioned setting plans.
- 3.2 ADJUSTMENT AND CLEANING
 - 3.2.1 Remove debris and surplus materials from Site upon completion of Work and as required during installation.
 - 3.2.2 Refinish shop applied finishes in field only with approval of Consultant.
 - 3.2.3 Clean off dirt on surfaces resulting from installation Work.
 - 3.2.4 Final Painting under Section 09 91 00 – Painting.

END OF SECTION