LCBO

BID SPECIFICATIONS ISSUED FOR TENDER
PREPARED BY IBI GROUP ARCHITECTS

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IBI GROUP ARCHITECTS IS AFFILIATED WITH IBI GROUP)

SPECIFICATIONS FOR STORE #686
OTTAWA, ONTARIO
PROJECT NO. 120707
AUGUST 25, 2020

IBI

BID SPECIFICATIONS

PROJECT

LCBO STORE #686
19 Beechwood Avenue
Ottawa, Ontario
K1M 1M2

OWNER

LIQUOR CONTROL BOARD OF ONTARIO
55 LAKESHORE BLVD. EAST, 2ND FLOOR,
TORONTO, ONTARIO
M5E 1A4

ARCHITECT

IBI GROUP ARCHITECTS
7th FLOOR – 55 ST. CLAIR AVENUE WEST
TORONTO, ONTARIO
M4V 2Y7

Project No: 120707
Issued for Tender: August 25, 2020

1.01 OWNER:

LIQUOR CONTROL BOARD OF ONTARIO
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1.02 PROJECT:

LCBO STORE #686
19 Beechwood Avenue
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1.03 PROFESSIONAL SEAL AND SIGNATURE

ARCHITECT OF RECORD:

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_____

Architect of Record **Date**

CONSULTANTS:

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The following is the summary of changes in the Standard Requirements for Retail Stores (SRRS) Revision #17, 2019, 1st Quarter.

Division 00

Section 00 01 07.01, Change Summary

Change summary updated to reflect changes incorporated for LBBR-Rev17

Division 01

Section 01 11 00, Summary of work

1.05: Added requirement for site supervisor to assist in off-loading, verification and coordination of LCBO-procured deliveries.

Section 01 18 00, Commissioning

1.18: Commissioning Process Allocation

1.18.1: Deleted the reference "This allocation will be released upon verified completion by the BCC."

1.18.1.1: Deleted percentage allocation for Mechanical "Shop drawings".
Increased allocated value for Mechanical "Plumbing" to 1.75%.
Increased allocated value for Mechanical "Performance Tests" to 2.25%.
Increased allocated value for Mechanical "Training" to 0.5%.
Deleted percentage allocation for Mechanical "O&M Manuals".
Deleted percentage allocation for Mechanical "As Built Drawings".

Deleted percentage allocation for Electrical "Shop drawings".
Increased allocated value for Electrical "Electrical Distribution" to 1.25%.
Increased allocated value for Electrical "Electrical Distribution" to 1.25%.
Increased allocated value for Electrical "Training" to 0.5%.
Deleted percentage allocation for Electrical "O&M Manuals".
Deleted percentage allocation for Electrical "As Built Drawings".

Section 01 33 00, Submittals

1.03.17: Dock Leveler added to list of required shop drawings.
: Overhead door added o to list of required shop drawings.

Division 03

Section 03 30 00, Cast-in-Place Concrete Requirements

1.05.3.3: Revised Floor Flatness (FF)/Floor Levelness (FL) table to include requirements for Framed or suspended slabs.

2.19: Added Tactile walking surface indicator plate for barrier-free ramps and sidewalk curbs.

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Division 07

Section 07 21 00, Building Insulation

2.01.5.1: Replaced insulation type 'RXL 60' by Roxul Limited with "Rockboard 60' by Rockwool. Product name has been rebranded under Rockwool.

2.01.6.1: Replaced insulation type 'Roxul AFB" and Flexibatt by Roxul Limited with "Rockwool AFB and Comforbatt" by Rockwool. Product name has been rebranded under Rockwool.
2.14: Added broom finish requirement for concrete slabs for truck loading ramps.

Division 08:

Section 08 32 00, Automatic Sliding Doors and Operators

1.04.1: Revised warranty verbage to include required 'preventive maintenance" by LCBO door Vendor.
2.01.5: Removed " Stanley" as an acceptable manufacturer.
2.01.6 Remove " Mac Tech Systems Inc." as an acceptable manufacturer.
2.01.9 Remove " Mac Tech Systems Inc." as an acceptable manufacturer.
2.02.9 Revised to include "Form C 3/4" recessed contact" by door manufacturer.
2.03.3 Revised to include "Coldroom" door.
2.03.6 Deleted sentence "A cut opening in the aluminium style is unacceptable as a stand alone catch" from the paragraph.
2.03.7 Added requirement for Door manufacturer to provide Form C ¾" recessed door alarm contacts.
2.05.1.1 Revised Acceptable Manufacturer and model to Optex OA-Flex T.
2.05.3.1 Revised Acceptable Manufacturer and model to Optex OA-Flex T.
2.05.3.1 Deleted Alternate Sensing System
2.03.7 Added requirement for Door manufacturer to provide Form C ¾" recessed door alarm contacts.

Section 08 70 00, Hardware

2.01.3.(.2)(.1): Added new 4-point panic device by Detex to replace former 4-point panic exit lock by Securiteh.
2.01.6.(.1):Multiple point panic exit lock system revised to 4-point panic device manufactured by Detex Corporation.
2.01.15: Added Heavy duty "Protector II" padlock for the roof hatch.

Section 08 70 00 01, Hardware Standards

1.02.2: Deleted Door Stop model IVES 452.
-Added Door Closer Model 1461 REG.
- Added Floor Stop Model CBH 103.
1.02.7: Deleted 4-Point Panic Exit Lock by Securitech and replaced with 4-Point Panic Device by Detex Corporation.
1.02.8: Deleted 4-Point Panic Exit Lock by Securitech and replaced with 4-Point Panic Device by

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Detex Corporation.
Revised *Notes to update manufacturer to “Detex Corporations” in place of Edwards Doors.
1.02.13: Added one(1) HD padlock for the Roof Hatch.
1.02.14: Added hardware for Auxiliary Storage Room.

Section 08 80 00, Glass and Glazing
2.01.1: Glass Manufacturer Glaverbel Group name changed to “AGC Glass”.
2.01.4.2: Revised Security Film specification to 3M Ultra S800.
2.01.4.5: Revised Ultra Violet film spec to include type RE35NEARXL by 3M.
2.01.4.6: Revised Combination film specifications to3M PRS70
3.01.5.9: Deleted washroom mirror height
3.01.6.1: Added Spandrel Glass Section to provide Security Mesh at all Spandrel Glass locations.
3.07 Added Spec Note for ultraviolet (UV) film installation
3.04.5.1: Walk-In Coldroom glazing specification changed from laminated to tempered glass

Division 09

Section 09 21 16, Gypsum Board
3.03.2: Added hardie plank lap siding and metal siding to list of exterior cladding to to provided with Security mesh.

Section 09 30 00, Ceramic and Porcelain Tile
3.01.2: Removed the reference to section 03 30 0 and replaced with “CAN/CSA-23.1/A23.2” reference.
3.01.3.1: Replace the term “slab” with “substrate”.
3.01.4: Relocated Spec. Notes from section 3.01.3 to precede section 3.01.4.

Section 09 91 00, Painting and Finishing
3.07.3: Finishes for Interior Ferrous Metals revised. Alkyd finish removed.
3.07.4: Finishes for Interior Galvanized Metals revised. Alkyd finish removed.
3.07.7: Finish revised. Alkyd finish removed.

Division 10

Section 10 28 13, Washroom Accessories
2.01.6: Added Stainless steel shelf for universal washroom.
2.01.7: Added tilt mirror for washrooms.

3.01.9.3: Added stainless steel shelf.
3.01.9.4: Added tilt mirror.
3.01.9.5: Added Coat hook.

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Section 10 90 00, Manufactured Specialties

2.02.3.1.2: Revised the “electric strike release” for Customer Service Return Gate to “electric-magnetic” release.

2.16.2: Revised product type for Warehouse Portable Ladder restraint.

2.08: Lockers & Rack

2.08.3: Revised paragraph to list four(1) locker options based on store size and store concept.

Division 11

Section 11 40 00, Food Service Equipment

2.02.6: Added THC Unit Condenser Shelf requirements.

2.03.1: Updated Refrigerator finish from color white to stainless steel.

2.03.2: Updated Refrigerator finish from color white to stainless steel.

2.04.1: Updated Microwave finish from color white to stainless steel.
-Removed microwave hinge location.

2.04.2: Updated Microwave finish from color white to stainless steel.

2.09: Subject heading renamed to “ Under-counter Bar Fridge.”

2.09.1: Location revised to “ As noted on Drawings.”

Section 11 41 20, Walk-in Coolers and Refrigeration Equipment

2.02: Updated SpecNote

2.02: Added to the specnote: Note: 3inch thick foam core panels have a weight of 2.2psf and 5inch thick mineral fibre core panels have a weight of 5.85psf)

2.02.1: Updated wall panel steel gauge and fabrication.

2.02.8: Updated wall panel and ceiling panel colour to polyester white.

2.03.1.3.2.5: Revised LED fixture length

2.03.1.3.2.6: Revised handle and finish.

2.03.1.3.2.7: Added hinge type.

3.04 .3 .3: Deleted paragraph .3 since the BCR system is installed mechanically balanced.

3.04 .5: Added clarification: “Walk-In Cooler unit and associated duct system is installed mechanically balanced by the Refrigeration contractor and does not require third-party balancing.”

Division 20

Section 20 05 00, Basic Mechanical Materials, Methods and Requirements

2.07: Added lamacoid requirements for thermostat/remote sensors.

3.10: Added extra the installation requirement for lamacoid (on wall, instead of cover)

Division 21

Section 21 22 00, Fire Extinguishers

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2.01.1: Changed the requirement of fire extinguisher from 3A:10BC to 3A:20BC.

Division 22

Section 22 11 19, Domestic Water Piping Specialties

2.03.2: Removed water hammer arrestor from trap seal primer assembly since manufacturer does not provide.
2.05.1.2: Updated Zurn/Wilkins backflow preventer model due to obsoleted product.
3.01.4 & 5: Added accessories for water meter assembly including 3-valve bypass and low-point drain.
3.05.3: Added accessories for backflow preventer to collect water discharge and dispose to funnel floor drain.

Section 22 33 00, Electric Domestic Hot Water Heaters

3.01.3: Improved the clause of providing catch pan and piping from catch pan to drain.
3.01.4 Added the clause to clarity that heater shall be suspended from OWSJ or slab above.

Section 22 42 00, Plumbing Fixtures and Fittings

2.02.2.2: Modified the supply of barrier free water closet so that wheelhandle is provided, instead of loose key.

Division 23

Section 23 08 16, Testing Adjusting and Balancing

1.01.2.1.4: Added clause that air balancing is not required by fit-up GC for beer cold room.
1.01.3.3: Added contact information for balancing services vendors.
3.02.5.6 & 7: Added the balancing instructions for different tonnage of RTU.

Section 23 31 00, Ductwork and Accessories

2.01.2: Added the round ductwork manufacturer (Flexmaster Canada Platinum Flow Ductwork). Added clause to clarify that non-Platinum Flow dampers may be used.
2.01.2: Removed Flexmaster Canada Platinum Flow Ductwork as galvanized steel – round.
2.01.2 Added galvanized steel – round (spiral) specifications as per industry standard.
2.01.3: Added the lined round ductwork manufacturer (Flexmaster Canada Platinum Flow Ductwork). Added clause to stipulate the use of Platinum Flow dampers only.
2.01.3: Removed Flexmaster Canada Platinum Flow Ductwork as galvanized steel – lined round.
3.02.2: Removed the installation section for lined round ductwork.

Section 23 34 20, Exhaust Fans

2.01.1.8: Added the maximum sound (Sones) for inline fan.
2.03.1.9b: Removed requirement of security hasp for roof mounted exhaust fan.
2.06: Added learning room exhaust system based on LCBO 083.

Section 23 36 00, Grilles and Diffusers

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2.01.5.1: Updated the supply diffusers types including retail supply grille, high ceiling round diffuser and urban concept store square diffuser.

Section 23 55 33, Gas Fired Unit Heaters

3.01.2: Improved the clause of unit heater installation including elevation and regulations.

3.01.7: Added temperature sensor installation height at 1.8m (6'-0") AFF. Provide all control wiring and accessories from unit heater to temperature sensor location. All control wiring shall be inside the conduit. Coordinate with LCBO for final locations of sensors.

Section 23 74 13, Roof Mounted Air Conditioning Units

2.01: Updated RTU accessories as per latest Lennox list including high performance economizer, MSAV for 6-ton and larger, 18" roof curb, temperature sensors in supply and return air plenum, phase monitor and removing refrigerant service valves.

Division 26

Section 26 05 00, Basic Electrical Materials, Methods and Requirements

1.07.3: Added CUL to electrical item certification
1.10.3: Added requirement for fire alarm report c/w sound level readings in dBA
1.10.9: Added requirement for emergency lighting test report.
2.17.1: Added sensors and mechanical controls for lamacoid label applications and locations
2.17.1: Added standardized sizes of lamacoids
:Changed Open/Cold Beer Sign lamacoid text height from 6mm to 3mm.
2.19.: Modified reference to sketch to now LCBO details.
3.02.2.1 Added use and install of BX section to conduits as opposed to conductors
3.09.2.1: Removed BX section for relocation and clarification on use to section 3.02.2.1
3.09.3: Removed BX support section for relocation and clarification on use to section 3.02.2.1
3.11.1: Modified switch type for office

Section 26 24 13, Electric Service and Distribution

2.02.4: Removed Cutler Hammer Canada, Siemens Electric as acceptable manufactures for distribution panelboard.
2.03.1: Added G4 controller for G4 power link system.
2.03.3.1.: Modified panel finish from grey baked acrylic enamel to unpainted galvanized steel.
2.03.3.2.: Modified panel trim finish from grey baked acrylic enamel to unpainted galvanized steel.
2.03.7: Removed Cutler Hammer Canada as acceptable manufactures for lighting branch circuit panelboard.
2.04: Modified specifications for branch circuit panels
: Removed Cutler Hammer Canada, Siemens Electric as acceptable manufactures for branch circuit panelboard.
:Added specifications for Pony Panels
2.04.6.1.: Modified panel finish from grey baked acrylic enamel to unpainted galvanized steel.
2.04.6.2.: Modified panel trim finish from grey baked acrylic enamel to unpainted galvanized

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steel.
2.17: Updated ARC FLASH and SHOCK section.
2.18.12: Added fire alarm strobe/horn strobe requirement for barrier free washroom.
2.01.5: Added K-Rated specifications for transformer.
3.01.1 Revised phrasing for incoming electrical service.
3.09.4: Added requirements for exhaust fan feeder slack.
3.16.8: Modified reference to sketch to now LCBO standard.
SK18: Updated electrical panel elevations with pony panel and details for TVSS installation.

Section 26 51 14, Lighting Fixtures and Lamps
2.02.4: Removed section for high pressure sodium lamps.
2.02.5: Removed section for metal halide.
2.02.6: Removed section for incandescent.
2.04: Removed entire section on high discharge ballasts.
2.05.2: Updated model number for retail exit signage.
2.05.3: Updated model numbers for emergency lighting components.
2.05.4: Updated warehouse lighting specifications.
2.05.6: Updated model number for 2x2 recessed lights.
2.05.7: Updated model number for entrance canopy lights
3.01.4: Added in electrical to drawings that need to be reviewed and coordinated before installing lighting
3.01.8: Modified warehouse HID lighting to LED
3.01.16: Added over to complete the word handover
3.01.7: Added in coordination with architectural RCP for warehouse lighting at pallet racking.

Drawings

The following Drawings have been **updated**:

Architectural Base-Building Guideline Drawing

1: A-101- Construction Plan:

1. Detail 4/A-101, added new detail for Auxiliary exit door in spandrel framing system where applicable.
2. Added note for minimum overhead clearance between BCR and Base Building Structure.
3. Revised Typical Note-7 for bollards.
4. Bicycle rack revised, quantity changed to two(2).
5. Revised annotation to read “maximum fifteen(15) steel tube bollards in front of vision glass locations and maximum(3) Maglin bollards in front of entrance vestibule locations.
6. Dwg. 2/A-101, added Barrier free tactile attention indicator to top and base of the ramp.
7. Typical note #10 added “for Barrier free tactile attention indicator for ramps and barrier-free curbs.
8. Dwg. 1 & 2/A-101: Removed “N.I.C” from Asphalt Drive.
9. Dwgs 1 & 2/A-101: Revised concrete truck ramp note to include “Broom Finish and LBBR

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specification division for finish.

2: A-102- Roof Plan:

1. 1/A-103 Deleted Exhaust Roof Curb specification from roof curb note.
2. 1/A-103: Added two(2) notes. 1)Refer to LBBR spec section 11 41 20 for insulated metal panel weights and 2) base building structural consultant must base supported loads calculations based on supporting the Beer Cold Room from the roof structure top chord.

3: A-103 - Roof Details:

1. Dwg. 2/A-103, added detail reference.
2. Dwg. 8/A-103, Revised Mechanical Roof Curb height to 18".
3. Dwg. 15/A-103, Revised general notes to delete roof curb specification.
4. Dwg. 16/A-103, Added enlarged Kooljet Curb detail.

4: A-104 - Exterior Elevations:

1. Elevation 3/A-104, bollards note revised.
2. Finishes #4, revised to include finish for exposed steel lintel.
3. Finishes #5, added expanded security mesh at all spandrel glass locations
4. Finishes #14, revised hollow metal door and frame finish.
5. Finishes #23, revised vertical high lift door frame finish.
6. Finishes #30, revised detail reference.

5: A-105 - Wall Sections:

1. 1/A-105: Added note for entrance and vestibule glazing frame "Transom frame width to match pocket door frame with(Entrance and Vestibule)".
2. Dwgs 1 through 5/A-105: Revised building foundation note and S.O.G note to read "refer to base bldg. struct"

6: A-106 - Wall Sections:

1. Dwgs 1 through 5/A-105: Revised building foundation note and S.O.G note to read "refer to base bldg. struct".

7: A-107 - Wall Sections:

1. 2/A-107 Added expanded security mesh at all spandrel glass locations.
2. Dwgs 1 through 5/A-105: Revised building foundation note and S.O.G note to read "refer to base bldg. struct".

8: A-108 - Section Details:

1. 1/A-108: Added note for entrance and vestibule glazing frame "Transom frame width to match pocket door frame with(Entrance and Vestibule)".
2. Dwgs 4, 5, 6 & 8/A-105: Revised building foundation note and S.O.G note to read "refer to base bldg. struct".
3. 1/A-108 Any diagonal bracing required for support must commence minimum 2'-0" above

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suspended channel to avoid interference with future M&E items.

4. 2/A-108 Any diagonal bracing required for support must commence minimum 2'-0" above suspended channel to avoid interference with future M&E items.
5. Dwgs 1, 4, 5, 7, 9, 10 & 12/A-105: Revised building foundation note and S.O.G note to read "refer to base bldg. struct".

9: A-109 - Section Details:

1. 1 & 2/A-109 Added expanded security mesh at all spandrel glass locations
2. 10/A-109 Revised detail reference.
3. 9 & 12/A-109 Bollards Sono-tube depth dimension removed and replaced with "Refer to Base Building Structural Dwgs".
4. Sono-tube notation revised to read "Refer to Base Building Structural Dwgs".
5. 9 & 12/A-109 Added note "Provide maximum 15 steel tube bollards in front of vision glass locations and 3 Maglin bollards in front of entrance vestibule locations

10: A-110 - Plan Details:

1. 4 & 6/A-110 Added expanded security mesh at all spandrel glass locations

11: A-111 - Plan and Section Details:

1. Detail 7/A-111 moved to Dwg sheet A-111 from Dwg sheet A-101.
2. Dwg 1/A-111: Added requirement for 3/4" concealed conduit in sliding door for tenant Height Strip Camera.

12: A-112 - Ramp & Screen Wall Details:

1. 1 & 5/A-112 Revised guard heights to 3'-6 1/4" per OBC

13: A-113 - Miscellaneous Details:

1. 3/A-113 Revised mounting height dimension of for security shutter junction box.
2. 4/A-113 Deleted detail "Wood Blocking at LED Sign Boxes".
3. 4/A-113-Added new detail "Kooljet Unit Structural Steel Deck Support".

14: A-114 - Reflected Ceiling Plan and Building Sections:

1. 2/A-114 Added outline of BCR in Section A-A and note for minimum overhead clearance between BCR and Base Building Structure.

15: A-115 - Garbage Enclosure Details:

1. 2/A-115 Concrete Foundation dimension removed and replaced with "Refer to Base Building Structural Dwgs".
2. Added one(1) typical note,, depth of all foundations to be confirmed by Base Building Structural engineer.

16: A-116 - Door Schedule, Door Types and Frame Types:

1. 1/A-116 Door width for door D106 revised to 38" wide.

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2. 1/A-116: For D105, added door sizes for Walkie Reach over head door and for Dock Leveller over head door.
3. 1/A-116: Added to Door Schedule for D107.
4. 1/A-116: Added door D108 to the schedule.
5. 1/A-116: Revised widths of door threshold, door sweep and door weather strip to 38" for doors D106 and D017.
6. 3/A-116: Frame Type 4 added to Frame Schedule.
7. 2/A-116: Added transom note: "transom frame with to match pocket door frame width:
8. 2/A-116: Added height for glazing frame for Door Types-A and Type-B.
9. 2/A-116: Added side-lite for interior vestibule for Door Type-B.
10. 2 & 3/A-116: Added requirement for 3/4" concealed conduit in sliding door for tenant Height Strip Camera.
11. 3/A-116: For Frame Type3, Added requirement for 3/ 4" concealed conduit in sliding door for tenant Height Strip Camera.

Electrical Base-Building Guideline Drawings.

1. E1: Updated drawing and notes to reflect store standards and design requirements.
2. E2: Updated single line diagram to latest panel and TVSS standards.
3. E2: Updated distribution diagram notes to suit the standard equipment requirements
4. E2: Updated Panel 6A mains from 200A to 600A
5. E3: Removed dock seal motor from panel schedule 2A
6. E3: Updated 200A service elevation detail to include TVSS install instructions
7. E4: Updated 400A service elevation detail to include TVSS install instructions
8. E4: Updated title for detail 1/E-4 to include T-bar ceiling application
9. E4: Updated title for detail 2/E-4 to include open ceiling application

Mechanical Base-Building Guideline Drawings.

1. M1: Updated unit heater heat exchanger to stainless steel
2. M1: Updated backflow preventer model to WATTS 909QT-S
3. M2: Updated the remark of RTU schedule to match latest Lennox list
4. M4: Added leader for backflow preventer to funnel floor drain in detail
5. M5: Added Kooljet roof curb on floor plan and added note 35 for detail
6. M5: Modified note 10 to include TwinCity EF roof curb detail
7. M5: Changed unit heater mounting height in note 25 from 8' AFF to 10' AFF
8. M5: Added unit heater temperature sensor height in note 25 at 6' AFF

The following Drawings are **new**:

.1 -

The following Drawings have been **deleted**:

.1 –

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Sketches

The following sketches have been **updated**:

1. 10 90 00 SK10: Modified Bolduc entry gate detail to identify installation responsibility of conduits.
2. 11 13 13 SK01: Dimensions illustrating extent of concrete truck ramp deleted
3. 11 41 0.03-Cold Room Unit: Kooljet unit and roof curb drawings revision is updated from rev#7 to Rev#8.
4. SK18: Electrical panel elevations updated to show addition of pony panels and TVSS installation instructions.
5. 26 24 13.03: Updated cash counter details to reflect actual receptacles that are to be installed.

The following sketches are **new**:

1. 09 30 00.02 SK02 Transition Strip Details added.
2. 11 40 00.12 SK01 THC Condenser Unit Shelf

The following sketches have been **deleted**:

Cutsheets

The following cutsheets have been **updated**

1. 08 70 00.09 – 3-Point Dead Bolt Panic Device (Revised from 4-Point Panic Exit Lock)
2. 11 40 00.09 – Cutsheet renamed to “Under-Counter Bar Fridge” from “Tasting Bar Refrigerator.”

The following cutsheets are **new**:

1. 08 70 00.14 – Medeco Padlocks
2. 10 28 13.01 - Universal Washroom Shelf.
3. 10 28 13.02 - Tilt Mirror.
4. 10 28 13.03 - Tilt Mirror.

The following cutsheets have been **deleted/archived**:

- END OF CHANGE SUMMARY –

END OF DOCUMENT

1.01 CONTRACT DOCUMENTS

.1 Work will be performed under one Contract; the Contract will be in the form of the Agreement between Owner and Contractor.

1.02 GENERAL CONDITIONS

.1 The General Conditions and Supplementary Conditions of the Contract will govern the performance of each Section of the Specifications.

1.03 SPECIFICATIONS

.1 The provisions of all Sections of Division 01 shall apply to each Section of Divisions 03 to 32, inclusive, which are included in the Specifications.

.2 Division 01, General Requirements, of the Specifications generally specifies work and co-ordination that is the direct responsibility of the Contractor, but shall not be interpreted to define absolutely the limits of responsibility that must be established between the Contractor and his Subcontractors by their separate agreements.

.3 Ensure that Subcontractors understand that the General Conditions of the Contract, Supplementary Conditions, and Division 01, General Requirements, apply to Sections of the Specifications governing their work.

.4 Work in the Specifications is divided into descriptive Sections which are not intended to identify absolute contractual limits between Subcontractors, nor between the Contractor and his Subcontractors. The Contractor shall organize division of labour and supply of materials essential to complete the Project in all its parts and provide a total enclosure and protection from weather of interior spaces, as established in the General Conditions of the Contract.

.5 It is intended that Work supplied under these Contract Documents shall be complete and fully operational in every detail for the purpose required. Including materials not herein mentioned, but which may be found necessary to complete or perfect any portion of Work in accordance with the Contract Documents.

.6 Specifications, Schedules and Drawings are complementary and items mentioned or indicated on one may not be mentioned or indicated on the others.

.7 Mention in the specifications or indication on the drawings of materials, Products, operations, or methods, requires that the Contractor Provide each item mentioned or indicated of the quality or subject to the qualifications noted; perform according to he conditions stated each operation prescribed; and provide labour, materials, Products, equipment and services to complete the Work.

.8 Where the singular or masculine is used in the Contract Documents, it shall be read and construed as if the plural, feminine or neuter had been used when the context or the statement so requires and as required to complete the Work, and the rest of the sentence, clause, paragraph, or Article shall be construed as if all changes in grammar, gender or terminology thereby rendered necessary had been made.

.9 Work designated as "N.I.C." is not included in this Contract.

.10 Wherever in the Contract Documents the word "include" is used in any form, the item of Work listed following shall not be interpreted to be restricted to only those items that are listed.

.11 Wherever in the Contract Documents the words "indicated" or "shown" are used they shall apply as meaning "indicated on Drawings" or "shown on Drawings" unless the context expresses another meaning.

.12 Wherever in the Specifications it is specified that work to which reference is made shall proceed or shall meet approval, direction, selection or request of jurisdictional authorities or others, such approval, direction, selection or request shall be in writing.

.13 Wherever in the Specifications it is specified that work shall be repaired, made good or replaced, it shall be performed without any additional cost to the Owner.

1.04 CONSTRUCTION SCHEDULE

.1 Submit a construction schedule utilizing critical path method within ten (10) working days of notification of bid acceptance, for approval.

.2 Correct, revise, update, and otherwise maintain schedule during progress of construction. Supply each corrected, revised and updated schedule to Owner, Consultant, and Subcontractors.

.3 Prepare schedule in approved format, on standard form of Owner.

1.05 SUPERINTENDENCE

.1 A designated site superintendent having no less than 5 years of experience must be provided by the General Contractor to oversee the Work.

.2 The Site Superintendent is required to be on site at all times when work forces are present, work is being executed or deliveries are being made.

.3 The Contractor shall provide the Superintendent with a pager, cell phone or other means by which the Consultant or Owner can make contact during hours of work.

.4 The site supervisor shall assist, as required, in the off-loading, verification and coordination of any LCBO-procured delivery.

1.06 SITE PROGRESS RECORDS

.1 Maintain at site a permanent written record of progress of the Work. Make the record available at all times with copies provided when requested. Include in record each day:

.1 Commencement and completion dates of the work of each trade in each area of Project.

.2 Attendance of Contractor's and Subcontractor's work forces at Project and a record of the work they perform.

.3 Visits to site by Owner, Consultant, jurisdictional authorities, testing companies, Contractor Subcontractors, and suppliers.

.2 Maintain a progress chart in a format approved from sample submitted. Show on chart proposed construction schedule and the progress achieved by Contractor and each Subcontractor.

1.07 WORK BY OTHERS

.1 The Contractor shall be the "Constructor", within the meaning of the Occupational Health and Safety Act (Ontario) ("OHSA"), solely responsible for construction safety at the Place of the Work and for compliance with the rules, regulation and practices required by the OHSA except only where other contractors or Owners' own forces have their own defined, physically partitioned and segregated work areas with separate access/egress from the Work being completed by the Contractor and may therefore be themselves considered Constructors as provided by OHSA.

In cases where other contractors (including the base building contractor, or Owners' own forces and suppliers hired and paid for by the Owner, do not have separate defined work areas the Contractor will, as a specific term and condition of this contract, assume all the Duties and Responsibilities of the Constructor as set out in OHSA over any and all aforementioned "other contractors", "Owners forces" and suppliers hired and paid for by the Owner". The Contractor agrees to assume full responsibility and oversight authority as the Constructor over each and will ensure strict compliance to the Contractor's own Occupational Health and Safety Policy and Program. In every case, the Contractor will assume the role of Constructor over each such supplier (added from last paragraph). The Contractor, as Constructor, is responsible for all work done within the Place of Work, will have the right to remove the other contractors and Owners' own forces from the Place of the Work should they not comply with the Contractor's Health and Safety Program and safety instructions.

1.08 EXAMINATION

.1 Site: Examine site, and ensure that each Section performing work related to site conditions has examined it, so that all are fully informed on all particulars which affect Project Work.

.2 Ensure by examination that all physical features at the Work, and working restrictions and limitations which exist are known, so that the Owner is not restricted in use of the premises for their needs.

.3 Previously Completed Work:

.1 Where dimensions are required for proper fabrication, verify dimensions of completed work in place before fabrication and installation of work to be incorporated with it.

.2 Verify that previously executed work and surfaces are satisfactory for installation or application, or both, and that performance of subsequent work will not be adversely affected.

.3 Ensure that work installed in an unsatisfactory manner is rectified by those responsible for its installation before further work proceeds.

.4 Commencement of work will constitute acceptance of site conditions and previously executed work as satisfactory.

.5 Rejected work resulting from application to, or installation on, or incorporation with, unsatisfactory previous work will be considered the responsibility of those performing the later work.

.4 Construction Measurements:

.1 Before commencing installation of work, verify that its layout is accurately in accordance with intent of Drawings, and that positions, levels, and clearances to adjacent work are maintained.

.2 Before commencing any work, verify that all clearances required by jurisdictional authorities can be maintained.

.3 If work is installed in wrong location, rectify it before construction continues.

.5 Review the entire site prior to any work. Should evidence be found of asbestos or any other hazardous substance, contact the Consultant prior to proceeding with any work. Should evidence of a hazardous substance be found during the work, contact the Consultant immediately on discovery of such evidence.

1.09 USE OF SITE

.1 Accept full responsibility for assigned work areas from the time of Contract award until Substantial Performance of the Work.

.2 Check means of access and egress, rights and interests which may be interfered with. Do not block lanes, roadways, entrances of exits. Direct construction traffic and locate access to site as directed by municipality.

.3 Where encroachment beyond property limits is necessary make arrangements with respective property owners.

1.10 PROTECTION OF WORK, PROPERTY AND PERSONS

.1 Provide necessary methods, materials, and construction to ensure that no damage or harm to work, materials, property and persons results from the Work of this Contract. Construction facilities relating to protection are specified in Section 01 50 00.

.2 Keep excavations, and pits free of water. Pump dry as required.

.3 Remove snow and ice immediately from interior of building.

.4 Protect adjacent private and public property from damage and, if damaged, make good to match in all details.

.5 Keep surfaces, on which finish materials will be applied, free from grease, oil, and other contamination which would be detrimental in any way to the application of finish materials.

.6 Do not apply visible markings to surfaces exposed to view in finished state or that receive transparent finishes.

.7 Protect surfaces of completed work exposed to view from staining, disfigurement and all other damage by restriction of access or by use of physical means suitable to the material and surface location. Establish with each Subcontractor the suitability of such protection in each case.

.8 Schedule finish work at end of construction when interference from tradesmen is at a minimum.

.9 Brace and shore masonry walls until their designed lateral support is incorporated at both top and bottom. Do not permit backfilling at masonry walls below grade until floor systems are installed and lateral bracing is thus achieved.

.10 Enforce fire prevention methods at site. Do not permit bonfires, open flame heating devices or accumulation of debris. Use flammable materials only if proper safety precautions are taken, both in use and storage.

.11 Do not store flammable materials in the building. Take necessary measures to prevent spontaneous combustion. Place cloths and other disposable materials that are a fire hazard in closed metal containers and remove them from the building every night.

.12 Where flammable materials are being applied, ensure that adequate ventilation is provided, spark-proof equipment is used, and smoking and open flames are prohibited.

.13 Ensure that volatile fluid wastes are not disposed of in storm or sanitary sewers or in open drain courses.

.14 Ensure that precautions are taken to prevent leakage and spillage from plumbing and mechanical work that may damage surfaces and materials.

.15 To prevent soiling or damage to finish flooring where pedestrian traffic occurs after the flooring has been installed, install and maintain 0.152 mm polyethylene membrane or reinforced kraft paper temporary protection, secured in place and with joints sealed by reinforced pressure sensitive tape.

.16 Install plywood panels of minimum 6mm thickness over completed finish flooring materials on which further construction work is performed or delivery of products is made, or both. Seal joints between panels with reinforced pressure sensitive tape.

.17 Protect metal deck on which construction personnel work, and on which materials are stored, with substantial planking.

.18 Prevent spread of dust beyond the construction site by wetting, or by other approved means, as it accumulates.

.19 Do not damage root systems of existing trees which are to remain, and future landscaped areas, by piling of surplus soil over them, by dumping of plaster or cement flushings or other debris over them, or by cutting of roots when excavating and grading. Do not use trees for anchorage of rigging cables.

1.11 SECURITY

.1 Be responsible for security of all areas affected by Work of this Contract until taken over by Owner. Take steps to prevent entry to the Work by unauthorized persons and guard against theft, fire and damage by any cause.

.2 Take acceptable precautions to guard Work site, premises, materials and the public during and after working hours due to the Work of this Contract.

.3 Any security service provided by the Owner is for the protection of the Owner's interest in the Work on the Site and shall not relieve the Contractor of the responsibility to protect the Site and the Work of the Contract.

1.12 SALVAGE

.1 Unless otherwise specified, materials on the site at the time of signing of Contract shall remain property of Owner.

.2 Unless otherwise specified, salvaged material resulting from construction, and surplus materials and construction debris shall become property of Contractor, who shall dispose of it away from site.

.3 Treasure, such as coins, bills, papers of value, and articles of antiquity, discovered during digging, demolition and cutting at the site shall remain property of Owner, and shall be delivered immediately into his custody.

1.13 OWNER OCCUPANCY

.1 The Owner reserves the right to occupy and use portions of the premises, whether partially or entirely completed, or whether completed on schedule or not, provided such occupancy does not interfere with the Contractor's continuing work.

.2 Partial occupancy or installation by the Owner of his equipment shall not imply acceptance of the Work in whole, or in part, nor shall it imply acknowledgement that terms of the Agreement are fulfilled.

1.14 SETTING OUT

.1 Before commencing work, verify lines, levels and dimensions shown on the drawing and report discrepancies in levels or dimensions to the Consultant. Be responsible for work done prior to the receipt of the Consultant's decision regarding reported discrepancies.

1.15 WASTE AUDIT/PLANS FOR WASTE REDUCTION

.1 Comply with requirements of authorities having jurisdiction.

.2 Prepare and submit waste audit and waste reduction plan in accordance with Ontario Regulation 102/94 Waste Audits and Waste Reduction Workplans.

.3 Prepare and submit source separation plan in accordance with Ontario Regulation 103/94 Industrial, Commercial and Institutional Source Separation Programs.

.4 Deliver to nearest appropriate depot all materials accepted for recycling by the region or municipality having jurisdiction over the Place of Work, including but not limited to cardboard, paper, plastic, aluminum, steel, and glass. Deliver to nearest appropriate depot all scrap and excess gypsum wallboard for recycling of this material. Pay all costs for this work.

1.16 QUALITY CONTROL AND COMMISSIONING

.1 LCBO requires that the Contractor, all sub trades and manufacturers follow a quality control process which has been identified in section 01 45 00. This will include the Contractor's commissioning process.

.2 The start-up of the roof top air condition units will be conducted by the Landlord's Contractor. Documentation for the units and the start-up will be provided to the LCBO coordinator during the turn-over of the space to LCBO. When the Contractor has completed the HVAC installation they shall coordinate with the Landlord's Contractor

who will arrange for the unit manufacturer to commission the units. The Landlord's Contractor will pay for the cost of the unit commissioning

END OF SECTION

1.01 GENERAL REQUIREMENT

.1 Provide labour, instruments and materials to conduct the commissioning process as outlined in this specification section.

1.02 RELATED DIVISIONS

.1 Division 01: General Requirements.
.2 Division 11: Equipment.
.3 Division 20: Basic Mechanical Requirements.
.4 Division 21: Fire Suppression.
.5 Division 22: Plumbing.
.6 Division 23: HVAC.
.7 Division 25: Integrated Automation.
.8 Division 26: Electrical.

1.03 PRODUCTS

.1 The commissioning process is an integral part of the quality control that shall be provided by the Contractor, the Sub Contractors and the System Manufacturers. The commissioning process shall have a monetary value of the overall contract price as described in this section. The Contractor shall be able to draw from this allocation on a monthly basis as work is completed and approved by the Consultants.

.2 LCBO has hired a Commissioning Consultant (CC) who will assist the Consultants and will coordinate with the Contractor to verify that the commissioning process has been completed to the requirements of the contract documents

1.04 THE COMMISSIONING PROCESS

.1 The commissioning process consists of:
  .1 Preparing a commissioning plan
  .2 Shop drawings review and comments
  .3 Scheduling and conducting tests
  .4 Inspection of building and mechanical installations
  .5 Documenting and distributing reports
  .6 Testing of Equipment and Systems
  .7 Demonstration of systems operation
  .8 Operating and maintenance manuals and as-built documentation
  .9 Training
  .10 Systems demonstration (this is not training) and turnover
  .11 Seasonal commissioning
  .12 Warranties

1.05 PREPARING A COMMISSIONING PLAN

.1 A draft commissioning plan has been included with the contract documents. The Contractor shall complete the plan at the beginning of the construction process. Update the plan on a monthly basis and report to the Architect. Finalize the commissioning

plan at the end of the commissioning process and include all reports and completed test forms.

1.06 SHOP DRAWINGS AND RECORD DRAWINGS

.1 Conform to Section 01 33 00 for requirements for shop drawings and record drawings.

1.07 SCHEDULING AND CONDUCTING TESTS

.1 The Contractor shall provide a construction schedule which shall include the commissioning schedule. The commissioning schedule shall identify all tests required by the specification and dates when the tests will occur. The Contractor will identify who will conduct the tests and what trades are required to coordinate with the testing process. Sample test forms have been included with the specification, however, the Contractor may choose to utilize their own forms but they must be approved by the Consultant.

.2 Commissioning schedule shall be submitted within two weeks of contract award date.

1.08 DOCUMENTING AND DISTRIBUTING REPORTS

.1 The Contractor shall be responsible for completing all test forms and arranging for a witnessing authority when it has been specified. The Contractor shall submit the completed forms and any other commissioning reports monthly/as it occurred, to the Architect as part of the commissioning plan update.

1.09 INSPECTION OF BUILIDNG, MECHANICAL AND ELECTRICAL INSTALLATIONS

.1 The Contractor shall coordinate with the Consultants and Commissioning Consultant who will inspect the installation of the building systems and the electrical systems. The Consultants and the Commissioning Consultant shall issue reports to the LCBO Project Coordinator. The Contractor shall correct any deficiencies associated with the contract documents.

1.10 TESTING OF EQUIPMENT AND SYSTEMS

.1 The Contractor shall hire the services of the manufacturer's technicians to test the equipment and associated systems. The technician shall record the results of the tests on the testing forms. The tests shall be witnessed by the Consultant or the Commissioning Consultant. When the tests have been completed satisfactorily the technician and witnessing authority shall sign the forms. A copy of the forms shall be forwarded to the Consultant. The original shall be inserted into the operating and maintenance manual.

.2 Should equipment or systems fail a test, the test shall be repeated after repairs or adjustments have been made. The additional tests shall be witnessed.

.3 Tests which have not been witnessed shall not be accepted and shall be repeated.

.4 The equipment and systems to be tested shall include:

.1 Plumbing and Drainage Systems

.2 Rooftop heating and air conditioning systems

.3 Mechanical systems
.4 Cold room structure and associated mechanical and electrical systems
.5 HVAC Controls and Building Automation System
.6 Power distribution system
.7 Lighting and Lighting Control
.8 Refrigeration Units
.9 Life Safety System

1.11 DEMONSTRATION OF SYSTEMS OPERATION

.1 The requirements for the final systems operational demonstration have been included in the specification. The Contractor shall be responsible for completing all tests identified in the specification and obtaining sign off documentation from all sub- contractors, testing agencies and manufacturers. When all testing has been completed the Contractor shall request that the Consultant and Commissioning Consultant attend systems operational demonstration of all systems associated with the project. The Contractor will arrange for the necessary persons to perform the demonstrations.

1.12 OPERATING AND MAINTENANCE MANUAL & AS-BUILT DOCUMENTATION

.1 Conform to section 01 33 00 for requirements for the O&M Manuals & as-built documentation.
.2 The Contractor shall be responsible for providing the as built documentation as identified in this specification. The as built shop drawings shall be delivered to the Architect prior to the substantial performance date. The as built drawing shall be delivered within one month of the substantial performance date.

1.13 TRAINING

.1 The Contractor shall be responsible to provide the training identified in this specification.
.2 The equipment and systems to be trained, as minimum, shall include:
.1 Plumbing and Drainage Systems
.2 Rooftop heating and air conditioning systems
.3 Mechanical systems
.4 Cold room structure and associated mechanical and electrical systems
.5 HVAC Controls and Building Automation System
.6 Power distribution system
.7 Lighting and Lighting Control
.8 Refrigeration Units
.9 Life Safety System
.3 Training to be conduction onsite
.4 Reviewed by Consultant operating and maintenance manuals shall be available prior to schedule the training
.5 Each training session shall be structured to cover:

.1 The operating and maintenance manual
.2 Operating procedures
.3 Maintenance procedures
.4 Trouble-shooting procedures
.5 Spare parts required
.6 Warranty details

.6 Submit a course outline to the Consultant before training commences. Provide course documentation for up to eight people.

.7 The training sessions shall be scheduled and co-ordinated by the Commissioning Consultant.

.8 Contractor shall allocate 50 hours for training. Training shall occur is multiple sessions. Owner will decide the sessions.

.9 When each training session has been completed The Owner or the Commissioning Consultant shall sign the associated form to verify completion

1.14 SYSTEM DEMONSTRATION AND TURNOVER

.1 The Contractor shall be responsible for conducting and providing the documentation identified in this specification for the turn over process to LCBO. All deficiencies and work not completed shall be identified.

.2 The system demonstration and turnover to The Owner shall occur when:
.1 The installation is complete and all deficiencies have been completed.
.2 The acceptance test conducted by the Consultant has been completed successfully
.3 The Commissioning Consultant system functional testing has been completed successfully for the mechanical and electrical systems including the cold room system
.4 Training has been completed
.5 Operating and Maintenance Manuals have been accepted
.6 Shop-drawings have been updated
.7 As-built drawings have been completed

.3 The systems demonstration shall be conducted by the Contractor and the manufacturers. The demonstration shall cover a demonstration of equipment installation and operation.

1.15 SEASONAL COMMISSIONING

.1 The Contractor shall be responsible for conducting seasonal testing on equipment not tested prior to the substantial performance date. This work shall be scheduled with the LCBO and the Architect. When the work has been completed the Contractor shall demonstrate the operation of the systems to the Consultants and the Commissioning Consultant.

1.16 WARRANTIES

.1 Equipment and system warranties shall not begin until the system demonstration and turnover has been conducted successfully and accepted by The Owner.

.2 The Contractors shall fill out the warranty form listing the equipment and systems and the start and finishing dates for warranty.

.3 Refer to the general conditions specification section for the requirements during the warranty period.

1.17 COMMISSIONING CONSULTANT

.1 A Commissioning Consultant (CC) reports to the Owner.

.2 The CC responsibilities shall include:

- .1 preparing the commissioning plan
- .2 co-ordinating with the Contractor to schedule tests
- .3 preparing a test form manual
- .4 witnessing selected tests
- .5 receiving all test forms
- .6 witness Contractors system demonstrations
- .7 conducting functional and performance tests as applicable
- .8 co-ordinating the Contractors training

.3 The Contractor shall co-operate with the CC.

.4 The Contractor shall provide assistance to the CC and have personnel available during the functional tests. Each system shall be tested in the operational mode.

.5 Performance testing shall begin when all systems have been completed, tested by the Contractors and the Consultant has completed their final review.

1.18 COMMISSIONING PROCESS ALLOCATION

.1 The commissioning process shall be allocated a value equal to 8% of the mechanical contract price, 5% of the electrical contract price, 5% of the refrigeration contract price.

.1 Mechanical 8%

HVAC	1.75
Plumbing	1.75
BAS	1.75
Performance Tests (Functional Testing)	2.25
Training	0.5
Total	**8.0%**

Electrical 5%

Electrical Distribution	1.25
Lighting Distribution	1.25
Performance Tests (demonstrate lighting Circuited according to the drawings)	2.0
Training	0.5
Total	**5.0%**

Cold Room 5%	
Equipment Startup	3.0
Performance Test	2.0
Total	**5.0%**

.2 The Contractors shall submit all test and verification forms. The Consultant may use these forms to compile deficiency lists.

END OF SECTION

1.01 GENERAL

.1 Co-ordination of the work of all Sections of the Specifications as required to complete the Project is the responsibility of the Contractor.

.2 The Contractor will be deemed to possess the necessary technical skills to carefully evaluate all requirements of the Contract, and to have included in the Stipulated Price all project co-ordination and supervision for the proper implementation of these requirements.

.3 Entry by the Owner's own forces and by Other Contractors shall not mean acceptance of the Work and shall not relieve the Contractor of their responsibility to complete the Contract.

.4 Placing, installation, application and connection of work by the Owner's own forces or by Other Contractors on and to the Contractor's Work shall not relieve the Contractor of his responsibility to provide and maintain the specified warranties.

.5 Coordinate with removals/installations specified in other Divisions and Other Contracts.

1.02 RELATED MECHANICAL AND ELECTRICAL WORK

.1 Co-ordination of the installation of systems specified in Divisions 22, 23, 26 and 28, including the interrelating operation and functioning between components of a system and between systems, is the responsibility of those performing the work of Divisions 22, 23, 26, and 28, with final co-ordination the responsibility of the Contractor.

.2 Conceal pipes, ducts, control systems and electrical distribution systems within wall, floor and ceiling construction except where indicated otherwise.

.3 Ensure that service poles, pipes, conduit, wires, fill-pipes, vents, regulators, meters and similar Project service installations are located in inconspicuous locations. If not indicated on Drawings, verify location of service installations with Consultant before commencing installation.

1.03 QUALITY ASSURANCE

.1 Requirements of Regulatory Agencies:
Co-ordinate requirements of jurisdictional authorities.

.2 Quality Control:

.1 Ensure that the Work meets specified requirements.

.2 Schedule, supervise and co-ordinate inspection and testing as specified in Section 01 45 00.

.3 Schedule, supervise and co-ordinate the commissioning process as specified in Section 01 45 00 1.11.

.3 Job Records:
Maintain job records and ensure that records are maintained by Subcontractors.

1.04 SUBMITTALS

.1 Schedule and expedite submission of specified submittals.

.2 Review submittals and make comments as specified in Section 01 33 00.

.3 Ensure that each original submission, and their subsequent revisions and re-submissions are made on schedule.

.4 Consultant to provide submittals schedule, and keep updated submittals log to be reviewed at site meetings.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

.1 Ensure that conditions within the building are maintained and that the Work proceeds under conditions meeting specified environmental requirements.

.2 Ensure that protection of adjacent property and the Work is adequately provided and maintained to meet specified requirements.

1.06 WARRANTIES

.1 Ensure that warranties are provided as specified. All warranties to start on the date of Substantial Completion.

.2 Co-ordinate warranty conditions of interconnected work to ensure that full coverage is obtained.

1.07 CO-ORDINATION

.1 Review Contract Documents and advise the Consultant of possible conflicts between parts of the Work before preparation of shop drawings, ordering of products or commencement of affected work.

.2 Co-ordinate all work in each area and work on which subsequent work depends to facilitate mutual progress, and to prevent conflict between parts of the Work.

.3 Ensure that each Section makes known, for the information of the Contractor and other Sections, the environmental and surface conditions required for the execution of its work; and that each Section makes known the sequence of others' work required for installation of its work.

.4 Ensure that each Section, before commencing its work, knows requirements for subsequent work and that each Section is assisted in the execution of its preparatory work by Sections whose work depends upon it.

.5 Concealment of Supports and Services:

.1 Unless otherwise indicated on Drawings, and/or approved, conceal from view supports, braces, pipes, ducts, tubing, conduit and wiring by construction in finished areas.

.2 Clarify with Consultant the intent of concealment wherever it is in doubt.

.3 Ensure that concealed supports and services are installed and tested, and approved, in ample time for installation of proper concealing construction in accordance with construction schedule.

.4 Ensure that work to be enclosed within ceiling and/or wall spaces can be so accommodated without interference with other parts of the Work.

.6 Existing equipment shall remain in present locations unless designated otherwise. Protect from damage. Remove, store and reinstall existing fixed equipment, fixtures

and components which interfere with construction and which are scheduled for relocation.

.7 Make provision for unrestricted relocation of light fixtures to replace ceiling panels at grid spaces of the same size, without interference or restriction by items located within the ceiling space.

.8 Where supports or openings are to be left for the installation of various parts of the Work furnish the necessary information to those concerned in ample time so that proper provision can be made for such items. Have cutting, drilling and other remedial work, and the subsequent patching or other work required for failing to comply with this requirement, performed at a later date at no additional Cost to Owner.

,9 Properly coordinate the work of the various Sections and trades, taking into account the existing installations to assure the best arrangement of pipes, conduits, ducts and mechanical, electrical and other equipment, in the available space. Under no circumstances will any extra payment be allowed due to the failure by the Contractor to coordinate the work. If required, in critical locations, prepare interference and/or installation drawings showing the work of the various Sections as well as the existing installation, and submit these drawings to the Consultant for review before the commencement of work.

.10 Deliver materials supplied by one Section to be installed by another well before the installation begins.

.11 Ensure that setting drawings, templates, and all other information necessary for the location and installation of materials, holes, sleeves, inserts, anchors, accessories, fastenings, connections, and access panels are provided by each Section whose work requires co-operative location and installation by other Sections, and that such information is communicated to the applicable installer.

.12 Sections giving installation information in error, or too late to incorporate in the Work, shall be responsible for having additional work done which is thereby made necessary.

.13 Remove and replace work installed in error which is unsatisfactory for subsequent work.

1.08 CUTTING AND PATCHING

.1 Before cutting, drilling, or sleeving structural load-bearing elements, obtain approval of location and methods.

.2 Do not endanger the Work or property by cutting, digging, or similar activities. No Section shall cut or alter work of another Section unless such cutting or alteration is approved by the latter Section.

.3 Cut and drill with true smooth edges and to minimum suitable tolerances.

.4 Fit construction tightly to ducts, pipes and conduits to stop air movement completely. The Section performing Work that penetrates a fire, air, vapour, moisture, thermal or acoustic separation of the building shall pack voids tightly with rock wool; seal air, vapour and moisture barriers; and caulk joints as may be required to ensure that no air movement through the penetration is possible.

.5 Cutting, drilling and sleeving of work shall be done only by the Section who has installed it. The Section requiring drilling and sleeving shall inform the Section who

has installed the work to be drilled or sleeved of the location and other requirements for drilling and sleeving.

.6 Replace, and otherwise make good, damaged work.

.7 Cutting and Patching for Holes and Chases, Bulkheads and Furring required by Mechanical and Electrical Work:

.1 Perform cutting or provision of holes up to and including 320 sq.cm and related patching by Division 22 or Division 26 as applicable.

.2 Provide holes and other openings larger than 320 sq.cm, and chases, bulkheads, furring and required patching by Section 01 31 13 who shall be responsible for determination of requirements for holes in excess of 320 sq.cm.

.8 Section 01 31 13 shall be responsible for all cutting and patching in addition to that specified for mechanical and electrical installations, and shall directly supervise performance of cutting and patching by other Sections.

.9 Patching or replacement of damaged work shall be done by the Subcontractor who provided it and at the expense of the Subcontractor who caused the damage. The Contractor shall be responsible for the co-ordination of such patching or replacement.

.10 Make patches invisible in final assembly.

1.09 BUILDING DIMENSIONS

.1 Take necessary job dimensions for the proper execution of the work. Assume complete responsibility for the accuracy and completeness of such dimensions, and for coordination.

.2 Verify that work, as it proceeds, is executed in accordance with dimensions and positions indicated which maintain levels and clearances to adjacent work, as set out by requirements of the Drawings, and ensure that work installed in error is rectified before construction resumes.

.3 Check and verify dimensions referring to the work and the interfacing of services.

.4 Do not scale directly from the Drawings. If there is ambiguity or lack of information, immediately inform the Consultant. Changes through the disregarding of this clause shall be the responsibility of the Contractor.

.5 All details and measurements of any work which is to fit or to conform with work installed shall be taken at the building.

.6 Advise Consultant of discrepancies and if there are omissions on Drawings, particularly reflected ceiling plans and jointing patterns for surfaces finishes, which affect aesthetics, or which interfere with services, equipment or surfaces. Do not proceed with work affected by such items without direction from the Consultant.

.7 Provide written requirements for site conditions and surfaces necessary for the execution of respective work, and provide setting drawings, templates and all other information necessary for the location and installation of material, holes, sleeves, inserts, anchors, accessories, fastenings, connections and access panels. Inform respective contractors whose work is affected by these requirements and preparatory work.

1.10 INTERFERENCE AND COORDINATION DRAWINGS

.1 Coordinate placement of equipment to ensure that components will be properly accommodated within the spaces provided prior to commencement of work.

.2 Prepare interference and equipment placing drawings to ensure that all components will be properly accommodated within the spaces provided. Provide copies of interference drawings to Consultant when requested by Consultant.

.3 Prepare drawings to indicate coordination and methods of installation of a system with other systems where their relationship is critical. Ensure that all details of equipment apparatus, and connections are coordinated.

.4 Take complete responsibility for any remedial work that results from failure to coordinate any aspect of the Work prior to its fabrication/installation.

.5 Ensure that accesses and clearance required by jurisdictional authorities and/or for easy maintenance of equipment are provided in the layout of equipment and services.

1.11 EXCAVATION AND BACKFILL

.1 Cutting of existing concrete and pavements, trenching, backfilling, and repair of exiting concrete and pavements for underground mechanical and electrical services will be the responsibility of Division 22 and 26 respectively.

.2 All work shall be performed in accordance with the requirements of Divisions 01, 03, 22, 26, 31, and 32.

1.12 ACCESS PANELS

.1 The General Contractor shall co-ordinate the installation of all access and inspection panels supplied by Mechanical and Electrical Contractors for installation by other trades.

END OF SECTION

1.01 PRECONSTRUCTION MEETING

.1 As soon as possible after award of Contract, arrange a meeting between the Consultants, Building Commissioning Consultants (BCC), Subcontractors, Project Superintendents, Inspection and Testing Company Representatives, and Representatives of others whose co-ordination is required during construction.

.2 Discuss at the meeting the means by which full co-operation and co-ordination of the participants during construction can be achieved.

.3 Document the responsibilities and necessary activities of the participants during construction as discussed, and distribute documentation to each participant.

1.02 PROJECT MEETINGS

.1 Hold site meetings at regular intervals during construction in order to co-ordinate the work of Subcontractors. Establish meeting schedule with Consultant at the beginning of construction. Meetings shall fall at the same time of each week in which they are scheduled.

.2 Ensure that responsible representatives, from offices and site forces, of Contractor and Subcontractors attend. Representatives of Owner, Consultant, and consultants shall also be permitted to attend.

.3 Inform Owner, Consultant, consultants, and the others whose attendance is required of the date of each meeting, in sufficient time to enable them to arrange for their presence.

.4 Prepare an agenda for each meeting; and make available, to all those concerned, information required for the resolution of problems to be discussed.

.5 Consultant to chair meeting and to prepare and distribute meeting minutes to all parties involved in project within 48 hours.

.6 Provide a Laptop computer with internet access and printer/scanner in the temporary Site Office for the duration of the project for the Consultants, Contractors, and Owner's use.

.7 At each meeting include a review of the quality control and commissioning process and report on their progress. The BCC will attend some selected meetings.

END OF SECTION

1.01 GENERAL

.1 Provide labour, Products, equipment, services tools and supervision necessary for submittals. Make submittals specified in this Section to Consultant unless otherwise specified.

- .1 Verify accuracy and completeness of submittals prior to submission.
- .2 Verify field measurements, field construction criteria, catalogue numbers and similar data.
- .3 Co-ordinate each submittal with requirements of the Work and the Contract Documents.
- .4 Notify Consultant in writing at time of submission, of any deviation in submittals from requirements of the Contract Documents.

.2 Submit in accordance with dates established under Section 01 11 00 for shop drawings, fabrication, manufacture, erection and installation to provide adequate time for reviews, securing necessary approvals, possible revisions and resubmittals, placing orders, securing delivery and to avoid construction delays.

.3 Accompany each submittal with a letter of transmittal in duplicate containing all pertinent information required for identification and checking of submittals including but not limited to the following:

- .1 Date of initial submission and date of each subsequent submission if required.
- .2 Project title and Consultant's project number.
- .3 Names of:
  - .1 Contractor.
  - .2 Subcontractor.
  - .3 Supplier/manufacturer as applicable.
- .4 Specification section numbers to which submission is related.
- .5 Countersigned stamp of Contractor certifying that they have reviewed the submission.

.4 Allow one week for the Consultant's review of each submission.

.5 When submittals are resubmitted, transmit under a new letter of transmission.

.6 Do not carry out Work until Consultants review of submittals has been completed.

.7 Be responsible for payment of charges for delivery of submissions and resubmission to Consultant.

1.02 CONSTRUCTION SCHEDULES

.1 Submit proposed construction schedule at beginning of Project, as specified in Section 01 11 00.

.2 As construction progresses, submit up-dated construction schedules each month to Owner, Consultant, and to each Subcontractor who is included on Schedule.

1.03 SHOP DRAWINGS

.1 Submit shop drawings for which submission is required in other Sections of the Specifications. Include in final shop drawings submissions detailed information, templates and installation instructions required for incorporation and connection of the work concerned. Submissions of all paint draw-downs and finish samples to be used in the Project for all relevant finishes must be submitted to the LCBO Design Co-ordinator for sign-off approval as a requirement of the Contract.

.2 In addition to shop drawings specified in other Sections, submit shop drawings required by jurisdictional authorities in accordance with their requirements.

.3 The Contractor shall check, sign, and make notations he considers necessary on shop drawings before each submission.

.4 Indicate on each submission changes from the Contract Drawings and Specifications that have been incorporated in the shop drawings. The Contractor shall be responsible for changes made from the Contract Drawings and Specifications that are not indicated or otherwise communicated in writing with the submission.

.5 Shop drawing review by Consultant or consultants is for the sole purpose of ascertaining general conformance with the design concept. This review shall not mean that Consultant and consultants warrant or represent that the information contained on the shop drawings is either accurate or complete, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of his responsibility for errors or omissions in the shop drawings or of his responsibility for meeting design, details and all other requirements of the Contract Documents.

.6 Contract Drawings and Specifications take precedence over shop drawings.

.7 The Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation, and for co-ordination of the work of all Subcontractors.

.8 Incorporate only dimensional system utilized for Drawings, except where substitutes are otherwise approved. Make soft conversions from metric system to imperial, or vice versa, when required for incorporation of units of one-dimensional system into construction of the other.

.9 Show on shop drawings:

- .1 Clear and obvious notes of any proposed changes from Drawings and Specifications.
- .2 Fabrication and erection dimensions.
- .3 Provisions for allowable construction tolerances and deflections provided for live loading.
- .4 Details to indicate construction arrangements of the parts and their connections, and interconnections with other work.
- .5 Location and type of anchors, and exposed fastenings.
- .6 Materials and finishes.
- .7 Physical dimensions of materials including thickness and gauges.
- .8 Descriptive names of equipment.
- .9 Mechanical and electrical characteristics when applicable.

.10 Information to verify that superimposed loads will not affect function, appearance, and safety of the work detailed as well as of interconnected work.

.11 Assumed design loadings, and dimensions and material specifications for load-bearing members.

.12 Dimensions and dimensioned locations of proposed chases, sleeves, cuts, and holes in structural members.

.13 All shop drawings of structural components or components that are to withstand dead loads, live loads and/or wind/horizontal loads shall be sealed and signed by a registered professional engineer.

.10 Shop drawing submission procedure:

.1 General contractor to submit one copy of shop drawings on sheets not larger than 280 mm x 430 mm to respective consultants for review and comment as follows:

.1 Submit millwork shop drawings to the interior design consultant.

.2 Submit architectural shop drawings to the architect.

.2 Submit structural, electrical and mechanical shop drawings directly to the respective engineer.

.2 Consultants will forward reviewed shop drawings to the architect either in hardcopy or a scanned copy by email.

.3 Architect will forward reviewed shop drawings to LCBO project coordinator for review and comment.

.4 LCBO project coordinator will review and forward a scanned copy to the general contractor and respective consultants.

.11 Shop drawings which require extensive correction will be sent back for revisions and resubmission. Otherwise, shop drawings will be sent back with review comments only.

.12 Only drawings noted for revision and resubmission need be resubmitted.

.13 Do not add new details or information to shop drawings after they have been finally reviewed, except when approval is given.

.14 Do not proceed with work dependent on shop drawing information until they have been reviewed and accepted by LCBO and LCBO consultants and verification is received from Contractor. Approval shall not relieve the Contractor of his responsibility for execution of the Work in accordance with Contract Documents.

.15 Fabricate work exactly as shown on shop drawings. If shop practice dictates revisions, revise drawings and resubmit.

.16 File one copy of each finally revised and corrected shop drawings at site.

.17 **LIST OF REQUIRED SHOP DRAWINGS TO BE SUBMITTED IN A TIMELY MANNER BY CONTRACTOR TO LCBO DESIGN CO-ORDINATOR, COPIED TO ALL RELEVANT DESIGN CONSULTANTS:**

(This list may not reflect all shop drawings required. It is the responsibility of the contractor to insure that all requirements for submittals are met as specified.)

Shop Drawings required:
Concrete Slab Expansion/Control Joints
Structural Steel – **Must be engineer-stamped.**
Warehouse Doors/Impact Doors
Entry Gates
Hardware
Glazing
Foot Grille
Shades
Power-Assist Swing Universal Washroom Door Operator
Security Shutters
Washroom Partitions
Washroom Accessories
Lockers
Floor Scrubber
Domestic Hot Water Heaters
Drains
Plumbing Fixtures and Trim
Plumbing Specialties
Sprinkler Layout
Fans
Fire Dampers
Grilles and Diffusers
Split System Air Conditioning Units
Smoke Detector (installed in Ductwork)
Controls for A/C Units, Fans, etc.

Relevant Sections for Shop Drawings:
a.. Section 05 50 00, Metal Fabrication
b.. Section 06 20 00, Finish Carpentry (millwork + trim)
c.. Section 08 11 00, Steel Doors and Frames.
d.. Section 08 70 00, Finishing Hardware.
e.. Section 08 71 15, Power Assist Swing Universal Washroom Door Operator.
f.. Section 10 28 13, Washroom Accessories.
g.. Section 11 40 00, Catalogued Equipment.

Catalogue cuts required:
Lunchroom Appliances
Office Furniture
Power-Assist Swing Universal Washroom Door Operator
Washroom Accessories
Floor Scrubber
Hardware

Plumbing
Drains
Domestic Hot Water Heaters
Grilles and Diffusers
Controls for A/C Units, Fans, etc.

1.04 PRODUCT DATA

.1 Before delivery of Products to the Site, submit Product data as specified in each section or as requested by the Consultant.

.2 Submit manufacturer's Product data for systems, materials, and methods of installation proposed for use. Such literature shall identify systems, each component, and shall certify compliance of each component with applicable standards.

1.05 SAMPLES

.1 Submit samples for which submission requirement is specified in other Sections of the Specifications.

.2 Submit samples in duplicate of adequate size to represent the material in its intended use on Project. Submit an extreme range of samples when the degree of marking or colour cannot be represented by a single sample.

.3 Label samples with Project name, number, Contractor, and date.

.4 Include in the Work cost of delivery and handling, assembly, and return to supplier of samples.

.5 If sample is disapproved, both samples will be returned. If sample is approved, one sample will be returned, marked "Reviewed".

.6 Reviewed samples shall serve as a model against which the products incorporated in the Work shall be judged.

.7 Each product incorporated in the Work shall be precisely the same in all details as the reviewed sample.

.8 Should any change of material, colour, texture, finish, dimensions, performance, function, operation, construction, joining, fastening, fabrication techniques, service characteristics, and other qualities be made to a product after approval has been given, submit for approval of the revised characteristics in writing and resubmit samples of the product for review if requested.

.9 When samples are very large, require assembly, or require evaluation at the site, they may be delivered to the site, as directed.

Relevant Sections for Samples (This list may not reflect all samples required. It is the responsibility of the contractor to insure that all requirements for submittals are met as specified.):

a. Section 07 92 00 Sealants
b. Section 08 38 19 Impact door glass
c. Section 08 80 00 Glazing
d. Sections 09 21 16 and 09 51 00 Suspended Ceiling Systems.

e. Section 09 21 16, Gypsum Board (trim).
f. Section 09 30 00, Ceramic and Porcelain Tile
g. Section 09 91 00, Paint.

1.06 PROJECT RECORD DRAWINGS

.1 Record, as the Work progresses, work constructed differently than shown on Contract Documents. Record all changes in the Work caused by site conditions; by Owner, Consultant, Contractor, and Subcontractor originated changes; and by site instructions, supplementary instructions, field orders, change orders, addendums, correspondence, and direction of jurisdictional authorities. Accurately record location of concealed structure, and mechanical and electrical services, piping, valves, conduits, pull boxes, junction boxes and similar work not clearly in view, the position of which is required for maintenance, alteration work, and future additions. Do not conceal critical work until its location has been recorded.

.2 White prints will be provided by the Consultant at no cost to the Contractor for each Section in which record drawings are required. Record changes in the Work on these prints in red ink.

.3 Dimension location of concealed work in reference to building walls, and elevation in reference to floor elevation. Indicate at which point dimension is taken to concealed work. Dimension all terminations and offsets of runs of concealed work.

.4 Make records in a neat and legibly printed manner with a non-smudging medium.

.5 Identify each record drawing as "Project Record Copy". Maintain drawings in good condition and do not use them for construction purposes.

.6 Maintain Project record drawings in a state current to Project. Such state will be considered a condition precedent for validation of applications for payment. The Consultant's visual inspection will constitute proof that record drawings are current.

.7 Provide Consultant with accurate red-marked record drawings for their transfer to AutoCAD with application for Certificate of Substantial Performance. Final acceptance of the Work will be predicated on receipt and approval of record drawings.

1.07 REVISIONS SCHEDULE

.1 Contractor shall provide a Revisions and Miscellaneous Outstanding Items schedule at each site meeting.

1.08 AFFIDAVITS

.1 Submit affidavits which may be required or which may be requested in other Sections of the Specifications.

.2 Affidavits shall verify that products and/ or methods meet requirements specified in the Contract Documents, and shall include test reports of approved testing laboratories to validate claims contained in affidavit.

.3 Submit affidavits in duplicate and signed and notarized by a responsible officer of the certifying company.

1.09 EXTENDED WARRANTIES

.1 Submit the extended warranties as specified in each applicable Section of the Specifications.

.2 Extended warranties shall commence on termination of the standard one year warranty granted in this Contract and shall be an extension of these same provisions.

.3 Submit each extended warranty in an approved uniform format.

1.10 PROJECT CLOSEOUT DOCUMENTATION

.1 Submit one digital copy of Project Data Book at completion of Project on application for Certificate of Substantial Performance to Consultant FTP site for review.

.2 Submit with digital copy of Project Data Book, scanned copies of each final approved shop drawing issued for Project on which have been recorded changes made during fabrication and installation caused by unforeseen conditions.

.3 Submit with Project Data Book together with extended warranties in one digital file.

.4 The Project Data Book digital file shall:

- .1 Have a title sheet, or sheets preceding data on which shall be recorded Project name, date, list of contents, and Contractor's and Subcontractors' names and addresses.
- .2 Contain only typed or printed information and notes, and neatly drafted drawings.
- .3 Contain maintenance and operating instructions on all building, and mechanical and electrical equipment.
- .4 Contain maintenance instructions as specified in various Sections.
- .5 Contain brochures and parts lists on all equipment.
- .6 Contain a list of manufacturers and trade names of finishes and coatings applied.
- .7 Contain sources of supply for all proprietary products used in the work.
- .8 Contain lists of supply sources for maintenance of all equipment in Project of which more detailed information is not included above.
- .9 Contain finished hardware schedule.
- .10 Contain charts, diagrams and reports specified in Divisions 22 and 26.
- .11 Contain final approved shop drawings.

.5 Consultants to review Project Data Book digital file and provide comments to the Contractor once they complete their review.

.6 Contractor to address the outstanding issues with the applicable Consultant, to the Consultant’s satisfaction, before uploading the FINAL Project Data Book to the Consultant FTP site.

.7 Contractor is to submit to Owner one hard copy of the FINAL Project Data Book:

- .1 Bound in a hard-cover, black, vinyl-covered, loose-leaf, letter size binder.
- .2 Be organized into applicable Sections of work with each Section separated by hard paper dividers with plastic covered tabs marked by Section.
- .3 DO NOT include hard copies of approved shop drawings.

.8 Consultant to submit to Owner:

.1 Two cd/dvd copies of the FINAL Project Data Book, including Consultant's Record drawings in both CAD and PDF format.
.2 One full Record drawings set at 11"x17" folded and with three-hole punching.

1.11 EXTRA MATERIALS

.1 Supply extra materials at completion of Project as specified in other Sections of the Specifications.
.2 Deliver extra materials as directed by the Owner to location he designates.
.3 Extra materials submitted as specified will consist of a maximum of one box, carton, crate, unit or tub of the specified material, not exceeding 3% of the overall material used for the project. Confirm with LCBO Project Coordinator final submission of extra material.

1.12 INSPECTION COMPANY REPORTS

.1 Submit copies of test reports as specified in other Sections of the Specifications for "Source Quality Control" and "Field Quality Control" immediately after they are completed.
.2 Submit three (3) copies of each report unless specified otherwise, and signed by a responsible officer of the inspection and testing company.
.3 Submit an additional report directly once completed to:
  .1 Applicable design engineer.
  .2 The Contractor.
  .3 Jurisdictional authorities when such reports are required by them.

1.13 COST BREAKDOWN

.1 Submit a complete cost breakdown within ten (10) working days of notification of award of contract.

1.14 PROGRESS BILLING

.1 Co-ordinate progress billing with cost breakdown.
.2 Include gross and net value of work completed during billing period.
.3 Include running total of gross and net value of work completed by the end of the billing period.

1.15 PRICING OF CHANGES TO WORK

.1 Submit with quotations for changes to the work detailed estimate sheets showing initial and revised quantities of labour, materials and equipment, and the related unit costs.
.2 Payment for use of small tools, travelling, out-of-town accommodations and preparation of price change submittals will be considered a part of overhead as specified in Supplementary General Conditions, issued under separate cover.

1.16 COMMISSIONING REPORTS

.1 Submit copies of commissioning reports prior to substantial performance, to Consultant for review. All commissioning reports identified in section 01 45 00 1.11 shall be submitted as part of the project close out documentation.

END OF SECTION

LCBO

SHOP DRAWINGS, FIXTURE CUTS & SAMPLES SCHEDULE

	Quantity	Date Received by GC	Date Referred & to who	Date Returned to Arch.	Status	Date Sent Back to G.C.
SHOP DRAWINGS						
Structural Steel						
Power-Assist Swing Universal Washroom Door Operator						
Warehouse Doors/Impact Doors						
Entry Gates						
Hardware						
Glazing						
Foot Grille						
Shades						
Security Shutters						
Washroom Partitions						
Washroom Accessories						
Lockers						
Domestic Hot Water Heaters						
Plumbing Fixtures and Trim						
Plumbing Specialties						
Sprinkler Layout						
Fans						
Fire Dampers						
Grilles and Diffusers						
Humidifiers						
Smoke Detector (installed in Ductwork)						
Controls for A/C Units, Fans, etc.						
Cart Corral C/W Shelf (if applicable)						
Double-sided Framed Corkboards						
Office Millwork/Filing Cabinets						
Staff Lunchroom Millwork						
FIXTURE CUTS						
Appliances - Kitchen Demo						
Appliances - Lunchroom						
Office Furniture						
Washroom Accessories						
Floor Scrubber						
Hardware						
Plumbing						
Domestic Hot Water Heaters						
Grilles and Diffusers						
Humidifiers						
Controls for A/C Units, Fans, etc.						
SAMPLES (2 samples of each)						
Finishes in Sched. D2 with "Submit Sample for Approval"						
Plus: Fin. No's: 23, 24, 32, 58, 61, 62, 63 & 64.						
T-bar & Ceiling Tile						
Floor Transition Strips/Tracks						
Spandrel Glass						

1.01 GENERAL

.1 Provide Labour, Products, equipment, services, tools and Supervision to ensure that Work complies with minimum acceptable standards of materials and performance of Work in accordance with codes and standards referenced in the Specification.

.2 Consider contract forms, codes, Specifications, standards, manuals, and installation and application instructions referred to in these specifications to be the latest published editions at the date of submission of the bid unless otherwise stated in the Specifications or otherwise required by the authorities having jurisdiction.

1.02 JURISDICTIONAL AUTHORITIES

.1 Where reference is made to jurisdictional authorities, it shall mean all authorities who have within their constituted powers the right to enforce the laws of the place of building.

.2 Requirements of jurisdictional authorities shall apply to the Work in precedence to the requirements of the Contract Documents, except that more stringent requirements of the Contract Documents shall take precedence over requirements of jurisdictional authorities.

.3 The Contractor shall carry out all work in full compliance with the requirements of the Municipal, Provincial and National Authorities having jurisdiction.

.4 The General Contractor and all sub-contractors shall adhere to the hours of work, the working conditions and rate of wages paid under prevailing local conditions and/or requirements, paying not less than minimum wages established by customary standard in the locality for the same or similar class of work.

.5 The Owner or Owner’s Designee shall be responsible for obtaining and paying for the Building Permit.

.6 The Contractor shall be responsible for obtaining and paying for all other necessary permits and relative inspection fees and no work shall commence until all permits are obtained.

1.03 FIRE PREVENTION AND SAFETY

.1 Enforce fire protection methods, good housekeeping, and adherence to local and underwriter's fire regulations.

.2 Fires will not be permitted on the site. Remove combustible and non-combustible waste at regular intervals and/or when directed. Precautions shall be taken to avoid fire by spontaneous combustion. Smoking shall be prohibited, post "No Smoking" signs.

.3 Provide ULC approved fire extinguishers, and other fire fighting services and equipment except where more explicit requirements are specified as the responsibility of individual Sections.

.4 Provide and maintain in good working order at least one (1) or as many as required, 2A 10BC fire extinguisher which shall be prominently placed and on the job from commencement of work until completion.

.5 Maintain clear emergency exit paths for personnel at all times.

.6 Use only fire resistant tarpaulins and similar protective covering on site.

1.04 REQUIREMENTS OF REGULATORY AGENCIES

.1 Work shall include protection measures consisting of materials, constructions and methods required by The Occupational Health and Safety Act of the Province of Ontario, and as otherwise imposed by jurisdictional authorities to save persons and property from harm.

.2 Ensure that pollution and environmental control of construction activities are exercised as required during the Work.

.3 Except where special permission is obtained, maintain clear access for roads and sidewalks on private or public property.

.4 Maintain roads and sidewalks clear of construction materials and debris, including excavated material. Clean roads and sidewalks as frequently as required to ensure that they are cleared of materials, debris and excavated material. Ensure that all driveways designated as fire routes by authorities having jurisdiction are kept clear at all times.

.5 Remove snow and ice from sidewalks as required.

1.05 REFERENCE STANDARDS AND CODES

.1 Where edition date is not specified, consider that references to manufacturer's and, published codes, standards and specifications are made to the latest edition (revision) approved by the issuing organization, current at the date of the Specifications.

.2 Reference standards, codes, and specifications are quoted in the Specifications to establish minimum standards. Work of quality or of performance characteristics that exceeds these minimum standards will be considered to conform.

.3 Should the Contract Documents conflict with specified reference standards, codes, or specifications, the more stringent in each case shall govern.

.4 Where reference is made to manufacturer's directions, instructions or specifications they shall include full information on storing, handling, preparing, mixing, installing, erecting, applying or other matters concerning the materials pertinent to their use and their relationship to materials with which they are incorporated.

.5 Have a copy of each code, standard and specification, and manufacturer's directions, instructions and specifications, to which reference is made in the Specifications, always available at construction site.

.6 Standards, specifications, associations, and regulatory bodies are generally referred to throughout the specifications by their abbreviated designations. These are, but not necessarily limited to:

AA	-	The Aluminum Association
AAMA	-	Architectural Aluminum Manufacturers Association
ACI	-	American Concrete Institute
AISI	-	American Iron and Steel Institute
ANSI	-	American National Standards Institute
ASTM	-	American Society for Testing and Materials
AWI	-	Architectural Woodwork Institute

AWMAC	-	Architectural Woodwork Manufacturers Association
CGSB	-	Canadian General Standards Board (designated CAN2)
CISC	-	Canadian Institute of Steel Construction
CPMA	-	Canadian Paint Manufacturers Association
CSA	-	Canadian Standards Association (designated CAN3)
CSSBI	-	Canadian Sheet Steel Building Institute
MTC	-	Ministry of Transportation and Communications,
OAA	-	Ontario Association of Architects
OBC	-	Ontario Building Code
OGCA	-	Ontario General Contractors Association
SAE	-	Society of Automotive Engineers
ULC	-	Underwriters Laboratories of Canada
ULI	-	Underwriters Laboratories Incorporated

1.06 EXISTING PUBLIC SERVICE LINES

.1 Where existing public services are indicated to be removed and/or relocated, perform Work in compliance with authorities having jurisdiction.

.2 Make good public roads, walkways and curbs soiled or damaged due to construction to the requirements of local authorities.

1.07 FIRE RATINGS, ASSEMBLIES AND SEPARATIONS

.1 Where a material, component, assembly, or separation is required to be fire rated, the fire rating shall be as determined or listed by one of the following testing authorities acceptable to the authorities having jurisdiction:

.1 Underwriters' Laboratories of Canada.

.2 Underwriters' Laboratories Inc.

.3 Factory Mutual Laboratories.

.4 The National Research Council of Canada.

.5 The National Board of Fire Underwriters.

.6 Intertek Testing Services.

.2 Where reference is made to only one testing authority an equivalent fire rating as determined or listed by another of the aforementioned testing authorities is acceptable if approved by authorities having jurisdiction. Obtain and submit such approval of authorities, in writing when requesting acceptance of a proposed equivalent rating or test design.

.3 Fire rated door assemblies shall include doors, frame, anchors, and hardware and shall bear label of fire rating authority showing opening classification and rating.

.4 Material having a fire hazard classification shall be applied or installed in accordance with fire rating authorities printed instructions.

.5 Fire rated assemblies shall be constructed in accordance with applicable fire test report information issued by fire rating authority. Deviation from fire test report will not be allowed.

.6 Construct fire separations as continuous, uninterrupted elements except for permitted openings. Extend fire rated walls and partitions from floor to underside of structural deck above.

.7 Fire separations may be pierced by openings for electrical and similar service outlets provided such boxes are non-combustible and are tightly fitted and sealed with a ULC approved sealant for the assembly being sealed.

.8 Construction that abuts on or is supported by a non-combustible fire separation shall be constructed so that its collapse under fire conditions will not cause the collapse of the fire separation.

.9 Do not use combustible members, fastenings, attachments and similar items to anchor electrical, mechanical or other fixtures to fire separations.

.10 At penetration through fire rated walls, ceilings or floors, completely seal voids with ULC approved firestopping material; full thickness of the construction element. In locations that require a smoke seal, provide appropriate ULC approved system installed in accordance with the manufacturer's recommendations.

END OF SECTION

1.01 GENERAL

.1 Be responsible for inspection and testing as required by the Contract Documents, statutes, regulations, by-laws, standards or codes or any other jurisdictional authority. Give the Consultant timely notice of the readiness for inspection, date and time for such inspection for attendance by the Consultant.

.2 Verify by certification that specified products meet the requirements of reference standards specified in the applicable specification sections.

.3 Conduct testing, balancing and adjusting of equipment and systems specified in applicable mechanical and electrical specifications sections by independent testing company.

.4 Related Requirements Specified Elsewhere:

.1 Inspections and testing required by the law, ordinances, rules and regulations of jurisdictional authorities: General Conditions of the Contract.

.2 Verification by affidavits and certification that specified products meet requirements of reference standards: In applicable Sections of the Specifications.

.3 Testing, balancing and adjusting of equipment: In applicable mechanical and electrical Sections of the Specifications.

.4 Cutting and patching: Section 01 31 13.

.5 Submission of inspection and testing reports: Section 01 33 00.

1.02 INSPECTION AND TESTING BY THE OWNER

.1 The Owner may appoint an independent inspection and testing company to carry out inspection and testing of the Work for conformance to the Contract Documents. Such costs for inspection and testing will be paid by the Owner. However, any additional inspection and testing due to non-conformance to the Contract Documents shall be at the Contractor's expense.

.2 Inspections and testing by the Owner will be promptly made. Uncover for examination any Work covered up prior to inspection or without approval of the Consultant. Make good such Work at no cost to the Owner.

.3 The Owner may inspect and test Products during manufacture, fabrication, shop testing, installation, construction and testing phases of the Contract. The Consultant will ascertain the quantity and quality of testing to be performed. Inspection and testing may be performed at the place of manufacture/fabrication, storage, or at the Site as designated by the Consultant. Where inspection and testing is done either during manufacture, fabrication, or at Site, ensure that proper facilities and assistance are provided.

1.03 INSPECTION AND TESTING

.1 Source And Field Quality Control specified in Other Sections:

.1 This Section includes requirements for performance of inspection and testing specified under Source Quality Control and Field Quality Control in other Sections of the specifications.

.2 Do not include in work of this Section responsibilities and procedures that relate solely to an inspection and testing company's functions that are specified in another Section which is paid for directly by the Owner. Such information is included in this Section for Contractor's information only.

.2 Do not limit responsibility for ensuring that products and execution of the work meet Contract requirements, and inspection and testing required to this end, to specified inspection and testing.

1.04 QUALIFICATIONS OF INSPECTION AND TESTING COMPANIES

.1 Inspection and testing companies to be certified by the Standards Council of Canada.

.2 Companies engaged for inspection and testing shall provide equipment, methods of recoding and evaluation, and knowledgeable personnel to conduct tests precisely as specified in reference standards.

.3 If requested, submit affidavits and copies of certificates of calibration made by an accredited calibrator to verify that testing equipment was calibrated and its accuracy ensured within the previous twelve months.

1.05 RESPONSIBILITIES OF THE CONTRACTOR

.1 Be responsible for quality control methods and procedures to ensure performance of the work in accordance with the Contract Documents.

.2 The Contractor is responsible for the commissioning process in accordance with the specification Section 01 45 00 1.11.

.3 Co-ordinate with the BCC and their scope of work identified in Section 01 45 00 1.11.

1.06 RESPONSIBILITIES OF INSPECTION AND TESTING COMPANIES

.1 Determine from specifications and Drawings the extent of inspection and testing required for Work of the Contract. Subcontractors shall notify Consultant of any omissions or discrepancies in the work inspected and/or tested.

.2 Perform applicable inspection and testing described in the Specifications and as may be additionally directed.

.3 Provide competent inspection and testing personnel when notified by the Contractor that applicable work is proceeding. Inspection personnel shall cooperate with the Consultant and Contractor to expedite the Work.

.4 Subcontractors shall notify the Consultant and Contractor of deficiencies and irregularities in the Work immediately when they are observed in the course of inspection and testing.

5 Inspection and testing companies shall not perform or supervise any of the Contractor's work, and shall not authorize:

.1 Performance of work that is not in strict accordance with the Contract Documents.

.2 Approval or acceptance of any part of the Work.

1.07 INSPECTION AND TESTING PROCEDURES

.1 Perform specified inspection and testing only in accordance with specified reference standards, or as otherwise approved.
.2 Observe and report on compliance of the Work to requirements of Contract Documents.
.3 Ensure that inspectors are on site or at fabricator's operations for full duration of critical operations, and as otherwise required to determine that the Work is being performed in accordance with the contract Documents.
.4 Identify samples and sources of materials.
.5 Review and report on progress of the work. Report on count of units fabricated and inspected at fabricator's operations.
.6 Observe and report on conditions of significance to work in progress at time of inspection or at fabricator's operations. Include where applicable and if critical to the work in progress:
    .1 Time and date of inspection.
    .2 Temperature of air, materials, and adjacent surfaces.
    .3 Humidity of air, and moisture content of materials and adjacent materials.
    .4 Presence of sunlight, wind, rain, snow and other weather conditions.
.7 Include in reports all information critical to inspection and testing.
.8 Ensure that only materials from the work and intended for use therein are tested.
.9 Determine locations for work to be tested.

1.08 TOLERANCES FOR INSTALLATION OF WORK

.1 Unless acceptable tolerances are otherwise specified in a Section or are otherwise required for proper functioning of equipment, site services, and mechanical and electrical systems:
    .1 "plumb and level" shall mean plumb or level within 1mm in 1m.
    .2 "square" shall mean not in excess of 10 seconds lessor or greater than 90 degrees.
    .3 "straight" shall mean within 1mm under a 1m long straightedge.
.2 Allowable tolerances shall not be cumulative.

1.09 MOCK-UPS

.1 Locate mock-ups where directed by Consultant.
.2 Approved mock-ups will establish the minimum acceptable quality of workmanship and will serve as the standard by which subsequent work will be judged acceptable.
.3 Resubmit mock-ups until approval is given by Consultant. Remove mock-ups that are designated as unsuitable.
.4 Do not proceed with work until mock-up has been approved. Only work which matches approved mock-up in all respects will be acceptable for Project.
.5 Retain each approved mock-up for duration of the Work and protect it from damage. Remove it upon Project completion, or incorporate it in the Project if so directed by Consultant.

1.10 REJECTED WORK

.1 Products and installations found defective; not in accordance with the Specifications; or defaced or damaged through negligence of the Contractor, his employees or Subcontractors, or by fire, weather or any other cause will be rejected for incorporation in the Work.

.2 Remove rejected products and work from the premises immediately.

.3 Replace rejected products and installations with no delay after rejection. Provide replacement products and execute replacement installations precisely as required by the Specifications for the defective products and installations replaced. Previous inspection and payment shall not relieve the Contractor from the obligation of providing sound and satisfactory products and installations in compliance with the Specifications.

1.11 COMMISSIONING

.1 The commissioning process is an integral part of the quality control that shall be provided by the Contractor, the Sub Contractors and the System Manufacturers. LCBO has hired a Building Commissioning Consultant (BCC) who will assist the Architects and Consultants and will coordinate with the Contractor to verify that the commissioning process has been completed to the requirements of the contract documents.

.2 The commissioning process consists of but is not limited to:

- .1 Shop drawing submittal, review and approval
- .2 Updating the commissioning plan
- .3 Scheduling and conducting tests
- .4 Documenting and distributing reports
- .5 Demonstration of systems operation
- .6 Training
- .7 Operations & Maintenance manuals
- .8 As built documentation
- .9 Turn over process to LCBO
- .10 Seasonal commissioning

.3 The shop drawing requirements have been documented in other parts of this specification

.4 A draft commissioning plan has been included with the contract documents. The Contractor shall update the plan at the beginning of the construction process. Finalize the commissioning plan at the end of the commissioning process and include all reports and completed test forms.

.5 The Contractor shall provide a construction schedule which shall include the commissioning schedule. The commissioning schedule shall identify all tests required by the specification and dates when the tests will occur. The Contractor will identify who will conduct the tests and what trades are required to coordinate with the testing process. Sample test forms have been included with the specification, however, the Contractor may choose to utilize their own forms but they must be approved by the Consultant.

.6 The Contractor shall be responsible for completing all test forms and arranging for a witnessing authority when it has been specified. The contractor shall submit the completed forms and any other commissioning reports monthly to the Architect, Consultants and the BCC as part of the commissioning plan update.

.7 The requirements for the final systems operational demonstration have been included in the specification. The Contractor shall be responsible for completing all tests identified in the specification and obtaining sign off documentation from all sub-contractors, testing agencies and manufacturers. When all testing has been completed the Contractor shall request that the Consultant and the BCC to attend systems operational demonstration of all systems associated with the project. The Contractor will arrange for the necessary persons to perform the demonstrations.

.8 The Contractor shall be responsible to provide the training identified in this specification.

.9 The Contractor shall be responsible to provide the O&M manuals identified in this specification. The manuals shall be delivered to the Architect, one month before the substantial performance date. The test forms and certificates shall be included in the commissioning plan final report.

.10 The Contractor shall be responsible for providing the as built documentation as identified in this specification. The as built shop drawings shall be delivered to the Architect prior to the substantial performance date. The as built drawing shall be delivered within one month of the substantial performance date.

.11 The Contractor shall be responsible for conducting and providing the documentation identified in this specification for the turn over process to LCBO. All deficiencies and work not completed shall be identified.

.12 The Contractor shall be responsible for conducting seasonal testing on equipment not tested prior to the substantial performance date. This work shall be scheduled with the LCBO and the Architect. When the work has been completed the Contractor shall demonstrate the operation of the systems to the Consultants and the BCC.

.13 The Landlord's Contractor will be responsible for the start- up and commissioning of the roof top air condition units. Start- up will be completed before the space is turned over to LCBO. The LCBO Contractor shall complete the HVAC installation and coordinate with the Landlord's Contractor to have the roof top unit manufacturer conduct the commissioning of the units. The LCBO Contractor shall coordinate with the BAS contractor . the Air and Water balancing contractor and the Commissioning Consultant. The Commissioning Consultant shall witness the final functional testing conducted by the unit manufacturer.

END OF SECTION

1.01 GENERAL

.1 Include in the Work construction facilities and temporary controls required as construction aids and by jurisdictional authorities, or as otherwise specified. Install to meet needs of construction as it progresses. Maintain construction facilities and temporary controls during use repair them when damaged, relocate them as required by the Work, remove them at completion of need, and make good adjacent construction and property affected by their installation.

.2 Construct temporary facilities of new materials unless otherwise approved.

.3 Ensure that structural, mechanical, and electrical characteristics of temporary facilities are suitable and adequate for use intended. Be responsible that no harm is caused to persons and property by failure of temporary facilities because of placing, location, stability, protection, structural sufficiency, removal, or any other cause.

.4 Prepare shop drawings and specifications of temporary work, and submit for approval of jurisdictional authorities if so required. Submit duplicate copy to Consultant for his information.

.5 Locate temporary facilities where shown on Drawings or as directed.

.6 Apply two coats of paint, in approved colours, to temporary constructions that are not prefinished, such as storage sheds; offices; supports; bracing and back side of signs; barricades; and where otherwise specified.

1.02 CONSTRUCTION SERVICES

.1 The Contractor will be responsible for the cost of Electrical Power for the contractor's hook-ups of equipment or for the contractor's temporary lighting at construction areas where necessary. The LCBO will provide an invoice to the Contractor for power usage at the contract closeout.

.2 Temporary heat at the construction areas shall be provided by the Contractor.

.3 The existing washrooms may be used by the Contractor during construction. Have toilets maintained in sanitary condition. Clean and disinfect the washrooms upon completion of work. Provide temporary washroom as required.

.4 Maintain fire protection as required by jurisdictional authorities.

.5 The Contractor shall co-ordinate with the Landlord’s representative for connection to all required construction services.

1.03 CONSTRUCTION AIDS

.1 Provide an area near the construction area to store materials and equipment during construction.

.2 Scaffolding:

.1 Erect scaffolds clear of walls, and ensure that they do not interfere with continuing work.

.2 Each user of scaffolding shall be responsible for its examination for sufficiency before using it. He shall make it secure if necessary, or shall notify the Contractor in writing that he will not commence work until it is made secure;

otherwise he will be held responsible for, and shall indemnify and save the Contractor harmless from and against, all damages or injuries sustained as a consequence of its insufficiency.

1.04 BARRIERS AND HOARDING

.1 Install barricades for traffic control, and to prevent damaging traffic over exterior and interior finished areas, as well as safety barricades and otherwise, as may be required.

.2 Erect, maintain and remove at time of completion 9.5 mm minimum plywood good one side panelled hoarding, painted, with 50 x 100 mm to the underside of ceiling, having lockable gates. Polyethylene sheets shall be used in the ceiling space to the underside of the metal deck to prevent the migration of dust.

1.05 PROTECTION

.1 Provide temporary construction as required by the Work to protect it from damage. Provide protection by materials of sufficient thickness to prevent all damage to structure and finish, and to waterproofing qualities of membranes, whenever each of these individual components are exposed. Damage shall include harm resulting from all construction work, such as falling objects, wheel and foot traffic, failure to remove debris, operation of machinery and equipment, and scaffolding and hoisting operations. Positively secure protection to prevent displacement from any cause.

.2 Box with wood or otherwise protect from damage, by continuing construction, finished sills, jambs, corners, and the like.

1.06 CONSTRUCTION SIGNS

.1 Signs other than signs and notices regarding safety and caution of instructions will not be permitted on or near the site. Subcontractor's signs will not be permitted.

1.07 OFFICES, SHEDS AND MATERIAL STORAGE

.1 Provide on the site where approved by the Owner, a temporary office not less than 3050 x 6096 mm for Contractor’s, Owner’s and Consultant’s use.

.2 Provide telephone service for the duration of the project for the Contractor’s, Consultant’s and owners use. Pay all accounts chargeable to the work so long as it is in progress.

.3 Provide a Laptop computer with internet access and printer/scanner in the temporary Site Office for the duration of the project for the Consultants, Contractors, and Owner’s use.

1.08 SERVICE AND UTILITY SYSTEMS

.1 Consult with utility companies and other authorities having jurisdiction to ascertain the locations of existing services on or adjacent to site.

.2 Information as to the location of existing services, if shown on the Drawings, does not relieve the Contractor of his responsibility to determine the exact number and location of existing services.

.3 Give proper notices for new services as may be required. Make arrangements with authorities and utilities for service connections required.

.4 Pay any charges levied by utilities or authorities for work carried out by them in connection with this Contract, unless specified otherwise.

.5 Operate and maintain all utility systems affected by work of this Contract, until the building or specific portions thereof have been accepted by the Owner.

.6 Report existing unknown services encountered during excavation to Consultant for instructions; cut back and cap or plug unused services. Be responsible for the protection of all active services encountered and for repair of such services if damaged.

1.09 PEST CONTROL

.1 Be responsible to provide control measures, restraining procedures, and treatments to prevent infestation and spread of insects, rodents and other pests deemed to be present at Site and/or noticed during course of the Work. Carry out fumigation, pest control procedure, and posting of warning signs, notices including contents of such notices in accordance with requirements of Pesticides Act and any other authorities having jurisdictions. Pesticides used shall be in accordance with Canada Pest Control Products Act, and provincial and municipal regulations.

END OF SECTION

1.01 GENERAL

.1 Products refer to new materials, manufactured components and assemblies, fixtures and equipment incorporated in the Work.

.2 Use only products of Canadian manufacture unless such products are not manufactured in Canada, are specified otherwise, or are not competitive.

.3 Products for use in the Project and on which the Bid was based shall be in production at time of Contract Document date, with a precise model and shop drawings available for viewing.

.4 Products specified by model, catalogue number, series, etc., and by manufacturer's name, which are incorporated in the Work shall be fabricated of same materials, of same quality, function and performance at the time they are produced for the Work as at date of Contract Documents.

.5 Where equivalent products are specified, or where alternatives are proposed, these products claimed by the Contractor as equivalent shall be comparable in construction, type, function, quality, performance, and, where applicable, in appearance. Where specified equivalents are used in the Stipulated Price for the Work, they shall be subject to final approval.

.6 Incorporate products in the work in strict accordance with manufacturers' directions unless specified otherwise. Manufacturer's directions, instructions and specifications, where reference is made to them, shall include full information on storing, handling, preparing, mixing, installing, erecting, applying, and other matters concerning the materials that are pertinent to their use and their relationship to materials with which they are incorporated.

.7 Products delivered to the Project site for incorporation in the Work shall be considered the property of the Owner. Maintain protection and security of products stored on the site after payment has been made for them.

.8 Do not install permanently incorporated labels, trademarks and nameplates, in visible locations unless required for operating instructions or by jurisdictional authorities.

1.02 APPROVAL OF PRODUCTS AND INSTALLATION METHODS

.1 Wherever in the Specifications it is specified that Products and installation methods shall meet approval of Authorities having Jurisdiction, underwriters, the Consultant, or others, such approval shall be in writing.

1.03 PRODUCT HANDLING

.1 Manufacture, pack, ship, deliver and store products so that no damage occurs to structural qualities and finish appearance, or in any other way detrimental to their function or appearance, or both.

.2 Brace assemblies such as door frames, large window units and similar products to prevent distortion or breakage in handling.

.3 Ensure that products, while transported, stored or installed, are not exposed to an environment which would increase their moisture content beyond the maximum specified.

.4 Schedule early delivery of products to enable the Work to be executed without delay. Before delivery, arrange for receiving at site.

.5 Deliver packaged products, and store until use, in original unopened wrapping or containers, with manufacturer's seals and labels intact.

.6 Label packaged products to describe contents, quantity and other information as specified.

.7 Label fire-rated products to indicate approval of Underwriters' Laboratories.

.8 Product handling requirements may be repeated, and additional requirements specified, in other Sections.

1.04 STORAGE AND PROTECTION

.1 Store products on site or in storage areas with secure protection against all harmful environmental conditions. Prevent damage, adulteration, staining and soiling of materials while stored.

.2 Protect prefinished metal surfaces by protective coatings or wrappings until time of final cleanup specified in Section 01 70 00. Protection shall be easily removable under work of Section 01 70 00 without damage to finishes.

.3 Store manufactured products in accordance with manufacturer's instructions.

.4 Store steel, lumber, masonry units, precast concrete work, and similar products on platforms raised clear of ground.

.5 Store finished products and woodwork under cover at all times.

.6 Storage and special protection requirements may be repeated, and additional requirements specified, in other Sections.

1.05 SPECIFIED PRODUCTS

.1 Products specified by manufacturer's name, brand name or catalogue reference shall be the basis of the bid and shall be supplied for the Work without exception in any detail, subject to allowable substitutions as reviewed.

.2 Where several proprietary products are specified, any one of the several will be acceptable.

.3 For products specified by reference standards, the onus shall be on the supplier to establish that such products meet reference standard requirements. The Consultant may require affidavits from the supplier, as specified in Section 01 33 00, or inspection and testing at the expense of the supplier, or both, to prove compliance. Products exceeding minimum requirements established by reference standards will be accepted for the Work if such products are compatible with, and harmless to, other products with which they are incorporated.

1.06 SCHEDULING OF PRODUCT DELIVERY

.1 Verify that products supplied by all Sections are ordered from suppliers in sufficient time to ensure delivery for incorporation in the Work within the time limits established by approved construction schedule.

.2 Obtain confirmed delivery dates from product suppliers.

.3 Immediately inform the Consultant should supplier's confirmation of delivery dates indicate that Project completion may be delayed.

.4 Submit copies of purchase orders and confirmations of delivery dates for products as may be requested.

1.07 SUBSTITUTION OF PRODUCTS DURING PROGRESS OF WORK

.1 Products substituted for those specified or approved, or both, shall be permitted only if the listed product cannot be delivered to maintain construction and if the delay is caused by conditions beyond the Contractor's control.

.2 Application for substitution will not be considered if caused by ordering of product later than date required by supplier's delivery schedule to ensure completion of the Work on schedule as approved.

.3 A substitution will be allowed only after Contractor's proof of non-availability has been reviewed by the Consultant.

.4 Obtain review of substitutions. Application for approval shall be made only by Contractor. Process proposals for substituted products in accordance with procedures established for Changes in the Work.

.5 Submit, with request for substitution, documentary evidence that substituted products are equal to, or superior to, approved products, and a comparison of price and delivery factors for both specified or approved products, and proposed substitute.

.6 Ensure that substituted products can be both functionally and dimensionally incorporated in the Work with no loss of intended function, performance space or construction time, and that spare parts and service are readily available. The Contractor shall be responsible for additional installation costs, including Consultant and engineering fees, required by incorporation of substituted products, and for adaptations made otherwise necessary to ensure that above requirements are satisfied.

.7 Review of substitutions for specified items will be performed by Consultant or consultants.

1.08 WORKERS, SUPPLIERS AND SUBCONTRACTORS

.1 Assign work only to workers, suppliers, and Subcontractors who have complete knowledge, not only of the conditions of the Specifications, but of jurisdictional requirements, and reference standards and specifications.

.2 Give preference to use of local workers, suppliers, and Subcontractors wherever possible.

1.09 WORKMANSHIP

.1 Unless otherwise specified in a more detailed manner, workmanship shall be of the highest quality recognized by the trade executing the work in accordance with standard practices, by the best methods recommended by the manufacturer of the product, and as approved by the Consultant.

1.10 FASTENINGS

.1 Include in the work of each Section necessary fastenings, anchors, inserts, attachment accessories, and adhesives. Where installation of devices is in work of other Sections, deliver devices in ample time for installation, locate devices for other Sections and co-operate with other Sections as they require.

.2 Do not install wood plugs or blocking for fastenings in masonry, concrete, or metal construction, unless specified or indicated on Drawings.

.3 Do not use fastenings which cause spalling or cracking of materials in which installed. Do not use powder actuated fastening devices unless specified.

.4 Use only approved driven fasteners.

.5 Install metal-to-metal fastenings fabricated of the same metal, or of a metal which will not set up electrolytic action causing damage to fastenings or components, or both. Provide separation of dissimilar metals. Use non-corrosive or galvanized steel fastenings for exterior work, and where attached to, or contained within, exterior walls and slabs. Leave steel anchors bare where cast in concrete.

.6 Install work with fastenings or adhesives in sufficient quantity to ensure permanent secure anchorage of materials, constructions, components, and equipment. Space anchors within limits of load-bearing or shear capacity.

.7 Space exposed fastenings evenly and in an organized pattern. Keep number to a minimum. Provide exposed metal fastenings of same material, texture, colour and finish as metal on which they occur.

.8 For metal shelving, ensure manufacturer/supplier provides necessary support in accordance with "LCBO Standard Details."

1.11 DIMENSIONS

.1 Check all dimensions at the site before fabrication and installation commences and report discrepancies to the Consultant.

.2 Where dimensions are not available before fabrication commences, ensure that dimensions required are agreed upon between the parties concerned.

.3 Prior to commencing work, ensure that clearances required by jurisdictional authorities can be maintained

.4 Wall thicknesses and openings shown on the drawings may be nominal only; ascertain actual sizes at the site.

.5 Verify dimensions of shop fabricated portions of the Work at the site before shop drawings and fabrications are commenced. The Owner will not accept claims for extra expense by reason of non-compliance with this requirement.

.6 Fabricate and erect manufactured items, shop fabricated items, and items fabricated on or off site, to suit site dimensions and site conditions.

.7 In areas where equipment is to be installed, check dimensional data on equipment to ensure that area and equipment dimensions are compatible with necessary access and clearance provided. Ensure that equipment supplied is dimensionally suitable for space provided.

.8 The mechanical and electrical drawings are intended to show approximate locations of mechanical apparatus, fixtures, equipment, piping and duct runs, electrical apparatus,

fixtures, outlets, equipment, units, and conduit in diagrammatic form and wherein the mechanical and electrical items are not dimensioned, consider their locations to be approximate. Check the drawings and confer with the Consultant to settle the actual locations of these items as may be required to suit aesthetic and site conditions. Such relocation shall be done without change to the Contract Price.

.9 Leave areas clear where space is indicated to be reserved for future equipment, including access to such future equipment.

.10 Whether shown on the Drawings or not, leave adequate space and provision for servicing of equipment and removal and reinstallation of replaceable items such as motors, coils and tubes.

1.12 RELOCATION OF MECHANICAL AND ELECTRICAL ITEMS

.1 The Owner and the Consultant reserve the right to relocate outlets at a later date, but prior to installation, without additional cost to Owner, assuming that the relocation per outlet does not exceed 3000 mm from the original location. No credits will be anticipated where relocation per outlet of up to and including 3000 mm reduces materials, products and labour.

.2 Should relocations per outlet exceed 3000 mm from the original location the Contract Price will be adjusted in accordance with the provisions for changes in the Contract Documents.

.3 Alter the location of pipes and other equipment, without additional cost to the Owner, if approved, provided the change is made before installation.

.4 Make necessary changes, due to lack of coordination, as required and when approved, at no additional cost, to accommodate structural and building conditions.

1.13 EXPANSION, CONTRACTION, AND DEFLECTION

.1 Conform to manufacturer's recommended installation temperatures. If items, components, assemblies, systems, and finishes are installed at temperatures different from operation or service temperatures, make provisions for expansion and contraction in service as acceptable to manufacturer and consultant. Repair all resulting damage should expansion and contraction provisions provide inadequate.

.2 Make provisions for expansion and contraction due to temperature changes within components, Products and assemblies, and between adjacent components, Products and assemblies, and due to building movements including but not limited to creep, column shortening, deflection, sway and twist. Ensure provisions for expansion, contraction and building movements prevent damages from occurring to and within components, Products and assemblies.

.3 Make adequate allowance at wall and partition heads for deflection of the structure above. Determine requirements from Consultant where additional information is required. Where partitions butt to underside of floor assembly, or structural framing, the clearance shall be based on the span of the members supporting the floor or structural framing. In making such allowance use methods which maintain the integrity of the wall or partition as a sound, and/or fire barrier.

.4 Make provisions in pipes, plenums, ducts and vessels containing air and fluids as is necessary to prevent damage due to fluid and air induced pressure, surges and vibrations, to pipes, plenums, ducts and vessels and to adjacent components, assemblies and construction to which pipes, ducts, plenums and vessels are attached or pass through.

1.14 DIELECTRIC SEPARATION

.1 Ensure that a dielectric separator is provided in a permanent manner over entire contact surfaces to prevent electrolytic action (galvanic corrosion) between dissimilar materials. Similarly, prevent corrosion to aluminum in contact with alkaline materials such as contained in cementitious materials.

END OF SECTION

1.01 PROGRESSIVE CLEANING

.1 Ensure that spatters, droppings, soil, labels, and debris are removed from surfaces to receive finishes, before they set up. Leave work and adjacent finished work in new condition.

.2 Use only cleaning materials which are recommended for the purpose by both the manufacturer of the surface to be cleaned and of the cleaning material.

.3 Maintain premises "broom clean" at all times. Vacuum clean interior areas immediately before finish painting commences.

.4 Do not burn or bury waste material at site. Remove as often as required to avoid accumulation.

.5 Do not allow waste material and debris to accumulate in an unsightly or hazardous manner. Sprinkler dusty accumulations with water. Provide containers in which to collect waste material and debris.

.6 Control lowering of materials. Use as few handlings as possible. Do not drop or throw materials from storeys above grade.

.7 Ensure that cleaning operations are scheduled to avoid deposit of dust or other foreign matter on surfaces during finishing work and until wet or tacky surfaces are cured.

.8 Each Section shall supply the Contractor with instructions for final cleaning of his work, and for inclusion in Project Data Book as specified in each trade Section and in Section 01 33 00.

1.02 FINAL CLEANING

.1 Final cleaning to take place the night before turn over to the LCBO. Coordinate exact times with LCBO Project Coordinator and Consultant.

.2 Before final inspection, replace glass and mirrors that have been broken, damaged and/or etched during construction, or which are otherwise defective.

.3 In addition to requirements for cleaning-up specified in the General Conditions of the Contract, and in Section 01 11 00, include in the Work final cleaning by skilled cleaning specialists on completion of construction.

.4 Remove temporary protections and make good defects before commencement of final cleaning.

.5 Remove dust, stains, paint spots, soil, grease, fingerprints, and accumulations of construction materials, interior and exterior to the building. Perform cleaning in accordance with installer's instructions for each material. Final cleaning of new and existing work shall include:

- .1 Washing of exterior paved surfaces, and interior concrete floors.
- .2 Cleaning and polishing of
  - .1 glass.
  - .2 mirrors.
  - .3 porcelain, enamel, and finish metals.
  - .4 washroom accessories.
- .3 Vacuum cleaning of ceilings, walls, and floors.
- .4 Cleaning of ceramic tile floors.

.5 Buffing and application of two light coats of wax, each buffed, of vinyl composition floor tile.

.6 Cleaning of glazed wall surfaces.

.7 Cleaning of hardware, mechanical fixtures, lighting fixtures, cover plates, and equipment, including polishing of their finish metal, porcelain, vitreous, and glass components.

.8 Removing of visible labels left on materials, components, and equipment.

.6 Maintain cleaning until Owner has taken possession of building or portions thereof.

.7 Complete base-building RTU filters, evaporator coils, and overall general cleanout upon completion of fit-out Contract.

.1 General Contractor to employ Standard Mechanical (Kevin Gelder, 905-625-9505)

1.03 ADJUSTING

.1 Ensure that all components of assemblies fit snugly, accurately and in true planes, and that moving parts operate positively and freely, without binding and scraping.

.2 Verify that work functions properly, and adjust it accordingly to ensure satisfactory operation. Lubricate products as recommended by the supplier.

1.04 DEMONSTRATION AND INSPECTION OF PRODUCTS AND SYSTEMS

.1 Arrange for a demonstration of systems and operating Products upon the 100% completion of their installation and prior to certification for Substantial Performance.

.2 Include in the arrangements for the attendance of the Consultant, Owner, jurisdictional authorities, and personnel assigned by the Owner for the operation of the systems and/or Products.

.3 Demonstrations shall be conducted by the Subcontractor responsible for the installation of the systems and/or Product, assisted by representatives of the manufacturer or supplier. All personnel conducting the demonstration shall be completely knowledgeable of all conditions of the operating, functioning and maintenance of the systems and/or Products.

.4 Owner's representative will acknowledge the successful completion of each demonstration on a form provided by the Contractor. The form shall be agreed to by the Owner, Consultant and Contractor prior to demonstration and testing.

.5 Submit copies of letters from manufacturers of Systems and/or Products before making application for certificate of Substantial Performance to verify that the Products has been installed and connected correctly, and that it is operating in a satisfactory manner. The certification shall be based upon inspection and testing of the Products by competent technical personnel. Include in letter of certification the names of personnel conducting the testing and inspection, the methods of inspection utilized, and the location in the building of the Products certified.

.6 Following submission of letters of certification and their acceptance by the Owner, the owner shall have the right to use the Products on a trial basis and for instructing their personnel in its use.

.7 During demonstration of Products and Systems, advise Owner, Owner's staff, and Consultant of location of all equipment name plates. Name plates shall be installed as specified in divisions 11 and 20.

.8 Lock and Key changes: all key pad locks installed, shall be changed from factory preset codes to a new code as selected by the Store Manager. Coordinate with Consultant.

1.05 FINAL INSPECTIONS AND CLOSE OUT

.1 Submit proposed closeout procedures and schedule of inspection to Consultant for approval before final inspections commence.

.2 Arrange for, conduct and document final inspections, close-out and take-over at completion of the Work in accordance with procedures described in OAA/OGCA TAKE-OVER PROCEDURES, OAA/OGCA Document No. 100-2018, July 2018.

1.06 SUBMITTALS

.1 Submit as per above, project record drawings, and extra stock as specified in Section 01 33 00 on application for certificate of Substantial Performance.

.2 Submit other documents as required by specified take-over procedures.

.3 Portion of final payment will be held back until all close out documents are received by LCBO.

.4 For base building construction: Upon completion of construction, provide survey dimensions and area calculations as prepared by a registered surveyor, for Area Certification purposes.

1.07 CLOSEOUT DOCUMENTATION AND RETAINAGE

.1 Closeout Document Review procedure

.1 Contractor to upload to Consultant ftp site a draft Closeout Document submission (pdf files) described in 01 33 00 consisting of:

a. Project Data Book,
b. final approved shop drawings, and
c. Hardcopy or scanned PDF copies of affected drawings.

.2 All the Consultants – Architectural, Structural, Mechanical, Electrical, Coldroom - to review contents concurrently. Consultants to coordinate where consecutive reviews are required. Consultants provide comments directly to Contractor and cc all other Consultants and LCBO Coordinator, review is complete.

.3 Contractor to address outstanding issues with the applicable Consultant, to the Consultant's satisfaction.

.4 Contractor uploads the "FINAL" Closeout Documents to the FTP site. Consultant provides to LCBO 2 cd/dvd copies c/w cad and pdf "Record Set" drawings and one full record set at 11"x17" (folded and with three-hole punching) for the LCBO to include in the Contractor's hardcopy Project Data Book.

.5 Contractor provides LCBO with one hardcopy of the finalized Project Data Book as currently described in 01 33 00. Upon LCBO possession of Project Data Book and 2 cd/dvd copies, Consultant will certify the Contractor's invoice for payment of the Closeout Documents.

.2 $20,000 of the final payment and an additional amount equal to outstanding deficiencies, as recorded by the Consultant, will be retained until all closeout documents are received by LCBO.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

.1 Labour, Products, equipment and services necessary to complete the work of this Section.

1.02 QUALITY ASSURANCE

.1 Applicators: Authorized by the manufacturer using approved mixing and pumping equipment approved.

.2 Pre-installation meeting: Prior to commencing work of this Section, arrange for manufacturer's technical representative to visit the site and review preparatory and installation procedures to be followed, conditions under which the work will be done, and inspect the surfaces to receive the work of this Section. Advise the Consultant of the date and time of the meeting.

.3 Manufacturer's site inspection: Have the manufacturer's technical representative inspect the Work at suitable intervals during application and at conclusion of the work of this Section, to ensure the Work is correctly installed. When requested, submit manufacturer's inspection reports and verification that the work of this Section is correctly installed.

1.03 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials in their original, unopened packages, and protected from exposure to the elements. Remove damaged or deteriorated materials shall be removed from the premises.

1.04 SITE CONDITIONS

.1 Before, during and after installation of work, building interior shall be enclosed and maintained at a temperature above 10°C.

PART 2: PRODUCTS

2.01 EQUIPMENT

.1 Floor underlayment: Cementitious underlayment, minimum compressive strength after 28 days 38 MPa by Maxxon Corporation:

- .1 Underlayment thickness of up to 10 mm: Level Right FS-10.
- .2 Underlayment thickness of up to 38 mm: Level Right Plus.
- .3 Underlayment thickness of up to 75 mm: Level Right

.2 Aggregate: Washed masonry, plaster or silica sand meeting requirements of the manufacturer for intended end use.

.3 Mix water: Potable, free from impurities.

.4 Sealer: Maxxon Overspray or Maxxon Acrylic Sealer by Maaxon Corporation or approved alternative.

.5 Primer: Ethylene - vinyl acetate copolymer, Maxxon Floor Primer by Maxxon Corporation or approved alternative.

.6 Crack filler: Quick setting patching compound, compatible with floor underlayment.

2.02 MIX

.1 Mix proportions and methods shall be in strict accordance with product manufacturer recommendations.

PART 3: EXECUTION

3.01 APPLICATION

.1 Spread underlayment to a smooth surface. Except at authorized joints, place underlayment as continuously as possible until application is complete so that no underlayment slurry is placed against underlayment product that has obtained its initial set.

.2 Provide continuous ventilation and adequate heat to rapidly remove moisture from the area until the underlayment has set and cured.

.3 Apply sealer to underlayment that receive glue down floor coverings.

.4 Clean floor areas where the underlayment has been damaged and seal regardless of floor covering to be used. Where floor covering manufacturers require special adhesive or installation systems, their requirements supersede these requirements.

3.02 FIELD QUALITY CONTROL

.1 Slump Test: Test underlayment as it is being pumped using a 50 mm x 100 mm cylinder resulting in a patty size of 225 mm plus or minus 25 mm diameter.

.2 At least one set of 3 molded cube samples shall be taken from each day's application. Cubes shall be tested as recommended by the manufacturer in accordance with modified ASTM C 109. Make test results available to the Consultant.

3.03 PROTECTION

.1 During construction, place temporary wood planking over underlayment wherever it will be subject to heavy wheeled or concentrated loads.

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 Reference Standards quoted in Contract Documents refer to:

.1 ASTM A36, Standard Specification for Carbon Structural Steel.

.2 ASTM A123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.3 ASTM A153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.4 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.

.5 CGSB 1-GP-181, Organic Zinc Rich Primer.

.6 CAN/CSA-G40.20/G40.21-M, General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steels.

.7 CAN/CSA G164-M, Hot Dip Galvanizing of Irregularly Shaped Articles.

.8 CAN/CSA S16.1-M, Limit States Design of Steel Structures.

.9 CSA S136.1-M, Commentary on CAN/CSA S136-M, Cold Formed Steel Structural Members.

.10 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.

.11 CSA W59-M, Welded Steel Construction (Metal Arc Welding).

1.02 DESIGN REQUIREMENTS

.1 Design details and connections, where not shown on Drawings, in accordance with CAN/CSA-S16.1 and CSA S136.1.

1.03 QUALITY ASSURANCE

.1 Retain a Professional Engineer, licensed in the Province of Ontario, with experience in Work of comparable complexity and scope, to perform the following services as part of the Work of this Section:

.1 Design steel stairs, handrails and railings, glazed guard, wire rope balustrade system, and metal fabrication items that are required to resist live, dead, lateral, wind, or seismic loads.

.2 Review, stamp, and sign shop drawings.

.2 Subcontractors Qualifications: Provide miscellaneous metals by a fabricator who has adequate plant, equipment, and skilled tradesmen to perform installations expeditiously, and is known to have been responsible for satisfactory installations similar to that specified during a period of at least the immediate past five years.

.3 Welder Qualifications:

.1 Weld structural components: in steel, in accordance with CSA W59.

.2 Execute welding by firms certified in accordance with CSA W47.1 Division 1 or 2.1. Ensure welding operators are licensed per CSA W47.1 for types of welding required by Work.

.4 Requirements of Regulatory Agencies:

.1 Conform to requirements of jurisdictional authorities for installations specified in this Section which resist structural forces imposed by dead and live loads.
.2 Submit shop drawings required by authorities to them.

1.04 SUBMITTALS

.1 Shop Drawings:
.1 Shop Drawings for miscellaneous support members are to be signed and sealed by a Professional Structural Engineer licensed to practice in the Province of Ontario.
.1 Upon completion of the Work, submit a P.Eng stamped general conformance letter from the Engineer indicating that installation has been completed, reviewed and accepted.
.2 Submit shop drawings for fabrication and erection of metal fabrications in accordance with Section 01 33 00 indicating materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories. Ensure shop drawings are of one uniform size and based on field measurements.

1.05 DELIVERY, STORAGE AND HANDLING

.1 Label, tag or otherwise mark items required by this Section and supplied for installation by others to indicate their function, location in building and shop drawing designation.
.2 Deliver fabrications to location at building site designated by Contractor and to meet requirements of construction schedule.

PART 2: PRODUCTS

2.01 MATERIALS

.1 General:
.1 Unless detailed or specified otherwise, standard products will be acceptable if construction details and installation meet intent of Drawings and Specifications.
.2 Include all materials, products, accessories, and supplementary parts necessary to complete assembly and installation of miscellaneous metals.
.3 Incorporate only metals that are free from defects which impair strength or durability, or which are visible. Install only new metals of best quality, and free from rust or waves and buckles, and that are clean, straight, and with sharply defined profiles.
.2 Metals:
.1 Steel, Structural Shapes, Plate, Bars: Hot-rolled to meet specified requirements of CAN/CSA-G40.20/G40.21-M, Grade 350.
.2 Steel, Hollow Structural Sections: Hot-formed, seamless, to meet specified requirements of CAN/CSA-G40.20/G40.21, Grade 350, Class H.
.3 Steel, Sheet: Cold rolled, stretcher levelled, fully-pickled, to meet specified requirements of ASTM A653/A653M.

.4 Galvanized sheet steel: ASTM A653/A653M Grade A, Z275 Commercial Quality zinc coating, size and shape as shown.

.3 Prime Paint on Steel: To meet specified requirements of CGSB 1-GP-40M for oil alkyd type structural steel primer and CGSB 1-GP-132M for Zinc chromate primer as applicable for specified finish treatments.

.4 Anchors: Where exposed to view, to match metal anchored.

.5 Bituminous Paint: Alkali resisting to meet specified requirements of CGSB 1-GP-108M.

.6 Powder coating: Epoxy polyester, light texture by Valspar Inc, or approved alternate.

.7 Galvanized primer paint: CGSB 1-GP-181; Organic zinc rich primer. For galvanized fabrications where touch up is to remain unpainted in finished work: Inorganic zinc rich primer, Galvafroid by W.R. Meadows of Canada Ltd.

.8 Butyl tape: Self-adhesive tape made from butyl compound as recommended by metal fabricator for intended use.

.9 Non-shrink grout: Pre-mixed, flowable, non-shrink grout without aggregate fillers; 'Master Builders Masterflow 713' by Master Builders Technologies Ltd., 'Sikagrout 212' by Sika Canada Inc.

2.02 FABRICATION

.1 General:

.1 Fabricate miscellaneous metals components specified in this Section with machinery and tools specifically designed for the intended manufacturing processes and with skilled tradesmen.

.2 Fit and assemble fabrications in shop. When this is not possible make a trial shop assembly.

.3 Incorporate anchors at 610 mm O.C. for components located in cast-in-place concrete.

.2 Construction:

.1 Fabricate miscellaneous metals with materials, component sizes, metal gauges, reinforcing, anchors, and fasteners of adequate strength to withstand intended use, and within allowable design factors imposed by jurisdictional authorities.

.2 Ensure that fabrications will remain free of warping, buckling, opening of joints and seams, distortion, and permanent deformation.

.3 Assembly:

.1 Accurately cut, machine and fit joints, corners, copes and mitres so that junctions between components fit together tightly and in true planes.

.2 Conceal fastenings from view unless otherwise indicated on Drawings.

.3 Weld all connections where possible; bolt where not possible, and cut off bolts flush with nuts. Countersink bolt heads, and provide method to prevent loosening of nuts. Ream holes drilled for fastenings.

.4 Weld joints tight, flush, and in true planes with base metals. Make welds continuous at joints where entry of water into voids of members or assemblies is possible.

.5 Grind welds smooth where exposed to view.

.6 Provide for differential movements within assemblies and at junctions of assemblies with surrounding construction.

.4 Finish Work:

.1 Incorporate holes and connections for items installed by other Sections of the Specifications.

.2 Cleanly and smoothly finish exposed edges of materials including holes.

.3 Cap open ends of sections exposed to view, such as handrails and stringers.

.5 Prime Painting of Steel: Clean all loose mill scale, rust, dirt, weld flux and spatter from surfaces after fabrication. Grind smooth sharp projections. Unless otherwise specified, apply to steel surfaces a shop prime coat of paint. Force paint into corners and cover open areas smoothly with a uniform coating. Deliver fabrications to site with primer undamaged. Paint all surfaces except those to be welded in field, encased in concrete, or that are machined or galvanized. Give surfaces that are inaccessible to finish field painting two coats of primer.

.6 Powder Coat Finish:

.1 Shop apply powder coating to metal fabricated items as indicated in accordance with manufacturer's instructions.

.2 Clean metal assemblies free of rust and grease. Pretreat with zinc phosphate. Spray apply powder coating electrostatically to a dry film thickness of 3 to 4 mils.

.7 Hot Dip Galvanizing:

.1 After fabrication, hot dip galvanize specific miscellaneous steel items as indicated. Plug relief vents air tight. After galvanizing, remove plugs, ream holes to proper size and re-tap threads. Straighten shapes and assemblies true to line and plane after galvanizing. Repair damaged galvanized surfaces with zinc rich primer in accordance with manufacturer's printed directions.

.2 Hot-dip galvanize members in accordance with CAN/CSA G164-M and requirements of the following ASTM, with minimum coating weights or thicknesses as follows:

.1 Rolled, pressed and forged steel shapes, plates, bars and strips: ASTM A123; average weight of zinc coating per square/metre of actual surface, for 4.8 mm and less thickness members 600 g/m^2 for 6 mm and heavier members 640 g/m^2.

.2 Iron and steel hardware: ASTM A153; minimum weight of zinc coating, in ounces per square foot of surface, in accordance with ASTM A153,Table 1 for the various classes of materials used in the Work.

2.03 SCHEDULE OF MECHANICAL ITEMS

.1 Provide metal fabrication items specified herein and items not indicated to be supplied under other Sections.

.2 Refer to Drawings for details of metal fabrication work and related items not specifically listed in this Section.

.3 Where work is required to be built into work of other Sections supply such members to respective Sections.

.4 Provide anchor bolts and expansion bolts or other means of anchorage required for building into floors, walls and ceilings, where it is necessary to secure metal and wood to concrete, masonry or steel work. Supply anchor bolts, nuts and similar hardware to the respective Sections for fastening.

2.04 SHELF ANGLES

.1 Of size indicated on Drawings and as specified in structural steel specifications, with adjustable inserts for vertical adjustment and slotted holes for horizontal; galvanized.

2.05 HANDRAILS, GUARDRAILS AND POSTS

.1 Design railings to withstand minimum horizontal and vertical loads as required to meet requirements of authorities having jurisdiction. In no instance shall load design of railings be less than 2.2 kN/m horizontally and 1.5 kN/m vertically.

.2 Close open ends of steel handrails with 1.9 mm thick closure neatly welded. Fabricate railings, handrails, and guardrails as shown on drawings.

2.06 SUPPORTS FOR ELECTRICAL TRANSFORMERS AND UNIT HEATERS

.1 Provide steel framing, constructed of galvanized steel pipes and steel sections as indicated, for support of electrical transformers and unit heaters. Include all ceiling anchorage rings, plates, rods, anchors and bolts and nuts.

.2 Continuously weld all steel plate, pipe and angle connections.

.3 Where indicated, provide 3 mm thick polished stainless steel cover plates.

.4 Provide all required openings in support framing. Make provisions for slotted connections as indicated. Grind and polish all cut-out edges and corners.

.5 Provide all threaded hanger rods, with anchoring plates, where required. Where indicated, weld on threaded bolt hangers to support framing.

.6 Co-ordinate work with Division 16 to locate supports.

.7 Provide shims if required to ensure perfectly level installation of supports and flush with underside of finished ceiling where ceilings are required.

2.07 MISCELLANEOUS STEEL FRAMING AND SUPPORTS

.1 Provide steel framing, constructed of galvanized steel pipes and steel sections, all loose steel brackets, supports and angles where indicated, except where such framing, brackets, supports and angles are specified under work of other Sections. Drill for countersunk screws, expansion anchors and anchor bolts. Unless otherwise specified, prime paint for interior installation; galvanized finish for exterior installation.

2.08 STEEL STRUCTURE AT IMPACT DOOR

.1 Supply and install 125mm x 125mm h.s.s. posts on each side of door opening at the impact door leading from the retail area to the warehouse. Posts shall include 6mm thick base plates appropriately sized to fit within wall partition, anchored to floor slab

with expansion-type lag bolts. Posts to be secured with steel angle framing to roof framing above. 125mm c-channel lintel welded to each post at the top of the door opening. Coordinate exact locations and sizes with wall type schedule and impact door size.

PART 3: EXECUTION

3.01 EXAMINATION

.1 Take site measurements to ensure that fabrications fit surrounding construction, around obstructions and projections in place, or as shown on Drawings, and to suit service locations.

.2 Obtain Consultant's written approval prior to field cutting or altering of structural members.

3.02 INSTALLATION

.1 Install miscellaneous metals, plumb, true, square, straight, level as applicable, and accurately and tightly fitted together and to surrounding construction.

.2 Provide anchor bolts, washers and nuts, lag screws, expansion shields, toggles, straps, sleeves, brackets, clips, and other items necessary for secure installation of stair, railings and miscellaneous metals as required by loading and jurisdictional authorities.

.3 Erect stairs and handrails in true vertical and horizontal planes, rigid, and free from whip.

.4 Continuously weld connections for railings, and anchor directly to steel stringers.

.5 Attach fabrications to masonry with lead plugs and galvanized steel or other corrosion resistant fastenings to support load with a safety factor of three.

.6 Insulate between dissimilar metals; or between metal, and masonry or concrete with bituminous paint to prevent electrolysis.

3.03 ADJUSTMENT AND CLEANING

.1 After erection, touch up primed surface that are burned, scratched or otherwise damaged with prime paint to match shop coat.

.2 Remove damaged, dented, defaced, defectively finished, or tool marked components and replace with new.

.3 Clean off dirt on surfaces resulting from installation.

3.04 PROTECTION

.1 Maintain protection of finished surfaces exposed to view that receive no site finishing from time of installation until final finishes are applied or to final cleanup.

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 ASTM A153, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.2 ASTM A325, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

.3 ASTM A653, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.4 CSA B111, Wire Nails, Spikes and Staples.

.5 CAN/CSA G164-M, Hot Dip Galvanizing of Irregularly Shaped Articles.

.6 CAN/CSA O80 Series M, Wood Preservation.

.7 CSA O121-M, Douglas Fir Plywood.

.8 CAN/CSA O141, Softwood Lumber.

.9 CSA O151-M, Canadian Softwood Plywood.

.10 NLGA, Standard Grading Rules for Canadian Lumber, National Lumber Grades Authority.

.11 CAN/ULC-S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.02 QUALITY ASSURANCE

.1 Lumber identification: By grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.2 Plywood, OSB and wood based composite panel construction sheathing identification: By grade mark in accordance with applicable CSA standards.

.3 Each piece of fire retardant treated lumber shall be shop marked with the pressure treatment brand and ULC monogram respectively, In accordance with CAN/CSA O80-M.

1.03 ROUGH CARPENTRY PROTECTION

.1 Prevent damage to rough carpentry as required to maintain carpentry as for duration of project and wood life span.

.2 Provide protection to Owner's staff, Contractor's employees and all others coming in contact with any rough carpentry work. Refer to architectural drawings for plywood wall protection detail.

PART 2: PRODUCTS

2.01 LUMBER MATERIALS

.1 Lumber: Unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with following standards:

- .1 CAN/CSA-O141.
- .2 NLGA Standard Grading Rules for Canadian Lumber.

.2 Furring, blocking, nailing strips, grounds, rough bucks, cants, curbs, fascia backing and sleepers:

- .1 Board sizes: "Construction" or better grade.

.2 Dimension sizes: "Construction" light framing or better grade.

2.02 PANEL MATERIAL AND PLYWOOD SHEATHING

.1 Douglas fir plywood (DFP): To CSA O121, standard construction.

.2 Canadian softwood plywood (CSP): To CSA O151, standard construction.

2.03 ACCESSORIES

.1 Rough hardware: Nails, bolts, screws, anchors, expansion shields, and other fastenings required to frame and fix rough carpentry as follows:

.1 Nails, spikes and staples: To CSA B111.

.2 Bolts: ASTM A325, 12 mm diameter unless indicated otherwise, complete with nuts and washers.

.3 Screws: Countersunk head, full thread type.

.4 Proprietary fasteners: Toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs recommended for purpose by manufacturer.

.5 Galvanize rough hardware exposed to the atmosphere in accordance with CAN/CSA G164-M.

.6 Fasteners for use in pressure treated wood: Provide hot dipped galvanized fasteners complying to ASTM A153 and connectors in accordance with ASTM A653, Class G185 for non-structural members. Provide type 304 or 316 stainless steel fasteners and connectors for use in Structural, pressure treated wood.

2.04 FINISHES

.1 Galvanizing: To CAN/CSA-G164, for galvanized fasteners for exterior work.

2.05 WOOD PRESERVATIVE

.1 Surface-applied wood preservative: Clear coloured or copper napthenate or 5% pentachlorophenol solution, water repellent preservative.

2.06 FIRE RETARDANT TREATMENT

.1 Fire retardant treatment of lumber and plywood: 'Dricon' fire retardant treatment by J. A. Biewer or approved equivalent, conforming to CAN/CSA-O80.20 and CAN/CSA-O80.27 respectively, to provide a flame spread rating of 25 or less in accordance with CAN/ULC-S102.

PART 3: EXECUTION

3.01 PREPARATION

.1 Treat surfaces of material with wood preservative, before installation.

.2 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.

.3 Treat curbs, nailers, sleepers and all other roof woodwork.

3.03 INSTALLATION

.1 Install furring and blocking as required to space-out and support other work as required.

.2 Align and plumb faces of furring and blocking to tolerance of 1:600.

.3 Use fire retardant lumber for blocking/framing in ceiling spaces, partitions and bulkheads.

.4 Install rough bucks, nailers and linings to rough openings as required to provide grounds and rough backing for frames and other work.

.5 Install wood nailers, curbs and other wood supports as required and secure using galvanized fasteners.

.6 Install plywood backboards, primed and painted white on both sides, with fire retardant paint.

.7 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.8 Countersink bolts where necessary to provide clearance for other work.

.9 Install rough carpentry to allow for expansion and contraction of the materials.

.10 Cut work into lengths as long as practicable and with square ends. Align, level, square, plumb, and secure work permanently in place. Brace work temporarily as required. Join work only over solid backing.

.11 Bore holes true to line and to same size as bolts. Drive bolts into place for snug fit, and use plates or washers for bolthead and nut bearings. Turn up bolts and lag screws tightly when installed, and again just before concealed by other work or at completion of Work.

.12 Install 19mm plywood blocking within partitions to support upper millwork cabinets as indicated on plan and to support the communications box located within the office (refer to sketch SKE-G7 within division 26 for extent of plywood at communications box).

3.05 CLEANING

.1 Clean rough carpentry on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.06 SCHEDULES

.1 Provide electrical equipment and other backboards for mounting electrical and other equipment as required. Use 19 mm thick plywood on 19 x 38 mm furring around perimeter and at maximum 300 mm intermediate spacing.

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 CAN/ULC-S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering.

.2 CAN/ULC-S702, Mineral Fibre Thermal Insulation for Buildings.

1.02 SUBMITTALS

.1 Product data: Submit manufacturer's Product data indicating characteristics, performance criteria, and limitations. Indicate installation requirements and techniques, storage, and handling criteria and installation procedure acceptable to manufacturer.

.2 Certification: Submit installer's certification verifying compliance with specification requirements.

1.03 QUALITY ASSURANCE

.1 Qualifications: Execute Work of this Section by company specializing in thermal insulation Work with minimum of three years, recent, documented experience, on Work of comparable complexity and scope.

.2 Requirements of Regulatory Agencies:

.1 Install only insulation with an inherent fire hazard classification in all its parts that is .within limits established by jurisdictional authorities.

.2 Validate fire hazard classification only by testing laboratories acceptable to jurisdictional authorities.

.3 Attach Underwriters' Laboratories labels to packages of fire rated materials.

.4 Completely isolate exterior wall system insulation from the interior of the building by non-combustible materials.

1.04 DELIVERY, STORAGE AND HANDLING

.1 Package insulation materials and label them to designate manufacturer, type, density and insulation value, and reference standard specification number if applicable.

.2 Store insulation materials in dry areas, protected from wetting and traffic. Store insulation flat, on a flat surface, and to prevent edge damage and placing of materials on top of stored boards.

.3 Ensure that insulation, adhesives and joint sealing tape are stored at a minimum temperature of 4 deg.C for 12 hours before installation, and that freezable adhesives are stored only at temperatures above 0 deg.C at all times.

PART 2: PRODUCTS

2.01 MATERIALS

.1 General:

.1 Ensure that all materials of an insulation system, and the construction with which it is in contact, are compatible.

.2 Ensure that others whose installations are affected are informed of the thickness and installation methods of board to be installed.

.2 Batt Insulation:

.1 CAN/ULC-S702, Type 1, friction fit. Mineral Wool by Rockwool. Thermal Resistance: RSI value/25.4 mm @ 24 °C of 0.76 m^2 K/W.

.2 Rigid Insulation Board:

.1 Cavity wall and spandrel glazing insulation: CAN/ULC -S701, Type 3, Extruded polystyrene, square edges. Thermal Resistance: RSI value/ 25 mm @ 24 °C of 0.87 m^2 C/W. Thickness: As indicated on Drawings, in thickness shown on drawings.

.1 Cavitymate by Dow Chemical Canada Inc.

.2 Celfort 200 [Foamular 150] by Owens Corning Canada Inc.

.3 ..... Or approved alternate.

.2 For Roof: Rigid polyisocyanurate board covered under the work of Section 07

.3 Acoustic/Fire insulation:

.1 Paperless, semi-rigid, spun mineral fibre mats, of thickness as indicated on Contract Drawings, Thermafibre by CGC Inc., Rockwool AFB or Comfortbatt by Rockwool, Quiet Zone Batts by Owens Corning Inc, or approved alternate. Thermal Resistance: RSI value/25.4 mm @ 24 °C of 0.76 m^2 K/W.

.4 Adhesives:

.1 Only as approved by board supplier; and that have perm rating of 0.025 or less, can be handled at temperature of 4 deg.C and over, have adequate early and permanent bond and tensile strength for application, have a service temperature between high and low temperatures they will be subjected to, and will not stain finish surfaces of materials which are a part of the system.

.5 Vapour Retarder: In accordance with Section 07 26 00, Vapour Retarders.

PART 3: EXECUTION

3.01 EXAMINATION

.1 Before commencing installation of insulation, ensure that all surfaces to which insulation is applied are clean, reasonably smooth with no abrupt changes in plane, free of grease and with protruding fins of mortar or concrete removed, and that the surfaces are otherwise acceptable for insulation application as specified.

3.02 INSTALLATION

.1 Adhesive Installation:

.1 Prime surfaces before application of adhesive only as recommended by adhesive manufacturer.

.2 Apply 50 mm diameter pads of adhesive to faces of panels at 300 mm to 355 mm centres each way, and at a coverage rate of 0.375 L to 0.5 L/sq.m.

.3 Apply adhesive to edges of boards, and at elements that penetrate boards, at a minimum wet film thickness of 3.2 mm to maintain vapour barrier.

.4 Position and press boards into full contact with adhesive, and temporarily shore them in place until adhesive has set.

.2 Acoustic/Fire Insulation:

.1 Install acoustic/fire insulation in partitions, between steel studs of exterior insulation and finish system, and as indicated on Contract Drawings and in accordance with the manufacturer's instructions. Fill stud cavities to full height of partitions and carefully cut and fit insulation around services and protrusions.

3.03 ADJUSTMENT AND CLEANING

.1 Fill all voids in insulation board system with insulation.

.2 Repair all seal breaks in the vapour barrier.

.3 Remove adhesive from finish surfaces before it sets and clean them. Do not mar surfaces while removing and cleaning.

END OF SECTION

PART 1: GENERAL

1.01 DESIGN REQUIREMENTS

.1 Vapour Permeance Requirements: Incorporate barriers in the construction envelope to ensure that air leakage, and water vapour permeance in excess of 0.025 perms, is prevented through them. Seal each crack, joint and penetration by other components to maintain integrity of this barrier.

.2 Fire Resistance Requirements: Ensure that rigid insulation used in the building and installed by this Section conforms to ULC S-114 for non-combustibility.

1.02 REFERENCES

.1 CAN2-51.23-M, Vapour Barrier Sheet, for Use in Building Construction.

.2 CAN/CGSB 19.21-M, Sealing and Bedding Compound, Acoustical.

.3 CAN/CGSB-51.34-M, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.

.4 ULC S114, Building Materials and Assemblies, Standard Method of Test for Surface Burning Characteristics of

1.03 SUBMITTALS

.1 Product data: Submit duplicate copies of manufacturer's Product data indicating:

.1 Performance criteria, compliance with appropriate reference standard, characteristics, and limitations.

.2 Product transportation, storage, handling and installation requirements.

.2 Samples: Submit following samples:

.1 Two 300 x 300 mm samples of vapour retarders.

1.04 QUALITY ASSURANCE

.1 Mock-up:

.1 Construct one 10 m^2 mock-up of [each type] vapour retarder in location acceptable to Consultant indicating as a minimum one lap joint, one inside corner, one window interface, and one electrical box.

.2 Arrange for Consultant's review and acceptance.

.3 Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.

PART 2: PRODUCTS

2.01 MATERIALS

.1 Sheet vapour retarder ‘Super Six' Polyethylene film to CAN/CGSB-51.34, 0.015 mm (6 mil) thick.

.2 Joint sealing tape: Air resistant pressure sensitive adhesive tape, type recommended by sheet vapour retarder manufacturer, 50 mm wide for lap joints and perimeter seals, 25 mm wide elsewhere.

.3 Sealant: CAN/CGSB 19.21; One-part, non-sag, non-bleeding, non-drying, non-hardening, sealant shall remain tacky for permanent bonding to all surfaces; 'Tremco Acoustical Sealant' by Tremco Ltd. or approved alternative.

PART 3: EXECUTION

3.01 EXAMINATION AND COORDINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

.2 Verify that existing substrates to receive vapour retarder are clean, dry, sound, smooth, and continuous.

.3 Coordinate installation of vapour retarders with work of other Sections to achieve an vapour tight building envelope.

3.02 SHEET VAPOUR RETARDER INSTALLATION

.1 Ensure services are installed and inspected prior to installation of retarder.

.2 Install sheet vapour retarder under the floor slab and on the warm side of exterior wall, roof, and ceiling assemblies prior to installation of floor slab, roof insulation or interior finishes to form a continuous vapour retarder.

.3 Use sheets of largest practical size to minimize joints.

.4 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.

.5 At exterior surface openings, cut vapour retarder to form openings and ensure material is lapped and sealed to frame.

.6 Ensure continuity of vapour retarder is maintained at junctures with other materials.

.7 At perimeter seals, seal perimeter of sheet vapour retarder as follows:

- .1 Apply continuous bead of sealant to substrate at perimeter of sheets.
- .2 Lap sheet over sealant and press into sealant bead.
- .3 Install fasteners through lapped sheets at sealant bead into substrate.
- .4 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

.8 Seal lap joints of sheet vapour retarder as follows:

- .1 Attach first sheet to substrate.
- .2 Apply continuous bead of sealant over solid backing at joint.
- .3 Lap adjoining sheet minimum 150 mm and press into sealant bead.
- .4 Install fasteners through lapped sheets at sealant bead into substrate.
- .5 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

.9 Seal electrical switch and outlet device boxes that penetrate vapour retarder as follows:

- .1 Wrap boxes with film sheet providing minimum 300 mm perimeter lap flange.
- .2 Apply sealant to seal edges of flange to main vapour retarder and seal wiring penetrations through box cover.

3.03 FIELD QUALITY CONTROL

.1 Inspect vapour retarder continuity immediately prior to installation of subsequent construction. Repair punctures, rips and tears to ensure continuity of vapour retarder.

.2 Where punctures and tears are extensive, replace entire damaged section.

.3 Do not cover or permit to be covered any portion of vapour retarder until it has been inspected by Consultant.

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 ASTM C920, Specification for Elastomeric Joint Sealants.

1.02 SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.1 Product data: Submit copies of Product data in accordance with Section 01 33 00 describing type, composition and recommendations or directions for surface preparation, material preparation and material installation.

.2 Submit sample of sealant material specified, mount on material similar to that of location where sealant is to be used. Sample size to be no smaller than 100mm x 100 mm. Identify with project name and number, date, sealant type and manufacturer's name.

.3 Approved samples shall be used as minimum standard for all work under this Section and installed work must match samples in every respect.

1.03 SITE CONDITIONS

.1 Do not install materials when ambient air temperature is less than 5° C, when recesses are wet or damp, or to manufacturer's recommendations.

1.04 WARRANTY

.1 Contractor hereby warrants that work of this section shall remain free from leaks and from defects in materials and workmanship in accordance with General Conditions, but for a period of 2 years, and agrees to promptly make good any defects which become apparent within warranty period. Defects shall include, but shall not be limited to, sag and failure in adhesion or cohesion.

PART 2 PRODUCTS

2.01 MATERIAL

.1 General:

.1 All sealant products to be certified low-VOC (ie. Below 250g/l). GC to submit proof of low-VOC compliance prior to application on site.

.2 Validation: sealants are to have the validation of Sealants and Weatherproofing Restoration Institute (SWRI).

.3 Provide joint sealants that are compatible with backing material, accessories, substrates and adjacent sealants for the intended uses based on the testing, recommendations, experience and written instructions of the sealant manufacturer.

.4 Colours for Exposed Joint Sealants Caulking: provide joint sealant colours as selected by the Consultant from the manufacturer’s full range of colours.

.5 Properly formulate each sealant type for anti-sag characteristics when material is used in vertical and overhead locations.

.6 Sealants applied in exterior conditions for piping or conduit penetrations to be UV resistant.

.2 Refer to Sealant Schedule in Part 3 for locations and uses of sealants.

.3 Sealant Type 'A': One component polyurethane base, moisture curing conforming to ASTM C920. Type S, Grade NS, Class 25. Colour: As confirmed by LCBO coordinator.

.1 Tremco "Dymonic"
.2 BASF “MasterSeal NP1”
.3 Dow Corning “CWS or CCS”
.4 Bondaflex “PUR 25” (polyurethane) or Bondaflex “SIL 199” (silicone)
.5 Or approved alternate.

or

Sealant Type ‘AA’: Multi-component polyurethane base, chemical curing conforming to ASTM C920, Type M, Grade NS, Class 25. Colour: To match brick and Block Base

.1 W.R. Meadows "Pourthane NS/SL"
.2 BASF “MasterSeal NP2”
.3 Tremco "Dymeric"
.4 Sika “Sikaflex 2C NS/SL”
.5 Or approved alternate.

.4 Sealant Type 'B': One component silicone base sealant, chemical curing, anti-fungus composition, conforming to ASTM C920, Type S, Grade NS.

.1 Dow Corning "786 Mildew Resistant Silicone Sealant" or “Tub Tile and Ceramic”
.2 GE Silicones "Sanitary 1700"
.3 Sonneborn "Sonolastic Omniplus"
.4 Bondaflex “SIL 100 WF”
.5 Or approved alternate.

.5 Sealant Type 'C': Multi-component silicone, semi self-levelling type, conforming to ASTM C920, Type M, Grade P, Class 25.

.6 Sealant Type ‘D’: One component, moisture cured polyurethane based elastomeric sealant conforming to ASTM C920, Type S, Grade NS, Class 25.

.1 Sikaflex 1a by Sika Canada
.2 Or approved alternative by Tremco Ltd.

.7 Joint Backing: Round, closed cell foamed polyethylene; closed cell urethane foam; rubber; rubber tubing; non-migrating plasticised vinyl having Shore 'A' hardness of 20 and tensile strength of 20 - 30 psi, type of which is compatible with sealant type, and as recommended by manufacturer.

.8 Primer: Compatible type recommended and furnished by same manufacturer as sealant.

.9 Bond breaker: Type recommended by material manufacturers to prevent bonding of sealant to back of recess.

.10 Cleaning agents: As recommended by material manufacturer, harmless to substrates and adjacent finished surfaces.

PART 3 EXECUTION

3.01 PREPARATION

.1 Clean joints and spaces to be caulked and maintain dry and free of dust, loose mortar, oil, grease and other foreign material which may damage or destroy bond of sealant. Thoroughly clean sides of joints and spaces to establish good bond between sealant and adjacent materials.

.2 Clean ferrous metals of all rust, mill scale and foreign materials by wire brushing, grinding or sanding.

.3 Wipe metal surfaces to be caulked, except precoated metals, with cellulose sponges or clean rags soaked with ethyl alcohol, a ketone solvent, xylol or toluol and wipe solutions or compounds which will not injure finish and which are compatible with primer and sealant.

.4 Where joints are 12 mm or deeper, insert backing material in continuous 30% compression with set-back from finished face of adjoining materials equal to required depth of caulking (width/depth ratio) as recommended by manufacturer of sealant, but not less than a distance which leaves minimum 6 mm thickness of sealant.

.5 On horizontal traffic surfaces, support joint filler against vertical movement which might result from loads, including foot traffic.

.6 Prime surfaces of joints with primer to which adhesion is required, unless otherwise instructed by manufacturer.

.7 Where surfaces of materials adjacent to joints are likely to become coated with sealant during caulking operations, mask these surfaces with masking tape prior to priming and caulking.

3.02 APPLICATION

.1 Read other Sections of Specifications for extent of caulking provided by those Sections. Do all other caulking specified or required.

.2 Do not thin or adulterate sealants.

.3 When surfaces of adjacent materials are to be painted, do all caulking before these surfaces are painted.

.4 Where surfaces to be caulked are prime painted in shop before caulking, check to make sure prime paint is compatible with primer and sealant. When incompatible, inform Consultant and change primer and sealant to compatible type approved by Consultant.

.5 Apply caulking compound using pressure-operated guns fitted with suitable nozzles in accordance with manufacturer's directions. Apply caulking compound in such manner as to ensure good adhesion to sides of joints and to completely fill all voids in joint.

.6 Surface of caulking compound shall be worked smooth, free from ridges, wrinkles, sags, air pockets and embedded impurities. Keep surface of caulking flush with faces of adjacent surfaces, unless otherwise indicated on drawings.

.7 Remove masking tape, soils and all caulking compound which may have been deposited on surfaces near joint.

3.03 CLEANING

.1 Clean surfaces adjacent to joints, remove sealant smears or other soiling resulting from application of sealants. At metal surfaces, remove masking and other residue. Do not to mar or damage finishes on materials adjacent to joints. Repair or replace marred or damaged materials.

3.04 CAULKING AND SEALING SCHEDULE

.1 Sealant Type 'A' & 'AA'

.1 Apply at following locations:

.1 Perimeter of new window, door and wall frames; Colour to match masonry, or surrounding surfaces. If not installed in brick veneer, then colour of sealant shall match adjacent wall finish.

.2 Junction of wall panels and abutting materials; Colour to match masonry mortar. If not installed in brick veneer, then colour of sealant shall match adjacent wall finish.

.3 Locations not covered by trim; Colour to match masonry mortar.

.4 At any location indicated on drawings but not covered by foregoing. Confirm colour with LCBO.

.5 Or approved alternate.

.2 Sealant Type 'B'

.1 Apply at following locations:

.1 At joint between washroom plumbing fixtures and walls/ floors;

.2 At junction of walls and vanity surfaces;

.3 At junction of equipment having horizontal work surfaces and walls;

.4 At junction of backsplash and walls.

.5 Or approved alternate.

.3 Sealant Type 'C'

.1 Apply at any joints shown on drawings or required by work which are subject to foot traffic.

.4 Sealant Type 'D'

.1 Apply at following resilient flooring locations:

.1 Areas where water may be tracked in from outdoors (i.e. vestibule areas)

.2 Where maintenance may create water that sits between transitional areas (i.e. quarry/linoleum, VCT/linoleum etc.)

.3 Around all other penetrations (i.e. floor outlets, drains, etc.) in order to prevent adhesive failure.

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 Reference Standards quoted in Contract Documents refer to:

- .1 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealled) by the Hot-Dip Process.
- .2 ASTM A568/A568M, Specification for General Requirements for Steel, Carbon and High-Strength Low-Alloy, Hot-Rolled Sheet and Cold-Rolled Sheet.
- .3 CAN/CGSB 1.40, Anticorrosive Structural Steel Alkyd Primer.
- .4 CAN4-S104M, Standard Method for Fire Test of Door Assemblies.
- .5 CAN4-S105M, Standard Specification for Fire Door Frames, Meeting the Performance Required by CAN4-S104M.
- .6 Insulation: Mineral fibre to CAN/ULC S702,

1.02 SUBMITTALS

.1 Shop Drawings

- .1 Submit shop drawings of fabricated items prior to fabrication. Shop drawings shall clearly show and describe in detail, materials, connections, attachments, anchorage, reinforcing, elevations, dimensions, thickness of metals, primer and location of openings.

.2 Correlate doors with door numbers given on Door Schedule.

1.03 QUALITY ASSURANCE

.1 Quality Standards

- .1 Perform work of this Section in accordance with requirements of Canadian Manufacturing Standards for Steel Doors and Frames, January, of Canadian Steel Door and Frame Manufacturers' Association, except as otherwise specified herein or shown on drawings.
- .2 Fire rated assemblies: Label and list fire rated doors and frames by an organization acceptable to authorities having jurisdiction and accredited by the Standards Council of Canada in conformance with CAN4-S104M and CAN4-S105M for ratings indicated.

1.04 PRODUCT HANDLING

.1 Maintain fabricated items free from damage. Store in dry area and remove polyethylene wrappings as soon as possible; allow air circulation around stacked frames.

PART 2: PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

.1 Acceptable manufacturers: Ali-Porte, S.W. Fleming Ltd., or other approved manufacturer.

2.02 MATERIALS

.1 Steel: commercial quality, to ASTM A568/A568M, Class 1, hot dip galvanized to ASTM A653/A653M, ZF075 satin coat finish. Minimum base thickness as follows:

.1	Face Sheets		1.2mm (18 ga.)
.2	Frames		1.6mm (16 ga.)
.3	Accessories – Doors and Frames:		
	.1	Lock/Strike reinforcements	1.6mm (16 ga.)
	.2	Hinge reinforcements	1.8mm (14 ga.)
	.3	Flush bolt reinforcements	1.6mm (16 ga.)
.4	Reinforcement for surface:		
	.1	Mounted Hardware	2.7mm (12 ga.)
	.2	Top and Bottom channels	2.7mm (12 ga.)
	.3	Mortar Guard Boxes	0.7mm (22 ga.)
	.4	Floor Anchors	1.6mm (16 ga.)
.5	Wall Anchors:		
	.1	Masonry Straps type	1.2mm (18 ga.)
	.2	Masonry Wire type	3.9mm (0.156") dia.
	.3	Steel Stud type	1.0mm (20 ga.)
	.4	Steel Stud Tension and Associated Wall type	1.0mm (20 ga.)

.2 Primer: Alkyd type to CAN/CGSB 1.40.

.3 Insulation: Mineral fibre to CAN/ULC S702, minimum density 24Kg/cu.m. (l.5 lbs/cu.ft.)

.4 Core Material:

.1 Interior Doors: Resin impregnated, rot resistant kraft, density of 16.5Kg/cu.m. (1.03 lbs/cu.ft.)

.2 Exterior Doors: Rigid polyisocyanuate board, closed cell, 32Kg/cu.m. (2.0 lbs/cu.ft.)

.5 Fire-rated doors to conform to U.L.C. requirements, and bear appropriate label stamp/embossing.

.6 Fire-rated frames to conform to U.L.C. requirements, and bear appropriate label stamp/embossing.

.7 Rubber Door Bumpers: single stud rubber or neoprene type, white

.8 Door sizes: refer to Door Schedule

.9 Signage at emergency exits: as indicated on mechanical and electrical drawings.

.10 Glass and glazing materials: In accordance with Section 08 80 00.

2.03 FABRICATION – DOOR FRAMES

.1 General:

.1 For Knock down frames:

.1 Fabricate knock-down frames for simple field assembly of frame elements to ensure square, rigid, tightly-fitted, and securely locked joints, both during erection and while in place.

.2 Mitered frame to be assembled using concealed interlocking connections

.2 Blank, drill, reinforce and tap frames to receive templated strikes and hinges.

.3 Fill exposed joints and surface depressions in frames with metallic paste and sand to a smooth finish.

.4 Protect mortised cut-outs with steel guard boxed, applicable to frames to be installed in openings in masonry and concrete walls.

.5 Reinforce frame scheduled for surface mounted hardware to accept surface mounted hardware including 4-point exit lock attachment. Drilling and tapping for surface mounted hardware shall be performed at the time of hardware installation.

.6 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.

2.04 FABRICATION - DOORS

.1 General:

.1 Construct doors in accordance with details and approved shop drawings, fully welded construction with no visible seams or joints on faces or vertical edges.

.2 Assemble doors with full sheets laminated under pressure to honeycomb core.

.3 Reinforce and frame openings required for glazing. Provide glazing stops with countersunk flat head screws.

.4 Mortise, reinforce, tap and drill doors and reinforcement to receive hardware using templates provided by hardware supplier including 4-point exit lock attachment.

.5 Provide sound deadening and thermal insulation material to fill all voids in doors.

.6 Assemble components by means of spot or arc welding.

.7 Fit exterior doors and all interior stair doors with flush steel channel caps at top of door and seal against moisture penetration.

.8 Provide condensate weep holes at bottom of exterior doors.

PART 3: EXECUTION

3.01 INSTALLATION

.1 Insulate frames for exterior doors with fibreglass for full height and depth.

.2 Provide sealants as per 07 92 00.

.3 Touch-up primer and paint as per 09 91 00.

.4 Provide anchorage to floor and wall constructions. Each wall anchor shall be located immediately above or below each hinge reinforcement on the hinge jamb directly opposite on the strike jamb. For rebate opening heights up to and including 1500mm provide two anchors, and an additional anchor for each additional 750mm of height or fraction thereof.

.5 Where frames terminate at finished floor level provide anchorage plates to suit floor construction and weld to inside of each jamb profile.

.6 Weld or wedge anchors inside each jamb as follows: 5 steel stud type anchors, plus one additional for each 610 mm or fraction thereof in height.

.7 Prepare each door opening for single stud rubber door silencers, three (3) for single door openings, two (2) for double door openings.

.8 Provide factory-applied touch up primer at areas where zinc coating has been removed during installation.

END OF SECTION

PART 1: GENERAL

1.01 DESIGN REQUIREMENTS

.1 Design shutter to span width and height of window opening with a minimum deflection of l/360. Modify shutter as necessary to obtain this deflection criteria. Shutters not meeting this deflection criteria shall be removed, modified, and replaced to the satisfaction of the Consultant at no cost to the Owner.

1.02 SUBMITTALS

.1 Shop Drawings: Submit Shop Drawings to LCBO Design Co-ordinator for Approval.

.2 Indicate each type of door arrangement of hardware, required clearances, electrical characteristics including voltage, size of motors, auxiliary controls and wiring diagrams.

.3 Indicate assembly details and dimensions of fabrication, required clearances and electrical connections.

1.03 MAINTENANCE DATA

.1 Provide operation and maintenance data for interlocking rolling shutter and hardware for incorporation into Project Data Book.

1.04 WARRANTY

.1 Warrant Work of this section against defects and deficiencies for a 1 year from date Work is certified as substantially performed in accordance with the general conditions of the Contract.

.2 Promptly make good defects and deficiencies which become apparent within the Warranty Period by replacing defective Work satisfactory to the Consultant and at no expense to the Owner.

PART 2: PRODUCTS

2.01 MATERIALS

.1 Unit shall be interlocking rolling shutter, perforated aluminium slats. Acceptable Manufacturers include:

- .1 Amstel Security Grilles and Shutters
- .2 Dynamic Closures Corporation.
- .3 Pentagon Security Shutters
- .4 Mobilflex Security Shutters
- .5 Or Approved alternate.

.2 Curtain shall consist of double channel aluminium sections with ‘V’ groove line appearance with minimum 1.6 mm perforated aluminium panel infill and of sufficient thickness to prevent bowing. Bottom slat extruded bar to be fitted with a bottom vinyl strip.

.3 Guide rails fabricated from heavy gauge aluminium and fitted with two noise and weather insulating strips. Guide rail shall be oil, acid, and alkali resistant.

.4 Panel box housings to be precision roll formed aluminium. Lower half detachable for future servicing. All panel box end plates to be manufactured by pressure die casting procedure from high grade aluminium alloy.
  .1 Panel box housing to come complete with prefinished metal cover (QC-2624 Silver Metallic finish) to conceal motor and drum mechanisms from view for conditions with exposed ceiling.

.5 Operation: Roll shutters to be electrically operated. Motor to be size and type recommended by the manufacturer. Low voltage motors shall be provided with appropriate transformers and associated wiring to connect to 120V power and Rocker type security switch. All electrical components to be CSA approved. The motor shall be of sufficient horsepower to lift the shutter without excessive strain.
  .1 Any roll shutter over an entrance exit door or window shall be equipped with a manual override to allow operation in case of power failure.
  .2 The manual override shall be operated by a removable crank, a spare crank is to be provided at time of installation.
  .3 Exterior pushbuttons: NEMA 4-Watertight enclosure, "Open-Close", complete with transformer and sufficient relays.
    .1 Operation:
      .1 Lock-on (momentary pressure) switch for upward opening of shutters
      .2 Maintained pressure for closing operations of shutters
  .4 Each motor unit shall be operated by a single Rocker type security switch located in Manager’s office, beyond the leading edge of entry door, where the operation of shutters could be viewed, also see Office Elevation drawings SKE-9a,b,c,d,e at the end of Division 26.

.6 Roll shutters shall be built to prevent curtains from being lifted from exterior.

.7 Finish:
  .1 Aluminium: Silver Metallic QC-2624.
  .2 Paint: Silver to match Silver Metallic QC-2624.

.8 All mounting bracket are to be bolted. Welded brackets are not acceptable.

PART 3: EXECUTION

3.01 ELECTRICAL WORK

.1 Coordinate with works of Division 26.

.2 Wire and interconnect all components of Interlocking Rolling Shutter as recommended by manufacturer.

.3 Install controls in accordance with manufacturer's directions.

.4 Install wiring in raceways unless noted otherwise.

.5 Use liquid tight flexible metal conduit with ground conductor for the last 450 mm to rotating equipment.

.6 Minimum wire sizes:
  .1 Power and lighting - No. 12 AGW
  .2 Control - No. 14 AGW

.3 Use type RW90 for all wiring

3.02 INSTALLATION

.1 Install shutters in accordance with manufacturer's printed instruments.

.2 Confirm locations of wood blocking in building shell walls and as indicated on drawings prior to installing shutters and notify LCBO about any lack of proper supports.

.3 Adjust shutter operating components to ensure smooth opening and closing of doors.

.4 Where a label is required, test labelled coiling doors for proper operation by activating fusible link. Test for coiling door to satisfy municipal inspector or other authorities having jurisdiction.

END OF SECTION

PART 1: GENERAL

1.01 SUBMITTALS

.1 Shop Drawings: Submit Shop Drawings to LCBO Design Co-ordinator for Approval.

.2 Indicate elevations, sections, details, required clearances, materials, operating components, dimensions, gauges, and finishes.

.3 Folding grille manufacturer's engineer to review site specific support details and confirm their suitability as part of Shop Drawing Submission.

.4 Provide operation and maintenance data for interlocking rolling shutter and hardware for incorporation into Project Data Book.

PART 2: PRODUCTS

2.01 MATERIALS

.1 Unit shall be interlocking rolling shutter, aluminium slats. Acceptable Products and Manufacturers include:

- .1 Air Vista by Amstel Security Grilles and Doors.
- .2 Paravent by Dynamic Closures Corporation.
- .3 Aeroflex by Mobilflex Folding Closures
- .4 Or approved alternate.

.2 Curtain shall consist of 150 mm wide x 1.8 mm thick aluminium panels with perforations. Curtain shall incorporate truss like plates at top and bottom of closure.

.3 Track shall be fabricated from 7 mm aluminum bearing surface to support and accept roller trolleys. Track curves shall have manufacturers accepted radii.

.5 Operation: Roll shutters to be manually operated.

.6 Locking: replaceable master keyable cylinder and floor bolts. Floor sockets for drop bolts to be spring loaded dustproof type.

.7 Grille support must be able to carry weight of fully stacked door at any point along its length.

.8 Finish: Clear Anodized.

PART 3: EXECUTION

3.01 INSTALLATION

.1 Install grilles in accordance with manufacturer's printed instruments. Refer to attached sketches.

.2 Adjust grille operating components to ensure smooth opening and closing of grilles.

END OF SECTION

PART 1: GENERAL

1.01 SUBMITTALS

.1 Product Data: Submit manufacturer's installation instructions.

.2 Shop Drawings:

- .1 Submit shop drawings of fabricated items prior to fabrication. Shop drawings shall clearly show materials, door elevations, head, jamb and meeting stile details including full or partial gaskets, dimensions, thickness of metals/materials, primer and locations of openings.
- .2 Correlate doors with door numbers given on Door Schedule.
- .3 Submit 100mm x 100mm sample of tinted glass panel.

.3 Closeout Submittals:

- .1 Cleaning and Maintenance instructions.
- .2 Warranty.

1.02 PRODUCT HANDLING

.1 Deliver product in manufacturer's original unopened packages with label legible and intact.

.2 Examine doors upon delivery for damage. Verify doors were shipped on edge or in upright position as indicated on packaging by manufacturer.

.3 Note specific doors shipped in other than on edge or upright position on bill of landing and contact manufacturer.

.4 Store doors at project site on edge or in upright position and under cover following manufacturer's instructions printed on carton.

1.03 WARRANTY

1 Manufacturer’s Warranty: Submit, for owner’s acceptance, manufacturer’s standard warranty document executed by authorized company official. Manufacturer’s warranty is in addition to and not a limitation of other rights Owner may have under the Contract Conditions.

.2 Warranty Period: Two-year, commencing on Date of Substantial Completion. Warranty covers repair or replacement of defective components or labour for two years after completion of impact traffic door installation.

PART 2: PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

.1 Durulite Retailer Traffic Door, Model #6084 RD by Chase Industries Inc. (DBA Chase Doors).

.2 Eliason Corporation, meeting specifications below.

.3 Finish/Colour:

- .1 Durulite (Chase) Door: Cloud Grey.
- .2 Eliason Corporation: Off White.
- .3 Colour of door frame shall be finished in a semi-gloss sheen alkyd, to match wall colour (see room finishes schedule). All costs associated with the colour

match, either on site or factory-finished, is to be carried by the impact door manufacturer.

2.02 FABRICATION

.1 Construct doors in accordance with details and approved shop drawings, fully welded construction with no visible seams or joints on faces or vertical edges.

.2 Door Panel shall be a monolithic, one piece, hollow shell of high-impact, cross-linked polyethylene with textured finish, minimum wall thickness of 3 mm, overall panel thickness of 48 mm. Bottom, leading and back edges to have molded-in keyways to accept gaskets.

.3 Door Panel Core shall be of high-density, foamed-in-place, non-CFC urethane bonded to interior of the cross-linked polyethylene shell providing an insulating R factor of 10.83.

.4 Standard Hinge System:

.1 Upper hinge: self closing "V" cam design. The roller assembly design shall allow up and down and back and forth adjustments to the door. Upper hinge seal shall be black PVC with a flexible nylon reinforced vinyl skirt.

.2 Lower hinge: shall be pillow block design of ductile iron with UHMW sleeve and ductile iron lower hinge adapter which has provision for mounting an optional spring assist.

.3 Hinge Shaft: 33 mm diameter inserted with screws through tubular steel spine which is foamed -in -place during fabrication and runs full length of door.

.5 Vision Panel:

.1 Single pane window to be 300 mm W x 762 mm H ADA ‘tinted’ type-20% light transmission. This shall be the total tint of both window panes per individual door panel (if applicable to supplier). Window glazing shall be 6 mm thick polycarbonate with aluminum frame recessed a minimum of 3 mm from the face of the panel. Bottom of vision panel shall be located maximum 900mm above finished floor. Edge of panels closest to the latch is not more than 250mm from latch side of the door. Refer to Architectural drawings.

.6 Gaskets:

.1 Gaskets shall be 60 to 80 durometer extruded santoprene fitted into matching, pre-formed gasket key and held by friction. Gaskets have wings which seal against rounded edges of the door.

.2 Door shall be fully gasketed. Leading edge shall be blade-type. Bulb type gasket to be used on the bottom and between the back of the door and jamb. Top seal is a coextruded PVC extrusion with flexible PVC gasket.

.3 Gasket to match door colour.

.7 Bumpers:

.1 From bottom of the door to underside of door window, of extra heavy duty polyethylene spring bumpers with 75 mm projection.

.2 Bumpers to be curled on warehouse side and flat on retail side.

.3 Colour: Black matte.

.8 Lower hinge guards on both sides of door
.9 Tolerances: Width and height of each panel: +/- 6 mm.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verify that openings are ready to receive work and opening dimensions and clearances are as indicated on drawings.
.2 Coordinate with responsible entity to perform corrective work on unsatisfactory conditions.
.3 Commencement of work by installer is acceptance of opening conditions.

3.2 INSTALLATION

.1 Follow manufacturer's instructions. Coordinate sequence of installation with other work to avoid delays.
.2 Provide and install steel door frames in accordance with Section 08 11 00.
.3 Install doors accurately in their respective frames with clearances, necessary anchors, hardware and accessories according to the manufacturer's data and as specified.
.4 Clean and lubricate operating parts.
.5 Adjust doors to open and close smoothly and freely without binding
.6 Check seals to ensure proper fit.

3.3 CLEANING

.1 Clean surfaces soiled by work as recommended by manufacturer.
.2 Remove surplus materials and debris from the site.

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 Standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association and to meet barrier free requirements where required.

.2 BHMA, Builders Hardware Manufacturing Association.

1.02 SUBMITTALS

.1 Hardware Schedule and Shop Drawings:

.1 The hardware specialist shall prepare and submit shop drawings containing a completely itemized schedule of hardware for review. The schedule of hardware shall list all doors by number (in sequence) and location with complete details of the hardware to be supplied, including installation heights and special instructions. Format of schedule to be approved.

.2 Hardware schedule shall incorporate catalogue numbers of hardware as specified, including material, function and finish as well as all alternatives which have been accepted. Submit appropriate catalogue literature.

.3 Contractor shall furnish copies of final reviewed shop drawings to the doors and frames fabricators and to the door and hardware installers.

.2 Templates:

.1 The hardware specialist shall promptly furnish templates and information necessary for proper preparation of doors and frames and for the installation of hardware to the doors and frames fabricator and to the doors and hardware installer, in ample time to facilitate the progress of the work.

.3 Maintenance instructions manual

.1 Prior to Date of Substantial Performance, hand over to the Owner, a manual containing a final "as built" hardware schedule, full instructions for the adjustment, maintenance, spare part list etc. of all hardware items, together with special keys, wrenches etc. required to carry out normal adjustments to hardware.

.4 Warranty

.1 Medeco Manufacturer’s Warranty and installation of cylinders: Submit Warranty document which covers repair or replacement of defective cylinders or labour for one year after date of Substantial Completion

1.03 QUALITY ASSURANCE

.1 Have the supervision, administration and servicing of the work of this section performed by a hardware specialist certified as an Architectural Hardware Consultant (A.H.C.).

.2 Have the installation of hardware performed by a firm which specializes in this work.

.3 The hardware installer shall fully cooperate with the hardware specialist to ensure doors and hardware are properly and securely installed and that the installed doors and hardware are functioning properly to the approval of the Consultant.

1.04 INSPECTION AND SUPERVISION

.1 The hardware specialist shall examine the drawings, Hardware Schedules and shop drawings to determine final dimensions, sizes and quantity of the hardware items required, ensure that the hardware listed shall fit and operate properly and make adjustments to the hardware at no extra cost to the Owner.

.2 The hardware specialist shall obtain and examine shop drawings for doors and frames to ensure proper provisions and preparations for hardware are made.

.3 The hardware specialist shall make periodic inspections of the hardware and door installations, report improper and unsatisfactory conditions and expedite the replacement or correction of faulty hardware.

.4 The hardware specialist and the door and hardware installer shall attend job site meetings when so requested.

1.05 DELIVERY AND STORAGE

.1 Deliver and store each hardware item in the manufacturers' original containers. The containers shall be clearly labeled as to content and door on which the hardware is to be installed in accordance with the shop drawing schedule of hardware.

.2 Store finish hardware in locked, clean and dry area.

.3 The hardware specialist shall be responsible for ensuring the timely delivery of hardware so that all on site work progresses without delay and interruptions.

1.06 EXTENDED WARRANTY

.1 Fully warranty locksets and latchsets for a period of three (3) years from the date of Substantial Performance of the Project.

.2 The warranty shall state expressly that all hardware will be replaced on the doors and frames at no cost to the Owner in the event of breakage or other defect occurring, willful damage excluded.

PART 2: PRODUCTS

2.01 MATERIALS

.1 Hardware - General:

.1 Hardware shall be as specified herein and as specified on the drawings.

.2 All hardware shall be by Schlage or approved alternative and accept Medeco cores.

.3 Installed hardware shall comply with applicable fire and building codes and requirements of local authorities having jurisdiction over doors and hardware.

.4 All hardware applied to metal doors and frames shall be made to template.

.5 All hardware shall be supplied complete with all necessary screws, bolts and other fastening of suitable size and type to anchor the hardware in position

neatly and properly in accordance with the best practices and to the Consultant's approval.

.6 All fastenings shall harmonize with the hardware as to materials and finishes.

.7 Use one manufacturer's products only for all similar items.

.2 **Hinges**: To ANSI/BHMA A156.1, ball bearing, 115 mm high, button tip, non rising pins, standard weight, steel.

.1 Provide minimum 2 pair butts for doors 2135 mm in height; 3 pair butts for over sized doors.

.2 Where specified, provide and install hinges with non-removable pins or with safety stud feature to prevent doors being removed from frames even if pins are removed.

.3 Stamp hinge catalogue numbers on face of leaf of each hinge at factory to enable easy recognition of hinge material and manufacture after doors are hung.

.3 **Locks and Latches** (bored): To ANSI/BHMA A156.2 Series 4000, Grade 2, designed for function and keyed as stated in Schedule, 70 mm backset, latch bolt throw 19 mm, knobs of plain round design, escutcheons, finished to satin chrome.

.1 Latch bolt: To ANSI/BHMA A156.5.

.2 Provide and install all locks and latches exactly as specification complete with cylinders. Contractor to supply and install new “Medeco” lock core, at retail turnover, by a bondable locksmith (date TBC with LCBO).

.1 Scope includes: All lockable millwork cabinets complete with lock cylinder/core/trim rings, sliding door locks, all folding security grille locks, office door lock, THC unit lock(s) where applicable, loss-prevention cage pad-lock.

.3 Strikes shall be box type, with lip projection not beyond jamb ASA dimensions. Strikes shall be ASA standard size with curved lip strikes for latch bolts and no lip strikes for dead locks. Provide complete with wrought boxes finished to match strike.

.1 Universal washroom to receive fail-safe electric strike complete with latch bolt monitor and be operable by “OP” key, refer to Scope listed in Keying below.

.1 Lever on approach side of door to be disconnected from bolt.

.2 Lever on washroom side to engage/disengage latch bolt.

.4 All locks installed on labeled fire doors and frames shall bear the ULC label.

.4 **Keying**:

.1 All new lock cores and keys to be Medeco for installation in deadlocks provided with special doors as listed in hardware schedule. Key into keying system as directed.

.2 One key to operate all locks to gain access to LCBO premises from outside (vestibule, sliding doors and folding grille). Locksmith shall engrave the key with “ENT” for *entrance*.

.3 A separate key operates all other items not including vestibule sliding doors and folding grille, refer to Scope listed in Locks and Latches above. Locksmith shall engrave the key "OP" for *operations*.

.4 Provide 5 engraved copies of each of these two keys (10 keys in total).

.5 Stamp all keys "DO NOT DUPLICATE".

.5 **Keypad Locks**: Provide keypad locks at offices "L1076 M" by Kaba Ilco, "CO-100 Standalone Electronic Lock" by Schlage or approved alternative.

.6 **Multiple Point Panic Exit Lock**:

.1 Emergency exit security deadlock shall be surface mounted 4-point spider l lock system complete with pull handle as manufactured by Detex Corporation. See template for installation scope.

.2 G.C to adjust the door closer force to ensure that the 4-point bolts fully engage in latches upon closing.

.7 **Stops**: to ANSI/BHMA A156.16.

.1 Supply and install floor stops exactly as specified in brushed chrome finish. Cast zinc stops are not acceptable.

.2 Supply and install wall bumpers equal in design to the type specified. Other designs of wall bumpers are not acceptable.

.1 Wall type bumper: convex pad, no visible fasteners, type L42101, finish 688

.2 Wall type bumper: concave pad, no visible fasteners, type L42251, finish 688.

.3 Wall stops shall not be installed on gypsum board partitions.

.4 Floor stops shall be installed so as not to create a tripping hazard.

.8 **Door Sweeps**:

.1 Automatic.

.9 **Pushplates and Kickplates**: To ANSI/BHMA A156.6, Type J106 metal aluminium bevelled edges, square corners, width less 16 mm on push side of door and 25 mm on pull side of door than width of door x 150 mm high.

.1 Brushed chrome finish, 1.2 mm (18 ga.) thick, from same manufacturer with self tapping, oval head screws at maximum 150 mm o.c. around perimeter of plates.

.10 **Door closers**: To ANSI/BHMA A156.4, surface mounted, parallel arm, modern type closer with cover, size as per recommended door size listed in standard, with back checking action, equipped with hold-open arm when specified, and equipped with arms or brackets where required.

.11 **Bi-passing sliding door hardware**: to ANSI/BHMA A156.14, Type D8731, 54 kg capacity without valance.

.12 **Exit devices**: To ANSI/BHMA A156.3, flat, full width, rim type, modern-style touch bar design with removable cover plates concealing mechanism and fasteners. Cover aluminum, colour selected by LCBO. Inside key locks or unlocks knob or lever. Outside key retracts latch.

.13 **Pocket sliding door hardware**: To suit size and weight of door.

.14 **Padlock**: Heavy duty "Protector II" padlock or alternate, as manufactured by Medeco Canada. Keyed to "Operations" key. Supplied and installed by general contractor.

2.02 FASTENINGS

.1 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.

.2 Exposed fastening devices to match finish of hardware.

.3 Use fasteners compatible with material through which they pass.

2.03 SPECIAL TOOLS

.1 Supply two sets of wrenches for door closers, locksets and fire exit hardware.

PART 3: EXECUTION

3.01 INSTALLATION

.1 Furnish wood door installer and metal door and frame manufacturers with manufacturers' instructions for proper installation of each hardware component and templates for preparation of their work to receive hardware. Hardware to be installed in accordance with templates and manufacturer's instructions.

.2 Hardware locations for wood doors: In accordance with DHI Recommended Locations for Architectural Hardware for Wood Doors.

.3 Hardware locations for steel doors: In accordance with DHI Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames.

.4 Provide even margins between doors and jambs and doors and flooring and, or thresholds as follows:

.1 Hinge side: 1.5 mm.

.2 Latchside and head: 1.5 mm.

.3 Flooring and/or thresholds: 12 mm.

.5 Adjust operable parts for correct function.

3.02 HARDWARE SCHEDULE

.1 Refer hardware schedule attached hereto.

3.03 CONTRACT CLOSEOUT

.1 Lock and Key changes: at the completion of the contract, all key pad locks installed, shall be changed from factory preset codes to a new code as selected by the Store Manager. Coordinate with Consultant.

END OF SECTION

1.01 DESCRIPTION

.1 The following is the Hardware Package for this project.

.2 Refer to Section 08 70 00 – Hardware, item 2.01.3 – Locks and Latches, for keying information.

.3 Refer to Section 08 71 15 and Section 26 24 13 for Universal Washroom hardware

1.02 HARDWARE LIST

.1 Retail Area to Office (D103):

3	HINGES	CB179 4 ½ x 4	C26D
1	DOOR CLOSER	1461 REG	689
1	KEYPAD LOCK (W/ KEY OVER-RIDE)	*Kaba Ilco L1076 M*	C26D
	Or (to be approved by LCBO)	*SchlageCO-100*	C26D
1	FLOOR STOP	CBH 103	C26D
1	KICKPLATE	CBH 903 T304 8 x 34.5	C32D

.2 Warehouse to Universal Washroom (D107):

3	HINGES	CB179 4 ½ x 4	C26D
1	STORE ROOM SET	AL80PD (NEP OR EQUAL)	626
1	KICKPLATE	CBH 903 T304 8 x 34.5	C32D
1	FLOOR STOP	CBH 103	C26D
1	COAT HOOK	CBH 60	C26D
1	ELECTRIC STRIKE	CX-ED2079 GRADE 2 UNIVERSAL (REFERENCE & COORDINATE WITH ELECTRICAL DRAWINGS)	
1	DOOR OPERATOR	REFER TO SECTION 08 71 15 (REFERENCE & COORDINATE WITH ELECTRICAL DRAWINGS)	
1	SIGN (***Universal Washroom***)	PICTO MALE & PICTO FEMALE & BARRIER FREE 6 x 6	BLK SLV

.3 Warehouse to Unisex Washroom (D106):

3	HINGES	CB179 4 ½ x 4	C26D
1	PRIVACY SET	AL40S NEP	626
1	KICKPLATE	CBH 903 T304 8 x 34.5	C32D
1	FLOOR STOP	CBH 103	C26D
1	COAT HOOK	CBH 60	C26D
1	SIGN (***Unisex Washroom***)	PICTO MALE & PICTO FEMALE 6 x 6	BLK SLV

.4 Warehouse to Janitor Room (D105):

3	HINGES	CB179 4 ½ x 4	C26D
1	PASSAGE SET	AL10S NEP	626
1	DOOR CLOSER	1461 REG	626

	1	KICKPLATE	CBH 903 T304 8 x 34.5	C32D
	1	FLOOR STOP	CBH 103	C26D
	1	SIGN..	(KEEP DOOR CLOSED AT ALL TIMES)	BLK SLV
.5	Warehouse to Staff Room (D108):			
	3	HINGES	CB179 4 ½ x 4	C26D
	1	PASSAGE SET	AL10S NEP	626
	1	KICKPLATE	CBH 903 T304 8 x 34.5	C32D
	1	FLOOR STOP	CBH 103	C26D
.6	Warehouse to Exterior (D110):			
	1	4-POINT PANIC DEVICE (c/w integral audible alarm. Lock to be prepared to receive Medeco cylinder).	Detex Corporation ECL-230X-TDB-DX2-IP-84-SN1 ECL-230X = EXIT CONROL LOCK TDB = TOP BOLT, DEAD BOLT AND BOTTOM BOLT. DX2 = TWO ADDITIONAL HINGE BOLT FOR 4 POINT LOCKING IP = INSIDE PULL 84 = DOOR HEIGHT SN1 = SEX NUTS FOR ADDED SECURITY. ENG = ENGLISH SIGN.	
	1	D-PULL (INSTALLED ON INTERIOR, COORDINATE W/ 4-POINT PANIC HARDWARE)	CBH 9018 SATIN STAINLESS, or approved alternate	
.7	Retail to Warehouse (D109):			
	3	HINGES	CB1960 4 ½ x 4 NRP	C32D
	1	DOOR CLOSER	4041 H-CUSH W/ HOLD OPEN	626
	1	PUSH BAR	VON DUPRIN	
	1	KICKPLATE	CBH 903 T304 8 x 34.5	C32D

*Note: G.C to adjust the door closer force to ensure that the 3-point bolts fully engage in latches upon closing.

*Notes:

1. Landlord to provide a standard panic bar (Von Duprin or approved alternate) to exterior door(s) at base building turnover to the LCBO. The 3-point exit lock(s) shall be supplied and installed by Detex Corporation payable by the LCBO contractor at store turnover to retail operations, contractor to confirm with LCBO Project

Coordinator for exact date. Contractor is responsible for the removal of the landlord's hardware and touch up of door as required (filling unused holes, sanding, priming, and painting).

2. G.C to adjust the door closer force to ensure that the 3-point bolts fully engage in latches upon closing.

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 ANSI/BHMA A156.19-90, Power Assist and Low-Energy Power-Operated Doors.

.2 Refer to Section 26 24 13 – Electrical Service

1.02 SUBMITTALS

.1 Product data:

.1 Submit manufacturer's product data and standard details for power-assisted swing doors, including:

.1 Fabrication, finishing, hardware, operators, accessories and other components of the work.

.2 Rough-in diagrams, wiring diagrams, parts lists and maintenance instructions, as well as certified test data, where required.

.2 Templates and diagrams:

.1 Furnish templates, diagrams and other data to fabricators and installers of related work as needed for coordination of power-assisted swing door operator installation.

.3 Shop drawings:

.1 Submit shop drawings for the fabrication and installation of power-assisted swing door operators and associated components of the work submitted to the LCBO Design Co-ordinator for approval.

.2 Indicate anchors, joint system, expansion provisions, hardware and other components not included in manufacturers standard data.

1.03 QUALITY ASSURANCE

.1 Manufacturer's qualifications: Provide units produced by a firm with not less than five years successful experience in the fabrication of power-assisted swing door operators of the type required for this project.

.2 Installer's qualifications: Engage an installer who is an authorized representative of the power-assisted swing door operator manufacturer for both the installation and maintenance of the type of units required for this project, and who has AAADM certification.

1.04 WARRANTY

.1 Units to be warranted against defect in material and workmanship for a period of two years from the date of acceptance.

.2 The supplier/seller shall provide for the duration of the warranty and extended warranty periods any and all of the prescribed maintenance to any and all of the supplied components which might limit the term or otherwise invalidate the warranty.

PART 2: PRODUCT

2.01 ACCEPTABLE PRODUCTS AND MANUFACTURERS

.1 Besam Canada Inc.: Swingmaster MP/405 OHC.
.2 Door-O-Matic: Benchmark.
.3 Gyro Tech: GT 500 Series.
.4 Entrematic: HA-8 with 09720 Controller.
.5 Horton Automatics: Series 7100.
.6 Stanley Access Technologies: 2000 Series.
.7 Or approved alternate.

2.02 OPERATOR

.1 Electric Operating Mechanism shall be self-contained electromechanical construction.
.2 The operator shall be shock mounted and concealed in an extruded aluminum case 114 mm x 150 mm bottom access or 150 mm x 150 mm side access header cover.
.3 The operator shall be readily convertible to any hand required. Opening force shall be accomplished by a D.C. permanent magnet motor working through reduction gears to the output shaft.
.4 Gear train bearings shall be sealed ball bearing types.
.5 Closing force shall be supplied by a field replaceable spring (four independent coil springs separated by Teflon discs and enclosed in an external spring box).
.6 Close speed control shall be accomplished by dynamic braking of the motor and shall be fully adjustable.
.7 Operator to act as a manual closer when power is off or when the master control unit is removed. An On/Off reset switch shall be supplied. The control circuit to the actuating switches shall be 24 VDC, Class II Circuit. A locked door motor protection circuit will be supplied that will shut off current to the motor if it is applied when the door is inadvertently locked or otherwise prevented from opening. Power to the motor is restored when the On/Off reset switch is turned back on. Manual door operation requires less than 12 lbs. of force applied to door stile.
.8 Mounting Option:
  .1 The operator shall be mounted to the surface of the existing door frame or wall and be concealed in a 150 mm x 150 mm aluminum cover.
  .2 Connecting hardware shall be a double arm arrangement that can either push the door or pull the door open to suit the job condition. When the operator mounting is on the pull side and an adjacent wall is within 100 mm of the door frame, specify a parallel arm.
.9 Hardware:
  .1 Door handles to match store room set AL80PD Neptune 626.

PART 3: EXECUTION

3.01 INSPECTION

.1 Assure to provide a complete and operational system with all associated items.

3.02 INSTALLATION

.1 Install, plumb, level, true-to-line and rigidly secure in openings. After applying operators and hardware, adjust to achieve smooth and quiet operation. Install in accordance with approved shop drawings.

.2 Co-ordinate this work with Section 08 11 00 for Steel Doors.

.3 Power supply to each door operator, wiring and controls shall be provided by Division 26 - Electrical. Make connections at operators and at control panel and supply and install each electrical work between operators and activating controls. Comply with requirements of Division 26 - Electrical. All wiring shall be concealed and where exposed shall be run in conduit. Location of exposed wiring shall be subject to Consultant's approval.

3.03 ADJUSTMENT AND CLEANING

.1 Remove dirt and excess sealants or compound from exposed surfaces.

.2 Test and adjust operators and controls smooth and proper operation.

.3 Upon completion of Work of this Section, remove from Site all debris, equipment and excess material resulting from Work of this Section.

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 ASTM C920, Specification for Elastomeric Joint Sealants.
.2 CAN/CGSB-12.1-M, Tempered or Laminated Safety Glass.
.3 CAN/CGSB-12.3-M, Flat, Clear Float Glass.
.4 CAN/CGSB-12.5-M, Mirrors, Silvered.
.5 CAN/CGSB-12.8, Insulating Glass Units.
.6 CAN/CGSB-12.9-M, Glass, Spandrel.
.7 CAN/CGSB-12.20-M, Structural Design of Glass for Buildings.
.8 CAN/CGSB-12.11-M, Wired Safety Glass.
.9 CAN/CGSB-19.13-M, Sealing Compound, One Compound, Elastomeric, Chemical Curing.
.10 Insulating Glass Manufacturer's Alliance (IGMA)

1.02 DESIGN REQUIREMENTS

.1 Limit glass deflection to flexural limit of glass with full recovery of glazing materials.
.2 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.
.3 Perform a thermal stress analysis on each insulating unit and provide heat strengthening units as necessary to prevent thermal breakage.
.4 Design glass to CAN/CGSB-12.20-M. Perform stress analysis. Design units to accommodate live, dead, lateral, wind, seismic, handling, transportation, and erection loads.
.5 Structural glazing:
  .1 Single Source Responsibility for Sealants, Gaskets and Other Glazing Accessories: In order to ensure consistent quality of performance, provide all glazing sealants and seals from a single manufacturer.
  .2 Preconstruction Compatibility and Adhesion Testing: Submit to sealant manufacturer, samples of each glass, gasket, glazing accessory and glass-framing member that will contact or affect glazing sealants for compatibility and adhesion testing. Schedule submission of test samples to provide sufficient time for testing and analysis of results to prevent delay in the progress of work.
.6 All glass to be Laminated, unless stated otherwise.

1.03 SUBMITTALS

.1 Shop drawings:
  .1 Submit shop drawings for fabrication and erection of glazing elements indicating materials, thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.
.2 Samples:
  .1 Submit one sample of each type of glass.
.3 Certificates:
  .1 Submit manufacturer's certification that glass and glazing materials are compatible.
.4 IGMA Compliance Audit:

.1 Submit a written certification of successful completion of a Compliance Audit within the last six months.

1.04 QUALITY ASSURANCE

.1 Insulating glass unit fabricators shall be a certified member of the Insulating Glass Manufacturer's Alliance (IGMA). IGMA members must participate in the certification program and shall have successfully passed a Compliance Audit within the last six months.

.2 Submit compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed for adhesion.

.3 Compatibility test report from manufacturer of insulating glass edge sealant, indicating that glass edge sealants were tested for compatibility with other glazing materials including sealants, setting blocks, edge blocks and any other material that contacts or can affect the edge seal.

1.05 DELIVERY, STORAGE AND HANDLING

.1 Label each piece of glass, and each container of glazing compound of sealant to indicate manufacturer, type, and quality. Leave labels on glass until final cleaning.

1.06 SITE CONDITIONS

.1 Environmental Conditions:

.1 Proceed with glazing only when glazing surfaces are accumulating no moisture from rain, mist or condensation.

.2 When temperature of glazing surfaces is below 4°C, obtain approval of glazing methods and protective measures which will be used during glazing operations.

1.07 WARRANTY

.1 Submit a warranty of the installation of insulating glass covering the period for four years beyond the expiration of the warranty period specified in the General Conditions of the Contract. Deflects in glass units shall include, but shall not be restricted to, breakage (other than by accidental cause exterior to the glazed unit after installation of the glass) and loss of seal. Fogging of glass inside sealed units will be considered sufficient evidence of loss of seal.

PART 2: PRODUCTS

2.01 MATERIALS

.1 Acceptable manufacturers: Glass shall be manufactured by AGC Glass, Guardian Industries, Okalux OSG, PPG or Viracon Inc.:

.1 Polished Plate or Float Glass: To meet specified requirements or CAN/CGSB-12.3-M, Glazing Quality.

.2 Insulating Glass Unit: To meet specified requirements of CAN/CGSB-12.8-M, with double sealed edge binding, 13 mm air space, and 6 mm thick clear glass inner and outer lites. Refer to Glazing Schedule for inner-outer (laminated-

.3 Laminated Safety Glass:

.1 Standard: CAN/CGSB-12.1-M, Category II, consisting of top layer of 3 mm thick clear float glass, 0.8 mm thick clear PVB interlayer, and bottom layer of 3 mm thick clear float glass.

.2 Sliding operator doors: CAN/CGSB-12.1-M, Type 1, Class B.; Laminated glass consisting of two 3 mm thick glass panes laminated together, laminating film thickness: 1.52 mm.

.3 Laminated glass as necessary to prevent thermal breakage.

.2 Glazing Accessories:

.1 Standard: Setting Blocks: Neoprene, of durometer hardness of Shore "A" 70 to 90.

.2 Setting Block (Structural Glazing): Silicone Setting Blocks.

.3 Rigid insulation for spandrel panel as identified in Section 07 21 00.

.4 Metal back pan as identified in Section 08 41 13.

.3 Glazing Sealants:

.1 Ensure that glazing sealants are completely compatible with insulating glass unit sealants.

.2 One Part Silicone Glazing Sealant: To meet specified requirements of CAN/CGSB-19.13-M, in glazing hardness grade.

.3 Glazing Tape: 'Visionstrip' by Tremco Ltd., extruded composite glazing, size as recommended by manufacturer.

.4 Dry Glazing: Unit manufacturer's standards as approved by Consultant.

.5 Glazing Sealant (Structural Glazing):

.1 Silicone, One Part in accordance with ASTM C920, Type S or M, Grade NS, Class 25.

.2 Structural glazing tensile bead: 'Spectrem 2 Sealant' by Tremco or 'Dow 795' by Dow Corning.

.3 Structural glazing weather bead: 'Spectrem 2 Sealant' by Tremco or 'Dow 795' by Dow Corning.

.4 Structural glazing (factory glazed): Two-part, neutral cure silicone sealant, 'Proglaze ll' by Tremco or 'Dow 983' by Dow Corning.

.5 Colour to later selection of Consultant.

.4 Ultra Violet Control Film System:

.1 Multi-layer optical film, exterior grade (exterior application).
Acceptable products:

.1 "RE35NEARXL" by 3M

.2 "NHE35" by Llumar

.2 Installation

.1 Remove existing window treatments prior to installation of UV film

.2 Apply edge sealing of film as recommended by manufacturer

.3 Sealant:
.1 Clear exterior grade silicone edge sealing as recommended by Film manufacturer.

.7 Privacy Film:
.1 One-way mirrored privacy film at Manager's Office window and/or door, and where noted on drawing:
.2 Acceptable Product: 3M Mirror Privacy Film
.3 Install in accordance with manufacturer's instructions.

PART 3: EXECUTION

3.01 INSTALLATION

.1 Provide glazing in accordance with IGMA recommendations, manufacturer's written instructions, and ensure that each material in a glazing system is compatible with the others. Provide continuous contact between glazing tapes and gasket to the glazing.
.2 Ensure that projections have been removed from rebates and that sufficient width and depth clearances are provided for specified glass.
.3 Remove stops and store during glazing to avoid damage to them.
.4 Do not set any glass without glazing beds or gaskets.
.5 Glass:
.1 Install glass in thickness to comply with Ontario Building Code requirements.
.2 Cut glass to fit openings and to allow clearances which will ensure that glass is held firmly in place and is not subjected to stresses.
.3 Ensure that glass edges are clean cut, not nipped or seamed.
.4 Replace oversize or flared lights with entirely new units or proper dimensions.
.5 Glazing Preparation and Methods: Clean glazing rebate surfaces of all traces of dirt, dust, or other contaminants.
.6 Positioning Glass: Support glass, in lights of over 2540 mm perimeter, by two setting blocks, one at each quarter point of each light.
.7 Tape Bedding at Fixed Stops: Cut tapes of full depth of stop accurately to length on a work table. Set sill and head tapes first at full length of rebated opening. Butt jamb tapes into sill and head tapes tightly to weld them together. Remove protective paper backing only when glass is ready for setting, and ensure that butted joints of tape are positively filled with applied sealant.
.8 Bedding at Stop Beads: Apply tape to removable stops as specified for fixed stops.
.9 Mirrors:
.1 Mounting height: no higher than 1000 mm. Ensure that mirror starts above the 100 mm lever handles.
.2 Provide one-piece 12 mm stainless steel channel frame with mitred corners.
.1 20 gauge stainless steel
.2 #4 Satin Chrome finish
.3 Provide backup as required to provide plumb mounting.

.10 Structural Glazing: Glaze units in accordance with reviewed shop drawings and in accordance with manufacturer's written instructions.

.6 Spandrel Glass:

.1 Security Mesh for all spandrel glass locations must be installed, affixed directly to the outside face of the metal studs and adjacent to all spandrel glass back pans, or as specified on Drawings. Overlap all Security Mesh panels minimum 75 mm all around to ensure complete perimeter protection, and weld panels at overlap to suit.

.7 Glazing Films:

.1 Install glazing films and edge sealants as recommended by manufacturer

.2 Install films in a manner such that there are bubbling and de-lamination of films does not occur.

.3 Schedule installation with LCBO Coordinator and Store Manager, and perform all installations in warm weather conditions.

3.02 ADJUSTMENT AND CLEANING

.1 Replace scratched, etched, or defective glazing resulting from manufacture, setting, handling, or storage before or during installation. Glass accidentally broken or physically damaged, by other than faulty glazing or materials, after glazing by this Section has been completed shall be replaced as specified in the General Conditions of the Contract.

.2 Remove stains, deposits, marks or blemishes caused by this Section from surfaces of all materials exposed to view. Replace materials that cannot be cleaned to appear as new.

.3 Remove excess glazing sealants from adjacent surfaces, including glass, during working life of material, and by methods not harmful to the surfaces.

.4 Collect broken glass and cuttings in boxes and remove from site.

3.03 PROTECTION

.1 Following glazing, mark each light of glass, except heat absorbing, to indicate its presence with a material, easily removable and harmless to glass.

3.04 GLAZING SCHEDULE

.1 Automatic Sliding Doors, side panels and transoms, specified in Section 08 32 00:

.1 Insulating glass units (Exterior): CAN/CGSB-12.8-M; 25 mm overall thickness. Laminated inside, laminated outside.

.2 Interior: 6mm clear laminated glass.

.3 Glazed by Section 08 32 00 in accordance with manufacturers standard methods as approved, and this section.

.2 Aluminium entrances, vestibules and doors (Walk-in Cooler), specified in Section 08 32 00:

.1 Insulating glass units (Interior): CAN/CGSB-12.8-M; 25 mm overall thickness. 6 mm thick clear tempered glass inner and outer lites.

.2 Glazed by Section 08 41 13 in accordance with manufacturer's standard method as approved, and this section.

.3 Mirrors: Provide and install all washroom mirrors throughout the project.

.4 Clear tempered glass (Interior) as shown on Drawing sheets, located at Office, complete with 3M mirror Privacy Film.

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 ASTM C475, Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

.2 ASTM C645, Specification for Non-Load Bearing (Axial) Steel Studs, Runners (Tracks), and Rigid Furring Channels for Screw Application of Gypsum Board.

.3 ASTM C754, Specification for Steel Framing Members to Receive Screw-Attached Gypsum Board.

.4 ASTM C840, Specification for Application and Finishing of Gypsum Board.

.5 ASTM C1002, Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases.

.6 ASTM C1047, Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base

.7 ASTM C1396, Specification for Gypsum Board.

.8 ASTM F1267, Standard Specification for Metal, Expanded, Steel.

1.02 DESIGN REQUIREMENTS

.1 Design ceiling suspension system in accordance with manufacturer's printed directions and ASTM C754.

.2 Design ceiling system for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority.

.3 Design hanger anchor and entire suspension system static loading not to exceed 25% of their ultimate capacity including lighting fixture dead loads.

.4 Design suspension system to support weight of mechanical and electrical items such as air handling boots and lighting fixtures, and with adequate support to allow rotation/relocation of light fixtures.

.5 Design subframing as necessary to accommodate, and to circumvent, conflicts and interferences where ducts or other equipment prevent the regular spacing of hangers.

1.03 SUBMITTALS

.1 Product Data: Submit Product Data indicating performance criteria, compliance with appropriate reference standard, characteristics and limitations.

.2 Shop Drawings: Submit engineer stamped shop and erection drawings in accordance with the requirement of Division 01 for Approval. Include engineer stamped shop drawings for metal stud walls between Retail area and Warehouse area and between Retail Area and Office. Include all necessary shop details and erection diagrams. Indicate member sizes, locations, thicknesses exclusive of coating, coatings, and material types. Include connection details for attaching framing to itself and for attachment to the structure. Indicate dimensions, openings, requirements of related work and critical installation procedures.

.3 Certifications: Submit written certification stating that suspended ceiling system is designed for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority.

PART 2: PRODUCTS

2.01 MATERIALS

.1 Standard board and Type 'X': To ASTM C1396, 13 mm, 16 mm and 19 mm thick as indicated on drawings, 1200 mm wide x maximum practical length, ends square cut, edges squared. As manufactured by CertainTeed, CGC Inc., or G-P products.

.2 Water resistant board: To ASTM C1396 treated to resist moisture, 13 mm thick, 1200 mm wide x maximum practical length. As manufactured by CertainTeed, CGC Inc., or G-P products, or approved alternate.

.3 Metal furring runners, hangers, tie wires, inserts, anchors: To ASTM C645, galvanized.

.4 Drywall furring channels: 0.5 mm (26 ga.) core thickness galvanized steel channels for screw attachment of gypsum board.

.5 Non-loadbearing channel stud framing: To ASTM C645, stud sizes and gauges as indicated, roll formed, hot dipped galvanized steel sheet, for screw attachment of gypsum board. Knock out service holes at 450 mm centres. For load bearing studs, at retrofit of an Impact Door, refer to Section 08 38 19.

.6 Floor and ceiling tracks: To ASTM C645, in widths to suit stud sizes, 32 mm flange height.

.7 Insulating strip: Rubberized, moisture resistant 6 mm thick cork or foam strip, 50 mm wide, with self sticking adhesive on one face, lengths as required.

.8 Batts (*in retail office and washroom walls*):Refer to Section 07 21 00 Building Insulation.

.9 Security mesh: Provide galvanized, expanded steel mesh with minimum weight of 4.9 kg/sq.m. (1.0 lb/sq.ft.):

- .1 AMICO – ISG Security Mesh ASM 1.5-9F by AMICO Canada.
- .2 DRAMEX Security Mesh -10F 1.5" by Dramex Expanded Metals.
- .3 Or approved alternate.

.10 Waterproof membrane: 1.5 mm thick, single-ply, self adhering, self sealing, rubberised asphalt, bonded to a cross-laminated high density polyethylene film. 'Blueskin WP 200' by Bakor Inc., 'Colphene 3000' by Soprema, or 'Mel-Rol' by W. R. Meadows, or approved alternate.

.11 Steel drill screws: To ASTM C1002.

.12 Casing beads, corner beads, control joints and edge trim: To ASTM C1047, ABS or PVC or metal, zinc-coated by hot-dip process, 0.5 mm (26 ga.) base thickness, perforated flanges, one piece length per location.

.13 Joint compound: To ASTM C475, asbestos-free.

.14 Vestibule access panel:

- .1 Acceptable Manufacturer:
  - .1 Baucoplus BP12-2424 – 610 x 610 mm door for 13mm thick drywall ceiling. For 16mm drywall, provide BP58-24x24.
  - .2 Or approved alternate.

.2 Door: Aluminium frame with gypsum board inlay and structural nylon corner elements.

.3 Frame: Recessed aluminium frame to provide edge similar to drywall bead against which ceiling can be finished.

.4 Materials:

.1 Extruded aluminium alloy 6063-T6

.2 Standard 16 mm gypsum board inlay

.3 Fibreglass reinforced nylon.

.4 Zinc-plated screws, stainless steel springs and retaining wire.

.5 Finish: Aluminium frames, gypsum board, nylon and aluminium cam latch to receive same finish and paint as surrounding surface.

.6 Hinge: Patented, concealed, two-point pin hinge, non-corroding. Allows door to open 120 degrees. Door can be removed.

.7 Latch: Flush screwdriver cam latch.

.8 Schedule: Install one BP12-24x24 access panel in Vestibule ceiling.

.15 Warehouse access panel:

.1 Steel access panel 24" x 36" – 610 x 915 mm door.

.2 Finish: Two coats alkyd enamel to match adjacent wall finish.

.3 Schedule: Install one painted steel 24" x 36" access panel, at 2400mm above finished floor, in warehouse wall to access space above beer coolers. Coordinate final location with refrigeration contractor.

PART 3: EXECUTION

3.01 ERECTION

.1 Do application and finishing of gypsum board in accordance with ASTM C840 except where specified otherwise.

.2 Install work level to tolerance of 1:1200.

.3 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles.

3.02 INSTALLATION OF FRAMING

.1 Align partition tracks at floor and ceiling and secure at 400 mm o.c. maximum.

.2 Install dampproof course under stud shoe tracks of partitions on slabs on grade.

.3 Place studs vertically at spacing indicated and not more than 50 mm from abutting walls, and at each side of openings and corners. Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.

.4 Erect metal studding to tolerance of 1:1000.

.5 Co-ordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.

.6 Co-ordinate erection of studs with installation of door and sidelight frames and special supports or anchorage for work specified in other Sections.

.7 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified. Secure studs together, 50 mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.

.8 Erect track at head of door to accommodate intermediate studs. Secure track to studs at each end, in accordance with manufacturer's instructions. Install intermediate studs above and below openings in same manner and spacing as wall studs.

.9 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.

.10 Provide blocking or furring channel secured between studs for attachment of fixtures as and where required.

.11 Install steel studs or furring channel between studs for attaching electrical and other boxes.

.12 Maintain clearance under steel deck to avoid transmission of structural loads to studs. Use extended leg ceiling tracks or double track slip joint.

.13 Install continuous insulating strips to isolate studs from uninsulated surfaces.

3.03 INSTALLATION OF SECURITY MESH

.1 Do not commence installation until structural steel stud installation is approved by Structural Engineer or Consultant to be capable of supporting all design loads and weight of Security Mesh system.

.2 Security Mesh for exterior walls must be installed, affixed directly to the outside face of the metal studs at all perimeter walls of LCBO Stores with EIFS cladding, hardie plank lap siding and/or metal siding from top of masonry base to parapet, or as specified on Drawings. Overlap all Security Mesh panels minimum 75 mm all around to ensure complete perimeter protection, and weld panels at overlap to suit. On exterior walls that are constructed of solid reinforced masonry, Security Mesh is not required.

.3 Security Mesh for interior demising walls must be installed, affixed directly to the inside face of the metal studs of all demising walls of an LCBO Store, from finished floor level tight to underside of deck, or as specified in the Drawings. Butt all Security Mesh panels all around to ensure complete adjacency protection, and tie panels at butt connections. Ensure that all Security Mesh is completely covered with drywall to conceal its presence after installation, including above tenant ceilings. On demising walls that are constructed of solid reinforced masonry, Security Mesh is not required.

.4 Reserved.

.5 Methods of cutting: 250 mm hand held circular saw with abrasive blade, cutting torch, or heavy duty high speed nibbler shear.

.6 Methods of securing:

.1 Manufacturers recommended security clips and compatible screws.

.2 Welding to steel studs and tracks: Weld with 3 mm x 12 mm fillet welded to steel studs – 1.2 mm (18 ga.) or heavier, not over 200 mm o.c. Edge welds must be within 50 mm of edge.

.3 Waffer head type self drilling screws with at least a – 8 shank, long enough to penetrate through steel supports at least 10 mm or wood supports at least 6 mm for 1.2 mm (18 ga.) or heavier, sharp point for 0.9 mm (20 ga.) or lighter.

.4 One way fasteners screws long enough to penetrate through steel supports at least 10 mm or wood supports at least 35 mm.

.7 End joints must be butted and occur over studs. Side joints must be butted and wire tied at mid-point between supports. For maximum strength and ease of installation, LWD of sheet should be placed horizontally, perpendicular to the framing members.

3.04 INSTALLATION OF GYPSUM BOARD

.1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm oc.

.2 Install all furring and runner channels radius to suit ceilings shown on reflected ceiling plan. Construct bulkheads and maintain curvatures as shown on the drawings.

.3 Do not apply gypsum board until bucks, anchors, blocking, electrical and mechanical work are approved.

.4 Apply single layer gypsum board to metal furring or framing using screw fasteners. Maximum spacing of screws 300 mm oc.

.5 Apply water resistant gypsum board where wall tiles to be applied and at core area. Apply water-resistant sealant to edges, ends, cut-outs which expose gypsum core and to fastener heads. Do not apply joint treatment on areas to receive tile finish.

.6 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated.

.7 Control Joints:

.1 Construct control joints of two back-to-back casing beads set in gypsum board facing and supported independently on both sides of joint. Provide continuous dust barrier.

.2 Install control joints straight and true.

.3 Install control joints at 9000mm maximum spacing in continuous runs.

.4 Install control joints at steps in walls and bulkheads, at areas of anticipated deflection, twist, creep and sway, and at walls subject to vibration.

.8 Construct expansion joints at building expansion joints.

.9 Install access doors to electrical and mechanical fixtures specified in respective Sections, and as required for concealed mechanical and electrical installation.

.10 Rigidly secure frames to furring or framing systems.

.11 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.

.12 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.

.13 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.

.14 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.

.15 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.

.16 Ensure all areas receiving wall coverings are completely smooth and free of any imperfections that may telegraph through the wall covering, or adversely affect the adhesion of the wall covering.

3.05 JANITOR ROOM CONSTRUCTION

.1 Wrap waterproof membrane under stud and track and up wall to protect steel from corrosion from incidental water exposure.

.2 Install cement board around perimeter of room from floor to ceiling.

.3 Ensure flush transition between any board thicknesses which vary.

3.06 REPAIR

1. Make good cut-outs for services and other work, fill in defective joints, holes and other depressions with joint compound.
2. Make good defective work, and ensure that surfaces are smooth, evenly textured and within specified tolerances to receive finish treatments.

END OF SECTION

PART 1 GENERAL

1.01 REFERENCES

.1 ANSI A108/A118/A136.1, Installation of Ceramic Tile.

.2 TTMAC Specification Guide 09300 Tile Installation Manual.

1.02 SUBMITTALS

.1 Materials data: Submit manufacturer's technical information and installation instructions for all specified materials.

.2 Prior to commencing the work, submit for approval four (4) representative tile samples of each type, finish and colour mounted on a 12.7 mm exterior grade plywood using the specified mortar and grouted with the specified grout. These samples shall be of current production, properly identified, clean and representative of the appearance of the finished work.

1.03 QUALITY ASSURANCE

.1 Provide tile, grout and setting materials from one source. Additives, dry-set mortars, installation materials and grouts shall be from the same manufacturer.

.2 Recommended installers:

.1 **Adlers Main Tile + Carpet Co. Ltd.**
Contact name: Mitchell Abrams
4005 Chesswood Drive, Toronto, Ontario M3J 2R8
Office (905) 738-4995
Cell (416) 721-5320
Fax (416) 398-9477
Email: mitch@adlersmaintile.com

.2 **Champion Flooring Limited**
Contact name: Steve Gillard
6600 Goreway Drive, Unit A, Mississauga, Ontario L4V 1S6
Office (905) 673-5899
Cell (416) 708-8649
Fax (905) 673-8488
Email: steve@championflooring.ca

.3 **Europro Tile & Marble**
Contact name: Xhezmi Zendeli
42 Woodland Trail Court, Woodbridge, Ontario L4L 9H9
Office/Cell (416) 333-8802
Fax (905) 856-6544
Email: info@europrotile.com

.4 **AddaiWEST Flooring Inc.**
Contact name: Michael Addai
5484 Tomken Road, Unit 29, Mississauga, Onatrio, L4W 2Z6
Office (905) 824-WEST (9378),

Cell (416) 833-7222
Fax (905) 824-9377
Email: michael@addaiwestflooring.com

1.04 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle tiles in a manner to avoid chipping, breakage or any other damage.

.2 Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Prevent damage or contamination to materials by water, moisture, freezing, excessive heat, foreign matter or other causes. Do not stir any frozen material until it has completely thawed.

.3 Provide heated and dry storage facilities on site.

.4 Deliver and store all materials on site at least 24 hours before work begins.

1.05 ENVIRONMENTAL CONDITIONS

.1 Maintain environmental conditions and protect work during and after installation. Comply with trade standards and manufacturer's printed recommendations.

.2 Turn off all forced ventilation and radiant heating systems and protect the work against drafts during installation and for at least 72 hours after completion.

.3 Supply temporary heaters where necessary to maintain an adequate temperature level in the working environment.

.4 Vent temporary heaters to exterior to prevent damage to tilework from carbon dioxide build-up.

.5 Maintain temperatures at not less than 10°C or not more than 35°C in tiled areas during installation and for 7 days after completion, unless higher temperatures are required by ANSI A108/A118/A136.1 installation standards or manufacturer's written instructions.

1.06 EXTRA MATERIAL

.1 Provide 1 box of each type of tile required for this project for maintenance use, as specified in Section 01 33 00.

.2 Extra materials to be from same production run as installed materials.

.3 Clearly identify each container of floor tile and each container of adhesive.

.4 Replace up to 25 cracked tiles due to settlement/shrinkage of concrete floor slabs during the warranty period. Replacement tiles, during the warranty period, to be new material supplied by the Contractor, separate from the extra material provided to the LCBO.

.5 Deliver to Owner, upon completion of the work of this section.

.6 Store where directed by Owner.

1.07 WARRANTY

.1 Warrant Work of this section against defects and deficiencies for a period of 2 years from date Work is certified as substantially performed in accordance with the general conditions of the Contract.

.2 Promptly make good defects and deficiencies which become apparent within the Warranty Period by replacing defective Work satisfactory to the Consultant and at no expense to the Owner.

.3 Defects shall include but not limited to loss of bond, loosening, cracking, splitting, warping and deformations.

PART 2: PRODUCTS

2.01 MATERIALS

.1 Porcelain Tile and Ceramic Tile:
- .1 Refer to Drawings for layout, size and type.
- .2 Refer to Finish Schedule for type of tile.

.2 Mortar: Flextile 53 Mortar with 44 additive or approved alternative.

.3 Drywall Latex Primer: Planicrete AC, as manufactured by MAPEI, or equivalent.

.4 Grout: For selection of one of the following grouts refer to Flooring Finishes Plan and Finishes Schedule.
- .1 Polymer Modified Tile Grout (500 series for wall, 600 series for floor): Portland cement based commercial tile grout conforming to ANSI A108/A118/A136.1, as manufactured by Flextile Ltd, or approved alternate.
- .2 Flextile 650: ANSI A 118.7, material shall be non-toxic, low odour, water cleanable and stain resistant. Colour as per floor finish plan/schedule.

.5 Grout residue removal: Ceramiclean by Stone Care International, Inc, or approved alternate. Follow tile manufacturer's recommended acid-wash cleaning process.

.6 Transition Strip:
- .1 For use at impact doors (warehouse to retail):
  - .1 6" Pemko Profile 259A
  - .2 Mill finish aluminium
  - .3 Use mitred transitions when changing directions and Tapcon screws, sized and coloured to suit transition strip, at corners to prevent lifting unless approved otherwise.
  - .4 Refer to Architectural drawings for further information.
- .2 For all other locations:
  - .1 Schluter Reno-Ramp, product # AERP 125 B90.
  - .2 Anodized aluminium.
- .3 Adhesive: Dry-set mortar

.7 Aluminum Tile Base Trim: Schluter "Schiene AE100", or approved alternative, in longest lengths possible at exposed edges of base tiles within retail area. Use mitred transitions when changing directions and at all corners. Refer to Architectural drawaings

.8 Exterior Trim: Refer to Architectural drawings.

.9 Grout haze remover: Type as recommended by floor tile manufacturer and approved by Consultant.

.10 Crack-isolation Membrane:

.1 For use on existing floor slabs where conditions require a decoupling membrane for the finished floor tile.

.1 Schluter DITRA, or approved alternate.

2.02 MIXING

.1 Use clean mixing containers.

.2 Use a low speed mixer (approximately 150 rpm).

.3 Mix all installation materials in strict accordance with the manufacturer's mixing instructions.

PART 3: EXECUTION

3.01 EXAMINATION

.1 Before work commences, examine the areas to be covered and report any flaw or adverse condition in writing to the General Contractor and the Owner. Do not proceed with the tilework until surfaces and conditions comply with the requirements indicated in the manufacturer's instructions and in ANSI A108/A118/A136.1. For more details, refer to the TTMAC Handbook for Ceramic Tile Installation.

.2 Ensure substrates are structurally sound, level and plumb, within the tolerances set out in CAN/CSA-23.1/A23.2 from finished floor levels of the surface, or better.

.3 Review existing conditions prior to commencement of work. Leveling of floors requiring floor tolerances greater than those provided, shall be completed by the Contractor. Arrange for site visit with LCBO Project Coordinator.

.1 Provide a crack-isolation membrane to separate existing substrate from finished floor tile.

.4 Concrete floor slab tolerance will be at a minimum FF=25 & FL=20. Given the existing floor slab flatness, Floor Tiling Contractor is responsible for installation of specified tiles in a flat, level and true fashion, ensuring an even and consistent floor finish free of lippage, unevenness and trip hazards. Tiled areas with floor drains shall have a minimum 2% slope to drain. Floor Tiling Contractor to demonstrate correct slope and drainage with LCBO Project Coordinator after tile work is complete.

3.02 SURFACE PREPARATION

.1 All supporting surfaces shall be structurally sound, solid, stable, level, plumb and true to a tolerance in plane as specified in Section 03 30 00. They shall be dry, clean and free of dust, oil, grease, paint, tar, wax, curing agent, primer, sealer, form release agent or any deleterious substance and debris which may prevent or reduce adhesion.

.2 Mechanically sand and scarify the substrate to completely remove all paint, loosely bonded topping, loose particles and construction debris.

.3 Neutralize any trace of strong acid or alkali from the substrate prior to the application of the mortar.

.4 Concrete Surfaces:

.1 Install gauging strips.

.2 Brush apply a latex slurry bond coat (Drywall Primer and Portland Cement).

.3 While the slurry coat is wet, spread the mortar mix, minimum 16 mm, (1 part Portland Cement, 5 parts sand, water) onto the floor surface. Work the mortar mixture with a steel trowel to promote a secure mechanical bond.

.4 Finish the surface with a steel trowel, light broom finish.

.5 Install polyethylene sheets on top of mortar bed for 14 days of "wet cure" prior to setting porcelain tile.

.5 Plaster: Prime all plaster wall surfaces with drywall primer multi-purpose latex and let dry completely before applying the mortar.

.6 Temporarily plug floor drains during construction procedures. Remove plugs during final cleanup work and demonstrate free and clear operation of each drain. Replace any damaged grates. Do not dispose of any mortar or grout down the drains.

.7 Contractor to to chip out any coverings or obstructions in drains and clean-outs before commencing installation of tile. Commencement of installation indicates acceptance of existing conditions. Rejected work, as deemed by the LCBO Project Coordinator shall be made good at the no additional cost to the LCBO.

3.03 INSTALLATION

.1 GC to be responsible for ensuring that all Floor Outlet Boxes, Foot Grille Frames and other in-floor items are raised or lowered, as necessary, to be flush with the surrounding floor tile.

.1 Floor tile to be flush with existing sidelite thresholds at all automatic sliding doors. Tile installer to coordinate with GC as required, ensure that tile is level and will not impede nor be damaged by breakaway door operation.

.2 Using a slightly damp towel, wipe the backside of the tile to remove any dust or other residue that may be left over from the manufacturing process.

.3 When universal dry-set mortar and fast-curing latex hydraulic installation is specified, use a notch trowel with deep enough grooves to promote an 80% minimum mortar contact with the back side of the tile for interior installations. In all areas, back-butter each piece with fresh mortar using the flat edge of the trowel and apply tiles immediately while both mortar surfaces are wet to obtain a 100% mortar contact and a void-free installation.

.4 Install tiles according to the manufacturer's strict recommendations as to the particulars of the mortar system and following the general outline procedure set forth in ANSI A108/A118/A136.1.

.5 On interior floors and walls, install tiles leaving a regular even spacing between tiles. No butt joints shall be permitted.

3.04 GROUTING

.1 Except where tiles are installed with the fast-curing latex hydraulic mortar, grout no sooner than 24 hours after installation.

.2 Where tiles are installed with the fast-curing hydraulic mortar, grout no sooner than 3 hours after installation.

.3 Prepare surface of tiles for easier grout release by damp wipe with clean water.

.4 Mix tile grout with water only. Do not mix with any grout additive.

.5 Use grout only on surfaces which are maintained at a temperature above 10 °C during application and for at least 72 hours after application.

.6 Install all sanded commercial tile grouts in strict accordance with the grout manufacturer's instructions and following the general outline procedure of ANSI A108/A118/A136.1 for latex Portland cement grouts. Ensure that all grout is removed with an appropriate haze remover.

.7 Clean tiles completely leaving no apparent cement laitance film on the surface of the tile. Do Not Acid Wash, especially where coloured grouts are used. Grout residue remover with #M Scotchbright scrubs can be used. Rinse 3 to 4 times with clean water.

.8 Ensure that transition strip profile is solidly embedded in the setting material and that all cavities are filled to prevent the collection of moisture.

3.05 PROTECTION

.1 Universal dry-set mortar installation:

- .1 Protect finished tilework against weather, and complete water immersion for at least 21 days after completion of the work.
- .2 Floors: Protect floor from foot traffic with boards for at least 24 hours and general traffic for at least 72 hours after installation. Prohibit heavy traffic on floors for at least 7 days after installation.
- .3 Walls: Protect walls from impact, vibration and hammering on adjacent and opposite walls for at least 14 days after installation.

.2 Since temperature and humidity during and after installation affect the final curing time of all cement-based and epoxy materials, allow for extended periods of cure and protection when temperatures drop below 15°C and/or when the relative humidity is higher than 70%.

3.06 CLEANING

.1 Remove all construction debris from the floor.

.2 Grout residues must be removed immediately after completion of installation with approved haze remover.

.3 Special cleaning to remove grout or product residue: Surface should be cleaned with a sulfamic or phosphoric mild acid-based detergent and rinsed with clean water if a light film of grout is still apparent. Follow tile manufacturer’s recommended acid-wash cleaning process.

.4 It is recommended to wait until the grout is fully cured, (usually 14 days), before performing the acid wash.

.5 Acid washed surface must be rinsed and neutralized using a clean water rinse and grout residue remover.

.6 Remove mortar or grout residue from all visible surfaces of transition strips. Oxidation films on strips may be removed with common polishing agents, but no abrasive cleaning agents should be used.

.7 Ensure mortar and grout residues are not disposed of through floor drains.

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 ASTM C636, Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.

1.02 DESIGN REQUIREMENTS

.1 Design ceiling suspension systems in accordance with ASTM C636 and manufacturer's printed directions.

.2 Design tile ceiling system for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority. Acoustic panel system is not designed to carry the weight of electrical equipment.

.3 Design hanger anchor and entire suspension system static loading not to exceed 25% of their ultimate capacity including lighting fixture dead loads.

.4 Design tile suspension system to support weight of mechanical and electrical items such as air handling boots and lighting fixtures, and with adequate support to allow rotation/relocation of light fixtures. Acoustic panel system is not designed to carry the weight of mechanical and electrical equipment.

.5 Design subframing as necessary to accommodate, to avoid conflicts and interferences where ducts or equipment prevent regular spacing of hangers.

1.03 SUBMITTALS

.1 Samples: Submit two samples of each specified acoustical board and exposed grid material.

.2 Affidavits: Submit two copies of affidavits to verify that ceiling meets fire protective requirements where required.

1.04 QUALITY ASSURANCE

.1 Subcontractor Qualifications:

.1 Install acoustical ceilings specified in this Section only by a Subcontractor who has adequate equipment and skilled mechanics to perform it expeditiously, and is known to have been responsible for satisfactory installations similar to that specified during a period of at least five years.

.2 Ensure that mechanics have full knowledge of specified systems and requirements of jurisdictional authorities.

.2 Requirements of Regulatory Agencies:

.1 Install only materials specified in Finish Schedule.

.2 Install ceilings that serve as fire protective membranes exactly as specified in Underwriters' Laboratories test design specification that validates specified rating. Verify, before installation of ceiling, that installations specified in other Sections, as a part of the entire assembly, are installed to meet validating specification for a ceiling-floor or a ceiling-roof assembly, whichever is applicable.

1.05 DELIVERY, STORAGE AND HANDLING

.1 Deliver finish materials in unopened packaging provided by manufacturer.

.2 Store materials in protected dry area.

.3 Ensure that finish metal members are not bent, dented, or otherwise deformed.

1.06 SITE CONDITIONS

.1 Install acoustical ceilings only in areas closed and protected against weather, and maintained at no less than 10 deg.C.

.2 Do not install acoustical ceilings in any area unless satisfied that construction in place has dried out, and that no further installation of damp materials is contemplated.

1.07 MAINTENANCE MATERIALS

.1 Provide two sealed cartons of each specified acoustical board for Owner's use.

PART 2: PRODUCTS

2.01 MATERIALS

.1 Accessories: Fabricate miscellaneous clips, splicers, connectors, screws, and other standard accessories of steel, zinc coated or cadmium plated, of strength and design compatible with suspension methods and system specified. Include special accessories required to provide a complete assembly of acoustical ceilings.

.2 Hangers: Galvanized annealed steel wire:

.1 2.6 mm (12 ga.) to support a maximum weight of 150 pounds per hanger

.2 3.8 mm (9 ga.) to support a maximum weight of 310 pounds per hanger.

.3 Galvanized annealed steel rod: 4.8 mm diameter to support a maximum weight of 500 pounds per hanger.

.3 Hanger Anchoring Devices: Phillips Red Head by Phillips Drill Company of Canada Limited, or approved alternate:

.1 WS-3822 wedge anchor with tie wire insert for use in composite concrete and steel deck.

.2 SDI-3822 for use in steel floor deck, with screw eye bolts to suit inserts.

.4 Exposed Tee Ceiling Grid System:

.1 Two directional, size as per drawings.

.2 Main Beams: 0.5 mm steel, bulb tees.

.3 Cross tees: 0.5 mm steel, with tongues to interlock with main beams.

.4 Wall Moulding: Angle section to match tees.

.5 Finish: Factory applied finish. Refer to Finish Schedule.

.6 Manufacturer: CGC Limited, Armstrong, or Certainteed.

.5 Acoustical Units:

.1 Acoustical units shall match submitted samples with no perceptible visual variations within a building area. Fabricate edges uniformly and true to fit suspension system, and to maintain true lines and surface planes.

.2 All locations shown on Room Finish Schedule: Refer to Drawing Finish Schedule and Reflected Ceiling Plan for location, colour and type of ceiling tiles, typical.

.3 Manufacturer: CGC Limited, Armstrong, or Certainteed.

.6 Eggcrate:

.1 Provide 610 mm x 610 mm eggcrate, with 12 mm x 12 mm x 12 mm cube, to match adjacent ceiling tile in locations where fire alarms have been provided in ceiling area above. Confirm locations with LCBO Coordinator or Consultant.

PART 3: EXECUTION

3.01 EXAMINATION

.1 Ensure that environmental conditions and installations preceding that of this Section are satisfactory, and will permit compliance with the quality and dimensions required of acoustical ceilings.

.2 Verify that installations by other Sections which are a part of an underwriter specification for a fire rated protective assembly have been done in accordance with that specification.

3.02 INSTALLATION

.1 Refer to Room Finish Schedule for types and locations of acoustical ceilings.

.2 Coordinate installation of acoustical ceiling systems specified in this Section. Ensure that adequate preparation is made for attachment of hangers and fasteners. Install framing for support and incorporation of flush-mounted and recessed service components. Ensure adequacy of supports by consultation and verification of methods and locations of installations specified in Division 23 and 26.

.3 Install hanger anchoring devices in appropriately drilled holes in composite concrete and metal deck construction. Install hanger wires plumb and securely anchored to the building structural framing, independent of walls, pipes, ducts, and metal deck; install additional framing and hangers to bridge interference items.

.4 Screw apply hanger anchoring devices to joists and supplementary framing. Ceilings shall not be secured to underside of roof deck.

.5 Do not use through the roof hangers.

.6 Space hangers for supporting grid at 1200 mm maximum centres each way, and to suit structure and ceiling system. Secure hangers to structure by a permanent method as approved. Secure wire hangers to framing by bending sharply upward and wrapping securely with three turns. Install hangers free of kinks and at no more than 5 degrees off vertical. Install extra hangers at each corner of lighting fixtures, and reinforce other ceiling equipment with hangers.

.7 Install the entire hanger and suspension grid to adequately support the ceiling assembly, including services incorporated, with a maximum specified deflection for each component member, and free from horizontal movement.

.8 Enclose recessed lighting fixtures to maintain fire rating as required by ULC test design specification validating system. Enclosure by an insulating blanket will not be acceptable should such a method be approved by ULC.

.9 Support recessed lighting fixtures independently from ceiling framing system. Install supports in accordance with ULC test design specification validating system.

.10 Lay out ceilings with acoustic units evenly spaced in each area, with grid lines symmetrical about room axes, columns and service elements, and with maximum border widths of equal dimensions on opposite sides of areas, or as indicated on reflected ceiling plans. Provide angle mouldings to match exposed grid where ceiling abut walls or other vertical surfaces.

.11 Frame around recessed fixtures, diffusers, grilles, and openings.

.12 Maintain true surface planes, and component and joint lines throughout each area.

.13 Butt joints between components tightly together.

.14 Install grid system ceilings as specified by the manufacturer of the system. Ensure that methods of installation used are acceptable to the manufacture of each system component and to Consultant.

.15 Brace system to maintain alignment of grid.

.16 Install acoustical panels in exposed tee system. Cut panels neatly to fit off-module grid and with sufficient clearances to ensure removal without damage.

.17 Do not install acoustical units with broken or marred edges exposed to view.

.18 Install hold-down clips at each panel. Adapt installation to provide ceiling access where required for services.

3.03 ADJUSTMENT AND CLEANING

.1 Clean soiled or discoloured surfaces of exposed ceiling surfaces on completion of ceiling installation.

.2 Replace components which are visibly damaged, marred, or not cleanable.

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 CAN/CGSB-1.188, Filler, Block, Emulsion Type.

.2 CAN/CGSB-85.100, Painting.

.3 Master Painters Institute (MPI), Painting Specification Manual.

1.02 SUBMITTALS

.1 Samples:

.1 Submit 215 x 280 mm draw-down samples 30 days before materials are required; labelled to indicated finish, formula, colour name, number, sheen and gloss units of:

.1 Each specified colour in each specified finish coat material.

.2 Each wood stain finish on each specified wood species, referenced to correct finish number specified in the Drawings.

.2 Affidavits:

.1 Submit affidavits from manufacturer to certify that materials supplied for Project meet Specifications requirements, and that he approves of their use of each proposed application.

.3 List of materials:

.1 Before ordering materials, submit a list of those materials proposed for use on Project for approval.

.2 For each material, give manufacturer and descriptive nomenclature that will appear on label.

.3 Do not order disapproved materials for Project.

1.03 QUALITY ASSURANCE

.1 Subcontractor Qualifications: Perform painting and finishing specified in this Section only by a Subcontractor who has adequate equipment and skilled tradesmen to perform Work expeditiously, and is known to have been responsible for satisfactory applications similar to that specified during a period of at least the immediate past five years.

.2 The best practices specified in CAN/CGSB-85.100-M, Painting, shall govern for painting materials, methods and procedures, unless specified otherwise in this Section.

1.04 DELIVERY, STORAGE AND HANDLING

.1 Deliver to site each container sealed, and labelled with manufacturer's name, catalogue number or brand name, colour, formulation type, reducing instructions, and reference standard specification number if applicable.

.2 Store only acceptable Project materials at site, and in an area specifically set aside for purpose that is locked, ventilated, maintained at a temperature of over 4 deg.C. and protected from direct rays of sun.

.3 Ensure that health and fire regulations are complied with in storage area. Provide carbon dioxide fire extinguishers of 20 lbs. minimum capacity in each storage area while materials are contained within.

1.05 SITE CONDITIONS

.1 Apply finishing materials only when air and surface temperatures exceed 4 deg. C. except for 7 deg. C. for latex paint at interior locations and 21 deg. C. for lacquers and enamels.

.2 Do not apply exterior finishes in direct sunlight that raises surface temperatures above that for proper application and drying, nor in rainy, foggy or windy weather.

.3 Do not apply finishes when relative humidity is over 85%, when condensation has formed or is likely to form, nor immediately following rain, forms or formation of dew.

.4 Do not apply finishes when dust is begin raised.

.5 Do not apply finishes on porous surfaces such as concrete, gypsum board, masonry, that contain over 12% moisture.

.6 Do not finish wood surfaces that contain over 15% moisture.

.7 Ensure that all areas in which paint is applied as are well-ventilated and broom clean.

1.06 MAINTENANCE MATERIALS

.1 Submit to LCBO Project Coordinator Product data, in accordance with section 01 33 00, for each finish painting material applied. Leave no containers of any finish painting material upon project completion.

PART 2: PRODUCTS

2.01 MATERIALS

.1 Painting shall be Premium Grade.

.2 Provide paint materials for paint systems from one manufacturer.

.3 .1 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids:

.2 Water-based for concrete, concrete block and gypsum board

.3 Manufactured without compounds which contribute to ozone depletion in the upper atmosphere.

.4 Manufactured without compounds which contribute to smog in the lower atmosphere.

.4 Shellac and turpentine: highest quality product from approved manufacturer listed in MPI Architectural Painting Specification Manual, compatible with other coating materials as required.

.5 Formulate and manufacture water-borne surface coatings with no aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.

.6 All materials and paints shall be lead and mercury free and shall have low VOC content where possible.

.7 All paint materials shall have good flowing and brushing properties and shall dry or cure free of blemishes or sags.

.8 Where required, paints and coatings shall meet flame spread and smoke developed ratings designated by local Code requirements and/or authorities having jurisdiction.

.9 Conform to latest MPI requirements for exterior and interior painting work including preparation and priming.

.10 Paint materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.): as listed in the MPI Approved Products List (APL) are acceptable for use on this project.

.11 Provide paint products meeting MPI "Environmentally Friendly" ratings based on VOC (EPA Method 24) content levels. Only qualified products with E2 or E3 "Environmentally Friendly" rating are acceptable for use on this project.

.12 Caution Area Paint for use around baler, top stair landing, and at electrical panels:

- .1 Sherwin Williams ArmorSeal 8100 Water Based Epoxy floor coating, or approved alternate.
- .2 Safety Yellow Satin finish (B70-8160).
- .3 Ensure surface is clean, dry, and in sound condition. Remove all oil, dust, grease, dirt, loose rust, and other foreign material to ensure adequate adhesion. Refer to manufacturer for detailed surface preparation information.

.13 Wood stain blocker for priming of exposed wood to be painted:

- .1 Zinsser Primer Stain Blocker Sealer, or approved alternate.
- .2 Ensure surface is clean, dry, and in sound condition. Remove all oil, dust, grease, dirt, loose rust, and other foreign material to ensure adequate adhesion. Refer to manufacturer for detailed surface preparation information.

2.02 MIXING

.1 Paints shall be supplied ready-mixed unless otherwise specified. Do not incorporate adulterants.

.2 Mix specified paste or powder coatings, or those that are filed-catalysed at job, to meet specified requirements of manufacturer.

.3 Pigment shall be well ground to form a soft paste in the vehicle during its storage life. Paddle mixing at job shall evenly disperse paste throughout mixture to ensure paint of smooth-flowing, easy brushing, consistency.

.4 Mix paints only in mixing pails place on suitably sized, non-ferrous or oxide resistant metal pans.

2.03 GLOSS/SHEEN RATINGS

.1 Paint gloss is defined as sheen rating of applied paint, in accordance with following values:

	Gloss @ 60 degrees	Sheen @ 85 degrees
Gloss Level 1 - Matte Finish (flat)	Max. 5	Max. 10
Gloss Level 2 - Velvet-Like Finish	Max.10	10 to 35
Gloss Level 3 - Eggshell Finish	10 to 25	10 to 35
Gloss Level 4 - Satin-Like Finish	20 to 35	min. 35
Gloss Level 5 - Traditional Semi-Gloss	35 to 70	

	Gloss @ 60 degrees	Sheen @ 85 degrees
Finish		
Gloss Level 6 - Traditional Gloss	70 to 85	
Gloss Level 7 - High Gloss Finish	More than 85	

PART 3: EXECUTION

3.01 EXAMINATION

.1 Verify that specified environmental conditions are ensured before commencing painting and finishing preparation and applications.

.2 Ensure that surfaces to receive finishing materials are satisfactory for specified materials; have been provided by other Sections as specified will not adversely affect execution, permanence, or quality of applications; and can be put into an acceptable condition by means of preparation specified in this Section.

.3 Test all surfaces for moisture content with an electronic moisture meter. Test surfaces of materials containing lime for acid-alkali balance.

.4 Maintain at site at all time until applications are completed a moisture meter, hygrometer and thermometer to verify surface and environmental conditions.

.5 Defective painting and finishing applications resulting from failure to properly test surfaces and/or from application to unsatisfactory surfaces will be considered the responsibility of this Section.

3.02 PROTECTION

.1 Mask instruction and specification plates attached to equipment being painted. Apply sufficient masking, clean drop cloths, and protective coverings to Work not receiving paint treatment that is installed by other Sections to ensure full protection from damage and soil. Sections include, but are not limited to, the following:

- .1 Light fixtures, fire and smoke detectors,
- .2 Sprinkler heads,
- .3 Prepainted diffusers and registers,
- .4 Prepainted equipment,
- .5 Fire rating labels and equipment specification plates,
- .6 Finished surfaces,
- .7 Mechanical or Electrical labelling of services (i.e. direction or use stencilling),

.2 Take particular care in storage and mixing areas that floors are protected by tarpaulins and metal pans.

.3 Place cloths and other disposable finishing materials, that are a fire hazard, in closed metal containers containing water, and remove from building every night.

.4 Ensure that the appropriate trades remove from finished surfaces store and reinstall after finishing is completed finish hardware, switch and receptacle plates, escutcheons, luminaire frames and similar items.

.5 Porous materials from which soil from finish materials cannot be completely removed shall be replaced by this Section.

.6 Post "No Smoking" signs and ensure that spark-proof electrical equipment is used in areas where inflammable painting materials are being applied.

.7 Post "Wet Paint" signs throughout freshly finished areas and remove when finishes are dry.

3.03 PREPARATION

.1 General:

.1 Vacuum clean interior areas immediately before finishing Work commences.

.2 Remove from surfaces grease, oil dirt, dust, ridges, and other soil and materials that would adversely affect the adhesion or appearance of finish coatings.

.3 Remove rust from damaged surfaces primed by other Sections and reprime.

.4 Touch up damaged prime coats on shop primed metals with same priming material. Feather out edges of hop coat and smooth repair coat into shop coat surfaces.

.5 Finish, patch and smooth surfaces to remove cracks, holes, ridges, and similar blemishes.

.6 Neutralize highly alkaline surfaces with a neutralizing wash of 4% solution of zinc sulphate. Brush off residue before painting.

.7 Scrub mildewed surfaces with a solution of tri-sodium phosphate, bleach with a solution of one part sodium hypochlorite (Javex) to three parts water, and rinse with clear water.

.2 Metal Surfaces:

.1 Unprimed Steel: Remove weld flux and scale with scrapers, wire brushes, wire power wheels, sandblasting, chipping, or grinding as may be required. Finish surfaces smooth, and remove alkali contamination from weld flux with phosphoric acid solution. Wash with solvent.

.2 Primed Steel: Before touch-up of prime paint, smooth out surface irregularities; clean weld joints, bolts, nuts and damaged areas with phosphoric acid solution; and wash with solvent.

.3 Galvanized Steel: Wash thoroughly with mineral spirits, and wipe dry with completely clean cloths. Apply galvanized steel primer: Alternately, phosphatize, or apply one coat of etch type primer except where either of these treatments are specified in another Section.

.3 Cementitious Substrates:

.1 Fill minor holes and cracks with Portland Mix. Match patches to texture of adjacent surfaces.

.2 Remove dirt, scale, loose mortar, and similar foreign matter by brushing.

.3 Remove oil and grease with a washing with tri-sodium phosphate solution followed by thorough rinsing with water.

.4 Remove efflorescence by dry brushing; or, if required, by washing with dilute muriatic solution of one part commercial muriatic acid to 20 parts water, followed by a complete rinse with a drenching by clear water.

.5 Wire brush concrete generally. Etch very smooth concrete, such as floors, with application of a solution of one part commercial muriatic acid (31.45%) to three parts of water by volume. Apply at rate of 1 gal. /100 sq.ft. When foaming action is finished, flush surfaces clean of cement laitence with high pressure water.

.4 Wood:

.1 Sand finish surfaces smooth with No.00 sandpaper.

.2 Clean soiled surfaces with an alcohol wash.

.3 Wipe off dust and other loose dirt, or vacuum clean before application of coatings.

.4 Seal knots, pitch, and sapwood with two coats of orange shellac where painted, or an application of special sealer. Use only a clear sealer that is compatible with transparent finish.

.5 After prime coat is dry and sanded, fill nail and screw holes, and cracks with wood filler, or with putty. Colour fillers to match wood or stain if surfaces are given clear final coatings. Smooth, sand and prime fillers when set.

.5 Gypsum Board:

.1 Fill minor holes and depressions, caused by accidental damage, with drywall joint compound, and sand smooth when it is set, taking care not to raise nap of paper cover.

.2 Ensure all areas receiving wall coverings are completely smooth and free of any imperfections that may telegraph through the wall covering, or adversely affect the adhesion of the wall covering.

.6 Existing Painted Surfaces:

.1 Remove finish that is incompletely bonded to substrate.

.2 Smooth uneven and rough surfaces.

.3 Roughen highly finished surfaces to ensure adhesion of new coatings.

.4 Reprime areas bared to substrate by preparation.

.5 Ensure all areas receiving wall coverings are completely smooth and free of any imperfections that may telegraph through the wall covering, or adversely affect the adhesion of the wall covering.

3.04 APPLICATION

.1 General:

.1 Perform painting and finishing specified in this Section under supervision of experienced foremen, with clean equipment designed for purpose used, and under directions and specific recommendations of manufacturers whose materials are used.

.2 Before commencing applications, arrange for a site meeting, at which conditions of surfaces and possible adaptations to suit, and use of materials and application

procedures shall be discussed between Contractor, Painting Subcontractor, Consultant, and representatives of materials manufacturers.

.3 Consult with Consultant before proceeding with application of finishes to surfaces for which a formula is not given in Specifications.

.4 Finish glazing rebates before glazing commences.

.5 Do not paint caulked joints.

.6 Remove spatters from adjacent surfaces, including glass, before they set up, and by methods not harmful to the surfaces.

.2 Finishing Methods:

.1 Apply finishing materials at proper consistency, free from brush marks, sags, crawls, streaks, runs, laps, skips, voids, pinholes, missed areas, and other perceptible defects, and with even colour, sheen and texture.

.2 Apply finishing materials to ensure full coverage, and at a rate not to exceed that recommended by the manufacturer for the applicable surface.

.3 Make clean true junctions with no overlap between adjoining applications of finish coatings.

.4 Leave all parts of mouldings and ornaments clean and true to details with no undue amount of coating in corners and depressions.

.5 Use materials of a single manufacturer in each coating system.

.6 If evidence is inconclusive that a specified coat has been applied, apply a full coat to the areas concerned.

.7 Where exposed to view, fill holes and open grain of exposed plywood edges with wood filler following prime coats. Smooth and sand before applying next coat.

.8 Paint glazing compound only after it is set and skimmed over. Remove dirt and grease from compound before painting, and without breaking skin.

.3 Staining:

.1 Pad filler well into pores of open-grained wood with a circular rubbing motion. Clean surplus off by rubbing across the grain before filler dries.

.2 Tint filler to match wood.

.3 Stain wood to obtain a uniformity of colour over entire stained surfaces. Adjust stain colours as necessary to obtain the same colour over variations between wood pieces.

.4 Existing Surfaces:

.1 Apply two final finish coats as specified in Finish Formula Schedule on existing painted surfaces.

.2 Primer is required only on surfaces bared by preparation.

3.05 ADJUSTMENT AND CLEANING

.1 Touch up and refinish minor defective applications.

.2 Refinish entire wall, ceiling or similar surfaces where finish is damaged or not acceptable.

.3 Remove spilled or splattered finish materials from surfaces if installations provided by other Sections. Do not mar surfaces while removing.

.4 Leave storage and mixing areas clean and in same condition as equivalent spaces in Project.

3.06 PAINTING AND FINISHING SCHEDULE

.1 General:

.1 This Section shall include painting and/or finishing of all surfaces exposed to view that have been installed with no final finish provided by the installer, unless otherwise specified.

.2 Finish interior surfaces, including objects within each area unless otherwise excluded, as indicated on Room Finish Schedule and Finish Schedule.

.3 Wall surfaces partially finished with other finish materials shall have remainder of surfaces finished as for surrounding surfaces.

.4 Finish equipment, panels, fitments, services, structure, attachments, accessories, prime coated hardware, or similar appurtenances on or near finished surfaces to match finish of the surfaces.

.5 Finish edges and tops of trim, projecting ledges, fitments, cupboards, and similar surfaces to match adjacent surfaces, whether or not they are above or beyond sight lines.

.6 Finish interior of alcoves, recesses, closets, cupboards, fitments, and similar spaces to match adjacent surfaces unless otherwise indicated.

.7 Finish high humidity designated areas such as Janitor room and behind refrigeration units with Elastomeric Antimicrobial Coating as indicated in Finish Formula Schedule.

.8 Finish surfaces visible through grilles, grille cloth, perforated metals, screening, convector covers, louvres, linear metal ceilings, and other openings, including inside of ductwork, with two coats of matte black paint. If it is the intention that finished surfaces be seen behind the elements listed above, finish the surfaces to match adjoining surfaces.

.9 Finish exposed metal housings of weatherstripping and door seals and door closers to match surface to which they are attached and which are painted or finished by this Section.

.10 All exposed conduit and device boxes fastened to unpainted sealed concrete columns within the retail area shall receive paint finish (Benjamin Moore 2112-60 Cement Gray). Where columns are designated to receive paint finish, conduits and device boxes fastened to the column shall be painted to match column colour.

.2 Doors and Drawers:

.1 Finish wood edges of doors and drawers and edges of metal doors exposed to view with the same number of coats of material and colour as adjoining surface finishes. Where not exposed to view, finish with two coats of varnish.

.2 Paint exposed plywood edges of doors to match stained finish.

.3 Finish interior of drawers with two coats of natural varnish, except when prefinished.

.3 Include finishing of the following surfaces by this Section
- .1 Steel lintels where exposed to view.
- .2 Access doors.
- .3 Convector covers.
- .4 Prime painted louvres, grilles, and diffusers at exterior.
- .5 Prime painted fire hose and extinguisher cabinets.
- .6 Prime painted electric panel doors and frames.
- .7 Mechanical, electrical and other equipment and accessories on roof.
- .8 Transite drain pipe shall have the word TRANSITE spray-stenciled once overall painting is complete, at a spacing of 15’ with a letter height of 1.5”. Lettering to be black where on white piping, and white where on black piping.

.4 Surfaces that Require No Finishing: Painting or finishing of the following surfaces is not included in this Section
- .1 Plastics
- .2 Metals with porcelain enamel, baked enamel or plated finishes.
- .3 Sound absorbent surfaces.
- .4 Vitreous, glazed ceramic or plastic facings.
- .5 Special coatings.
- .6 Factory finished surfaces as specified in other Sections.
- .7 Control panels, circuit breakers, switches, receptacles or similar electrical components.
- .8 Name and specification plates on equipment.
- .9 Ducts, pipes and conduit concealed from view.

.5 Colours:
- .1 Colours of paints, including shades of stains, shall be applied to match approved samples.
- .2 Colours shown on Finish Schedule

3.07 FINISH FORMULA SCHEDULE

.1 Exterior Primed or Galvanized Metal:

.1 Formula EXT 5.3B

Alkyd, High Gloss Finish:

1st. Coat: Cementitious Primer.
2nd. Coat: Exterior Alkyd.
3rd. Coat: Exterior Alkyd.

.2 Formula EXT 5.3G

Light Industrial Coating, ‘Eggshell’ Gloss Finish:

1st. Coat: Cementitious Primer.
2nd. Coat: Exterior W.B. Light Industrial Coating.
3rd. Coat: Exterior W.B. Light Industrial Coating.

.2 Interior painted Cementitious Substrates:

.1 Formula INT 4.2D

High Performance Architectural Latex, Low Sheen "Velvet-Like" Finish, Filled:

1st. Coat: Latex Block Filler, CAN/CGSB-1.188.
2nd. Coat: Interior HIPAC Latex.
3rd. Coat: Interior HIPAC Latex.

.3 Interior Ferrous Metals:

.1 Formula INT 5.1B

Waterborne Semi-Gloss Finish:

1st. Coat: Acrylic Metal Primer.
2nd. Coat: Light Industrial Water based coating.
3rd. Coat: Light Industrial Water based coating.

.4 Interior Galvanized Metal:

.1 Formula INT 5.1B

Waterborne Semi-Gloss Finish:

1st. Coat: Acrylic Metal Primer.
2nd. Coat: Light Industrial Water based coating.
3rd. Coat: Light Industrial Water based coating.

.5 Interior Painted Wood:

.1 Formula INT 6.3A

High Performance Architectural Latex, Low Sheen "Velvet-Like Finish, Low VOC:

1st. Coat: Latex Primer.
2nd. Coat: Interior HIPAC Latex.
3rd. Coat: Interior HIPAC Latex.

.6 Interior Stained Wood:

.1 Formula INT 6.3D

Alkyd Varnish on Close Grain Woods, Semi-Gloss Finish:

1st. Coat: Wood Stain.
2nd. Coat: Sanding Sealer/Shellac.
3rd. Coat: Alkyd Varnish.
4th. Coat: Alkyd Varnish.

.2 Formula INT 6.3D

Alkyd Varnish on Open Grain Woods, Semi-Gloss Finish:

1st. Coat: Wood Filler Paste.
2nd. Coat: Wood Stain.
3rd. Coat: Sanding Sealer/Shellac.
4th. Coat: Alkyd Varnish.

.7 Interior Painted Wood Floors (Service Platform Floors):
- .1 Floor colour is to match handrails/pickets. Refer to Finish Schedule.
- .2 Waterborne epoxy, Low Gloss Finish, Low VOC:

.8 Interior Gypsum Board:
- .1 Formula INT 9.2A
  Latex, Flat Finish. Low VOC:
  1st. Coat: Latex Primer Sealer.
  2nd. Coat: Interior Latex.
  3rd. Coat: Interior Latex.

.9 Interior High Humidity Finish for use behind all retail fridges and designated areas:
- .1 Elastomeric Antimicrobial Coating, Pennsanitex by Pennkote Limited, or approved alternate.
- .2 Apply coating in accordance with manufacturer's written instructions.

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 CAN/CSA B651-M, Barrier Free Design.

1.02 SUBMITTALS

.1 Shop Drawings: Submit shop drawings.

.2 Samples: Submit samples of accessories that are requested.

1.03 DELIVERY, STORAGE AND HANDLING

.1 Package accessories and label with description of contents and installation location.

.2 Delivery accessories where designated at site by Contractor.

1.04 MAINTENANCE

1. Maintenance Tools: Provide special tools necessary for accessing, assembly/ disassembly or removal of toilet, bath and cleaning accessories.

PART 2: PRODUCTS

2.01 MATERIALS

.1 Towel Dispenser

- .1 Universal towel dispenser to accept all standard single fold and roll towels (150 mm diameter and up to 250 mm long), front loading.
- .2 Material: all welded 22 gauge steel construction, full length piano hinge and vinyl laminated protected saw tooth cutting edge.
- .3 Finish: White epoxy powder coat finish.
- .4 Mounting: Surface.
- .5 Acceptable manufacturer:
  - .1 Model 101 by Frost Products Limited.
  - .2 Bobrick Washroom Equipment of Canada ltd.
  - .3 Or approved alternate.

.2 Waste Receptacle

- .1 Free standing medium sized, 17.5 gal capacity, 882 mm high waste container.
- .2 Material: 22 gauge cold rolled steel.
- .3 Finish: Epoxy powder coat paint white with black vinyl trim.
- .4 Construction: all welded construction with soft rounded edges, recessed feet, equipped with standard bag holder apparatus and flipper type free swinging top mounted door.
- .5 Acceptable manufacturer:
  - .1 Model 301-NL by Frost Products Limited.
  - .2 Bobrick Washroom Equipment of Canada ltd.
  - .3 Or approved alternate.

.3 Toilet tissue dispenser:

- .1 Single roll type, surface mounted, chrome plated steel frame, capacity of 500 sheet double ply roll, spring tension for controlled delivery.

.2 Acceptable manufacturer:
.1 Model K14978 by Kimberly Clark-Professional.
.2 Or approved alternate.

.4 Grab bars:
.1 38 mm diameter x 18 gauge wall tubing of stainless steel, No. 4 satin finish and peened grip area, 75 mm diameter wall flanges, concealed screw attachment with steel back plates and accessories. Provide 38 mm space between bar and wall. Grab bar material and anchorage to withstand pull of 1.3 kN vertically or horizontally.
.2 Bar behind fixture: 610 mm minimum.
.1 Model 1001-24 by Frost Products Limited.
.2 Bobrick Washroom Equipment of Canada ltd.
.3 Or approved alternate.
.3 Bar at side of fixture: L-shaped, 762 mm horizontal leg and 762 mm vertical.
.1 Model 1003 by Frost Products Limited.
.2 Bobrick Washroom Equipment of Canada ltd.
.3 Or approved alternate.

.5 Mop Hooks (1- three holder and 1 four holder)
.1 Formed Channel, 20 gauge type 304 stainless steel, satin finish with 3 and 4 rubber cam holders respectively.
.2 Acceptable manufacturer:
.1 Model 8215-3 & 4 by Watrous.
.2 Model 1113 & 4 by Frost.
.3 Or approved alternate.

.6 Stainless Steel Shelf
.1. Heavy duty Stainless steel, 18”long x 4” depth shelf.
.2 Material: Stainless steel, 22gauge shelf welded to stainless steel wall plate.
.3 Finish: No.4 brushed finish.
.4 Mounting: Surface, all mounting screw holes below shelf.
.5 Acceptable manufacturer:
.1 Model 950-4 by Frost
.2 Or approved alternate.

.7 Fixed Tilt Mirror
.1. Mirror frame: One piece heavy-gauge stainless steel with mitred corners.
.2 Wall frame: Heavy-gauge stainless steel, satin finish.
.3 Finish: No.4 Satin chrome finish.
.4 Mounting: Vandal resistant concealed mounting.
.5 Mirror protection: Shock resistant primary back
.6 Acceptable manufacturer:
.1 Model 941-2436FT by Frost
.2 Model 293--2436 by Bobrick
.3 Or approved alternate.

PART 3: EXECUTION

3.01 INSTALLATION

.1 Verify and coordinate templates, inserts, and rough-in frames and verify exact location of washroom accessories for installation.

.2 Provide fastening and mounting kits for washroom accessories.

.3 Locate washroom accessories where indicated on Drawings and where directed by Consultant.

.4 Install washroom accessory fixtures, accessories, and items in accordance with manufacturer's instructions and CAN/CSA B651-M. Provide exposed tamper-proof screws of stainless steel to match units.

.5 Install washroom accessories plumb, level, and securely and rigidly anchored to substrate surfaces and framing. Adjust accessories for proper operation and verify mechanisms function smoothly.

.6 Install grab bars to withstand minimum 408 kg downward pull. Provide necessary reinforcements as required.

.7 Clean and polish exposed surfaces and fill accessories with necessary supplies prior to acceptance by Consultant.

.8 Install the following in each washroom:

- .1 1 waste receptacle
- .2 1 toilet tissue dispenser.
- .3 1 tilt mirror (see Section 08 80 00)
- .4 1 towel dispenser

.9 Install the following in the universal washroom:

- .1 1 Straight grab bar behind water closet.
- .2 1 L-shaped grab bar to side of water closet.
- .3 1 Stainless steel shelf (refer to Architectural dwgs.).
- .4 1 Tilt mirror (see Section 08 80 00).
- .5 1 Coat Hook (see Hardware Standards section)

END OF SECTION

PART 1: GENERAL

1.01 SUBMITTALS

.1 Submit product data sheets of each item specified indicating performance criteria, compliance with appropriate reference standard(s), characteristics, and limitations.

.2 Submit shop drawings in accordance with Section 01 33 00 and 05 50 00.

.3 Closeout submittals: Submit cleaning and maintenance instructions for miscellaneous specialties for incorporation into Operations and Maintenance Manuals.

1.02 DELIVERY, STORAGE, AND HANDLING

.1 Package or crate, and brace products to prevent distortion in shipment and handling. Label packages and crates, and protect finish surfaces by sturdy wrappings.

PART 2: PRODUCTS

2.01 FLOOR GRILLES

.1 Material: Tread rails shall have interchangeable 4.7mm thick self-cleaning multi directional Black Vinyl Finish (vinyl durometer 90.) Frame shall be Mill Finished. All aluminium components shall be extruded 6063-T5 aluminium alloy.

.1 Deflection: minimum uniform load of 980 Newton applied over a 100mm square surface in order to obtain a 1/180” deflection over a 1220 mm span.

.2 Manufacturer: Bolar (Tel: 1-800-552-6527), model BSV-2- WWI Installation SSA, or approved alternate.

.3 Countersunk stainless steel machine screws, supplied by manufacturer, at corners of each grill section to fasten to frame.

.4 Slab depression Waterproofing Liner: chemical, corrosion and abrasion resistant, two-component, polyurethane based and liquid-applied elastomeric coating.

.1 Acceptable products: Sikagard E.W.L or approved alternate.

.5 Fabricate work square, true, straight, level and free of distortion with joints closely fitted and properly secured. Level concrete slab depression with cement leveller to required tolerance. Provide adequate reinforcing and anchorage.

.6 In conditions where more than one piece is required, ensure that seam is centred and is reinforced with adequate blocking below to prevent a tripping hazard.

.7 Fabricate mats and frames in largest practical sized units to suit conditions.

.8 Install frame flush with floor finish, and align evenly adjoining sections of grilles at junctions and corners. [Refer to Floor Finishes Schedule]

.9 Reinforce any portion of the frame or foot grille that has been compromised due to installation of work of other Sections. Submit shop drawings for review and acceptance.

2.02 ENTRANCE CONTROLS/ SECURITY GATE

.1 General:

.1 Provide all required wiring for electrical devices.

.2 Entrance Controls/ Security Gate:

.1 Accepted products: Bolduc Solutions, "BMS-5M42-45" or approved alternate
  .1 Finish: stainless steel (brushed)
  .2 (Left Side)(Right Side) 1 arm and cart corral as shown on drawings
.2 Submit Shop Drawings of security gate and cart corral for LCBO approval prior to installation.
.3 Connect to fire alarm system, manufacturer to supply a 25' lead for connection to the alarm signaling system
.4 Manufacturer to supply and install a manual pull station for emergency exiting

.3 Customer Service Return Gate:
.1 Accepted products: Bolduc Solutions, "Crowd Control, Surveillance Model" or approved alternative
  .1 Finish: stainless steel (brushed)
  .2 Provide electric-magnetic release, Release to be mounted and only accessible from the inside surface of customer service desk,

2.03 FILING CABINET

.1 Location: Kitchen Demo: In separate Special Events Coordinator's Office near Kitchen Demo (refer to LCBO Coordinator for final location).
.2 Acceptable manufacturers:
.1 Steelcase, distributed by POI, Tel: (905) 479-1123:
Three High lateral filing Cabinet, 36" wide with lock, Model RLF18363F, Colour 4242 Milk.

2.04 LATERAL FILE/LOCKING DRAWER

.1 Drawers: 2-drawer, lockable, lateral file
.2 Location: Below counters
.3 Quantity: As per Architectural drawings.
.4 Size: 30"w x 18"d x 27 7/8"h
.5 Electrical requirements: 110 volts
.6 Colour: 3002 Polar White
.7 Acceptable manufacturers:
.1 Artopex 55 Series, 55 21 030 LT2 with counter weight, distributed by POI, Tel: (905) 479-1123.

2.05 PEDESTAL UNITS

.1 Location: Office
.2 Quantity: As per Architectural Drawings. An even number of pedestal units shall be made up with equal quantities of type 'A' and type 'B' pedestals. An odd number of pedestal units shall be made up of one additional type 'A' pedestal (i.e., five pedestal units shall be three type 'A' and two type 'B').
.3 Acceptable manufacturers:

.1 Steelcase, distributed by POI, Tel: (905) 479-1123:
.1 'A' type: 2 box, 1 file, model: RPF2427AF, Colour: 4242 Milk
.2 'B' type: 2 file, model: RPF2427BF, Colour: 4242 Milk
.4 G.C. to coordinate height of counter with height and installation of pedestal units.

2.06 TASK CHAIRS

.1 Acceptable product, distributed by POI:
.1 Steelcase Crew Chair #TS30801 (full back, no arms)
.2 Frame: 0835 black
.3 Fabric: Jacks Classic Collection Fabric- Pewter 5B64- group 1
.4 Quantity: **As per Architectural Drawings**

2.07 KEYBOARD TRAY

.1 Product Specifications:
.1 Colour: Black and/or Silver
.2 Size: 50mm h x 750mm w x 350mm d
.3 Weights: Maximum 20lbs
.4 Adjustability: height, angle with swivel to left and right
.5 Other features: Wrist rest
.2 Quantity: **As per Architectural Drawings**
.3 Location: Office

2.08 LOCKERS & RACK

.1 Location: Warehouse. Refer to LCBO Coordinator for final location
.2 Colour: beige complete with a black base, or approved alternate.
.3 Product Specifications: Individual lockers for minimum 16 people.
1. Option 1 (Standard store):
Approximate size: 12" h x 12" w x 18" d, 16 lockers.
Configuration: 2 upright sections each 6 lockers high, separated by 4 lockers horizontally placed, complete with coat rod. Door pulls to serve as padlock hasps, refer to attached drawing (padlock not included) all top units to have sloped top.

.4 Specifications:
.1 Materials: Locker bodies to be fabricated by not less than 24 ga. Cold rolled steel. Back and sides to be provided with continuous lock framing.
.2 Door construction: Clear acrylic
.3 Door Frame: Not less than 15 ga. formed steel channel, weld to form one piece construction, complete with heavy duty padlock hasp.
.4 Frame: To be equipped with two 14 ga. 5-knuckle hinges for each door.
.5 Acceptable manufacturers and products:
.1 Clear Front "Safety-View Locker" by Hallowell
.2 Or approved alternative

2.09 STAFF ROOM FURNITURE

.1 Armless Chair:

.1 Polypropylene seat and back, stacker 21 1/2"w X 21 1/2"d X 33"h

.2 Colour: Black.

.3 Acceptable manufactures:

.1 Global: Sonic Armless Chair, model # 6508

.2 Steelcase: Dominos Armless Chair model, #TS37101

.4 Suppliers:

.1 POI, (905) 479-1123

.2 Square Cafeteria Table:

.1 36"w X 36"d X 29 1/2"h, with chrome base

.2 Finish and Colour: Laminate, Standard Grey or D92-60 Wilsonart Dove Grey

.3 Acceptable manufactures:

.1 Global: CAS 36 Grey Laminate top, chrome base

.2 Spec Fitt Furniture: Model FX4, 4 Column X Base, painted base

.4 Suppliers:

.1 POI, (905) 479-1123

2.10 UNDER-COUNTER MOUNTED CPU CRADLES

.1 Location: office areas

.2 Model: CPRCCL – Vertical Locking CPU Cradle

.3 Colour: Black

.4 Supplier: POI, or approved alternate

.5 Quantity: One CPU cradle

2.11 CASH STOOL

.1 Location: Checkout area (refer to architectural drawings)

.1 3 in 1 Sit Stand stool

.1 Fully upholstered backrest (14"w X 10"h)

.2 Seat pan (17 1/2”w X 15 1/2”d)

.3 Upholstery: Vinyl – Gunmetal US 392

.4 Control Mechanism: Geometric shaped adjustment paddles and icon plates

.5 Pneumatic lift: 200mm knurled dual height adjustment system (seat height 7 1/2” of adjustment between 19 1/4" – 35 1/2”)

.6 Base/Glide/Casters: 22” chrome base, 18” footring, 5 lock casters

.2 Accepted suppliers:

.1 ErgoCentric, 1-866-438-3746 ext.229, or approved alternates

PART 3: EXECUTION

3.01 PREPARATION

.1 Verify substrate surfaces are solid, free from surface water, dust, oil, grease, projections and other foreign matter detrimental to performance.

.2 Items to be built-in: Provide information and templates required for installation of work of this Section, and assist or supervise, or both, the setting of anchorage devices, and construction of other work incorporated with products specified in this Section in order that they function as intended.

.3 Verify there is adequate supports and/or blocking in gypsum wall assemblies prior to installation of wall mounting items.

3.02 INSTALLATION

.1 Install miscellaneous specialties level and securely and rigidly anchored to substrate in accordance with authorities having jurisdiction, reviewed shop drawings, and manufacturer's written instructions.

.2 Isolate dissimilar metals and metal to concrete or masonry with 2 coats of bituminous paint.

.3 After installation, adjust miscellaneous specialties in accordance with manufacturer’s written instructions.

.4 Install items plumb, straight and level to a tolerance of 1:500.

.5 Securely fix items in place with concealed fasteners.

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 Refer to Sections

20 05 00	Basic Mechanical Materials
20 07 00	Mechanical Insulation
23 23 00	Refrigeration Piping and Accessories

1.02 SUBMITTALS

.1 Product Data: Submit manufacturer's printed product literature, specifications and datasheet indicating the following:

- .1 Component dimensions, describe components within assembly, anchorage and fasteners.
- .2 Description of equipment, giving manufacturer’s name, type, model, year and capacity.
- .3 Details of operation, servicing and maintenance.
- .4 Recommended spare parts list.

.2 Refrigeration Shop Drawings:

- .1 Submit shop drawings
- .2 Shop drawings shall be stamped by a professional engineer, confirming that the refrigeration shelving meets LCBO requirements.
- .3 Submit manufacturer-designed, engineer-stamped piping layout drawings.

.3 Commissioning/Start-Up Report:

- .1 Submit start up report indicating refrigerant type/ quantity, degrees of sub cooling, degrees of superheat, compressor amp draw, site glass observation, suction pressure, suction temperature, discharge pressure, discharge temperature and ambient temperature.

1.03 PRE-INSTALLATION MEETING

.1 Conduct pre-installation meeting one week prior to commencing work of this section and on-site installations, to verify project requirements, co-ordinate with other building sub-trades, establish condition and completeness of floor and wall surfaces, manufacturer’s installation instructions and manufacturer’s warranty requirements.

1.04 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle sign components in accordance with Section 01 60 00 - Material and Equipment.

.2 Package accessories and label with description of contents and installation location.

.3 Deliver accessories to site and store where directed.

1.05 WARRANTY

.1 Units to be warranted against defect in material and workmanship for a period of one year from the date of acceptance.

.2 Compressors shall be warranted against defect in material and workmanship for a period of five years from the date of acceptance.

.3 The supplier/seller shall provide for the duration of the warranty and extended warranty periods any and all of the prescribed maintenance to any and all of the supplied components which might limit the term or otherwise invalidate the warranty.

PART 2: PRODUCTS

2.01 REFRIGERATORS

.1 **Staff Kitchen Refrigerator**: Top mount freezer, total 19.0 Cu. Ft. capacity, finish stainless steel, specify Left or Right hinged (verify with LCBO Design Coordinator), size: 1650 mm H x 760 mm W x 815 mm D. Acceptable manufacturer: L.G. Appliances, or approved equal. Provide catalogue cut to LCBO Design Coordinator for Approval. Refrigerator to be EnergyStar certified.

2.02 MICROWAVES

.1 **Staff Kitchen Microwave**: minimum 1.1 Cu. Ft., maximum 12”h x 21”w x 16”d, finish stainless steel. Acceptable manufacturer: LG, Panasonic, or approved equal. Contractor to provide catalogue cut with latest model for approval.

2.03 IDENTIFICATION

.1 Equipment Nameplates: Minimum 1.6 mm thick x [25 mm x 65 mm] [12 mm x 50 mm], 2-ply laminated coloured plastic plates,

- .1 Bevelled edges and engraved wording to completely identify the equipment with no abbreviations.
- .2 Wording to include but not limited to:
  - .1 Name, make and manufacturer model number
  - .2 LCBO Store Number and equipment tag number as per drawings
  - .3 Overall equipment capacity, cubic footage available, surface available, or product specific dimensions of work surfaces
  - .4 Overall product dimensions
- .4 Use stainless steel screws for securing nameplates in place.

PART 3: EXECUTION

3.01 PREPARATION

.1 Verify dimensions, tolerances, and method of attachment with other work on site.

.2 Verify that surfaces are ready to receive work of this Section and match reviewed shop drawings.

3.02 INSTALLATION

.1 Provide manufacturer's handling instructions, anchorage information, roughing-in dimensions, and templates for installation of products specified in this Section

.2 Install products only as specified by manufacturer

.3 Verify location and mounting heights of products with Consultant before roughing-in or installation.

.4 Include reinforcing, anchorage and mounting device required for the installation of each product.

.5 Install products plumb, level, straight, tight and secure to mounting surfaces.

.6 Use only fasteners that match material and finish of fastened products where exposed to view.

.7 All required plumbing and electrical connections for Food Service Equipment shall be installed as part of the work of Division 22 and Division 26 respectively.

.8 Seal all penetrations to meet CRCA Guidelines.

3.03 ADJUSTING AND CLEANING

.1 Adjust operating units to ensure free-acting, tightly closing and properly functioning operation. Lubricate as required.

.2 Refinish damage or defective products so that no variation in surface appearance is discernible. Refinish products at site only if approved.

3.04 SOUND LEVEL READINGS FOR REFRIGERATED CASES AND TEST PROCEDURE:

.1 All LCBO refrigerated cases are required to have a sound level with fans in operation no more than 63 – 70 dBA. At no time is a level greater than 70 dBA acceptable.

.2 Sound level measurements to be obtained using a handheld sound level meter [SLM]. The SLM must comply with at least the minimum Type 2 requirements of ANSI S1.4 or IEC 61672. Take three sound level readings, one inch from the air intake grill of each of the refrigerated cases. This will be at the lowest height just inside the front face of the unit. Take one reading on each side, approximately three inches from the end of the unit and one reading in the middle. Readings will be the average sound level over a one minute time frame with the circulation fans in operation.

END OF SECTION

PART 1: GENERAL

1.01 SUBMITTALS

.1 Submit product data sheets of each item specified indicating
  .1 Performance criteria, compliance with appropriate reference standard(s), characteristics, limitations, and finishes.
  .2 Product transportation, storage, handling and installation requirements.

.2 Shop drawings: Submit shop drawings indicating elevations, sections and details of opening size, clearances, handling of operating components, anchorage, dimensions, gauges, materials, and finishes.

.3 Samples: Submit two 300 x 300 mm samples of fabric type.

.4 Closeout submittals: Submit cleaning and maintenance instructions for incorporation into Operations and Maintenance Manuals for the following:
  .1 Functional description detailing operation and control of components.
  .2 Performance criteria and maintenance data.
  .3 Operating instructions and precautions.
  .4 Safety precautions.

1.02 WARRANTY

.1 Manufacturer shall provide warranty that all components are free of manufacturing defects for two years from date of installation. This warranty is void if the product has been improperly installed or subjected to improper care.

PART 2: PRODUCTS

2.01 MANUAL ROLLER SHADES

.1 Roller shade system, solar reflective sun control system by one of the following acceptable manufacturers:
  .1 Solarfective – Solar Glass,
  .2 Sunproject – Phifer,
  .3 CartsPlus Healthcare Products Ltd – MechoSystems,
  .4 Glamour Line (IMC Emerald Corp) – Sunshadow,
  .5 Elite Solar Shades – Mermet,
  .6 Or approved alternate.

.2 Shade fabric criteria:
  .1 Composition: 35% Fiberglass, 65% Vinyl on Fiberglass, dense vertical weave
  .2 Openness: 5% factor to suit orientation and glazing
  .3 Emissions: Low chemical emissivity
  .4 Warranty: 10 year
  .5 Colour: bi-colour white/light grey weave. Submit sample for approval.
  .6 Fire retardant and anti-microbial without topical treatment.
  .7 Shade cloth seconds or shade cloth manufactured using reprocessed materials are unacceptable.

.3 Mounting: header-mounted.

.4 Exposed metal components, including the box, shall be clear anodized aluminum.

.5 Accessories without exposed fastening: Single fascia: One-piece extruded aluminium.

.6 Operating chain shall not extend lower than 1.1m above finished floor.

3.01 INSTALLATION

.1 Install roller window shades in accordance with authorities having jurisdiction, reviewed shop drawings, and manufacturer's written instructions.

.2 Install shades in locations shown using specified fasteners, plumb, true, square, straight, and level in proper planes, complete with all fascias/soffits, trims and accessories.

3.02 ADJUSTMENT AND CLEANING

.1 The shade cloth fabric shall hang flat, without buckling or distortion. The edge, when trimmed, shall hang straight without ravelling. An unguided roller shade cloth shall roll true and straight, without shifting sideways more than 3 mm in either direction due to warp distortion, or weave design.

.2 Adjust, correct and lubricate fabric shade as required, to provide smooth and efficient operation without binding.

.3 Clean shade surfaces and remove all finger marks and smudges from fascia, soffits, and trim surfaces. Remove all protective films.

.4 Leave fabric shade in raised position and in first-class condition upon completion of the Work of this Section.

END OF SECTION

PART 1: GENERAL

1.01 APPLICATION

This Section specifies requirements, products, common criteria and characteristics, and methods and execution that are common to one or more Sections of Mechanical Work Divisions, and it is intended as a supplement to each Section and is to be read accordingly.

1.02 DOCUMENTS

The mechanical Specification and the mechanical drawings are an integral part of the Contract Documents and are to be read accordingly.

Comply with the requirements of the General Requirements Section of this Specification.

The mechanical drawings are performance drawings, diagrammatic, and show approximate locations for equipment and materials. The drawings are intended to convey the scope of work and do not necessarily show architectural and structural details. The locations of materials and equipment shown may be altered (when revised layouts have been submitted and approved), to meet requirements of the material and/or equipment, other equipment and systems being installed, and of the building. Provide all fittings, offsets, transformations, and similar items required as a result of obstructions and other architectural or structural details but not shown on the mechanical drawings.

1.03 PLANNING AND LAYOUT OF WORK

The exact locations and routing of mechanical and electrical services are to be properly planned, coordinated and established with all affected trades prior to installation such that the services will clear each other as well as any obstructions. Generally, give the right-of-way to piping requiring uniform pitch and locate and arrange other services to suit.

All 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 requirements are to be relocated at no cost.

1.04 CO-OPERATION & RELATIONSHIP WITH OTHER WORK AND TRADES

Co-operate fully with all trades in such a manner as to not interfere with other work being carried on in the building. Where other work and equipment has to be installed along with mechanical work, arrange with other trades to install this work to best suit the particular condition.

Examine the architectural, structural, and electrical drawings and specifications in conjunction with the mechanical drawings and specifications and be satisfied that the mechanical work as shown and specified can be performed without changes to the building.

Co-operate and co-ordinate with the Building Commissioning Consultant (BCC) hired by LCBO.

1.05 QUALIFICATION OF TRADESMEN

Maintain at the job site, at all times, qualified personnel and supporting staff, with proven experience in erecting, supervising, testing and adjusting projects of comparable nature and complexity.
All apprentices must always be supervised by a qualified journeyman.

1.06 CODES AND STANDARDS

All work is to be executed in accordance with all governing Codes, Standards, and By-laws.
Where any Code, Regulation, By-law, or Standard is quoted it means the current edition including all revisions or amendments at the time of the Contract. Where references are made to printed directions or recommendations, it means the current edition of such directions and recommendations.
All mechanical piping system work, including equipment, must comply in all respects with requirements of the Ontario Technical Standards and Safety Authority.
Where required, fittings, valves, equipment, etc., must bear a CRN number.
All electrical items associated with mechanical equipment are to be CSA (or equivalent agency) certified electrically, or bear a stamp to indicate ESA approval.

1.07 SHOP DRAWINGS

Submit shop drawings in accordance with the requirements of Division 01.
Show on shop drawings:

.1 Clear and obvious notes of any proposed changes from Drawings and Specifications.
.2 Fabrication and erection dimensions.
.3 Provisions for allowable construction tolerances and deflections provided for live loading.
.4 Details to indicate construction arrangements of the parts and their connections, and interconnections with other work.
.5 Location and type of anchors, and exposed fastenings.
.6 Materials and finishes.
.7 Physical dimensions of materials including thickness and gauges.
.8 Descriptive names of equipment.
.9 Mechanical and electrical characteristics when applicable.

.10 Information to verify that superimposed loads will not affect function, appearance, and safety of the work detailed as well as of interconnected work.
.11 Assumed design loadings, and dimensions and material specifications for

load-bearing members.

.12 Dimensions and dimensioned locations of proposed chases, sleeves, cuts, and holes in structural members.

.13 All shop drawings of structural components or components that are to withstand dead loads, live loads and/or wind/horizontal loads shall be sealed and signed by a registered professional engineer.

LIST OF REQUIRED SHOP DRAWINGS TO BE SUBMITTED IN A TIMELY MANNER BY CONTRACTOR TO LCBO DESIGN CO-ORDINATOR, COPIED TO ALL RELEVANT DESIGN CONSULTANTS: (This list may not reflect all shop drawings required. It is the responsibility of the contractor to insure that all requirements for submittals are met as specified.)

Shop Drawings required:

.14 Refrigeration – **piping layout drawings must be manufacturer-designed and engineer-stamped.**

.15 Domestic Hot Water Heaters

.16 Drains

.17 Plumbing Fixtures and Trim

.18 Plumbing Specialties

.19 Sprinkler Layout

.20 Fans

.21 Fire Dampers

.22 Grilles and Diffusers

.23 Controls for A/C Units, Fans, etc.

Catalogue cuts required:

.24 Plumbing

.25 Drains

.26 Domestic Hot Water Heaters

.27 Grilles and Diffusers

.28 Controls for A/C Units, Fans, etc.

1.08 PERMITS, CERTIFICATES AND FEES

Apply for, obtain and pay for all permits, licenses, inspections, examinations and fees required.

Arrange for inspection of all work by authorities having jurisdiction. On completion of the work, present to the Owner the final unconditional certificates of approval of the inspecting authorities.

Before starting any work, submit the required number of copies of drawings and Specifications to the authorities for their approval and comments. Comply with any changes required as part of the Contract but notify the Consultant immediately of such changes for proper processing of these requirements. Prepare and furnish any additional drawings, details or information as may be required.

1.09 RECORD DRAWINGS

Record, as the Work progresses, work constructed differently than shown on Contract Documents. Record all changes in the Work caused by site conditions; by Owner, Consultant, consultant, Contractor, and Subcontractor originated changes; and by site instructions, supplementary instructions, field orders, change orders, addendums, correspondence, and direction of jurisdictional authorities. Accurately record location of concealed structure, and mechanical and electrical services, piping, valves, conduits, pull boxes, junction boxes and similar work not clearly in view, the position of which is required for maintenance, alteration work, and future additions. Do not conceal critical work until its location has been recorded.

White prints will be provided by the Consultant at no cost to the Contractor for each Section in which record drawings are required. Record changes in the Work on these prints in red ink.

Dimension location of concealed work in reference to building walls, and elevation in reference to floor elevation. Indicate at which point dimension is taken to concealed work. Dimension all terminations and offsets of runs of concealed work. Make records in a neat and legibly printed manner with a non-smudging medium. Identify each record drawing as "Project Record Copy". Maintain drawings in good condition and do not use them for construction purposes.

Maintain Project record drawings in a state current to Project. Such state will be considered a condition precedent for validation of applications for payment. The Consultant's visual inspection will constitute proof that record drawings are current. Provide Consultant with accurate record drawings, in hard copy with red-line mark-ups, with application for Certificate of Substantial Performance. Final acceptance of the Work will be predicated on receipt and approval of record drawings.

1.10 INSTRUCTION TO OWNER

Instruct the Owner’s representatives in all respects of the operation and maintenance of mechanical systems and equipment. Obtain in writing from the Consultant a list of the Owner’s representatives qualified to receive instructions.

Arrange for, and pay for services of service engineers and other manufacturers’ representatives required for instruction on specialized portions of the installation.

Submit to Consultant at the time of final inspection, a complete list of systems, stating for each system:

.1 date instructions were given to the Owner’s staff
.2 duration of instruction
.3 name of persons instructed
.4 other parties present (manufacturer’s representative, consultants, etc.)

The minimum time to be allocated to training shall be 16 hours. The Contractor shall provide a schedule, a list of systems and equipment for which training will be provided, names of people who will provide the training and an agenda for each session.

1.11 OPERATION AND MAINTENANCE MANUALS

Submit three (3) copies of Project Data Book at completion of Project on application for Certificate of Substantial Performance.

Submit with Project Data Book, one copy of each final approved shop drawing issued for Project on which have been recorded changes made during fabrication and installation caused by unforeseen conditions.

Submit with Project Data Book extended warranties together in one report binder.

The Project Data Book shall:

.1 Consist of a hard-cover, black, vinyl-covered, loose-leaf, letter size binder.

.2 Have a title sheet, or sheets preceding data on which shall be recorded Project name, date, list of contents, and Contractor's and Subcontractors' names and addresses.

.3 Be organized into applicable Sections of work with each Section separated by hard paper dividers with plastic covered tabs marked by Section.

.4 Contain only typed or printed information and notes, and neatly drafted drawings.

.5 Contain maintenance and operating instructions on all mechanical equipment.

.6 Contain maintenance instructions.

.7 Contain brochures and parts lists on all equipment.

.8 Contain a list of manufacturers and trade names of finishes and coatings applied.

.9 Contain sources of supply for all proprietary products used in the work.

.10 Contain lists of supply sources for maintenance of all equipment in Project of which more detailed information is not included above.

.11 Contain finished hardware schedule.

.12 Contain charts, diagrams and reports.

Operations and Maintenance Manuals shall be submitted and reviewed by the Consultant of Record and BCC before training shall commence.

1.12 EXISTING CONDITIONS

Before submitting tenders, carefully examine the drawings, Specifications and the job site to determine and confirm the existing conditions which will or may affect the proposed work. Claims for extra payment because of failure to fulfil this condition will not be considered. Existing conditions include, without being limited to, such items as: electrical power characteristics and location; water supply and sewer sizes and location; soil conditions and space limitations.

Note work performed by the Landlord and all work not performed by him as part of the Contract.

1.13 WORKPLACE SAFETY

Comply with requirements of the Workplace Hazardous Materials Information System (WHMIS) regarding the use, handling, storage and disposal of hazardous materials.

Comply with all requirements of Ontario Regulation 213/91, Occupational Health and Safety Act and Regulations for Construction Projects.
Submit WHMIS MSDS (Material Safety Data Sheets) for all products where required, and maintain one copy at the site in a visible and accessible location and available to all personnel.

1.14 WORK WARRANTY

Include for an overall 12 month warranty period for all mechanical work materials and workmanship. The warranty period is to commence at substantial completion. All warranty work shall be scheduled with LCBO who will determine when the work shall commence. The work to be performed shall be documented and provided to the Consultant for review. All equipment, materials and systems shall conform to the specification requirements. The cost of all work shall be the responsibility of the Contractor.

1.15 EQUIPMENT WARRANTIES

Warrant all mechanical equipment against defect in material and workmanship for a period of two years from the date that the LCBO occupies the property.
The equipment installer/seller is to provide for the duration of the warranty and extended warranty periods, any and all of the prescribed maintenance to any and all of the supplied components which might limit the term or otherwise invalidate the warranty.
Should the Consultant determine that testing and balancing will be required after warranty work has been completed, the Contractor shall schedule and pay for the Agency who will conduct this work. Submit report to the Consultant for review.

The warranty of any systems that is commissioned after the substantial performance date shall begin when that system has been commissioned and accepted by the Consultant.

1.16 PRODUCT AND PRODUCT MANUFACTURER REQUIREMENTS

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, acceptable manufacturers are stated for any products specified by manufacturer's name and model number. The tender price may be based on products supplied by any of the manufacturers named as acceptable for the particular product. If acceptable manufacturers are not stated for a particular product, base the tender price on the products supplied by the specified manufacturers.
If products supplied by a manufacturer named as acceptable are used in lieu of the manufacturer specified, be responsible for ensuring that the substituted product is equivalent in performance and operating characteristics (including energy consumption if applicable) to the specified product, and, it is to be understood that any additional costs, and changes to associated or adjacent work resulting from

provision of products supplied by a manufacturer other than the specified manufacturer is included in the tender price.
Products required to have ASME, CSA, ULC, GCA or other approval are to be properly marked or labelled indicating that the product has been approved.

1.17 ELECTRICAL POWER CHARACTERISTICS

Unless otherwise shown or specified the permanent power supply is to be 600 volt, 3 phase, 4 wire, and 120/208 volt, 3 phase, 4 wire for final use.
Confirm the characteristics of construction power supply.

1.18 SEASONAL EQUIPMENT/SYSTEM START UP

Provide start up, testing and commissioning of any system that requires seasonal commissioning. For example if the acceptance period for the project was during the Winter then schedule start-up of the air conditioning during the Spring of the following season. Provide the necessary labour from the equipment supplier and the Balancing Contractor and the Controls Contractor. Schedule the work with LCBO and the BCC. Provide reports to the Consultant and the BCC for review.

PART 2: PRODUCTS

2.01 PIPE SLEEVES

Minimum 0.635 mm thick galvanized steel with an integral flange at one end to secure the sleeve to formwork construction.
Factory fabricated, flanged, high density polyethylene sleeves with reinforced nail bosses.

Schedule 40 mild galvanized steel pipe with a welded-on square steel anchor and water stop plate at the sleeve midpoint.

2.02 PIPE ESCUTCHEON PLATES

One-piece chrome plated brass or #4 finish type 302 stainless steel plates with screws, each sized to cover the pipe sleeve or wall or slab opening, and to fit tightly around the pipe or pipe insulation.

2.03 PIPING HANGERS AND SUPPORTS

Pipe hanger and support materials, including accessories, are to be in accordance with the Manufacturers Standardization Society (MSS) Standard Practice Manual ANSI/MSS SP- 58, Pipe Hangers and Supports – Materials, Design and Manufacture, and where possible, MSS designations are to be indicated with each product. **Hangers and supports for insulated piping are to be sized to fit around the insulation.** Unless otherwise specified, all ferrous hangers and supports are to be electro-galvanized.
Horizontal Suspended Piping: Hangers and supports are to be:

.1 adjustable steel clevis hanger – Anvil Fig. 260
.2 swivel ring band type hanger – Anvil Fig. 69

Horizontal Pipe On Vertical Surfaces: Supports are to be:

.3 steel offset pipe clamp – Myatt Fig. 170
.4 heavy-duty steel pipe clip – Myatt Fig. 161 or 162
.5 single steel pipe hook – Myatt Fig. 156

Vertical Risers Through Floors: supports are to be:

.6 copper tubing riser clamp – Anvil Fig. CT-121C
.7 Heavy-duty steel riser clamp – Anvil Fig. 261

Vertical Piping on Vertical Surfaces: Supports are to be:

.8 steel offset pipe clamp – Myatt Fig. 170
.9 heavy-duty steel pipe clip or soil pipe bracket – Myatt Fig. 161 and 162

Special Hangers and Supports: Special hangers and supports for various applications are as follows:

.10 for groups of pipes having the same slope – Anvil Fig. 195 welded steel brackets, Anvil Fig. 46 universal trapeze assemblies, or Unistrut or equal support assemblies, all with U-bolts, clamps, etc., to secure pipes in place
.11 for sections of piping connected to vibration isolated equipment – hangers and supports as specified above but complete with Anvil Fig. 247 spring hangers
.12 for piping on an existing roof – Portable Pipe Hangers (Canada) Inc. "PP" Series prefabricated portable pipe support system components to suit the pipe, complete with all required accessories including bases, galvanized structural steel frames, and galvanized steel pipe hangers and/or supports conforming to MSS SP-58
.13 for piping on new roofs – Lexcor "Flash-Tite" or Thaler Roofing Specialties Products Inc. "MERS" Series insulated aluminium support risers with diameter, height, securement method and flashing to suit the application, all required accessories, channel type aluminium cross members, and galvanized steel pipe hangers and/or supports
.14 for fire protection piping – generally as above but ULC listed and/or FM approved, and in accordance with Chapter 2 of NFPA No. 13
.15 for bare horizontal copper piping – generally as above but factory vinyl coated to prevent direct copper/steel contact
.16 for bare copper vertical – corrosion resistant ferrous clamps with flexible rubber materials (**not tape**) to isolate the pipe from the clamp
.17 insulation protection shields – equal to Anvil "Rib-lock" Fig. 168 galvanized steel shields with ribs to keep the shield centred on the hanger

Hanger Rods: Galvanized carbon steel (unless otherwise specified), round, threaded, to ASTM A36, complete with captive machine nuts with washers at hangers, sized to suit the loading in accordance with Table 3 in MSS SP-58, but in

any case minimum 9.5 mm diameter.

Acceptable Manufacturers: Acceptable hanger and support material manufacturers are:

.18 E. Myatt & Co. Inc.
.19 Anvil International Inc.
.20 Empire Tool & Mfg. Co. Inc.
.21 Hunt Manufacturing Ltd.
.22 Or approved alternate.

2.04 ACCESS DOORS

.1 Prime coat painted steel (unless otherwise specified) flush access doors, each complete with a minimum 1.5 mm thick frame, minimum 1.2 mm thick door panel, heavy-duty rust-resistant concealed hinges, a positive locking screwdriver lock, and mounting and finishing features to suit the particular construction in which is to be installed.

.2 Access door sizes are to suit the concealed work for which they are supplied, and wherever possible they are to be of a standard size for all applications, but in any case they are to be minimum 250 mm x 250 mm.

.3 Access doors in fire rated construction are to be ULC listed and labelled and of a rating to maintain the fire separation integrity.

.4 Where access doors are located in surfaces where special finishes are required, they are to be of a recessed door type capable of accepting the finish in which they are to be installed so as to maintain the final building surface appearance throughout.

.5 Acceptable manufacturers are Lettage, Zurn, and Pedlar.

2.05 ELECTRIC MOTORS

Motors, unless otherwise specified, are to meet all requirements of EEMAC Standard MG1, applicable IEEE Standards, and applicable CSA C222 Standards and shall be of Canadian Manufacture.

Single Phase Motors: Unless otherwise specified, motors smaller than 0.373 kW (½ HP) are to be 115 volt, continuous duty capacitor start type with an EEMAC 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 ambient temperature.

Three Phase Motors: Unless otherwise specified, motors 0.373 (½ HP) and larger are to be totally enclosed, fan cooled, 3 phase, T-frame, high efficiency squirrel cage continuous duty induction motors suitable for voltages indicated on the Drawings, EEMAC Design “B” for normal starting torque or Design “C” for high starting torque as required by the application, each complete with Class “B” insulation, a 1.5 service factor at 40° C ambient temperature, regreasable open ball bearings with grease fittings to permit relubrication without dismantling the motor, a cast iron frame with cast iron feet where required, cast iron end bracket and precision

machined bearing fit, and balanced carbon steel shaft assembly with die-cast aluminium rotor windings.
Motor connection boxes are to be located on the side of the motor most easily accessible for maintenance and remote from belts, gears or driven equipment. If boxes are located on the wrong side of motor they are to be relocated.
Each multi-speed motor and associated switching device is to be circuited such that the overload device in the starter protects the motor on each step of the multi-speed switch. As an alternative to this requirement the motor may have integral overload protection.
Shop drawings are to be submitted for all electric motors and are to include the following information:

.1 horsepower
.2 voltage
.3 frequency
.4 speed
.5 staring current and torque characteristics
.6 full load current
.7 class of insulation
.8 enclosure type
.9 service factor
.10 ambient temperature reference
.11 type of bearings
.12 location of connection box
.13 manufacturer

Acceptable Manufacturers: Acceptable motor manufacturers are:

.14 Westinghouse Canada Inc.
.15 Canadian General Electric
.16 Baldor
.17 U.S. Motors
.18 Weg
.19 Marathon
.20 Magnatech
.21 Toshiba
.22 Or approved alternate

2.06 ELECTRICAL WIRING MATERIALS AND COMPONENTS FOR MECHANICAL EQUIPMENT AND SYSTEMS

Refer to Division 26.
Conduit, Conductors, and Wiring Accessories for power and control wiring which is to be done as part of the mechanical work (see Part 3 of this Section) is to be as specified in Division 26. Components such as motor starters, disconnect switches, etc., are to be as specified below.

Motor Starters – 3 Phase: Equal to Allen-Bradley full voltage, non-reversing, across-the-line combination magnetic starters selected to suit the size and voltage of the associated motor, and capable of starting the motor under the imposed load. Starters are to be complete with the following:

.1 a moulded case magnetic circuit breaker
.2 three-phase, ambient compensated, thermal overload relays with heaters sized in accordance with motor nameplate rating
.3 a 120 volt secondary control transformer sized 50 VA larger than the associated motor standard volt ampere requirement
.4 a minimum of two N/O and two N/C auxiliary contacts wired to terminals
.5 push-to-test type pilot lights for motors, a hand-off-auto selector switch
.6 for automatically, controlled motors, a hand-off-auto selector switch
.7 an EEMAC 2 sprinkler-proof enclosure

Motor Starters – 1 Phase: Unless otherwise specified, starters for 1 phase motors are to be equal to Allen-Bradley Bulletin 600, 115 volt, thermal overload protected manual starting switches with a neon pilot light, a surface or flush mounting EEMAC enclosure to suit the application, and where automatic operation is required, a separate "hand-off-automatic" selector switch in an enclosure to match the starter enclosure.

Disconnect Switches: Heavy-duty, front operated switches, each in accordance with requirements of CSA C22.2 No. 4 and complete with:

.8 a red operating handle which can be padlocked in the off position
.9 a hinged front cover with mechanical interlock to prevent door opening when the switch is on
.10 a quick-make, quick-break, non-teasible, positive acting switch mechanism with visible blades and line terminal shields
.11 for fused switches, fuse clips suitable for HRC fuses as specified for motor starters
.12 an enamelled steel enclosure, EEMAC 3, galvanized where located outdoors, EEMAC 2 sprinkler-proof where located indoors

2.07 MECHANICAL WORK IDENTIFICATION MATERIALS

Equipment Nameplates: Laminated plastic (Lamacoid) white-black-white (black text on white background unless otherwise noted). Minimum 1.6 mm thick, minimum 12 mm x 50 mm for smaller items such as damper motors and control valves, and minimum 25 mm x 65 mm for equipment. Each nameplate is to be complete with bevelled edges and engraved wording to completely identify the equipment with no abbreviations. Wording is generally to be as per the drawings but must be reviewed prior to engraving. Name plates shall include equipment tag number as per drawings, and electrical panel number the unit is fed from. Lamacoids for any electrical outlets and switches must be placed above the cover plate (not on the cover plate). Refer to Table 1 below for more details. Supply stainless steel

screws for securing nameplates in place.

.1 Fit up contractor to install nameplates on all landlord supplied equipment.

Valve Tags: Coloured, 40 mm square, 2-ply laminated plastic with bevelled edges, red-white, yellow-black, etc., to match the piping classification colour, each complete with a 3.2 mm diameter by 100 mm long brass plated steel bead chain, and four lines of engraved maximum size identification wording, i.e.:

.2 VALVE V2

.3 20 mm

.4 DOMESTIC COLD WATER

.5 NORMALLY OPEN

Standard Pipe Identification: Standard pipe identification is to be equal to Smillie McAdams Summerlin Ltd. "Coil-Mark" consisting of coloured, coiled, semi-rigid vinyl plastic of a length to wrap completely around the pipe, and indoor/outdoor type vinyl ink lettering and directional arrows.

Duct Identification: Custom made Mylar stencils with a 50 mm high lettering to accurately describe the duct service, i.e. "AHU-1 SUPPLY", complete with a directional arrow, and coloured inks with ink pads and roller applicators. Ink colours are to contrast with the lettering background.

Table 1: Lamacoid Label Details

Item	Text to be Listed on Lamacoid	Text Height (mm)
Electrical Outlets	Panel and circuit number *(Example: 2A-12).*	3
Staff Rm Exhaust Fan Switch	EXHAUST FAN TIMER	3
Washroom Light Switches	MANUAL–ON AUTO-OFF	6
Washroom Wall Mounted Occupancy Sensors	AUTO-ON AUTO-OFF	6
Emergency Test Light Button	EMERGENCY LIGHTS – PUSH TO TEST *(This lamacoid shall be red with white text).*	6
Security Shutters	SECURITY SHUTTER #X *(please note, #1 is closest to the office)*	3
Sun Shade	SUN SHADE	3
Hydro Meter	LCBO HYDRO METER	6
Warehouse Ceiling Fan Switch	CEILING FANS, panel and circuit number	6 for name, 3 for panel and circuit number
Rooftop Exhaust Fans	EF-X, panel and circuit number *(note "X" will depict the item number)*	6 for name, 3 for panel and circuit number
Roof Top Unit	RTU-X, panel and circuit number	6 for name, 3 for panel and circuit number
Rooftop Refrigeration Unit (Kooljet), Walk-In	WIC-AC-X, panel and circuit number	6 for name, 3 for panel and circuit number

Coldroom		
Rooftop Condensing Unit, Walk-In Coldroom	WIC-CU-X, panel and circuit number	6 for name, 3 for panel and circuit number
Rooftop Refrigeration Condenser – Reach-In Case Refrigerator	RIC-CU-X, panel and circuit number	6 for name, 3 for panel and circuit number
Warehouse Unit Heater	UH-X, panel and circuit number	6 for name, 3 for panel and circuit number
Gas Meter	LCBO GAS METER	6
Water Meter	LCBO WATER METER	6
Domestic Water Shut-Off Valve	LCBO WATER SHUT-OFF	6
Trap Seal Primer	TRAP SEAL PRIMER, panel and circuit number	6 for name, 3 for panel and circuit number
Eye Wash Mixing Valve	EYE WASH MIXING VALVE	6
Battery Unit	BU-X, panel and circuit number *(This lamacoid shall be red with white text).*	6 for name, 3 for panel and circuit number
Reach-In Case Refrigerator Indoor Units	RIC-EVAP-X, panel and circuit number	6 for name, 3 for panel and circuit number
Open / Cold Beer Sign's Switch	OPEN/COLD BEER SIGN, panel and circuit number	6 for name, 3 for panel and circuit number
Electrical Panels	Panel and Voltage *(example: PANEL-2A, 208V)*	6
THC Unit and THC Remote Condenser	THC, panel and circuit number	6 for name, 3 for panel and circuit number
Phase Loss Box	PHASE LOSS	6
TVSS	TVSS, panel and circuit number	6 for name, 3 for panel and circuit number
Kooljet PLC	WIC-HMI, panel and circuit number	6 for name, 3 for panel and circuit number
Retail Area Sensors	Item identification *(note, labels supplied and installed by BAS contractor)*	**3**
Office Lights	OFFICE LIGHTS	3
Vestibule Electric Heater	VEST-HTR, panel and circuit number	6 for name, 3 for panel and circuit number
Vestibule Supply Fan	VEST-SF, panel and circuit number	6 for name, 3 for panel and circuit number

Vestibule Supply Fan Filter	FAN FILTER	6
Baseboard Heaters	BBH-X, panel and circuit number	6 for name, 3 for panel and circuit number
Domestic Hot Water Heater	HWT-X, panel and circuit number	6 for name, 3 for panel and circuit number
Forced Flow Heater	FFH-X, panel and circuit number	6 for name, 3 for panel and circuit number
Heat Pumps	HP-X, panel and circuit number	6 for name, 3 for panel and circuit number
Fan Coil Units	FCU-X, panel and circuit number	6 for name, 3 for panel and circuit number
Thermostat / Remote Sensors	Item identification	3

PART 3: EXECUTION

3.01 GENERAL PIPING AND DUCTWORK INSTALLATION REQUIREMENTS

Unless otherwise specified, locate and arrange horizontal pipes and ducts above or at the ceiling on floors on which they are shown, arranged so that under consideration of all other work in the area, the maximum ceiling height and/or usable space is maintained.

Unless otherwise specified, install all work concealed in finished spaces, and concealed to the degree possible in partially finished and unfinished spaces. Refer to and examine the Architectural drawings and room finish schedules. to determine finished, partially finished, and unfinished area. Note that walls which are painted are considered finished.

Install all pipes and ducts parallel to building lines.

Neatly group and arrange all exposed work.

Locate all valves, dampers and any other equipment which will or may need maintenance or repairs and which are installed in accessible construction so as 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 the accessories at the floor level.

Make all connections between pipes of different materials using proper approved adapters. Provide cast brass dielectric type adapters at connections between steel and copper pipe.

Ensure that equipment and material manufacturers' installation instructions are followed unless specified herein or on the drawings, and unless such instructions contradict governing codes and regulations.

Carefully clean all ducts, pipe and fittings prior to installation. Temporarily cap or plug ends of pipe, ducts and equipment which are open and exposed during

construction.
Install piping and ductwork which are to be insulated so that they have sufficient clearance to permit insulation to be applied continuously and unbroken around the pipe or duct, except at fire barriers, in which case the insulation will be terminated at each side of the fire barrier.

3.02 INSPECTION AND CLEANING

Inspect surfaces and structure prepared by other trades before performing your work. Verify that surfaces or the structure to receive your work have 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.

Ensure that exposed ferrous metal products, except ductwork and piping, have at least one factory prime coat, or paint such ferrous metal products with one prime coat on the job.
Clean and wire brush ferrous metal products before applying the prime coat. For factory applied finishes, repaint or refinish surfaces damaged during shipment, erection or construction work.

3.03 INSTALLATION OF PIPE SLEEVES

Where pipes pass through concrete and/or masonry surfaces provide pipe sleeves as follows:

.1 in poured concrete slabs, unless otherwise specified – minimum 0.635 mm thick flanged galvanized steel or, where permitted by governing authorities, factory fabricated plastic sleeves

.2 in concrete or masonry walls – Schedule 40 galvanized steel pipe

Size sleeves, unless otherwise specified, to leave 12 mm clearance around the pipes, or where pipe is insulated, a 12 mm clearance around the pipe insulation.
Pack and seal the void between the pipe sleeves and the pipe or pipe insulation for the length of the sleeves as follows:

.3 pack sleeves in non-fire rated interior construction with mineral wool and seal both ends of the sleeves with non-hardening silicone base caulking compound

.4 pack sleeves in exterior walls above grade with mineral wool and seal both ends of the sleeves water-tight with approved non-hardening silicone base caulking compound unless mechanical type seals have been specified

Sleeves in fire rated construction will be packed and sealed as part of the work specified in Division 07.
Where sleeves are required in masonry work, accurately locate and mark the sleeve position, and turn the sleeves over to the trade performing the masonry work for installation.
Terminate sleeves for piping which will be exposed so that the sleeve is flush at both

ends with the wall, partition or slab surface so that the sleeve may be completely covered by an escutcheon plate.

3.04 DUCT OPENINGS

Duct openings, air inlet and outlet openings, fire damper and similar openings will be provided in poured concrete work, masonry drywall and other building surfaces by the trade responsible for the particular construction in which the opening is required.

3.05 SLEEVE AND FORMED OPENING LOCATION DRAWINGS

Prepare and submit for review and forwarding to the concrete reinforcement detailer, drawings indicating all required sleeves, recesses and formed openings in poured concrete work.

Such drawings are to be complete and accurately dimensioned and relate sleeve, recesses, and formed openings to suitable grid lines and elevation datum.
Begin to prepare such drawings immediately upon notification of acceptance of Tender and award of Contract.

3.06 INSTALLATION OF PIPE ESCUTCHEON PLATES

Provide escutcheon plates suitable secured over all 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.

3.07 INSTALLATION OF FASTENING AND SECURING HARDWARE

Provide all fastening and securing hardware required for mechanical work to maintain installations attached to the structure or to finished floors, walls and ceilings in a secure and rigid manner capable of withstanding the dead loads, live loads, superimposed dead loads, and any vibration of the installed products.
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.
Where the floor, wall or ceiling construction is not suitable to support the loads, provide additional framing or special fasteners to ensure proper securement to the structure that is to support the products. Provide reinforcing or connecting supports where required to distribute the loading to the structural components.
Obtain written consent before using explosive actuated fastening devices. If consent is obtained, comply with requirements of CSA Standards CAN3-Z166.1 and 2-M85.

3.08 INSTALLATION OF PIPE HANGERS AND SUPPORTS

Provide all required pipe hangers and supports. 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 the structure only.

For insulated pipe, size the hanger support to suit the insulated pipe and install the hanger or support on the outside of the insulation and insulation finish.

Underground Piping: Support requirements for underground piping as follows:

.1 support underground pipe, unless otherwise specified, on a well compacted bed of dry, natural, undisturbed earth free from rocks or protrusions of any kind, or on compacted material as specified

.2 support underground service piping penetrating building exterior walls or foundations to prevent pipe damage if minor building settlement occurs

.3 ensure that all bedding and supports for underground pipes are flat and true and that allowances are made for pipe hubs, couplings, or other protrusions so that no voids are left between the pipe and the bedding

Horizontal Above Ground Piping: 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 to and including 25 mm dia. are to be clevis type or adjustable ring type, and hangers for suspended pipe 40 mm dia. and larger are to be adjustable clevis type. Space hangers and supports in accordance with the following:

.4 cast iron pipe: hang or support at every joint with maximum 2.4 m spacing

.5 plastic pipe: conform to pipe manufacturer's recommended support spacing

.6 copper and steel pipe: hang or support at spacing in accordance with the following schedule:

PIPE DIA. (mm)	MAX. SPACING STEEL (meters)	MAX. SPACING COPPER (meters)
to 32	2.1	1.8
40	2.7	2.4
50	3.0	2.7
65	3.6	3.0
75	3.6	3.0
90	3.6	3.6
100	4.2	3.6
250	6.0	

.7 changes in direction: where pipes change direction, either horizontally or vertically, provide a hanger or support on the horizontal pipe not more than 300 mm from the elbow, and where pipes drop from tee branches, support the tees in both directions not more than 50 mm on each side of the tee.

.8 grouped piping: when pipes with the same slope are grouped and a common hanger or support is used, space the hanger or support to suit the spacing requirement of the smallest pipe in the group and secure pipes in place on the common hanger or support.

Vertical Piping: Unless otherwise shown or specified, support vertical piping by means of supports specified in Part 2 of this Section, spaced in accordance with the following:
support vertical pipes at maximum 3 m intervals
for sections of vertical piping with a length less than 3 m support the pipe at least once
for all vertical cast iron plan end pipe (mechanical joint type), secure the riser or pipe clamp around the pipe under a flange integral with the pipe for vertical support purposes, or provide a length of hub and spigot pipe to facilitate proper support

Piping On the Roof: Support piping on the roof as follows:

.9 on existing roof – provide support members as specified in Part 2 of this Section spaced as per the schedule above and of a type to suit the application, and, for each support, carefully scrape away the roofing gravel, bed the support in a heavy covering of roofing mastic, then scrape the gravel back up around the support – secure pipes to supports

.10 on new roof – supply manufactured roof supports as per Part 2 of this Section to accommodate the piping involved and support spacing specified above, and hand the supports to the roofing trade on the roof for installation as part of the roofing work, then secure piping in place on the supports

Isolation for Bare Copper Tubing: Each hanger, support or securement for horizontal bare copper tubing is to be plastic coated to prevent direct contact between the pipe and the ferrous hanger. Each wall or floor clamp for vertical bare copper piping is to be isolated from the pipe by means of strips of flexible rubber inserts. The 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.

Insulation Protection Shields: For insulated horizontal piping to and including 40 mm diameter, provide galvanized steel insulation protection shields between the insulation and the hanger or support. Install shields immediately after the pipe is insulated.

Pipe Support from Steel Deck: Do not support piping from steel deck without written consent from the Structural Consultant.

3.09 ACCESS DOORS

Supply access doors to give access to all mechanical work which may need maintenance or repair but which is concealed in inaccessible construction, except as otherwise specified herein or on the drawings.
Locate access doors inconspicuously in walls and partitions and arrange mechanical work to suit. Arrange mechanical work in ceiling spaces to suit approved access door locations.
Group piping and ductwork to ensure the minimum number of access doors is required. Access doors will be installed by the trades responsible for the particular type of construction in which the doors are required.

3.10 MECHANICAL WORK IDENTIFICATION

Exposed Piping & Ductwork: Identify 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 wall or partition
.5 at 6 m intervals on pipe and duct runs exceeding 6 m in length
.6 on each side of special valves, special fittings and branch connections
.7 at least once in each room, and at least once on pipe and duct runs less than 6 m in length

Concealed Piping & Ductwork: Identify concealed piping and ductwork as per Part 2 of this Section in locations as follows:

.8 at points where pipes or ducts enter and leave rooms, shafts, pipe chases, furred spaces, and similar areas
.9 at maximum 6 m intervals on piping and ductwork above suspended accessible ceilings, and at least once in each room
.10 at each access door location
.11 at each piece of connected equipment, automatic valve, etc.

Equipment: Provide an identification nameplate for each piece of equipment, including items such as control valves, motorized dampers, instruments, and similar products. Secure nameplates in place with stainless steel screws unless such a practice is prohibitive, in which case use epoxy cement applied to cleaned surfaces. Locate all nameplates in the most conspicuous and readable location. Locate all nameplates of thermostat and sensors on the wall.

Valve Tagging & Chart: Tag valves and prepare a valve tag chart in accordance with the following requirements:

.12 attach a valve tag to each new valve, except for valves located immediately at the equipment they control
.13 prepare a typed or computer printed valve tag chart to list all tagged valves, with, for each valve, the tag number, location, valve size, piping service, and valve attitude (normally open or normally closed)
.14 if an existing valve tag chart is available at the site, valve tag numbering is to be an extension of existing numbering and the new valve tag chart is to incorporate the existing chart
.15 frame and glaze one copy of the chart and affix same to a wall where later directed at the site
.16 include a copy of the valve tag chart in each copy of the operating and maintenance instructions

3.11 PIPE LEAKAGE TESTING

Before new piping has been insulated or concealed, and before equipment, fixtures

and fittings have been connected, test all piping for leakage. All tests are to be witnessed, by LCBO Project Coordinator and BCC Representative and test forms to be submitted to Consultant for review, arrange prior to testing for all representatives availability.

Drainage & Vent Piping: Securely close all openings and pipe ends and fill piping with water up to the highest level, and ensure that the water stands at the same level for a minimum of two hours. After the fixtures and fittings are set and the pipes connected to the building drain or drains, turn on water into all pipe, fixtures, fittings and traps in order to detect any imperfect material or workmanship. Make a smoke test if required by the Municipality.

Domestic Water Piping: Test piping with cold water at a pressure of 1 ½ times normal working pressure and maintain the pressure for a minimum of two hours.

Sprinkler System Piping: Test all system piping with cold water in accordance with requirements of NFPA No. 13, "INSTALLATION OF SPRINKLER SYSTEMS", and in accordance with any additional requirements of governing authorities.

Natural Gas Piping: Test piping in accordance with the requirements of CAN 1-B149.1. After completion of the verification test, locate the required tag stating the results of the verification test at the point of entry of the gas main into the building, affixed to the pipe in a secure manner. Check all piping joints and connections for leaks with a water/soap solution while the piping is under pressure.

Refrigerant Piping: Test refrigerant piping for leakage and dehydrate in accordance with requirements of Chapter 18 of the 1997 ASHRAE HANDBOOK – FUNDAMENTALS.

Temporarily remove or valve off all piping system specialties or equipment which may be damaged by test pressures prior to pressure testing the systems, and flush piping to remove foreign matter.

Make tight leaks found during tests while the piping is under pressure, and if this is impossible, remove and refit the piping and reapply the test until satisfactory results are obtained.

Where leaks occur in threaded joints in steel piping, no caulking of these joints will be allowed under any conditions.

Tests may be done in sections, as later approved.

In addition to the leakage tests specified above, demonstrate proper flow throughout the systems including mains, connections and equipment, as well as proper venting and drainage. Include for any necessary system adjustments to achieve the proper conditions.

Refer to Section 23 31 00 for duct pressure test.

3.12 ELECTRICAL WORK FOR MECHANICAL EQUIPMENT AND SYSTEMS

The supply of electrical motors, starters, controls, relays, thermostats float switches, pressure switches, flow switches, pilot lights, remote control stations, safety devices,

aquastats, control transformers, disconnects for control circuits, and interlocks is part of the mechanical work.
Mounting of the above equipment is also part of the mechanical work except for line voltage wall thermostats, disconnect switches, and starters, which will be mounted as part of the electrical work.
Division 26 will mount isolation disconnect switches where required for safe servicing of motors, as well as disconnects at electrical panels of all factory assembled package equipment, e.g. rooftop units, condensing units, air conditioning units.
In the case of roof mounted exhaust fans, safety isolation switches are to be factory mounted within the fan, complete with wiring from switch to motor.
Division 26 will provide all power wiring as defined herein.
All control and interlock wiring for mechanical equipment, including connection to equipment and to source of supply is to be done as part of the mechanical work.
Power wiring is defined as all single or three phase wiring carrying the full current of the mechanical equipment, including wiring of full equipment current carrying line voltage controls and isolation disconnects in line between the source and the mechanical equipment, and connection to the equipment.
Control and interlock wiring is defined as all mechanical equipment wiring other than power wiring outlined above.
Detailed wiring diagrams for each motor are to be provided as part of the mechanical work.
Unless specifically indicated otherwise, all damper motor power and control wiring is to be done as part of the mechanical work.
To obtain line voltage supply for motorized dampers, motorized valves or other controls, provide wiring to the nearest lighting or power panel, including connection to same, unless shown otherwise on the drawings.
Where low voltage supply source is required, obtain line voltage supply as described previously and also provide control transformers of necessary voltage and wattage to suit the low voltage equipment and controls.

Unless specifically indicated otherwise, all wiring for damper motor power and control from nearest lighting panel except where the drawings indicate power outlets by Division 26, is to be done as part of the mechanical work, and for these instances, wire from the outlet to the damper motor.
All power wiring shall be installed and run parallel to the building lines.

3.13 INSTALLATION OF PRESSURE GAUGES AND THERMOMETERS

Provide pressure gauges and thermometers where shown and/or specified on the drawings.

Installation Requirements: Conform to the following installation requirements:

.1 for installation of thermometers in piping wells, provide a coat of metallic base heat transfer paste or grease in the piping well

.2 for pressure gauges in piping at equipment locations, install the pressure gauge between the equipment and the first pipe fitting
.3 locate, mount and adjust all instruments so they are easily readable
.4 where pressure gauges and/or thermometers are located at high level or in an area where they cannot be easily seen, provide remote reading instruments

3.14 CONCRETE WORK FOR MECHANICAL SERVICES

Provide all concrete work, including reinforcing and formwork required for mechanical work.
All concrete work is to be in accordance with requirements of Division 03 unless otherwise specified.

3.15 CUTTING AND PATCHING FOR MECHANICAL WORK

All cutting and patching of building surfaces required for mechanical work, including core drilling walls and slabs for piping, will be done as part of another Division of the work, however, the cost for such cutting and patching is to be included in the cost for the mechanical work.

3.16 EXCAVATION AND BACKFILL FOR MECHANICAL WORK

Do all excavation and backfill, including pipe bedding, required for mechanical work.
All excavation and backfill work is to be in accordance with requirements of Division 02 unless otherwise shown or specified.

3.17 QUALITY CONTROL AND COMMISSIONING

Refer to Section 01 45 00 and 01 45 00 1.11 for the quality control and commissioning requirements.
The mechanical systems to be commissioned shall include:

.1 Drainage and plumbing system
.2 Domestic boilers
.3 All mechanical equipment
.4 Air handling units
.5 Controls and BAS
.6 Sprinkler System
.7 Hydronic System (if applicable)

END OF SECTION

1 GENERAL

1.01 APPLICATION

.1 This Section specifies seismic control and restraint 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 SEISMIC CONSULTANT

.1 Retain and pay for the services of an experienced Seismic Consultant who is a registered professional engineer licensed in the area of the work and a member in good standing of a Professional Engineers Association in the area of the work.

.2 The Seismic Consultant is to:

.1 determine the proper seismic hazard level, design, recommend, and review all proposed mechanical work seismic restraint shop, placement and securing drawings, and sign and stamp all drawings prior to submittal for review as specified below;

.2 supervise installation of all mechanical work seismic restraint and, when work is complete, certify in writing that the seismic restraint work has been installed in accordance with signed, stamped and reviewed drawings;

.3 prepare and submit to the Municipality and authorities having jurisdiction, on a form approved by the Municipality and authorities having jurisdiction, at the beginning of seismic restraint work and when the work is complete, original signed and sealed Letters of Assurance for the design, installation and field review of all seismic restraint work.

1.03 SUBMITTALS

.1 **Shop Drawings/Product Data Sheets:** Obtain all required equipment information and submit manufacturer's shop drawings/product data sheets for all restraining devices and steel bases. Include placement data, and details of attachment to both the equipment and the structure meeting requirements of the forces involved. All product data sheets and drawings are to be signed and stamped by the Seismic Consultant referred to above.

.2 **Seismic Consultant's/Seismic Control Product Manufacturer's Certification Letters:** Submit copies of the Seismic Consultant's Letters of Assurance as specified above. Submit copies of the Seismic Consultant and seismic control manufacturer's certification letters as specified in Part 3 of this Section.

.3 **Samples:** If requested, submit samples of seismic restraint materials for review.

1.04 QUALITY ASSURANCE

.1 Seismic restraints are to be designed by a registered professional engineer as specified above, and are to be installed by qualified tradesmen under the supervision of and to the approval of the design engineer.

.2 Unless otherwise specified seismic control and restraints are to be designed in accordance with Code requirements, ANSI/SMACNA Seismic Restraint Manual: Guidelines For Mechanical Systems, SMACNA/ASHRAE Service Restraint Applications CD-ROM, and the P.P.I.C. Manual Guidelines For Seismic Restraints of Mechanical Systems and Plumbing Piping Systems, all of which are to form a part of this Section.

.3 Seismic control and restraints for fire protection piping and equipment are to be in accordance with NFPA requirements. When specified and/or required, design is also to include Factory Mutual requirements.

.4 All restraint products must be tested in an independent testing laboratory, or certified by the Seismic Consultant, to confirm that the restraint products meet all requirements of this Section, i.e. dynamic ultimate limit load state as required by the Code, "Fail Safe" design, etc. If particular tests are carried out to represent a restraint type, the test is to be valid for the full load range of the restraint. Submit such tests or certification when requested.

.5 Seismic control and restraint product manufacturers are to provide all required assistance during the installation, and, when the installation is complete, submit written reports from the manufactures listing any deficiencies to the installation.

2 PRODUCTS

2.01 GENERAL

.1 Isolation, anchors, bolts, bases, restraints, etc., are to be designed to withstand without failure or yielding, the dynamic G load as specified in the Code for the seismic zone in which the building is located. Design loads are ultimate limit state loads (1.5 times working load) acting through the centre of gravity of the anchored or restrained equipment. "Fail Safe" designs are acceptable.

.2 For both isolated and non-isolated floor mounted equipment, i.e. tanks, heat exchangers, boilers, etc., design and provide anchors and bolts to withstand, without failure or yielding, a dynamic ultimate limit state load as defined in the Code, of the greater of 0.3 g or as required by the Code, applied horizontally through the centre of gravity.

.3 Where impact forces may be significant, use ductile materials.

.4 Seismic restraining devices which are factory supplied with equipment are to meet all requirements of this Section.

2.02 ACCEPTABLE MANUFACTURERS

.1 Acceptable seismic restraint product manufacturers are:

.1 Mason Industries Inc.;

.2 Kinetics Noise Control;

.3 Vibro-Acoustics Ltd;

.4 Price Industries Inc.

2.03 SLACK CABLE RESTRAINTS

.1 Aircraft cable galvanized slack cable restraints meeting all current requirements of the Building Code, sized to suit the application and complete with all required cable ties, anchor hardware (selected for a load equal to twice the weight of the equipment), and similar connection accessories.

2.04 ANCHOR BOLTS

.1 Equal to Mason Industries type SAB seismic anchor bolts.

2.05 VIBRATION ISOLATION PRODUCTS

.1 Refer to the mechanical work Section entitled Mechanical Vibration Control.

3 EXECUTION

3.01 INSTALLATION OF SEISMIC RESTRAINT MATERIALS

.1 Provide seismic restraint for all mechanical equipment, piping, and ductwork, including diffusers, grilles, etc., as per the requirements of the current edition of the Building Code and this Section of the Specification.

.2 **Mechanical Components Restraint Guide:** The following Mechanical Components Restraint Guide is to be used as a general guide only to establish appropriate restraint methods, hardware, and attachments, however, due to the differences in construction, size, weight, and configuration of different manufacturer's equipment and the variety of ways and means that the equipment and components can be installed, specific restraint methods are to be confirmed in the field. All seismic restraint materials and methods are to be reviewed and approved by the Seismic Consultant.

MECHANICAL COMPONENT RESTRAINTS GUIDE

ITEM	TYPE OF RESTRAINT	MINIMUM NO. OF RESTRAINTS	NOTES
D.H.W. Tanks	SCR	4	Attach to removable steel strap yoke
Force Flow Heaters	TSR-SCR	4	
Fans – Suspended - Isolated - Non-Isolated	 SCR SCR	 4 4	
Fans – Roof Mounted - On roof curb	BTRC	4	Roof curb bolted to roof.
Grilles, Registers, Diffusers	SCR	4	Where not bolted to duct (i.e. in tee-bar ceilings)
Piping	SCR TSR	As required	As per Specification
Ductwork	SCR TSR	As required	As per Specification

LEGEND	
SCR	Slack cable restraint (bolted to structure)
SNBR	Seismic snubber (bolted to structure)
TSR	Threaded support rod (bolted or clamped to structure)
BTSLPR	Bolt to sleeper (sleeper bolted to structure)
BTHP	Bolt to concrete housekeeping pad (pad to be keyed to structure)
CSSB	Custom steel shoe base (bolted to structure)
BTRC	Bolt to roof curb. Roof curb bolted to roof structure

.3 Provide structural steel bases for all equipment unless the equipment manufacturer certifies direct attachment capabilities.

.4 Space restraints under equipment so that the minimum distance between adjacent corner restraints is at least equal to the height of the centre of gravity of the equipment. Include the height of the centre of gravity on shop drawings, otherwise, design for increased forces on the supports and submit design calculations with shop drawings. In particular, chillers are to meet this requirement.

.5 Requirements pertaining to seismic control work are as follows:

.1 execute seismic control and restraint work in accordance with drawing details, reviewed shop drawings, the ANSI/SMACNA Seismic Restraint Manual, the PIPC Manual: Guidelines For Seismic Restraints of Mechanical Systems and Plumbing Piping Systems, and National Uniform Seismic Installation Guidelines (NUSIG);

.2 seismic control systems are to work in all directions;

.3 fasteners and attachment points are to resist the same maximum load as the seismic restraint;

.4 drilled or power driven anchors and fasteners are not permitted;

.5 no equipment, equipment supports or mounts are to fail before failure of the structure;

.6 supports of cast iron or threaded pipe are not permitted;

.7 seismic control measures are not to interfere with the integrity of firestopping;

.8 all equipment is to be bolted to the structure, and all bolts are to fitted with isolation washers;

.9 the number, size, type, and installation of anchor bolts are to be as recommended by the anchor bolt manufacturer and the seismic design consultant;

.10 where more than a 3 mm (1/8") differential exists between an anchor or attachment bolt diameter, an anchor and attachment point hole, or an isolator gap attachment bolt and equipment anchor attachment hole, pack the air gap with Mason type 0.5 FastSteel reinforced epoxy putty;

.11 all hung equipment and pipe hangers are to be fitted with a means of preventing upward movement, and non-isolated equipment and pipe hanger rods are to be fitted with oversized steel washers and nuts above and below the hanger or equipment attachment point, locked tight to prevent uplift of the equipment or hanger;

.12 where suspended equipment hanger rod length exceeds 50 rod diameters between the structure and the equipment attachment point, reinforce the rods with angle iron to prevent bending due to uplift forces;

.13 seismic control measures are not to jeopardize noise and vibration isolation systems, and 6 mm (¼") to 9 mm (3/8") clearance during normal operation of equipment and systems is to be provided between seismic restraint and equipment;

.14 where hold-down bolts for seismic restraint equipment penetrate roofing membranes coordinate with roofing trade for installation of pitch pockets/"gum cups" and sealing compound to maintain the water-tight integrity of the roof;

.15 where friction type clamps are used for support of equipment and connecting services, secure clamps to steel work by means of welding or other positive means to prevent slippage or loosening of the clamps due to seismic forces.

.6 **Slack Cable Restraint Requirements:** Provide slack cable restraint assemblies for:

.1 all service piping 25 mm (1") dia. and larger;

.2 all horizontal and vertical piping 65 mm (2½") dia. and larger;

.3 all ductwork and duct mounted equipment;

.4 all isolated and non-isolated ceiling hung fans, tanks, equipment, etc.;

.7 **Slack Cable Restraint Installation Requirements:** Installation requirements for slack cable restraints include the following:

.1 connect slack cable restraints to ceiling hung equipment in such a way that the axial projection of the wires passes through the centre of gravity of the equipment;

.2 orient restraint wires on ceiling hung equipment at approximately 90º to each other (in plan), and tie back to the ceiling slab at an angle not exceeding 45º to the slab;

.3 install cables using appropriate grommets, shackles, and other hardware to ensure alignment of the restraints and to avoid bending the cables at connection points, and, where feasible, wrap cables directly around pipes as opposed to using collars;

.4 for piping systems, provide transverse slack cable restraints at a maximum spacing of 12.5 m (40'), and longitudinal restraints at 25 m (80')maximum spacing, or as limited by anchor/slack cable performance;

.5 for piping less than 250 mm (10") dia., reduce transverse restraint spacing to 6 m (20'), and note that smaller piping may be rigidly tied to larger piping for restraint, but not the reverse;

.6 vary adjacent spacing of restraints on a piping run by 10% to 30% to avoid coincident resonance;

.7 transverse bracing for one pipe section may also act as longitudinal bracing for the piping connected perpendicular to it if the bracing is installed within 600 mm (24") of the elbow or tee, and if the connected piping is the same or smaller dia., and note that branch lines are not to be used to restrain main lines;

.8 provide flexibility in piping joints or sleeves where piping penetrates building seismic or expansion joints;

.9 wherever possible, support the weight of vertical piping risers at a point or points above the centre of gravity of the riser, and provide lateral guides at the top and bottom of the riser, and at intermediate points not to exceed the transverse spacing specified above for horizontal pipes, with guide clearance not exceeding 3 m (10');

.10 install restraints at least 50 mm (2") clear of all other equipment and services;

.11 adjust restraint cables such that they are not visibly slack, or such that the flexibility is approximately 40 mm (1½") under thumb pressure for a 1.5 m (5') cable length, with an equivalent ratio for other cable lengths, and adjust the clearance of cable strap/spacer piece restraints so as not to exceed 6 mm (0.23");

.12 provide transverse and axial restraints within 4 m (12') of a vertical bend;

.13 at steel trusses, connect to top chords at panel points and follow the truss manufacturer's instructions;

.14 all diffusers and grilles mounted in t-bar ceilings or which are not positively secured to ductwork or the structure are to be fitted with slack cable restraints to prevent them from falling in the event the ceiling t-bar grid is displaced;

.15 do not bridge vibration isolators with slack cable restraints;

.16 other approved restraint systems are conventional pipe guides, rigid restraint where piping passes through a block or concrete wall, or a cable strap and spacer piece attached to the structure and used where the piping is adjacent to a wall and conventional slack cable restraints cannot be used.

3.02 SITE INSPECTION AND LETTERS OF CERTIFICATION

.1 When all seismic control products have been installed, arrange for the seismic control product manufacturer and Seismic Consultant to examine the installation of all seismic control products and to certify in writing (separate letters) that the products have been properly installed in accordance with governing Codes and Regulations, and recommendations and instructions. The Seismic Consultant is to apply his professional stamp to the letter.

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 **Product Data:** Submit copies of manufacturer's product data sheets for all products specified in this Section. Product data sheets are to include product characteristics, limitations, dimension, finishes, and installation recommendations.

.2 **Manufacturer's Certification Letter:** Submit a letter from the vibration isolation manufacturer to certify correct installation of his products, as specified in Part 3 of this Section.

1.03 SEISMIC RESTRAINT REQUIREMENTS

.1 Refer to the mechanical work Section entitled Seismic Control and Restraint for requirements for use of a Seismic Consultant, and seismic restraint requirements applicable to vibration isolated materials and equipment.

2 PRODUCTS

2.01 GENERAL

.1 Vibration isolation products are to be in accordance with the Seismic Consultant's drawing schedule and details, and as specified below.

.2 **Springs:** All springs are to be stable, colour coded, selected to operate at no greater than ⅔ solid load, designed in accordance with the 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 the manufacturer's recommendations to suit the static deflection and maximum equipment load.

.3 **Finishes:** All steel components of isolation products not exposed to the weather or moisture are to be zinc plated. All 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 two coats of neoprene.

.4 Where the 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 **Seismic Rated Vibration Isolation:** All seismic rated isolators and snubbers are to be listed, rated, and approved by the State of California Office of Statewide Health and Planning Department (O.S.H.P.D.) and carry an O.S.H.P.D. pre-approved number. All seismic restraints supplied with vibration isolation are to meet requirements specified in the mechanical work Section entitled Seismic Control and Restraint.

.6 **Flexible Piping Connections:** Flexible piping connections to vibration isolated equipment are specified in the appropriate piping sections of the Specification.

2.02 ISOLATION PADS

.1 Sandwich type pads, 20 mm (¾") nominal thickness, selected for 3.2 mm (1/8") static deflection unless otherwise specified, consisting of two waffle type or ribbed 50 durometer neoprene pads permanently bonded to a minimum #10 gauge steel plate, and complete with rubber bushed bolt holes and equipment anchor bolts with neoprene isolation grommets. Acceptable products are:

.1 Vibro-Acoustics Ltd. Type NSN;

.2 The VMC Group Vibration Mounting & Controls Inc. (Korfund-Dynamics) "SHEAR-FLEX PLATES";

.3 Kinetics Noise Control Vibron Products Group Type NGS/NGD;

.4 Mason Industries Inc. Type SW/S/SW with HG Bolt Insertion Washers;

.5 J. P. Environmental Products Inc. Type JSJ.

2.03 SPRING HANGERS

.1 Welded steel plate housing with top and bottom rod mounting holes and spring retainer, neoprene double deflection isolation element, stable colour coded spring, and heavy-duty rubber washers. Acceptable products are:

.1 Vibro-Acoustics Ltd. Type SHR-SN;

.2 The VMC Group Vibration Mounting & Controls (Korfund-Dynamics) "Spring-Flex" Series HRSA;

.3 Kinetics Noise Control Vibron Products Group. Type SRH;

.4 Mason Industries Inc. Type 30N;

.5 J. P. Environmental Products Inc. Type TSH.

2.04 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. 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. Environmental Products Inc. Type TRH.

3 EXECUTION

3.01 INSTALLATION OF VIBRATION ISOLATION MATERIALS

.1 Provide vibration isolation products for mechanical work in accordance with the drawing schedule and details, and requirements specified herein and/or on the drawings.

.2 Supply to the 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, all vibration isolation products are to be the product of one manufacturer.

.4 Ensure that the 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 **Isolation For Base Mounted Equipment:** 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 all bases level so that all ductwork and piping connections can be made to a rigid system at the proper operating level, before isolated adjustment is made, and ensure that there is no physical contact between isolated equipment and the building structure;

.2 all steel bases are to clear the sub-base by 25 mm (1");

.3 all concrete bases are to clear the sub-base by 50 mm (2").

.6 **Isolation of Piping:** Isolate all piping larger than 25 mm (1") dia. directly connected to motorized and/or vibration isolated equipment with 25 mm (1") static deflection spring hangers at spacing intervals in accordance with the following:

.1 for pipe to and including 100 mm (4") dia. – first three points of support;

.2 for pipe 125 mm (5") to 200 mm (8") dia. – first four points of support;

.3 for pipe 250 mm (10") dia. and larger – first six points of support;

.4 the first point of isolated piping support is to have a static deflection of twice the deflection of the isolated equipment but maximum 50 mm (2");

.5 secure the top of the spring hanger frame rigidly to the structure, and do not install spring hangers in concealed locations;

.6 where it is impossible to use at least two spring hangers, provide Senior Flexonics Ltd. Style 102 (or 102-U as required) or equal, twin sphere, moulded rubber flexible connection assemblies, selected by the manufacturer and suitable in all respects for intended application, and complete with required nipples and connections to provide proper vibration isolation.

.7 **Control Wiring Connections:** For all control wiring connections to vibration isolated equipment ensure that 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. Connections are to be long enough so that the conduit will remain intact if the equipment moves 300 mm (12") laterally from its installed position, and flexible enough to transmit less vibration to the structure than is transmitted through the vibration isolation. Coordinate these requirements with the mechanical trades involved. If electrical power connections are not made in a similar manner as part of the electrical work, report this fact to the Consultant.

.8 **Manufacturer's Inspection & Certification:** Arrange and pay for the vibration isolation product manufacturer to visit the site to inspect installation of his equipment. Do any revision work required as a result of improper installation. When the vibration isolation equipment manufacturer is satisfied with the installation, obtain and submit a letter starting that he has inspected the installation and that his equipment is properly installed.

.9 **Seismic Restraint Isolation:** Refer to the mechanical work Section entitled Seismic Control and Restraint for requirements pertaining to seismically restrained vibration isolation.

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 CAN/ULC S700 Series, Standards For Thermal Insulation.

.2 CAN/ULC S102, Surface Burning Characteristics of Building Materials and Assemblies.

.3 NFPA 96, Standard For Ventilation Control and Fire Protection of Commercial Cooking Equipment.

.4 CAN/CGSB-51.2, Thermal Insulation, Calcium Silicate, for Piping, Machinery and Boilers.

.5 WHMIS, Workplace Hazardous Materials Information System.

.6 Refer to Section 20 05 00.

1.02 INSULATION SYSTEM SAMPLES AND PRODUCT DATA SHEETS

.1 At least four weeks prior to insulation work commencing, submit a sample of each type of insulation (and insulation accessories and finish), in applied form, for approval. Mount the samples on a rigid plywood board. Identify each product with the manufacturer's name and insulation type, and the proposed use of the insulation. Include a product data sheet for each insulation sample.

.2 Include samples of all insulation jacket materials, each identified as to intended use, and product data sheets for protective coatings.

1.03 QUALITY ASSURANCE

.1 Mechanical insulation is to be applied by a licensed journeyman insulation mechanic who is a member of Union Local 95, or by a Local 95 apprentice under direct, daily, on-site supervision of a journeyman mechanic.

.2 The Company with the sub-contract for mechanical insulation work is to be a member in good standing of the Thermal Insulation Association of Canada.

PART 2: PRODUCTS

2.01 FIRE HAZARD RATINGS

.1 All insulation materials are to meet requirements of CAN/ULC S700 Series Standards.

.2 Unless otherwise specified, all insulation system materials inside the 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 CAN/ULC S102.

2.02 PIPE INSULATION MATERIALS

.1 **Flexible Foam Elastomeric:** Closed cell, tubular foamed plastic pipe insulation, 25/50 flame spread/smoke developed rated, with all required installation accessories. Acceptable products are:

.1 Armstrong World Industries "AP Armaflex"

.2 Nomaco Inc. "NOMALOCK" or "NOMAGARD"

.3 Or approved alternate.

.2 **Premoulded Mineral Fibre:** Rigid, sectional, sleeve type insulation with a factory applied vapour barrier jacket. Acceptable products are:
- .1 Johns Manville. "Mico-Lock AP-T Plus"
- .2 Knauf Fibre Glass "Pipe Insulation" with "ASJ-SSL" jacket
- .3 Manson Insulation Inc. "ALLEY K APT"
- .4 Or approved alternate.

.3 **Pipe Insulation @ Hangers & Supports:** Insulation is to be a 300 mm long piece of sectional pipe insulation with a thickness equal to the adjacent insulation, a foil and glass reinforced kraft paper vapour barrier jacket, and a minimum 0.80 mm thick G60 galvanized steel shield the same length as the insulation. The insulation is to be:
- .1 Johns Manville "Thermo-12 Gold" or Pabco Insulation "SUPER CALTEMP GOLD 1200" rigid calcium silicate
  or
- .2 Belform Insulation Ltd. "Koolphen K" closed cell phenolic foam
- .3 Or approved alternate.

2.03 EQUIPMENT INSULATION MATERIALS

.1 **Blanket Mineral Fibre:** Blanket type roll form insulation with a factory applied vapour barrier facing. Acceptable products are:
- .1 Knauf Fibre Glass Blanket Insulation with multi-purpose "FSK" facing
- .2 Manson Insulation Inc. "ALLEY WRAP FSK"
- .3 Johns Manville Type 150 "Microlite"
- .4 Or approved alternate.

2.04 DUCTWORK SYSTEM INSULATION MATERIALS

.1 **Rigid Mineral Fibre Board:** Preformed board type insulation with a factory applied reinforced aluminum foil and kraft paper facing. Acceptable products are:
- .1 Knauf Fibre Glass Insulation Board with FSK facing
- .2 Manson Insulation Inc. "AK BOARD FSK"
- .3 Johns Manville Type 814 "Spin-Glas"
- .4 Or approved alternate.

.2 **Blanket Mineral Fibre:** Blanket type roll form insulation, 40 mm thick, with a factory applied vapour barrier facing. Acceptable products are:
- .1 Knauf Fibre Glass Blanket Insulation with multi-purpose "FSK" facing
- .2 Manson Insulation Inc. "ALLEY WRAP FSK"
- .3 Johns Manville Duct Wrap Type 150 "Microlite"
- .4 Or approved alternate.

.3 **Premoulded Calcium Silicate:** Rigid block and sheet insulation. Acceptable products are:
- .1 Johns Manville "Thermo-12 Gold"

.2 Pabco Insulation "SUPER CALTEMP GOLD 1200"
.3 Or approved alternate.

.4 **Flexible Foam Elastomeric Sheet:** Sheet form, closed cell foamed plastic pipe insulation, 25/50 flame spread/smoke developed rated. Acceptable products are:
.1 Armstrong World Industries "AP Armaflex"
.2 Nomaco Inc. "NOMAPLY"
.3 Or approved alternate.

2.05 FIRE RATED DUCT WRAP

.1 3M Fire Protection Products "Fire Master" (Thermo Fire Systems Inc. 905-469-0063) flexible, non-combustible, blanket type mineral fibre duct wrap completely encapsulated in reinforced foil, 40 mm thick, suitable for installation with zero clearance to combustibles, and ULC tested and listed to ULC Design FRD-4 for kitchen exhaust duct to facilitate a 1 or 2 hour fire resistance rating to kitchen grease exhaust duct in accordance with requirements of NFPA-96.

2.06 INSULATION FASTENINGS

.1 **Wire:** Minimum 1.8 mm dia. galvanized annealed wire.
.2 **Wire Mesh:** Minimum 1.8 mm dia. galvanized annealed wire factory woven into 25 mm hexagonal mesh.
.3 **Duct Insulation Fasteners:** Weld-on 2 mm dia. zinc coated steel spindles of suitable length, complete with minimum 40 mm square plastic or zinc plated steel self-lock washers.
.4 **Tape Sealant:** Equal to MACtac Canada Ltd. ULC listed and labelled 25/50 rated self-adhesive insulation tapes, types PAF, FSK, ASJ, or SWV as required to match the surface being sealed.
.5 **Adhesive – Mineral Fibre Insulation:** Clear, pressure sensitive, quick setting brush consistency adhesive, non-flammable when wet, fire resistive when dry, suitable for a temperature range of -20º C to 82º C and compatible with the type of material to be secured, and WHMIS classified as non-hazardous.
.6 **Adhesive – Flexible Elastomeric Insulation:** Armstrong World Industries Inc. #520 air-drying contact adhesive.
.7 **Lagging Adhesive:** White (or coloured), brush consistency, ULC listed and labelled, 25/50 fire/smoke rated lagging adhesive for canvas jacket fabric, complete with fungicide and washable when dry.

2.07 INSULATION JACKETS AND FINISHES

.1 **Canvas:** S. Fattal Canvas Inc. "Thermocanvas Classic" or Robson Thermal Mfg. Ltd. "FLAMEX FR CANVAS" ULC listed and labelled 25/50 rated roll form canvas jacket material.
.2 **Insulation Cement:** Heat resistant, trowel consistency thermal insulating and finishing cement to CAN/CGSB 51.12, and suitable in all respects for the application.

.3 **Protective Coating – Flexible Foam Elastomeric Insulation:** Equal to Armstrong World Industries "WB Armaflex" white, water based latex enamel, semi-gloss.

PART 3: EXECUTION

3.01 GENERAL INSULATION APPLICATION REQUIREMENTS

.1 Unless otherwise specified, do not insulate the following:
- .1 factory insulated equipment and piping
- .2 branch domestic water piping located under counters to serve counter mounted plumbing fixtures and fittings
- .3 exposed chrome plated domestic water angle supplies from concealed piping to plumbing fixtures and fittings

.2 Install insulation directly over pipes and ducts and not over hangers and supports.

.3 Do not apply insulation unless leakage tests have been satisfactorily completed.

.4 Ensure that all surfaces to be insulated are clean and dry.

.5 Ensure that the ambient temperature is minimum 13º C for at least one day prior to the application of insulation, and for the duration of insulation work, and that relative humidity is and will be at a level such that mildew will not form on insulation materials.

.6 Install piping insulation continuous through pipe openings and sleeves.

.7 Install duct insulation continuous through walls, partitions, and similar surfaces except at fire dampers.

.8 **Pipe insulation at hangers and supports** is to consist of minimum 300 mm long sections of calcium silicate or phenolic foam sectional insulation with vapour barrier jacket and galvanized steel shields between the insulation and the hanger or support for all pipe 50 mm dia. and larger.

.9 When insulating "cold" piping and equipment, extend insulation up valve bodies and other such projections as far as possible, and protect the insulation jacketing from the action of condensation at its junction with the metal.

.10 When insulating vertical piping risers 75 mm diameter and larger, use insulation support rings welded directly above the lowest pipe fitting, and thereafter at 4.5 m centres and at each valve and flange. Insulate as per Thermal Insulation Association of Canada National Insulation Standards, Figure No. 9.

.11 Where existing insulation work is damaged as a result of a new mechanical work, repair the damaged insulation work to new work standards.

.12 Where mineral fibre rigid sleeve type insulation is terminated at valves, equipment, unions, etc., neatly cover the exposed end of the insulation with a purpose made PVC cover on "cold" piping, and with canvas jacket on "hot" piping.

3.02 PIPE INSULATION REQUIREMENTS – MINERAL FIBRE

.1 Insulate the following pipe with mineral fibre insulation of the thickness noted:
- .1 domestic hot and cold water piping inside building and above ground – 25 mm thick

.2 storm drainage piping from roof drains to the point where main vertical risers extend straight down, without offsets, and connect to horizontal mains – 25 mm thick

.3 condensate drainage piping inside the building from cooling equipment drain pans to drainage discharge points or to main vertical drain risers – 25 mm thick

.4 steam piping from humidifier cabinets to duct mounted steam manifolds – 25 mm thick

.5 condensate piping from duct steam manifolds to humidifier cabinets or drain points – 25 mm thick

.6 refrigerant suction piping (between compressor and evaporator coil) inside building – 20 mm thick

.7 refrigerant hot gas piping (between compressor and condenser0 inside building – 13 mm thick

.8 refrigerant hot gas by-pass piping (between compressor discharge and evaporator coil) inside building – 13 mm thick

.2 **Piping:** Ensure that the overlap flap of the section insulation jacket is secured tightly in place. Cover section to section butt joints with tape sealant.

.3 **Fittings:** Insulate fittings with sectional pipe insulation mitred to fit tightly, and cover butt joints with tape sealant.

.4 **"Cold" Piping Valves, Strainers, Etc.:** Insulate valves, strainers, and similar piping system accessories in "cold" piping such as domestic water piping with cut and tightly fitted segments of sectional pipe insulation with all joints covered with tape sealant.

.5 **Concealed Rough-In piping at Plumbing Fixtures:** Take special care at concealed domestic water rough-in piping at plumbing fixtures to ensure that the piping is properly insulated. If necessary due to space limitations, use 12 mm thick sectional pipe insulation in lieu of 25 mm thick insulation.

3.03 PIPE INSULATION REQUIREMENTS – FLEXIBLE FOAM ELASTOMERIC

.1 Install flexible elastomeric pipe insulation in strict accordance with the manufacturer's published instructions to suit the application, and using adhesive, joint sealants and finish to produce a water-tight installation. Insulate the following pipe with flexible elastomeric pipe insulation of the thickness noted.

.1 refrigerant piping outside the building – 25 mm thick

3.04 PIPE INSULATION REQUIREMENTS – FIRE RATED INSULATION

.1 Where pipe which is to be insulated as specified above penetrates fire rated walls and slabs, provide fire-rated, non-combustible sectional mineral wool insulation on the portion of pipe in the fire barrier and for a distance of 50 mm on either side of the fire barrier. Insulation thickness is to be as specified, but in any case minimum 25 mm.

3.05 EQUIPMENT INSULATION REQUIREMENTS – BLANKET TYPE MINERAL FIBRE

.1 Insulate the following equipment with mineral fibre blanket type insulation of the thickness noted:

- .1 roof drain sumps where inside the building – 25 mm thick
- .2 water meter – 40 mm thick

.2 Wrap the equipment to a thickness and insulating value equal to an equivalent thickness of rigid sectional pipe insulation. Laminate the insulation in place with adhesive and secure with wire. Apply a jacket of the insulation vapour barrier material secured in place with adhesive or sealant tape.

.3 Cover roof drains sumps with purpose made PVC fitting covers.

3.06 DUCTWORK INSULATION REQUIREMENTS – MINERAL FIBRE

.1 Insulate the following ductwork systems with mineral fibre insulation of the thickness noted:

- .1 all fresh air intake ductwork inside the building – 40 mm thick
- .2 supply air ductwork outward from fans, except for supply ductwork exposed in the area it serves – 25 mm thick rigid board or 40 mm thick flexible blanket, including where ceiling space is used as a return air plenum.
- .3 exhaust discharge ductwork inside the building for a distance of 3 m downstream (back) from exhaust openings to atmosphere – 25 mm thick rigid board or 40 mm thick flexible blanket. Otherwise, return/exhaust ductwork does not require insulation.
- .4 any other ductwork, casing, plenums or sections specified or detailed on the drawings to be insulated – thickness as specified

.2 Insulation for exposed rectangular ductwork is to be rigid board type. Insulation for round ductwork and concealed rectangular ductwork is to be blanket type.

.3 Liberally apply adhesive to all surfaces of the ductwork. Provide weld-on pins at 450 mm centres on the bottom duct surface only where blanket insulation is to be applied, and at 450 mm centres on bottom and side surfaces of ducts where board insulation is to be applied. Secure the insulation in place with tight circumferential and longitudinal joints. Secure and seal all joints with 75 mm wide tape sealant. Install self-lock washers over pins and cut off any excess pin length. Ensure that the insulation does not sag or bulge.

.4 At each trapeze type duct hanger under rectangular ductwork to be insulated with blanket type insulation, provide a 100 mm wide full length piece of rigid mineral fibre board insulation between the duct and the hanger and over joints with strips of tape sealant.

.5 At each band type duct hanger around round ductwork to be insulated, provide a 100 mm wide section of sleeve or scored board type mineral fibre insulation and cover joints with tape sealant.

3.07 DUCTWORK INSULATION REQUIREMENTS – FLEXIBLE

ELASTOMERIC

.1 Insulate all exposed exterior ductwork (except fresh air intake ductwork) with 40 mm thick flexible elastomeric sheet insulation applied in two 20 mm thick layers with staggered tightly butted joints.

.2 Install the insulation in strict accordance with the manufacturer's published instructions to produce a weather-proof installation. Seal sheet metal work joints watertight with duct sealer prior to applying insulation.

3.08 DUCTWORK INSULATION REQUIREMENTS – CALCIUM SILICATE

.1 Insulate the Demo Kitchen exhaust hood ductwork from the hood to the exhaust fan with 40 mm thick calcium silicate block insulation.

.2 Secure the insulation in place with adhesive, and with wire on 450 mm centres. Point all gaps and joints with insulating cement. Where ductwork is exposed, cover the insulation with wire mesh secured to the wire and with edges laced together, and apply a coat of finished cement trowelled smooth. Use drywall type metal corner bead for duct edges where finishing cement is applied.

3.09 DUCT WRAP REQUIREMENTS – FIRE RATED MATERIAL

.1 As an alternative to calcium silicate insulation as specified above, provide blanket type fire rated duct wrap system material for the Demo Kitchen exhaust hood ductwork from the hood to the exhaust fan to produce a 2 hour rating.

.2 Install the duct wrap material in accordance with ULC design requirements and the wrap supplier's recommendations.

.3 Arrange and pay for the duct wrap supplier to examine the completed duct wrap system at the site. Submit a letter from the supplier to certify that the duct wrap system has been properly installed.

3.10 INSULATION FINISH REQUIREMENTS

.1 **Canvas:** Unless otherwise shown and/or specified, jacket all exposed mineral fibre and calcium silicate insulation work inside the building with canvas secured in place with a full 100% 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 **Protective Coating – Flexible Elastomeric Insulation:** Apply two heavy coats of the specified coating to all flexible elastomeric insulation exposed above grade.

.3 Provide UV protective coating for all exterior insulation finishes.

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 NFPA 13, Installation of Sprinkler Systems.
.2 OBC, Ontario Building Code.
.3 OFC, Ontario Fire Code.
.4 ASTM A53, Specification for Pipe, Steel, Black and Hot-Dipped Zinc-Coated Welded and Seamless.
.5 ASTM A 234, Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
.6 ASME B16.4 Gray Iron Threaded Fittings.
.7 IAO, Insurance Advisory Organization.
.8 ULC, Underwriters Laboratories Canada.
.9 FM, Factory Mutual.
.10 Refer to Section 20 05 00.
.11 Refer to Section 01 18 00 Commissioning.

1.02 SHOP DRAWINGS

.1 Submit sprinkler system shop drawings to the regulatory authority for review and approval prior to submitting to the Consultant. Shop drawings are to include all products specified in this Section except pipe and fittings, and complete layout drawings indicating the source of water supply with test flow and pressure, "head end" equipment piping schematic, pipe routing and sizing, zones, **and proposed sprinkler head locations**, all signed and sealed by a qualified professional mechanical engineer registered/licensed in the Province of Ontario. Shop drawings are also to include copies of hydraulic calculations and a list of all design data used in preparing the calculations, system layout, and sizing.

1.03 DESIGN REQUIREMENTS

.1 Design the sprinkler system in accordance with NFPA 13 the OBC, and the OFC, and, where required, local building and fire department requirements and the standards of the LCBO insurer.
.2 Sprinkler head locations must be carefully coordinated with all drawings, including architectural reflected ceiling plans, and requirements of the LCBO Design Coordinator.

1.04 QUALITY ASSURANCE

.1 Sprinkler work is to be performed by a sprinkler company who is a member in good standing of the Canadian Automatic Sprinkler Association.
.2 Coordinate all sprinkler system work with all trades at the site and accept responsibility for and the cost of making adjustments to piping and/or spacing to avoid interference with other building components.
.3 All system components must be ULC listed and labelled.

PART 2: PRODUCTS

2.01 SYSTEM DESCRIPTION

.1 Engage and pay for owner's (base building) sprinkler contractor to perform all work (unless stated otherwise)

2.02 PIPE, FITTINGS AND JOINTS

.1 Schedule 40 mild black carbon steel, ASTM A53, Grade B. Screwed piping is to be complete with Class 125 cast iron screwed fittings to ANSI/ASME B16.4. Welded piping is to be complete with factory made seamless carbon steel butt welding fittings to ASTM A234, Grade WPB, long sweep pattern wherever possible.

2.03 SERVICE MAIN DOUBLE CHECK VALVE ASSEMBLY

.1 Minimum 2005 kPa rated ULC listed and FM approved dual check valve backflow preventer assembly (less shut-off valves) to CAN/CSA B64, complete with test cocks.

2.04 SHUT-OFF AND CHECK VALVES

.1 Minimum 1205 kPa rated ULC listed and FM approved ball or butterfly valves.

.2 Minimum 1205 kPa rated, resilient seat, ULC listed and FM approved check valves.

2.05 BALL DRIPS

.1 Equal to National Fire Equipment Ltd. Model #58-2, 20 mm dia. automatic ball drip.

2.06 SHUT-OFF VALVE SUPERVISORY SWITCHES

.1 ULC listed and FM approved, tamper-proof, 24 volt or 115 volt AC supervisory switches, each designed to activate a fire alarm system trouble alarm condition if the valve is closed or tampered with, and each complete with all required mounting and connection hardware.

2.07 SIAMESE CONNECTION

.1 National Fire Equipment Model 229 flush wall mounting brass clapper type dual inlet siamese connection with two 65 mm dia. inlets threaded to Fire Dept. hose requirements and equipped with caps and chains, and a 150 mm dia. outlet. All exposed metal parts of the Siamese are to be stainless steel plated with a #4 finish.

2.08 WATER FLOW ALARM SWITCH

.1 Pipe mounting water flow alarm switch, minimum 1725 kPa rated, designed to activate two SPDT snap action switches when water flow exceeds 0.758 L/sec, and complete with an automatic reset pneumatic retard device with field adjustable (0 to 70 seconds) switch activation delay to reduce false alarms caused by transient water flow surges.

2.09 ALARM CHECK VALVE

.1 ULC listed and FM approved enamelled cast iron check valve assembly designed for either vertical or horizontal mounting and to activate an alarm when the wet sprinkler system is activated and complete with all required trim and accessories for connection of a water motor gong, excess pressure pump, and alarm test by-pass.

2.10 EXCESS PRESSURE PUMP

.1 Equal to Albany Pump Co. Ltd. Series "CEP" close-coupled all bronze gear pump sized to maintain sufficient pressure in the sprinkler main to prevent the alarm check valve from initiating a flow alarm during fluctuations in the pressure of the Municipal water supply. The pump is to be complete with a mounting and connection accessory package, and a prewired power and control panel equal to TornaTech Inc. Model "JP" with EEMAC 2 enclosure.

2.11 WATER MOTOR ALARM

.1 Surface wall mounting water motor driven alarm consisting of a water motor with 20 mm dia. inlet and 25 mm dia. drain connection, inlet strainer, a red enamelled steel exterior wall mounted strike and gong assembly, drive shaft sleeve and drive shaft, and exterior identification which reads 'SPRINKLER FIRE ALARM – WHEN BELL RINGS CALL FIRE DEPT. OR POLICE'.

2.12 ZONE INSPECTOR'S TEST AND DRAIN VALVES

.1 ULC listed and FM approved combination inspector's test and drain fitting with valves and sight glass, and a drain fitting orifice sized to suit installed sprinkler heads.

2.13 SPRINKLER HEADS

.1 ULC listed 57 degree C heads unless otherwise specified, chrome plated exposed pendant type heads, semi-recessed chrome plated heads, and fully recessed concealed heads with caps finished to match the colour of the ceiling, all located as specified in Part 3 of this Section.

2.14 SPARE SPRINKLER HEAD CABINET

.1 Surface wall mounting, red enamelled steel identified cabinet with hinged door, shelves with holes for sprinkler heads, a wrench or wrenches suitable for each type of sprinkler head, and a minimum of four of each type of sprinkler heads used.

PART 3: EXECUTION

3.01 SPRINKLER SYSTEM PIPING INSTALLATION REQUIREMENTS

.1 Provide all required sprinkler system piping. Do all work in accordance with requirements of NFPA No. 13, Ontario Regulations, and "Reviewed" shop drawings.

.2 All horizontal piping as high above finished floors as possible with due allowance for clearances for sprinklers as required by NFPA l3.

.3 Provide drain valves and piping as required to permit all sprinkler piping to be completely drained.

.4 Provide inspector's test connections in accordance with NFPA l3 and as required by governing Codes and the insurance underwriting agency.

.5 All drains and test connections are to be discharged into the building drainage system through an approved indirect waste connection or are to be piped to discharge to the building exterior. Provide precast concrete splash blocks at all drains and test connections discharging to the building exterior at unpaved points.

.6 All piping is to be concealed above ceiling in all areas. Drains and/or test connections are not to be terminated exposed in finished rooms, areas, or toilet rooms.

.7 All piping through interior walls and partitions is to be sleeved and closed off with escutcheons where visible. Penetrations through fire rated walls are to be sleeved, packed, and grouted as required to maintain the fire rating of the wall. Piping through floors and exterior walls, including foundation walls, are to be sleeved, packed and grouted with non-shrinking cement as required to make watertight.

.8 When work is complete, test system components and the overall system and submit completed test certificate and other documentation in accordance with Chapter 8 of NFPA No. 13.

3.02 INSTALLATION OF DOUBLE CHECK VALVE ASSEMBLY

.1 Provide a double check valve assembly in the sprinkler main inside the building where required. Equip the assembly with inlet and outlet supervised shut-off valves.

.2 Ensure that a funnel floor drain combination is located adjacent to the assembly.

3.03 INSTALLATION OF SHUT-OFF AND CHECK VALVES

.1 Provide shut-off valves in piping where shown and/or required. Locate valves for easy operation and maintenance. Unless otherwise noted, equip each shut-off valve with a supervisory switch, and equip each supervised valve with a 150 mm square engraved red-white plastic tag to correspond with supervised valve numbering specified and/or shown as part of the electrical fire alarm system work.

3.04 INSTALLATION OF SIAMESE CONNECTION

.1 Provide a Siamese connection for the sprinkler system where shown. Confirm exact location with the LCBO Design Coordinator prior to roughing-in.

.2 Design the in rack sprinkler in accordance with NFPA 13, the OBC, the OFC, and where required, local building and fire department requirements and standards of the LCBO insurer. In rack sprinkler system shall be a sub-zone.

.3 Equip the Siamese connection with a check valve, and equip the check valve with a ball drip to drain the piping between the Siamese and the check valve. Pipe the outlet of the ball drip to the nearest suitable floor drain.

3.05 INSTALLATION OF FLOW ALARM SWITCHES

.1 Provide zone alarm switches in accessible locations where shown and/or required.

.2 Adjust to suit site water pressure conditions. Check and test operation.

.3 Identify each switch with a 150 mm square red-white laminated engraved plastic tag. Confirm wording prior to manufacture.

3.06 INSTALLATION OF ALARM CHECK VALVE AND EXCESS PRESSURE PUMP

.1 Provide an alarm check valve in the sprinkler main where shown and/or required. Check and test operation and adjust to suit site water pressure conditions.

.2 Provide an excess pressure pump, arranged to prevent alarm check valve activation during normal water pressure variations in the Municipal main.

.3 Supply a starter and control panel for the pump and wall mount adjacent to the pump. Connect the panel pressure switch with copper tubing in accordance with the pump/panel manufacturer's instructions. Adjust the pressure switch to suit site water pressure conditions. Start-up the pump, test operation, and adjust as required.

3.07 INSTALLATION OF WATER MOTOR ALARM

.1 Provide a water motor alarm at an exterior wall. Secure the gong assemble on the exterior wall outside the building, and connect with the drive assembly. Install the inlet strainer shipped loose with the assembly.

.2 Provide galvanized steel drain pipe from the impeller-motor assembly down on the interior side of the wall and terminate the piping back out through the wall with a 45 degree piping elbow and wall plate located 600 mm above finished grade.

.3 Confirm exact location of the alarm gong with the LCBO Design Coordinator prior to roughing-in.

.4 When installation is complete, check and test operation and adjust as required.

3.08 INSTALLATION OF INSPECTOR'S TEST CONNECTIONS

.1 Provide inspector's test connections with drain piping for sprinkler zones as required. Coordinate locations with the LCBO Design Coordinator.

.2 Terminate drain piping over a funnel and floor drain unless otherwise shown or specified.

3.09 INSTALLATION OF SPRINKLER HEADS

.1 Provide all required sprinkler heads. Unless otherwise shown or specified, sprinkler heads are to be as follows:

.1 in Utility and Warehouse areas – pendent or upright type chrome plated exposed heads

.2 in all T-bar ceilings of the Retail Area, Office, and Staff Lunchroom areas, and any other areas indicated on the reflected ceiling plan(s) – semi-recessed with chrome plated heads and trim to match the T-bar ceiling tile/grid-submit a sample to the LCBO Design Coordinator for approval

.3 in all drywall ceiling areas and refrigerant ceilings as per reflected ceiling plan(s) – fully recessed concealed heads with concealment caps factory finished to match the adjacent ceiling finish colour – submit a sample to the LCBO Design Coordinator for approval

.4 Provide sprinkler guard for in rack sprinklers.

.2 Ensure that proper clearance is maintained above product to be stored on racks and shelves. Maintain maximum headroom in areas with no ceilings.

.3 Provide guards for heads in refrigerators, and in Service and Warehouse areas where there is a likelihood of damage due to LCBO operations.

.4 Assume full responsibility for protecting sprinkler heads during painting operations. Replace any painted or damaged components.

3.10 INSTALLATION OF SPARE SPRINKLER HEAD CABINET

.1 Supply a full compliment (to fill cabinet) of the types of sprinkler heads used (minimum of 4 of each type) and place in a wall mounted storage cabinet located adjacent the sprinkler system “head end” equipment.

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 ULC, Underwriters Laboratories Canada.

.2 ANSI/NFPA 10, Portable Fire Extinguishers.

.3 Refer to Section 20 05 00.

1.02 SHOP DRAWINGS

.1 Submit product data shop drawings for fire extinguishers.

PART 2: PRODUCTS

2.01 PORTABLE FIRE EXTINGUISHERS

.1 ULC listed 3A:20BC rated 5 lb. fire extinguishers in accordance with ANSI/NFPA 10, complete with wall brackets.
Acceptable manufacturer: Evergreen Fire and Safety Services, Tel: 1-866-727-1299 or equal.

PART 3: EXECUTION

3.01 INSTALLATION OF FIRE EXTINGUISHERS

.1 Provide portable fire extinguishers in accordance with Code requirements, but in any case a minimum of seven.

.2 Provide additional fire extinguishers in the Demo Kitchen area as required.

.3 Unless otherwise shown or specified, locate fire extinguishers as per local authority.

.4 All fire extinguishers must be in place, fully charged, when the space is occupied by the LCBO.

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 ASTM B88, Specification For Seamless Copper Water Tube.
.2 ANSI/AWWA B300, Hypochlorites.
.3 AWWA, C601, Disinfecting Water Mains.
.4 Refer to Section 20 05 00.

1.02 SHOP DRAWINGS

.1 Submit shop drawings for all valves.

PART 2: PRODUCTS

2.01 PIPES, FITTINGS AND JOINTS

.1 **Hard Copper:** Type L hard drawn seamless copper to ASTM B88, complete with forged copper solder type fittings to suit the pipe, and soldered joints using 95% tin, 5% Antimony or Silvabrite 100 solder.

.2 **Soft Copper:** Type K soft copper to ASTM B88, supplied in a continuous coil with no joints if possible, and complete with, if joints are required, compression type flared joint couplings.

.3 **Polyethelene:** Semi-rigid high density polyethylene tubing, 12 mm dia., 1380 kPa rated, supplied in continuous lengths with no underground joints.

2.02 SHUT-OFF VALVES

.1 Class 600, 4140 kPa WOG rated full port ball type valves, each complete with a forged brass body with solder ends, forged brass cap and blowout-proof stem, forged brass chrome plated ball, “Teflon” or “PTFE” seat, and a removable lever handle. Acceptable products are:
  .1 Toyo Valve Co. Fig. 5049A
  .2 Milwaukee Valve Co. #BA-155
  .3 Kitz Corporation Code 59
  .4 Apollo #77-200
  .5 Or approved alternate.

2.03 CHECK VALVES

.1 Class 125, bronze, 1380 kPa WOG rated horizontal swing type check valves with solder ends. Acceptable products are:
  .1 Toyo Valve Co. Fig. 237
  .2 Milwaukee Valve Co. #1510
  .3 Kitz Corporation Code 23
  .4 Apollo #61-600
  .5 Or approved alternate.

2.04 DRAIN VALVES

.1 Minimum 2070 kPa water rated, 20 mm dia. straight pattern full port bronze ball valves, each complete with a threaded outlet suitable for coupling connection of 20 mm dia. Garden hose, and a cap and chain. Acceptable products are:
- .1 Toyo Valve Co. Fig. 5046
- .2 Dahl Brothers Canada Ltd. Fig. No. 50.430
- .3 Kitz Corporation Code 5866
- .4 Apollo #78-100 or #78-200
- .5 Or approved alternate.

2.05 CHLORINE

.1 Javex Manufacturing Canada "JAVEX-12" or equal sodium hypochlorite to ANSI/AWWA B-300.

PART 3: EXECUTION

3.01 PIPING INSTALLATION REQUIREMENTS

.1 Provide all required domestic water piping.

.2 Piping, unless otherwise specified, is to be as follows:
- .1 for underground piping to above ground inside the building, except as noted below, type K soft copper
- .2 for pipe inside the building and above ground – type L hard copper
- .3 for underground trap seal primer water piping to floor drains – semi-rigid polyethylene tubing

.3 Slope all piping so that it can be completely drained.

.4 Provide proper dielectric unions in all connections between copper pipe and ferrous pipe or equipment.

3.02 INSTALLATION OF SHUT-OFF AND CHECK VALVES

.1 Provide shut-off valves to isolate all domestic water piping connections to equipment, and to isolate all branch piping off mains.

.2 Provide check valves in piping at slop sink connections.

.3 Ensure that all valves are located for easy access.

3.03 INSTALLATION OF DRAIN VALVES

.1 Provide a drain valve at the bottom of domestic water piping risers and at all other piping low points.

.2 Locate drain valves so that they are easily accessible.

3.04 FLUSHING AND DISINFECTING PIPING

.1 Flush and disinfect domestic water piping after leakage testing is complete.

.2 Flush piping with a sufficient flow of domestic water to produce a velocity of 1.5mps for ten minutes, or until all foreign materials have been removed and the flushed water is clear. Provide connections and pumps as required. Open and close valves, faucets, hose bibs, and service connections to ensure thorough flushing.

.3 When flushing is complete, disinfect the piping with a solution of chlorine in accordance with AWWA C601.

.4 Take samples and submit certified copies of water sample test analysis to indicate pure water in the system.

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 AWWA C700, Standard For Cold-Water Meters, Displacement Type, Bronze Main Case.

.2 CSA, Canadian Standards Association.

.3 Refer to Section 20 05 00.

1.02 SUBMITTALS

.1 **Shop Drawings**: Submit shop drawings for all products specified in Part 2 of this Section.

.2 **Hydrant Keys:** Prior to application for Substantial Performance, submit a minimum of three identified operating keys for key operated hydrants.

PART 2: PRODUCTS

2.01 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, an inlet opening equal to the diameter of the pipe in which the arrestor is required, and sized to suit the number and type of fixtures in the grouping. Acceptable products are:

- .1 Zurn #Z-1705
- .2 Ancon SG Series "SHOK-GARD"
- .3 Precision Plumbing Products Inc. SC or SWA Series
- .4 Watts Regulator Series 15
- .5 Or approved alternate.

2.02 VACUUM BREAKERS

.1 Threaded brass or bronze 20 mm diameter hose connection vacuum breakers to CSA B64, each designed to connect to the hose bib inlet to the non-removable when in place.

2.03 DOMESTIC WATER THERMAL EXPANSION TANK

.1 Pre-charged domestic water thermal expansion tank in accordance with Section VIII of the ASME Boiler and Pressure Code, carbon steel outer shell construction and complete with fixed butyl rubber bladder to prevent water from contacting shell interior, top NPT stainless steel system connection, 0.301"-32 charging valve connection and prime painted exterior. Acceptable products are

- .1 Watts Industries (Canada) Inc. Series DETA;
- .2 Zurn/Wilkins Model WTTA;
- .3 Or approved alternate.

PART 3: EXECUTION

3.01 INSTALLATION OF TRAP SEAL PRIMERS

.1 Provide 115 volt electronic trap seal primers to automatically maintain a water seal in floor drain traps. Size the primer(s) and manifold(s) to suit the number of floor drains involved.

.2 Ensure that a 115 volt 15 ampere circuit to each assembly is part of the electrical work of Division 26 and extended from the nearest suitable panelboard.

.3 Connect trap primer tubing to each floor drain. Do not terminate the tubing in the throat of the floor drain.

.4 Provide access door (fire rated if required by Code).

3.02 INSTALLATION OF WATER HAMMER ARRESTORS

.1 Provide accessible water hammer arrestors in domestic water piping at groups of plumbing fixtures and at the top of risers as required to prevent piping water hammer. Ensure that each arrestor is accessible for service or replacement.

.2 Install each unit in a piping tee either horizontally or vertically in the path of potential water shock in accordance with the manufacturer's published instructions and details.

3.03 INSTALLATION OF VACUUM BREAKERS

.1 Provide a vacuum breaker for each domestic water wall hydrant that is not factory equipped with a vacuum preventer.

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 CAN/CSA B182.2, PVC Sewer Pipe and Fittings.
.2 ASTM BA306, Copper Drainage Tube (DWV).
.3 ASTM B88, Specification For Seamless Copper Water Tube.
.4 CAN/CSA B70, Cast Iron Soil Pipe, Fittings and Means of Joining.
.5 Refer to Section 20 05 00.

PART 2: PRODUCTS

2.01 PIPE, FITTINGS AND JOINTS

.1 **PVC Sewer:** Equal to Ipex "Ring-Tite" DR35 rigid hub and spigot pattern sewer pipe and fittings to CAN/CSA B182.2, complete with gasket joints assembled with pipe lubricant.
.2 **PVC-DWV:** Equal to Ipex System 15 rigid PVC drain, waste and vent pipe and fittings to CAN/CSA B181.2, complete with solvent weld joints.
.3 **Hard Copper:** Type DWV hard temper copper to ASTM B306, with forged copper solder type drainage fittings and 95% tin, 5% Antimony solder joints, or, type L hard copper to ASTM B88, complete with forged copper solder type fittings and 95% tin, 5% Antimony solder joints.
.4 **Cast Iron:** Class 4000 cast iron plain end pipe and fittings to CAN/CSA B70, complete with mechanical joints equal to Husky SD 4000.

PART 3: EXECUTION

3.01 PIPING INSTALLATION REQUIREMENTS

.1 Provide all required drainage and vent piping. Pipe, unless otherwise noted, is to be as follows:

.1 for underground pipe inside the building and to points 1.5 m outside the building – rigid PVC sewer pipe, minimum 100 mm dia. and buried a minimum depth of 600mm.
.2 for pipe inside the building and above ground in sizes to 75 mm dia., except as noted below – type DWV copper
.3 for pipe inside the building and above ground in sizes 75 mm dia. and larger – Class 4000 cast iron or XFR PVC.
.4 for condensate drainage piping above ground – type L hard copper. Condensate lines from cold room evaporators to be 1 ¼"
.5 for concealed pipe inside the building and above ground in lieu of DWV copper and cast iron, where and to the extent permitted by governing Codes and Regulations – rigid PVC DWV

.2 Unless otherwise shown or specified slope horizontal drainage piping above ground in accordance with Code requirements.
.3 Install and slope underground drainage piping to inverts or slopes indicated on the Drawings to facilitate straight and true gradients between the points shown. Verify available slopes before installing the pipes.

.4 Unless otherwise shown or specified, all floor drains, hub drains, and funnel floor drains are to be vented through the roof by Landlord's base-building contractor. Adjustments, including any necessary additional vent piping, are to be performed by LCBO's contractor where required.

.5 For plumbing fixtures, a vent stub shall be provided terminating 600mm above the slab and a roof penetration complete with cone for venting to be provided by landlord's base-building contractor. Piping for plumbing fixtures' vents to be installed by LCBO's contractor in addition to adjustments required to stubs and sealed penetrations.

.6 Unless otherwise shown or specified, slope horizontal branches of vent piping down to the fixture or pipe to which they connect with a minimum pitch of 25mm in 1.2m.

.7 Extend vent stacks up through the roof generally where shown but with exact locations to suit site conditions. Terminate vent stacks above the roof in vent stack covers.

.8 Provide proper die-electric unions at connections between copper pipe and ferrous pipe or equipment.

.9 Temporarily plug floor drains during construction procedures. Remove plugs during final cleanup work and demonstrate free and clear operation of each drain. Replace any damaged grates. Do not dispose of any mortar or grout down the drains.

.10 For existing base building underground, sub-slab or below-deck drainage and vent piping, chip or cut existing concrete slab to adjust existing locations or level of pipes, drain flanges, cleanouts, trap seal primers, and vents as required. Make good floor finish. Contractor to carry a cost to chip/cut slab up to four square feet to allow for adjustments.

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 CSA C191, Performance of Electric Storage Water Heaters.

.2 ASME, American Society of Mechanical Engineers.

.3 Refer to Section 20 05 00.

1.02 SHOP DRAWINGS

.1 Submit shop drawings for domestic hot water heaters.

PART 2: PRODUCTS

2.01 ELECTRIC DOMESTIC HOT WATER HEATER(S)

.1 Rheem Canada Ltd. CSA certified electric hot water heater(s) with model numbers and performance as specified on the drawings, and complete with:

- .1 a 1035 kPa rated (working pressure) steel tank, glass lined, wrapped with minimum R-15 glass fibre insulation, covered with an enamelled steel jacket with access panel, and equipped with a bottom draincock
- .2 immersion heating element(s) consisting of "Nichrome" imbedded in magnesium oxide and sealed in a seamless copper tube, or "Nichrome" wire filament in a sealed stainless steel sheath
- .3 a sacrificial anode rod
- .4 an adjustable thermostat, and a high temperature safety cutout
- .5 an ASME rated temperature and pressure relief valve
- .6 for heaters located above the floor, a round galvanized steel auxiliary catch pan with drain connection

.2 Acceptable manufacturers are:

- .1 Rheem Canada Ltd.
- .2 John Wood (GSW Water Heating Co.)
- .3 A.O. Smith Water Products Co.
- .4 Bradford White
- .5 Or approved alternative

PART 3: EXECUTION

3.01 INSTALLATION OF ELECTRIC HOT WATER HEATER(S)

.1 Provide domestic hot water heaters as follows:

- .1 Staffroom/Washroom areas – minimum size 90 L
- .2 single washroom – minimum size 27 L
- .3 Demo Kitchen – minimum size 180 L
- .4 glass/dish washer – minimum size 180 L

.2 Locate heaters as close as possible to the plumbing fixtures or appliances they serve. Ensure that heaters located above ceilings are adequately accessible.

.3 Provide a catch pan and piping from the catch pan to drain.

.4 Suspend heater(s) from OWSJ or from slab above if it's a suspended slab. Provide

shop drawing of the support stamped by P.Eng.

.5 Secure each heater in place, level and plumb, and:
  .1 pipe the pressure and temperature relief valve to drain
  .2 pipe the drain valve outlet to drain

.6 Ensure that floor drains are properly located for tank drainage.

.7 When installation is complete, check the overall installation and check controls and safeties. Set the thermostat to deliver 60 degree C domestic hot water.

.8 Ensure that electrical connection of each heater is specified and/or shown as part of the electrical work, and includes a disconnect switch for each heater.

.9 If unit is to be mounted above grade, provide adequate structural support designed by a Structural Engineer.

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 CSA B45 Series Standards, Plumbing Fixtures.

.2 ANSI Z358.1-2004.

.3 Refer to Section 20 05 00.

1.02 SHOP DRAWINGS

.1 Shop Drawings: Submit shop drawings (fixture cuts) for all plumbing fixtures and fittings.

PART 2: PRODUCTS

2.01 GENERAL RE: PLUMBING FIXTURES AND FITTINGS

. 1 Fixtures and fittings, where applicable, are to be in accordance with requirements of CSA B45 Series, Plumbing Fixtures.

.2 All fixtures and fittings for use by the handicapped are to be barrier-free and in accordance with Ontario Building Code requirements.

.3 Unless otherwise specified, all vitreous china fixtures are to be white.

.4 Unless otherwise specified, all fittings exposed to view are to be chrome plated and polished.

.5 All fittings located in areas other than private washrooms are to be vandal-proof.

.6 All fixtures carriers are to be suitable in all respects for the fixture they support and the construction in which they are located.

2.02 BARRIER FREE WATER CLOSET – TYPE WC-1

.1 Zurn #Z5560 “ECOVANTAGE” white vitreous china water closet, 1.6 gpf low consumption, high performance pressure assisted two-piece toilet, elongated ADA height front rim, siphon jet action, 2-1/8” fully glazed trapway, elongated front rim, chrome plated handle, bolt caps, closet bolt/wax ring kit and floor mounted toilet with 12” standard rough-in.

.2 Each water closet is to be complete with:

- .1 seats: Z5957SS-EL, elongated, solid plastic open front white seat with cover and check hinge.
- .2 supply: McGuire # H166N3 chrome plated angle supply with wheelhandle stop and flexible riser

2.03 BARRIER FREE LAVATORY – TYPE L-2

.1 American Standard #0955.000/0059.020 ‘MURRO’ Basin, 22” x 21-1/4” x 6-1/2” (559mm x 540mm x 165mm) high, with center hole, vitreous china, wall hung, for carrier with concealed arms, rear overflow, recessed self-draining faucet ledge, semi-pedestal P-trap cover.

- .1 Chicago Faucets Marathon #2200 single lever faucet, center hole only, cast brass body, 2.2 GPM (8.3 LPM) max flow aerator outlet, 4-3/4” (121mm) long cast spout, lever handle, adjustable volume control.

.3 Drain - McGuire #155AC Open Grid Drain, chrome plated cast brass one piece top, 1/16" (1.5mm) tubular 1-1/4" (32mm) tailpiece. Full assembly shall be treated inside and out with 'SANIGUARD' antimicrobial compound.

.4 Supply – McGuire #H170BVRB Faucet Supplies, chrome finish polished brass, commercial duty ¼ turn ball valve angle stop, ½" (13mm) I.D. Inlet x 5" (127mm) horizontal extension tubes, combination V.P). Loose key handle, escutcheon and stainless steel braided flexible riser.

.5 p-Trap - McGuire #8872CBSAN 'p' Trap, C.P., polished, cast brass adjustable body, 1-1/4" (32mm) with cleanout plug, seamless brass wall bend and escutcheon. Full Assembly shall be treated inside and out with 'SANIGUARD' antimicrobial compound.

.6 Carrier - Jay R. Smith #0700-Z Basin Carrier, with steel pipe legs, block base feet support, concealed arms and pedestal plate. (For narrow wall installation provide 'Z' type sleeve for arms.)

2.04 EYEWASH FOUNTAIN

.1 Eyewash Fountain - Type EE-1

.1 Guardian Model G5022 eyewash/drench hose unit: complete with two plated aerator heads, each head has a "flip-top" dust cover, internal flow control and filter, forged brass squeeze valve with stainless steel lever handle, 8' (2440mm) reinforced PVC hose with 300psi (2070kpa) maximum working pressure, NPS 3/8 (10mm) supply and NPS 3/8 stay-open ball valve. Emergency Fixture Mixing Valves: Bradley Model S19-2000 packaged water blending system, mixing cold and hot water to maintain a set outlet temperature of 25°C-30°C. Consists of liquid-filled thermal motor and a piston control mechanism with positive shutoff of hot water when cold water supply is lost, allow cold flow in event of loss or interruption of hot water supply or thermostat failure, cold water bypass, outlet temperature gauge, stainless steel cabinet, NPS 1/2 (13mm) connections.

2.05 JANITOR'S SINK – TYPE JS-1

.1 Atlantic Stainless Fabricators Ltd. (contact Mohamed Rajik at 416-285-5535) or approved alternates, floor mounted sink, minimum 1.2 m long x 610 mm x 254 mm deep, constructed of #16 gauge type 304 stainless steel with a # 4 finish and complete with a 75 mm dia. corner standing waste with 254 mm high perforated removable corner guard with clips. Perforation at full extent of corner guard, wall clips, a full length (610 mm x minimum 1219) 1219 mm high surround, and the following:

.1 supply fitting: Chicago Faucets #305VBR-XK-Hose-58 200 mm centreset wall mount faucet assembly with cast brass lever handles, vacuum breaker, integral stops, and 1800 mm of hose with hanger.

.2 trap: 75 mm dia. "P" trap conforming to material requirements specified in Section 22 13 16

.2 Refer to architectural drawings for exact sink dimensions.

.3 Sink shall have integral slopes in drain at ½":1'-0", C/W, and all required trim and closures.

2.06 LUNCHROOM COUNTER SINK- TYPE S-2

.1 Franke Kindred Canada Ltd. #QSL2020/8 "STEEL QUEEN" undercoated, single 460 mm x 410 mm x 200 mm deep bowl counter sink constructed of #20 gauge grade 18-8 stainless steel with a mirror finish rim and satin finish bowl, ledgeback punched on 200 mm centres for a supply fitting, 89 mm dia. basket strainer waste fitting with 38 mm dia. tailpiece, and the following:

.1 supply fitting: Symmons #S-23-LST "Symmetrix" 200 mm centre single lever handle kitchen sink faucet with swing spout with aerator and long supply tubes

.2 trap: rough copper or brass 38 mm dia. "P" trap with cleanout plug

.3 supplies: 12 mm dia. ball type shut-off valves as per Section 22 11 16

2.07 ACCEPTABLE MANUFACTURERS

.1 Acceptable plumbing fixture and fitting manufacturers are as follows:

.1 vitreous china fixtures: American Standard, Eljer, Crane and Kohler

.2 supply fittings: Sloan, American Standard, Moen

.3 stainless steel sink: Franke Kindred Canada Ltd., Elkay, Moen and American Standard Industries "Airstaline"

.4 water closet seats: Centoco, Moldex, Olsonite and Beneke

.5 flush valves: Sloan, Zurn, and Cambridge Brass

.6 fixture carriers: Smith, Zurn, and Watts

.7 fixture trim: unless otherwise specified, American Standard, Zurn, Cambridge Brass, Chicago Faucet, and Symmons

.8 Eyewash Fountain: Guardian, Haws, Bradley

.9 Portable Eyewash Station: FENDALL PURE FLOW 1000

.2 Or approved alternate.

PART 3: EXECUTION

3.01 INSTALLATION OF PLUMBING FIXTURES AND FITTINGS

.1 Provide all required plumbing fixtures and fittings.

.2 Protect all fixtures and trim during construction period. Replace any fixtures that contain cracks, flaws or imperfections.

.3 Confirm the exact location of all plumbing fixtures and trim prior to roughing-in.

.4 When installation is complete, check and test the operation of each fixture and fitting. Adjust or repair as required.

.5 Supply templates for all counter mounted fixtures and trim and hand to the trade who will cut the counter. Ensure openings in the counter are properly located.

.6 For the type JS-1 janitor's sink, locate the supply fitting approximately 915 mm above the finished floor, and locate the hose hanger approximately 450 mm above the finished floor. Confirm exact dimensions prior to roughing-in.

.7 For water closets, urinals, type L-2 lavatories, and type JS-1 janitor's sinks, ensure that caulking around the perimeter of the fixture at the wall or floor is specified in Division 07.

.8 Connect fixtures complete with supplies and drains, separately trapped, supported level and square. Hot water faucets shall be on left side. Thermostatic controlled mixing valves shall include check stops on supplies.

.9 Set lavatory maximum temperature limit stops to deliver maximum 38°C water.

.10 Insulate exposed fixture piping in accordance with local plumbing and building codes.

.11 Locate emergency eyewash stations as per ANSI Z358.1-2004. The Flushing Fluid Nozzles shall be mounted no less than 838mm and not greater than 1143mm. Coordinate with Contractor for wall blocking support as required.

END OF SECTION

PART 1: GENERAL

1.01 SUMMARY

.1 Section includes:

.1 Labour, products, equipment and services necessary to complete the work of this Section including but not limited to the following:

.1 Performance testing and balancing of heating, ventilating, air conditioning and hydronic systems.

.2 Measuring and reporting all specified space noise levels. Noise level to be below NC35.

.3 Measuring and reporting all specified vibration isolation levels.

.4 Rechecking of testing and balancing during the alternate (heating/cooling) season.

.2 Section Excludes:

.1 The following systems do not require air and water balancing

.1 Domestic cold water.

.2 Domestic hot water (except balancing valve on connections to hot water recirculation piping).

.3 Natural gas (except natural gas metering as part of heating equipment performance test).

.4 Beer coolers.

.5 In-floor heating.

.2 The following equipment does not require air and water balancing:

.1 Hydronic and electric convection heaters (baseboards).

.2 Hydronic and electric forced flow heaters.

.3 Humidifiers.

.3 Unless stated otherwise, Testing, Adjusting and Balancing Services shall be included in the General Contractor's scope of work.

.1 General Contractor is responsible for all coordination.

.2 All direct costs for balancing are to be included in the General Contractor's Scope of Work.

.3 The following are approved Testing, Adjusting and Balancing Services vendors:

.1 Air & Water Precision Balancing
47 Ted Reeve Dr.
Toronto, ON M4E 3X1
Ph: 647-896-5353
Email:matt@awpbgroup.com

.2 DesignTest
70 East Beaver Creek Rd.
Richmond Hill, ON L4B 3B2
Ph: 905-886-6513
Email: ssahota@designtest.ca

.3 Dynamic Flow Balancing

1200 Speers Rd.
Oakville, ON L6L 2X4
Ph: 905-338-0808
Email:emolnar@dynamicflowbalancing.com

.4 Pro Air Testing
21 Goodrich Rd Unit #13
Toronto ON M8Z 4Z8
Ph: 416-252-3232
Email: abdo-proairtesting@bellnet.ca

.5 Vital Canada Group
1143 Bancroft Dr
Mississauga, ON L5V 1B7
Ph: 905-848-1000
Email: info@vitalcanada.com

.6 VPG Associates
2062 King Rd
King City, ON L7B 1K9
Ph: 905-833-4334
Email: mail@vpgassociates.com

1.02 RELATED WORK IN OTHER SECTIONS

.1 Factory testing, and calibrating of equipment or control systems.

.2 Testing and checking of equipment supplied by other Divisions, except where such equipment forms an integral part of the mechanical systems.

1.03 QUALIFICATIONS

.1 Perform testing and balancing of air and water systems by an accredited Testing and Balancing Firm who is a member of the Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB).

.1 Acoustic and vibration measurements may be performed by a specialist sub-contractor to the Testing and Balancing Firm.

1.04 PERFORMANCE STANDARDS

.1 Perform testing and balancing in accordance with the current issue of:

.1 Associated Air Balance Council Standards for Total System Balance.

.2 SMACNA “Testing, Adjusting and Balancing” guidelines.

.2 Instruments: recently calibrated; state date of calibration in the report.

1.05 COORDINATION

.1 General

.1 Review with affected trades before fabrication, the location of balancing devices, test connections and access openings and report conditions which could affect optimum system performance.

.2 By inspection, assure that all testing, balancing and metering devices are installed properly and in pre-selected locations.

.3 The Mechanical Contractor will obtain the approval of the testing and balancing firm and the mechanical engineer before relocating these devices due to field conditions.

.4 Coordinate efforts so that items requiring replacement and/or delivery time (sheaves, motors, etc.) are tested as early as possible.

.2 The Mechanical Contractor and/or associated sub-contractors will provide the following assistance and/or services to the testing and balancing firm.

.1 Schedule sufficient time so that initial testing and balancing can be completed before occupancy begins and coordinate with trades involved.

.2 Keep testing and balancing firm informed of any major changes made during construction and furnish same with a set of project drawings and reviewed Shop Drawings.

.3 Furnish balancing devices, test connections access openings, balancing probe inlets and plugs.

.4 Clean and pre-run all equipment, filters, etc. and place all heating, ventilating and air conditioning systems into full operation and continue same during each working day of testing and balancing.

.5 Provide immediate labour from pertinent mechanical trades and tools, equipment and materials to make equipment and system alterations and adjustments, as required including control adjustments.

.6 Building Automation System technical representative to operate the BAS during air and water balancing testing.

.7 Make available all equipment data (Shop Drawing Performance Data and operating instructions) to the Testing and Balancing Firm.

.8 Refrigeration machine manufacturer service representative for performance testing of the refrigeration equipment. Testing and Balancing Firm witnesses and records all test results.

.9 Fuel fired heating equipment manufacturer service representative, or other qualified service company technical representative, for performance testing of heating equipment. Testing and Balancing Firm witnesses and records all test results.

.3 The General Contractor is to contact the TAB contractor to coordinate testing. All required equipment and devices must be complete and in place for this test. Should return visits be required by the TAB contractor as a result of incomplete work, the costs of return visits by the TAB contractor will be retained from the General Contractor. The General Contractor shall arrange for elevated platforms for the balancing. This includes but is not limited to scissor lifts, scaffolding and approved ladders.

.4 The Consultant shall provide reproducible mechanical drawings and refrigeration (cold room) drawings for the TAB contractor's and Commissioning Agent's review at the 60%-90% design stage.

1.06 DEFINITIONS

.1 Balancing: To proportion and regulate flows within the distribution system (subsystems, branches, mains, terminals, etc.) at appropriate pressures in accordance with the design intent. This includes setting discharge volume and patterns of terminal devices, and individual return and exhaust air volumes.

2. Testing: To measure, interpret and report in writing, such parameters as may be required to verify design compliance and as specified herein

1.07 SUBMITTALS

.1 Submit in accordance with the requirements of Division 01.

.2 Submit layout drawings and Report Format a minimum 14 days prior to start of air and water balancing on-site.

.1 Layout Drawings:

.1 Identify specific locations of all adjusting, balancing and permanent measuring devices, neatly marked on a set of plans for approval by the Consultant. A set of reproducible mechanical drawings and refrigeration (cold room) drawings will be furnished by the Consultant for this purpose.

.2 Propose, for review by the Consultant, additional devices deemed advisable for satisfactory operation and completion of the work of mechanical division.

PART 2: PRODUCTS

2.01 NOT USED

.1 Not used.

PART 3: EXECUTION

3.01 REQUIRED REPORTS

.1 Provide the following Start-Up and Performance Testing reports:

.1 Air and water balancing report (at the beginning of the project).

.2 Air and water balancing report (after completion of air and water system).

.2 Report Format

.1 Include the following header information for each test report:

.1 Owner Name

.2 Project Name

.3 Contractor Name

.4 Consultant Name

.5 Name of Test Report

3.02 AIR AND WATER BALANCING

.1 Site Visits

.1 Visit the site as required prior to testing and balancing systems and advise respective trades of this Section's requirements for probe inlets etc. Submit a report to the Consultant after each site visit

.2 Balancing Tolerances

.1 Balance all systems to the performance parameters indicated on drawings and in the specifications.

.2 If interpretation, clarification or additions to performance parameters are required, request such information from the Consultant

.3 Balancing Tolerances

.1 Air Flow Rates

Under 70 L/S	10% of flow
Over/at 70 L/S	5% of flow

.2 Water Flow Rates

Hydronic Heating	5% of flow
Chilled Water	2% of flow
Condenser Water	5% of flow
Process Chilled water	2% of flow
Process Cooling Water	5% of flow

.3 Heat Flow Rates

Air Coils	5% of design capacity
Heat Exchangers	5% of design capacity
Water Heaters	5% of design capacity

.4 Drawing Review

.1 Review all pertinent plans, specifications, Shop Drawings, interference drawings and other documentation to become fully familiar with the systems and their specified and intended performance.

.5 Air Systems

.1 Test relative barometric pressures in various building areas, as deemed necessary by the Consultant and at least in all areas served by different systems.

.2 Operate, test and balance all air systems over their entire design range of operation including minimum and maximum fresh air, return air and supply air.

.3 Balancer is responsible for sheave changes and setting motor speeds.

.4 Simulate full heating and cooling conditions. Record sufficient data to verify compliance with design requirements.

.5 Balance air systems within acceptable tolerances before water systems are balanced.

.6 Rooftop Unit LGH 5-ton or smaller: Adjust torque % on controller to achieve design air flow capacity.

.7 Rooftop Unit LGH 6-ton or larger: Adjust sheaves or pulleys to achieve design air flow capacity. Adjustment shall not been done at VFD or controller.

.6 Hydronic Systems

.1 Operate, test and balance all water systems over their entire design range of operation.

.2 Simulate full heating and cooling conditions. Record sufficient data to verify compliance with design requirements.

.3 Balance water systems within acceptable tolerances before air systems are balanced.

.7 Continuous Recording

.1 Set-up trend logs on the Building Automation System to record on a temperature and humidity levels on a 24-hour basis, in areas as directed by the Consultant.

.8 Data Required

.1 Submit the following data as a minimum. If contractor's standard forms provide for additional data, also submit such additional data. Indicate if tests were not specifically made. Do not repeat design data or other values not specifically tested.

.2 Hydronic heating equipment (boilers, heaters, etc.)

.1 Manufacturer and model

.2 Gas and fuel oil input flow rating

.3 Gas and fuel oil input pressure rating

.4 Gas pressure regulator inlet and outlet pressure

.5 Entering and leaving water temperature - design and actual

.6 Entering and leaving water pressure - design and actual

.7 Water flow rate - design and actual

.8 Steam flow rate and pressure - design and actual

.9 Combustion efficiency test at maximum rated capacity; including flue gas analysis

.10 Combustion efficiency test - as per Ministry of Environment Guideline A-9, corrected to 3% O2, for fuel input ratings exceeding 10 MMBtu/h (2932 kW)

.11 Thermal efficiency, based on ASME short form power test code, for fuel input ratings exceeding 10 MMBtu/h (2932 kW)

.3 Motors:

.1 Manufacturer

.2 Model or serial number

.3 Rated amperage and voltage

.4 Rated horsepower

.5 Rated RPM

.6 Corrected full load amperage
.7 Measured amperage and voltage
.8 Calculated BHP (kW)
.9 Measured RPM
.10 Sheave size, type and manufacturer

.4 Fans:
.1 Manufacturer
.2 Model or serial number
.3 Rated CFM (L/S)
.4 Rated RPM
.5 Rated pressures (suction and discharge)
.6 Measured CFM (L/S)
.7 Measured RPM
.8 Measured pressures (suction and discharge)
.9 Pulley size, type and manufacturer
.10 Belt size and quantity

.5 Pumps:
.1 Manufacturer
.2 Model or serial number
.3 Rated GPM (L/S)
.4 Rated Head
.5 Rated pressures
.6 Measured discharge pressure (full flow and no flow)
.7 Measured suction pressure (full flow and no flow)
.8 Measured gpm (L/s) at operating conditions
.9 Operating head
.10 Operating RPM

.6 Air Systems
.1 Grille, register or diffuser reference number and manufacturer
.2 Grille, register or diffuser location
.3 Design velocity
.4 Design cfm (L/s)
.5 Effective (or free) area factor and size
.6 Measured velocity
.7 Measured cfm (L/s)

.7 Heat transfer equipment:
.1 Manufacturer and type
.2 Design inlet and outlet temperatures
.3 Design pressure drop
.4 Design flow rate
.5 Measured inlet and outlet temperatures
.6 Measured pressure drop
.7 Measured flow rate

3.03 DEFICIENCIES

.1 Immediately report to Consultant, any deficiencies in the systems or equipment performance resulting in design requirements being unobtainable.

3.04 DRAFT REPORTS

.1 On completion of the start-up, testing, adjusting and balancing of all systems, submit to the project team, a hand-written, legible draft report on all tests, adjustments, and balancing performed. Submit the report not more than 2 days after testing and include the following:

- .1 Summary of all systems
- .2 Testing methods and instrumentation
- .3 Air systems testing and balancing data
- .4 Liquid systems testing and balancing data
- .5 Acoustic survey report
- .6 Attachments including systems schematics with numbered terminals for referring to data above

.2 After review by the Consultant and at the Consultants direction, retest up to 10% of all measurements in locations as directed by the Consultant, at no cost extra to the contract.

3.05 FINAL REPORTS

.1 Submit to Consultant following completion of alternate season testing and balancing. Final report to be in PDF format and submitted not more than 7 days after testing. General Contractor to include final TAB report in Operation Maintenance manuals.

3.06 SPOT CHECKS

.1 Before acceptance of the air and water balancing report, the Consultant may request to witness spot-checks of the report results.

.2 If results indicate unusual testing inaccuracy, omissions, or incomplete balancing/ adjustment, in the opinion of the Consultant, re-balance entire affected system(s) at no increase in Contract Price.

3.07 ACCEPTANCE

.1 The Substantial Performance of the Mechanical Work will be considered reached when the initial Start-Up and Performance Testing report is accepted by the Consultant and in the opinion of the Consultant all systems have been satisfactorily installed, operated tested, balanced, and adjusted to meet the specified and intended performance.

.2 The substantial performance will not depend upon alternate season testing, however, make such relevant repairs or modifications deemed necessary during this re-checking as part of the guarantee of the work.

.3 The total performance of the Mechanical Subcontract (Contract) will not be considered reached until the alternate season testing and balancing is completed and the final report submitted and accepted by the Consultant

3.08 ADDITIONAL TESTING

.1 The Consultant may request such additional testing in connection with this project as he deems necessary.

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 ASHRAE Standard 15, Safety Code For Mechanical Refrigeration.
.2 UL 207, Refrigerant – Containing Components and Accessories, Non-Electrical.
.3 UL42, Electrical Operated Valves.
.4 ASTM B280, Specification For Seamless Copper Tube For Air Conditioning and Refrigeration Field Service.
.5 ANSI B16.22, Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.
.6 ASTM B32, Specification For Solder Metal.
.7 ANSI B16.24, Cast Copper Alloy Pipe Flanges and Flanged Fittings.
.8 ASTM A126, Specification For Grey Cast Iron Castings For Valves, Flanges and Pipe Fittings.
.9 ARI 760, Solenoid Valves for Use With Volatile Refrigerants.
.10 ASHRAE Standard 17, Method of Testing Capacity of Thermostatic Refrigerant Expansion Valves.
.11 ASHRAE Standard 63, Method of Testing Liquid Line Refrigerants.
.12 ARI 495, Standard for Refrigerant Liquid Receivers.
.13 ANSI B31.5, Refrigerant Piping.
.14 ANSI A13.1 Scheme For Identification of Piping Systems.
.15 ANSI Z53.1, Safety Colour Code.
.16 ANSI/ASME 31.5, Refrigerant Piping and Heat Transfer Components.
.17 Refer to Section 20 05 00.
.18 Refer to Section 20 07 00.
.19 Supply and installation of this section of work has been contracted by LCBO with an approved vendor.

1.02 QUALITY ASSURANCE

.1 Comply with ASHRAE Standard 15. The application of this Standard is intended to assure the safe design, construction, installation, operation, and inspection of every refrigerating system employing a fluid which normally is vaporized and liquefied in its refrigerating cycle.
.2 Comply with ASME Boiler and Pressure Vessel Code: Section IX: Welding and Brazing Qualifications.
.3 All products are to comply with UL 207, or UL 429, Electrical Operated Valves.
.4 **Refrigerant piping work of this Section is to be done as part of the food service equipment and walk-in cooler/freezer work specified in Division 11 by journeyman refrigeration mechanics.**

1.03 SHOP DRAWINGS

.1 Submit shop drawings and/or product data sheets for system components to present sufficient information to confirm compliance with the Specification. Shop drawings and/or product data sheets are required for the following:
  .1 tubing and fittings

.2 valves
.3 strainers
.4 moisture-liquid indicators
.5 filter-driers
.6 flexible metal hose
.7 liquid-suction interchanges
.8 oil separators (when specified)
.9 gauges
.10 refrigerant and oil
.11 pipe/conduit roof penetration cover
.12 soldering and brazing materials

.2 Submit schematic dimensioned layout shop drawings of refrigerant piping and accessories, including flow capacities, valve locations, oil traps, slopes of horizontal runs, floor/wall/roof penetrations, and equipment connection details.

1.04 START-UP REPORTS

.1 Submit start-up reports for refrigeration equipment specified in Division 11. As a minimum each report is to include:
.1 refrigerant type/quantity used
.2 degrees of sub-cooling
.3 degrees of superheat
.4 compressor ampere draw
.5 site glass observations
.6 suction pressure
.7 suction temperature
.8 discharge pressure
.9 discharge temperature
.10 ambient temperature

PART 2: PRODUCTS

2.01 PIPING AND FITTINGS

1. **Refrigerant Piping**: Copper refrigerant tube, ASTM B280, cleaned, dehydrated and sealed, marked ACR on hard temper straight lengths, tagged ASTM B280 on coils by the manufacturer.
2. **Condensate Drainage Piping**: Copper tube as per Section 22 13 16 or PVC / CPVC schedule 40 plastic drain pipe.
3. **Fittings, Valves and Accessories:**
.1 solder joints: wrought copper fittings, ANSI B16.22
.1 solder, refrigerant tubing: Cadmium free, AWS A5.8, 45 percent silver brazing alloy, Class BAg-5
.2 solder, drain piping: 95-5 tin-antimony, ASTM B32 (95TA)
.2 flanges and flanged fittings: ANSI B16.24
.3 refrigeration valves:

.1 stop valves: brass or bronze alloy, packless, or packed type with gas tight cap, frost-proof, backseating

.2 pressure relief valves: forged brass with nonferrous, corrosion resistant internal working parts of high strength, cast iron bodies conforming to ASTM A126, Grade B - set valves in accordance with ASHRAE Standard 15

.3 solenoid valves: ARI 760, UL listed, two-position, direct acting or pilot-operated, moisture and vapor-proof type of corrosion resisting materials, designed for intended service, with solder-end connections, fitted with suitable NEMA 250 enclosure of type required by location and normally closed holding coil

.4 thermostatic expansion valves: brass body with stainless steel or non-corrosive non-ferrous internal parts, diaphragm and spring-loaded (direct-operated) type with sensing bulb and distributor having side connection for hot-gas bypass and external equalizer - size and operating characteristics as recommended by the manufacturer of evaporator and factory set for superheat requirements - solder-end connections - testing and rating in accordance with ASHRAE Standard 17

.5 check valves: brass or bronze alloy of the swing or lift type, with tight closing resilient seals for silent operation, designed for low pressure drop, and with solder-end connections- direction of flow is to be legibly and permanently indicated on the valve body

4. **Strainers**: Designed to permit removal of the screen without removing the strainer from the piping system, and equipped with screens 80 to 100 mesh in liquid lines up to 30 mm, 60 mesh in liquid lines over 30 mm, and 40 mesh in suction lines
5. **Refrigerant Moisture/Liquid Indicators**: double-ported type having heavy sight glasses sealed into a forged bronze body, screwed brass seal cap, and incorporating a means of indicating refrigerant charge and moisture indication
6. **Refrigerant Filter-Dryers**: UL listed, angle or in-line type conforming to ASHRAE Standard 63, complete with a heavy-gauge steel shell protected with corrosion-resistant paint, perforated baffle plates to prevent desiccant bypass - size as recommended by the manufacturer for the service and capacity of the system with connection not less than the line size in which it is installed - filter driers with replaceable filters are be furnished with one spare element of each type and size
7. **Flexible Metal Hose**: seamless bronze corrugated hose, covered with bronze wire braid and complete with standard copper tube ends
8. **Receivers**: conforming to ARI 495, of steel construction, equipped with tappings for liquid inlet and outlet valves, pressure relief valve, and liquid level indicator

2.02 PIPE CLAMPS

1. “Cushaclamp” style - channel mount, electro-dichromate steel, “controlled squeeze” stud configuration with thermoplastic elastomer pipe cushion.

PART 3: EXECUTION

3.01 INSTALLATION OF REFRIGERANT PIPING SYSTEMS

.1 Provide complete systems of refrigerant piping with all required accessories to connect food service equipment, walk-in coolers/freezers, and compressor condenser equipment. Refer to Sections 11 40 00 and 11 41 20, and to sketch drawings SK01 - 23 23 00, SK02 - 23 23 00, and SK03 - 23 23 00 found at the end of this Section.

.2 Design and install refrigerant piping and refrigerant containing parts in accordance with ASHRAE Standard 15 and ANSI B31.5. Refrigerant piping is to be brazed with 15 percent silver solder in accordance with AWS A5.8.

.3 Design and install refrigeration piping with a pressure drop not to exceed 2F.

.4 Install piping as short as possible, with a minimum number of joints, elbows and fittings.

.5 Install piping with adequate clearance between pipe and adjacent walls and hangers to allow for service and inspection. Space piping (including insulation), to provide 25 mm minimum clearance between adjacent piping or other surfaces. Use proper pipe sleeves through walls, floors, and ceilings, sized to permit installation of pipes with full thickness insulation.

.6 Locate and orient valves to permit proper operation and access for maintenance of packing, seat and disc. Generally, locate valve stems in overhead piping in the horizontal position. Provide a union adjacent to one end of all threaded end valves. Control valves usually require reducers to connect to pipe sizes.

.7 Use copper tubing in protective conduit when installed below ground.

.8 Swab fittings and valves with the manufacturer's recommended cleaning fluid to remove oil and other compounds prior to installation.

.9 Install hangers and supports per ANSI B31.5 and the refrigerant piping manufacturer's recommendations.

.10 Protect refrigerant system during construction against the entrance of foreign matter, dirt and moisture. Cap open ends of piping and connections to compressors, condensers, evaporators and other equipment until assembly.

.11 Pass nitrogen gas through the pipe or tubing to prevent oxidation as each joint is brazed. Cap each system with a reusable plug after each brazing operation to retain the nitrogen and prevent the entrance of air and moisture.

.12 Pipe relief valve discharges to atmosphere for systems containing more than of refrigerant.

.13 Provide strainers in liquid lines serving each thermostatic expansion valve, and in suction lines serving each refrigerant compressor not equipped with an integral strainer.

.14 Provide flexible metal hose at the suction and discharge connection to each compressor.

3.02 SIGNS AND IDENTIFICATION

1. Equip each refrigerating system erected on the premises with an easily legible

permanent sign securely attached and easily accessible, indicating thereon the name and address of the installer, the kind and total number of pounds of refrigerant required in the system for normal operations, and the field test pressure applied.

2. Systems containing more than 50 kg of refrigerant are to be equipped with durable signs in accordance with ANSI A13.1 and ANSI Z53.1, having letters not less than 12.7 mm in height designating:
   .1 valves and switches for controlling refrigerant flow, the ventilation and the refrigerant compressor(s)
   .2 signs on all exposed high pressure and low pressure piping installed outside the machinery room, with the name of the refrigerant and the letters HP or LP

3.03 FIELD QUALITY CONTROL

1. Prior to initial operation examine and inspect each piping system for conformance to the Specifications, reviewed shop drawings, and ASME 31.5. Equipment, material, or work rejected because of defects or non-conformance with the drawings, reviewed shop drawings, and Specifications are to corrected immediately.

3.04 FIELD TESTS

.1 After completion of piping installation and prior to initial operation, conduct tests on the piping systems in accordance with requirements specified in Section 20 05 00 and ASME B31.5. Perform tests in the presence of the LCBO and BCC representatives. If any test fails, correct defects and perform the test again until it is satisfactorily completed and all joints are proved tight.

.2 Every refrigerant-containing part of each system that is erected on the premises, except compressors, condensers, evaporators, safety devices, pressure gauges, control mechanisms, and systems that are factory tested, are to be tested and proved tight after installation, and before operation.

.3 The high and low side of each system is to be tested and proved tight at not less than the lower of the design pressure or the setting of the pressure-relief device protecting the high or low side of the system, respectively, except systems erected on the premises using non-toxic and non-flammable Group A1 refrigerants with copper tubing not exceeding 16 mm O.D. These may be tested by means of the refrigerant charged into the system at the saturated vapor pressure of the refrigerant at 20 degree C minimum.

.4 Test Medium: A suitable dry gas such as nitrogen is to be used for pressure testing. The means used to build up test pressure is to have either a pressure-limiting device or pressure-reducing device with a pressure-relief device and a gauge on the outlet side. The pressure relief device is to be set above the test pressure but low enough to prevent permanent deformation of the system components.

3.05 SYSTEM TESTING AND CHARGING

1. System Test and Charging: As recommended by the equipment manufacturer or as follows:

.1 Connect a drum of refrigerant to charging connection and introduce enough refrigerant into system to raise the pressure to 70 kPa gauge. Close valves and disconnect refrigerant drum. Test system for leaks with halide test torch or other approved method suitable for the test gas used. Repair all leaking joints and retest.

.2 Connect a drum of dry nitrogen to charging valve and bring test pressure to design pressure for low side and for high side. Test entire system again for leaks.

.3 Evacuate the entire refrigerant system by the triplicate evacuation method with a vacuum pump equipped with an electronic gauge reading in mPa (microns). Pull the system down to 665 mPa (500 microns) and hold for four hours then break the vacuum with dry nitrogen (or refrigerant). Repeat the evacuation two more times breaking the third vacuum with the refrigeration to be charged and charge with the proper volume of refrigerant.

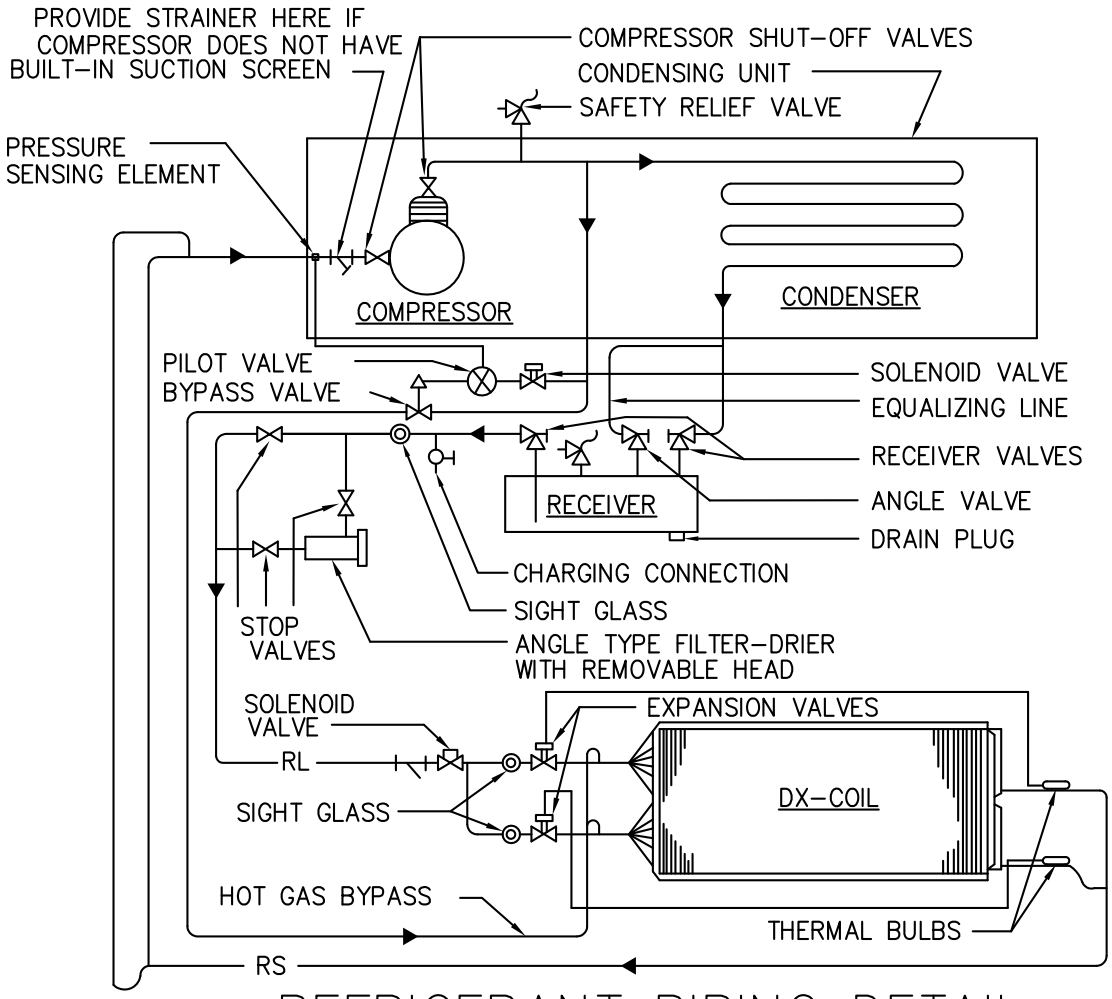
3.06 SYSTEM START-UP AND REPORTS

.1 When the installation of each refrigerant piping system is complete and tests have been successfully performed, start-up each system, check and test operation, pressures, temperatures, controls, safeties, etc., make any required adjustments, and leave each system in proper operation condition .

.2 Arrange and pay for equipment supplier representatives to be present to supervise and document start-up procedures, and to sign the start-up reports.

.3 Submit start-up reports as specified in Part 1 of this Section.

END OF SECTION



REFRIGERANT PIPING DETAIL (EVAPORATOR LOCATED LOWER/SAME LEVEL AS COMPRESSOR)

NOTES:

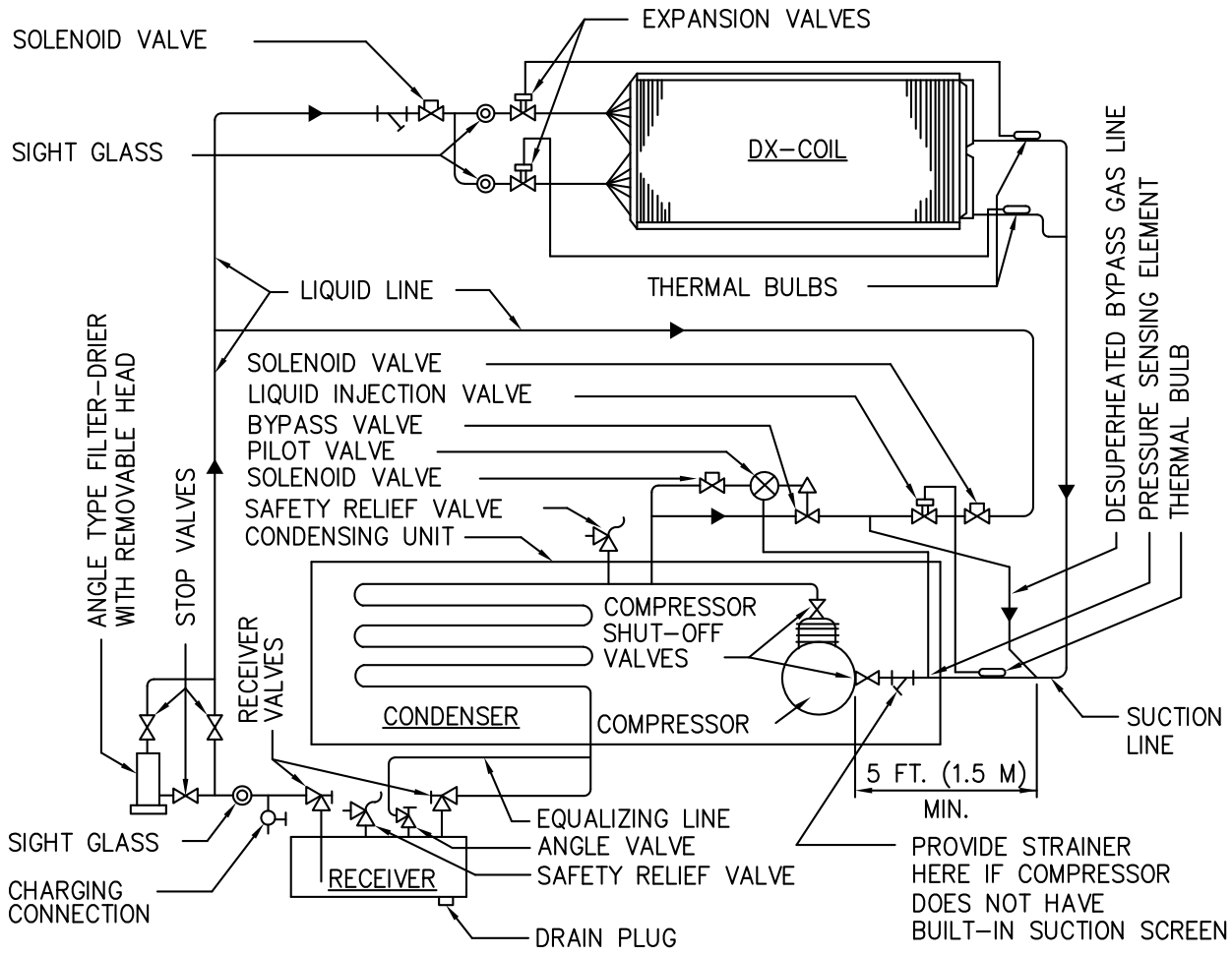
1. REFRIGERANT PIPING SIZES SHOWN ON PLANS ARE BASED ON R-22. REVISE PIPE SIZES IF ANOTHER REFRIGERANT IS USED.
2. DOUBLE REFRIGERANT SUCTION RISER IS SHOWN. PROVIDE DOUBLE RISER ONLY IF PLANS INDICATE. DOUBLE REFRIGERANT SUCTION RISERS TO BE SIZED BY MANUFACTURER OF EQUIPMENT DEPENDING ON COMPRESSOR UNLOADING CAPABILITIES. CROSS SECTIONAL AREA OF DOUBLE RISERS SHALL EQUAL OR EXCEED CROSS SECTIONAL AREA OF HORIZONTAL REFRIGERANT SUCTION PIPE SHOWN.
3. DETAIL SHOWS SINGLE CIRCUIT REFRIGERANT PIPING. DUPLICATE REFRIGERANT PIPING REQUIRED FOR DOUBLE CIRCUIT SYSTEMS.
4. HOT GAS BYPASS SHALL BE INOPERABLE UNTIL COMPRESSOR IS ON LOWEST CAPACITY STEP.
5. REFRIGERANT PIPING TO BE INSTALLED IN FIELD SHALL BE APPROVED BY MANUFACTURER OF EQUIPMENT BEFORE STARTING INSTALLATION.

LCBO

Title: REFRIGERANT PIPING DETAILS

Scale: 1/8"=1'-0" Date; MAY 2012

DWG NO.: SK01 23 23 00



REFRIGERANT PIPING DETAIL
(EVAPORATOR LOCATED HIGHER THAN COMPRESSOR)

NOTES:

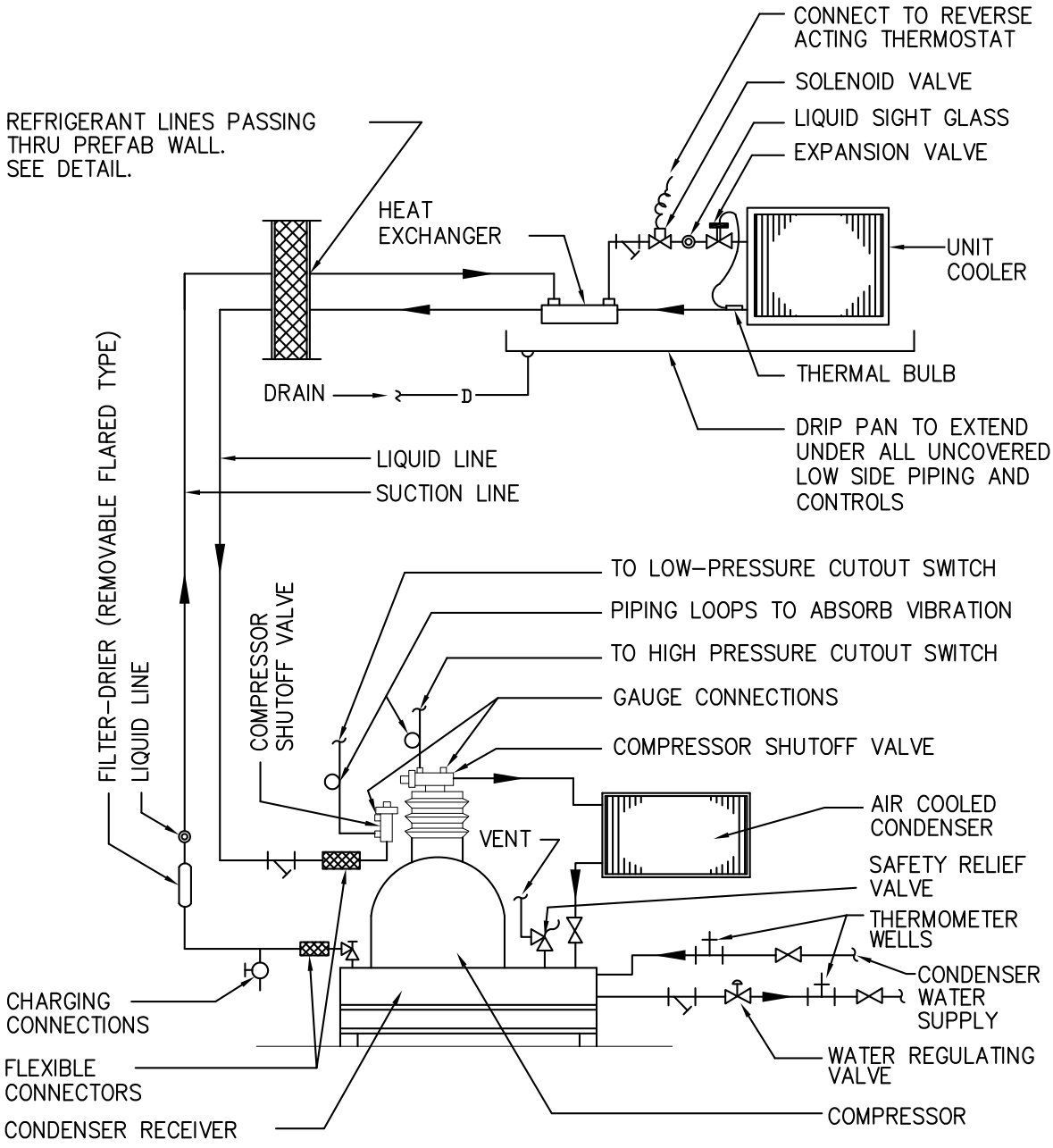
1. REFRIGERANT PIPE SIZES SHOWN ON PLANS ARE BASED ON R-22. REVISE PIPE SIZES, IF ANOTHER REFRIGERANT IS USED.
2. DETAIL SHOWS SINGLE CIRCUIT REFRIGERANT PIPING. DUPLICATE REFRIGERANT PIPING REQUIRED FOR DOUBLE CIRCUIT SYSTEMS.
3. HOT GAS BYPASS SHALL BE INOPERABLE UNTIL COMPRESSOR IS ON LOWEST CAPACITY STEP.
4. REFRIGERANT PIPING TO BE INSTALLED IN FIELD SHALL BE APPROVED BY MANUFACTURER OF EQUIPMENT BEFORE STARTING INSTALLATION.

LCBO

Title: REFRIGERANT PIPING DETAILS

Scale: 1/8"=1'-0" Date; MAY 2012

DWG NO.: SK02 23 23 00



REFRIGERANT PIPING DIAGRAM FOR (INDOOR FLOOR MOUNTED COMPRESSOR)

NOTE:

WHEN WATER COOLED CONDENSER IS USED IN LIEU OF COMBINATION AIR COOLED-WATER COOLED CONDENSER, REMOVE AIR COOLED CONDENSER FROM THIS DETAIL.

DO NOT SCALE DRAWINGS. DETAILS ARE PROVIDED TO EXPRESS DESIGN INTENT AND SHOULD BE ADAPTED TO SUIT SITE CONDITIONS.

ALL NECESSARY SAMPLES AND SHOP DRAWINGS SHALL BE SUBMITTED TO THE LCBO FOR APPROVAL PRIOR TO PROCEEDING WITH THE WORK.

LCBO

Title: REFRIGERANT PIPING DETAILS

.

Scale: 1/8"=1'-0" Date; MAY 2012

DWG NO.: SK03 23 23 00

PART 1: GENERAL

1.01 REFERENCES

.1 ASTM A653, Specification for Sheet Steel, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.

.2 ASTM A53, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.3 SMACNA, Sheet Metal and Air Conditioning Contractors Association.

.4 CAN/ULC S102, Surface Burning Characteristics of Building Materials and Assemblies.

.5 ASTM A568, Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled.

.6 ASTM B209, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.7 CAN/ULC S112, Standard Method of Fire Test of Fire-Damper Assemblies.

.8 NFPA 96, Vapour Removal From Cooking Equipment.

.9 AABC, Associated Air Balance Council.

.10 Refer to Section 20 05 00.

1.02 SHOP DRAWINGS

.1 Submit shop drawings for the following:

- .1 manual balancing dampers
- .2 backdraft dampers
- .3 fusible link dampers

PART 2: PRODUCTS

2.01 DUCTWORK

.1 **Galvanized Steel – Rectangular:** Lock forming grade hot dip galvanized steel, ASTM A653, shop fabricated, with metal gauges in accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible (minimum 0.478 mm -22 gge) to suit the duct configuration and working pressure classification. The steel thickness and zinc coating class is to be factory stencilled on the steel. Galvanizing for bare uncovered duct to be finish painted is to be G60. All other galvanizing is to be G90.

.2 **Galvanized Steel – Round (Spiral):** alpha industries limited "free-flow" or equivalent, prime lock forming quality to ASTM A525M, satin coated finish on ductwork to be painted, G60 coating on all other ductwork, spiral lockseam, factory fabricated fittings with fully welded seams and joints, with metal gauges in accordance with published SMACNA "HVAC duct construction standards metal and flexible" to suit the duct configuration and classification.

.3 **Aluminum - Rectangular**: Alloy 3003 Temper H14 aluminum, ASTM B209, shop or factory fabricated, water-tight, with metal gauges and fabrication in accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible to suit the duct working pressure classification.

.4 **Flexible Metallic:** Spirally wound corrugated aluminum tube with continuous lock

seams, SMACNA Form "M-UN", ULC listed and labelled as Class 1, constructed of aluminum alloy type 3003-0, supplied in 3 m lengths and suitable for air velocities up to 20.3 m/s and operating pressures from 1.50 kPa positive to 0.249 kPa negative. Acceptable products are:

.1 Flexmaster Canada Ltd. "T/L"
.2 Peppertree Air Solutions, Inc.
.3 Or approved alternate.

2.02 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 maximum flame spread rating of 5 and smoke developed rating of 0.

2.03 ROUND TO RECTANGULAR DUCT CONNECTIONS

.1 Galvanized steel, flared, flanged or notched "SPIN-IN" round duct take-off collars in accordance with Fig. 2-6 of SMACNA HVAC Duct Construction Standards Metal and Flexible.

2.04 SPLITTER DAMPERS

.1 Minimum 0.95 mm thick (20 gge) damper blade constructed of the same material as the duct, reinforced as required to suit blade size, system velocity, and to prevent "chatter", and complete with operating hardware equal to Dyn Air Inc. #Q-50 "DYN-A-QUAP S-S" quadrant regulator with RW-50 backup washers to prevent leakage, long square bearing pin, and slide pin.

2.05 AIR TURNING VANES

.1 For square elbows - multiple-radius turning vanes, interconnected with bars, adequately reinforced to suit the pressure and velocity of the system, constructed of the same material as the duct they are associated with, and in accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible.

2.06 MANUAL BALANCING (VOLUME) DAMPERS

.1 Flanged and drilled, single or parallel blade (depending on damper size) manual balancing dampers, each constructed of the same material as the connecting ductwork unless otherwise specified, each designed to maintain the internal free area of the connecting duct, and each complete with:

.1 a hexagonal or square shaft extension through the 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 the blade from moving more than 90^{o}
.4 linkage for multiple blade dampers

.5 a locking hand quadrant damper operator with 50 mm standoff mounting

.2 **Rectangular Dampers:** Ruskin # MD35-ASL, equipped with a reinforced channel type frame.

.3 **Round Dampers:** Ruskin # CDRS82, equipped with a minimum 200 mm deep frame, and blade stiffeners where required.

.4 Acceptable manufacturers are:

.1 Ruskin
.2 T.A. Morrison & Co. Inc. "TAMCO"
.3 Nailor Industries Inc.
.4 NCA Manufacturing Ltd.
.5 Or approved alternate.

2.07 BACKDRAFT DAMPERS

.1 T.A. Morrison & Co. Inc. "TAMCO" Series 8000, insulated, counterbalanced backdraft dampers, 65 mm deep, sized as shown and complete with:

.1 extruded aluminum frame and blades minimum 1.58 mm thick, with captive extruded TPE thermoplastic blade gaskets and side seals in slots integral with the aluminum extrusions
.2 6.4 mm thick polyethylene foam insulation capped with a PVC liner for the interior side of each damper blade, and polyethylene foam insulation for the frame
.3 damper blade counterweights internal to the frame and consisting of adjustable weights fastened to brackets which are riveted to the blades
.4 dual PVC linkage tracks at each end of the blades, and non-corrosive linkage with Delrin pivot arm and Delrin bearings

2.08 FUSIBLE LINK DAMPERS

.1 Curtain blade type, dynamic, galvanized steel (unless otherwise specified) fusible link dampers, ULC classified to Standard 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, and, unless otherwise specified, a 74 ^{O}C rated standard fusible link.

.2 Fusible link dampers are to be type "B" or type "C" (as required) with the folded curtain blade out of the air stream except where damper size or location requires the use of type "A" dampers with the curtain blade in the air stream.

.3 Acceptable manufacturers are:

.1 Ruskin Manufacturing
.2 Nailor Industries Inc.
.3 Greenheck
.4 NCA Manufacturing Ltd.
.5 Or approved alternate.

2.09 FIRE STOP FLAPS

.1 Equal to Nailor Industries Inc. Model 0716 rectangular or Model 0722 round, ULC listed and labelled, blade type galvanized steel fire stop flaps, each complete with ceramic fibre insulation on both sides of the blade, and, unless otherwise specified, a 74° C fusible link.

2.10 THERMAL BLANKET MATERIAL

.1 Equal to Nailor Industries Inc. Model 0725 or Model 0726 ceramic fibre material with round or rectangular opening for a grille or diffuser neck.

2.11 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. "HYPOLON"
.3 Or approved alternate.

.2 Waterproof, flameproof, high temperature flexible connection material meeting requirements of NFPA 90A, consisting of a woven glass fibre fabric coated on both sides with silicone rubber to produce a material with an operating temperature range of from 50°C to 260° C. Acceptable products are:

.1 Duro Dyne Canada Inc. "Thermofab"
.2 Dyn Air Inc. "SILICON HI-T"
.3 Or approved alternate.

2.12 DUCT ACCESS DOORS

.1 In accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible with sizes suitable in all respects for the purpose for which they are provided, and, unless otherwise specified, constructed of the same material as the duct they are associated with.

2.13 INSTRUMENT TEST PORTS

.1 Equal to Duro-Dyne of Canada Ltd. #1P1 or #1P2 (to suit insulation thickness where applicable), gasketed, leakproof instrument test ports for round or rectangular ducts as required, each complete with a neoprene expansion plug and a plug securing chain.

2.14 ACOUSTIC LINING

.1 Minimum 25 mm thick acoustic lining material meeting NFPA 90A requirements and flame spread and smoke developed fire hazard ratings of CAN/ULC S102 flexible for round ducts, board type for rectangular ducts, consisting of a bonded fiberglass mat coated on the inside (airside) face with a black fire-resistant coating.

.2 Acceptable manufacturers are:

.1 Johns-Manville “Permacote Linacoustic”
.2 Knauf
.3 Manson Insulation Inc.
.4 Or approved alternate.

2.15 OPEN ENDED DUCTWORK

.1 Bird screen to be installed on any open ended ductwork.

PART 3: EXECUTION

3.01 GENERAL RE: FABRICATION AND INSTALLATION OF DUCTWORK

.1 Unless otherwise specified, construct, install and seal ductwork in accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible to suit the duct pressure class designation of 750 pa positive or 500 pa negative as applicable. Construct ductwork so the manufacturer's gauge markings are external.

.2 **All ductwork is to be sealed as per SMACNA Seal Class "A", except for round duct with self-sealing gasketed fittings and couplings.**

.3 **Rectangular Duct Support Inside Building:** Support horizontal rectangular ducts inside the building in accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible, but use trapeze hangers with galvanized steel channels and galvanized steel hanger rods for all ducts that are exposed, and all concealed ducts wider than 500 mm.

.4 **Round Duct Support Inside Building:** Support round ducts inside the building in accordance with 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 the top of the duct to a hanger rod, all similar to Ductmate Canada Ltd. type "BA". If the duct is insulated, size the strap to suit the diameter of the insulated duct.

.5 **Support of Roof Mounted Ducts:** As specified in this Section.

.6 **Watertight Ductwork At Humidifier Steam Maniford:** Provide watertight horizontal ductwork a minimum of 3 m upstream and downstream of steam humidifier manifolds. Construct the ducts without bottom longitudinal seams. Seal all other joints with duct sealer. Slope drain points. Provide the drain points.

.7 **Application of Sealants:** 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 the sealant.

.8 **Wall Flanges:** Provide neat sheet metal flanges around exposed ducts passing through walls.

3.02 INSTALLATION OF GALVANIZED STEEL DUCTWORK

.1 Provide all required standard galvanized steel ductwork. Unless otherwise shown or specified, ductwork is standard galvanized steel, round or rectangular as shown.

Where rectangular duct is shown, round duct may be substituted with size conversion as per SMACNA or ASHRAE charts.

3.03 INSTALLATION OF ALUMINUM DUCTWORK

.1 Provide aluminum ductwork 3 m upstream and 3 m downstream of steam humidifier duct manifold locations.

.2 Slope aluminum ductwork down to a drain point in the bottom of the duct.

.3 Refer to "COMMENTARY ON ALUMINUM DUCTS" on pages 1.58, 1.59 and 1.60 of SMACNA HVAC Duct Construction Standards Metal and Flexible, however, do not use drive and S cleats for joining waterproof aluminum ductwork. Use the following SMACNA joining methods:

- .1 T-21 - welded flange
- .2 T-22 - companion angle and gasket
- .3 T-24A flanged

.4 Keep longitudinal joints at the top surface of horizontal runs. Provide proper transverse supports to prevent deflection. Ensure that the duct is rigid.

.5 When mastic is used for sealing such as sealing longitudinal joints, apply the mastic to both surfaces before they are mated. When dry, apply mastic again for a water-tight seal.

3.04 INSTALLATION OF FLEXIBLE DUCTWORK

.1 Provide maximum 3 m long lengths of flexible ductwork for connections between galvanized steel duct mains and branches, and necks of ceiling grilles and diffusers where shown.

.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 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.

.5 Use metal draw bands and sealants to connect flexible ducts to collars at ducts and diffusers.

.6 Ensure that flexible ducts are supported so that they are perpendicular to the diffuser collars to ensure proper airflow to diffusers and at least 25mm of straight duct is connected to diffuser’s neck.

.7 Ensure flexible ductwork enters a diffuser from a 90 degree bend with at least 25mm of straight duct.

3.05 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 the drawings. Install splitter

dampers so they cannot vibrate and rattle and so that the damper operation mechanisms are in an easily accessible and operable location.

3.06 INSTALLATION OF TURNING VANES

.1 Provide turning vanes in ductwork elbows where shown on the drawings and wherever else required where, due to site installation routing and duct elbow radius, turning vanes are recommended in accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible.

3.07 INSTALLATION OF MANUAL BALANCING (VOLUME) DAMPERS

.1 Provide manual balancing dampers in all open end ductwork, in all supply and return air duct mains, and wherever else shown and/or specified.

.2 Install the dampers so that the operating mechanism is accessible and positioned for easy operation, and so that the dampers cannot move or rattle.

.3 Confirm exact damper locations with personnel doing air quantity balancing testing work and install dampers to suit.

3.08 INSTALLATION OF BACKDRAFT DAMPERS

.1 Provide backdraft dampers where shown and for all exhaust fans.

.2 Install and secure the dampers so that they cannot move or rattle.

3.09 INSTALLATION OF FUSIBLE LINK DAMPERS

.1 Provide fusible link dampers where shown and/or specified on the drawings and as required in any rated assemblies and/or to satisfy authorities having jurisdiction. Ensure that the damper rating (1½ or 3 hr.) is suitable for the fire barrier it is associated with.

.2 Install dampers with retaining angles on all four sides of the sleeve on both sides of the damper and connect with ductwork in accordance with the damper manufacturer's instructions and details to meet Code requirements.

.3 Provide expansion clearance between the damper or damper sleeve and the opening in which the damper is required. Ensure that the openings are properly sized and located, and that all voids between the damper sleeve and the opening are properly sealed to maintain the rating of the fire barrier.

3.10 INSTALLATION OF FIRE STOP FLAPS AND THERMAL BLANKETS

.1 Provide fire stop flaps in the duct connection necks of grilles and diffusers installed in ULC fire rated suspended ceiling systems where shown on the drawings.

.2 Provide thermal blanket material to completely cover grille and/or diffuser pans above suspended ULC fire rated ceilings.

.3 Install and secure in place in accordance with the manufacturer's instructions and ULC requirements.

3.11 INSTALLATION OF FLEXIBLE CONNECTION MATERIAL

.1 Provide a minimum of 100 mm of flexible connection material where ducts connect to fans / HVAC air handling equipment and wherever else shown or specified.

.2 Rigidly secure a minimum of 75 mm of duct material (minimum 24 gge) to each edge of the flexible fabric and to the fan, duct, plenum, etc., in accordance with Fig. 2-17 in SMACNA HVAC Duct Construction Standards Metal and Flexible. Ensure that connections to the flexible fabric material are arranged and supported so as to not impose any external forces on the fabric.

.3 For kitchen exhaust ductwork use high temperature flameproof flexible connection material.

3.12 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. Install in accordance with requirements of 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 that the doors are properly located for damper maintenance.

3.13 INSTALLATION OF INSTRUMENT TEST PORTS

.1 Provide instrument test ports in all main ducts at connections to air conditioning units and to fans, in all larger branch duct connections to mains, and wherever else required for proper air quantity balancing and testing.

.2 Locate test ports where recommended by personnel performing air quantity testing and balancing work.

3.14 INSTALLATION OF ACOUSTIC LINING

.1 Provide acoustic lining in locations as follows:

- .1 in all transfer ducts unless factory lined
- .2 wherever else shown and/or specified on the drawings
- .3 minimum of 5 M downstream of all supply and return ducts connected to air handling equipment

.2 Install lining in accordance with requirements of 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 as per Detail "A" of Fig. 2-19, Flexible Duct Liner Installation, found in the SMACNA manual referred to above.

3.15 PAINTING OF DUCTWORK EXPOSED TO OUTDOORS

.1 All ductwork exposed to outdoors is to be completely and carefully sealed with Dow Corning silicone sealer. Ductwork is then to be painted on the outside with primer and two coats of Asphaltum or similar weather and corrosion resistant paint. This requirement applies to intake and discharge cowls, hoods, cabinets, etc.

3.16 AIR QUANTITY TESTING AND BALANCING

.1 A qualified testing and balancing agency, certified and member in good standing of AABC and NEEB to perform Total System Balance,

.2 Refer to Section 23 08 16 for Testing, Adjusting and Balancing.

3.17 INSPECTION, TESTING AND BALANCING

.1 Cleaning:

.1 Prior to start-up of fans, blow out complete systems of duct work with high velocity air for not less than two hours using where possible the installed air handling equipment to full capacity and by blanking off duct sections to achieve required velocity. Do not install air filters prior to blow-out of duct work systems. Use auxiliary portable blowers for cleaning where installed fan systems are not adequate to blow out complete system free from dust and dirt

.2 After duct systems have been blown out, clean interior of plenums, coils, and register, grille or diffuser outlet collars with industrial type vacuum cleaner. On completion of cleaning process, install filters before placing systems in final operation.

.3 For renovation projects, contractor to submit no fewer than 10 photos at equal spacing along duct system to confirm cleanliness.

.2 Testing:

.1 Pressure test the following duct work systems:

.1 Duct work pressure class +/- 4" (1000 Pa) and over

.2 Supply air duct work class +3" (750 Pa) which is concealed in vertical risers

.3 Buried duct work

.2 Test Pressure: equal to duct work pressure class.

.3 Conduct pressure tests based on SMACNA Leakage Test Manual as follows:

.1 Allowable leakage per area of duct work: $F = C_L \times P^{0.65}$

F = leakage rate l/s /10 sq.m of duct surface area
CL = leakage class based on pressure class
P = static pressure, Pa

F = leakage rate cfm/100 sq.ft of duct surface area
CL = leakage class based on pressure class
P = static pressure, in.w.c.

.2 Leakage Class, C_L:

Duct Construction Class			
Duct Class	Up to 500 Pa	750 Pa	Over 750 Pa
Seal Class	C	B	A
Leakage Class, CL (Metric)			

Rectangular Metal	0.34	0.17	0.08
Round Metal	0.17	0.08	0.04
Duct Construction Class			
Duct Class	Up to 2”	3”	Over 3”
Seal Class	C	B	A
Leakage Class, CL (Imperial)			
Rectangular Metal	24	12	6
Round Metal	12	6	3

.4 Visually inspect duct work for air leakage at joints and connections to equipment, under normal operating conditions.

.5 Test duct work systems before they are insulated, painted or concealed.

.6 Immediately correct defects discovered during tests and retest systems to complete satisfaction of Consultant.

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 AMCA, Air Movement and Control Association International Inc.
.2 ANSI/AMCA 210, Laboratory Methods of Testing Fans For Aerodynamic Performance Rating.
.3 ANSI/AMCA 211, Certified Ratings Programme – Fan Performance.
.4 AMCA 300, Reverberant Room Method For Sound Testing of Fans.
.5 AMCA 311, Certified Ratings Programme – Sound Performance.
.6 NFPA 90A, Installation of Air Conditioning and Ventilation Systems.
.7 AFBMA, Anti-Friction Bearing Manufacturers Association.
.8 OSHA, Occupational Safety and Health Administration.
.9 UL 705, Power Ventilators.
.10 UL 762, Restaurant Exhaust Fan.
.11 Refer to Section 20 05 00.
.12 Refer to Section 23 31 00.

1.02 SHOP DRAWINGS

.1 Submit shop drawings for fans and accessories.
  .1 Include the following:
    .1 certified fan performance curves
    .2 complete motor data, including manufacturer
    .3 product data sheets for all including disconnects, curbs, dampers, etc.

PART 2: PRODUCTS

2.01 INLINE FANS

.1 Inline centrifugal belt-drive fans as per the drawing schedule, each CSA certified and labeled, and each AMCA certified and labeled for air and sound performance in accordance with tests performed to AMCA Standards 210 and 300. Each fan is to be complete with:
  .1 **housing:** rigid structural galvanized steel framework with formed galvanized steel panels including a flanged inlet panel with fan inlet venturi, a flanged discharge panel and two removable access panels to permit servicing and/or removal of all interior components without disturbing duct connections
  .2 **housing insulation:** factory applied, neoprene spray coated glass fibre board material meeting NFPA 90A requirements and permanently secured in place
  .3 **wheel:** centrifugal, non-overloading aluminum wheel, statically and dynamically balanced, complete with backwardly inclined blades and an inlet cone attached to the housing inlet panel venturi
  .4 **fan shaft and bearings:** ground and polished steel shaft sized for a first critical speed of at least 25% over the maximum fan operating speed and mounted in permanently sealed and lubricated pillow block ball type bearings

sized for an AFBMA L-50 average lift of 200,000 house at maximum fan rpm

.5 **motor:** a motor conforming to requirements specified in Section 20 05 00, and motor and drive to be mounted out of the airstream. LCBO contractor shall supply and install a NEMA 4 disconnect mounted on the fan housing.

.6 **mounting hardware kit:** galvanized steel mounting brackets for all four corners, and spring type vibration isolators provided by the fan manufacturer sized to suit the fan weight and mounting arrangement, all supplied loose for field installation

.7 **wire mesh guard:** removable 12 mm x 12 mm welded galvanized steel wire mesh in a galvanized steel frame sized to cover the open end of the fan

.8 **sound (at inlet):** 9.4 Sones or below for 1000 CFM air capacity at 0.6 in.wg E.S.P.; 8.6 Sones or below for 850 CFM air capacity at 0.6 in.wg E.S.P.; 8.2 Sones or below for 750 CFM air capacity at 0.6 in.wg E.S.P.

.2 Acceptable manufacturers are:

.1 Greenheck Fan Corp.
.2 Loren Cook
.3 Twin City Fan and Blower
.4 American Coolair Corp. ILG
.5 Carnes
.6 Or approved alternate.

2.02 CEILING EXHAUST FANS

.1 Ceiling exhaust fans as per the drawing schedule, each CSA certified and labeled, and each AMCA certified and labeled for air and sound performance in accordance with tests performed to AMCA Certification Programs 211 and 311. Fans are to be complete with:

.1 **fan housing:** steel housing with electrical receptacle and box, electrical connection access cover, and an outlet duct connection collar with backdraft damper

.2 **fan wheel/motor assembly:** removable fan-motor assembly with forward curved balanced centrifugal wheel direct connected to a permanently lubricated, overload protected and vibration isolated mot which is equipped with a length of prewired power cord with plug for plug-in connection/disconnection at the housing receptacle

.3 **exhaust grille:** white, steel/aluminum exhaust grille

.4 **accessories:** for fans as per the drawing schedule and/or details, factory supplied accessories as follows:

.1 an exterior discharge accessory with integral birdscreen and backdraft damper
.2 a washable aluminum mesh filter

.2 Acceptable manufacturers are:

.1 Greenheck Fan Corp.

.2 Loren Cook
.3 Twin City Fan and Blower
.4 Carnes
.5 Or approved alternate.

PART 3: EXECUTION

3.01 INSTALLATION OF INLINE FANS

.1 Provide inline centrifugal fans where shown.
.2 Install mounting brackets for each fan and secure in place with vibration isolator and hanger rods, independent of connecting ductwork.

3.02 INSTALLATION OF CEILING EXHAUST FANS

.1 Provide ceiling exhaust fans where shown.
.2 Rigidly secure each fan housing in place in the ceiling space and coordinate installation with the electrical work of Division 26 where electrical power connection to the housing receptacle is specified.
.3 Install fan-motor assemblies and plug into housing receptacles.
.4 Install accessories supplied loose.

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 SMACNA, Sheet Metal and Air Conditioning Contractors Association.

.2 Refer to Section 20 05 00.

1.02 SHOP DRAWINGS

.1 Submit shop drawings for grilles and diffusers.

1.03 COLOUR SAMPLES

.1 Submit grille and diffuser finish colour samples to the Architect and LCBO Design Coordinator for approval.

PART 2: PRODUCTS

2.01 GRILLES AND DIFFUSERS

.1 Grilles and diffusers are to be complete with all required mounting and connection accessories to suit the construction in which they are installed.

.2 Noise generated by diffusers is to be such that room sound pressure level does not exceed noise criterion 32 with an 8 DB room attenuation, the sound power level reference to 10 to the –12 power watts.

.3 All air pattern devices are to be fully adjustable from the face of the diffuser or grille. Dampers are not to be located in the diffusers, or the neck of the diffusers.

.4 **Grille and Diffuser Finish and Colour:** Unless otherwise specified grilles and diffusers are to be finished with factory applied baked enamel. Unless otherwise specified, finish colours are to be as follows:

- .1 in t-bar ceilings – match colour of t-bar
- .2 in drywall ceilings or walls – match colour of ceiling /wall paint

.5 **Diffuser Types:** Unless otherwise shown or specified, grilles and diffusers are to be as follows:

- .1 supply diffusers – T-bar E.H. Price SCD (4 cone); Drywall E.H. Price SPD; retail E.H. Price 520D; warehouse vertical E.H. Price RCDA; Warehouse horizontal E.H. Price HCD1; E.H. Price RID (for high ceiling); E.H. Price PDF (for urban concept store)
- .2 exhaust and wall return grilles – steel fixed single deflection type complete with damper, E.H. Price 530D
- .3 ceiling linear supply/return grilles – E.H. Price SDS/SDR

.6 **Acceptable manufacturers are:**

- .1 E.H. Price
- .2 Titus
- .3 Nailor
- .4 Or approved alternate

PART 3: EXECUTION

3.01 INSTALLATION OF GRILLES AND DIFFUSERS

.1 Provide grilles and diffusers where shown and/or specified on the drawings. Wherever possible, grilles and diffusers are to be the product of one manufacturer (E.H. Price or Titus). Unless otherwise specified connect grilles and diffusers in accordance with requirements of SMACNA HVAC Duct Construction Standards Metal and Flexible.

.2 Exactly locate grilles and diffusers to conform to the final architectural reflected ceiling plans and detailed wall elevations, and to conform to the final lighting arrangement, ceiling layout, ornamental, and other wall treatment.

.3 Equip supply diffusers having a basic four-way or all around air pattern for operation in one, two, or three way pattern where indicated on the drawings.

.4 Provide diffusers with vertical discharge adjustment only in ceilings whose height requires such a device.

.5 Paint the visible internal surfaces behind each grille and diffuser flat black.

.6 Confirm grille and diffuser finishes prior to ordering.

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 ASHRAE/IES 90.1, Energy Standards For Buildings.

.2 CSA, Canadian Standards Association.

.3 Refer to Sections 01 45 00
11 40 00
11 41 20
26 05 00
26 24 13

PART 2: PRODUCTS

2.01 NOVAR BAS SYSTEM

.1 LCBO has specified Novar OPUS Controls for all locations. No alternatives will be accepted.

.2 Energy Management configuration, supply design and installation will be performed exclusively by the supplier of the product. Costs of design, supply and installation will be included as part of this general contract. The cost of training and commissioning is included in the contract.

.3 Acceptable manufacturers are:

.1 Novar

.4 The Engineer/General Contractor is to provide the BAS contractor with a full set of Mechanical and electrical drawings plus equipment drawings immediately upon completion of such documents.

PART 3: DESCRIPTION

3.01 NOVAR BAS SYSTEM

.1 Furnish and install control devices and systems, except as noted in other specification sections, to provide the functional equipment requirements for a complete Building and Energy Management System.

.2 To provide DDC Control of the major HVAC systems with (electric/electronic) or (pneumatic) actuation of all HVAC valves and dampers and all lighting switching panels.

.3 Provide Distributed Direct Digital Control of terminal units, heaters or similar units for control of room conditions.

.4 Fail Safe Operation: Design and install control valves and dampers to “fail safe” in either the normally open or normally closed position as required for freeze, moisture, and smoke or fire protection.

3.02 SCOPE

.1 Furnish and install a Novar OPUS Direct Digital control system as manufactured by Novar Controls Corporation. The system shall be complete in all respects including labour, materials, equipment and services necessary and shall be installed by Novar

trained personnel regularly engaged in the installation of Novar OPUS Direct Digital Control Systems (Substitutions not acceptable).

3.03 EQUIPMENT WITH FACTORY FURNISHED CONTROLS AND EQUIPMENT

.1 All control equipment and systems specified as being factory furnished and installed including any remote field installed devices required for connection to the factory installed systems, such as flow switches, sensors, etc., will be completely installed and wired by the supplier/manufacturer of the equipment. The installation and wiring of these systems will not be the responsibility of the BAS Contractor.

.2 Provide I/O summary.

.3 If the I/O summary or sequence of operation requires an interface to the DDC control system furnished and installed by the BAS contractor, the equipment manufacturer will furnish dry contacts at the equipment panel.

.4 If the interface software has been previously written and is available as a standard offering of the DDC system manufacturer, then the cost of supplying the interface software will be included in the pricing of the DDC manufacturer.

3.04 HVAC PIPING SYSTEMS

.1 All control valves, pressure and flow taps, thread-a-lets, and wells are to be installed by the mechanical contractor under the supervision of the controls contractor.

.2 Water flow switches (except those furnished with refrigeration or chiller equipment), water differential pressure switches and sensors, and flow sensors, shall be furnished and wired to the DDC control system (if specified in the I/O summary or sequence of operation) by the control contractor. These devices will be installed and /or piped into the piping system by the mechanical contractor.

3.05 POWER WIRING

.1 The electrical contractor shall furnish and install all power wiring for the DDC and other control systems as shown on the mechanical or electrical plans or as defined below:

.1 Furnish, install and wire all power feeds through all disconnect switches, starters and variable speed controllers to the final device (all motors, control panels, , etc.).

.2 Furnish, install and wire 120 VAC wiring to all DDC panels and controllers fed from dedicated or spare circuit breakers in electrical distribution panels as shown or as specified. The DDC controls contractor will furnish 24v transformers or power supplies as required to the electrical contractor for mounting and wiring into the DDC field control panels except as noted in subparagraph (4) below.

.3 Furnish, install and wire all remote start/stop and manual or automatic motor speed devices.

.4 The electrical contractor will furnish, install and wire all line or low voltage control wiring for other equipment as shown on the mechanical or electrical plans as specified.

.2 The electrical contractor will terminate damper actuator power wiring in a 4 x 4 junction box within three (3) feet of each damper actuator location. The BAS contractor will furnish and install the required transformers and wire the control transformers from the 4 x 4 120v power junction box to the damper actuator(s).

3.06 INTERLOCK WIRING

.1 All hard-wired interlock wiring as shown on the mechanical and electrical plans, I/O summary, or as required by the DDC sequence of operation will be furnished, installed and wired by the electrical contractor.

.2 Wiring of thermostats or other factory pre-wired panels furnished by others to control fans, pumps, variable speed drives, chillers, cooling towers, condensing units, rooftop or other prepackaged equipment, etc., will be furnished, installed and wired by the Electrical Contractor.

3.07 OTHERS AS REQUIRED BY JOB

.1 An Ethernet Data Jack as shown on the data plans, is required by the DDC system, installed and wired by an LCBO contractor.

3.08 BAS WIRING

.1 The BAS Contractor shall supply and install all BAS wiring. The wiring shall be compatible for the type of service. The wires shall be in conduits where protection is required – generally in back-of-house areas where wiring is exposed to potential impact.

PART 4: QUALITY ASSURANCE

4.01 CRITERIA

1. All hardware and software supplied under this section shall be the responsibility of the BAS Contractor. The Contractor shall also be responsible for the complete installation and proper operation of the system including commissioning. The BAS Contractor must be a licensed dealer of Novar OPUS Controls.
2. Code Approval:
   - .1 All computer based electronic equipment conforms to the requirements of the FCC regulation.
   - .2 All wiring shall be in accordance with the Canadian Electric Code and manufacturers recommended practices.
   - .3 All equipment and components shall be designed and tested to assure compliance with the FCC for conducted and radiated emissions.
3. The specification covers minimum requirements and is not intended to preclude provision of equipment or methods that exceed the minimum requirements.
4. The specification section 01 45 00 1.11. Commissioning, shall apply to this section.

5. The systems to be commissioned shall include:
   - .1 The verification of all sensors
   - .2 The operation of all devices
   - .3 The functional testing of all control sequences
   - .4 Verification of all schedules and reports
   - .5 Seasonal commissioning
6. Coordinate the commissioning program with the commissioning agent.

PART 5: SYSTEM OVERVIEW

5.01 COMPONENTS

.1 The Novar opus BAS shall be comprised of a minimum of the following components to achieve a complete operative system:

- .1 The Novar opus Control Panel (XCM) to be located in LCBO's Service Platform area, or as directed by LCBO coordinator.
- .2 I/O units as required to the XCM
- .3 XCM-Liquid Crystal Display
- .4 Sensors/Control units as required to interact with complete HVAC system.
- .5 All other arrangements to be made through LCBO and controlled through the system's XCM and a dedicated Ethernet Port located in the electrical room.

5.02 SYSTEM INTEGRATION FOR ROOFTOP UNITS

- .1 The duct-mounted supply and return air sensors that shall be supplied with the rooftop unit are factory supplied and installed.
- .2 The combination space temperature/CO2 sensors shall be supplied by the unit manufacturer and wired/installed by the BAS contractor.
- .3 The space humidity sensors shall be supplied by the unit manufacturer and wired/installed by the BAS contractor.
- .4 The outdoor sensors shall be supplied and installed by the BAS contractor at 600mm above RTU.
- .5 Time-of-day schedules shall programmed by the BAS contractor and not inherent in the RTU controller.
- .6 Mixing dampers and CO2 control shall be controlled by the CO2 program integral to the rooftop unit, which will be set to 800ppm and will initialize the economizer control. By 1000ppm the economizer damper shall be 100% open and when the CO2 level drops back below 700ppm, the economizer will revert to the minimum setting noted in the RTU schedule in the mechanical drawings.
- .7 The heating and cooling modes, including fan operation in both occupied and unoccupied mode shall be controlled by the RTU program, but enabled by the BAS.
- .8 Dehumidification is controlled by the RTU's integral Humiditrol program, but the signal to enable dehumidification mode shall be sent by the BAS.

.9 Free cooling mode in both occupied and unoccupied mode shall be controlled by the RTU program but enabled by the BAS.

PART 6: SEQUENCE OF OPERATIONS

6.01 BAS CONTROLLED EQUIPMENT

.1 Lennox Rooftops:

.1 Unoccupied/Occupied shall be activated by a daily schedule

.2 Optimum start/stop shall be utilized to bring the space temperature up to setpoint for the scheduled start time

.3 In occupied mode fan will run continuous

.4 In unoccupied mode fan will run only on a call for heating or cooling

.5 Occupied heating setpoint shall maintain a temperature of 20°C

.6 Unoccupied heating setpoint shall maintain a space temperature of 15.5°C (Adjustable)

.7 Heating shall be utilized to maintain setpoint when the outdoor temperature < 12.5°C

.8 Gas burners shall be energized to maintain heating setpoint.

.9 When space temperature < setpoint differential (0.5°C), heat stage 1 shall energize. If after 5 minutes the space temperature < setpoint plus 2nd differential (0.5°C), heat stage 2 shall energize and run for a minimum 5 minutes. When the space temperature > 2nd stage differential, heat stage 2 shall de-energize. When the space temperature > 1st stage differential, heat stage 1 shall de-energize

.10 Occupied cooling setpoint shall maintain a temperature of 21.5°C

.11 Unoccupied cooling setpoint shall maintain a space temperature of 23.5°C

.12 DX cooling shall be utilized to maintain cooling setpoint when the outdoor temperature > 15.5°C

.13 Economizer cooling (free cooling) shall be modulated to maintain cooling setpoint when the outdoor temperature is < 15.5°C

.14 Economizer minimum position to be set as per the mechanical drawing.

.15 (DX Cooling) When space temperature > setpoint differential (0.5°C), cool stage 1 shall energize. If after 5 minutes the space temperature > setpoint plus 2nd differential (0.5'C), cool stage 2 shall energize and run for a minimum 5 minutes. When the space temperature < 2nd stage differential, cool stage 2 shall de-energize. When the space temperature < 1st stage differential, cool stage 1 shall de-energize

.16 (Economizer Cooling) When space temperature > setpoint differential (0.5°C), and the outdoor temperature is less than 15.5°C, economizer shall energize and modulate to maintain a supply air temperature of 15.5°C. When

the space temperature < 1st stage differential, economizer shall de-energize, outdoor air damper to minimum position.

.17 Electrical phases shall be monitored globally from incoming electrical distribution service. On a phase failure rooftops shall not operate until phase loss condition is restored to normal

.1 Data logs will be trended for the following on a 1 hour average stored locally for previous 7 days

.2 Space temperature

.3 Supply air temperature

.4 Fan on/off

.5 Cool stage 1 on/off

.6 Cool stage 2 on/off

.7 Heat stage 1 on/off

.8 Heat stage 2 on/off

.9 Return air temperature

.10 CO2

.11 Humidity

.12 Economizer damper position

.13 RTU start/stop optimum

.18 Economizer position Alarms will be as follows

1. No air flow after 3 minutes on a call for fan
2. Supply air > 62.5°C and < 4.5°C
3. Space temperature > 29°C and < 15°C
4. No communication with main controller

.19 (De-humidification) During the occupied period, the RTU controller shall enable the de-humidification program when the space humidity rises above 50% RH and disable the program when the space humidity falls to 47% RH. During the unoccupied program, the BAS will enable the RTU when the space humidity rises above 50% RH, the RTU controller will enable the de-humidification program. The BAS will disable the RTU when the space humidity falls to 47%. If the space temperature falls below the heating setpoint in dehumidification mode, the rooftop will energize the heating sequence to maintain the heating setpoint.

.2 Fridges:

.1 Unoccupied/Occupied shall be activated by a daily schedule

.2 Occupied setpoint shall maintain a temperature of 11°C for wine fridges, 9°C for beer fridges and monitor 10°C for cold room.

.3 Unoccupied setpoint shall maintain temperature of 15°C for wine fridges, 13°C for beer fridges and 14°C for cold room.

.4 DX cooling shall be utilized to maintain cooling setpoint

.5 (DX Cooling) When fridge temperature > setpoint by 1.0°C, cooling shall energize. When the fridge temperature < setpoint by 1.0°C, cooling shall de-energize.

1. Data logged
2. Alarm if fridge temperature > 10.0°C than setpoint

.3 Lighting Zone System Functions:

.1 Lighting zones will broken down as follows or as determined by the Consultant:

.1 50% Employee light fixtures & 50% Warehouse and cold room
.2 50% Customer light fixtures
.3 Valance
.4 Track Lights and display
.5 Daylight Harvesting (first 2 rows above cash at front of store)
.6 Exterior Awnings and Vestibule Pot Lights
.7 Exterior Signs
.8 Exterior Security (Wall Packs) and Front Door canopy lights
.9 Vintage Lighting – Zone 1 (employee), Zone 2 (Customer) according to ceiling design.

.2 Unoccupied/Occupied shall be activated by a daily schedule for each zone

.3 Overrides will be available in the Manager's office through the use of the XCM-LCD Screen. When the desired lighting zone button is pushed once, that zone will activate for 1 hour or until the button is pushed once again.

.4 Exterior lighting will operate in series with a daily schedule and analog light sensor. When the FTC's < 50 and the scheduled time is occupied the lights will come on. When the FTC's > 50 the lights will turn off

.1 Override Data Logged
.2 User Event Logged

.5 Upon security alarm activation (Alarm Condition) all lighting to be turned on.

.6 Indoor Task Area Daylight Sensor (Light Harvesting)

.7 Indoor daylight sensor for ceiling mounting to measure light reflected up from the surface below for applications that harvest daylight by ON/OFF control of lighting circuits. The sensor is to switch lights ON when natural light is insufficient and OFF when natural light is sufficient and be disabled during unoccupied hours.

.1 Override Data Logged
.2 User Event Logged

.8 Indoor light level set point to be default at 75 food candles (adjustable to site conditions)

.4 Warehouse Unit Heater
- .1 Unoccupied/Occupied shall be activated by a daily schedule.
- .2 Occupied setpoint shall maintain a room temperature of 17°C (Adjustable).
- .3 Unoccupied setpoint shall maintain temperature of 15°C (Adjustable).
- .4 When room temperature < setpoint by 1.0°C, heating shall energize. When the room temperature > setpoint by 1.0°C, heating shall de-energize.
- .5 Data logged:
  - .1 Alarm if room temperature < 5.0°C than setpoint

.5 Vestibule Supply Fan and Heater
- .1 Unoccupied/Occupied shall be activated by a daily schedule
- .2 Occupied setpoint shall maintain a room temperature of 17°C (Adjustable)
- .3 Unoccupied setpoint shall maintain temperature of 15°C (Adjustable)
- .4 Fan shall run continuously during occupied period for on-call heating.
- .5 Fan shall be activated by temperature control during unoccupied period.
- .6 When room temperature < setpoint by 1.0°C, heating shall energize using the SCR controller. When the room temperature > setpoint by 1.0°C, heating shall de-energize using the SCR controller.
- .7 SCR controller shall modulate termperature downwards to avoid supply temperature reaching 52°C (125°F).
- .8 Data logged:
  - .1 Alarm if room temperature < 5.0°C than setpoint
  - .2 Alarm if duct heater commanded on, but the status is off
  - .3 Alarm if the fan is commanded on, but the status if off

.6 Janitor Room Exhaust Fan
- .1 Fan shall operate continuously.
- .2 Data logged:
  - .1 Alarm if fan is commanded on, but the status is off

.7 Washroom Exhaust Fan
- .1 Unoccupied/Occupied shall be activated by a daily schedule
- .2 Fan shall be operated continuously during occupied hours.
- .3 Data logged
  - .1 Alarm if fan is commanded on, but the status is off

.8 Staff Room Exhaust Fan
- .1 Fan shall be controlled by 15-minute timer with no hold.
- .2 Data logged:
  - .1 Alarm if fan is commanded on, but the status is off

.9 Global Functions:
- .1 Outdoor temperature
- .2 Outdoor light sensor
  - .1 Monitor
  - .2 Data logged

.3 General Security Alarm

6.02 OPERATOR INTERFACE

.1 The site will communicate through HTML on the LCBO WAN network. Any PC/Laptop running on the network will be able to access the system with the proper IP address, user name and password.

.2 A local PC/Laptop can connect directly to LAN port # 2 and serve up the web pages

.3 IP address to be supplied by LCBO's IT department

6.03 TRAINING

.1 Two (2) four (4) hour training sessions will be taught on site. One (1) session before opening and after completion and commissioning of the project. The second will be six (6) months following grand opening. Personnel being trained will be determined by LCBO.

6.04 OPERATING AND MAINTENANCE MANUALS

.1 Provide operating and maintenance manuals prior to the commencement of training. The manuals shall include the operating requirements for the BAS system and individual equipment, and the maintenance requirements for all equipment.

6.05 AS BUILT DRAWINGS AND CONTROL SEQUENCES

.1 Provide, prior to substantial performance, the as built shop drawings and building drawings indicating the location of equipment. Provide the as built control sequences.

END OF SECTION

PART 1: GENERAL

1.01 APPLICATION

.1 This Section specifies requirements, products, common criteria and characteristics, and methods, and execution that are common to succeeding Sections of Divisions 26 and 28, and it is intended as a supplement to each Section and is to be read accordingly.

1.02 REFERENCES

.1 CAN/CSA C22.2 No. 83, Electrical Metallic Tubing.
.2 CSA C22.2 No. 45, Rigid Metal Conduit
.3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
.4 CSA C22.2 No. 38, Thermoset Insulated Wires and Cables.
.5 CSA C22.2 No. 75, Thermoplastic-Insulated Wires and Cables.
.6 CSA C22.2 No. 51, Armoured Cable.
.7 CSA C22.2 No. 127, Equipment and Lead Wires.
.8 CSA C22.2 No. 208, Fire Alarm and Signal Cable
.9 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes and Fittings.
.10 Ontario Electrical Safety Code.

1.03 DOCUMENTS

.1 The electrical Specification and the electrical drawings are an integral part of the Contract Documents and are to be read accordingly.
.2 Comply with the requirements of the General Requirements Section of this Specification.
.3 The electrical drawings are performance drawings, diagrammatic, and show approximate locations for equipment and materials. The drawings are intended to convey the scope of work and do not necessarily show architectural and structural details. The locations of materials and equipment shown may be altered (when revised layouts have been submitted and approved), to meet requirements of the material and/or equipment, other equipment and systems being installed, and of the building. Provide all fittings, offsets, conduit, boxes, conductors, and similar items required as a result of obstructions and other architectural or structural details but not shown on the electrical drawings.

1.04 PLANNING AND LAYOUT OF WORK

.1 The exact locations and routing of electrical and mechanical services are to be properly planned, coordinated and established with all affected trades prior to installation such that the services will clear each other as well as any obstructions.
.2 All boxes, receptacles, 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 requirements are to be relocated at no cost.

1.05 CO-OPERATION & RELATIONSHIP WITH OTHER WORK AND TRADES

.1 Co-operate fully with all trades in such a manner as to not interfere with other work being carried on in the building. Where other work and equipment has to be installed along with electrical work, arrange with other trades to install this work to best suit the particular condition.

.2 Examine the architectural, structural, and mechanical drawings and specifications in conjunction with the electrical drawings and specifications and be satisfied that the electrical work as shown and specified can be performed without changes to the building.

1.06 QUALIFICATION OF TRADESMEN

.1 Maintain at the job site, at all times, qualified personnel and supporting staff, with proven experience in erecting, supervising, testing and adjusting projects of comparable nature and complexity.

.2 All apprentices must always be supervised by a qualified journeyman.

1.07 CODES AND STANDARDS

.1 All work is to be executed in accordance with all governing Codes, Standards, and By-laws.

.2 Where any Code, Regulation, By-law, or Standard is quoted it means the current edition including all revisions or amendments at the time of the Contract. Where references are made to printed directions or recommendations, it means the current edition of such directions and recommendations.

.3 All electrical items are to be CSA & CUL (or equivalent agency) certified electrically, or bear a stamp to indicate ESA approval.

1.08 SHOP DRAWINGS

.1 Refer to Division 01.

1.09 PERMITS, CERTIFICATES AND FEES

.1 Apply for, obtain and pay for all permits, licences, inspections, examinations and fees required.

.2 Arrange for inspection of all work by authorities having jurisdiction. On completion of the work, present to the Owner the final unconditional certificates of approval of the inspecting authorities.

.3 Before starting any work, submit the required number of copies of drawings and Specifications to the authorities for their approval and comments. Comply with any changes required as part of the Contract but notify the Consultant immediately of such changes for proper processing of these requirements. Prepare and furnish any additional drawings, details or information as may be required.

.4 Upon completion of the project, present to the Consultant a copy of all reports and a signed statement to the effect that all tests have been carefully carried out as required by the Specifications and the manufacturer's recommendations and that the

equipment and installations have been inspected by all jurisdictional authorities.

1.10 DOCUMENTS REQUIRED

.1 The following documents are to be submitted to the Consultant on completion of the project as described above:

- .1 Electrical Inspection Certificate
- .2 Fire Department Certificate
- .3 Fire Alarm Verification Certificate and report c/w sound level readings in dBA
- .4 As-Built Drawings and Disks
- .5 Data book
- .6 Guarantee
- .7 Service Equipment Coordination Certificates
- .8 Other Certificates Specified
- .9 Emergency lighting test report c/w light levels.

1.11 RECORD DRAWINGS

.1 Refer to Division 01.

.2 Show on the record drawings the installed invert of any underground electrical services entering and leaving the building and the property. Dimension underground services at key points of every run in relation to the structure and the building. Record elevations of the underground services in relation to the ground floor level of the building.

1.12 INSTRUCTION TO OWNER

.1 Instruct the Owner's representatives in all respects of the operation and maintenance of electrical systems and equipment. Obtain in writing from the Consultant a list of the Owner's representatives qualified to receive instructions.

.2 Arrange for, and pay for services of service engineers and other manufacturers' representatives required for instruction on specialized portions of the installation.

.3 Submit to Consultant at the time of final inspection, a complete list of systems, stating for each system:

- .1 date instructions were given to the Owner's staff
- .2 duration of instruction
- .3 name of persons instructed
- .4 other parties present (manufacturer's representative, consultants, etc.)

.4 The training shall be conducted over a minimum period of 16 hours and be completed prior to substantial performance. The Contractor shall provide a schedule, a list of systems and equipment for which training will be provided, names of people who will provide the training and an agenda for each session.

1.13 OPERATION AND MAINTENANCE MANUALS

.1 Refer to Division 01.

.2 Operations and Maintenance manuals shall be submitted and approved by the Consultant before training shall commence.

1.14 EXISTING CONDITIONS

.1 Before submitting tenders, carefully examine the drawings, Specifications and the job site to determine and confirm the existing conditions which will or may affect the proposed work. Claims for extra payment because of failure to fulfil this condition will not be considered. Existing conditions include, without being limited to, such items as: electrical power characteristics and location, soil conditions and space limitations.

.2 Note work performed by the Landlord and all work not performed by him as part of the Contract.

1.15 WORKPLACE SAFETY

.1 Comply with requirements of the Workplace Hazardous Materials Information System (WHMIS) regarding the use, handling, storage and disposal of hazardous materials.

.2 Comply with all requirements of Ontario Regulation 213/91, Occupational Health and Safety Act and Regulations for Construction Projects.

.3 Submit WHMIS MSDS (Material Safety Data Sheets) for all products where required, and maintain one copy at the site in a visible and accessible location and available to all personnel.

1.16 WARRANTY

.1 Include for an overall 12 month warranty period for all electrical work materials and workmanship. The warranty period is to commence at Substantial Completion.

.2 Extended warranties, where applicable, are specified with equipment. Extended warranties will commence upon expiry of the standard 12 month warranty.

.3 All warranty work shall be scheduled with LCBO who will determine when the work shall commence. The work to be performed shall be documented and provided to the Consultant for review. All equipment, materials and systems shall conform to the specification requirements. The cost of all work shall be the responsibility of the Contractor.

1.17 PRODUCT AND PRODUCT MANUFACTURER REQUIREMENTS

.1 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, acceptable manufacturers are stated for any products specified by manufacturer's name and model number. The tender price may be based on products supplied by any of the manufacturers named as acceptable for the particular product. If acceptable manufacturers are not stated for a particular product, base the tender price on the products supplied by the specified manufacturers.

.2 If products supplied by a manufacturer named as acceptable are used in lieu of the manufacturer specified, be responsible for ensuring that the substituted product is equivalent in performance and operating characteristics (including energy consumption if applicable) to the specified product, and, it is to be understood that any additional costs, and changes to associated or adjacent work resulting from provision of products supplied by a manufacturer other than the specified manufacturer is included in the tender price.

.3 Products required to have CSA, ULC, or other approval are to be properly marked or labelled indicating that the product has been approved.

1.18 ELECTRICAL POWER CHARACTERISTICS

.1 Unless otherwise shown or specified the permanent power supply is to be 600 volt, 3 phase, 4 wire, and 120/208 volt, 3 phase, 4 wire for final use.

.2 Confirm the characteristics of construction power supply.

PART 2: PRODUCTS

2.01 CONDUIT

.1 EMT (Thinwall), galvanized electrical metallic tubing to CSA C22.2 No. 83, complete with factory made bends where site bending is not possible, and joints and terminations made with compression gland type insulated connectors.

.2 Rigid galvanized steel to CSA C22.2 No. 45, with exterior zinc and interior enamel coatings, galvanized threads where factory cut, red lead coated threads where site cut, factory made bends where site bending is not possible, factory made and threaded fittings and connectors, and terminations made with rigid Ericson type couplings.

.3 Galvanized steel flexible liquid-tight metallic conduit to CSA C22.2 No. 56, complete with Ideal “Steel Tough” liquid-tight flexible conduit connectors at terminations.

.4 CSA approved and labelled rigid plastic (PVC) conduit complete with site made heat gun bends for conduit to 50 mm diameter, factory made elbows in conduit larger than 50 mm diameter, solvent weld joints, factory made expansion joints where required, and terminations made with proper and suitable connectors and adaptors.

2.02 NOT USED

2.03 WALL AND CEILING OUTLET BOXES

.1 CSA approved stamped galvanized steel outlet boxes, as follows:

.1 100 mm octagonal or square for ceiling boxes complete with 9.5 mm dia. fixture stud where required

.2 100 mm square with plaster rings for recessed switches and receptacle in plaster walls

.3 masonry boxes for recessed switch, receptacle, and similar device boxes in

masonry walls

.2 For applications where outlet boxes will be exposed in the Retail Area, 100 mm, single-gang, die-cast aluminium box for wall or pole mounting complete with two spare entry plugs. Silver-grey powder coat paint finish. RDA Lighting Inc. D5634 3/4" or approved equal.

.3 Each outlet box must be suitable in all respects for the application, and complete with suitable securing lugs, connectors suitable for connected conduit, knockouts and, where necessary, suitable concrete rings, covers and any other required accessory.

2.04 NOT USED

2.05 NOT USED

2.06 PULLBOXES AND JUNCTION BOXES

.1 Galvanized or prime coast plated steel, suitable in all respects for the application and complete with screw-on or hinged covers as required and connectors suitable for connected conduit.

.2 Crouse-Hinds Canada Ltd. “Condulet”, threaded cast Feraloy pull boxes and junction boxes of an exact type to suit the application, each complete with screw-on gasketed cover.

.3 The physical size of pullboxes is to be in accordance with requirements of the OESC to suit the number and size of conduits and conductors.

2.07 CONDUCTORS AND CONNECTORS

.1 “T90 Nylon” single copper conductor to CSA C22.2 No. 75, colour coded, 90 degrees C rated, PVC insulated and nylon covered.

.2 “RW90” CSA certified, single copper conductor to CSA C22.2 No. 38, 90 degrees C rated X-link polyethylene insulated, colour coded

.3 “AC-90” flexible armoured cable with “RW-90” conductors and bare copper ground conductor to CSA C22.2 No. 51 (Bulletin No. 994).

.4 Conductors to and including No. 12 AWG are to be solid. Conductors in sizes larger then No. 12 AWG are to be stranded. All branch circuit conductors are to be constructed of 98% conductive copper and are to be approved for 600 volts.

.5 Armoured cable connectors are to be proper squeeze type connectors and plastic anti-short bushings at terminations.

.6 Connectors for conductors in conduit are to be, unless otherwise specified, IDI Electric (Canada) Ltd. “Ideal” No. 451, No. 452 and No. 453, “Wing-Nut”, CSA certified, 600 volts rated pressure type connectors.

2.08 LOW VOLTAGE (24 VOLT) CONDUCTORS

.1 ULC listed and labelled, CSA certified to C22.2 No. 127, No. 18 AWG “TEW” thermoplastic insulated, solid copper wire rated for 600 volt service, and 105 degrees

C complete with the required number of copper conductors and colour coding.

.2 Alcatel Canada Wire Ltd. "Securex II", FAS 105, 300 volt, 105 degree C rated fire alarm system flexible armoured cable with solid copper conductor, flame retardant PVC insulation, and red colour outer jacket, ULC listed and labelled and CSA certified to C22.2 No. 208. Cable is to be complete with an overall jacket.

2.09 CONDUCTOR PULLING LUBRICANT

.1 IDI electric (Canada) Ltd. " Ideal Yellow 77" or "Wire Lube" as required.

2.10 LOCAL LIGHTING SWITCHES

.1 Unless otherwise specified, DECORA decorator rocker type switches, 20 ampere rated, 120 volt AC, premium quality, Specification grade, white, complete with matching faceplates. Acceptable manufacturers are:

.1 P & S
.2 Bryant
.3 Or approved alternate

2.11 NOT USED

2.12 AUTOMATIC WALL SWITCHES

.1 The Watt Stopper Corp. Model PW-100 Passive Infrared Wall Switch Sensor, single gang, 120 volt automatic wall switch, white, with motion sensor and wall plate.

.2 For the Office occupancy sensor, the Watt Stopper Corp. Model DW203 dual technology multi-way dual relay wall switch sensor, single gang, 120 volt automatic wall switch, white, with motion sensor and wall plate.

2.13 NOT USED

2.14 RECEPTACLES

.1 Unless otherwise specified, DECORA decorator type, U-ground, premium quality, heavy-duty, Specification grade, white, 15 ampere, 120 volt receptacles, single or duplex as shown, each suitable for side or back wiring and complete with captive mounting screws and a matching faceplate. Acceptable manufacturers are:

.1 P & S
.2 Bryant
.3 Lutron
.4 Or approved alternate

.2 As above but standard shape in lieu of decorator type.

.3 Specification grade, 15 ampere, 125 volt, duplex, premium quality, orange isolated ground receptacles, each suitable for side or back wiring and complete with a one-piece mounting strap and a white nylon faceplate.

.4 Specification grade, 15 ampere, 125 volt, duplex, premium quality, GFCI receptacles, each suitable for side or back wiring and complete with a one-piece

mounting strap and a white nylon faceplate.

2.15 ACCESS DOORS

.1 Minimum No. 12 gauge prime coat painted steel flush access doors, each complete with a heavy frame and anchor, heavy duty rust-resistant concealed hinges, a positive locking screwdriver lock, and mounting and finishing provisions to suit the particular construction in which it is installed. Access door sizes shall suit the concealed work for which they are supplied. Access doors in fire rated ceilings, walls, partitions, structures, etc., are to be ULC listed and labelled and of a rating to maintain the fire separation integrity.

2.16 FASTENING AND SECURING HARDWARE

.1 Concrete fasteners – "WEJ-IT" anchors, lead cinch anchors and/or "STAR" or "PHILLIPS" self-drilling anchors.

.2 Masonry inserts – "WEJ-IT" expansion shields and machine bolts or, for light loads, fibre or lead plugs and screws.

.3 Drywall or plaster wall and/or ceiling fasteners – 2-wing spring toggles.

.4 Structural steel – Crane Canada Ltd., beam clamps.

2.17 IDENTIFICATION NAMEPLATES

.1 Laminated plastic (Lamacoid) white-black-white (black text on white background unless otherwise noted) with bevelled edges, stainless steel screws, and clear proper identification engraving. Each nameplate is to be sized to suit the equipment for which it is provided, and the required wording. Provide nameplates for all electrical service switches, sensors/mechanical controls, panels, contactors, office switches controlling lights, screens and security shutters. Lamacoids for any electrical outlets, controls and switches must be placed below the cover plate (not on the cover plate). Fit-up contractor to install nameplates on all landlord supplied equipment. Text height shall be 3mm for switches/outlets, 6mm for all other equipment and 25mm high with 6mm stroke width for warning/instruction nameplates. Refer to Table 1 below for details.

Table 1: Lamacoid Label Details

Item	Text to be Listed on Lamacoid	Text Height (mm)
Electrical Outlets	Panel and circuit number *(Example: 2A-12).*	3
Staff Rm Exhaust Fan Switch	EXHAUST FAN TIMER	3
Washroom Light Switches	MANUAL–ON AUTO-OFF	6
Washroom Wall Mounted Occupancy Sensors	AUTO-ON AUTO-OFF	6
Office Occupancy Sensor	CEILING - AUTO-ON AUTO-OFF VALENCE - MANUAL-ON AUTO-OFF	6

Emergency Test Light Button	EMERGENCY LIGHTS – PUSH TO TEST *(This lamacoid shall be red with white text).*	6
Security Shutters	SECURITY SHUTTER #X *(please note, #1 is closest to the office)*	3
Sun Shade	SUN SHADE	3
Power-Fail Phone Jack	POWER-FAIL PHONE JACK	3
Scanner Gun Outlet	SCANNER GUN OUTLET	3
Hydro Meter	LCBO HYDRO METER	6
Warehouse Ceiling Fan Switch	CEILING FANS, panel and circuit number	6 for name, 3 for panel and circuit number
Rooftop Exhaust Fans	EF-X, panel and circuit number *(note "X" will depict the item number)*	6 for name, 3 for panel and circuit number
Roof Top Unit	RTU-X, panel and circuit number	6 for name, 3 for panel and circuit number
Rooftop Refrigeration Unit (Kooljet), Walk-In Coldroom	WIC-AC-X, panel and circuit number	6 for name, 3 for panel and circuit number
Rooftop Condensing Unit, Walk-In Coldroom	WIC-CU-X, panel and circuit number	6 for name, 3 for panel and circuit number
Rooftop Refrigeration Condenser – Reach-In Case Refrigerator	RIC-CU-X, panel and circuit number	6 for name, 3 for panel and circuit number
Warehouse Unit Heater	UH-X, panel and circuit number	6 for name, 3 for panel and circuit number
Gas Meter	LCBO GAS METER	6
Water Meter	LCBO WATER METER	6
Domestic Water Shut-Off Valve	LCBO WATER SHUT-OFF	6
Trap Seal Primer	TRAP SEAL PRIMER, panel and circuit number	6 for name, 3 for panel and circuit number
Eye Wash Mixing Valve	EYE WASH MIXING VALVE	6
Battery Unit	BU-X, panel and circuit number *(This lamacoid shall be red with white text).*	6 for name, 3 for panel and circuit number
Reach-In Case Refrigerator Indoor Units	RIC-EVAP-X, panel and circuit number	6 for name, 3 for panel and circuit number
Open / Cold Beer Sign's Switch	OPEN/COLD BEER SIGN, panel and circuit number	3 for name, 3 for panel and circuit number
Electrical Panels	Panel and Voltage *(example: PANEL-2A, 208V)*	6
THC Unit and THC Remote Condenser	THC, panel and circuit number	6 for name, 3 for panel and circuit number

Phase Loss Box	PHASE LOSS	6
TVSS	TVSS, panel and circuit number	6 for name, 3 for panel and circuit number
Kooljet PLC	WIC-HMI, panel and circuit number	6 for name, 3 for panel and circuit number
Retail Area Sensors	Item identification *(note, labels supplied and installed by BAS contractor)*	**3**
Office Lights	OFFICE LIGHTS	3
Vestibule Electric Heater	VEST-HTR, panel and circuit number	6 for name, 3 for panel and circuit number
Vestibule Supply Fan	VEST-SF, panel and circuit number	6 for name, 3 for panel and circuit number
Vestibule Supply Fan Filter	FAN FILTER	6
Baseboard Heaters	BBH-X, panel and circuit number	6 for name, 3 for panel and circuit number
Domestic Hot Water Heater	HWT-X, panel and circuit number	6 for name, 3 for panel and circuit number
Forced Flow Heater	FFH-X, panel and circuit number	6 for name, 3 for panel and circuit number
Heat Pumps	HP-X, panel and circuit number	6 for name, 3 for panel and circuit number
Fan Coil Units	FCU-X, panel and circuit number	6 for name, 3 for panel and circuit number
Thermostat / Remote Sensors	Item identification	3

2.18 FIRESTOPPING AND SMOKE SEAL MATERIALS

.1 Asbestos-free elastomeric materials, test, listed and labelled by ULC in accordance with CAN 4-S115-M85, 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) not less than the fire rating for surrounding construction.

.2 Materials are to be compatible with abutting dissimilar materials and finishes.

.3 Acceptable manufacturers are Instant Firestop Inc., Dow Corning Canada Inc., 3M Canada Inc. and Fire-Stop Systems (Canstrut Inc.).

2.19 NOT USED

2.20 NOT USED

PART 3: EXECUTION

3.01 GENERAL CONDUIT AND CONDUCTOR INSTALLATION

REQUIREMENTS

.1 Unless otherwise specified, locate and arrange horizontal conduits and conductors above or at the ceiling on floors on which they are shown, arranged so that under consideration of all other work in the area, the maximum ceiling height and/or usable space is maintained.

.2 Unless otherwise specified, install all work concealed in finished spaces, and concealed to the degree possible in partially finished and unfinished spaces. Refer to and examine the Architectural drawings and room finish schedules to determine finished, partially finished, and unfinished areas. Note that walls which are painted are considered finished.

.3 Conduit and main distribution feeders (as approved by Consultant) may be exposed in unfinished areas such as electrical and mechanical rooms, unless otherwise noted on the drawings or specified herein.

.4 Install all conduits and conductors parallel to building lines.

.5 Neatly group and arrange all exposed work.

.6 Locate all electrical devices which will or may need maintenance or repairs and which are installed in accessible construction so as to be easily accessible from access doors.

.7 Ensure that equipment and material manufacturers' installation instructions are followed unless otherwise specified herein or on the drawings, and unless such instructions contradict governing codes and regulations.

.8 Temporarily pack all open boxes located in concrete, plaster and masonry to prevent debris from entering the box.

.9 All isolated ground circuits must contain separate phase, neutral and ground conductors (i.e.: common neutral configuration is unacceptable). Conductors are to be minimum No. 12 AWG and No. l0 AWG for runs longer than 15 m.

.10 Inspect surfaces and structure prepared by other trades before performing your work. Verify that surfaces or the structure to receive your work have 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.

3.02 INSTALLATION OF CONDUIT

.1 Unless otherwise specified, provide conduit for all conductors.

.2 Conduit is to be as follows:

.1 "AC-90" flexible armoured cable ("BX") – (MAXIMUM PERMITTED RUN 1.5m) in accessible suspended ceiling spaces, in stud wall construction to ceiling spaces and wherever else shown. Support "BX" armoured cabling with two hole cable straps to "Code" requirements for runs in ceiling space and in stud wall construction.

.1 all conduit exposed outside the building, all conduit inside the building for electric service conductors, and all other conduit exposed inside the building and less than 1.8 m above the finished floor – rigid galvanized steel

.2 all underground conduit – rigid PVC

.3 for short branch circuit connectors to motorized equipment and distribution transformers, minimum length 450 mm, maximum length 600 mm with 180 degree loop where possible – galvanized steel flexible liquid-tight conduit

.4 at points where conductors cross building expansion joints – galvanized steel flexible conduit

.5 for conduit except as noted above – EMT

.3 Provide a separate ground conductor in all plastic conduit.

.4 Support underground conduit on a well tamped flat bed of earth, free rocks or protrusions of any kind.

.5 Support and secure surface mounted and suspended single or double runs of metal conduit at support spacing in accordance with OESC requirements by means of galvanized pipe straps, conduit clips, ring bolt type hangers, or by other proper manufactured devices.

.6 Support multiple mixed size metal conduit runs with Unistrut Ltd., Electovert Ltd. "CANTRUSS" or Burndy Ltd. "FLEXIBLE" conduit racks spaced to suit the spacing requirements of the smallest conduit in the group.

.7 Unless otherwise noted, conduit fittings are to be constructed of the same material as the conduit and are to suitable in all respect for the application.

.8 Provide proper adaptors for joining conduits of different materials.

.9 Cut square and properly ream all site cut conduit ends.

.10 Where conductor sizes are increased to suit voltage drop requirements, increase the scheduled of specified conduit size to suit.

.11 Site made bends for all conduit must maintain the full conduit diameter with no kinking, and conduit finishes must not flake or crack when the conduit is bent.

.12 Plug ends of roughed-in conduit which are exposed during construction with approved plugs.

.13 Ensure that all conduit systems which are left empty for future wiring are clean, clear, capped and properly identified at each termination point. Provide end bushing and suitable fish wire in all such conduit.

.14 Provide two 25 mm dia. empty conduits to ceiling spaces from flush mounted panelboards located below and/or near a hung ceiling.

.15 Install horizontal conduit so that it can drain, without pockets in which water can collect.

.16 Locate conduits at least 150 mm clear of hot pipes, flues, and other such hot materials.

3.03 CONDUIT EXPANSION FACILITIES

.1 Wherever concealed or surface mounted conduits cross building expansion joints, and in maximum 30 m intervals in straight runs of conduit 30 m or longer, provide flexible conduit and expansion facilities to permit free movement without imposing additional stress or loading upon the support system, and to prevent excessive movement at joints and connections.

3.04 NOT USED

3.05 NOT USED

3.06 INSTALLATION OF WALL & CEILING OUTLET BOXES AND BACK BOXES

.1 Provide an outlet box or back box for each luminaire, wiring device, telephone outlet, fire alarm system component, communications systems components, and any other such outlet.

.2 Outlet boxes shall be flush mounted in interior construction and surface mounted in concealed interior locations. For applications where outlet boxes will be exposed in the Retail Area, outlet boxes shall be die-cast aluminum with silver-grey power coat paint finish.

.3 Outlet boxes for surface mounted exterior lighting, receptacles, and other device outlets, boxes flush mounted in exterior building surfaces, and boxes mounted in interior device locations where the connecting conduit is rigid, and for boxes in perimeter walls where insulation and vapour barrier is present, are to be "FS" or "FD" Series cast boxes unless otherwise noted.

.4 Do not install outlet or back boxes "back-to-back" in walls and partitions. Stagger such outlets and seal against noise transmission. "Thru-wall" type boxes will not be permitted for any application.

.5 The horizontal location of switches, thermostats, sensors, outlets and control devices are shown diagrammatically only, and are subject to change without extra cost providing information is given prior to installation. Outlets may be relocated up to 3 m from the original location, without change in price, as directed by the Consultant or LCBO Design Coordinator. Architectural drawings and the Consultant's or LCBO Design Coordinator's instructions have precedence over electrical drawing diagrammatic layouts.

.6 The responsibility for ensuring that all switches, thermostats and other controls are kept as close to door jambs and other openings as possible and for checking door swings prior to installation and locating switches on the lock side of the door, rests with the Contractor.

.7 Provide blank coverplates in finished areas, on existing obsolete boxes which are to remain in position.

3.07 NOT USED

3.08 INSTALLATION OF PULLBOXES AND JUNCTION BOXES

.1 Provide pullboxes in conduit systems wherever shown on the drawings, and/or wherever necessary to facilitate conductor installations. Generally, conduit runs exceeding 30 m in length, or with more than three 90 degree bends are to be

equipped with a pullbox installed at a convenient and suitable intermediate accessible location.

.2 Provide junction boxes wherever required and/or indicated on the drawings, including the following for the Manager's Office:

.1 a 200 mm square, 65 mm deep junction box for connection of lighting circuits to switches

.2 a 200 mm square, 65 mm deep junction box for connection of cash receptacles

.3 Boxes in rigid conduit and EMT inside the building are to be stamped galvanized or prime coated steel.

.4 Boxes in exterior rigid conduit are to be "Condulet" cast gasketed boxes unless otherwise noted.

.5 Boxes in plastic conduit are to be rigid PVC plastic boxes.

.6 All pullboxes and junction boxes must be accessible after the work is completed.

.7 Accurately locate and identify all concealed pullboxes and junction boxes on "as-built" record drawings.

.8 Clearly identify main pull or junction boxes (excluding obvious outlet boxes) by spray painting the outside of the covers. Paint colours are to be as directed by the Consultant or LCBO Design Coordinator.

.9 Provide 16x16x8 junction box for BAS transducer.

3.09 INSTALLATION OF CONDUCTORS

.1 Provide all required conductors.

.2 Conductors, unless otherwise noted, are to be as follows:

.1 for isolated power system load side wiring – "RE90"

.2 for all wiring except as noted above or except as specified elsewhere – "T90 Nylon

.3 Splicing of conductors #8 AWG and larger is to be done with solderless pressure type splicing connectors of the split bolt or compression sleeve type. Splices are to be insulated with filler putty and minimum of two half-lapped layers of vinyl plastic tape. Compression joints are to be made using approved hydraulic tools to assure a permanent mechanically secure high conductivity joint.

.4 Conductors up to and including #10 AWG are to be joined with hand twist plastic insulated pressure connectors having expandable tapered spring and extended skirt. Hand twist joints will not be permitted with conductors larger than #10 AWG and the number of size of conductors within each connector is to be in accordance with the manufacturer's recommendations. Set screw connectors will not be allowed for this type of joint.

.5 Generally, conductor sizes are indicated on the drawings. Such sizes are minimum requirements and must be increased, where required, to suit the length of run and voltage drop.

.6 Colour code conductors throughout to identify phases, neutrals and ground by means

of self-laminating coloured tape, coloured conductor insulation, or properly secured coloured plastic discs. Colours, unless otherwise noted, are to be as follows:

.1 phase A – red
.2 phase B – black
.3 phase C – blue
.4 ground – green
.5 neutral – white
.6 control – orange

.7 Colours for isolated power system "load" side power wiring are to be as follows:

.1 live No. 1 – ivory
.2 live No. 2 – orange
.3 ground – green

.8 When pulling wires into conduit, use lubricant and ensure that wires are kept straight and are not twisted or abraised.

.9 Use "French Chalk" or "Talcum Powder" only for pulling in isolated power system "load" side wiring.

3.10 INSTALLATION OF LOW VOLTAGE CONDUCTORS

.1 Provide all required low voltage conductors.

.2 Low voltage conductors are to be No. 18 AWG "TEW" except for use in fire alarm system applications and unless otherwise noted. Provide specified fire alarm cables for fire alarm system applications or security system applications as approved by Code and local governing authorities.

.3 Install all low voltage conductors in conduit unless otherwise noted. All conductors not installed in conduit must be FT fire rated in accordance with governing Code flame spread and smoke developed requirements.

.4 Colour code conductors for communications systems in accordance with the system component manufacturer's recommendations.

3.11 INSTALLATION OF LOCAL LIGHTING SWITCHES

.1 Provide identified sensor switch in the office

.2 Locate switches for security shutters and window shades in the Office.

.3 Unless otherwise specified, switches are to be decorator type, white on horizontal surfaces, cream colour on vertical surfaces, and complete with matching faceplates.

.4 Unless otherwise noted, switches and control devices mounting heights shall be not less than 900 mm and not more than 1200 mm above floor.

.5 Ensure that switches located adjacent to doors are located at the strike side of the door. Confirm door swing requirements on the architectural drawings, not on the electrical drawings.

3.12 NOT USED

3.13 INSTALLATION OF AUTOMATIC WALL SWITCHES

.1 Provide motion sensor automatic wall switches in the following areas:

.1 all Staff Rooms
Sequence of Operations:
-Lighting: Manual-ON, Auto-OFF

.2 all washrooms
Sequence of Operations:
-Lighting: Auto-ON, Auto-OFF.

.3 Janitor's Room
Sequence of Operations:
-Lighting: Manual-ON, Auto-OFF

.4 Office (Occupancy Sensor)
Sequence of Operations:
-Office ceiling lights activate automatically via sensor.
-Button "I" would manually control (ON/OFF) the ceiling lighting.
-Button "II" would manually control (ON/OFF) the valence lighting.
-The sensor would turn off ceiling/valence lighting after 15mins of inactivity.

.2 Unless otherwise specified, locate switches 900-1100mm above the finished floor.

3.14 INSTALLATON OF RECEPTACLES

.1 Provide all required receptacles.

.2 Unless otherwise specified or shown, receptacles are to be white on horizontal surfaces, cream colour on vertical surfaces, and equipped with matching faceplates.

.3 Floor, ceiling and isolated ground receptacles are to be standard shape. All other receptacles are to be decorator type.

.4 For the Office layout, include receptacles as follows:

.1 isolated ground duplex receptacles for a CPU, printer, and a computer

.2 receptacles for stereo equipment

.3 a receptacle for a Demo Kitchen grease interceptor control panel.

.4 receptacles for general use

.5 Provide GFI duplex receptacle at Bell telephone backboard.

.6 Provide a separate insulated ground wire for each isolated ground receptacle.

.7 Where dishwashers and other appliances are required, provide appropriate receptacles.

.8 Provide GFCI duplex receptacles where receptacles are located within 1m of any water source.

3.15 SUPPLY OF ACCESS DOORS

.1 Supply access doors to give access to all junction boxes, pullboxes, conductor joints, transformers and other similar electrical work which may need maintenance or repair but which is concealed in inaccessible construction. Not all access doors are shown on drawings. It is the responsibility of the electrical contractor to include price of all required access doors in their price. No extra will be allowed for failure to do so.

.2 Access doors will be installed by the trade responsible for the particular type of construction in which the doors are required. Supply the access doors to the trade installing same at the proper time.

3.16 INSTALLATION OF FASTENING AND SECURING HARDWARE

.1 Provide all fasteners and similar hardware required for conduit, conductors, etc., and for equipment hanger and/or support material unless otherwise noted.

.2 Explosive powder actuated fasteners will not be permitted unless specific written approval for their use and type has been obtained from the Consultant.

.3 Under no circumstances use ceiling suspension hangers or grids for the suspension or support of conduit and conductors.

3.17 INSTALLATION OF IDENTIFICATION NAMEPLATES

.1 For each piece of electrical distribution equipment from the electrical source of supply up to and including panelboards, for special control panels and cabinets, and for each other piece of electrical equipment, provide engraved Lamacoid identification nameplates secured to apparatus with stainless steel screws. Nameplates are to indicate the equipment designation and the source of electrical supply.

.2 Panelboard nameplates are to identify the panelboard number as designated on the drawings, unless otherwise instructed. Nameplates for disconnect switches, control panels, and cabinets are to outline their service and source of supply.

.3 Provide self-adhesive identification labels on the inside and outside of each device outlet faceplate, identifying the location from which each device is fed.

3.18 GENERAL ELECTRICAL WORK TESTING

.1 In addition to the tests required by the governing authorities, Codes and Regulations, perform the following:

- .1 after all luminaries, switches, receptacles, motors, signals, etc., are installed, whether same are installed as part of this Section of the work or by other Sections (telephone systems excepted), test all work to ensure that there are no grounds or crosses
- .2 establish and ensure proper motor rotation – measure full load running currents and check overload elements – report to the Consultant any discrepancies which are found.
- .3 Document all tests on associated forms and submit to the Consultant and Commissioning Agent for review and approval.
- .4 Verify the electrical voltage, prior to beginning of fit up construction and at the end of construction/project completion.

3.19 BRANCH CIRCUIT BALANCING

.1 Connect all branch lighting and power circuits to panelboards so as to balance the

actual (wattage) within 5%. If required, transpose branch circuits when the work is complete to meet this requirement.

.2 At the request of the Consultant, perform all necessary tests to show the above requirement has been fulfilled. Make such tests after the building is occupied.

.3 Record all measurements on the associated forms and submit to the Consultant and Commissioning Agent for review and approval

3.20 CONCRETE WORK FOR ELECTRICAL SERVICES

.1 Provide all concrete work, including reinforcing and formwork required for electrical work.

.2 All concrete work is to be in accordance with requirements of Division 03 unless otherwise specified.

3.21 CUTTING AND PATCHING FOR ELECTRICAL WORK

.1 All cutting and patching of building surfaces required for electrical work, including core drilling walls, and slabs for conduit will be done as part of another Division of the work, however, the cost for such cutting and patching is to be included in the cost for the electrical work.

3.22 INSTALLATION OF FIRESTOPPING AND SMOKE SEAL MATERIALS

.1 Where electrical work penetrates or punctures new and or existing fire rated construction, provide ULC certified, listed and labelled packing material to seal holes and voids in the walls or slabs and within the raceway to ensure that the continuity and integrity o the fire separation is maintained. If required by Consultant, submit certificates of compliance from an independent testing agency, attesting that the firestopping and smoke seal materials meet ULC requirements.

.2 Install fire stopping and smoke seal materials in accordance with ULC certification and the manufacturer's instructions. Comply with OBC requirements and obtain approvals from local Building Inspection Department. Ensure that openings through fire separations do not exceed the maximum size wall opening, and maximum and minimum dimensions, indicated in ULC Guide No. 40 U19 for Service Penetration Assemblies and fire stopping materials.

.3 Install fire stopping and smoke seal materials in accordance with ULC certification and the manufacturers instructions. Ensure that the continuity and integrity of the fire separation is maintained and conforms to the requirements of the latest edition of ULC publication "List of Equipment and Materials", Volume II, Building Construction.

.4 Work is to be executed by a qualified applicator approved by the material manufacturer.

3.23 QUALITY CONTROL AND COMMISSIONING

.1 The Quality Control and Commissioning section 00 45 00 shall apply to this section.

.2 The electrical systems to be commissioned shall include:
- .1 Testing of the power distribution
- .2 Testing of the lighting system
- .3 Functional testing demonstration
- .4 Seasonal commissioning

END OF SECTION

Note, the following is for reference, final locations and quantities to be confirmed with LCBO Design Coordinator

LCBO STORE CABLING (updated 14/11/2006) **SECTION 26 05 00.03**

▲ = voice Δ = data

Cash lane	▲Δ	**Each**	
Customer service desk	▲Δ	**On side closest to cash lane**	
	▲ΔΔ	**On other side of customer service desk**	
Office	▲Δ	**Every seat in office including printer**	
	▲	**CA38a jack above DVR**	**locate in ceiling space above door - homerun back to demark**
	▲	**Power fail jack**	**locate above desk**
	Δ	**DVR drop**	**locate in security cabinetry on wall**
	Δ	**Line cut drop**	**locate in ceiling space above door**
		Coax from 0-1 terminated on back wall at cabinet.	**Hi-speed for Rogers**
Vintages	▲Δ	**Where required**	
Licensee desk	▲ΔΔΔ	**Where required**	
Access point (1)	Δ	**Retail area**	**locate centrally towards back of store**
(2)	Δ	**Warehouse area**	**locate 10' up on wall inside warehouse door**
Lunchroom	▲	**Inside or outside lunchroom**	**Locate 54" up wall**
25 pair backbone		**0-1 to GREEN patch panel in office cab**	
Dist Mgr's Office	▲ΔΔ	**Where required**	
Dist Mgrs Admin Asst	▲ΔΔ	**Where required**	
BAS System	Δ	**Where required**	**Beside BAS Panel**

CABINET

Full Service store	**RFM3022**	
New Image store	**RFM3022**	
Rural Community store	**AX100282**	**Mount on wall next to server**

1 GENERAL

1.01 SUBMITTALS

.1 Submit shop drawings of products specified in this Section.

.2 Submit copies of documents requested herein, testing reports, certificate of approvals, and commissioning sheets.

.3 Refer to Section entitled Electrical Work General Instructions, for general submission requirements.

2 PRODUCTS

2.01 VIBRATION CONTROL AND SEISMIC RESTRAINT

.1 Electrical equipment installation is to meet local governing authority having jurisdiction and code seismic requirements and additional requirements for vibration isolation.

.2 Provide labour, materials, and equipment required and necessary to seismically restrain electrical equipment and equipment bases including concrete pads, and guarantee function of materials and equipment supplied.

.3 Make electrical connections to vibration-isolated equipment with flexible conduit or other flexible means acceptable to Consultant and local governing authority having jurisdiction so as not to restrict maximum anticipated movement of equipment under seismic excitation movement.

.4 In event that inadequate isolation is provided by isolation product manufacturer's isolation package, be responsible for improving isolation to an acceptable standard at no additional cost to contract. Isolation product manufacturer's seismic restraint engineer to verify that seismic restraints and combination isolator/restraints intended for use on project are fit for intended purpose. Be responsible for ensuring that manufacturer's seismic restraints are in compliance with applicable local building code requirements for Place of Work.

.5 Provide additional seismic requirements for suspended electrical raceways, luminaires, and other equipment as per governing local authority requirements and requirements of current codes and by-laws.

.6 Acceptable manufacturers of seismic restraints include:

.1 Vibro-Acoustics;

.2 Mason Industries;

.3 Kinetic Noise Control.

2.02 VIBRATION CONTROL AND SEISMIC RESTRAINT

.1 Electrical equipment installation is to meet local governing authority having jurisdiction and code seismic requirements and additional requirements outlined herein.

.2 Provide labour, materials, and equipment required and necessary to seismically restrain electrical equipment and equipment bases including concrete pads, and guarantee function of materials and equipment supplied.

.3 Make electrical connections to vibration-isolated equipment with flexible conduit or other flexible means acceptable to Consultant and local governing authority having jurisdiction so as not to restrict maximum anticipated movement of equipment under seismic excitation movement.

.4 In event that inadequate isolation is provided by isolation product manufacturer's isolation package, be responsible for improving isolation to an acceptable standard at no additional cost to contract. Isolation product manufacturer's seismic restraint engineer to verify that seismic restraints and combination isolator/restraints intended for use on project are fit for intended purpose. Be responsible for ensuring that manufacturer's seismic restraints are in compliance with applicable local building code requirements for Place of Work.

.5 Provide additional seismic requirements for suspended electrical raceways, luminaires, and other equipment as per governing local authority requirements and requirements of current codes and by-laws.

.6 Include for manufacturer of vibration control products, such as Vibro-Acoustics, to develop/design a seismic restraint system and perform seismic calculations in accordance with latest requirements of local governing building code, requirements of local governing authority having jurisdiction, and additional requirements specified in this article. Design of seismic restraints to include provisions to withstand forces of area rating as per governing building code requirements.

.7 Submit for Consultant's review, seismic design drawings and product shop drawings with calculations approved and sealed by a Professional Engineer licensed and registered in Place of Work and experienced in such Work. Be responsible for costs for services of this Professional Engineer. Shop drawings to identify equipment type, manufacturer's name, model number and weight of equipment to be restrained.

.8 Shop drawings to additionally include placement drawings for electrical equipment and equipment assemblies including runs of cable trays and conduit/cable racks showing methods of attachment to particular structure for each piece of equipment and assembly and provide anchorage/attachment details. Submit samples of materials required to complete seismic restraint work for review if and when required. Include for Professional Engineer to inspect same on site (note that multiple inspections to be required as work progresses) and to provide typewritten Inspection Reports to Consultant throughout construction and to provide "Letters of Assurance and Conformance" with specified Codes, Standards and Bylaws. Additionally, include copies of documents in Operating and Maintenance Manuals.

.9 Use of manufacturer's isolation package is acceptable providing it meets requirements of this Specification.

.10 Provide vibration isolation for equipment or parts connected rigidly to isolated equipment.

.11 Provide vibration isolation for transformers by means of bridge bearing neoprene isolators or open steel spring isolators. Static deflection of vibration isolators for electrical transformers is indicated below. Isolators requiring a static deflection greater than 13 mm (1/2") to be open spring isolators unless otherwise specified.

POWER RANGE (kVA)	ON GRADE (Isolated Slab)	LOCATION ON GRADE (Continuous Slab)	UPPER Floor (Suspended Slab)
Under 10	6mm	6mm	18mm
10 - 100	6mm	12mm	25mm
Over 100	6mm	25mm	38mm

.12 Standard vibration isolation requirements of equipment such as gensets, power transformers and distribution equipment, to comply with following:

.1 choose equipment isolation mounts on basis of achieving 98% vibration isolation efficiency at lowest operating speed. Natural frequency of each vibration isolation system to be at least 1/10 of lowest excitation frequency of rotating machinery, whenever practicable, but in no case less than 1/7. Where structural floor deflection exceeds 1/10 of determined static deflection of isolator, increase isolator static deflection to maintain this minimum ratio of floor to isolator deflection. Where static deflections are shown on drawings, Specifications, or schedules, they are to be used as a guide only. Actual isolators are to achieve required static deflection under load, with at least 50% reserve deflection;

.2 submit shop drawings identifying equipment, lowest operating speed, weight, brand, type and location of isolators prior to ordering or fabrication.

.13 Following typical electrical equipment require seismic protection:

.1 transformers;

.2 switchboards/switchgear;

.3 panelboards;

.4 fire alarm system, cabinets and devices;

.5 luminaires;

.6 conduit and duct banks;

.7 other electrical equipment, as required.

.14 Neoprene Isolators:

.1 Neoprene isolators to be bridge bearing rated type manufactured from bridge bearing quality neoprene, CAN/CSA-S6-88 Section 11.5.8.

.2 Where a ribbed pad is used, height of ribs is not to exceed 0.7 times width of rib.
A steel layer to be used to distribute load in a multi-layered unit.

.3 Select neoprene pads or elements at supplier's optimum recommended loading and do not load beyond limit specified in neoprene manufacturer's literature.

.4 Test neoprene isolators to ASTM specifications. Submit to Consultant, following test data to verify performance of neoprene isolators:

.1 a data sheet listing all of ASTM test results;

.2 load deflection curves for isolator indicating deflection to full compression for both laterally restrained and unrestrained isolators.

.15 Open Steel Spring Isolators:

.1 Springs to be "Iso-Stiff" (spring coefficient 1.0 to 1.5) with a working deflection between 0.3 and 0.6 of solid deflection.

.2 Spring mounts to be complete with levelling devices, minimum 6mm (1/4") thick neoprene sound pads, and zinc chromate plated hardware.

.3 Sound pads to be sized for a minimum deflection of 1.2 mm (0.0472") and meet requirements for neoprene isolators.

.16 Seismic restraints to restrain equipment in all directions and to be sized to meet appropriate Sp factor defined in Table 4.1.9.D of current National Building Code and Commentary J of Supplement to current Code. Calculations bearing seal of a qualified Professional Engineer to be submitted with shop drawings to justify stated seismic restraint requirements.

.17 Attachment points and fasteners to be capable of withstanding a load of 3 times sized capacity of restraint. Equipment suppliers to provide proof of conformance with this clause by means of shop drawings certified by a qualified Professional Engineer.

.18 Submit test data to Consultant, showing load deflection curves up to 1.5 times rated capacity of restraint, and certifying that neither neoprene elements nor restraint body sustained any deformation after release of load.

.19 Adjust restraints to have clearances between 3mm (1/8") and 6mm (1/4") under normal operating conditions of equipment.

.20 Acceptable manufacturers of seismic restraints include:

.1 Vibro-Acoustics;

.2 Mason Industries;

.3 Kinetic Noise Control;

.4 Other Consultant's approved equal manufacturers.

3 EXECUTION

3.01 INSTALLATION

.1 Comply with seismic restraint Engineer's and manufacturer's installation recommendations.

.2 Test, adjust, and certify installation. Submit copies of test report to Consultant.

.3 Refer to Part 2 for specific installation requirements.

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 CSA C9, Dry Type Transformers.
.2 CSA C802.2, Minimum Efficiency Values for Dry-Type Transformers.
.3 ASA No. 61, Grey Colour.
.4 CSA C22.2 No. 29, Panelboards and Enclosed Panelboards.
.5 CSA C22.2 No. 5, Moulded Case Circuit Breakers.
.6 Refer to Section 26 05 00.

1.02 SHOP DRAWINGS

.1 Submit shop drawings for all products specified in Part 2 of this Section.
.2 For distribution transformers submit a detailed and dimensioned shop drawing for the suspended mounting platform assembly with vibration isolation. The shop drawing is to be prepared by and stamped by a professional structural engineer registered in the Province of Ontario.

PART 2: PRODUCTS

2.01 NOT USED

2.02 NOT USED

2.03 LIGHTING BRANCH CIRCUIT PANELBOARDS

.1 Schneider Electric/Square D "Powerlink G4 System" Controller The controller G43500 is to have Modbus, Modbus TCP, BACnet/IP, BACnet MS/TP, DMX512 and C Bus communications protocol, the panelboard shall be manufactured to CSA and the Ontario Electrical Safety Code, and designed for sequence phase connection of branch circuit breakers. Standard warranty period of 18 months from the date of shipment or 12 months from the date of energization.
.2 Panelboards for 120/208 volt, 3 phase 4 wire 225A service with minimum circuits as shown on single line diagram or panel schedule, the circuit breaker interrupting capacity is to be a minimum of 14KA at 120V or as shown on drawings or schedule.
.3 Panelboards are to be complete with:
  .1 an EEMAC 1 sprinkler-proof, constructed of code gauge galvanized steel with removable box ends, wiring gutter space on all sides, and an unpainted galvanized steel finish
  .2 trim for flush or surface wall mounting as shown, constructed of code gauge steel, bonderized, finished with unpainted galvanized tub to be supplied flush or surface depending on application and keyed alike lock with key. Panel directory shall be supplied inside the trim door with directory card protector.
  .3 drip shield for surface mounted panelboards
  .4 hard drawn electrical grade copper bus and ground bus
  .5 high strength, set screw type, anti-turning wire connectors

.6 isolated ground bus for panelboards feeding electrically sensitive equipment, where shown on drawings

.7 200% oversized neutrals for panelboards with isolated ground circuits.

.4 Circuit breakers connected to dedicated devices are to be complete with handle lock devices

.5 Branch circuit breakers shall have rated ampacity as noted on panel schedule.

.6 Branch circuit breakers to operable by integral solenoid. Solenoid shall be controlled by Novar BAS System, refer to Section 25 05 00. Novar controller to be supplied by others.

.7 Acceptable manufacturers are:

.1 Schneider Electric Square D

.2 Or approved alternate.

.8 Lighting Branch Circuit Panelboards shall be complete with an externally mounted Transient Voltage Surge Suppressors as noted in Section 2.12.

2.04 BRANCH CIRCUIT PANELBOARDS

.1 Schneider Electric factory assembled dead front panelboards as per the drawing, manufactured to CSA C22.2 No. 29 and the Ontario Electrical Safety Code, and designed for sequence phase connection of branch circuit breakers. Standard warranty period of 1 year from the date of purchase.

.2 Panelboards for 120/208 volt service are to be type "NQ" up to 225A with, unless otherwise noted, minimum "QOB" frame, bolt-on moulded case circuit breakers.

.3 Panelboards for 347/600 volt service are to be type "NF" up to 400A with minimum "EDB" frame, bolt-on moulded case circuit breakers.

.4 Panel type shall be selected based on branch breaker capacity as per chat below: Panelboard rating chart:

Type	Voltage	Amp	KAIC Rating	Branch Circuit Breaker Capability	Circuits
NQ	240V	400A	10-22 KA	15A-100A	84
NF	347/600V	400A	22-100 KA	15A-100A	84 (when fed with up to 75KVA)
NF	347/600V	400A	22-100 KA	15A-100A	66 (when fed with 112.5KVA or greater)

.5 Where specified and/or scheduled on the drawings, breakers are to be "Quick-Gard" ground fault, CSA Class "A", Group 1, combination thermal magnetic bolt-on circuit breakers/solid-state ground fault interrupters.

. 6 Panelboards are to be complete with:

.1 an EEMAC 2 sprinkler-proof, enclosure complete with drip shield, constructed of code gauge galvanized steel with removable box ends, wiring gutter space on all sides, and an unpainted galvanized steel finish

.2 trim for flush or surface wall mounting as shown, constructed of code gauge steel, bonderized, finished with unpainted galvanized steeland complete with concealed fasteners, concealed hinge, chrome plated door latch and keyed alike lock with key, a steel frame holder and circuit directory card protected by clear acetate and secured to the back of the door, and Mylar circuit breaker identification strips

.3 no drip shield for flush mounted panelboards

.4 hard drawn electrical grade copper bus and ground bus

.5 high strength, set screw type, anti-turning wire connectors

.6 isolated ground bus for panelboards feeding electrically sensitive equipment

.7 oversized neutrals for panelboards with isolated ground circuits

.7 Circuit breakers connected to dedicated devices are to be complete with handle lock devices, and as a minimum, for 20% of the circuits in each panelboard

.8 Where panelboards are indicated to be equipped with low voltage relays the panelboard is to be complete with a barriered wireway at the side of the enclosure.

.9 Acceptable manufacturers are:

.1 Schneider Electric Square D

.2 Cutler-Hammer Canada

.3 Siemens Electric Ltd.

.4 Or approved alternate

Panelboards to be equipped with nine (9) spare/free circuits minimum in groups of three (3) and for each group of three (3) to be consecutive in the panel. In the event the store dips below this threshold a pony panel shall be installed. Panel type shall be selected based on branch breaker capacity as per chart below:

Type	Voltage	Amp	KAIC Rating	Branch Circuit Breaker Capability	Circuits
NQ	240V	225A	10-22 KA	15A-100A	42

.10 Branch Circuit Panelboards shall be complete with an externally mounted Transient Voltage Surge Suppressors as noted in Section 2.12.

2.05 DISTRIBUTION CONDUCTORS

.1 Distribution conductors are to be as specified in Section 26 05 00, and CSA type "RA90" (X-LINK) Alcatel Canada Wire Inc., "CORFLEX II" cable suitable for 1,000 volt service and consisting of cross-linked polyethylene insulated single copper conductors, 90 degrees C. rated, enclosed by a continuous extruded corrugated aluminium sheath with an overall PVC jacket.

.2 Acceptable manufacturers are:

.1 Alcatel Canada Wire Inc.
.2 Phillips Cables Ltd.
.3 ITT Royal Electric Division
.4 Or approved alternate

2.06 NOT USED

2.07 NOT USED

2.08 NOT USED

2.09 DISCONNECT SWITCHES

.1 Cutler-Hammer Canada heavy duty, sprinkler-proof, CSA approved, front operated with a handle suitable for padlocking in the "OFF" position and arranged so that the enclosure cover cannot be opened while the handle is in the "ON" position. Operating mechanisms are to be quick-break, positive acting with visible blades and a line terminal shield. Fusible units are to be complete with fuse clips suitable for HRC fuses, unless otherwise noted. The ampere rating, number of poles and fuse requirements are to be as indicted on the drawings. Standard warranty period of 1 year from the date of purchase.

.2 Acceptable manufacturers are:

.1 Cutler-Hammer Canada
.2 Schneider Canada
.3 Siemens Electric Ltd.
.4 Or approved alternate

2.10 FUSES

.1 Unless otherwise indicated, fuses are to be equal to English Electric Ltd., Form I, Class "J" HRC fuses for constantly running equipment, and Form II, Class "C" fuses for motor equipment that cycles "ON" and "OFF".

2.11 NOT USED

2.12 TRANSIENT VOLTAGE SURGE SUPPRESSORS

.1 Schneider electric SquareD external surge protection device "SPD" Series Model SSP02EMA16 for 120/208V service and SSP08EMA24 for 600/347V service transient voltage surge suppressors, each factory tested, complete with surge counter, sprinkler proof and Thermo-Dynamic Fusing System. Standard warranty period of 10 years from the date of purchase.

.2 Or approved alternate.

2.13 DOUBLE VOLTAGE RELAYS

.1 Double voltage relays are to be complete with an EEMAC 2 enclosure except where shown otherwise. Relays are to be heavy-duty, long life type with silver to silver contacts, and contact arrangements, time delay and current ratings to suit control requirements.

2.14 CONTROL STATIONS

.1 Control stations are to be complete with an EEMAC 2 enclosure and an engraved laminated plastic nameplate to designate services. Pushbuttons and selector switches are to be double break, silver contact unitised type, having readily interchangeable operators, contact blocks and legend plates. Pilot lights are to be provided as required and shown on the drawings. In finished areas control station are to be flush mounting type.

2.15 NOT USED

2.16 DISTRIBUTION SYSTEM TESTING, START-UP AND COORDINATION STUDY

.1 Provide on-site engineering inspection, testing, start-up and verification of distribution equipment. Prepare coordination study and short circuit calculations of system. Perform work to standards of applicable local governing authorities and local electrical inspection authority. Submit coordination study and short circuit calculations as part of shop drawing submission and prior to fabrication of equipment, within two (2) weeks of award.

.2 Review and survey existing systems and/or obtain where available, coordination study of existing systems to use in determining best coordination for additional and revised equipment with existing systems. Where existing studies are not available, survey existing systems and prepare additional coordination studies as required to provide a full and proper coordination of entire existing, revised and additional systems.

.3 The engineering inspection, testing and start-up will be performed by an approved independent testing company and shall be done prior to the system being energized, and shall include the following items where applicable:

.1 Testing, cleaning when necessary, and calibrating all relays and circuit breaker trip devices (calibration of all protective devices shall conform to

requirements of approved coordination curves);

.2 Function test of associated control devices;

.3 Replacement of fuses destroyed during the testing;

.4 An acceptance test in the presence of and satisfaction of the Consultant;

.5 The presence, for the length of time required, of qualified and competent equipment manufacturer's service representative during start-up;

.6 Carry out insulation resistance testing of all out going feeders with respect to ground;

.7 Testing of cables, power receptacles and switches;

.8 inspection and testing of cables, power panels, lighting panels, transformers, power receptacles and switches;

.9 inspection and testing of electrical devices installed furniture systems, etc., whether or not devices are supplied by Electrical Divisions;

.10 inspection and testing of motor starters and variable speed drives.

.4 Where relays, breakers, etc., do not perform to the approved coordination curves, they shall be revised as part of the work.

.5 Where defective or incorrectly applied relays or breakers are found in the distribution system, identify clearly in report and provide recommended course of corrective action.

.6 Adjust and calibrate existing trip units, relays, breakers, etc., which do not perform to approved coordination curves. Where defective or incorrectly applied relays or breakers are found in existing distribution system, identify problem areas clearly on curves of test report and provide recommended course of remedial action. Where replacement of existing devices not identified in Documents to be replaced is necessary to provide coordination, submit estimate of costs to Consultant for review. Where approved by Owner, perform work at additional cost to Contract amount. Clearly show on coordination curves in report and clearly identify recommended remedial course of action..

.7 Short Circuit and Coordination Study:

.1 Protective system devices have been selected such that protection is adequate and good coordination is possible, however, since differences do exist between manufacturers, some changes in trip ratings or relay settings may be necessary and are to be carried out. Obtain local electrical utility information on their protective devices and include requirements as necessary.

.2 Coordination study to be approved by Engineer prior to start of manufacturing of distribution equipment.

.3 Immediately upon award of contract, arrange for testing company to provide and carry out following:

.1 prepare a set of coordination curves on K.E. No. 336E Time Current Characteristic graph paper and forward two (2) copies to Consultant for review;

.2 this is to be accompanied by supporting symmetrical as well as asymmetrical fault current calculation data with tabulations to verify

protection of various elements of systems under maximum and minimum fault conditions at various points in systems.

.4 Plot time-current characteristic curves for following:

.1 main and feeder protective devices at voltage levels used in distribution system;

.2 protective devices associated with largest motor, refrigeration machine compressors and largest device in each distribution panel;

.3 motor generator protective devices, damage curves and current decrement curves.

.5 Cooperate with and obtain from other manufacturers a list of equipment requiring protective devices to be used in distribution system and prepare coordination curves as soon as possible. Be responsible, along with other manufacturers' equipment connected to distribution system, to ensure that proper control and protective devices are selected such that they coordinate with protective devices.

.6 It is responsibility of manufacturer to examine plans and specifications to ensure that relays and protective devices being installed in distribution system provide satisfactory coordination.

.8 Provide visual and mechanical inspection of the ground system and verify that it is in compliance with issued documents and OESC requirements.

.9 Document testing and coordination study in a report signed by a Professional Engineer licensed in the Place of Work and authorized by testing company. Include for minimum two (2) copies of the report to be submitted to Consultant for review. The report shall include all test results with properly plotted curves, identified trouble areas of coordination, extensive comments regarding test results and recommendations on best methods to resolve the problem areas.

.10 Acceptable testing and co-ordination companies shall be independent of distribution system equipment.

2.17 SHOCK AND ARC FLASH PROTECTION

.1 General:

.1 Provide for electric shock and arc flash protection as required by local governing electrical code and authorities.

.2 Determine severity of potential exposure, planning safe work practices and selecting personal protective equipment under general guidelines of governing edition of CSA Z462.

.3 Design safety signs and labels for applications to equipment under general guidelines of ANSI Z535.4.

.4 Determine arc flash hazard distance and incident energy that workers may be exposed to from electrical equipment under general guidelines of IEEE 1584.

.5 Incorporate documentation with distribution system testing and coordination report.

.6 Acceptable companies to provide this work are same as those listed for

distribution system testing and coordination study work.

.2 Arc Flash Hazard Analysis:

.1 Perform Arc Flash Hazard analysis according to IEEE 1584equations that are presented in NFPA70E, Annex D.

.2 Retrieve short circuit calculations and clearing times of phase overcurrent devices from short circuit and coordination study specified previously.

.3 Calculate flash protection boundary and incident energy at significant locations in electrical distribution system (switchboards, switchgear, motor-control centres, panelboards, busway and splitters) where work could be performed on energized parts.

.4 Arc-Flash Hazard Analysis to include significant locations in 240 V and 208 V systems fed from transformers equal to or greater than 125 kVA.

.5 Specify safe working distances for calculated fault locations based upon calculated arc flash boundary considering incident energy of 1.2 cal/cm2.

.6 Include Arc Flash Hazard analysis calculations for maximum and minimum contributions of fault current magnitude. Minimum calculation to assume that utility contribution is at a minimum and a minimum motor load. Conversely, maximum calculation to assume a maximum contribution from utility and motors to be operating under full-load conditions. Other switching scenarios are to be included as necessitated by power system design and layout.

.7 Arc Flash computation to include both line and load side of main breaker calculations, where necessary.

.8 Base Arc Flash calculations to be based on actual overcurrent protective device clearing time. Cap maximum clearing time at 2 seconds based on IEEE 1584 section B.1.2.

.3 Arc Flash Warning Labels:

.1 Provide minimum 90 mm x 127 mm (3.5" x 5") thermal transfer type label of high adhesion polyester for each work location analysed.

.2 Label to have an orange header with wording, "WARNING, ARC FLASH HAZARD", and include following information:

.1 location designation;

.2 nominal voltage;

.3 flash protection boundary;

.4 hazard risk category;

.5 incident energy;

.6 working distance;

.7 engineering report number, revision number and issue date;

.8 Machine print labels with no field markings;

.4 Provide Arc Flash labels as applicable to project and required by local codes and standards, and to requirements of local governing authorities and as reviewed with Consultant. Provide labels for following equipment (and base labels on recommended overcurrent device settings:

.1 panelboards;

.2 distribution transformers;

.3 switchboards;

.4 high voltage equipment;

.5 other equipment as required by local governing authorities;

2.18 BARRIER-FREE WASHROOM CONTROLS AND CALL SYSTEM

.1 Provide emergency call system with integrated door controls consisting of CSA approved and/or ULC listed components to provide system in compliance with local governing codes and standards, with following components and operations:

.1 Door controls: 113 mm square, active push to open / push to lock plates with contacts, embossing to suit application as reviewed with consultant, metal construction with finish reviewed with consultant, tamper-proof and impact resistant features, square recessed mounting box.

.2 Exterior over door dome light with sounder that illuminates and sounds tone when assistance call station is activated.

.3 Interior press for assistance push buttons: 40 mm diameter, red mushroom head push button station with single gang stainless steel faceplates, NO / NC contacts, maintained, push/pull operation, contact block, tamper-proof screws and “Press for Emergency Assistance” engraving.

.4 Controller: Microprocessor controller and multi-function relays to control various door control functions, and complete with steel enclosure.

.5 Exterior of door annunciators: Single gang, dome light with sounder and white polycarbonate lens with “assistance required” engraving.

.6 Interior of door call assurance annunciators: Single gang, led dome light with sounder, tamper-proof screws and polycarbonate lens with “Assistance Required” engraving; message is not visible until station is activated.

.7 Signage: Solid, white, fire rated PVC, 150 mm x 270 mm engraved lamacoid emergency sign with wording – “In event of emergency push emergency button and audible and visual signal will activate” in letters at least 25 mm high with 5 mm stroke and that is posted above call station. Exact sizing and nomenclature to be as per local governing code requirements and reviewed with consultant prior to ordering.

.8 Power supplies, wiring and ancillary devices as required and as recommended by system manufacturer.

.9 Activated assistance call station sends signal to audible and visual devices that indicate that someone in washroom needs assistance.

.10 Audible devices and visual devices to illuminate and sound tone when assistance call stations are activated. Visual and audible signals to be distinct and of different types of signals from other building systems.

.11 Call stations, audible devices and visual devices to only be reset when call has been responded to and activated station locally reset.

.12 Fire alarm strobe/horn strobe to illuminate and or sound in the event of a fire to warn individuals using the barrier free washroom

.2 Provide system to suit application as shown and as required. Interconnect system to door hardware and door hardware vendors of Division 08 to ensure compatibility with particular emphasis on power requirements and latching mechanisms. Ensure that stations meet requirements of each application as recommended by manufacturer. Include required accessories to suit. Provide weatherproof and corrosion resistant devices for devices located in non-climate controlled areas.

.3 Verify system sequence of operation with local governing authority inspector where required, and review with consultant.

.4 Manufacturer's authorized vendor to supply, install, test, start-up and certify complete systems as required.

.5 Install devices and perform work in accordance with manufacturer's instructions and requirements and in accordance to applicable codes of local governing authorities.

.6 Acceptable manufacturers and vendors include 'Camden' door controls (CX-WEC Series) or approved alternate.

.7 Operation and Sequencing

.1 Door to be normally closed, latched and unlocked with LED indicator GREEN.

.2 Access washroom by:

.1 Turn lever and pulling/pushing door open OR

.2 Press warehouse side button to automatically retract latch and open door.

.3 Once inside washroom and door is closed, press the 'Push To Lock' button to lock the outside lever, disable the outside door operator push button and turn the LED indicators on both inside and warehouse side from GREEN to RED.

.4 Exit washroom by:

.1 Turn inside lever and pulling/pushing door open OR

.2 Press inside push button to automatically retract latch and open door to reset the opening to its Normal state.

.5 Upon exiting washroom, the LED indicators on both inside and warehouse side to revert from RED to GREEN.

.6 Activate Emergency Call System by pushing Call Assistance button inside washroom to trigger flashing RED LED indicators and auditory alarm on warehouse side. 'Assistance Requested' inside washroom shall illuminate.

.7 Access washroom in emergency by:
  .1 Open from the warehouse side using a mechanical key if door is locked OR
  .2 Open from inside washroom by pressing Emergency Push Button to unlock door lever, and trigger Emergency Call System (RED LED indicator flashing and auditory alarm.)

.8 Reset Emergency Call System by mechanical key or button inside washroom to return to normal condition.

PART 3: EXECUTION

3.01 NOT USED

3.02 NOT USED

3.03 NOT USED

3.04 INSTALLATION OF BRANCH CIRCUIT PANELBOARDS

.1 Provide factory assembled branch circuit panelboards where indicated on the drawings. Provide two 25 mm dia. empty conduits from the top of each flush mounted panelboard to an accessible location in the ceiling space.

.2 Support cabinets and enclosures independent of connecting conduit, and accurately install with reference to wall finishes.

.3 Equip panelboards with suitable lugs or provisions to accommodate the main and branch conductors schedule. Provide locking bars for a minimum of 20% of the breakers in each panelboard.

.4 Turn over to the Consultant, prior to application for a Certificate of Substantial Performance of the Work, a quantity of two panelboard cabinet or enclosure keys per panelboard.

.5 Where two or more panelboards are installed in one cabinet, equip the panelboards with double lugs and increase gutter capacity to accommodate additional cabling.

.6 Identify all panelboard breakers in a permanent manner, and complete typed panelboard circuit directories to the Consultant's approval.

.7 Upon completion of the installation of the ground fault interrupting breakers, demonstrate in the presence of the Consultant that all protected circuits will "trip" when a simulated ground fault is applied to the "load" side of each circuit breaker/ground fault interrupter combination., Megger the load side neutral on all GFI protected branch circuits to ensure that the neutral is not grounded on the load side on the GFI. Verify the GFI operation with a temporary load (100 watt lamp in an insulated socket with pigtail leads). provide a written report confirming that all tests have been performed and that the system is functioning properly.

3.05 INSTALLATION OF DISTRIBUTION CONDUCTORS

.1 Provide all required distribution wire and cable. The conductors, unless otherwise

noted, are to be installed in conduit as specified in Section 26 05 00.

.2 Provide a Unistrut Corporation channel support system for overhead suspended "CORFLEX II" cable. The support system is to consist of channels on 1 m centres, supported by suitable threaded steel rods secured to the structure., Secure the cable on the channel at one diameter spacing with suitable aluminium clips.

.3 Support surface mounted and vertical "CORFLEX II" cables at one diameter spacing at 1 m centres by means of proper insulated two hole clips secured to the building construction in an approved manner.

.4 Provide all required cable support system accessories which are not specified herein or shown on the drawings but are required for proper installation.

.5 Ground and bond single conductor "CORFLEX II" cables at both ends where the sheath currents do not affect the cable ampacity. For certain areas, where sheath currents will reduce the cable ampacity, ground and bond the cable at the supply end and isolate the cable at the load end as recommended by the cable manufacturer, and provide a No. 3/0 green TW ground conductors for each cable run. Refer to Section No. 10 of the Ontario Electrical Safety Code.

.6 Do not install "CORFLEX II" cable in poured concrete work.

3.06 NOT USED

3.07 NOT USED

3.08 NOT USED

3.09 INSTALLATION OF DISCONNECT SWITCHES

.1 Provide safety switches (disconnects) as follows:

.1 wherever shown on the drawings and/or specified herein

.2 for motorized equipment which cannot be seen from the motor starter location or that is more than 9 m from the starter location

2. Ensure that enclosures for safety switches located outside the building are EEMAC3.

3. Ensure that enclosures for safety switches located inside the building are EEMAC 2.

4. Ensure that power feeders for disconnect switches servicing exhaust fans are installed/equipped with adequate slack to compensate for exhaust fan hinged access service plate

3.10 INSTALLATION OF FUSES

.1 Provide a complete set of fuses for each fusible disconnect provided as part of the electrical work.

.2 Supply three spare fuses of each size and type used on the project, mount the fuses on a painted and identified plywood rack, and secure the rack in a location where later directed.

3.11 NOT USED

3.12 INSTALLATION OF TRANSIENT VOLTAGE SURGE SUPPRESSORS

.1 Provide a transient voltage surge suppressor for each panelboard. Wall mount in accordance with the manufacturer's instructions and connect complete.

3.13 NOT USED

3.14 GROUNDING

.1 Do all required grounding work in accordance with the drawings and in accordance with requirements of governing authorities, including the Ontario Hydro Electrical Safety Code. Provide Utility's grounding requirements and confirm with the Utility.

.2 Provide required grounding, regardless of whether it has been shown on the drawings or called for in these Specifications.

.3 Grounds are to be so arranged that under normal operating conditions no injurious amount of current will flow in any grounding conductor.

.4 Throughout the building, solidly ground the system and make all required grounding connections to all new electrical devices and apparatus. Ground conductors are to be insulated 2/0 copper wire connected with approved fittings in accordance with the Ontario Electrical Safety Code.

.5 Extend isolated grounding conductors of computer receptacles to isolated ground bus of the computer panelboard serving the area. From the ground bus extend ground conductors to the building grounding station. Provide separate insulated ground wire for each isolated ground circuit.

.6 Provide separate communications ground bus in manager's office. Connect to main system ground.

3.15 INSTALLATION OF EXTERIOR SIGNS

.1 Installation of exterior signs is per Section 10 14 00.

.2 Provide sleeve(s) through exterior wall for power and/or communications, as required. Coordinate exact location and requirements with shop drawings prior to rough-in. Provide fire stopping as required.

.3 Provide final connection.

3.16 ELECTRICAL CONNECTIONS FOR MECHANICAL, REFRIGERATION, ETC., EQUIPMENT

.1 Provide all required electrical connections to equipment/systems provided and/or supplied as part of the mechanical work and as part of the work of other Divisions. Connection work is to include:

- .1 "line" and "load" side power wiring connections to all mechanical equipment, including trap seal primers
- .2 mounting of loose motor starters and disconnect switches supplied with mechanical equipment, and provision of motor starter panels(s) with splitter

trough as required

.3 "line" and "load" side power wiring connections to condensing units and evaporators associated with coolers and refrigerated display cases specified in Sections 11 40 00 and 11 41 20, and all required control wiring for such equipment, including, for the cooler:

.1 Two relays, one to control the fan coil for the cooler box, and one to control the temperature for the condensing unit

.4 "line" side power wiring connection to the Warehouse overhead door controllers, and to the loading dock leveller system

.5 A receptacle for the gas island cook top range specified in Section 11 40 00, with dedicated panelboard circuit

.6 A 20 ampere, 208/240 volt, 4 wire receptacle for the under-counter oven specified in Section 11 40 00

.7 receptacles for dishwashers specified in Section 11 40 00

.8 power connectors to motorized shade/sign as per LCBO standard

.9 double isolated ground duplex receptacles for LCBO communication

.10 Include for installation of the relay modules supplied by the LCBO security system installer. The relay modules are Altronix Model RB5

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 CSA, Canadian Standards Association.
.2 ULC, Underwriters Laboratories of Canada.
.3 ANSI C62.41, Guide For Surge Voltages In Low Voltage AC Power Circuits.
.4 ANSI C82.11, Electronic Ballast Performance.
.5 EMI/RFI, Electromagnetic Interference/Radio Frequency Interference.
.6 CSA C22.2 No., 141, Unit Equipment For Emergency Lighting.
.7 ANSI C62.45, Recommended Practice on Surge Testing For Equipment Connected To Low-Voltage AC Power Circuits.
.8 Refer to Section 26 05 00.

1.02 SHOP DRAWINGS

.1 Submit shop drawings for all products specified in this Section. Include photometric data for all fixtures.

PART 2: PRODUCTS

2.01 GENERAL RE: LIGHTING FIXTURES

.1 Lighting fixtures are to be in accordance with the Lighting Legend/Lamp Schedule and the specification and are to be CSA approved or have special ESA approval.
.2 Confirm exact colours and finishes of fixtures with the LCBO Project Coordinator and/or the Consultant after award of contract but prior to ordering. Obtain information in time to meet the installation schedule.
.3 Unless otherwise noted, luminaries with ballasts are each to be provided with its own ballast and ballasts are not to be shared.

2.02 GENERAL RE: LAMPS

.1 Lamps are to be in accordance with the Lighting Legend/Lamp Schedule, and the specification.
.2 Fluorescent Lamps: Unless otherwise specified, T8 fluorescent lamps are to be equal to Philips Lighting “Plus 800” Series, energy saving, low mercury, high efficiency, rapid start, T-8 lamps with colour temperature of 3000K, colour rendering index (CRI) of at least 85, rated average life of a minimum 36,000 hours, and initial lumens of at least 2950. T5HO lamps shall be equal to Philips Lighting “Silhouette T5HO” Series, 3000K CRI of at least 85, 25,000 hours life and initial lumens of 5000. Confirm colour temperatures with Lighting Legend prior to ordering.
.3 Compact Fluorescent Lamps: Compact fluorescent lamps are to have a rated average life of a minimum 10,000 hours, colour temperature of 3000K, minimum colour rendering index of 80, and complete with energy saving electronic ballasts as recommended by the lamp manufacturer. Confirm colour temperature with Lighting Legend prior to ordering.

2.03 FLUORESCENT FIXTURE BALLASTS

.1 T8 Fluorescent fixture ballasts are to be electronic type, equal to Advance Transformer Co., rapid start, electronic energy saving T-8 ballasts as follows:

.1 CSA approved and ULC listed and labelled comply with FCC Rules and Regulations, and ANSI Spec C62.41/C62.45
.2 rapid start in accordance with ANSI Spec. C82.11
.3 Free of PCBs
.4 Class A sound rating
.5 capable of starting lamps down to 10 degrees C
.6 total harmonic distortion not greater than 10%
.7 minimum power factor of 0.97 and ballast factor of at least 0.88
.8 lamp current crest factor not greater than 1.7
.9 frequency of operation between 20 kHz minimum to 60 kHz maximum without visible flicker
.10 EMI/RFI filtering
.11 five year full replacement parts and labour included warranty
.12 a nameplate indicating the ballast manufacturer, ballast model number, type, voltage and frequency, sound rating, CSA approval, the number and type of lamps the ballast will operate, power factor value, and a wiring diagram

.2 T5HO Ballasts shall be the same as above, except program start (to ANSI requirements), ballast factor of 1.00.

.3 Ballasts for fluorescent fixtures to be dimmed are to be as above but purposely made for dimming applications.

2.04 NOT USED

2.05 LIGHTING FIXTURES AND LAMPS

.1 Base lighting, unless otherwise specified, is to be manufactured by Canlyte-Lightolier. Alternatives will be not accepted.

.2 Sales/Retail Area Exit Lights: Lumacell LAE Series CAT. # LAE-1/L/R/2/A-OW-ACD, extruded aluminium edge-lit pictogram illuminated exit lights No substitution will be permitted unless otherwise stated by the LCBO Project Coordinator during the design period. Refer to attached Cut Sheet.

.3 Emergency Lighting: Battery Unit – 24 volt, 30 minutes operation, operation on 120 volt single phase, plug-in type, 6 terminal block, light activated test switch, fully adjustable lighting heads c/w 6 Watt LED, 591 lumens, MR16, sealed lead battery, (10 years), solid state charger, temperature compensation, sealed transfer switch, low voltage disconnect, brown out protection, built-in time delay battery lockout circuit, dual diagnostic indicator light, white polyester paint
CAT.# RG24S-720-2-LD14-TD-TMBD- -LTS
Recessed Remote Head: New 24V, 6 W LED, 591 lumens round MR16, frame-in kit c/w integral cable clamps and mounting bars. Lumacell CAT.# RSTH-19-WH-MR16-LD14

Surface Mounted Double Head: 24V, 6 W LED, 591 lumens, surface adjustable, double head Lumacell CAT.# M-QM-2-LD14
Surface Mounted Single Head: 24 V, 6 W LED, 591 lumens surface adjustable, single head Lumacell CAT.# M-QM-LD14
Light heads/trim located in drywall/T-bar ceilings shall match the colour of the finished ceiling they are installed within. Where located in Vintage baffle ceilings or Urban Design concept open Retail space, heads/trim shall be black.
No substitution will be permitted unless otherwise stated by the LCBO Project Coordinator during the design period. Refer to attached Cut Sheet.

.4 Warehouse Lighting: Lithonia LED Lighting-IBL Series #12L-WD-SD125-LP735 DLC wide distribution c/w lens, frame and door, LED-12000 Lumens, LED down, 100 Watts, 3500K, unless otherwise reviewed and discussed with the LCBO Project Coordinator during the design period.

.5 Janitor Room Lighting: 4' Phillips FluxStream LED Linear fixture with wire guard, fixture to be mounted to wall surface at high level, mounting height to be confirmed with LCBO Project Coordinator.

.6 Washroom/Staff Room/Office Lighting, Washrooms and Office: 2x2 Recessed LED Fixture by Lithonia Lighting ACLED Series Cat. #2ACL2-40L-D38-LP830

.7 Entrance Canopy Lights: 4" Dia. Exterior recessed LED downlight, 23W. Cat.# L4-17LM-30K-120-G-80CRI-HW-CS-PF.

.8 Loading Dock Security Lights: SLIM57N RCL, 57W LED, 4000K. Suitable for wet locations.

.9 All Other Fixtures and Lamps: Lighting fixtures and lamps not specified above are to be in accordance with the interior design schedule which must be adhered to unless, due to physical changes to be building structure alternative fixtures have to be proposed, in which case the alternative proposal will be reviewed by the LCBO Project Coordinator.

2.06 NOT USED

2.07 NOT USED

2.08 NOT USED

2.09 NOT USED

2.10 INTERIOR LIGHTING CONTROL LIGHT SENSOR

.1 The Watt Stopper Inc. Model LS-101 "LightSaver" ceiling mount, electronic, 24 volt, microprocessor based daylight sensor, ULC listed, complete with a multi-band digital photosensor, a removable white colour cover, and the following:

.1 100 degree light measuring angle

.2 adjustable deadband with 25%, 50%, 75% or 100% in relation to set points to prevent lighting from cycling on-off due to minor daylight changes due to clouds

.3 adjustable time delay ranges of 3, 10, 15 or 30 minutes to prevent lighting from cycling on-off on partly cloudy days
.4 lighting level set points of from 1 to 850 fc
.5 LCD display with menu button and select button
.6 LED status indicators
.7 a #TRP-1 transformer relay power pack

.2 Acceptable manufacturers are:
.1 The Watt Stopper Inc.
.2 Tork (Nsi Industries)
.3 Borg General Controls
.4 Or approved alternate

PART 3: EXECUTION

3.01 INSTALLATION OF LIGHTING FIXTURES AND LAMPS

.1 Provide all required lighting fixtures and lamps.

.2 Thoroughly review ceiling types, finishes and construction details before placing fixture orders, and ensure that required mounting assemblies, frames, rings and similar features are included.

.3 Carefully coordinate the fixture installation with the work of other trades to ensure that the necessary recessing depths and mounting spaces are provided.

.4 Install fixtures in accordance with applicable electrical and architectural drawing reflected ceiling plans and/or wall elevations and/or field instruction. Confirm locations prior to roughing-in. In equipment rooms and similar secondary areas, install fixtures after the mechanical and other major work is roughed in and adjust locations as required.

.5 Align and position all adjustable luminaires, and ensure that luminaires with adjustable lamp holders are properly positioned to correspond to the lamps specified.

.6 Comply with the requirements of OESC regarding support of luminaires in suspended ceilings.

.7 All lamps are to be new and intact when the project is complete and ready for acceptance.

.8 Install Warehouse LED. lighting such that lenses are below the blades of ceiling fans and at least 25 mm below the bottom of steel joists.

.9 Provide separate lighting zones with relays and contactors, and office wall switches to permit LCBO staff to shut-down specific lighting groups as follows:
.1 Zone 1: retail track lights (including Beer and Party zones)
.2 Zone 2: retail perimeter valence lights including transparency boxes (for retail, Beer and Party zones)
.3 Zone 3: retail ceiling fluorescent and pot lights
.4 Zone 4: office ceiling lights
.5 Zone 5: office valence lights
.6 Zone 6: Kitchen Demo lights

.7 Zone 7: Vintages fluorescent lights (store-to-store basis depending on Vintages shape and configuration)
.8 Zone 8: Vintages incandescent track lights
.9 Zone 9: Warehouse

.10 Lighting fixtures are to be installed accurately in line and level. Any fixtures that are not, in the opinion of the Architect, installed properly, are to be taken down and reinstalled to his satisfaction, without cost to the Owner. Fixtures are to be left clean, free from dirt, grease, fingerprints, etc.

.11 Co-ordinate with the architectural drawings for installation of plaster frames and rings in the appropriate ceilings to accommodate installation of recessed lighting fixtures.

.12 Surface mounted luminaries, which are to be installed on ceilings, are to be securely bolted to Unistrut or equal channels, which are secured to the structure. Align fixtures to correct light distribution.

.13 Support recess mounted luminaires from the building structure and independent of the ceiling system and roof deck.

.14 Where 1.2 m long fluorescent luminaries are mounted in continuous rows, 2.4 m long luminaries may be used, but are to be installed using 1.2 m long lamps in tandem, and with hangers spaces at maximum 1.2 m centers.

.15 Include a full lamp listing in the Operating and Maintenance Instruction Manuals.

.16 Upon Substantial Completion of the work supply a minimum of 10% spare lamps for each type of lamp used. Handover the spare lamps to the Store Manager, in identified packaging.

.17 Warehouse lighting at pallet racking to be mounted at not lower than bottom of joist. All other areas to be at 14'. Confirm with LCBO Project Coordinator and architectural reflected ceiling plan

.18 Provide Emergency Lighting/Exit sign verification report to Consultant and commissioning agent.

.19 For renovation projects, existing emergency battery units and lighting shall be replaced where they are not compatible with the addition of a new remote push-button for emergency light testing.

3.02 NOT USED

3.03 INSTALLATION OF INTERIOR LIGHTING CONTROL

.1 Provide ceiling mounted daylight sensors adjacent to exterior windows in the Retail Area where shown to switch area lighting on and off in response to exterior light levels.

.2 For each daylight sensor, provide a transformer relay power pack.

.3 Secure daylight sensors in place on the ceiling surface, generally where shown but with exact locations in accordance with the sensor manufacturer's instructions.

.4 Install the transformer relay power packs in the ceiling space.

.5 Do all required 24 volt and 120 volt wiring in conduit in accordance with the drawing wiring schematic, and when installation is complete, adjust each sensor for optimum energy savings to the approval of the Owner.

3.04 COMMISSIONING OF LIGHTING CONTROL

.1 Verify the proper operation of the lighting control system and demonstrate to the Consultant and the Commissioning Agent that the system functions as intended.

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 Refer to Section 26 05 00.

1.02 SHOP DRAWINGS

.1 Submit shop drawings for the following:
- .1 pushbuttons, bells/buzzers
- .2 special boxes

PART 2: PRODUCTS

2.01 NOT USED

2.02 NOT USED

2.03 PUSHBUTTONS AND SIGNALS

.1 **Loading Dock and Pushbutton Signal:** SCHNEIDER #XB4BA31, 24 volt, round, weatherproof, pushbutton. Supply and install GE/Edwards #338-G5 , 24 volt, single stroke industrial chimes, surface mounting, 81 dB at 10', and complete with a satin aluminium finish. Install in warehouse, retail, cold room and office.

.2 **Check-Out Counter Pushbutton and Signal:** GE/Edwards #693-12, lock-nut mounting, 24 volt, 16 mm dia. recessed white pushbutton. Supply and install Edwards #5560M-AQ & signals sound file is 06_Beep-cvt.wav. Install in warehouse, retail, cold room and office. Sound value setting shall be 81 dBA @ 10 feet.

.3 **Auxiliary Exit From Retail Space:** GE/Edwards #CCS1985 24 Volt electronic signal, recessed mounting, 75 dB at 300 mm, white finish.

PART 3: EXECUTION

3.01 EMPTY CONDUIT/RACEWAY SYSTEMS FOR COMMUNICATIONS & SECURITY SYSTEMS

.1 Provide complete systems of empty conduit and raceway for security, telephone and data system wiring as shown on the drawings and on LCBO SKE sketch sheets found at the end of this Section.

.2 Provide fish wires in all ducts and raceways.

.3 Refer to PART 3 of Section 26 05 00 for conduit/raceway/box/faceplate installation requirements.

.4 Terminate empty conduit with bushed ends.

.5 Wherever it is necessary to change the directions of conduit runs, use a standard conduit bend. No "T" or "L" type fittings will be permitted.

3.02 NOT USED

3.03 INSTALLATION OF PUSHBUTTONS AND SIGNALS

.1 Provide an exterior pushbutton at the Warehouse overhead door, connected to a buzzer inside the Warehouse, a buzzer in the Office ceiling space and a buzzer in the cold room ceiling space.

.2 Provide pushbuttons at check-out desks connected to a chime in the Office ceiling space, a chime in the cold room and a chime in the Warehouse area. Adjust the location of the chime in the Office ceiling space so that the dB level in the Office does not exceed 75 Db.

.3 Provide 15A-1P circuits, low voltage transformers, any required accessories, and all required line voltage and low voltage wiring in conduit.

.4 Confirm exact locations of components with the LCBO Design Coordinator prior to roughing-in.

3.04 SECURITY SYSTEM FACILITIES

.1 Provide all required facilities for installation of security system equipment and wiring.

.2 Provide a duplex receptacle adjacent to each security CCTV camera location, including wiring from the receptacle to the panelboard.

.3 At cash counters provide ceiling security system as shown.

.4 Provide junction boxes above cash desks connected to 20 mm dia. conduit with fishwire and terminate conduit above t-bar ceiling within the designated office area.
Refer to attached sketches SK01 - 26 05 00 and SK02 - 26 05 00 2.

.5 Within office ceiling space and near the security conduits install two 15A 125 volt duplex receptacles.

.6 Provide a wood shelf on heavy-duty enamelled steel wall brackets capable of supporting a 100 lb. load with adjacent duplex receptacle for the remote VCR unit. Refer to architectural drawings.

.7 Emergency Exit Doors in retail space not regularly used for entrance/exit shall have a signalling device mounted above the door and shall be wired to annunciate an open door.

3.05 OFFICE ELECTRICAL SYSTEMS

.1 Refer to LCBO electrical sketch sheets found at the end of this Section.

.2 Office electrical system components are to include, but are not to be limited to, the following:

- .1 150 mm x 150 mm x 100 mm pullbox at 150 mm a.f.f. to connect data and telephone conduits from Cash System underfloor duct system. Include conduits to above finished ceiling and conduits stubbed out to ceiling space. Conduits are to include three 50 mm dia. and one 25 mm dia. E.C. with fishwire.
- .2 loop wire panel (computer and cash registers)
- .3 telephone with empty conduit to ceiling space
- .4 voice 1104 box (computer modem)
- .5 data 1104 box (credit/debit)
- .6 voice 1104 boxes (telephone)

.7 voice 1104 box (facsimile line)
.8 three data 1104 boxes near CPU
.9 debit/credit bridge
.10 DVAC monitoring panel

3.06 NOT USED

END OF SECTION

PART 1: GENERAL

1.01 REFERENCES

.1 CAN/ULC S527, Standard for Control Units for Fire Alarm Systems.
.2 CAN/ULC S524, Installation of Fire Alarm Systems.
.3 CAN/ULC S536, Standard for Inspection and Testing of Fire Alarm Systems.
.4 CAN/ULC S537, Verification of Fire Alarm Systems.
.5 Section 26 05 00.

1.02 SHOP DRAWINGS

.1 Submit product data sheets for all fire alarm system components, a complete riser diagram indicating the system architecture, and a certified schematic wiring diagram.

PART 2: PRODUCTS

2.01 SYSTEM DESCRIPTION

.1 The fire alarm system is existing. Extend system to renovated area. Relocate existing devices as shown on drawings. Provide new devices as shown.
.2 Engage and pay for Owner's fire alarm contractor to perform all related work.
.3 Re-verify modified zones.

2.02 GENERAL RE: SYSTEM COMPONENTS

.1 Edwards of Canada Ltd. CSA approved and ULC listed and labelled (CAN/ULC-S527) components for a fully electrically supervised, non-coded, single stage, zoned, fire alarm system in compliance with all applicable requirements of local governing authorities.
.2 The system is to include the following components:
  .1 main control panel with integral annunciator
  .2 alarm initiating devices
  .3 alarm signalling devices
  .4 control connections to building systems and equipment
  .5 batteries and battery charger, end-of-line devices, and all required ancillary devices
  .6 wiring in conduit

2.03 NOT USED

2.04 MANUAL PULL STATIONS

.1 Open circuit type, semi-flush wall mounting interior type, each complete with a pull lever, a break-glass feature, red enamel finish with aluminium markings and bilingual identification.

2.05 THERMAL DETECTORS

.1 Surface ceiling mounted low silhouette design, twist-lock mounting automatic thermal detectors are as follows:

.1 combination 57 degrees C. fixed temperature and 8 degrees C. rate-of-rise type
.2 57 degrees C. fixed temperature type

2.06 CEILING MOUNTED PRODUCTS OF COMBUSTION DETECTORS

.1 Ionization type products of combustion detectors, each complete with:
.1 dual ionization chambers
.2 field adjustable sensitivity
.3 an integral LED alarm lamp
.4 magnetically operated functional test feature
.5 a separate baseplate with wiring terminals, for mounting to a standard 100 mm outlet box
.6 locking feature to prevent unauthorized removal of unit head from base

2.07 DUCT MOUNTING PRODUCTS OF COMBUSTION DETECTORS

.1 Duct housing, complete with:
.1 ionization detector
.2 duct air sampling tube of suitable required length
.3 remote alarm indicator assembly with LED type lamp and single gang stainless steel faceplate

2.09 ALARM BELLS

.1 Steel alloy bells, 24 volt DC, 250 mm dia., each complete with mounting plate and, in finished areas, a flush box and prime coated grille. Exterior installations and devices marked "WP" are to be provided with cast aluminium weatherproof boxes.

PART 3: EXECUTION

SPECNOTE: The following, section 3.01, is intended for existing landlord-owned fire alarm systems that are being extended into or modified within the leased spaces.

3.01 GENERAL

.1 Engage and pay for Owner's fire alarm contractor to perform all fire alarm work.
.2 Re-verify relevant zones after work is completed.
.3 All work shall be performed in accordance with the Owner's standard specifications, and in the style and quality exhibited in the remainder of the installation of the system.
.4 Owner's contractor shall warrant all devices and work for 12 months or the remainder of the existing warranty, whichever is longer.

3.02 INSTALLATION OF FIRE ALARM SYSTEM

.1 Provide a complete fire alarm system as shown.

.2 Actuation of any alarm initiating device is to cause the following:
- .1 all audible devices to sound continuously
- .2 the zone of the alarm condition to be indicated at the control panel annuciator
- .3 activation of circuitry to transmit an alarm signal to the Fire Department or to an outside private protection company via the telephone system
- .4 designated air handling equipment to start-up or shut-down by means of control wiring from the control panel to equipment starters
- .5 release door holders (if connected)

.3 Mount all equipment and connect complete in accordance with the manufacturer's instructions and requirements.

.4 Install each pull station in a standard 100 mm recessed outlet box with plaster cover.

.5 Secure the baseplate of each thermal detector to a recessed 100 mm outlet box.

.6 Secure the baseplate of each smoke detector to a 100 mm outlet box.

.7 Mount each duct mounted products of combustion detector on the duct in question and connect with smoke sampling tubes which extend into the duct air stream. Install a remote alarm lamp assembly for each duct mounted detector. Wall mount each lamp assembly on a standard 100 mm outlet box as close as possible or practicable to the detector. Do not locate duct detectors within 1 m of duct size increaser or decreaser fittings or any duct elbow.

.8 Provide alarm bells on standard device boxes in locations as shown. Ensure that the sound levels are in accordance to the requirements of all applicable local codes. Recess mount all bells in finished areas.

.9 In addition to wiring connections to fire alarm system components, extend control wiring in conduit from the control panel to:
- .1 fire protection system piping alarm valves for alarm initiation
- .2 fire protection system piping supervised valves for trouble initiation
- .3 the Demo Kitchen fire suppression system control panel
- .4 fan equipment starters

.10 Provide end-of-line resistors to electrically supervise all wiring.

.11 Confirm the exact location of all components prior to roughing-in.

.12 Do all required system wiring. Install all wiring in EMT unless otherwise noted. Refer to Section 26 05 00.

.13 Alarm signal circuits and alarm receiving circuits must be run in separate conduits. All wiring connections are to be colour coded. Ensure that wiring colour coding is consistent for the entire length of each run. Conduit couplings for fire alarm system wiring are to be painted red.

.14 The entire system must be installed in accordance with CAN/ULC S524 and the applicable provisions of governing authorities.

.15 When all fire alarm system work is complete and ready for acceptance, arrange for an independent inspection and testing agency to inspect, test and verify the equipment, including initiating devices, signalling devices, control devices and wiring. This work is to comprise an examination of such equipment in accordance with the latest editions of CAN/ULC-S536 and S537 for the following:

.1 to ensure that the entire system functions in accordance with the sequence of operations on the drawings and as specified

.2 to ensure that the type of equipment installed is that designated by the contract documents

.3 to ensure that the wiring connections to all equipment components show that the installer observed ULC and CSA requirements

.4 to ensure that the equipment was installed in accordance with the manufacturer's recommendations, and that all signalling devices of whatever manufacture were operated or tested to verify their operation

.5 to ensure that the supervisory wiring of those items of equipment connected to a supervised circuit is operating and that the governmental regulations, if any, concerning such supervisory wiring, have been met to the satisfaction of inspecting officials

.6 to ensure that all devices are commissioned and operable

.16 Arrange for the manufacturer to supply reasonable amounts of technical assistance with respect to any changes required as a result of testing and verification. During the period of inspection, make electricians available to the manufacturer to do any required correction work and to assist during inspections.

.17 On completion of the verification, inspection and testing of the system, obtain from the system manufacturer and forward to the Consultant, a certificate of liability insurance and obtain from the testing agency a verification certificate together with detailed inspection reports listing each and every system component, its location in the building and its acceptability. The verification certificate and inspection reports are to be prepared and signed by the testing agency, confirming that the system is installed in accordance with requirements specified above.

END OF SECTION