Halton District School Board **Addendum No. 1**

RFT 26-035 - School Renovations - Kilbride Public School

The following, issued by the Halton District School Board (HDSB) February 2 2026, shall be incorporated in the specifications and shall form part of the proposal document for the above.

ATTACHED:

1. Bidders are asked to refer to the attached Addendum No. 1 as drafted by The Ventin Group Ltd. (+VG Architects). (104 pages)
2. Please see attached electrical (70 pages) and mechanical (154 pages) specifications as developed by EXP Services Inc.

RECEIPT OF ADDENDA MUST BE ACKNOWLEDGED ON THE FORM OF QUOTATION.

PAGE 1 OF 329
END OF ADDENDUM 1

KILBRIDE ELEMENTARY SCHOOL RENOVATION
6611 PANTON ST, BURLINGTON, ON L7P 0L8
HALTON DISTRICT SCHOOL BOARD
ADDENDUM NO. 1
FEBRUARY 02, 2026

The following additional instructions shall apply to and govern the tender documents.

QUESTIONS AND ANSWERS

Q1 Specification ' Section 08400 3. Doors mentioned a Fino Sliding Door By Muraflex, however, that door does not appear to be on the floor plans, hardware or door schedule. please advise.

A1 The reference to a Fino sliding door by Muraflex in Specification Section 08400 is not applicable to this project. No Fino sliding door is included in the scope of work. This reference shall be disregarded. All door types to be provided are as indicated on the architectural drawings and door schedules. Refer to the attached updated Section 08400

Q2 Drawing A8.1 mentions existing aluminum frames requiring new caps for w13,w14,w15 and w16. Is this required? It mentions hollow metal in the description. Please confirm.

A2 The intent is to replace the existing window assemblies at W13, W14, W15, and W16. Provide completely new window assemblies, including frames, glazing, and all associated components. Refer to the updated Architectural drawing A8.1 and specifications. Removal and disposal of existing window assemblies is included in the scope of work.

Q3 Could you please provide Roofing Assembly details, from Drawings I can see only 16mm fiberboard, Base and cap. Can you please confirm?

A3 Section 07520 applies to the canopy roof only as indicated on the drawings. Scope is limited to the following assembly: metal deck, 19 mm dense deck surface, air barrier, 16 mm cover board, tapered insulation as required for drainage, modified bitumen base sheet, and modified bitumen cap sheet. Provisions related to roof drains, mechanical/electrical penetrations, roof-mounted equipment, expansion joints, patios, and walkways do not apply to the canopy roof.

Q4 Please advise if Bid Bond and Agreement to Bond need to be submitted at the time of the tender closing?

A4 Yes, all bonding must be submitted at the time of tender closing with your bid submission.

Q5 please advise when is the closing date, RFT 26-035 first pate states no later than 2:00 p.m. local time on February 10, 2026. Proposed

A5 The closing date for RFT 26-035 School Renovations - Kilbride Public School is on or before 2:00 pm on February 9, 2026.

Q6 The specification book specifies 92,000.00 for cash allowances, but does not show an amount for contingency. The tender form specifies an amount of $90,000.00 for contingency. Please confirm there is a contingency amount as well as cash allowance?

A6 Yes. The Tender Form includes a contingency allowance of $90,000.00, which is separate from and in addition to the cash allowances identified in the specification book. Bidders are to include all allowances shown on the Tender Form in their bid submissions.t

Q7 In the specs it mentions a fino sliding door by muraflex. I don't see it on floorplan, hardware schedule or elevations. Clarify.

A7 Refer to Answer 1.

Q8 Could you clarify the extent of terrazzo repairs, as there seems to be more areas at exterior door locations that might need repair that were visible at the site tour.

A8 Refer to updated drawing A2.1 issued with this addendum, clarifying the extent of the terrazzo repairs.

Q9 Detail 3 on A3.1 indicates only the front half of the masonry block to be removed because of damage, however, Detail 4 indicates the block on the inside is removed partially, & block below is filled with concrete. Could you clarify the cores to be filled & blocks to be replaced.

A9 The intent is as follows: fill both cores of the first two courses of the existing concrete foundation blocks with concrete at the repair locations shown. The remaining existing foundation blocks are to remain.

Q10 Can you please confirm if Commdoor Aluminum is approved

A10 Fulton Windows (Commdoor Aluminum doors) is indicated on Section 08400 as an acceptable product. Refer to the updated section 08400 attached with this Addendum.

Q11 D01A, D01B, D11A and D11B are calling for aluminum frames and doors based on hardware schedule. But the drawing only calls for D01A to be aluminum and the rest to be hollow metal. Can you confirm what is the finish is? Specs say clear anodized, but drawings have P/PTD, meaning painted?

A11 Doors and frames at D01A, D01B, D11A, and D11B are to be aluminum, as indicated in the updated hardware schedule. The required finish is clear anodized. Refer to the updated drawings and hardware schedule for confirmation.

Q12 For the glass, can Oldcastle BE and Saand be acceptable vendors other than Trulite?

A12 Oldcastle BE and SAAND are acceptable manufacturers, provided that the products supplied meet or exceed the requirements of the Contract Documents.

AMENDMENT NO1. – REVISIONS/ CLARIFICATIONS TO ARCHITECTURAL SPECIFICATIONS

The Work under this Contract shall be **phased** to maintain safe and continuous use of the **main school entrance** and to minimize disruption to school operations, particularly at the commencement of the school year.

The Contractor shall coordinate all sequencing, temporary protection, and access requirements accordingly.

PHASE 1 – MAIN ENTRANCE CANOPY (PRIORITY WORK)

1. Construction of the **new entrance canopy** shall be the **first phase of work** and shall be completed **prior to the start of the school year**, unless otherwise directed by the Owner.
2. This phase is intended to ensure the **main entrance remains fully operational, weather-protected, and safe for students, staff, and visitors** at school opening.
3. Work shall include all required demolition, structural installation, roofing, flashing, and integration with existing construction necessary to achieve a fully functional canopy.
4. Temporary weather protection, hoarding, and pedestrian safety measures shall be always provided during this phase to maintain safe access to the main entrance.

PHASE 2 – INTERIOR FLOOR REPLACEMENT (EARLY WORK)

5. Interior **floor replacement work** identified within the Contract Documents shall be scheduled **early in the construction period**, following or in coordination with Phase 1, as approved by the Owner.
6. The Contractor shall sequence flooring work to:
    - Minimize disruption to school operations,
    - Coordinate with any required access restrictions, and
    - Ensure completed areas are returned to service promptly.
7. Where required, flooring work shall be completed during off-hours, school breaks, or in isolated zones to maintain safe circulation within the building.

PHASE 3 – EXTERIOR BRICK REMEDIATION (FINAL PHASE)

8. Exterior brick remediation work shall be scheduled as the final phase of construction, after the main entrance canopy and interior flooring work have been substantially completed and the building is fully operational.
9. This work may proceed while the school is occupied, provided that all safety, access control, and protection measures are in place.
10. Scaffolding, lifts, or other access equipment required for brick remediation shall be positioned so as not to obstruct the main entrance, designated pedestrian routes, or emergency egress paths.
11. Any temporary closures or restrictions required for this phase shall be coordinated in advance with the Owner and shall be limited in duration and extent.

GENERAL PHASING AND COORDINATION REQUIREMENTS

12. The Contractor shall submit a detailed construction schedule reflecting the above phasing requirements as part of the post-award submittals.
13. All phasing shall be coordinated with the Owner's representative to align with school operational needs, including school start-up, daily arrival and dismissal periods, and special events.
14. The Contractor shall maintain safe, clearly indicate pedestrian access to the main entrance unless otherwise approved in writing by the Owner.
15. Dust control, noise mitigation, and vibration management measures shall be implemented throughout all phases of the Work.
16. Any deviations from the phasing described herein shall require prior written approval from the Owner.

CLARIFICATION

17. This phasing note is issued to clarify sequencing intent only and does not relieve the Contractor of responsibility for coordinating means, methods, safety, and protection of existing facilities in accordance with the Contract Documents.

SECTION 01020 ALLOWANCES –

- A Cash Allowance of $15,000.00 (HST extra) is included in the Contract for the supply of finish hardware only, in accordance with the drawings and specifications.
- Installation of all finish hardware, including mechanical and electrified hardware associated with the entrance door replacement, is included in the Contract and is not part of the Cash Allowance.
- The Cash Allowance excludes card readers and intercom equipment (existing to remain), 120VAC power supply to hardware power supplies, door and frame fabrication, and painting/touch-ups.

- Include a cash allowance of $5,000.00 for the supply of door hardware for the aluminum door at the library (Opening W12). The allowance shall include, but is not limited to, panic hardware, door closer, weatherstripping, and all other hardware components required for a complete and operable door assembly.

Section 08400 **ALUMINUM ENTRANCE DOORS, FRAMES & SCREENS**

- Section 08400 applies to aluminum entrance doors, frames, and screens only. Aluminum window assemblies are specified elsewhere.
- Removed reference to Fino sliding door.
- No operable window vents are included in the project. Windows are to be fixed unless explicitly noted otherwise.
- Where conflicts occur, finish requirements in Section 08400 shall govern to be cleared anodized.
- Manufacturer Clarification Revise Article – Qualifications – Manufacturers as follows:
- Replace the reference to
  "Fulton Windows (Commadoor Aluminum doors)"
  with
  "Fulton Windows (Commdoor Aluminum)".
- All other listed manufacturers remain unchanged.

Section 12522 MANUALLY OPERATED ROLLING SHADES

- Refer to the updated section 12522 attached. No motorized shades to be provided. Sunshades required only in 5 library windows.

Section 10800 WASHROOM ACCESSORIES

- Refer to the updated section 10800 attached.

AMENDMENT NO 2. – REVISIONS TO ARCHITECTURAL DRAWINGS

- Refer to the attached revised drawings A2.1, A3.1, A4.5, A8.1
- Refer to the attached New Drawing A3.2
- These drawings are to replace the existing drawings issued with the tender package.

ATTACHMENT

- Updated Hardware Schedule.
- Section 01020 Cash Allowance
- Section 08400 Aluminium Entrance Doors, Frames & Screens.
- Section 10800 Washroom Accessories.
- Section 12522 Manually Operated Rolling Shades
- Section 07520 2 Ply Modified Bitumen Roofing

End of Addendum #1

FINISHING HARDWARE SCHEDULE

KILBRIDE P.S. Reno 2025 HDSB

6611 PANTON ST KILBRIDE , ON.

Architect
VG ARCHITECTS

Detailer: **AUSTIN BARIL**
Consultant: **ROSS RUPRECHT B.A., A.H.C.**

Submittal Date: **APRIL 4/25 ,NOV 25/25, DEC 2/25, JAN 16/26**

Manufacturers & Finishes

Manufacturers

Baron Metal
Camden
CBH
Gallery
Glynn-Johnson
GYRO-TECH
Ives
K.N. Crowder
LCN
MISC
Schlage
Schlage E.S.
UNK
Von Duprin
Zero

Finishes

626 - Satin chromium plated over nickel
628 - Satin aluminum, clear anodized
630 - Satin stainless steel
652 - Satin chromium plated over nickel
689 - Aluminum painted
US32D - Satin stainless steel

Openings Schedule

Opening Number(s)	Qty	Door Catalog	Location 1	To/ From	Location 2	Nominal Width	Nominal Height	Door Thickness	Hand	Label	Degree of Opening	Hardware Group	Remarks	Heading Num.
D01A	1	<Aluminum>	EXTERIOR	FROM	VEST	1050, 1050	2121	45	LHRA/RHRA		100°	EXT PR ALUM RM ADO	ADO, CR	1
D01B	1	<Aluminum>	VEST	FROM	CORR	1050, 1050	2121	45	LHRA/RHRA		100°	41 ADO	ADO	2
D02A	1		EXTERIOR	FROM	VEST	967, 967	2070	45	LHRA/RHRA		100°	EXTERIOR PR HM	CR	3
D02B	1		VEST	FROM	CORR	967, 967	2070	45	LHRA/RHRA		100°	VEST PR		4
D03A	1		EXTERIOR	FROM	VEST	1050, 1050	2180	45	LHRA/RHRA		90°	EXT PR HM RM ADO	ADO, CR	5
D03B	1		VEST	FROM	CORR	1050, 1050	2180	45	LHRA/RHRA		90°	41 ADO	ADO	6
D04	1		EXTERIOR	FROM	CLASS RM	920	2190	45	LHR		110°	EXTERIOR SGL EO		7
D05	1		EXTERIOR	FROM	CLASS RM	910	2083	45	RHR		90°	EXTERIOR SGL EO		8
D08	1		EXTERIOR	FROM	GYM	920	2130	45	LHR		110°	EXTERIOR SGL EO		9
D09	1		EXTERIOR	FROM	GYM	916	2130	45	RHR		110°	EXTERIOR SGL EO		10
D10	1		EXTERIOR	FROM	STORAGE	916	2130	45	RHR		110°	EXTERIOR SGL NL		11
D11A	1	<Aluminum>	EXTERIOR	FROM	VEST	1050, 1050	2170	45	LHRA/RHRA		100°	EXT PR ALUM RM ADO	ADO, CR	12
D11B	1	<Aluminum>	VEST	FROM	CORR	1050, 1050	2170	45	LHRA/RHRA		100°	41 ADO	ADO	13
D12	1		EXTERIOR	FROM	LIBRARY	1110	2158	45	LHR		110°	EXTERIOR SGL EO		14
D17	1		CORR	TO	UNIV WR	965	2100	45	LH		90°	WR ADO	ADO	15

GENERAL:

ALL AUTO OPERATORS GYRO-TECH NO ALTERNATE WILL BE ACCEPTED.

FINISHING HARDWARE SUPPLIER SECTION 08710 TO SUPPLY & INSTALL AUTO OPERATORS.

Hardware Schedule

Heading #1 (Group: EXT PR ALUM RM ADO)

Item #1 1 Pair of doors D01A, EXTERIOR FROM VEST 100° LHRA/RHRA

1050, 1050 x 2121 x 45 - AL DR x AL FR

REM HARDWARE MULLION WITH QUICK ELECTRICAL DISCONNECT.

1		UNK WEATHER STRIPPING BY DOOR AND FRAME SUPPLIER	
6	Standard Hinge	Ives 5BB1HW 5 X 4.5 NRP 630	630
1	Removable Mullion	Von Duprin KR4854-BLANK -96 --689- 154	689
1	Exit Device	Von Duprin CD-33A-EO-4'-626- 45-- INS-2	626
1	Exit Device	Von Duprin CD-33A-NL-OP-4' -626- 45--388/626- INS-2	626/626
2	Cylinder	Schlage 20-001 114 XQ11-949 36-083	626
1	Cylinder	Schlage 20-021 GMK 626	626
1	Electric Strike	Von Duprin 6300- CON 24VAC -630	630
2	Door Pull	Gallery GSH 1180-2 C32D 45	US32D
1	Surface Closer	LCN 4021 REGARM 689 45	689
1	Mounting Bracket	LCN 4020-18G	689
1	Electronic Closer	GYRO-TECH OPERATOR 8710 X HEADER (NO ALTERNATE)	628
2	Kick Plate	CBH CBH 903 200 X 40MM LDW C32D	US32D
2	Overhead Door Stop	Glynn-Johnson 105S US32D	US32D
1	Accessory	Camden CM-160/22 INSTALL ADO HEADER	
2	Accessory	Camden CM-60/4	
2	Accessory	Camden CM-89S	
1	Accessory	Camden CX-33	
1	Threshold	Zero 625A 96	A
1	Weatherstripping	K.N. Crowder W-25-CA X DOOR HEIGHT	CA
2	Gasketing	Zero SWEEP 8192AA 48	AA
2	Miscellaneous Item	Schlage E.S. 679-05HM BY SECURITY CONTRACTOR	BLK
1	Miscellaneous Hardware	UNK CARD READER BY SECURITY CONTRACTOR	
1	Miscellaneous Hardware	LCN WEATHER RING8310-802	PLA

THIS HARDWARE SUPPLIER SECTION 08710 TO SUPPLY AND INSTALL AUTO OPERATOR.

DIV 16 ELECTRICAL CONTRACTOR TO PROVIDE 120VAC TO FRAME HEADER AND SUPPLY & INSTALL ALL LVW IN CONDUIT TO ALL ACTUATORS AND ELECTRICAL COMPONENTS LISTED IN THE HARDWARE SCHEDULE. INTEGRATION OF SECURITY INTERCOM WITH ADO BY DIV 26

Heading #2 (Group: 41 ADO)

Item #2 1 Pair of doors D01B, VEST FROM CORR 100° LHRA/RHRA

1050, 1050 x 2121 x 45 - AL DR x AL FR

6	Standard Hinge	Ives 5BB1HW 5 X 4.5 NRP 652	652
2	Door Pull	Gallery GSH 4012-2 C32D 45	US32D
2	Push Bar	Von Duprin 350-626--	626
1	Surface Closer	LCN 4040XP EDA ST-3068	689
1	Mounting Bracket	LCN 4040XP-18PA 689	689
1	Electronic Closer	GYRO-TECH OPERATOR 8710 X HEADER (NO ALTERNATE)	628
2	Kick Plate	CBH CBH 903 200 X 40MM LDW C32D	US32D
2	Overhead Door Stop	Glynn-Johnson 105S US32D	US32D
1	Accessory	Camden CM-160/22 INSTALL ADO HEADER	
2	Accessory	Camden CM-60/4	
2	Accessory	Camden CM-89S	
1	Miscellaneous Hardware	MISC WIRING / RISER DIAGRAM	

THIS HARDWARE SUPPLIER SECTION 08710 TO SUPPLY AND INSTALL AUTO OPERATOR.

DIV 16 ELECTRICAL CONTRACTOR TO PROVIDE 120VAC TO FRAME HEADER AND SUPPLY & INSTALL ALL LVW IN CONDUIT TO ALL ACTUATORS AND ELECTRICAL COMPONENTS LISTED IN THE HARDWARE SCHEDULE.

Heading #3 (Group: EXTERIOR PR HM)

Item #3 — 1 Pair of doors D02A, EXTERIOR FROM VEST — 100° LHRA/RHRA

967, 967 x 2070 x 45 - HM DR x HM FR

6	Standard Hinge	Ives 5BB1HW 5 X 4.5 NRP 630	630
2	Exit Device	Von Duprin CD-98EO-626- x	626
2	Cylinder	Schlage 20-001 114 XQ11-949 36-083	626
1	Electric Strike	Von Duprin 6300- CON 24VAC -630	630
2	Door Pull	Gallery GSH 1180-2 C32D 45	US32D
2	Surface Closer	LCN 4040XP EDA 689	689
2	Mounting Bracket	LCN 4040XP-18PA 689	689
2	Kick Plate	CBH CBH 903 200 X 40MM LDW C32D	US32D
2	Overhead Door Stop	Glynn-Johnson 104S US32D	US32D
2	Threshold	Zero 625A 48"	A
4	Weatherstripping	K.N. Crowder W-13-CA X OPENING HEIGHT	CA
2	Weatherstripping	K.N. Crowder W-20S-CA X OPENING WIDTH	CA
2	Gasketing	Zero SWEEP 8192AA 48	AA
2	Miscellaneous Item	Schlage E.S. 679-05HM BY SECURITY CONTRACTOR	BLK
1	Miscellaneous Hardware	UNK CARD READER BY SECURITY CONTRACTOR	

Heading #4 (Group: VEST PR)

Item #4 — 1 Pair of doors D02B, VEST FROM CORR — 100° LHRA/RHRA

967, 967 x 2070 x 45 - HM DR x HM FR

6	Standard Hinge	Ives 5BB1HW 5 X 4.5 NRP 652	652
2	Door Pull	Gallery GSH 4012-2 C32D 45	US32D
2	Push Bar	Von Duprin 350-626--	626
2	Surface Closer	LCN 4040XP EDA ST-3068	689
2	Mounting Bracket	LCN 4040XP-18PA 689	689
2	Kick Plate	CBH CBH 903 200 X 40MM LDW C32D	US32D
2	Overhead Door Stop	Glynn-Johnson 104S US32D	US32D

Heading #5 (Group: EXT PR HM RM ADO)

Item #5 1 Pair of doors D03A, EXTERIOR FROM VEST 90° LHRA/RHRA

1050, 1050 x 2180 x 45 - HM DR x HM FR

REM HARDWARE MULLION WITH QUICK ELECTRICAL DISCONNECT.

6	Standard Hinge	Ives 5BB1HW 5 X 4.5 NRP 630	630
1	Removable Mullion	Von Duprin KR4854-BLANK -96 --689- 154	689
1	Exit Device	Von Duprin CD-98-NL-OP -4' 626	626
1	Exit Device	Von Duprin CD-98EO-626- x	626
2	Cylinder	Schlage 20-001 114 XQ11-949 36-083	626
1	Cylinder	Schlage 20-021 GMK 626	626
1	Electric Strike	Von Duprin 6300- CON 24VAC -630	630
2	Door Pull	Gallery GSH 1180-2 C32D 45	US32D
1	Surface Closer	LCN 4021 REGARM 689 45	689
1	Mounting Bracket	LCN 4020-18G	689
1	Electronic Closer	GYRO-TECH OPERATOR 8710 X HEADER (NO ALTERNATE)	628
2	Kick Plate	CBH CBH 903 200 X 40MM LDW C32D	US32D
2	Overhead Door Stop	Glynn-Johnson 105S US32D	US32D
1	Accessory	Camden CM-160/22 INSTALL ADO HEADER	
2	Accessory	Camden CM-60/4	
2	Accessory	Camden CM-89S	
1	Accessory	Camden CX-33	
1	Threshold	Zero 625A 96	A
2	Weatherstripping	K.N. Crowder W-13-CA X OPENING HEIGHT	CA
1	Weatherstripping	K.N. Crowder W-20S-CA X OPENING WIDTH	CA
1	Weatherstripping	K.N. Crowder W-25-CA X DOOR HEIGHT	CA
2	Gasketing	Zero SWEEP 8192AA 48	AA
2	Miscellaneous Item	Schlage E.S. 679-05HM BY SECURITY CONTRACTOR	BLK
1	Miscellaneous Hardware	UNK CARD READER BY SECURITY CONTRACTOR	
1	Miscellaneous Hardware	LCN WEATHER RING8310-802	PLA

THIS HARDWARE SUPPLIER SECTION 08710 TO SUPPLY AND INSTALL AUTO OPERATOR.

DIV 16 ELECTRICAL CONTRACTOR TO PROVIDE 120VAC TO FRAME HEADER AND SUPPLY & INSTALL ALL LVW IN CONDUIT TO ALL ACTUATORS AND ELECTRICAL COMPONENTS LISTED IN THE HARDWARE SCHEDULE. INTEGRATION OF SECURITY INTERCOM WITH ADO BY DIV 26

Heading #6 (Group: 41 ADO)

Item #6 — 1 Pair of doors D03B, VEST FROM CORR — 90° LHRA/RHRA

1050, 1050 x 2180 x 45 - HM DR x HM FR

6	Standard Hinge	Ives 5BB1HW 5 X 4.5 NRP 652	652
2	Door Pull	Gallery GSH 4012-2 C32D 45	US32D
2	Push Bar	Von Duprin 350-626--	626
1	Surface Closer	LCN 4040XP EDA ST-3068	689
1	Mounting Bracket	LCN 4040XP-18PA 689	689
1	Electronic Closer	GYRO-TECH OPERATOR 8710 X HEADER (NO ALTERNATE)	628
2	Kick Plate	CBH CBH 903 200 X 40MM LDW C32D	US32D
2	Overhead Door Stop	Glynn-Johnson 105S US32D	US32D
1	Accessory	Camden CM-160/22 INSTALL ADO HEADER	
2	Accessory	Camden CM-60/4	
2	Accessory	Camden CM-89S	
1	Miscellaneous Hardware	MISC WIRING / RISER DIAGRAM	

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Heading #7 (Group: EXTERIOR SGL EO)

Item #7 — 1 Single door D04, EXTERIOR FROM CLASS RM — 110° LHR

920 x 2190 x 45 - HM DR x HM FR

3	Standard Hinge	Ives 5BB1HW 4.5 X 4.5 NRP 630	630
1	Exit Device	Von Duprin CD-98EO-626-920 x LHR	626
1	Cylinder	Schlage 20-001 114 XQ11-949 36-083	626
1	Door Pull	CBH CBH 353	US32D
1	Surface Closer	LCN 4040XP SCUSH 689 45	689
1	Mounting Bracket	LCN 4040XP-18PA 689	689
1	Kick Plate	CBH CBH 903 200 X 40MM LDW C32D	US32D
2	Weatherstripping	K.N. Crowder W-13-CA X OPENING HEIGHT	CA
1	Weatherstripping	K.N. Crowder W-20S-CA X OPENING WIDTH	CA
1	Weatherstripping	K.N. Crowder W-25-CA X DOOR HEIGHT	CA
1	Gasketing	Zero SWEEP 8192AA 48	AA
1	Miscellaneous Item	Schlage E.S. 679-05HM BY SECURITY CONTRACTOR	BLK

Heading #8 (Group: EXTERIOR SGL EO)

Item #8 — 1 Single door D05, EXTERIOR FROM CLASS RM — 90° RHR

910 x 2083 x 45 - HM DR x HM FR

3	Standard Hinge	Ives 5BB1HW 4.5 X 4.5 NRP 630	630
1	Exit Device	Von Duprin CD-98EO-626-910 x RHR	626
1	Cylinder	Schlage 20-001 114 XQ11-949 36-083	626
1	Door Pull	CBH CBH 353	US32D
1	Surface Closer	LCN 4040XP SCUSH 689 45	689
1	Mounting Bracket	LCN 4040XP-18PA 689	689
1	Kick Plate	CBH CBH 903 200 X 40MM LDW C32D	US32D
2	Weatherstripping	K.N. Crowder W-13-CA X OPENING HEIGHT	CA
1	Weatherstripping	K.N. Crowder W-20S-CA X OPENING WIDTH	CA
1	Weatherstripping	K.N. Crowder W-25-CA X DOOR HEIGHT	CA
1	Gasketing	Zero SWEEP 8192AA 48	AA
1	Miscellaneous Item	Schlage E.S. 679-05HM BY SECURITY CONTRACTOR	BLK

Heading #9 (Group: EXTERIOR SGL EO)

Item #9 — 1 Single door D08, EXTERIOR FROM GYM — 110° LHR

920 x 2130 x 45 - HM DR x HM FR

3	Standard Hinge	Ives 5BB1HW 4.5 X 4.5 NRP 630	630
1	Exit Device	Von Duprin CD-98EO-626-920 x LHR	626
1	Cylinder	Schlage 20-001 114 XQ11-949 36-083	626
1	Door Pull	CBH CBH 353	US32D
1	Surface Closer	LCN 4040XP SCUSH 689 45	689
1	Mounting Bracket	LCN 4040XP-18PA 689	689
1	Kick Plate	CBH CBH 903 200 X 40MM LDW C32D	US32D
2	Weatherstripping	K.N. Crowder W-13-CA X OPENING HEIGHT	CA
1	Weatherstripping	K.N. Crowder W-20S-CA X OPENING WIDTH	CA
1	Weatherstripping	K.N. Crowder W-25-CA X DOOR HEIGHT	CA
1	Gasketing	Zero SWEEP 8192AA 48	AA
1	Miscellaneous Item	Schlage E.S. 679-05HM BY SECURITY CONTRACTOR	BLK

Heading #10 (Group: EXTERIOR SGL EO)

Item #10 — 1 Single door D09, EXTERIOR FROM GYM — 110° RHR

916 x 2130 x 45 - HM DR x HM FR

3	Standard Hinge	Ives 5BB1HW 4.5 X 4.5 NRP 630	630
1	Exit Device	Von Duprin CD-98EO-626-916 x RHR	626
1	Cylinder	Schlage 20-001 114 XQ11-949 36-083	626
1	Door Pull	CBH CBH 353	US32D
1	Surface Closer	LCN 4040XP SCUSH 689 45	689
1	Mounting Bracket	LCN 4040XP-18PA 689	689
1	Kick Plate	CBH CBH 903 200 X 40MM LDW C32D	US32D
2	Weatherstripping	K.N. Crowder W-13-CA X OPENING HEIGHT	CA
1	Weatherstripping	K.N. Crowder W-20S-CA X OPENING WIDTH	CA
1	Weatherstripping	K.N. Crowder W-25-CA X DOOR HEIGHT	CA
1	Gasketing	Zero SWEEP 8192AA 48	AA
1	Miscellaneous Item	Schlage E.S. 679-05HM BY SECURITY CONTRACTOR	BLK

Heading #11 (Group: EXTERIOR SGL NL)

Item #11 — 1 Single door D10, EXTERIOR FROM STORAGE — 110° RHR

916 x 2130 x 45 - HM DR x HM FR

3	Standard Hinge	Ives 5BB1HW 4.5 X 4.5 NRP 630	630
1	Exit Device	Von Duprin CD-98-NL-OP -4' 626	626
1	Cylinder	Schlage 20-001 114 XQ11-949 36-083	626
1	Cylinder	Schlage 20-021 GMK 626	626
1	Door Pull	CBH CBH 353	US32D
1	Surface Closer	LCN 4040XP SCUSH 689 45	689
1	Mounting Bracket	LCN 4040XP-18PA 689	689
1	Kick Plate	CBH CBH 903 200 X 40MM LDW C32D	US32D
2	Weatherstripping	K.N. Crowder W-13-CA X OPENING HEIGHT	CA
1	Weatherstripping	K.N. Crowder W-20S-CA X OPENING WIDTH	CA
1	Weatherstripping	K.N. Crowder W-25-CA X DOOR HEIGHT	CA
1	Gasketing	Zero SWEEP 8192AA 48	AA
1	Miscellaneous Item	Schlage E.S. 679-05HM BY SECURITY CONTRACTOR	BLK

Heading #12 (Group: EXT PR ALUM RM ADO)

Item #12 1 Pair of doors D11A, EXTERIOR FROM VEST 100° LHRA/RHRA

1050, 1050 x 2170 x 45 - AL DR x AL FR

REM HARDWARE MULLION WITH QUICK ELECTRICAL DISCONNECT.

1		UNK WEATHER STRIPPING BY DOOR AND FRAME SUPPLIER	
6	Standard Hinge	Ives 5BB1HW 5 X 4.5 NRP 630	630
1	Removable Mullion	Von Duprin KR4854-BLANK -96 --689- 154	689
1	Exit Device	Von Duprin CD-33A-EO-4'-626- 45-- INS-2	626
1	Exit Device	Von Duprin CD-33A-NL-OP-4' -626- 45--388/626- INS-2	626/626
2	Cylinder	Schlage 20-001 114 XQ11-949 36-083	626
1	Cylinder	Schlage 20-021 GMK 626	626
1	Electric Strike	Von Duprin 6300- CON 24VAC -630	630
2	Door Pull	Gallery GSH 1180-2 C32D 45	US32D
1	Surface Closer	LCN 4021 REGARM 689 45	689
1	Mounting Bracket	LCN 4020-18G	689
1	Electronic Closer	GYRO-TECH OPERATOR 8710 X HEADER (NO ALTERNATE)	628
2	Kick Plate	CBH CBH 903 200 X 40MM LDW C32D	US32D
2	Overhead Door Stop	Glynn-Johnson 105S US32D	US32D
1	Accessory	Camden CM-160/22 INSTALL ADO HEADER	
2	Accessory	Camden CM-60/4	
2	Accessory	Camden CM-89S	
1	Accessory	Camden CX-33	
1	Threshold	Zero 625A 96	A
1	Weatherstripping	K.N. Crowder W-25-CA X DOOR HEIGHT	CA
2	Gasketing	Zero SWEEP 8192AA 48	AA
2	Miscellaneous Item	Schlage E.S. 679-05HM BY SECURITY CONTRACTOR	BLK
1	Miscellaneous Hardware	UNK CARD READER BY SECURITY CONTRACTOR	
1	Miscellaneous Hardware	LCN WEATHER RING8310-802	PLA

THIS HARDWARE SUPPLIER SECTION 08710 TO SUPPLY AND INSTALL AUTO OPERATOR.

DIV 16 ELECTRICAL CONTRACTOR TO PROVIDE 120VAC TO FRAME HEADER AND SUPPLY & INSTALL ALL LVW IN CONDUIT TO ALL ACTUATORS AND ELECTRICAL COMPONENTS LISTED IN THE HARDWARE SCHEDULE. INTEGRATION OF SECURITY INTERCOM WITH ADO BY DIV 26

Heading #13 (Group: 41 ADO)

Item #13 — 1 Pair of doors D11B, VEST FROM CORR — 100° LHRA/RHRA

1050, 1050 x 2170 x 45 - AL DR x AL FR

6	Standard Hinge	Ives 5BB1HW 5 X 4.5 NRP 652	652
2	Door Pull	Gallery GSH 4012-2 C32D 45	US32D
2	Push Bar	Von Duprin 350-626--	626
1	Surface Closer	LCN 4040XP EDA ST-3068	689
1	Mounting Bracket	LCN 4040XP-18PA 689	689
1	Electronic Closer	GYRO-TECH OPERATOR 8710 X HEADER (NO ALTERNATE)	628
2	Kick Plate	CBH CBH 903 200 X 40MM LDW C32D	US32D
2	Overhead Door Stop	Glynn-Johnson 105S US32D	US32D
1	Accessory	Camden CM-160/22 INSTALL ADO HEADER	
2	Accessory	Camden CM-60/4	
2	Accessory	Camden CM-89S	
1	Miscellaneous Hardware	MISC WIRING / RISER DIAGRAM	

THIS HARDWARE SUPPLIER SECTION 08710 TO SUPPLY AND INSTALL AUTO OPERATOR.

DIV 16 ELECTRICAL CONTRACTOR TO PROVIDE 120VAC TO FRAME HEADER AND SUPPLY & INSTALL ALL LVW IN CONDUIT TO ALL ACTUATORS AND ELECTRICAL COMPONENTS LISTED IN THE HARDWARE SCHEDULE.

Heading #14 (Group: EXTERIOR SGL EO)

Item #14 — 1 Single door D12, EXTERIOR FROM LIBRARY — 110° LHR

1110 x 2158 x 45 - HM DR x HM FR

3	Standard Hinge	Ives 5BB1HW 4.5 X 4.5 NRP 630	630
1	Exit Device	Von Duprin CD-98EO-626-1110 x LHR	626
1	Cylinder	Schlage 20-001 114 XQ11-949 36-083	626
1	Door Pull	CBH CBH 353	US32D
1	Surface Closer	LCN 4040XP SCUSH 689 45	689
1	Mounting Bracket	LCN 4040XP-18PA 689	689
1	Kick Plate	CBH CBH 903 200 X 40MM LDW C32D	US32D
2	Weatherstripping	K.N. Crowder W-13-CA X OPENING HEIGHT	CA
1	Weatherstripping	K.N. Crowder W-20S-CA X OPENING WIDTH	CA
1	Weatherstripping	K.N. Crowder W-25-CA X DOOR HEIGHT	CA
1	Gasketing	Zero SWEEP 8192AA 48	AA
1	Miscellaneous Item	Schlage E.S. 679-05HM BY SECURITY CONTRACTOR	BLK

Heading #15 (Group: WR ADO)

Item #15 — 1 Single door D17, CORR TO UNIV WR — 90° LH

965 x 2100 x 45 - HM DR x HM FR

INSTALL WR SET UP AS FAIL SAFE .

3	Standard Hinge	Ives 5BB1HW 5 X 4.5 NRP 630	630
1	Lockset	Schlage ND80P6D RHO 626 MK	626
1	Electric Strike	Von Duprin 6211- FS Shim 24VDC-630	630
1	Electronic Closer	GYRO-TECH OPERATOR 8710 PULL SIDE X HEADER(NO	628
2	Kick Plate	CBH CBH 903 400 X 40MM LDW C32D MTD BOTH SIDES	US32D
1	Wall Door Stop	Ives WS401/402CVX	626
1	Accessory	Camden CM-160/22 INSTALL ADO HEADER	
1	Accessory	Camden CX-WC13AXSM-PS	
1	Accessory	Camden EMERG WR KIT CX-WEC10K2	
1	Miscellaneous Hardware	Schlage CON-6W	
1	Miscellaneous Hardware	MISC WIRING / RISER DIAGRAM	

THIS HARDWARE SUPPLIER SECTION 08710 TO SUPPLY AND INSTALL AUTO OPERATOR.

DIV 16 ELECTRICAL CONTRACTOR TO PROVIDE 120VAC TO FRAME HEADER AND SUPPLY & INSTALL ALL LVW IN CONDUIT TO ALL ACTUATORS AND ELECTRICAL COMPONENTS LISTED IN THE HARDWARE SCHEDULE. REFER TO WIRING /RISER DIAGRAM SUPPLIED BY HARDWARE SUPPLIER.

CX-33: ADVANCED LOGIC RELAY

CX-33 is a 'state of the art' door controller designed for 'universal' operation in virtually any automatic door application. This compact unit is small enough to fit inside most door operator cases. It provides a large 3 segment LED and simple push buttons for the easiest programming, and supports illuminated signage in restroom applications. It also leads the market with a range of exclusive operating features, including time duration in airlock applications and protection of automatic door operators when utilizing magnetic locks.

Features

- 15 operating modes with sub-modes
- Easily sequence multiple inputs with multiple maintain and hold outputs
- New V3.2 Features Include:
  - Lock Down Mode
  - Delayed Relay Activation
  - Selectable N.O or N.C. Inputs
- Large 3 segment (blue) LED display
- Outstanding power filtering and surge protection
- Selectable time delays with delay on input activation
- Larger terminal strips
- 12V to 24V AC/DC
- 3 year warranty

MODEL	
CX-33	Advanced Logic Relay

Specifications

Voltage:	12V to 24V AC/DC
Current Draw:	105mA Typical, 320mA Max
Response Time:	0.5 Seconds
Display:	Blue Multi-Segment LED
Input:	4 x Dry 1 x Wet: min. 5V AC/DC N/O or N/C Selectable
Output:	3 x Form C (SPDT)
Contact Rating:	3A @ 30 VDC
Temp Range:	-22°F to +185°F (-30°C to +85°C)
Time Delay:	Hold 1 timer: 0-50 Seconds Delay 1 Timer: 0-15 Seconds Hold 2 timer: 0-50 Seconds Delay 2 timer: 0-60 Seconds Hold 3 Timer: 0-50 Seconds Delay on Activate: 0-10 Seconds
Dimensions:	2"H x 6"W x 7/8"D (51mm x 152mm x 22mm)

CX-33PS: ADVANCED LOGIC RELAY, POWER SUPPLY AND CABINET

*The industry leading **CX-33** Advanced Logic Relay is available in a metal cabinet that centralizes all door control system components; a 12/24 VDC power supply module, and color coded termination blocks for quick and easy installation.*

Features

- Rugged and compact metal cabinet
- Pre-wired with large terminal block for easy access
- Removable door with option for cabinet lock
- Five convenient conduit knockouts; one per side
- 12/24V DC power supply, 2 Amp. (UL listed)
- Available as part of Camden Restroom Control Kits (See pages 34-37).
- Short circuit and thermal overload protection
- 3 year warranty

MODEL	
CX-33PS	Advanced Logic Relay, 2 Amp, Power Supply Cabinet and Transformer
Option	
'L'	Add suffix '**L**' to model number for Cabinet Lock

Specifications

Voltage:	16V to 28V AC/DC
Output:	12V or 24 VDC
Current:	2 Amps
Temp Range:	32°F to +120°F (0°C to +49°C)
Dimensions:	11-1/16" H x 7-7/8"W x 2-13/16"D 281mm x 200mm x 72mm)

CX-WC: BARRIER FREE RESTROOM CONTROL KITS

Listed Components
Compliant

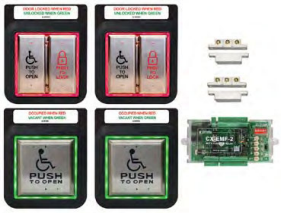
MODELS	
CX-WC13AXFM	**FLUSH MOUNT COMBO ILLUMINATED PUSH PLATE SYSTEM** (1) **CX-33** Advanced Logic Relay (1) **CM-2520/4854SE1** Combo switch, 2" x 4" narrow 'PUSH TO OPEN' & 'PUSH TO LOCK', Flush mount AURA™ illuminated enclosure and sign (1) **CM-45/454SE1** 4-1/2" Square (concealed screws) push plate, with sounder, illuminated RED/GREEN/BLUE flush mount CM-55i box; Double sided. 'DOOR LOCKED WHEN 'RED' / 'UNLOCKED WHEN GREEN' AND 'OCCUPIED WHEN RED' / 'VACANT WHEN GREEN'; 'WHEELCHAIR' symbol and 'PUSH TO OPEN', blue (1) **CX-MDA** Magnetic contact, surface, SPST, white Add suffix 'F' for French and 'FE' for bilingual
CX-WC13AXSM-PS	**SURFACE MOUNT COMBO ILLUMINATED PUSH PLATE SYSTEM** (1) **CX-33PS** Advanced Logic Relay, 2 Amp Power Supply, Cabinet and Transformer (1) **CM-2520/4854SE1** Combo switch, 2" x 4" narrow 'PUSH TO OPEN' & 'PUSH TO LOCK', Surface mount AURA™ illuminated enclosure and sign (1) **CM-45/454SE1** 4-1/2" Push plate switch, wheelchair & 'PUSH TO OPEN' with Surface mount AURA™ illuminated enclosure and sign (1) **CX-ED2079** Grade 2 ANSI electric strike with 3 faceplates (1) **CX-MDA** Magnetic contact, surface, SPST, white Add suffix 'F' for French and 'FE' for bilingual
CX-WC13AXFM-PS	**FLUSH MOUNT COMBO ILLUMINATED PUSH PLATE SYSTEM** (1) **CX-33PS** Advanced Logic Relay, 2 Amp Power Supply, Cabinet and Transformer (1) **CM-2520/4855SE1** Combo switch, 2" x 4" narrow 'PUSH TO OPEN' & 'PUSH TO LOCK', Flush mount AURA™ illuminated enclosure and sign (1) **CM-45/455SE1** 4-1/2" Push plate switch, wheelchair & 'PUSH TO OPEN' with Flush mount AURA™ illuminated enclosure and sign (1) **CX-ED2079** Grade 2 ANSI electric strike with 3 faceplates (1) **CX-MDA** Magnetic contact, surface, SPST, white Add suffix 'F' for French and 'FE' for bilingual
CX-WC14AXSM	**SURFACE MOUNT TWO DOOR RESTROOM SYSTEM** (1) **CX-EMF2** Multi-Function Relay Controller (2) **CM-2520/4854SE1** Combo switch, 2" x 4" narrow 'PUSH TO OPEN' & 'PUSH TO LOCK', Surface mount AURA™ illuminated enclosure and sign (2) **CM-45/454SE1** 4-1/2" Push plate switch, wheelchair & 'PUSH TO OPEN' with Surface mount AURA™ illuminated enclosure and signs (2) **CX-MDA** Magnetic contact, surface, SPST, white Add suffix 'F' for French and 'FE' for bilingual
CX-WC14AXFM	**FLUSH MOUNT TWO DOOR RESTROOM SYSTEM** (1) **CX-EMF2** Multi-Function Relay Controller (2) **CM-2520/4854SE1** Combo switch, 2" x 4" narrow 'PUSH TO OPEN' & 'PUSH TO LOCK', Flush mount AURA™ illuminated enclosure and sign (2) **CM-45/454SE1** 4-1/2" Push plate switch, wheelchair & 'PUSH TO OPEN' with Flush mount AURA™ illuminated enclosure and signs (2) **CX-MDA** Magnetic contact, surface, SPST, white Add suffix 'F' for French and 'FE' for bilingual

CX-WC13AXFM

CX-WC13AXSM-PS


CX-WC13AXFM-PS

CX-WC14AXSM



CX-WC14AXFM

CDH
Commercial Doors & Hardware Ltd.
2150 Winston Park Drive, Unit 16
Oakville, L6H 5V1

KILBRIDE P.S. Reno 2025 HDSB
6611 PANTON ST KILBRIDE , ON.

Submittal Date: APRIL 4/25 ,NOV 25/25, DEC 2/25, JAN 16/26

CX-WC: BARRIER FREE RESTROOM CONTROL KITS

MODELS	
CX-WC17	**COLUMN™ SWITCH RESTROOM SYSTEM KIT** (2) **CM-7536/4** 'Push to Open' Switches (1) **CM-7536/8B** 'Push to Lock' (Red) Switch (2) **CM-AF503** LED Annunciators (with 'Occupied' and 'Locked' Message Labels) (1) **CX-33** Controller (1) **CX-MDA** Surface Magnetic Contacts Add suffix 'F' for French and 'FE' for bilingual
CX-WC17VR-PS	**COLUMN™ SWITCH RESTROOM SYSTEM KIT WITH POWER SUPPLY & HANDS-FREE SENSORS** (2) **CM-7536VR/4** 'Push to Open' Column™ Switches and Signs (1) **CM-7536VR/8B** 'Push to Lock' (Red) Column™ Switch and Sign (1) **CX-33PS** Controller and Power Supply Cabinet (1) **CX-ED2079** Grade 2 Electric Strike (1) **CX-MDA** Surface Magnetic Contacts Add suffix 'F' for French and 'FE' for bilingual

CX-WC17

CX-WC17VR-PS

CX-WEC SERIES: EMERGENCY CALL SYSTEMS FOR UNIVERSAL RESTROOMS

Listed Components

ADA Compliant

***CX-WEC Series** are equipment packages designed to meet the latest building code requirements for universal restrooms. Emergency Call Systems may be installed in restrooms without an automatic door operator, or with Camden CX-WC Series barrier-free restroom kits (with operator).*

Specifications

Current Draw: CX-WEC Series: 165mA

MODELS	
CX-WEC10	**UNIVERSAL EMERGENCY CALL KIT** (1) **CM-450R/12** Mushroom Push button, single gang, stainless steel faceplate, push/pull, 'PRESS FOR EMERGENCY ASSISTANCE' (1) **CM-AF501SO** Single gang LED annunciator with adjustable sounder 'ASSISTANCE REQUESTED' (1) **CM-AF141SO** Single Gang LED Dome Light with sounder (1) **CM-SE21A** English, solid white sign, 'IN THE EVENT OF AN EMERGENCY PUSH EMERGENCY BUTTON AND AUDIBLE AND VISUAL SIGNAL WILL ACTIVATE'; For use without automatic door operator, or with CX-WC 10, 11, 12, 13 & 14 barrier-free restroom control kit. Add suffix 'F' for French and 'FE' for bilingual
CX-WEC10K2	**UNIVERSAL EMERGENCY CALL SYSTEM KIT, WITH WHITE DOME LIGHT** (1) **CM-AF540SO** Double gang, push/pull mushroom push button, red, 'Assistance Required', with LED annunciator & adjustable sounder, 'Assistance Requested' (1) **CM-AF141SO** Single Gang LED Dome Light with sounder (1) **CM-SE21A** English, solid white sign, 'IN THE EVENT OF AN EMERGENCY PUSH EMERGENCY BUTTON AND AUDIBLE AND VISUAL SIGNAL WILL ACTIVATE' Add suffix 'F' for French and 'FE' for bilingual

CX-WEC10

CX-WEC10K2

WWW.CAMDENCONTROLS.COM

KINETIC BY CAMDEN VERSIONS AVAILABLE

CM-40, CM-41 & CM-60 SERIES: ROUND PUSH PLATE SWITCHES

UL Listed Components ADA Compliant

CM-40, CM-41 and CM-60 Series 'All-Active' push plate switches are heavy-duty, ADA-compliant door controls. Faceplates are stainless steel or solid brass, and the assembly is designed for easy installation. The CM-41 4-1/2" square stainless steel backplate is large enough to cover a poorly installed electrical box. Also fits Camden 4-1/2" square surface boxes.


CM-40/2

CM-41/3

CM-60/4

Features

- Durable stainless steel or brass construction
- 4 stud switch design and rubber dampers for quieter operation
- All-Active design requires minimal actuation force
- Weather resistant boot included
- Large variety of graphics options
- Available in a range of architectural finishes
- 3 year 'Camden Tough' warranty with '2 for 1' replacement

Specifications

Voltage:	12/24V AC/DC
Contact Rating:	15A @ 30 VDC
Contact Type:	SPDT Form 'C'
Mounting:	**CM-40/41:** Single Gang **CM-60:** Single/Double Gang or 4 x 4
Switch Type:	Momentary
Std. Finish:	US32 / 630
Dimensions:	**CM-40:** 4-1/2" Diameter x 1-3/4"D (114mm x 44mm) **CM-41:** 4-1/2"H x 4-1/2"W x 1-3/4"D (114mm x 114mm x 44mm) **CM-60:** 6" Diameter x 1-1/8"D (152mm x 28.6mm)

ROUND SWITCHES

CM-40	4-1/2" Round push plate switch, brushed stainless steel finish
CM-41	4-1/2" Round push plate switch, with square back plate, brushed stainless steel finish
CM-60	6" Round push plate switch, brushed stainless steel finish

NO-BATTERY KINETIC BY CAMDEN™ WIRELESS ROUND SWITCHES with built-in transmitter. Receiver required.

CM-40K	4-1/2" Round push plate switch, brushed stainless steel finish
CM-41K	4-1/2" Round push plate switch, with square back plate, brushed stainless steel finish
CM-60K	6" Round push plate switch, brushed stainless steel finish

OPTIONS (Add suffix to model above)

Faceplate Graphic Options


CM-xx/1


CM-xx/2


CM-xx/A2


CM-xx/2AL


CM-xx/2AR

CM-xx/3

CM-xx/3F

CM-xx/4

CM-xx/A4

CM-xx/4AL

CM-xx/4AR

CM-xx/4F

CM-xx/8

CM-xx/8B

CM-xx/8F

CM-xx/8D

Architectural Finishes		Water Tight Option	Contact Option
CM-xxx-AB Antique Brass	CM-xxx-OB Oil Rub Bronze	CM-xxx-WT Boot & watertight coating	CM-xxx-DP DPDT switch instead of SPDT
CM-xxx-SB Satin Brass	CM-xxx-PB Polished Brass		

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CDH
Commercial Doors & Hardware Ltd.
2150 Winston Park Drive, Unit 16
Oakville, L6H 5V1

KILBRIDE P.S. Reno 2025 HDSB
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CM-49, 79, 59S AND 89S: SURFACE AND FLUSH MOUNT ESCUTCHEONS (FOR ROUND PUSH PLATE SWITCHES)

*Camden offers a range of **flame and vandal resistant** low profile escutcheons for mounting 4-1/2" and 6" round push plate switches. ABS escutcheons feature a patented 2-piece design and may be ordered as complete 'kits' or individual parts. Stainless steel escutcheons feature one piece heavy gauge construction.*

Features	
• Exclusive 2 piece ABS escutcheons can be surface mounted or mounted on in-wall single gang, double gang or 4" square electrical boxes	• Heavy gauge stainless steel escutcheons provide an attractive, rugged look • ABS models are designed for use with Lazerpoint RF™ 915 Mhz. wireless wall switch transmitters

FOR 4-1/2" ROUND SWITCH - STAINLESS STEEL ESCUTCHEON	
CM-59S	Surface, Round, Standard Depth. Heavy gauge stainless steel, 7-3/4" x 1-1/18"D
FOR 4-1/2" ROUND SWITCH - ABS SPACESHIP ESCUTCHEON	
CM-49	Surface/Flush Mount Kit, includes **CM-49A, CM- 49B, CM-49C & CM-49G,** 8-3/4" x 2"D
CM-49A	Flush enclosure only (fits single gang box), 7" x 13/16"D
CM-49AK	Flush Mount Kit, includes **CM-49A, CM-49C & CM-49G,** (fits single, double and 4 x 4 boxes), 7" x 13/16"D
CM-49B	Surface mount enclosure only (must be used with **CM-49A**), 8-3/4" x 1"D
CM-49C	Adapter plate for mounting on double gang or 4" Square box, 4" x 1/16"D
CM-49G	Gasket for **CM-49A** OR **CM-49B**, 6-1/4" x 1/8"D
FOR 6" ROUND SWITCH - STAINLESS STEEL ESCUTCHEON	
CM-89S	Surface, round standard depth. Heavy gauge stainless steel, 9-5/8" x 1-1/2"D
FOR 6" ROUND SWITCH - ABS SPACESHIP ESCUTCHEON	
CM-79	Surface/Flush Mount Kit, includes **CM-79A, CM-79B, CM-49C & CM-79G,** 9-5/8" x 2"D
CM-79A	Flush enclosure only (fits single gang box), 8" x 3/4"D
CM-79AK	Flush Mount Kit, includes **CM-79A, CM-49C & CM-79G,** (fits single, double and 4 x 4 boxes), 8" x 3/4"D
CM-79B	Surface mount enclosure only (must be used with **CM-79A**), 9-5/8" x 1-1/8"D
CM-79G	Gasket for **CM-79A or CM-79B**, 7-1/4" x 1/8"D

CM-59S

CM-49A *CM-49B*
(Shown with TX-9 Transmitter)

CM-89S

CM-79A *CM-79B*
(Shown with TX-9 Transmitter)

CDH
Commercial Doors & Hardware Ltd.
2150 Winston Park Drive, Unit 16
Oakville, L6H 5V1

KILBRIDE P.S. Reno 2025 HDSB
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CM-160 / 170 / 180 SERIES: KEY SWITCHES

Key switches *for automatic doors are designed for mounting on the door operator cabinet or door frame, and are available in a range of 2 or 3 position momentary or maintained models. The key cylinder and 2 keys are included.*

Features

- Black lamacoid (plastic) or stainless steel faceplates
- Key removable in all maintained positions
- 2, 3, 4 position maintained and 2 position momentary models
- All switches are keyed alike

MODELS

CM-160	Key switch with plastic lamacoid (mini) faceplate
CM-170	Key switch with stainless steel (narrow stile) faceplate
CM-180	Key switch with stainless steel (single gang) faceplate

OPTIONS (Add suffix to model above)

Faceplate Graphics

MOMENTARY	MAINTAINED	MAINTAINED	MAINTAINED	MAINTAINED
OFF / OPEN	OFF / AUTO	AUTO / OFF / HOLD OPEN	DAY / OFF / NIGHT	EXIT / AUTO / OFF / HOLD OPEN
CX-xx/20	*CX-xx/21*	*CX-xx/22*	*CX-xx/23*	*CX-xx/24*

Extra Keys

CM-A126	(2) Extra keys for CM-160, 170 and 180 series key switches

Listed Components

CM-160/23

CM-170/21

CM-180/23

Specifications

Voltage:	12/24 VDC
Contact Rating:	4A @ 28 VDC
Switch Life:	100,000 cycles
Dimensions:	**CM-160:** 3"H x 1-11/16"W x 1-3/8"D (76mm x 42mm x 35mm) **CM-170:** 4-1/2"H x 1-3/4"W x 1-3/8"D (114mm x 44mm x 35mm) **CM-180:** 4-1/2"H x 2-3/4" W x 1-3/8" D (114mm x 70mm x 35mm)

CM-190 SERIES: TOGGLE SWITCH

CM-190 Series *maintained toggle switches are designed to control automatic door operators, featuring a choice of faceplates, for mounting on the operator cabinet/wall.*

Features

- Mini metal faceplate designed to install on door operator cabinet or door frame
- 2 or 3 position maintained operation
- Single gang faceplate for mounting on standard electrical box
- Heavy duty 6 Amp. contacts

MODELS

CM-190	Mini aluminum faceplate
CM-195	Single gang stainless steel faceplate

OPTIONS (Add suffix to model above)

Faceplate Graphics

ON / OFF	*CX-xx/30*
AUTOMATIC / OFF / OFF / HOLD OPEN	*CX-xx/31*

Listed Components

CM-190/30

CM-195/31

Specifications

Voltage:	12/24 VDC
Contact Rating:	6A @ 30 VDC
Switch Life:	50,000 cycles
Temp Range:	-4°F - 185°F (-20°C - 85°C)
Dimensions:	**CM-190:** 2-5/8" H x 1-1/2" W x 2"D (59mm x 38mm x 51mm) **CM-195:** 4-1/2" H x 2-3/4" W x 2"D (114mm x 70mm x 51mm)

CANADIAN BUILDERS HARDWARE
MANUFACTURING INC.

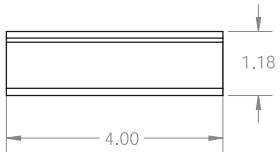
71 Sheffield Street
Toronto, Ontario
M6M 3E9
Canada
Tel: 416-243-1166
Fax: 416-243-3352
Email: info@cbhmfg.com
Web: www.cbhmfg.com

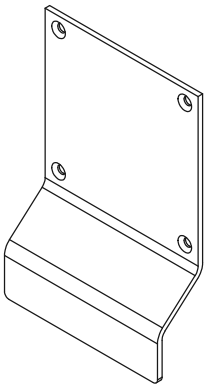
All dimensions are in inches. Product specifications are subject to change. For the most updated product features, contact our customer service department.

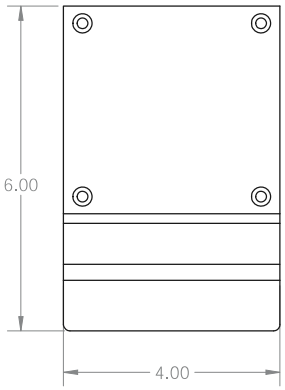
CBH 353

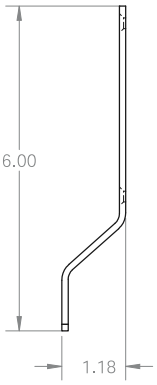
MATERIAL:
BRASS, BRONZE AND STAINLESS STEEL (.125")

FINISHES: ALL STANDARD









Quality Craftsmanship Since 1978.

CANADIAN BUILDERS HARDWARE
MANUFACTURING INC.

71 Sheffield Street
Toronto, Ontario
M6M 3E9
Canada
Tel: 416-243-1166
Fax: 416-243-3352
Email: info@cbhmfg.com
Web: www.cbhmfg.com

All dimensions are in inches. Product specifications are subject to change. For the most updated product features, contact our customer service department.

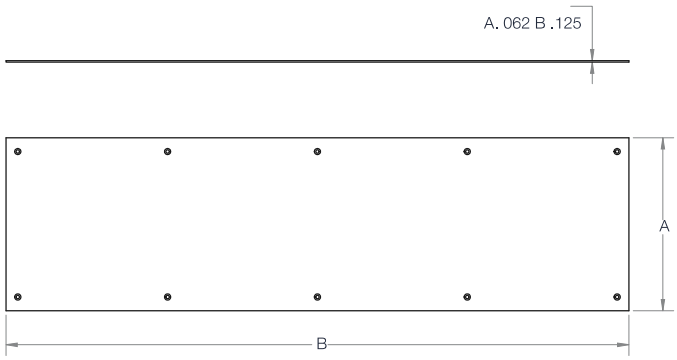
CBH 900/901/902/903

MATERIAL: ALUMINUM, BRASS, BRONZE AND STAINLESS STEEL

FINISHES: ALL STANDARD

SKUS:
CBH 900-ALUMINUM KICKPLATE
CBH 901-BRASS KICKPLATE
CBH 902-BRONZE KICKPLATE
CBH 903-STAINLESS STEEL KICKPLATE

.050 GAUGE PLATES WILL BE SUPPLIED STANDARD.
FOR THICKER GAUGE PLATES USE SUFFIX



CBH 900-ALUMINUM
CBH 901-BRASS
CBH 902-BRONZE
CBH 903-STAINLESS STEEL

KICKPLATE

All kickplates are drilled, countersunk and supplied standard with #6 x 5/8 oval head socket wood screws. Machine screws or tape fastening is available upon request.

Kickplates available with bevelled edges at extra cost. All tape Kickplates are bevelled edge.

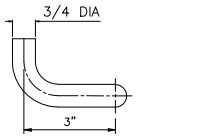
Quality Craftsmanship Since 1978.

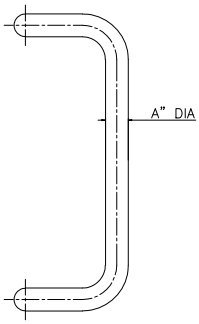
GSH 1180 - (1, 2, 3 OR 4) 12" C/C

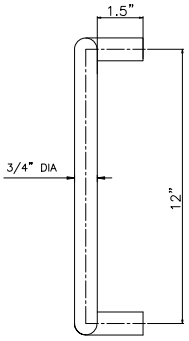
Gallery™
specialty hardware ltd.

GallerySpecialty.com
1.800.267.1236

- Wrought Brass, Bronze, Aluminum and Stainless Steel
- Fasteners for 1 3/4" Door provided
- C3, C4, C9, C10, C10B, C14, C15, C26, C26D, C28 and C32D
- 1=3/4" DIA
- 2=1" DIA
- 3=1-1/4" DIA
- 4=1-1/2" DIA







676 Petrolia Road, Toronto, ON, Canada M3J 2V2
Tel: 416.667.9593 Fax: 416.667.0806
Email: info@galleryspecialty.com

GSH 4007 7"-4009 9"-4012 12" (1, 2, 3 OR 4)

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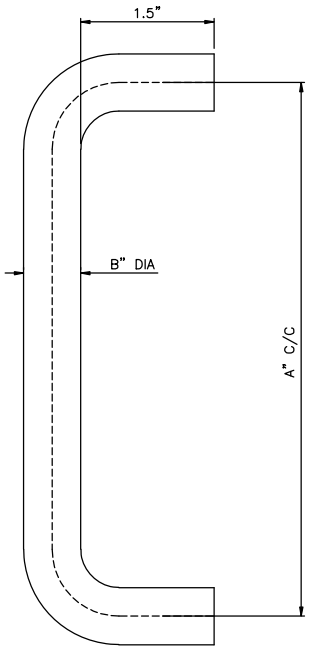

- Wrought Brass, Bronze, Aluminum and Stainless Steel
- Fasteners for 1 3/4" Door provided
- C3, C4, C9, C10, C10B, C14, C15, C26, C26D, C28 and C32D
- 1=3/4" DIA
- 2=1" DIA
- 3=1-1/4" DIA
- 4=1-1/2" DIA

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Tel: 416.667.9593 Fax: 416.667.0806
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100 Series concealed overhead door holders/stops

100 Series heavy-duty

Glynn-Johnson offers a complete line of overhead door holders and stops, accommodating virtually all openings with solutions for even the most complex door control problems. These concealed holders and stops provide the most attractive and reliable heavy-duty door control available.

Glynn-Johnson 100 Series holders and stops provide the most reliable and versatile concealed overhead door control. They are designed for installation on virtually all types of doors mounted on conventional type butt hinges, pivots, continuous hinges, swing clear hinges and numerous other specialty hinges. When used in conjunction with many surface-applied door closers, 100 Series holders and stops provide the most effective control for entrance doors and vestibule doors of all types, as well as heavy or often used interior doors. Templates provided allow for variable mounting positions, ranging from 85° - 110° of opening.

Five models:

- 100H Series hold-open model
- 100HP Series internal hold-open model
- 100F Series friction hold-open model
- 100S Series stop-only model
- 100SE Series special stop-only model

Six sizes:

- Each model comes in six sizes.
- Simple
- Standardized

Three options:

- ADJ—Adjustable jamb bracket
- CJ—Jamb Bracket for use with LCN 5030 closer
- SOC—Pin-in-socket security screw package

Unmatched convenience:

- Non-handed
- Improved compatibility with door closers
- Single/double-acting doors
- Interior/exterior applications
- Reduced door prep
- Durable
- Improved corrosion resistance
- Function conversion kits are available

Materials and finishes

In heavy gauge brass or 300 Series stainless steel, these models offer the broadest range of finishes in the industry, complementing any design and offering the highest resistance to corrosion. Available in the following finishes:

BHMA	US	Finish description
605	US3	Polished Brass
606	US4	Satin Brass
612	US10	Satin Bronze
613	US10B	Oil Rubbed Bronze
619	US15	Satin Nickel
625	US26	Polished Chrome
626	US26D	Satin Chrome
629	US32	Bright Stainless Steel
630	US32D	Stainless Steel
643E/716	–	Aged Bronze, Blackened, Edge Relieved
706	SP4	Powder Coat Brass
691	SP10	Powder Coat Bronze
689	SP28	Powder Coat Aluminum
695	SP313	Powder Coat Dark Bronze
622	SPBLK	Powder Coat Black

Models

These models provide a wide range of optional features, and are ideal for use on entrance and vestibule doors, large doors, doors opened frequently, or doors subject to abuse. These models are also furnished with an offset-style jamb bracket.

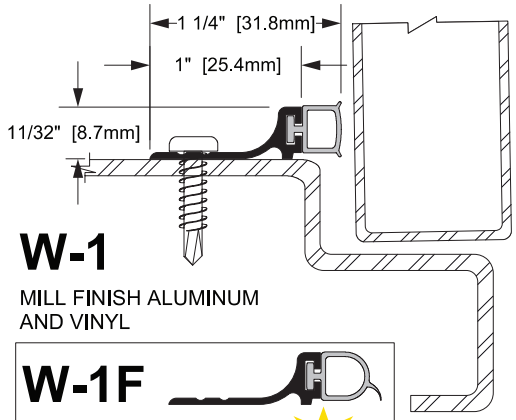
Designed for heavy-duty applications, 100 Series models will provide long-lasting protection to doors, frames, hinges, related hardware and surrounding walls or obstructions.

100H Series hold-open

(Suffix H) The hold-open function should be used where it is desired to hold a door open at a predetermined position for short or long periods of time, permitting an unobstructed traffic flow through the opening.

These models are both selective and adjustable, featuring the most reliable hold-open mechanism available. They feature a control knob which protrudes from the face of the door and turns the hold-open function on or off. Set in the inactive position, the unit acts as a stop and shock absorber. The tension on the hold-open mechanism can be adjusted using an Allen wrench to offset air currents or other exterior conditions. The hold-open tension adjustment is located in the bottom of the track in the top of the door.

WEATHERSTRIP



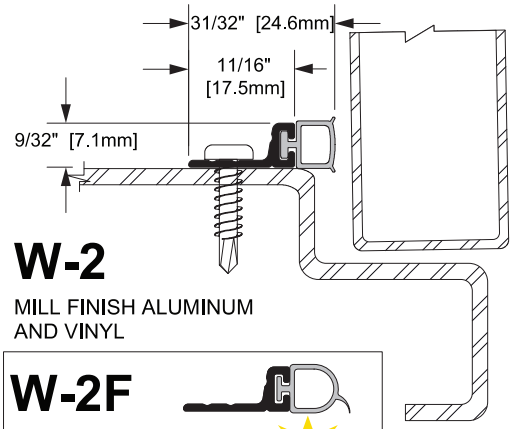
W-1

MILL FINISH ALUMINUM
AND VINYL

W-1F

MILL FINISH ALUMINUM
AND VINYL

NEW



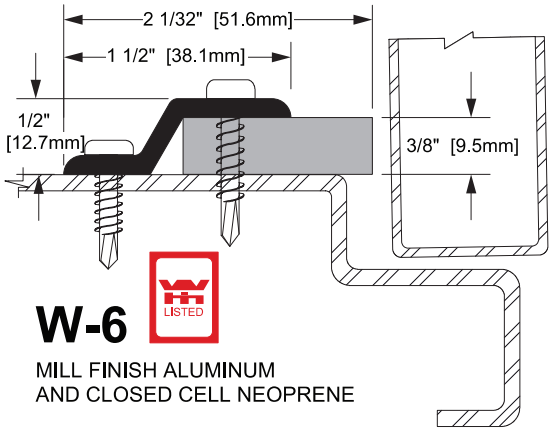
W-2

MILL FINISH ALUMINUM
AND VINYL

W-2F

MILL FINISH ALUMINUM
AND VINYL

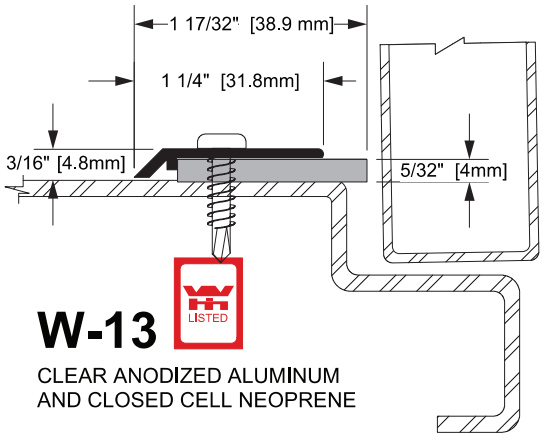
NEW



W-6

LISTED

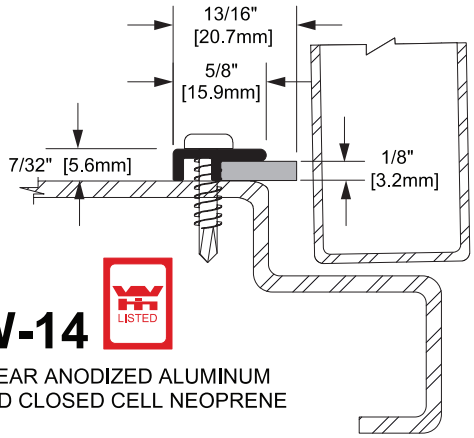
MILL FINISH ALUMINUM
AND CLOSED CELL NEOPRENE



W-13

LISTED

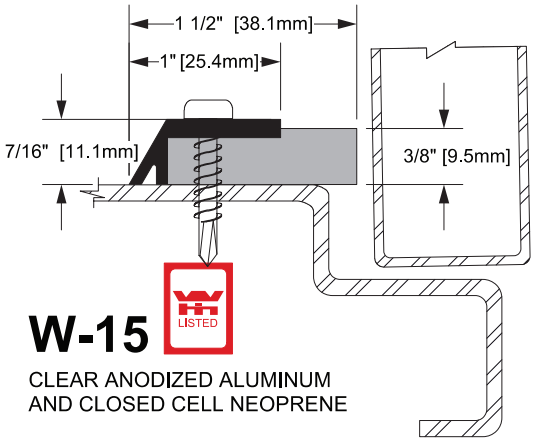
CLEAR ANODIZED ALUMINUM
AND CLOSED CELL NEOPRENE



W-14

LISTED

CLEAR ANODIZED ALUMINUM
AND CLOSED CELL NEOPRENE



W-15

LISTED

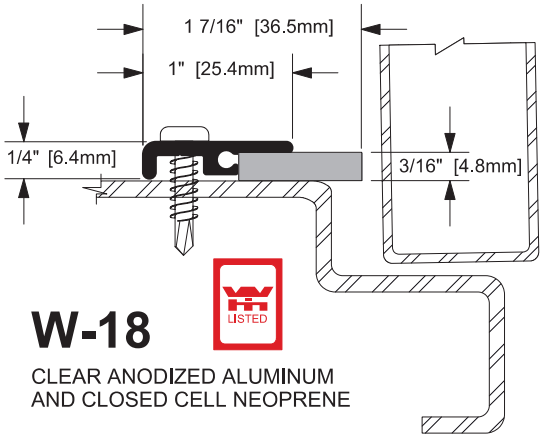
CLEAR ANODIZED ALUMINUM
AND CLOSED CELL NEOPRENE

CDH
Commercial Doors & Hardware Ltd.
2150 Winston Park Drive, Unit 16
Oakville, L6H 5V1

KILBRIDE P.S. Reno 2025 HDSB
6611 PANTON ST KILBRIDE , ON.

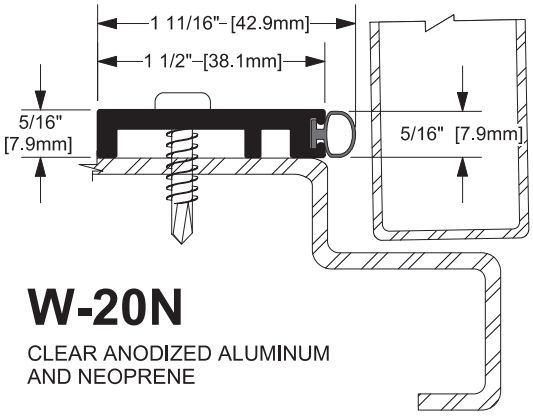
Submittal Date: APRIL 4/25 ,NOV 25/25, DEC 2/25, JAN 16/26

WEATHERSTRIP



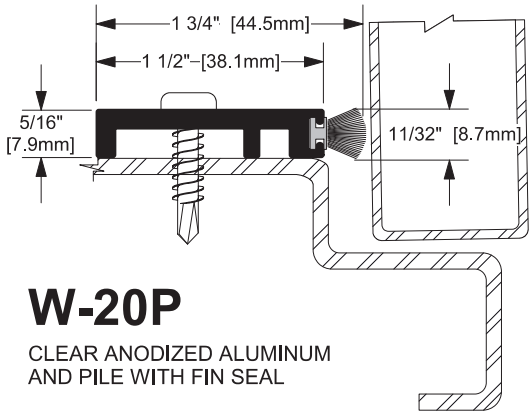
W-18

CLEAR ANODIZED ALUMINUM
AND CLOSED CELL NEOPRENE



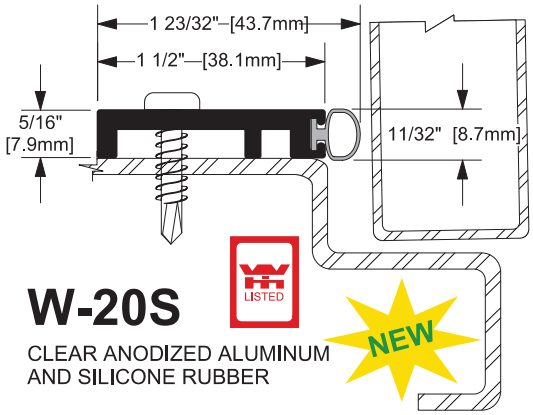
W-20N

CLEAR ANODIZED ALUMINUM
AND NEOPRENE



W-20P

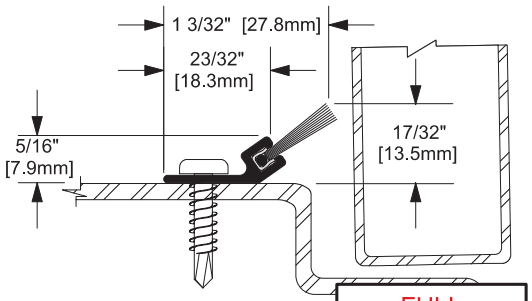
CLEAR ANODIZED ALUMINUM
AND PILE WITH FIN SEAL



W-20S

CLEAR ANODIZED ALUMINUM
AND SILICONE RUBBER

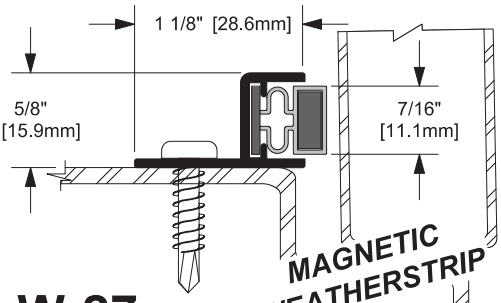
NEW



W-23

CLEAR ANODIZED ALUMINUM
AND NYLON BRUSH

FULL BRUSH SEAL LISTINGS ON PAGE 27



W-27

CLEAR ANODIZED ALUMINUM
AND VINYL WITH MAGNET

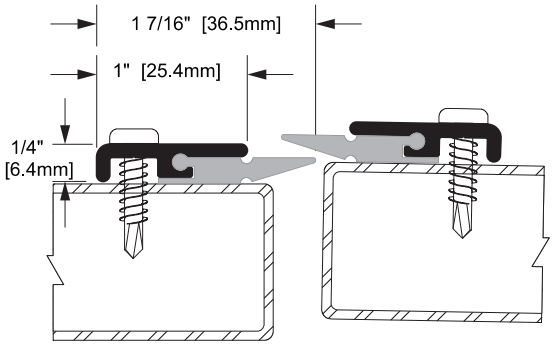
MAGNETIC WEATHERSTRIP

CDH
Commercial Doors & Hardware Ltd.
2150 Winston Park Drive, Unit 16
Oakville, L6H 5V1

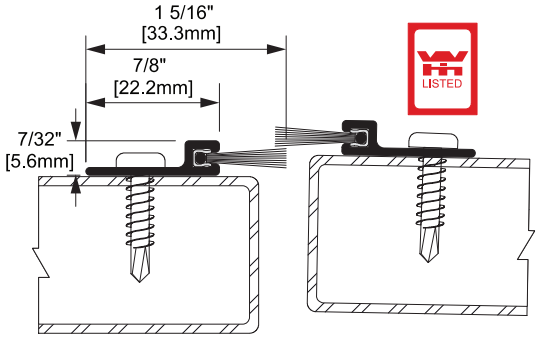
KILBRIDE P.S. Reno 2025 HDSB
6611 PANTON ST KILBRIDE , ON.

Submittal Date: APRIL 4/25 ,NOV 25/25, DEC 2/25, JAN 16/26

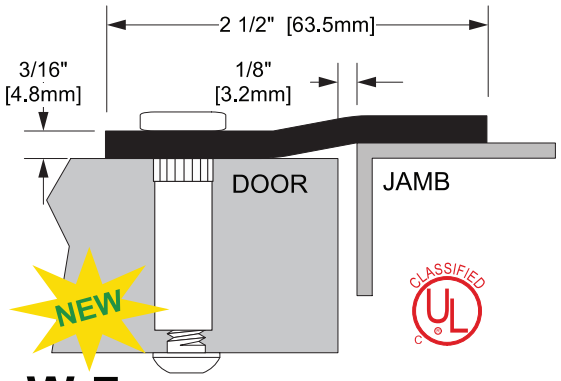
ASTRAGALS



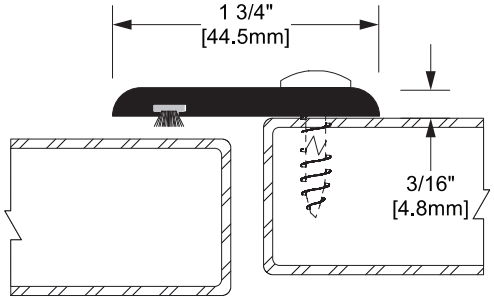
W-5 CLEAR ANODIZED ALUMINUM AND VINYL



W-25 CLEAR ANODIZED ALUMINUM AND NYLON BRUSH



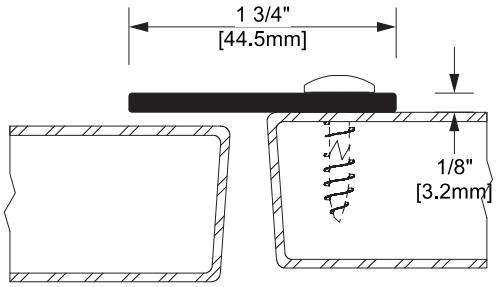
W-7 SECURITY ASTRAGAL
PRIMED C.R. STEEL c/w SECURITY SLEEVE



W-8 EXTRUDED ALUMINUM

W-8P EXTRUDED ALUMINUM WITH PILE

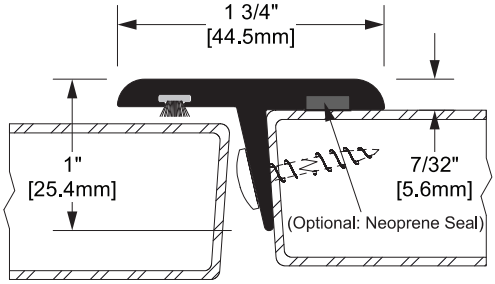
W-8SL EXTRUDED ALUMINUM WITH SILICONE



W-8S C.R. STEEL WITH CONDITIONED EDGES

W-8SP AS ABOVE, PRIMED FINISH

W-8SS STAINLESS STEEL, SEE PG. 20



W-9 EXTRUDED ALUMINUM WITH PILE

W-9S EXTRUDED ALUMINUM WITH SILICONE

CDH
Commercial Doors & Hardware Ltd.
2150 Winston Park Drive, Unit 16
Oakville, L6H 5V1

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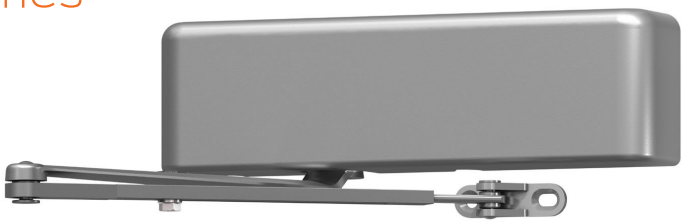
6611 PANTON ST KILBRIDE , ON.

Submittal Date: APRIL 4/25 ,NOV 25/25, DEC 2/25, JAN 16/26

4020 Series



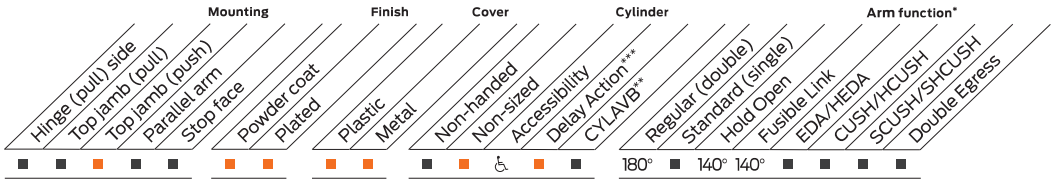
The 4020 is a heavy duty closer with adjustable spring power using the LCN Green Dial. This creates a custom fit to meet the specific demands of high traffic use and brings reliable performance.

Features

Certifications	Grade 1 - ANSI A156.4, UL 10C, ADA, 100 hour salt spray, meets BAA - Buy American Act
Body construction	▪ Cast iron body ▪ Full complement bearing ▪ 1 ½" diameter piston ▪ 11/16" diameter double heat treated pinion journal
Fluid	All weather fluid
Handing	Handed
Templating	Peel-n-Stick templates - 2 ½" x 6" mounting hole pattern
Size	Adjustable 1-5 or sized 6
Warranty	30 years

Cover	▪ Plastic Cover (PC), standard ▪ Metal Cover (MC), optional
Fasteners	Self Reaming and Tapping Screws (SRT)
Mounting	Top jamb (Push side)
Arms	Regular arm
Finishes/colors/ powder coat	▪ 622 Matte black ▪ 689 Aluminum ▪ 690 Statuary bronze ▪ 691 Light bronze ▪ 693 Black ▪ 695 Dark bronze ▪ 696 Brass ▪ Custom colors optional ▪ Optional SRI primer - powder coat only ▪ Optional plated finishes

Special templates | Customized installation templates or products may be available to solve non-standard applications. Contact LCN Product Support for assistance.

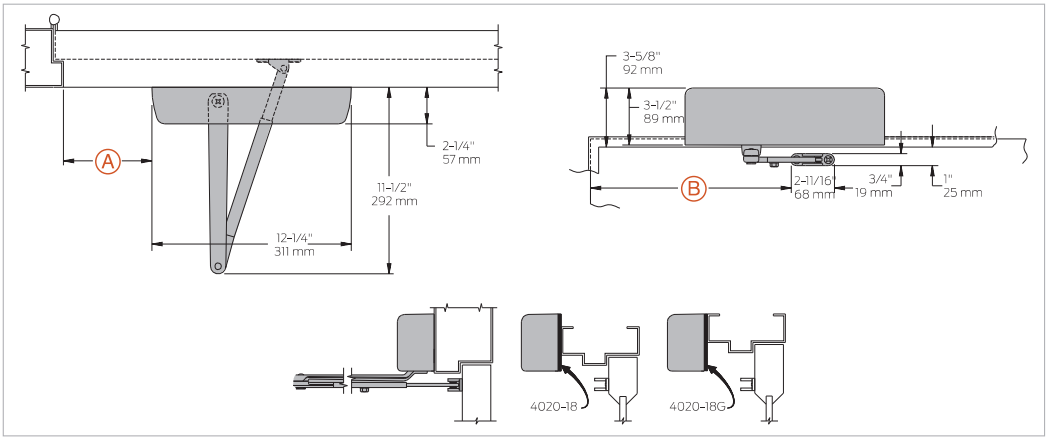


■ Available
■ Not available

Closer available with less than 5.0 lbs. opening force on 36" door.
* Maximum opening/hold open point with standard template.
** Advanced Variable Back Check.
*** Delay action for 4040XP incorporates standard 4041 cylinder.

Mounting details

Top jamb (push) side mounting



Butt hinges	Should not exceed 5" (127 mm) in width
Auxiliary stop	Recommended at hold open point or where the door cannot swing 180°
Reveal	▪ 2 9/16" (65 mm) allows 180° opening with regular arm ▪ 4 13/16" (122 mm) allows up to 140° opening with regular arm ▪ 8" (203 mm) allows up to 140° opening with Long Arm (LONG) where standard rod and shoe is replaced with optional long rod and shoe (4020-79LR)
Head frame	Less than 3 7/16" (87 mm) requires plate, 4020-18. Use plate, 4020-18G for flush ceiling condition. Either plate requires 1 3/4" (44 mm) frame minimum.
Top rail	▪ Requires minimum 1 1/2" (38 mm) ▪ Closer on 4020-18 plate requires 2" (51 mm) minimum ▪ Closer on 4020-18G plate requires 2 3/4" (70 mm) minimum
Delay action	▪ Add suffix "CYLDEL" to selected cylinder. ▪ Not available with 4026 cylinder ▪ Delays closing from maximum opening to approximately 75° ▪ Delay time adjustable up to approximately 1 minute
Maximum opening	Can be templated for: 100°: A = 6" (152 mm), B = 12 3/8" (314 mm) 140°: A = 4" (102 mm), B = 10 3/8" (264 mm) 180°: A = 2" (51 mm), B = 8 3/8" (213 mm)

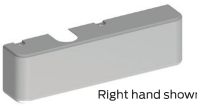
Notes:
- Hold open points up to maximum opening or 140°, whichever is less, for Hold Open or Fusible Link Arm
- For hold open beyond 140°, use 4110 Series closer

Accessories

Cylinders

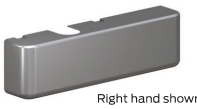
4021(6)-3071
Cast iron cylinder assembly (CYL)
- Handed
- Standard

Covers



Right hand shown

4020-72
Plastic Cover (PC)
- Handed
- Standard



Right hand shown

4020-72MC
Metal Cover (MC)
- Handed
- Required for plated finishes and custom powder coat finishes
- Optional

Arms

4020-3077
Regular Arm (REGARM)
- Non-handed

4020-3077L
Long Arm (LONG)
- Non-handed
- Includes 4020-79LR for deep reveals
- Optional

4020-3049
Hold Open Arm (H)
- Handed
- Provides hold open function, adjustable at elbow
- 5 3/4" (146 mm) maximum reveal, 140° hold open
- Optional

4020-3049FL
Fusible Link Arm (FL)
- Handed
- Releases hold open function, adjustable at shoe, when exposed to temperatures above 165° F
- 3 7/8" (98 mm) maximum reveal
- Optional

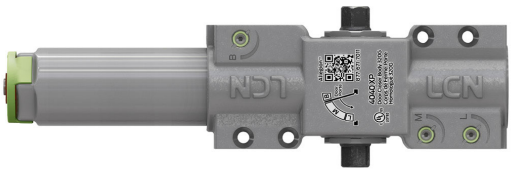
Note: Check local codes before specifying FL arms. NOT A life safety product!

Installation accessories

4020-18
Plate
- Required where head frame is less than 3 7/16" (87 mm)
- Requires minimum 1 3/4" (44 mm) minimum head frame and 2" (51 mm) top rail 3 7/8" (98 mm) maximum reveal

4020-18G
Plate
- For flush ceiling condition
- Requires minimum 1 3/4" (44 mm) minimum head frame and 2 3/4" (70 mm) top rail

4040XP Series



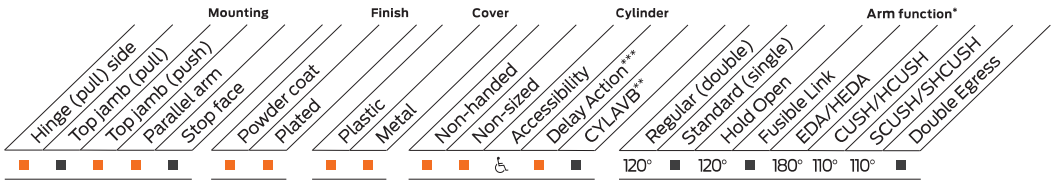
The 4040XP Series is LCN's most popular door closer—and for good reason. This durable non-handed, surface-mounted heavy-duty closer, is designed for the most demanding high-use-and-abuse applications as well as for easy installation and maintenance.

Features

Certifications	Grade 1 - ANSI A156.4, UL 10C, ADA, 100 hour salt spray, meets BAA - Buy American Act
Body construction	▪ Patented positive stop ▪ Patented regulation valve indicators ▪ Independent speed adjustments ▪ QR code for instructions and support ▪ Cast iron body ▪ Full complement bearing ▪ 1 ½" diameter piston ▪ Double heat treated pinion journal
Fluid	All weather liquid X fluid
Handing	Non-handed
Templating	Peel-n-Stick templates - 2 ¼" x 5" mounting hole pattern
Size	Adjustable spring size 1-6, includes LCN Green Dial
Warranty	30 years

Cover	▪ Redesigned snap-fit plastic cover (PC) with improved retention fit, standard ▪ Metal Cover (MC), optional
Fasteners	Self reaming and tapping screws (SRT)
Mounting	Hinge (pull side), top jamb (push side), parallel arm (push side)
Arms	Regular arm
Finishes/colors/ powder coat	▪ 622 Matte black ▪ 689 Aluminum ▪ 690 Statuary bronze ▪ 691 Light bronze ▪ 693 Black ▪ 695 Dark bronze ▪ 696 Brass ▪ Custom colors optional
	▪ Optional SRI primer - powder coat only ▪ Optional plated finishes

Special templates | Customized installation templates or products may be available to solve non-standard applications. Contact LCN Product Support for assistance.

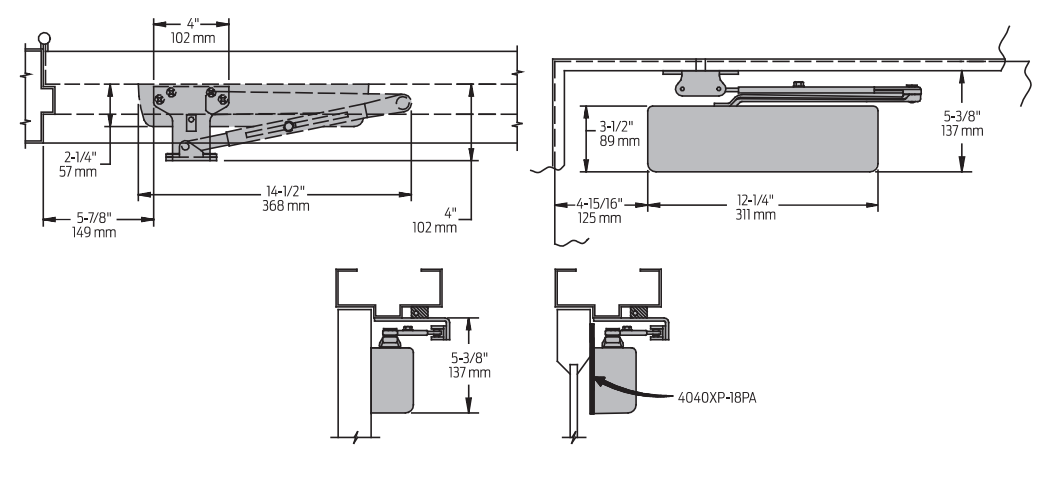


■ Available
■ Not available

♿ Closer available with less than 5.0 lbs. opening force on 36" door.
* Maximum opening/hold open point with standard template.
** Advanced Variable Back Check.
*** Delay feature incorporates standard 4040 cylinder (not XP).

Mounting details

Parallel arm (push) side mounting



Butt hinges	Should not exceed 5" (127 mm) in width
Auxiliary stop	Recommended at hold open point, where the door cannot swing 180º, or where Cush-n-Stop Arm is not used
Reveal	Should not exceed 7/32" (6 mm)
Top rail	Less than 5 3/8" (137 mm) measured from the stop requires plate, 4040XP-18PA. Plate requires 2" (51 mm) minimum from the stop.
Head frame	Flush or rabetted requires PA shoe adapter, 4040XP-419
Stop width	Minimum 1" (25 mm). CUSH arm requires minimum 1 1/2" (38 mm)
Blade stop	Clearance requires 1/2" (13mm) blade stop spacer, 4040XP-61
Clearance	▪ 4040XP-62PA shoe is 4" (102 mm) from door face ▪ EDA shoe projects 5 1/2" (140 mm) from door face ▪ CUSH shoe projects 6" (152 mm) from door face
Delay action	▪ Incorporates standard 4041 cylinder, without XP cylinder ▪ Delays closing from 120º to 70º ▪ Delay time adjustable up to approximately 1 minute
Maximum opening	▪ 180º opening/hold open points with all except CUSH arms ▪ 110º opening/hold open with CUSH arms

Notes:
- Optional mounting requires PA shoe, 4040XP-62PA for regular or Hold Open Arms
- Add prefix "P" to closer description (eg. P4040XP)
- P4040XP closer includes 4040XP-201 fifth hole spacer to support PA shoe

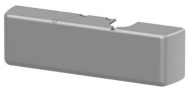
Accessories

Cylinders

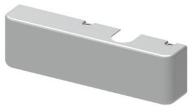
4040XP-3071
Cast iron cylinder assembly (CYL)
- Non-handed
- Heavy duty

4041-3071 DEL
Delay Action Cylinder (CYLDEL)
- Used for delayed action closing
- Non-handed
- Heavy duty

Covers



4040XP-72
plastic cover (PC)
- Non-handed
- Includes 4040XP-54 snap-on cover clip
- Redesigned patented snap-fit cover with improved retention fit



4040XP-72MC
metal cover (MC)
- Handed
- Required for plated finishes and custom powder coat finishes
- Optional

Arms

4040XP-3077
Regular Arm (REGARM)
- Non-handed
- Mounts pull side or top jamb with shallow reveal P4041 closer includes PA shoe, 4040XP-62PA required for parallel arm mounting

4040XP-3077L
Long Arm (LONG)
- Non-handed
- Includes long rod and shoe, 4040XP-79LR for top jamb mount
- Optional

4040XP-3077ELR
Extra Long Arm (XLONG)
- Non-handed
- Includes extra long rod and shoe, 4040XP-79ELR for top jamb mount with deep reveal
- Optional

4040XP-3049
Hold Open Arm (H)
- Non-handed
- Mounts pull side or top jamb with shallow reveal, hold open adjustable shoe
- 4040XP closer includes 4040XP-62PA shoe required for parallel arm mounting
- Optional

4040XP-3049L
Hold Open Long Arm (HLONG)
- Non-handed
- Includes long head and tube, 4040XP-3048L for top jamb mount
- Optional

4040XP-3077EDA
Extra Duty Arm (EDA)
- Non-handed
- Features forged, solid steel main and forearm for potentially abusive installations
- Optional

4040XP-3049EDA
Hold Open Extra Duty Arm (HEDA)
- Handed
- Parallel arm features forged, solid steel main and forearm for potentially abusive installations
- Hold open function is adjusted at the shoe
- Optional

4040XP-3077EDA/62G
Extra Duty Arm with 62G Thick Hub Shoe (EDAW62G)
- Non-handed
- Features forged, solid steel main and forearm for potentially abusive installations
- 62G shoe provides additional blade stop clearance
- Optional

4040XP-3049EDA/62G
Hold Open Extra Duty arm with 62G Thick Hub Shoe (HEDA62G)
- Handed
- Features forged, solid steel main and forearm for potentially abusive installations
- 62G shoe provides additional blade stop clearance; hold open function is adjusted at the shoe
- Optional

4040XP-3077CNS
Cush-n-Stop Arm (CUSH)
- Non-handed
- Features solid forged steel main arm and forearm with stop in soffit shoe.
- Optional

4040XP-3049CNS
Hold Open Cush-n-Stop Arm (HCUSH)
- Non-handed
- Hold open function with templated stop/hold open points
- Handle controls hold open function
- Optional

Accessories

Arms (cont.)

4040XP-3077SCNS
Spring Cush-n-Stop Arm (SCUSH)
- Non-handed
- For potentially abusive applications features solid forged steel main arm and forearm with spring loaded stop in the soffit shoe
- Optional

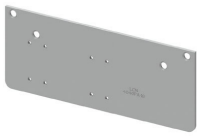
4040XP-3049SCNS
Spring Hold Open Cush-n-Stop Arm (SHCUSH)
- Non-handed
- For potentially abusive applications features solid forged steel main arm and forearm with spring loaded stop in the soffit shoe
- Handle controls hold open function
- Optional

Installation accessories

4040XP-18
Plate
- Required for hinge side mount where top rail is less than 3 3/4" (95 mm)
- Requires minimum 2" (51 mm) minimum top rail

4040XP-18G
Plate
- Locates top jamb mounted closer flush with top of head frame face in flush ceiling condition
- Requires 1 3/4" (44 mm) minimum head frame

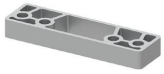
4040XP-18TJ
Plate
- Centers top jamb mounted closer vertically on head frame where face is less than 3 1/2" (89 mm). Plate requires 1 3/4" (44 mm) minimum head frame



4040XP-18PA
Plate
- Required for parallel arm mounting where top rail is less than 5 1/2" (140 mm), measured from the stop
- Requires 2" (51 mm) minimum top rail

4040XP-62PA
PA shoe
- Required for parallel arm mounting

4040XP-30
CUSH shoe support
- Provides anchorage for fifth screw used with CUSH arms, where reveal is less than 3 1/16" (78 mm)
- Optional



4040XP-61
Blade stop spacer
- Required to lower parallel arm shoe to clear 1/2" (13 mm) blade stop
- Optional

4040XP-419
PA flush panel adapter
- Provides horizontal mounting surface for parallel arm shoe on single rabbeted or flush frame
- Optional

4040XP-62A
Auxiliary shoe
- Requires a top rail of 7" (178 mm)
- Shoe replaces -62PA for parallel arm mounting of regular arm with overhead holder/stop
- Optional

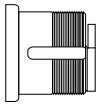
4040XP-54
Snap-on cover clip
- Used to secure 4040XP-72 plastic cover to cylinder body

Conventional cylinders

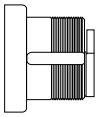
Cylinders to use with rim, mortise exit and competitive devices

Security	Key mechanism	Pins	Patent protected keyway families	Schlage rim cylinders for exit devices: Cylinder (horizontal tailpiece)	Cylinder (vertical tailpiece)	Lockout cylinder (horizontal tailpiece)	Schlage mortise cylinders for Von Duprin and other straight cam applications: Cylinder with compression ring, spring and blocking ring	Cylinder with compression ring and spring
Basic security Open keyways	Standard pin and tumbler	6	–[1]	20-022	20-021	–	20-002	20-001
	Check pin	6	S (Everest 29)					
Enhanced security Restricted use	Check pin	6	T (Everest 29)	20-022	20-021	–	20-002	20-001
	SL	7	R (Everest 29)	91-075	91-074	–	91-052	91-051
Upgraded Security Primus level restricted use, geographic exclusivity, and independent sidebar	Legacy Primus	6	S, T (Everest 29)	20-710	20-709	20-716	20-703	20-700
	Primus RP	6	Obverse[1] (Classic)	20-710-RP	20-709-RP	20-716-RP	20-703-RP	20-700-RP
	Primus XP	6	S, T (Everest 29)	20-710-XP	20-709-XP	20-716-XP	20-703-XP	20-700-XP
	Primus XP SL	7	R (Everest 29)	91-775-XP	91-774-XP	–	91-752-XP	91-751-XP
High security All Primus benefits plus added UL 437 physical security	Legacy Primus	6	S. T (Everest 29)	20-510	20-509	20-516	20-503	20-500
	Primus RP	6	Obverse[1] (Classic)	20-510-RP	20-509-RP	20-516-RP	20-503-RP	20-500-RP
	Primus XP	6	S, T (Everest 29)	20-510-XP	20-509-XP	20-516-XP	20-503-XP	20-500-XP
	Primus XP SL	7	R (Everest 29)	91-575-XP	91-574-XP	–	91-562-XP	91-561-XP

Security	Key mechanism	Pins	Patent protected keyway families	Adams Rite[2] MS, 4500 and 4700 Series; Lori 4500 Series and Corbin Russwin DL3000 Series deadlocks: Cylinder only	Lockout function[3]	Cylinder with 3/8" blocking ring	Adams Rite[2] 4070 deadbolt: Cylinder only
Basic security Open Keyways	Standard pin and tumbler	6	–[1]	26-072	--	20-013	26-073
	Check pin	6	S (Everest 29)				
Enhanced security Restricted Use	Check pin	6	T (Everest 29)	26-072	--	20-013	26-073
	SL	7	R (Everest 29)	91-060	--	91-054	91-061
Upgraded security Primus level restricted use, geographic exclusivity, and independent sidebar	Legacy Primus	6	S, T (Everest 29)	--	20-718	20-706	20-708
	Primus RP	6	Obverse[1] (Classic)	--	20-718-RP	20-706-RP	20-708-RP
	Primus XP	6	S, T (Everest 29)	--	20-718-XP	20-706-XP	20-708-XP
	Primus XP SL	7	R (Everest 29)	91-758-XP	--	91-755-XP	91-759-XP
High security All Primus benefits plus added UL 437 physical security	Legacy Primus	6	S. T (Everest 29)	--	20-518	20-506	20-508
	Primus RP	6	Obverse[1] (Classic)	--	20-518-RP	20-506-RP	20-508-RP
	Primus XP	6	S, T (Everest 29)	--	20-518-XP	20-506-XP	20-508-XP
	Primus XP SL	7	R (Everest 29)	91-558-XP	--	91-555-XP	91-559-XP



Cylinder only

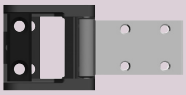


Cylinder with compression ring and spring (lockout function)

1. Out-of-patent keyways like Classic Obverse are available. Obverse, however, can gain patent protection in a Primus RP or XP cylinder. RP is recommended because patent coverage carries to 2029 versus 2024 for Primus XP.
2. All cylinders include a set screw pack (B220-050) for Adams Rite locks.
3. Includes cylinder, compression ring and spring. Lockout keys must be ordered separately and lockout cylinders will not be master keyed by Schlage.

Note: 1 1/8" length standard. Optional lengths available in 1/8" (4mm) increments up to 1 3/4" (44mm).

33A/35A Rim device



1439 Roller ships standard, optional strikes available

299 Strike needs to be specified for Hollow Metal Frames

33A and 35A for all types of single and double doors with mullion, UL listed for panic exit hardware. Devices are ANSI A156.3 – 2014 Grade 1. The 35A has a smooth mechanism case and the 33A has grooved case. The rim device is non-handed except when the SS (signal switch) option is used. See opposite page for available outside trim and device functions.

33A/35A fits door stiles as narrow as 1 3/4" (44mm). Newly designed device has a one piece center case cover.

Finishes – US3, US4, US10, US15 (35A Only) US26, US26D, US26D-AM,US28, 313 and 315.

Specifications

Device lengths	**3'** 2' 4" to 3' (711mm to 914 mm) Door size **4'** 2'10" to 4' (864 mm to 1219 mm) Door size
Device centerline from finished floor	39 13/16" (1011 mm) 39 11/16" (1008 mm) with Mullion
Center case dimensions	8 3/16" x 1 9/16" x 2 13/32" (208mm x 40mm x 62mm)
Mechanism case dimensions	2 1/4" x 2 1/4" (57mm x 57mm)
Projection	Pushbar Neutral – 3 13/16" (97 mm) Pushbar Depressed – 3 1/16" (78 mm)
Latch bolt	Deadlocking, 3/4" (19mm) throw
Fasteners & sex bolts (SNB)	Includes 1 3/4" (44mm) – 2 1/4" (57mm) wood & metal doors #425 SNB furnished standard for end case #325 SNB furnished standard for EO (exit only device)
Electric options	**ALK** Alarm kit **CX** Chexit delayed exit **EL** Electric latch retraction **HD-EL** Electric latch retraction with hex dogging **QEL** Quiet electric latch retraction **RX** Request to exit, WP-RX waterproof option **LX** Latchbolt monitoring **LX-RX** Request to exit / latchbolt monitoring **RX-LC, LX-LC, LX-RX-LC** Low current option for RX, LX, LX-RX **SS** Signal switch **CON** Allegion Connect
Mechanical options	**AX** Accessible device
Miscellaneous options	**GBK** Glass bead kit **PN** Pneumatic **SG** Safety glow **SEC** Security screws **SNB** Sex bolts
Dogging feature	**Hex Dogging standard** **CD** Cylinder dogging **LD** Less dogging
Strikes	**1439** – Dull black **Optional strikes**

QEL
Quiet electric latch retraction
- Bolt retraction via switch
- Converts exit door to push-pull operation

AX
Accessible device
- UL certified to meet new 5 lb. maximum operating force requirement
- Exceeds ANSI/BHMA requirements

CX
Chexit delayed exit
- Meets NFPA 101 requirements
- Self-contained controls, locking, alarm

ALK
Alarm exit kit
- Unauthorized opening triggers 85-decibel horn
- Set in armed or disarmed mode by key

EL
Electric latch retraction
- Enables remote unlatching
- Alternative to manual dogging

RX
Pushpad monitor switch
- Signals use of an opening
- SPDT switch to monitor pushpad

E (E360L)
Electric lever trim
- Electrified remote locking/unlocking
- Fail safe & fail secure options available
- No key override

CON
Allegion Connectors
- Common connectors to connect various door hardware all the way to the power supply

PN
Pneumatic latch retraction
- For areas where electrical devices banned
- Special linkage for mechanical or pneumatic dogging

CD
Cylinder dogging
- Replaces hex key dogging
- Requires standard 1 1/4" mortise cylinder

CDH
Commercial Doors & Hardware Ltd.
2150 Winston Park Drive, Unit 16
Oakville, L6H 5V1

KILBRIDE P.S. Reno 2025 HDSB
6611 PANTON ST KILBRIDE , ON.

Submittal Date: APRIL 4/25 ,NOV 25/25, DEC 2/25, JAN 16/26

Standard trim

	EO	DT	NL	NL-OP
	No outside trim Exit only	 **Dummy trim** Pull when dogged	 **Night latch** Key retracts latchbolt	 **Night latch** Key retracts latchbolt optional pull required
Product description	33A-EO 35A-EO	33A-DT 35A-DT	33A-NL 35A-NL	33A-NL-OP 35A-NL-OP
Trim description	—	386DT	386NL	388
Base size	—	7 15/32" x 1 5/8" (190x41mm)	7 15/32" x 1 5/8" (190x41mm)	7 1/2" x 1 11/16" (190x43mm)
Grip size	—	8 1/2" x 4 5/16" (216x110mm)	8 1/2" x 4 5/16" (216x110mm)	—
Projection	—	2 7/16" (62mm)	2 7/16" (62mm)	1" (25mm)
ANSI function	01	02	03	03
Cylinder type	—	—	Rim	Rim
Handing	—	—	Handed	—
Optional trim	—	x360L-DT x550DT x IVES 8190	—	x550DT x IVES 8190 10"

	L	L-BE	T	T-BE
	 **Lever** Key Locks and Unlocks	 **Lever Blank Escutcheon** Always Operable (No Cylinder)	 **Thumbturn** Key Locks and Unlocks	 **Thumbturn** Always Operable (No Cylinder)
Product description	33A-L 35A-L	33A-L-BE 35A-L-BE	33A-T 35A-T	33A-T-BE 35A-T-BE
Trim description	360L	360L-BE	360T	360T-BE
Base size	7 1/2" x 1 11/16" x 7/8" (190x43x22mm)	7 1/2" x 1 11/16" x 7/8" (190x43x22mm)	7 1/2" x 1 11/16" x 7/8" (190x43x22mm)	7 1/2" x 1 11/16" x 7/8" (190x43x22mm)
Grip size	—	—	—	—
Projection	3" (76mm)	3" (76mm)	1 13/16" (46mm)	1 13/16" (46mm)
ANSI function	08 or 09 field selectable	—	11 or 12 field selectable	—
Cylinder type	1 1/4" Mortise	—	1 1/4" Mortise	—
Handing	Handed/Reversible	Handed/Reversible	—	—
Optional trim	—	E360L-BE	—	E360T-BE

Note: 360L & 360T used on wood door require the 33A-WDA cover plate

Notes

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Push pads

Dummy push pad

The 330 dummy pushpad is designed as a companion unit for all 33A devices. The 350 dummy pushpad is a companion unit for all 35A devices. The pushpad is rigid or nonfunctioning. A push/pull operation can be accomplished by using 386DT, 360L-DT, 550DT, 392-6 trim or any Ives pull.

The 330/350 can be equipped with a functional pushpad and will accommodate an RX switch. Specify RX-330. May also be equipped with the RX2, double RX switch. Specify RX2-330.

To order, specify:

1. 330 or 350
2. Size 3' or 4' (914mm or 1219mm)
3. Finish – 605, 606, 612, 625, 626, 628, 710 and 622/711 (630–350 only)

Safety glow (SG)

Self-illuminating touchpad defines the location of the exit door in dark or smoke-filled area. The Safety Glow coating is a special powder coat finish that glows brightly during low or no light conditions. This coating was developed to meet MEA standards where luminescent exit door markings are required in commercial facilities. There are no batteries or electronics, the coating is charged when exposed to light.

To order, specify: Suffix SG, EL 33A27A-SG

Red silk screen (RSS)

Red silkscreen lettering on touchpad trim. "Emergency Exit Only, Push To Open And Sound Alarm." This comes standard on SS devices.

To order, specify: Suffix RSS, 33A27L-RSS RHR

Braille, embossed and knurled touchpads

* Image shown is a special order.

Braille touchpad embossed with the standard message “CAUTION STAIRWELL” in braille and raised letters provides assistance to persons with impaired vision. Letters are ½" (13mm) high and braille is #2, raised height is 3⁄32" (2mm). Other messages are available on special order, limited to 20 characters per line.*

To order, specify: Suffix BR, EL33A27L-BR

Embossed touchpad is embossed with the word “PUSH”.

To order, specify: Suffix EMB, EL33A27L-EMB

Knurled touchpad is to provide warning to persons with impaired vision.

To order, specify: Suffix PBKN, EL33A27L-PBKN

* Consult factory for availability.

CDH
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Oakville, L6H 5V1

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6611 PANTON ST KILBRIDE , ON.

Submittal Date: APRIL 4/25 ,NOV 25/25, DEC 2/25, JAN 16/26

ALLEGION

CDH

Commercial Doors & Hardware Ltd.
2150 Winston Park Drive, Unit 16
Oakville, L6H 5V1

KILBRIDE P.S. Reno 2025 HDSB
6611 PANTON ST KILBRIDE , ON.

Submittal Date: APRIL 4/25 ,NOV 25/25, DEC 2/25, JAN 16/26

Device types

98/99 Rim exit device

98 and 99 rim exit devices for all types of single and double doors with mullion, UL listed for panic exit hardware. Devices are certified to ANSI/BHMA A156.3 2014, Grade 1. The 98 device has a smooth mechanism case and the 99 device has a grooved case. The rim device is non-handed except when the following device options are used: SD (special dogging), -2 (double cylinder) or SS (signal switch). Covers stock hollow metal doors with 86 or 161 cutouts on single doors (may cover cutouts on pairs – consult template).

Specifications

Device functions	Device ships EO/DT/NL; Field selectable; For TP, K or L remove NL drive screw from device
Device lengths	3' 2'4" to 3' (711mm to 914mm) Door size 4' 2'10" to 4' (864mm to 1219mm) Door size
Device centerline from finished floor	39 13/16" (1011mm) 39 11/16" (1008mm) with mullion
Center case	8" x 2 3/4" x 2 3/8" (203mm x 70mm x 60mm)
Mechanism case	2 1/4" x 2 1/4" (57mm x 57mm)
Projection	Pushbar neutral – 3 13/16" (97mm) Pushbar depressed – 3 1/16" (78mm)
Latch bolt	Deadlocking, 3/4" (19mm) throw
Finishes	605, 606, 612, 625, 626/626AM, 628, 710, 711 and 643e (619 and 630 available with 98 Series only)
Fasteners and sex bolts (SNB)	Includes screw pack for 1 3/4" (44mm) and 2 1/4" (57mm) thick metal or wood doors (Optional 425 SNB available, see page 66 for quantities)

Accessories

299 Strike
Ships standard,
optional strikes available.

Hex key dogging
Comes standard on
98/99 rim exit devices.

Features and options

Electrified options

LX	Latch bolt monitor switch
RX	Request to exit
RX2	Double request to exit
E	Electric locking and unlocking trim
EL	Electric latch retraction
ESL	Emergency secure lockdown
QEL	Quiet electric latch retraction
SS	Signal switch
CX	Chexit delayed exit
ALK	Alarm exit kit
WP-RX	Waterproof request to exit
CON	Allegion Connect

Mechanical options

-2	Double cylinder
-2SI	Double cylinder with security indicator
AX	Accessible device
GBK	Glass bead kit
PN	Pneumatic latch retraction
QM	Quiet mechanical
SNB	Sex bolts
SEC	Security screws
WH	Weep holes
XP	Extra protection

Dogging feature
Hex key dogging standard

Dogging options

CD	Cylinder dogging
CD-CX	Chexit cylinder dogging
CDSI	Cylinder dogging with security indicator
HDSI	Hex dogging with security indicator
SD	Special center case dogging
LD	Less dogging
DI	Dogging indicator
CI	Cylinder dogging indicator

Strikes
299 – Dull black

Dogging options

Cylinder dogging (CD)

Cylinder dogging is available on all 98/99 Panic exit devices to replace the standard hex key dogging. Unit requires a standard 1¼" (32mm) mortise cylinder with an inverted straight cam. When ordering, reference Schlage cylinder 20-001, 1¼", XQ11-949. This provides the L583-477 cam inverted at the factory.

To order, specify: Use prefix, CD, example CD99L

Less dogging (LD)

Less dogging is available in all 98/99 Panic exit devices to remove the dogging option.

To order, specify: Use prefix LD, example LD99L

Special center case dogging (SD)

Special cylinder dogging in the center case is available for Chexit, EL, QEL, ALK panic devices to allow for mechanical push/pull operation. With this option, the latch bolt is held retracted and pushbar is still operable. Specify handing—RHR or LHR.

SD requires 1¼" (32mm) mortise cylinder with an inverted straight cam. When ordering, reference Schlage cylinder 20-001, 1¼", XQ11-949. This provides the L583-477 cam inverted at the factory.

Note: Available on rim and vertical panic exit devices only.

To order, specify:

1. Prefix SD, example SD99L and Handing.
2. Not for 98/9975 Devices.

Cylinder dogging kit* (CDK)

For field conversion, from hex key dogging, conversion kit is available.

To order, specify: 99CDK or 98CDK, specify finish.

*Cannot be added to fire exit hardware.

Hex key dogging kit* (HDK)

For field conversion, from cylinder dogging, conversion kit is available.

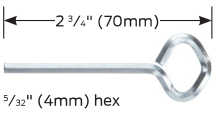
To order, specify: 99HDK or 98HDK, specify finish.

*Cannot be added to fire exit hardware.

Dog keys

Dog key (old style)

Dog key (standard)



Dogging indicator (CI/DI)

- Red indicator light blinks every 5 seconds when not dogged, visible from over 75 feet away
- Available in a hex or cylinder dogging format
- Designed for battery life over one year
- Available as a factory option or field retrofit kit
- Designed for device with mechanical dogging built after 1997

To order, specify:

As device option:

1. DI99EO 3' 630 (hex dogging)
2. CI98EO 4' 628 (cylinder dogging)

As retrofit kit:

1. DI Retrofit Kit 3' 662 (hex dogging)
2. CI Retrofit Kit 4' 613 (cylinder dogging)

Steel mullions

1654 Prepared for two 1606 strikes. **If 1606 strikes are not specified on the order, two per mullion will be added. Additional charges apply.**

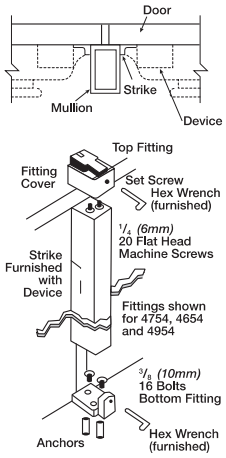
4954 Prepared for 264 or 299 strikes. For use with all Von Duprin Panic rim devices. **Note:** Specify strike choice with device.

9954 Prepared for and must be used with two 268 strikes (88-F device), or two 499F (22-F, 98-F, 99F devices). UL fire labeled mullion for up to 3 hour opening using Von Duprin fire exit rim devices. This mullion is not easily removed due to special fittings.

22-F and 88-F devices are rated up to 8' x 8" (2438mm x 2438mm).

98-F and 99-F devices are rated up to 10'0" (3048mm).

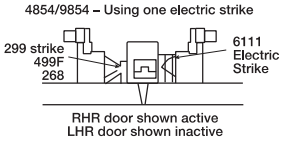
Note: If 268 or 499F strikes are not specified on the order, two per mullion will be added. Additional charges apply.



4754 Prepared for two 4263 monitor strikes.

4854 Prepared for one 299 and one 6111 electric strike. Indicate handing for electric strike.

9854 Prepared for one 268 or 499F strike and one 6111 electric strike. Indicate handing for electric strike. UL fire labelled mullion for up to 3 hour openings up to 8' x 8' (2438mm x 2438mm) using Von Duprin Fire Exit Rim Devices.



Aluminum mullions

5654 Prepared for two 264 or 299 strikes with weatherstripping. Includes one set of 154 stabilizers.

5754 Prepared and furnished with one 1408 double door strike. Includes one 154 stabilizer set. Note: specify device "less strike".

Sizes for mullions

1654, 4954, 4754, 4854, 5654	**9854, 9954**
7' 2" (2184mm)	7' 3" (2210mm)
*8' 2" (2489mm)	8' 3" (2475mm)
*10' 2" (3099mm)	10' 3" (3124mm)
KR1654, KR4954, KR4754, KR4854	**KR9854**, KR9954*****
7' 6" (2286mm)	7' 5" (2261mm)
8' 6" (2591mm)	*8' 5" (2565mm)
10' 6" (3200mm)	*10' 5" (3175mm)

* Only qualifying applications will be provided with UL Label.
** Fire rated same as 9854
*** Fire rated same as 9954

Angle plate is used with narrow transom frames. The plate attaches to the transom extending the surface area needed to mount the mullion. Must be ordered separately. Specify finish.

154 Stabilizer is a two-piece interlocking set. One piece mounts on the mullion with the top mounting hole 5 3⁄16" (148mm) below the centerline of the strike; the other piece mounts on the door. Shims are provided to adjust for misalignment between the door and mullion.

The set maintains integrity between the door and mullion to prevent vandalism and to ensure contact between the device and strike as the doors expand and contract with temperature changes.

Furnished standard on aluminum mullions; optional for steel and all blank steel mullions.

MT54 Storage kit is a set of floor and wall brackets that provide convenient storage of the keyed removable mullion when removed from the opening.

To order, specify

1. Model MT54
2. Finish SP28, SP313, or SPBLK

6200 Series strikes for mortise or cylindrical devices

Overview
Von Duprin electric strikes are known for their reliability, durability and security. The 6200 Series is designed to withstand abuse. Its heavy-duty stainless steel construction is fully UL1034 and UL10C listed.

6200 Series electric strikes are designed for use with a variety of mortise or cylindrical locksets. It interfaces with the latch mechanism of the exit device. The 6200 Series movable lip (keeper) allows a door to open, even when the latch bolt is extended. This feature, called remote release provides added benefits such as increased convenience and efficiency. The 6200 Series also provides added security and traffic control.

6200 Series electric strikes can be used for retrofit applications or new construction. To assure the proper selection of an electric strike on new applications, lockset compatibility charts are shown below. When using a lockset not listed or when retrofitting a strike to an existing application, please contact Von Duprin Technical Support for application assistance.

Features and benefits

- Non handed design provides greater flexibility
- Strike box is adjustable to compensate for misalignment of the door or frame
- Two piece plug connectors are furnished for ease of installation and for removal during strike servicing
- UL1034 Burglary-Resistant and UL10C Electric Strike for Fire Door
- Six finishes available to suite with existing hardware
- Durable stainless steel construction
- 24 VDC standard with 12 VDC and AC operation optional

6200 Series power requirements

Models	Voltage	Current	Duty	Amps	Ohms
All	12V	DC	Continuous	0.60	21
All	16V	DC	Continuous	0.40	38
All	24V	DC	Continuous	0.33	83
All	28V	DC	Continuous	0.25	111

Continuous duty = Energized 1 minute or more

Cylindrical lockset compatibility[1,2,3]

6211, 6211AL, 6211WF, 6212, 6213, 6214, 6215, 6221, 6222, 6223, 6224, 6224AL, 6225 and 6226 Strikes

Manufacturer	Cylindrical latchbolt projection
Baldwin	1/2" – 3/4" (13mm – 19mm)
Best	3/8" – 3/4" (10mm – 19mm)
Corbin	1/2" – 3/4" (13mm – 19mm)
Falcon	1/2" – 3/4" (13mm – 19mm)
Russwin	1/2" – 3/4" (13mm – 19mm)
Sargent	1/2" – 3/4" (13mm – 19mm)
Schlage	3/8" – 3/4" (10mm – 19mm)
Yale	1/2" – 3/4" (13mm – 19mm)

Mortise lockset compatibility[1,2,3]

6211, 6211AL, 6211WF, 6212, 6213, 6214, 6215, 6221, 6222, 6223, 6224, 6224AL, 6225 and 6226 Strikes

Manufacturer	Model number
Von Duprin	7500
Adams Rite	4510, 4710
Baldwin	6000
Best	24H, 30H
Corbin	9000
Falcon	M2300, M2500, M2600, M3300, M3500, M3600
Precision	Mortise
Russwin	Mortise
Sargent	7700, 8100, 9000
Schlage	L9000, K30, K40, K50, K60
Yale	7030, 7130, 8600, 8700

Mortise lockset compatibility[1,3]

6210

Manufacturer	Model number
Von Duprin	7500
Best	30H (not 45H/47H)
Corbin/Russwin	ML2200, 5000, 9000, CR2200 (not 2000)
Falcon	M100, M200, M300, M400, M500, M600
Sargent	7700, 8100 (not 7800/8200)
Schlage	L9000
Yale	8700 (not 8800)

1. Von Duprin cannot guarantee compatibility as other manufacturer's designs may change without notice.
2. Signalling may not function when using 3/8" (10mm) throw bolt. Deadlocking cannot be guaranteed with all locks.
3. When using a lockset not listed or when retrofitting a strike to an existing application, please contact Von Duprin Technical Support for assistance.

6300 Series surface mounted strike for rim exit devices

Overview
Von Duprin electric strikes are known for their reliability, durability and security. The 6300 Series is designed to withstand abuse. Its heavy-duty stainless steel construction is fully UL1034 and UL10C Listed.

6300 Series electric strikes are designed for use with a variety of rim devices. It interfaces with the latch mechanism of the exit device. The movable lip (keeper) allows a door to open even when the latch bolt is extended. This feature, called remote release, provides added benefits such as increased convenience and efficiency. The 6300 Series also provides added security and traffic control.

6300 Series electric strikes are ideal for aftermarket applications. It is easy to install without modifying or altering the door frame. To assure the proper selection of an electric strike on new applications, lockset compatibility charts are shown on the next page. When using a lockset not listed or when retrofitting a strike to an existing application, please contact Von Duprin technical support for application assistance.

The 6300 is fail-secure (FSE) only to achieve compliance with UL10C for fire-rated openings. In a fail-secure application, the door is normally locked. To unlock the door, power must be applied. The 6300 strike can be used with either 12VDC or 24VDC. There are 2 connectors that ship with it and the appropriate connector for either 12VDC or 24VDC will be used, based upon the available voltage at the opening.

Features and benefits

- Non-handed design provides greater flexibility
- Requires no alteration or cutting to existing frame
- UL1034 burglary-resistant and
- UL10C electric strike for fire door
- Stainless steel (satin) finish
- Durable stainless steel construction
- Field selectable voltage 12VDC or 24VDC
- Dynamic strength 70 ft-lbs
- Endurance 2,000,000 cycles

6300 Series power requirements

Model	Voltage	Current	Duty	Amps	Ohms
6300	12V	DC	Continuous	0.50	22
6300	24V	DC	Continuous	0.24	89

Rim exit device compatibility 6300 strikes

Manufacturer	Model Number
Von Duprin	VD 22/22-F Rim
Von Duprin	VD 33A/35A Rim*
Von Duprin	VD 55 Rim
Von Duprin	VD 88 Rim
Von Duprin	VD 98/99 and 98/99-F Rim
Falcon	Falcon 24/24-F Rim*
Falcon	Falcon 25/25-F Rim
Falcon	Falcon 19/19-F Rim
Falcon Doromatic	Falcon Doromatic 1590*
Falcon Doromatic	Falcon Doromatic 1790*
Falcon Doromatic	Falcon Doromatic 2090*

* Stile and frame condition may affect compatibility.

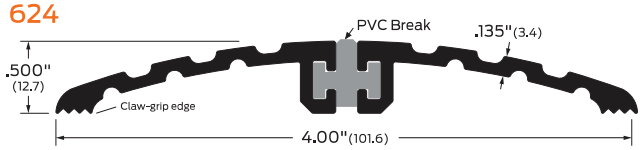
Model specifications

Model number	6300
Retrofits model	N/A
Latchbolt throw	3/4"
Face plate length	9"
Projection	3/4"
Lockset	Rim exit device
Number of doors	Single or pair with mullion
Door/frame type	Hollow metal, aluminum and wood
EB (entry buzzer)	Optional
Certifications	UL1034, UL10C, UL 294, CSFM
Application notes	Surface mounted electric strike ideal for aftermarket applications. Strike designed for use with Von Duprin 98/99, however it can be used with most rim exit devices.

Thresholds

Thermal break thresholds

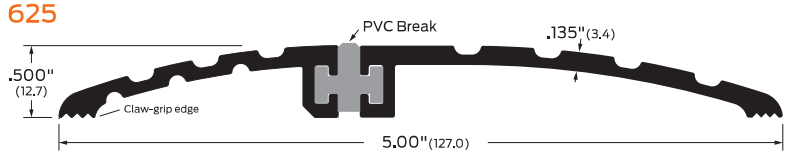
624



Finishes:	Options:	ANSI/BHMA:	
A, BK, D, G	E, EL, V3, EV3, ELV3	624A, 624D, 624G, 624BK	J32139
		624A-E, 624D-E, 624G-D, 624BK-E	J32239

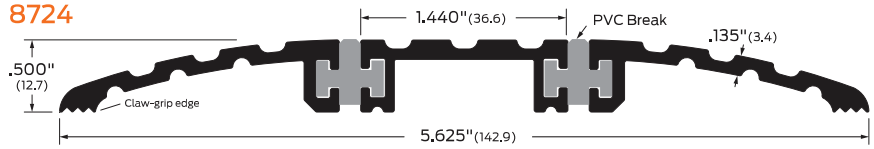
BHMA CERTIFIED

625



Finishes:	Options:
A, BK, D, G	E, EL, V3, EV3, ELV3

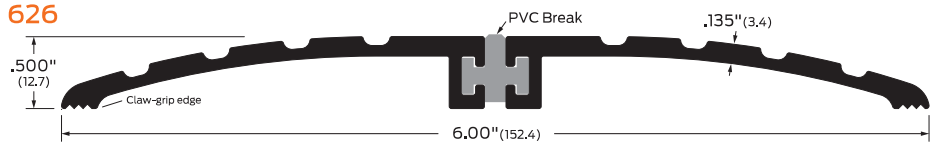
8724



Finishes:	Options:	ANSI/BHMA:	
A, BK, D, G	E, EL, V3, EV3, ELV3	8724A, 8724D, 8724G, 8724BK	J32139
		8724A-E, 8724D-E, 8724G-E, 8724BK-E	J32239

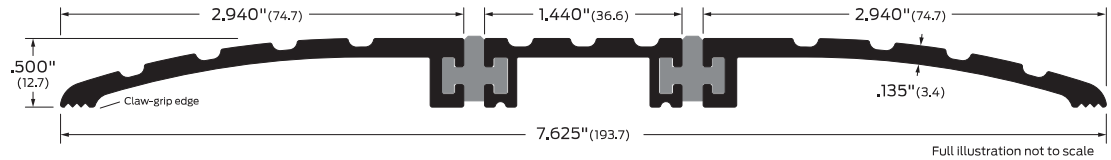
BHMA CERTIFIED

626



Finishes:	Options:
A, BK, D, G	E, EL, V3, EV3, ELV3

8726



Full illustration not to scale

Finishes:	Options:
A, BK, D, G	E, EL, V3, EV3, ELV3

All items on this page:

See Thresholds Accessories & options page for details.

Finishes:

A	Aluminum mill finish
BK	Aluminum black anodized
D	Aluminum dark bronze anodized
G	Aluminum gold anodized
B	Bronze, architectural mill finish
B-ORB	Oil-rubbed bronze

Options:

E	Epoxy abrasive tread
EL	Photoluminescent and abrasive epoxy tread
V3	Full body strength fill
EV3	Epoxy and full body strength fill
ELV3	Photoluminescent and abrasive epoxy tread, full body strength fill

Note:

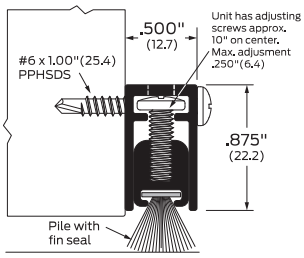
Special anchors available for mounting most thresholds on concrete surfaces.

Width dimensions for thresholds on this page are nominal. Slight variations may result from thermal break manufacturing.

Perimeter seals

Door sweeps

871

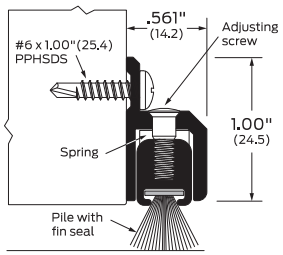


Finishes: AA, BK, D, G
Options: S, SEC
ANSI/BHMA: 871AA, 871BK, 871D, 871G R3F434

Adjustable

10C

255

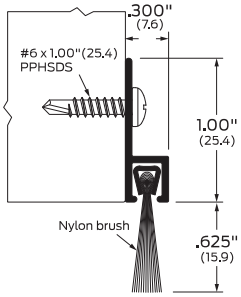


Finishes: AA, BK, D, G
Option: SEC
ANSI/BHMA: 255AA, 255BK, 255D, 255G R3F434

Adjustable

10C

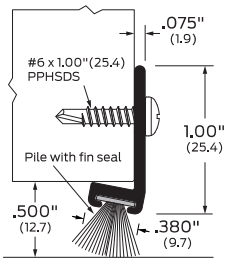
8192



Finishes: AA, BK, D, G
Options: PSA, SEC
ANSI/BHMA: 8192AA, 8192BK, 8192D, 8192G R3A436

10C

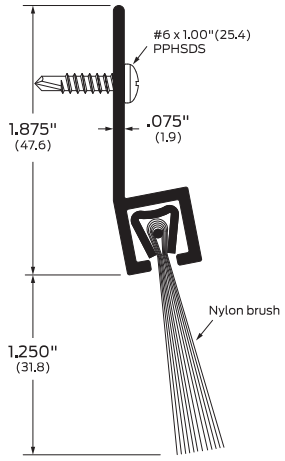
98



Finishes: A, BK, D, G
Options: PSA, S, SEC
ANSI/BHMA: 98A, 98BK, 98D, 98G R3F436

10C

96



Finishes: A, BK, D, G
Option: SEC
ANSI/BHMA: 96A, 96BK, 96D, 96G R3A436

Suitable for mixed-use commercial, hospitality, multi-family, as well as sliding barn doors.

All items on this page:

BHMA CERTIFIED

See Perimeter seals Accessories & options page for details.

Finishes:

A	Aluminum mill finish
AA	Aluminum clear anodized
BK	Aluminum black anodized
D	Aluminum dark bronze anodized
G	Aluminum gold anodized

Options:

PSA	Pressure-sensitive adhesive
S	Order as a set
SEC	Security screws

Note:

GT710/8710

Low-Energy
ADA Swing Door Operator

Where SOLUTIONS are AUTOMATIC

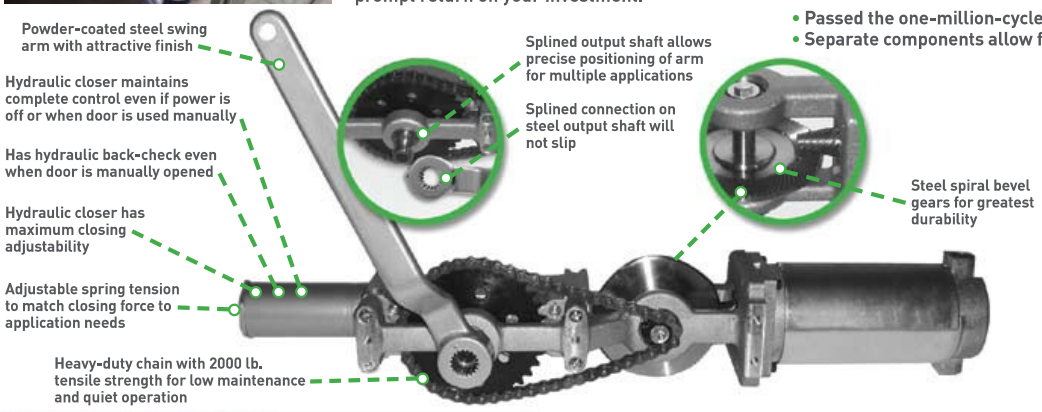
Product Features and Benefits

- Hydraulic design offers **proven reliability**
- Adjustable closing speeds to **enhance energy savings**
- Manual mode requires very little pressure to open **promoting ease of operation**
- Approved on fire door assemblies rated up to 3 hours, **maintaining security and safety**
- Hydraulic back-check during windy conditions **protects the door and operator from damage**

GT710/8710 Low-Energy ADA Swing Door Operator

The NABCO GT710/8710 Low-Energy Operator is engineered for interior and exterior use, and designed to automate essentially any new or existing door frame. The GT710/8710 operates in both automatic and manual modes with a hydraulic back-check that protects the door and mechanical operator from damage when forced open in windy conditions or when manually operated. The GT710/8710 Operator has been approved for use on fire door assemblies rated up to 3 hours. The low-energy performance, combined with the adjustable opening and closing speeds, reduces energy consumed, which offers a prompt return on your investment.

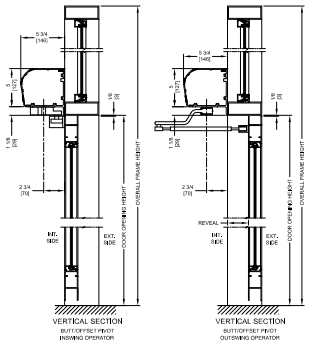
- Passed the one-million-cycle endurance test
- Separate components allow for lower repair costs



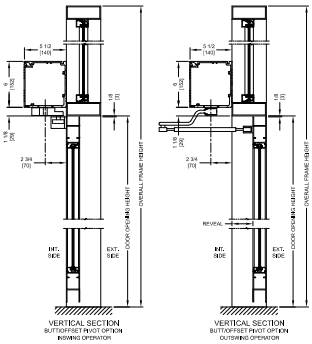
PRODUCT INFORMATION

Header dimensions	**Side load - 5" H X 5 3/4" D** (GT710) **curved header** **Side load - 6" H X 5 1/2" D** (GT8710)
Standard finish	**Clear and dark bronze anodized**
Optional finishes	**Painted, clad, special anodized**
Mounting	**Surface applied or overhead concealed**
Installation types	**Push or pull**
Operating voltage	**120 VAC @ <5 amps**
Auxiliary power output	**12VDC 750mA**
Operator drive	**Electro-hydraulic**
Motor voltage	**Pulse width modulated**
Motor type	**1/8th HP @ peak**
Control type	**Microprocessor**
Door panel weight	**300 lbs.**
Adjustable open	**Force and speed**
Adjustable close	**Force and speed**
Closing method	**Spring/hydraulic** (with selectable power assist)
Adjustable opening angle	**Up to 145º**
Power boost close	**Selectable**
Basic features	**Low-energy operation** **Push and go** **Obstacle detection in opening and closing cycles** **Sequential or timer mode operation** **LCD display for programming and diagnostics** **Open- or closed-circuit safety inputs** **Momentary or maintained activation**
Switch modes	**On, off, hold-open**
Opening and closing speed	**Adjustable**
Hold-open time	**Adjustable** (0-30 seconds)
Code compliances	**ANSI A156.19/ANSI A117.1**
Approvals	**UL, ULC**

GT710 Operator



GT8710 Operator



CONFIGURATIONS:
The GT710/8710 is available for multiple configurations, such as single doors, simultaneous pairs, and dual-egress, as well as the Opman configuration, which is a single continuous header for a pair of doors containing a manual closer on one side and an automatic operator on the other.

NABCO Service and Specifications

Along with the NABCO factory branches, NABCO has the largest independently owned network of automatic door distributors in North America. Their friendly, qualified installers and technicians always strive to exceed your expectations from install to after-sales service. NABCO's factory branches and independent distributors provide AAADM-certified technicians to ensure your doors meet all ANSI A156.10/A156.19 standards.

Complete three-part specifications and CAD drawings are available on the NABCO website.

NABCO
Member of the Nabtesco Group

Member AAADM

NABCO ENTRANCES INC.
S82 W18717 Gemini Drive | Muskego, WI 53150 | 877-622-2694 | Fax 888-679-3319
www.NABCOentrances.com | Email info@nabcoentrances.com

Distributed by:

06/15

PART 1 GENERAL

1.1 CASH ALLOWANCES

1. Comply with General Requirements of CCDC-2 2020 for Cash Allowances.

2. Include the following Cash Allowances in the Contract Price. These allowances shall be expended in whole or in part, when authorized by the Architect in writing. The unused portion of the Allowances shall be credited to the Owner.

3. The Contract Price and not the cash allowance, includes the Contractor's overhead and profit in connection with such cash allowance.

   No refund of overhead and profit will be expected on any unspent portion of Cash Allowances. Likewise, no overhead and profit will be allowed on total amount by which all Cash Allowances are exceeded.

4. Expend cash allowance as directed by the Consultant in writing. Allowance will be adjusted to actual cost, but no adjustment will be made to Contractor's charges including overhead and profit which are included in the Contract Price.

5. Cash allowances are designed for work and services deemed to be necessary by the Owner, from time to time, throughout the execution of the Work. Where a cash allowance refers to an item or category of work already included in the Contract Documents, it shall be assumed to cover work or services in addition to that included, unless specifically indicated otherwise.

6. Contractor may be required from time to time, to assist in tendering of certain items of work or services covered by allowance, as directed by Consultant.

7. Material Supply Items:

   1. Scope for material supply items covered by Cash Allowance includes:

      1. Net cost of material.

      2. Applicable taxes and duties.

      3. Delivery to site.

   2. In addition to above scope covered by Cash Allowance, include in Contract Price costs for:

      1. Handling at site, including unloading, uncrating, storage and hoisting.

      2. Protection from elements, from damage.

      3. Labour, installation, and finishing.

4. Other expenses required to do cash allowance work (i.e., contract co-ordination).

5. Overhead and Profit.

8. Material and Installation Items:

1. Scope of each material and installation item covered by Cash Allowance includes:

1. Net cost of material.

2. Applicable taxes and duties.

3. Delivery to site.

4. Handling at site, including unloading, uncrating, storage and hoisting.

5. Labour, installation, and finishing.

2. In addition to above scope covered by Cash Allowance include in Contract Price costs for:

1. Protection from elements, from damage.

2. Overhead and Profit.

3. Other expenses required to do cash allowance work (i.e., contract co-ordination).

9. Inspection and Testing Work:

1. Scope for inspecting and testing covered by Cash Allowance includes:

1. Net cost of testing laboratory services and field inspection.

2. In addition to above scope covered by Cash Allowance include in Contract Prices for:

1. Overhead and Profit.
2. Supply of material tested, patching and completion of work tested.
3. Other testing on re-testing work specified in Section 01400.
4. Other expenses required to do cash allowance work (i.e., contract co-ordination)

10. The following is a breakdown of the Cash Allowance Items **to be included** in the Contract Price:

	ITEM	VALUE +HST
	Inspection and Testing • Testing of topsoil • Testing of compacted fill • Other soils compaction testing • concrete testing • structural steel inspection/testing • mortar testing • asphalt testing • building envelope - air barrier, curtain wall, windows • waterproofing • sprayed fireproofing	$10,000.00
	Designated Substance Removal (Additional removal not already identified in the ACM Summary report)	$5,000.00
	Window covering for new windows in library (Additional window covering not else addressed in the specifications)	$20,000
	Interior Signage (supply and install) • door signage • bulkhead signage • Vision Strips • Updates to the existing school	$5,000.00
	Exterior Signage (Supply and Install) • New School Sing • Door signage	$10,000
	Low-voltage systems work by Hamilton Video and Sound. • including supply and installation of the new PA system head end, device removal in washroom, and the wiring and systems testing for removal/reinstallation of access controls/door operators and intercom devices at vestibule doors.	$35,000
	TELEPHONE INSTALLATION Upgrade Telephone System	$,7000.00
	LIBRARY EXIT DOOR TO BE ALUMINUM DOOR	$5,000.00
	SUMMARY OF CASH ALLOWANCE	**$97,000+ HST**

This total amount is to be included in the Base Bid Amount.

11. Progress payments on accounts of work authorized under cash allowances shall be included in the Consultant's monthly certificate for payment. Copies of invoices are to be submitted to substantiate claims.

PART 2 – <u>PRODUCTS</u> Not Used

PART 3 – <u>EXECUTION</u> Not Used

END OF SECTION

1. GENERAL

1.1. GENERAL REQUIREMENTS

1.1.1. Division One, General Requirements, is a part of this section and shall apply as if repeated here.

1.2. INTENT

1.2.1. Provide for the proper and complete installation of all roofing and flashings as required to prevent entry of moisture into the insulation and structure below the roofing and flashing.

1.3. QUALIFICATIONS

1.3.1. Work shall be executed by an applicator who has adequate plant, equipment and skilled tradesmen to perform this work 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. Likewise applicator must be a member of the C.R.C.A. and a member in good standing with the appropriate provincial roofing contractors association.

1.3.2. Applicator must be approved by the Consultant, Owner and the roofing material manufacturers.

1.3.3. Applicator shall provide a list of a least five (5) projects available for inspection employing same roofing system within 200km. radius of the project.

1.3.4. The intent is to have a complete roofing system provided by one manufacturer. The following manufacturers are considered to have equivalent systems/products suitable for use on this project; Siplast, Garland, Tremco, Soprema, IKO, Bakor.

1.4. PREQUALIFIED ROOFING CONTRACTORS

Flynn Canada Ltd.
6435 Northwest Drive
Mississauga, ON L4V 1K2
905-671-3971

H & N Roofing & Sheet Metal Ltd.
29 Bayview Crt.
London, ON N5W 5W5
519-453-1720

Nedlaw Roofing Limited
232-B Woolwich St. S.
Breslau, ON. N0B 1M0

519-648-2218

Smith-Peat Roofing & Sheet Metal Ltd.
152 Thames Road West
Exeter, ON N0M 1S3
519-235-2802

Solar Roofing & Sheet Metal Ltd.
3 Miller Street
Toronto, ON M6N 2Z6
416-658-6045

Specified Roofing Contractors Inc.
99 Englehard Drive
Aurora, ON L4G 3V1
905-727-0079

Trio Roofing
243 Advance Blvd.
Brampton, ON L6T 4J2
905-456-1688

Triumph Roofing
1 Connie St.
Toronto, ON M6L 2H8
416-534-8877

Semple Gooder Rfg Corp.
1365 Martin Grove Rd.
Toronto, ON M9W 4X7
416-743-5370

Dean Chandler Roofing
275 Comstock Rd.
Scarborough, ON M1L 2H2
416-751-7840

Bothwell Accurate Co.
6675 Rexwood Rd.
Mississauga, ON L4V 1V1
905-673-0615

Schrieber Bros Roofing
50 Hockley Dr.
Hamilton, ON L8E 3P1
905-561-7780

Atlas Apex Rfg.
65 Disco Road

Toronto, ON M9W 1M2
416-421-6244

Provincial Industrial Rfg.
166 Bowes Rd.
Concord, ON L4K 1J6
905-669-2569

Topline Rfg.
1325 Fewster Dr.
Mississauga, ON L4W 1A2
905-602-0760

BML Roofing Systems Inc.
15 Ryan Place
Brantford, ON N3S 7S1
519-751-0953

1.5. REFERENCES

1.5.1. CSA - Canadian Standards Association

1.5.2. CGSB - Canadian General Standards Board

1.5.3. ULC - Underwriters Laboratories of Canada

1.5.4. FM - Factory Mutual Engineering Corporation

1.5.5. CRCA - Canadian Roofing Contractors Association

1.5.6. Canadian Construction Documents Committee (CCDC), CCDC 2-2020 Stipulated Price Contract.

1.5.7. ASTM – Standards Test Methods for Sampling and Testing Bitumen Saturated Felts and Woven Fabrics for Roofing and Waterproofing.

1.6. ADMINISTRATIVE

1.6.1. Submit to the Consultant submittals listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

1.6.2. Work affected by submittal shall not proceed until review is complete.

1.6.3. Present shop drawings, product data, samples and mock-ups in SI Metric

units.

1.6.4. Where items or information is not produced in SI Metric units converted values are acceptable.

1.6.5. Review submittals prior to submission to the Consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected.

1.6.6. Notify the Consultant, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

1.6.7. Contractor is responsible to verify field measurements and all site conditions including adjacent properties and roof areas.

1.6.8. Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's review of submittals.

1.6.9. Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by the Consultant's review.

1.6.10. Keep one reviewed copy of each submission on site.

1.7. SHOP DRAWINGS & PRODUCT DATA

1.7.1. The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by the Contractor to illustrate details of a portion of the Work.

1.7.2. Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

1.7.3. Allow 7 days for Consultant's review of each submission.

1.7.4. Adjustments made on shop drawings by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to the Consultant prior to proceeding with Work.

1.7.5. Make changes in shop drawings as the Consultant may require, consistent with Contract Documents. When resubmitting, notify the Consultant in

writing of any revisions other than those requested.

1.7.6. Accompany submissions within containing:
1. Date.
2. Project title and number.
3. Contractor's name and address.
4. Identification and quantity of each shop drawing, product data and sample.
5. Other pertinent data.

Submissions shall include:
1. Date and revision dates.
2. Project title and number.
3. Name and address of:
4. Subcontractor.
5. Supplier.
6. Manufacturer.
7. Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
8. Details of appropriate portions of Work as applicable:
9. Fabrication.
10. Layout, showing dimensions, including identified field dimensions, and clearances.
11. Setting or erection details.
12. Capacities.
13. Performance characteristics.
14. Standards.
15. Operating weight.
16. Wiring diagrams.
17. Single line and schematic diagrams.
18. Relationship to adjacent work.

1.7.7. After Consultant's review, distribute copies.

1.7.8. Submit 3 prints of shop drawings for each requirement requested in specification Sections and as Consultant may reasonably request.

1.7.9. Submit 3 copies of product data sheets or brochures for requirements requested in Specification. Sections and as requested by the Consultant where shop drawings will not be prepared due to standardized manufacture of product.

1.7.10. Delete information not applicable to project.

1.7.11. Supplement standard information to provide details applicable to project.

1.7.12. If, upon review by the Consultant no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication

and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

1.7.13. The review of shop drawings by the Consultant is for sole purpose of ascertaining conformance with general concept. This review shall not mean that the Consultant approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting all requirements of construction and Contract Documents. Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of all sub-trades.

1.8. HANDLING & STORAGE OF MATERIALS

1.8.1. Handle and store materials carefully to prevent damage. Manufacturer's labels, seals and identification shall remain intact. Store containers upright and roll materials on end to prevent flattening. Protect materials from moisture at all times.

1.8.2. Deliver materials in sufficient quantities to allow for continuity of work.

1.8.3. Co-ordinate delivery with Owner.

1.8.4. Store materials marked "keep from freezing" in areas where temperatures will remain above 4°C (40°F).

1.8.5. Contractor shall assume responsibility for the protection and safekeeping of products stored on the job site.

1.8.6. Provide a continuous fence at grade level around all machinery, material and equipment 7'6" in height with welded mesh and welded tubing that includes a gate/door with locking gate to meet or exceed manufacturer’s recommendations.

1.8.7. The Contractor's materials and equipment shall be kept orderly and shall not encumber operations of facilities. Job site shall be maintained free of marketing signage.

1.9. INSPECTION & TESTING

1.9.1. Roofing shall be completed in strict accordance with specifications, conforming to best trade practice and to the satisfaction of the Owner or his authorized representative. Afford facilities and access for inspecting the

work as required and immediately act upon instructions given.

1.9.2. Notify inspection authority minimum two working days in advance of commencing work and provide further notification as required due to temporary postponement of work, etc.

1.9.3. Make and repair all cut tests for testing purposes at locations requested. Cut tests will be made during progress of work or on completion of work. Wherever possible, tests will be made before workmen have left the site, all at no additional cost to the contract.

1.9.4. Samples of roof membrane from cut tests and samples of material taken from containers may be kept by the Consultant. These samples may be submitted to an independent laboratory for testing purposes. Cut test locations should be reinstated with material and installation as specified immediately after cut tests have been provided.

1.9.5. Should test results prove that a material is not functionally equal to specified material:

Contractor shall pay for all testing. Roofing installed and found not to comply with the specifications shall be removed and replaced at no change in the contract price.

1.9.6. Membrane manufacturer to inspect installation to ensure compliance with product application requirements. It is the Contractor's responsibility to arrange with the manufacturer's representative to provide inspections. The manufacturer's representative shall visit the project during the course of roofing work often enough to ensure that the work is being undertaken in accordance with the manufacturer's written recommendations. The Consultant shall be notified of all such visits in writing.

1.9.7. When all work is substantially completed the Roofing Contractor shall arrange for an inspection. At this time the Roofing Contractor's superintendent and foreman should be present. The Roofing Contractor should also arrange for the manufacturer's representative of the roof membrane to be in attendance.

1.9.8. If work is deemed incomplete or discrepancies are found by the Consultant, complete the outstanding items and rearrange for a further inspection.

1.9.9. The Roofing Rontractor shall correct all deficiencies before a date agreed upon by the Consultant and Owner.

1.9.10. The inspection and testing service does not relieve the Contractor’s responsibility for quality control of production and for errors made the Contractor.

1.10. REJECTED WORK

1.10.1. Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Consultant as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

1.10.2. Make good other Contractor's work damaged by such removals or replacements promptly.

1.10.3. If in opinion of Consultant it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner may deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which shall be determined by Consultant.

1.11. EXAMINATION

1.11.1. Prior to commencement of work, examine surfaces and ensure that defects of level or construction are corrected before proceeding with work. Commencement of work shall imply acceptance of surfaces.

1.12. WORK RESTRICTIONS

1.12.1. Do not load or permit any part of the structure to be loaded with a weight that will endanger its safety. Questions of structural loading as part of construction means and methods shall be addressed by a licensed Structural Engineer engaged by the Contractor.

1.13. CO-ORDINATION

1.13.1. Co-ordinate work with other trades and ensure all openings, drains pipes, sleepers, etc., are installed and flashed at the appropriate time.

1.13.2. Co-ordinate progress of the work, progress schedules, submittals, use of site temporary utilities and construction facilities.

1.13.3. The Contractor shall have a competent foreperson or superintendent on the job site at all times during the execution of the contract when work is in progress. This foreperson shall not be changed without permission unless the Consultant deems that this foreperson is unsatisfactory to carry out the work, or if the foreperson's employment is terminated. This foreperson shall represent the Contractor for each specific phase and any minor direction given this foreperson will be held as being given to the Contractor.

1.13.4. It shall be the responsibility of the Contractor's foreperson to inform General Contractor which areas are to be worked upon and to determine what

measures may be necessary to limit disruption of the building activities to a minimum.

1.14. PROTECTION

1.14.1. Protect the building and work of other trades from soiling and other damage. Damage to the building as a result of this work shall be repaired as instructed, all at no extra cost to the contract. Protect the interior of the building as required and directed.

1.14.2. Contractor shall be responsible for protection of property during course of work. Lawns, shrubbery, paved areas and building including interior shall be protected from damage. Repair damage at no extra cost to contract.

1.14.3. Roof installation shall be scheduled in such a manner that traffic over new roofing is eliminated. Wherever traffic cannot be avoided, adequately protect roof areas with plywood sheathing, etc. Damage to roofing shall be repaired as instructed by the Owner or authorized representative at no extra cost to the contract.

1.14.4. Arrange work sequence to avoid using newly constructed roofing for storage, walking surface or equipment movement.

1.14.5. Protect building surfaces at set-up areas with tarpaulin and secure tarpaulin. Spilled or scattered debris shall be cleaned-up immediately. Removed material to be disposed from roof as it accumulates.

1.15. PROJECT MEETINGS

1.15.1. The Consultant will call an initial project meeting. The Roofing Contractor must invite the superintendent and foreman to fully participate in this initial briefing meeting.

1.15.2. The agenda of the briefing meeting will include:

1. Introduction all key personnel participating in the project.
2. Establishing limits on work hours, access, movements on site, etc.
3. Reviewing the approved work schedule.
4. Establishing all administrative and procedural matters.
5. Providing all procedural forms and communication routing.
6. Establishing regular periodic project meetings throughout the progress of work.
7. Provide physical space and make arrangements for meetings.
8. Chair the meeting and record the minutes. Include significant proceedings and decisions. Identify actions by parties.
9. Reproduce and distribute copies of minutes within three days after each meeting and transmit to meeting participant, affective parties not in attendance, the Consultant and Owner.

1.16. CONSTRUCTION SAFETY MEASURES

1.16.1. Observe construction safety measures of Provincial Government, Workers'/Workmen's Compensation Board and municipal authority provided that in any case of conflict or discrepancy more stringent requirements shall apply.

1.16.2. In event of conflict between any provisions of above authorities the most stringent provision will apply.

1.16.3. The Contractor shall comply with the safety regulations presently in effect in this Province and shall provide such supervision and apparatus necessary for the safety of all concerned.

1.16.4. All application, material handling, and associated equipment shall conform to and be operated in conformance with the guidelines as outlined by the "Workplace Hazardous Materials Information System" (WHMIS), the Ministry of Labour, the Occupational Health and Safety Act (OS) and the "Foreman's Safe Roofing Guidelines".

1.16.5. The Contractor must follow the Ministry of Labour's guidelines and recommendations. The Consultant is to receive a copy of this document.

1.16.6. Comply with federal, provincial, local and Owner's fire and safety requirements.

1.16.7. Maintain fire extinguisher equipment in sufficient quantity and size as per Provincial Health and Safety Regulations and within easy access whenever power tools, roofing kettles and torches are being used.

1.16.8. Ensure that no part of the building is subject to a load, which will endanger its safety or cause permanent deformation.

1.16.9. The Contractor will adequately train and instruct workers in accordance with WHMIS requirements and will provide the Owner with detailed information with respect to the training provided to workers, the language in which instructions are given and a copy of training manuals used.

1.16.10. The Contractor will consult with the Consultant and if required further consult with Ministry of Labour co-ordinator regarding the physical set up of the job site and comply with any orders of the co-ordinator in that regard.

1.16.11. The Contractor will supply the Consultant with a list of hazardous materials to be used and "Material Safety Data Sheets" for them to be kept, in a readily accessible location for the duration of the project.

1.16.12. The Contractor will not bring any controlled products onto the Owner's property that are not labelled in accordance with WHMIS requirements.

1.16.13. The Ministry of Labour co-ordinator is permitted to inspect the work site at any time and to speak to workers to determine the adequacy of their safety knowledge if they consider it necessary. Any violation of Ministry of Labour requirements may result in work being stopped until they are rectified. Repeated or serious violations may result in cancellation of the contract.

1.16.14. The Contractor will indemnify the Owner for any costs the Owner incurs as a result of his failure to comply with Occupational Health and Safety Act.

1.16.15. Provide and maintain protection and warning signs at all areas, which may be dangerous to the occupants or the public.

1.16.16. Remove all ladders from the building at the end of each working day to prevent unauthorized access to the building and cause possible damage.

1.16.17. Disconnect propane burners from bottles at the end of each working day. Store propane bottles in protected area away from ignition source and building.

1.16.18. Contractor's workers shall be properly protected and use all required protective clothing including face masks, goggles and gloves, etc.

1.17. ENVIRONMENTAL

1.17.1. Apply only dry materials and apply only during weather that will not introduce moisture into roofing system. Do not apply material during inclement weather or over damp, frozen or unsuitable substrate.

1.17.2. Do not install materials marked "keep from freezing" when daily temperatures are scheduled to fall below 4°C (40°F).

1.17.3. Do not perform masonry work below 2°C (35°F). Make proper provisions to protect work from freezing forty-eight (48) hours after layer if work is performed between 2°C (35°F) and 7°C (45°F).

1.17.4. Store solvent-soaked cleaning rags in approved containers in a location to prevent a threat to fire safety or health of the building occupants or workmen. Dispose from site daily.

1.18. MATERIALS SOURCE SEPARATION PROGRAM

1.18.1. Separate building materials for recycling that are to be removed from site.

1.18.2. Provide containers to deposit reusable and/or recyclable materials.

1.18.3. Locate containers in locations, to facilitate deposit of materials without hindering daily operations.

1.18.4. Locate separated materials in areas which minimize material damage.

1.18.5. Collect, handle, and transport off-site, salvaged materials in separate condition. Transport to an appropriate recycling facility

1.19. WORKFORCE

1.19.1. Once roofing commences, work shall not be postponed for any reason other than weather. Roofing crew shall consist of qualified and experienced personnel and/or more if required due to size and/or schedule of completion. The workforce shall not be changed without written permission from the Consultant.

1.20. GUARANTEE / WARRANTY

1.20.1. The Contractor represents that the Contractor has the special qualifications for doing the Work and that the plans and specifications are, in the Contractor's opinion, appropriate and adequate for the construction and/or renovations set out therein.

1.20.2. The Contractor and Subcontractor hereby jointly and severally warrant the work of this section, including roof membrane, vapour retarder, insulation and sheet metal work against any actual leakage for a period of two [2] years from the date of substantial performance, and agree to make good promptly any defects which occur or become apparent within the warranty period, such defects to include but not be restricted to leaking, failure to stay in place, undue expansion, lifting, deformation, loosening or splitting of seams, joint declaration, failure to adhere, deterioration, blisters, etc.

1.20.3. The Contractor shall furnish the guarantee/warranty in writing, on a form satisfactory to the Owner or the authorized representative signed.

1.20.4. The guarantee/warranty period shall commence from the day of substantial performance.

1.20.5. The specified roofing membrane system shall carry a manufacturer's extended limited warranty. The length of the warranty period shall be for a period of ten [10] to thirty [30] years from the date of substantial performance for materials, including labour, to repair leaking membrane and maintain the roofing membrane in a watertight condition.

1.20.6. The Contractor's guarantee and the manufacturer's extended warranty are to exclude: normal wear and tear, damage caused by neglect, carelessness of vandalism caused by the installation or removal of any equipment and or material built into or part of the roofing membrane system, damage caused by excessive traffic over the roofing membrane, or use of the roof area for the purpose that is was not intended, or damage structure building components and finishes or building contents.

1.20.7. The shipment of and arrival on the site of the manufacturer's materials will constitute the manufacturer's agreement to warrant the roof in accordance with the conditions as outlined above.

1.20.8. The Owner's representatives are to conduct an inspection of the project 60 days prior to the expiration of the two [2] year roofing guarantee. The Contractor will be contacted at the time if any deficiencies related to the guarantee and/or long-term warranty are evident and will require attention. The Contractor will correct the deficiencies before the expiration of the Contractor's guarantee or make arrangements for the correction.

1.21. COMPLETION

1.21.1. Clean-up and remove all debris, surplus materials, tools and equipment, etc., upon completion of work to the satisfaction of the Consultant.

1.22. WORKMANSHIP

1.22.1. Workmanship shall be of the highest quality. Use competent trades people and execute work in accordance with contract documents.

1.22.2. Regard manufacturer's printed recommendations and latest literature as the minimum requirement for materials, method and procedures.

1.22.3. Notify the Consultant should the specifications conflict with the manufacturer's recommendations, otherwise it will be assumed that the Contractor and manufacturer are in agreement with procedure outline.

1.22.4. Advise the Consultant of adjustments to specified roofing procedures recommended by manufacturers caused by weather and site conditions. Make adjustments to specified procedure only after review with the Consultant, and receive approval in writing.

1.22.5. When roofing operations require open torch operation advise Roofing Consultant of nature of work. In such cases higher safety and insurance limits may be imposed. Any additional cost to meet these requirements will be at the Contractor's expense.

1.22.6. Unsuitable or damaged materials shall immediately be removed from the site.

1.22.7. Wherever two or more plies of membrane are applied, the second ply, etc., shall extend minimum 6" (150mm) beyond the termination of the previous ply of membrane.

1.22.8. Roof curb and sleeper heights shall be minimum 12" (300mm) measured from the surface of the completed roof system to the top. This applies to prefabricated curbs and sleepers as well as those provided by the carpenters.

1.23. INSPECTION & DECLARATION

1.23.1. Contractor's Inspection: Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents. Notify the Consultant in writing of satisfactory completion of Contractor's Inspection and that corrections have been made. Request Consultant's Inspection.

1.23.2. Consultant's Inspection: Consultant and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.

1.23.3. Completion: submit written certificate that following have been performed: Work has been completed and inspected for compliance with Contract Documents. Defects have been corrected and deficiencies have been completed. Equipment and systems have been tested, adjusted and balanced and are fully operational. Operation of systems have been demonstrated to Owner's personnel. Work is complete and ready for Final Inspection.

1.23.4. Final Inspection: when items noted above are completed, request final inspection of Work by Consultant, and Contractor. If Work is deemed incomplete by Consultant, complete outstanding items and request re-inspection.

1.24. SHEET METAL WORK

1.24.1. Sheet metal work shall be of the highest quality installed in accordance with best trade practice and to the following requirements.

1.24.2. Apply two coats of bituminous back paint to all surfaces of metal in contact with masonry, concrete or dissimilar metals.

1.24.3. Seams shall be of the "slip lock type" that permit adequate movement without resulting in deformation or loosening of metal flashings. Lapped joints or exposed raw edges will not be accepted. Exposed edges shall be "doubled back" at least 1/2" (12.5mm). At eaves, parapets, etc., metal shall be hooked over continuous starter strips minimum one gauge thicker

than the metal used for flashing. Secure starter strips at 12" (300mm) on centre or closer as required.

1.24.4. Fabricate all possible work in shop in maximum 8' (2450mm) lengths by brake forming, bench cutting, drilling and shaping. On vertical sections or horizontal planes greater than 30" (750mm) install metal in 4' (1200mm) section unless otherwise specified or shown.

1.24.5. Space joints evenly where exposed. When flashing is being installed in more than one piece, offset joints in adjacent flashings by approximately 50%.

1.24.6. Form inside and outside corners by means of standing seams.

1.24.7. Slope all metal to interior to maintain minimum 8% slope. Do not form metal in a manner where water will pond on top of metal flashing.

1.24.8. Where metal terminates under fascia boards, secure metal at 24" (600mm) on centre using specified fasteners. At curbs to openings or at sleepers, etc., provide locked or standing seams at corners.

1.24.9. Where metal flashings enter reglets, ensure reglet is minimum 3/4" (18.75mm) deep and minimum 3/8" (9.37mm) wide. Metal flashing portion that enters reglet shall extend the full depth and be complete with a 3/8" (9.37mm) return upstand to permit proper securement in the reglet. Secure metal flashings in reglets at 24" (600mm) centres and further secure metal to vertical surface at locks.

1.24.10. At reglets wider than 3/8" (10mm) and deeper than 3/4" (19mm) provide polyethylene rod, 25% wider than joint width.

1.24.11. All flashings shall be installed in perfectly straight lines. Irregular or badly fitted work will not be accepted. Exposed fastenings will only be permitted where concealed fastening is impossible. Provide neoprene washers at exposed fastenings.

1.24.12. Where sheet metal counter-flashings are the only form of waterproofing, provide waterproofing underlayment prior to installing metal. Overlaps of underlayment shall be minimum 2" (50mm) and end laps minimum of 6" (150mm).

1.25. SAMPLES OF SHEET METAL FLASHINGS

1.25.1. Install mockup samples of metal flashings indicating method of joints, fastening, seams, expansion joints and stiffeners for approval by Consultant or Owner prior to fabrication.

1.25.2. Commencement of metal flashing installations implies that this Contractor has accepted the surfaces as satisfactory and accepted responsibility for appearance of completed work.

1.26. SCOPE OF WORK

1.26.1. Unless specified otherwise supply and install sheet metal counter-flashings at perimeters, walls, parapets and curbs, etc., as required and directed.

1.26.2. Unless specified otherwise supply and install wood sleepers, to support equipment at locations directed, complete with wood blockings and cant strips minimum 12" (300mm) high measured from surface of completed roof. Sleepers shall be covered with membrane flashings and metal counter flashings. Construct sleepers using continuous 2 x 6 (50mm x 150mm) wood blockings.

1.26.3. Unless specified otherwise supply and install "stack jacks" specified. Trim height of existing pipes as required and/or extend existing pipes as required and directed. Maintain a minimum height of 12" (300mm) above the completed roof surface.

1.26.4. Unless specified otherwise supply and install spun aluminum chimney stack base flashing complete with aluminum collars, etc., minimum 12" (300mm) in height.

1.26.5. Install Torch Safe strips at junction of vertical surfaces.

1.26.6. All conduits, piping, etc., that pass through sleeves and curbs to roof openings, etc., shall be installed by using products specified.

1.26.7. Parapet shall be totally covered with membrane flashings and sheet metal counter-flashings.

1.26.8. Unless specified otherwise supply and install gasline supports as specified. Provide 1/4" (6.25mm) space between the gasline clamp and the pipe itself. Gasline piping not in use shall be removed. All work relating to gaslines is to be completed by a licensed gas fitter. All gaslines are to be cleaned and painted.

1.26.9. Unless specified otherwise provide MERS-800A duct supports supplied by Thaler Metal Industries Ltd.

1.26.10. Unless specified otherwise install specialty supports for outside lighting supplied and specified by Division 16 – Electrical.

1.26.11. Where ductwork passes through the top of roof curbs provide tapered wood blockings surfaced with 1/2" plywood covered with membrane flashings extending minimum 12" up the vertical surface of the ductwork.

1.26.12. Where ductwork passes through walls extend modified membrane onto ductwork approximately 12" and ensure tapered insulation of ductwork slopes away from wall.

1.26.13. Where several pipes pass through the top of a large roof curb provide metal base flashings including metal cover and provide tapered wood blockings surfaced with 1/2" plywood completely covered with membrane flashings.

1.26.14. Where gaslines pass through the top of a roof curb, the roof curb is to be extended in height minimum 6" above gaslines where the gaslines will pass through the side of the curb.

1.26.15. Supply and install scupper drains.

1.26.16. Supply and install fully tapered polyisocyanurate insulation specified and provide additional slope if required to achieve positive drainage. Roofing Contractor is responsible to ensure positive drainage.

1.26.17. Unless specified otherwise where rigid electrical conduits pass through roof supply and install electrical outpost supplied by Lexcor; where flexible conduits pass through the roof provide wire outlet post supplied by Lexcor.

1.26.18. Provide high temp caulking sealant where hot pipes pass through top of curbs and base flashings and around collars.

1.26.19. Coordinate with requirements for installation of skylight, by Section 08452, and / or install tubular daylighting devices provided by Section 08625.

2. PRODUCTS

2.1. Products shall conform to the requirements of jurisdictional authorities, to C.S.A and C.G.S.B. specification number named including all revisions to date.

2.2. Products substituted without prior written approval shall be removed from the site and areas disturbed shall receive specified products.

2.3. Compatibility of roof system components is essential and this shall be confirmed by the applicator.

2.4. Product data sheets and material data sheets shall be issued to the Consultant prior to ordering materials.

2.5. Submit sample of products prior to ordering and do not order products or start work before receiving Owner's written approval.

2.6. Asphalt primer – PA-917 LS primer conforming to C.G.S.B. specification #37-GP-9A.

2.7. Adhesive – Parafast or Millenium Adhesive supplied by Siplast.

2.8. Steel deck overlayment – 5/8" (16mm) prime glass-faced gypsum roof board (Dens-Deck prime), supplied by Georgia-Pacific Corporation.

2.9. Vapour retarder and reinforcement - applicable to steel deck overlayment – Paradiene 20 TG, 2.32mm modified membrane conforming to CGSB 37-G-56M supplied by Siplast.

2.10. Roof membrane composition - modified bituminous base sheet membrane 2.32mm Paradiene 20 TG EG surfaced with a modified cap sheet membrane 3.94mm Paradiene 30 TG Bright White (BW)with publish SRI 90 granular cap supplied by Siplast.

2.11. Membrane Flashings - modified bituminous base sheet membrane 2.32mm Paradiene 20 SA surfaced with a modified cap sheet membrane 4.14mm Parafor 30 TG (BW) with published SRI 90 granular cap supplied by Siplast. Colour to be selected by Owner and Consultant from manufacturer's full range of colours.

2.12. Waterproofing Underlayment – Paradiene 20 SA 98mls (2.55mm) thickness 3.28ft (1.00m) 33.5ft (10.21m) length self-adhesive modified bitumen membrane consisting of light weight random fibrous glass mat impregnated and coated with high quality styrene butadiene-styrene (SBS) modified bitumen with TA 325 self adhesive primer . Supplied by Siplast.

2.13. Cant strips - 3" x 3" (75mm x 75mm) torch safe cant strips supplied by Siplast.

2.14. Stack Jacks (pipe flashing) - SJ-41A 12" in height pre-insulated aluminum "stack jacks" supplied by Thaler Metal Industries Inc.

2.15. Miscellaneous Flashings (for protrusions through roof) – Provide ChemLink . Para Pro 123 Flashing System as supplied by Siplast

2.16. Sheet Metal for Flashing - 26 ga. pre-painted galvanized steel series 8000 supplied by Stelco - colour to be selected by Owner and Consultant prior to prefabrication from manufacturer's full range of colours.

2.17. Miscellaneous Metal for Flashing - for "hook-on" strips, fastening strips, metal bellows, etc., same metal as specified for sheet metal flashing but thickness shall be 1 ga. thicker.

2.18. Back paint for metal - asphalt primer (two coats) conforming to C.G.S.B. specification #37-GP-9.

2.19. Nails, bolts, screws and other fastenings - compatible with metal specified. Size of fasteners and type shall suit applicable conditions and must be approved by Owner or his authorized representative prior to use.

2.20. Roof drains – specified by Division 15 – Mechanical.

2.21. Plastic cement – PA-1021 plastic conforming to ASTM D 4586 Type II forasbestos free, asphalt base roof cement supplied by Siplast.

2.22. Caulking Sealant – PS 209 elastomeric sealant colour gray meeting CAN-19-13M82. Supplied by Siplast.

3. EXECUTION

3.1. PREPARATION

3.1.1. Remove all dust, dirt and debris from substrate and ensure same is smooth and free of all foreign matter. Perform only as much roof that can be completed each day or before showers commence. Take whatever action is necessary to prevent moisture from entering during roofing installations. Vacuum roof deck surfaces if necessary.

3.1.2. Inspect roof deck to determine if additional work is required before proceeding.

3.1.3. Any sharp projections, that in the opinion of the Consultant may penetrate the vapour retarder, shall be grounded smooth and flush.

3.2. ASPHALT PRIMING

3.2.1. Apply primer at the rate of 1 gal. (4.5L) per 100 sq. ft. (9m2) by brush or spray method. Work primer into surface by brooming and allow sufficient time for primer to penetrate and ensure same does not run into the building or stain aesthetic surfaces. Limit quantity of primer at deck openings and at points of termination to prevent damage to the building's interior.

3.2.2. Apply primer to vertical surfaces commencing at the top of cant strips and terminate primer 1" (25mm) below reglets and/or highest possible point.

3.2.3. Apply asphalt primer over all cementitious decks.

3.3. STEEL DECK OVERLAYMENT

3.3.1. Apply adhesive to the steel deck in ribbon form by mechanical means at the recommend rate parallel to flutes and centred on high sections of deck. On 8" (200mm) modular decks apply 2 ribbons of adhesive. Immediately place dens-deck with the long sides at right angles to the run

of the deck. All joints must be staggered and no pieces less than 1/3 of the full size sheet will be accepted. Apply vapour retarder over the surface of the dens-deck. Conform to "rated system" requirements.

3.4. VAPOUR RETARDER

3.4.1. Apply vapour retarder in straight lines, smooth, free from air pockets, wrinkles, fishmouths, open laps or tears, etc. Reinforce and extend vapour retarder minimum 12" (300mm) at perimeter, vertical walls, pipes and other abutments. Continuously secure and laminate reinforcement to vapour retarder. Envelope insulation with vapour retarder and reinforcement by minimum 6" (150mm), all continuously secured to insulation.

3.4.2. Applicable to steel deck overlayment and cementitious deck – install Paradiene 20 TG membrane torch installed over dens-deck. Overlaps shall be minimum 4" (100mm) on side laps and all end laps shall be minimum 3" (75mm).

3.5. ROOF BOARD INSULATION

3.5.1. Place Paratherm polyisocyanurate roof insulation with all joints staggered over the vapour retarder membrane with the longest side parallel to the perimeter where work is commencing. Where cutting and fitting is required, minimum width of insulation must be 12" (300mm). Do not force insulation into place. Cut neatly at protrusions and points of termination. Replace all broken, damaged or misfit boards as work progresses. Protect insulation from moisture during all phases of the application progresses. Paratherm is to be set in Parafast by Siplast a highly elastomeric, two components, one step, all purpose, foamable adhesive that contains no solvents and sets in minutes. Apply adhesive to vapour retarder with specified adhesive applied in 2 cm. wide bands every 33 cm using the manufacturer's recommended applicator. Protect insulation from moisture during all phase of application process. Remove any temporary waterproof cut off prior to continuing with further work.

3.5.2. Subsequent layers of Paratherm polyisocyanurate insulation shall be applied with specified adhesives at the same application rate and bead spacing as the previous layer. Ensure all layers of Paratherm polyisocyanurate roof insulation are offset at joints of each layer by minimum 12" (300mm). Tapered polyisocyanurate insulation is to be positioned on top of the flat stock polyisocyanurate and below the cover board.

3.5.3. Tapered insulation shall be installed on top of the polyisocyanurate insulation prior to installing the insulation cover board. Tapered insulation to be set Parafast adhesive and at the same bead spacing and application rate as previous layer.

3.6. INSULATION COVER BOARD

3.6.1. Cover board shall be installed with specified adhesives at the same application rate and bead spacing as the previous layer(s) of insulation. Ensure cover board is offset at joints by minimum 12" (300mm). Walk cover-board in to place to ensure good contact.

3.7. INSTALLATION OF TORCH SAFE CANT STRIPS

3.7.1. Apply a single continuous and uniform bead OF Parafast adhesive in 2 cm. wide bands every 33 cm using the manufacturer's recommended applicator to the surface of the cover board and embed the cant strips in place.

3.8. ROOF MEMBRANE BASE SHEET

3.8.1. Initially apply base sheet over cover board terminating 2" (50mm) above top of cant strips. Membrane shall be torched into place. Side laps shall be minimum 3" (75mm) and end laps minimum 6" (150mm) all continuously torched into place.

3.8.2. Starting at low points of each roof area apply modified bituminous membrane base sheet torched into place.

3.8.3. Rolls must first be unrolled to align each course then rerolled before torching commences.

3.8.4. Base sheet membrane not to be left exposed longer than ten days before cap sheet is applied. It is recommended the cap sheet application be completed immediately after base sheet has been installed.

3.8.5. At the end of each working day all insulation and cover board must be covered with a minimum of base sheet membrane.

3.9. ROOF MEMBRANE BASE SHEET FLASHING

3.9.1. Extend base sheet from a point 4" (100mm) on the flat roof surface terminating at the highest possible points and at eaves, parapets, copings the flashing membrane shall extend across the top and down the fascia to a point 1/2" (12.5mm) above the lowest terminating point of metal flashing at fascia.

3.9.2. Width of base sheet 1m wide, with lengths to fit, are to be cut from across the width of the rolls and torched or self adhere into place with no voids and with all laps sealed and mitres neatly cut and well sealed.

3.9.3. At sloping roofs base sheet membrane is to terminate 3ft up the sloping roof.

3.10. ROOF MEMBRANE CAP SHEET

3.10.1. Over the surface of the base sheet place the 4mm cap sheet into place and simultaneously heat the surface of the base sheet and underside of cap sheet to a point where the bitumen flows at a sufficient temperature to form homogeneous mass consisting of the base and cap sheet. Slowly roll membrane into the continuous bead of hot melted bitumen overlaps of the cap sheet shall not coincide with the base membrane but be offset by minimum 12" (300mm). Side laps shall be 3" (75mm) (follow selvage edge lines and end laps shall be 6" (150mm). The cap sheet shall terminate at the base of all cant strips.

3.10.2. The rolls must first be unrolled to align each course and then rerolled prior to torching the membrane into place.

3.10.3. All end laps of adjacent sheets are to be degranulated before the cap sheet membrane sheets are bonded together.

3.10.4. Liquid modified bitumen must flow in front of the cap sheet as it is being rolled onto the base sheet to ensure proper and complete adhesion. A bead of bitumen must flow out at the side lap onto the adjacent surface to seal the side laps.

3.10.5. Bleed outs of bitumen onto adjacent surfaces must be covered with additional loose granules the same colour as the cap sheet.

3.10.6. All end laps are to be neatly cut, the underlying selvage edge corners mitred and the cap sheet is to be neatly cut and fitted around all openings, sleeves, drains and curbing.

3.10.7. Care is to be taken not to walk on the freshly applied cap sheet and any marring or damaging of the cap sheet surface must be repaired either with additional granules broadcast into melted bitumen or with an additional ply of cap sheet. Contractors shall have a wet sponge on site at all time when applying the cap sheet membrane.

3.10.8. If a piece of cap sheet for repair is needed then this piece is to be at least 18" long and is to extend from the side lap of the repaired sheet over to butt against the side lap of the adjacent cap sheet course (The selvage strip is to be removed from the piece of repair material).

3.11. ROOF CAP SHEET FLASHING MEMBRANE

3.11.1. Apply one ply 4mm granular cap sheet as previously specified extending from a point 6" (150mm) on the flat roof surface terminating at highest possible point and at eaves, parapets and copings the flashing membrane shall extend across the top and down the fascia to a point 1/2" (12.5mm) above the lowest terminating point of metal flashing at fascia.

3.11.2. Width of the cap sheet 1m wide with lengths to fit, are to be cut from across the width of the rolls and torched into place with no voids and with all laps sealed and mitres neatly cut and well sealed.

3.11.3. All laps at mitres at adjacent sheets and the underlying cap sheet membrane surfaces are to be degranulated before the cap sheet membrane is torched into place

3.11.4. At parapets with a metal upstand to terminate membrane flashings a bead of sealant is to be applied and covered with granular

3.11.5. Mechanical fastening at curbs shall consist of nailing at the top at 6" (150mm) oc. Wherever reglets occur and at vertical surfaces apply a bead of Parafast(PS-304 Sealant) where membrane terminates and secure 1" (25mm) below with a continuous metal fastening strip at 12" (300mm) oc.

3.11.6. "Strip-in" flanges of "stack jacks" and other flashing flanges with the flashing membrane basically as previously specified. Ensure flanges are primed and set into (PA-828 Flashing Cement) a bed of hot asphalt set in over the base sheet. The prime membrane shall be torched to the flange all as specified and directed. Around the base of the stack jack provide Parafast adhesive (PS-304 Sealant) and granular to match the colour of the membrane.

3.12. ROOF DRAINS

3.12.1. Temporarily block drain pipe during installation and ensure insulation thickness has been reduced.

3.12.2. Copper drains shall be set into a bed of Mastic. Ensure flashing flange is primed and strip-in flange with base sheet and cap sheet membrane.

3.12.3. Referring to scupper drains, ensure that same are prefabricated, complete with gravel stop, and flanges are primed. Extend base membrane through the scupper opening and turn the membrane down the face. Set scupper into a bed of Mastic, secure and strip-in flanges with cap sheet membrane.

3.13. CAULKING

3.13.1. Apply caulking sealant into all reglets and at points deemed necessary by the Owner or his authorized representative following installation of metal flashing. Caulking sealant shall be applied in strict accordance with the manufacturer's literature. Ensure caulking is tooled to provide and even finish. Colour of caulking shall match sheet metal counter-flashings or other adjacent material confirmed by the Consultant.

3.13.2. Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.

3.13.3. Clean bonding joint surfaces of harmful matter substances including

dust, rust, oil grease, and other matter which may impair work.

3.13.4. Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

3.13.5. Ensure joint surfaces are dry.

3.13.6. Prepare surfaces in accordance with manufacturer's directions.

3.13.7. Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.

3.13.8. Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

3.13.9. Apply bond breaker tape where required to manufacturer's instructions.

3.13.10. Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

3.13.11. Apply sealant in accordance with manufacturer's written instructions.

3.13.12. Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.

3.13.13. Apply sealant in continuous beads.

3.13.14. Apply sealant using gun with proper size nozzle.

3.13.15. Use sufficient pressure to fill voids and joints solid.

3.13.16. Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.

3.13.17. Tool exposed surfaces before skinning begins to give slightly concave shape.

3.13.18. Remove excess compound promptly as work progresses and upon completion.

3.13.19. Cure sealants in accordance with sealant manufacturer's instructions.

3.13.20. Do not cover up sealants until proper curing has taken place.

3.14. CLEANUP

3.14.1. Clean adjacent surfaces immediately and leave work neat and clean.

3.14.2. Remove excess and droppings, using recommended cleaners as work progresses.

3.14.3. Remove masking tape after initial set of sealant.

3.15. VENT AND OTHER PIPES PROTRUDING THROUGH DECK

3.15.1. Install stack jacks, etc., including all accessories, specified and supplied by Division 15 and / or Division 16. Ensure flanges are primed and set in a continuous bed of asphalt. "Strip-in" flanges with 3-ply flashing membrane. Extend first ply 6" (150mm), second ply 9" (225m) and the third ply 12" (300mm) beyond the flange.

END OF SECTION

1. GENERAL

1. GENERAL REQUIREMENTS

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

2. QUALIFICATIONS

1. Manufacturers approved for the work of this Section are:

1. Kawneer Company, Canada Limited.
2. Muraflex
3. Fulton Windows (Commdore Aluminum doors)
4. Alumicor
5. Aerloc
6. SaftiFirst

2. No other manufacturer or supplier, except those noted above, shall be used unless approved in writing by the Architect seven (7) days prior to tender closing.

3. **It is the responsibility of the approved manufacturers to *meet or exceed and submit OBC SB-10 Energy Efficiency Compatibility Results.***

Note: The above-mentioned submittal is to incorporate the specified sealed glazing unit and each opening component as a whole before the shop drawings are accepted or before any shop drawings are reviewed.

3. SHOP DRAWINGS

1. Submit shop drawings in accordance with Section 01300 – Submittals.

2. Submit shop drawings for the fabrication and installation of associated components of the work. Indicate anchors, joint system, expansion provisions, hardware, and other components not included in manufacturer's standard data. Include glazing details (where required).

3. Before shop drawings and fabrication are started, take critical measurements at the site to facilitate installation and fitting of work.

4. ***Shop drawings that are submitted are to be in the units of the tendered drawings with critical on center mullion dimensions (dimension string from datum level to top of opening noting center of mullions) noted along with all other regular shop drawing dimensions, no exceptions. Both units (metric and imperial) are allowed. Openings are to be identified with the corresponding tags on the tendered drawings.***
(Coordinate with typical A8 drawing notes)

4. SUBMITTALS

1. Submit samples of sections and finishes for Architect's approval before fabrication.

2. Furnish templates, diagrams, and other data to fabricators and installers of related work, as needed for coordination installation.

3. Coordinate with Section 08700 Finish Hardware and security subcontractor for any electrical provisions required.

5. DESIGN

1. Design for wind and snow loads as set out by the Ontario Building Code, 2012 as currently amended for the building location. Copies of any and all structural calculations made in connection with the supplementary design and/or detailing of the work of this section shall be promptly furnished to the Architect if requested.

2. Submit with shop drawings certification that window and entrance design and construction will meet the specified requirements. Certification shall be in the form of test reports on similar units performed by an independent testing laboratory, and shall meet approval of Architect before fabrication commences.

6. WARRANTY

1. The Work and materials of this Section shall be under warranty in accordance with CCDC Document 2 - 2020 but for a period of five years and ten (10) years for hermetically sealed units from the date of Architect's Certificate of Substantial Completion.

2. PRODUCTS

1. MATERIALS

1. Aluminum: Extruded Members: 6063-T54 alloy and temper.

2. Fasteners, Screws & Bolts: 300 Stainless Steel or 400 series stainless steel cadmium plated and of sufficient size and quantity to perform their intended function.

3. Glazing Tape: Tremco 440 tape with built-in shim and as recommended by window manufacturer.

4. Weathering and Glazing Gaskets: Extruded black closed cell or dense elastomer of durometer appropriate to the functions.

5. Spacer Shims: oil resistant rubber or plastic acceptable to glass

manufacturer, channel shaped and approximately 4" long (100 mm).

6. Silicone Sealant: Dow Corning #795 or as per manufacturers recommendations exceeding CAN2-19.13-M82 Class 40 requirements.

7. Isolating Coating: Black alkali resistant bitumastic enamel.

8. Spray-On Insulation: Supply and install by this section as per Section 07215.

9. Miscellaneous: Supply all covers, copings, special flashings, filler pieces, termination pieces, caps closures and expansion joint covers as required and as indicated on drawings.

10. Glass for Aluminum Doors: as per 08800 Glass and Glazing Section.

11. Glass for Exterior Aluminum Entrance Framing: as per 08800 Glass and Glazing Section.

12. Glass for Interior Aluminum Screens: as per 08800 Glass and Glazing Section.

2. FABRICATION

1. General

1. Construct aluminum assemblies of extruded sections to size and profile shown on drawings.

2. Build units square, true, accurate to size, free from distortions, waves, twists, buckles or other defects detrimental to performance or appearance.

3. Units too large for handling or shipping shall be prefabricated in shop, disassembled and marked for shipping and field assembly.

4. Use concealed fastenings. No exposed screws shall show in the finished work unless approved by the Architect. Such screws shall be countersunk and finish match surfaces in which they occur.

5. Joints shall be accurately cut and fitted to result in a tightly closed joint.

3. DOORS, ENTRANCE SCREENS, INTERIOR SCREENS

1. Frames

1. "Kawneer Trifab 451UT, Center, Interior Glazed" thermally broken framing at exterior entrance screens where the door system is stand alone.

2. "Kawneer Trifab 451, Center, Interior Glazed" framing at interior entrance screens where the door system is stand alone.

3. For products listed above, coordinate with manufacturer and drawings for side light base heights (dimension to match doors) with associated aluminum sill flashing, metal liner, insulation and aluminum panels where indicated on drawings.

2. Conform to CAN3-A440-M90 performance standards Air Leakage to meet the Fixed rating, and Type A3, Water Leakage Type B5 and Wind Resistance Type C7.

3. Doors

1. Exterior entrance / vestibule doors shall be thermally broken insulated aluminum doors by Kawneer, 560 InsulClad or approved equivalent Kawneer insulated door system, complete with insulated glazing, and compatible with the wall assembly and frame conditions. Finish to be clear anodized.
2. Provide door and frame system dimensions suitable for the existing wall construction and clearances; adjust framing members within manufacturer's standard systems to suit site conditions.

3. Coordinate with door schedules for heads and stiles sizing and base height. Adjacent screens / curtain wall bases to match door base height typical.

4. Provide mid-rail at all doors that require panic devices, coordinate with door schedules for sizing.

5. The core shall be foamed-in-place urethane foam at density of 5.0 lb./cu.ft. (64 kg.m³). Provide insulated aluminum panel where indicated on drawings.

6. Stiles shall have a wall thickness of .125". (3.2 mm). Glazing mouldings shall be .050" thick (12.7 mm).

7. Use snap-in type square glazing stops with neoprene bulb type glazing. Do not use exposed screws to secure stops. Use lock-in, tamperproof type stops.

8. Equip door leaf with an adjustable mechanism in top rail near the lock stile, to provide for minor clearance adjustments after installation.

4. Door Hardware

1. Equip all aluminum doors with continuous weather stripping with adjustable weather stripping at the base; and aluminum thresholds, 6mm (1/4") maximum vertical height, over 6mm up to ½" (12.7mm) height to be sloped / bevel in a 1 in 2, 50%. Closer cover to match

door finish colour.

2. Equip all aluminum doors with full height (continuous) heavy-duty stainless steel hinge.

3. All other hardware including concealed closers, exposed closers, locksets, exit device, push/pulls, overhead stops, handicap automatic door openers to be supplied under Section 08700 – Finishing Hardware and installed under Section 06200 – Finish Carpentry.

5. Finish

1. Prepare and fabricate components as required before finishing.

2. Finish to be clear anodized.

3. Metals other than aluminum shall match colour finishes.

6. Closures, Flashings and Miscellaneous Covers

1. Provide .125" (3 mm) thick aluminum closures and caps where required.

3. EXECUTION

1. INSTALLATION

1. Secure work adequately and accurately to the structure in required position and in manner not restricting thermal movement. Work shall be plumb, square and level, free of twist, warp or other superimposed loads. Provide shims as required.

2. All metal to metal joints shall be sealed to provide a weathertight assembly in accordance with manufacturer's instructions.

3. Use concealed fixings where possible, where not possible use flat head screws in countersunk holes. Exposed bolt or nut heads not permitted. Match exposed fastenings with surfaces on which they occur.

4. Isolate all aluminum coming in contact with unlike materials with heavy shop coating of black alkali resistant bitumastic enamel to prevent electrolytic or chemical reaction.

5. Fill voids between aluminum extrusions and wall surfaces at exterior doors and entrance framing with foam spray applied insulation where required to prevent movement or infiltration of air. Supply and install spray-on insulation as per Section 07215 – Spray-On Insulation.

6. Supply and install all caps and closures where required to create a complete installation and as indicated on the drawings.

2. CAULKING

1. Caulking between aluminum and aluminum; aluminum and glass to conform to this section. Caulking to perimeter drywall masonry and concrete all by this section as per Section 07900 - Sealants.

2. Caulking by this Section shall be installed as per Section 07900.

3. GLAZING

1. Glaze windows in accordance with CAN3-A440-M90.

2. Set glazing tape against permanent stops, allow 1/8" for cap bead, set horizontal strips first using full width pieces of tape, then set vertical pieces. Butt tape at corners, do not lap tape or run continuous at corners.

3. Set glass on setting blocks, number as recommended by glass manufacturer. Set glass with draw lines horizontal.

4. Apply heal bead on interior, using sealant. Place spacer shims, set glazing tape against glass and install stops.

5. Apply cap bead to fill void on exterior. Tool sealant with a slight bevel, sloped away from the glass to create a water shed.

6. Mark each light with a large white cross to indicate the presence of glass.

7. Replace under this section defective, damaged or broken glass due to faulty setting, handling or storage.

8. Neoprene bulb type glazing in accordance with manufacturer's instructions.

4. ADJUST AND CLEAN

1. Adjust all hinges, closers and weather stripping for optimum condition. Lubricate operating equipment.

2. Clean surfaces promptly after installation, exercising care to avoid damage of the protective coating (if any).

3. Advise the contractor of protective treatment and other precautions required through the remainder of the construction period, to ensure that doors will be without damage or deterioration (other than normal weathering) at the time of acceptance.

4. Aluminum shall be isolated from concrete, mortar, plaster and dissimilar

metal with bituminous paint. Windows shall be protected from other building materials during and after insulation until acceptance by the General Contractor. Thereafter, it shall be the responsibility of the General Contractor to maintain protection and provide final cleaning.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

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

1.2 SHOP DRAWINGS

1. Submit shop drawings in reproducible vellum form in accordance with GC 3.10 of CCDC Document 2-2020 and Section 01300 – Submittals.

2. Submit catalogue illustrations as required by Architect.

3. Indicate size and description of components, base material, surface finish inside and out, hardware and locks, attachment devices, description of rough-in-frame, building-in details anchors for grab bars.

1.3 SUBMITTALS

1. Submit samples of all accessories for approval by the Architect.
2. Approved manufacturers are ASI.

1.4 DELIVERY, STORAGE AND HANDLING

1. Package accessories and label with description of contents and installation location. Each accessory to be individually wrapped complete with all fixings as required.

2. Deliver accessories where designated at Site by Contractor.

1.5 MAINTENANCE AND OPERATING INSTRUCTIONS

1. Provide for inclusion in data book, three (3) printed copies of maintenance and operating instructions of all accessories.

PART 2 PRODUCTS

2.1 MATERIALS

1. Sheet Steel: Commercial grade, stretcher levelled sheet steel to ASTM A526-71 (1975) with G90 zinc coating to ASTM A525-79.

2. Stainless Steel Sheet: To ASTM A666-72 (1979) type 302 with No. 4 finish, minimum 0.9 mm (0.036"/20 gauge).

3. Stainless Steel Tubing: AISI Type 304, commercial grade, seamless welded, 1.2mm (0.047") wall thickness.

4. Fasteners: Screws and bolts hot dip galvanized. Expansion shields fibre, lead or rubber as recommended by fixture manufacturer for component and its intended use.

5. Fasteners: Screws and bolts stainless steel. Expansion shields, lead or rubber as recommended by fixture manufacturer for component and its intended use.

2.2 FINISHES

1. Chrome and Nickel Plating: to ASTM B456-79 satin finish.

2. Stainless Steel: to AISI No. 4 satin lustre finish.

3. Baked enamel: condition metal by applying one coat of metal conditioner to CGSB 31-GP-107a, apply one coat Type 2 primer to CGSB 1-GP-81M and bake apply two coats Type 2 enamel to CGSB 1-GP-88e and bake to hard, durable finish. Sand between final coats. Colour selected from standard range by Architect.

2.3 KEYING

1. All accessories to be keyed alike. Provide six keys.

2.4 TRADEMARKS AND LABELS

1. Trademarks and labels shall not be visible in the finish exposed surfaces.

2.5 MANUFACTURER

1. Provide accessory items manufactured by companies as noted or approved equal; Bobrick, Frost and ASI are approved manufacturers.

2.6 ACCESSORIES

1. **Toilet Paper Dispensers**: Shall be provided by Halton District School Board and installed by this contractor. Provide one at each water closet.

2. **Paper Towel Dispenser:** Shall be provided by Halton District School Board and installed by this contractor. Provide one by each washroom and classroom sink.

3. **Clothes/ Coat Hooks:** Model No. B233 by Bobrick Washroom Equipment, Inc. Provide one at each washroom.

4. **Fixed Mirrors:** Model No. B165 S.S. Channel Frame Mirror 18" (456 mm) wide x 30" (762mm) by Bobrick Washroom Equipment, Inc. Provide one above each washroom sink, mounted max. 1000mm above finished floor. For Male & Female gang washroom, provide 24"(610 mm) wide x 60" (1520 mm) high mirror.

5. **Soap Dispenser:** Shall be supplied by Halton District School Board for each sink and installed by this Trade Contractor. Install one by each washroom and classroom sink. Soap dispensers to be installed one on each side of the Bradley

6. **Waste Receptacle:** Model No. B-277 Stainless Steel complete with vinyl

liner Model No. 3944-12 by Bobrick Washroom Equipment Inc.

8. **SND** - Surface Mounted Sanitary Napkin Disposal: Marino #H260 to be provided and installed by this contractor. Install one in each universal washroom, barrier free washroom, unisex / single washroom and for each stall in female gang washrooms unless otherwise indicated on drawings. Where the recessed B-35303 model is not able to be installed, this surface mounted product is to be used in lieu.

10. **Grab Bars:** Refer to Architectural drawings for locations.

    1. At Barrier Free Accessible Water Closets:

        1. 1 1/2" (38 mm) dia. peened satin finished stainless steel, 24" (610 mm) long straight bar, standard flange position at back of water closet.

        2. L-shaped bar 1 1/2" (38 mm) dia. peened satin finished stainless steel, 30" (760 mm) long horizontal and vertical 30" (760 mm) at side of water closet.

        3. Install item 1 and 2 grab bars noted above at each universal / barrier free water closets.

11. **GB** - Grab bars to be 18 (1.2 mm) gauge stainless steel tubing, with Mandrel bends. Knurled grab bars to be peened grip full length of the tubing to within 4" (100 mm) of ends of bends. Secure concealed fastening grab bars with 2 1/2" (64 mm) No. 14 screws to solid backing, capable of supporting a 500 lb. (225 kg) pull. All accessories must comply with the 2012 January 1, 2015 Ontario Building Code as currently amended.

14. Contractor to install any and all washroom accessory items supplied by owner.

2.7 FABRICATION

1. Weld, ground flush and smooth joints of fabricated components. Use mechanical fasteners only when approved.

2. Form exposed surfaces from one sheet of stock, free of joints.

3. Brake form sheet metal with 2 mm radius bends.

4. Form flat surfaces without distortion. Maintain flat surfaces without scratches or dents.

5. Paint back of components where contact is made with building finishes to prevent electrolysis.

6. Hot dip ferrous metal anchors and fastening devices to conform with CGSB G164.

7. Shop assemble, and package components complete with anchors and

fittings.

8. Deliver inserts and rough-in frames to site at appropriate time for building in. Provide templates or rough-in measurements as required.

9. Provide steel anchor plates and components for installation on studding and building framing.

10. All exposed stainless-steel edges to be hemmed.

11. All stainless-steel units to be double panned.

PART 3 EXECUTION

3.1 INSTALLATION

1. Installation of all miscellaneous specialties by this Section. Install all items to secure backing.

2. Securely fasten accessories level and plumb in the locations shown on the drawings and as specified herein. Mounting heights as shown on drawings, or as directed by Architect.

3. Co-ordinate installation with the work of trades providing adjacent construction as required to achieve the reveals or other edge conditions shown where front faces of units are flush with the finished wall surfaces.

4. Perform drilling of steel, masonry and concrete necessary to install the accessories.

5. Insulate accessory surfaces to prevent electrolysis due to contact with masonry, concrete or dissimilar metal surfaces. Use bituminous paint, building paper or other approved means.

6. Clean all accessories in conformance with Division 1.

3.2 LOCATION AND QUANTITY

1. Provide washroom accessories as noted as indicated on drawings and/or called for within this section. Installations shall meet the minimum requirements of the O.B.C., as currently amended.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

1. Division One - General Requirements is a part of this section and shall apply as if repeated here.

1.2 DESCRIPTION

Supply and installation of **five (5) manually operated rolling shades** at **library windows only**, as indicated on the drawings.
No motorized shades, electrical connections, privacy screens at doors, or additional window locations are included.

1.3 RELATED WORK

1. Documents affecting the work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

2. Masonry - Section 04200

3. Wood Blocking - Section 06100

4. Finish Carpentry - Section 06200

5. Aluminum Entrance Framing, Windows & Doors — Section 08800

6. Aluminum Window Curtain Wall System Section 08900

7. Electrical —Refer to Electrical Sections

1.4 QUALITY ASSURANCE

1. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the metnods needed for proper performance of the work of this Section.

1.5 SUBMITTALS

1. Product Data: Within 60 calendar days after the General Contractor has received the Owner's Notice to Proceed, submit:

    1. Materials list of items proposed to be provided under tnis Section.

    2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

3. Shop Drawings in sufficient detail to show fabrication, installation, anchorage and interface of the work of this Section with the work of adjacent trades.

4. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the work.

2. Construct one complete light proof window shade with attachments and accessories for approval by the Architect.

1.6 WARRANTY

1. Three-year written warranty against mechanical and fabric failure (including fabric fading) under normal conditions.

1.7 ACCEPTANCE

1. All manual shades remain the property of the supplier until accepted in place by the Architect.

1.8 SCOPE

1. Supply and installation of Manual Rolling shades with 1% opening weave in all 5 windows in Library.

2. Provide privacy screens at glazing in all doors and sidelights for new doors. Product equal to Velo PS and Velo PSL by Activar Inc. 1-800-554-6077.

PART 2 PRODUCTS

2.1 MANUAL SHADE SYSTEM

1. Manually Operated Double Roller Shade System: Sun Project, Lite-Lift Dual MDL 11-140 EM, dual bracket roller system with Front Fascia Panel. Commercial chain-driven, manually operated roller-screen shading system complete with aluminum fascia and stainless steel drive chain. Sunshade fabric to be 3% open weave flame retardant Thermoveil, Shadecloth on South and West sides of building and 5% open weave flame retardant Thermoveil Shadecloth on North and East sides of building and Black-out EB 200, PVC free. Seams, if required, shall be equally spaced vertically to form material in equal widths. Shade shall be a two layered combination of 3%/5% open weave shade be depending on room location, and a black out shade. Drawings are based on Sun Project Canada Inc., (905-660-3117). Acceptable alternate product/manufacturer is Solarfective Products Ltd., MechoShade or Silent Gliss.

2. Manually Operated Shade Locations: 5 library windows as indicated.

3. Sunshade Fabric: 3% and 5% open weave flame retardant. Architect to choose colour when shop drawings are submitted. Seams, if required, shall be equally spaced vertically to form material in equal widths.

4. Provide Moduline Electra Tandem 105 120VAC where required for layout of multiple blinds.

5. Approved equal product/manufacturer is Solarfective Products Ltd.

2. Shade Roller: Extruded aluminum tube, 6063-ST6 alloy, 2.55 in. OD The tube is extruded with two fabric-mounting channels designed so that the shade clotn does not disengage from the tube itself.

3. Mounting Spline: Extruded vinyl with asymmetrical locking channels and embossed fabric guide for use with 2.55 in. OD tube. Spline has sufficient capacity to hold shade and additional weight without disengaging from the tube.

4. End Brackets: Consist of 1/8" in. thick sheet steel. Wall, jamb or ceiling mounted as required and permanently installed.

5. Centre Support Brackets: supplied to meet span or weight requirements. Ceiling or wall mounted.

e. Weights: Mill-finished aluminum, flat bars, single lengths for each shade panel.

6. Recessed Housing: is specifically designed for acoustic or plaster ceilings with a removable closure plate for access to the recessed and concealed roller system.

7. Finishes: All exposed aluminum parts have a clear anodized finish. Steel parts are either cadmium plated, satin finished or have been bonderized prior to painting with a baked enamel finish.

8. Exterior hembars shall be rectangular 6 mm x 37 mm, with internal grooves to accommodate a fabric guide carrier at each end.

9. Side channel shall be a heavy-duty two-piece Snap-On 75 x 22 side channel for inside or frontal mount.

2.2 Fabric shall be hot laser cut and reinforced at the edges with a high frequency thermoweld seal. Fabric is reinforced with heat sealed sprinp tempered stainless steel batten stiffeners positioner approximately every 900 mm insuring that fabric cannot escape or be pulled out of the side channel.

2.3 SUNSHADE FABRIC

1. Provide manual rolling shades in all other areas fabric to be 1% open weave flame

retardant. The architect to choose colour when the shop drawings are submitted. Seams, if required, shall be equally spaced vertically to form material in equal widths.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

1. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

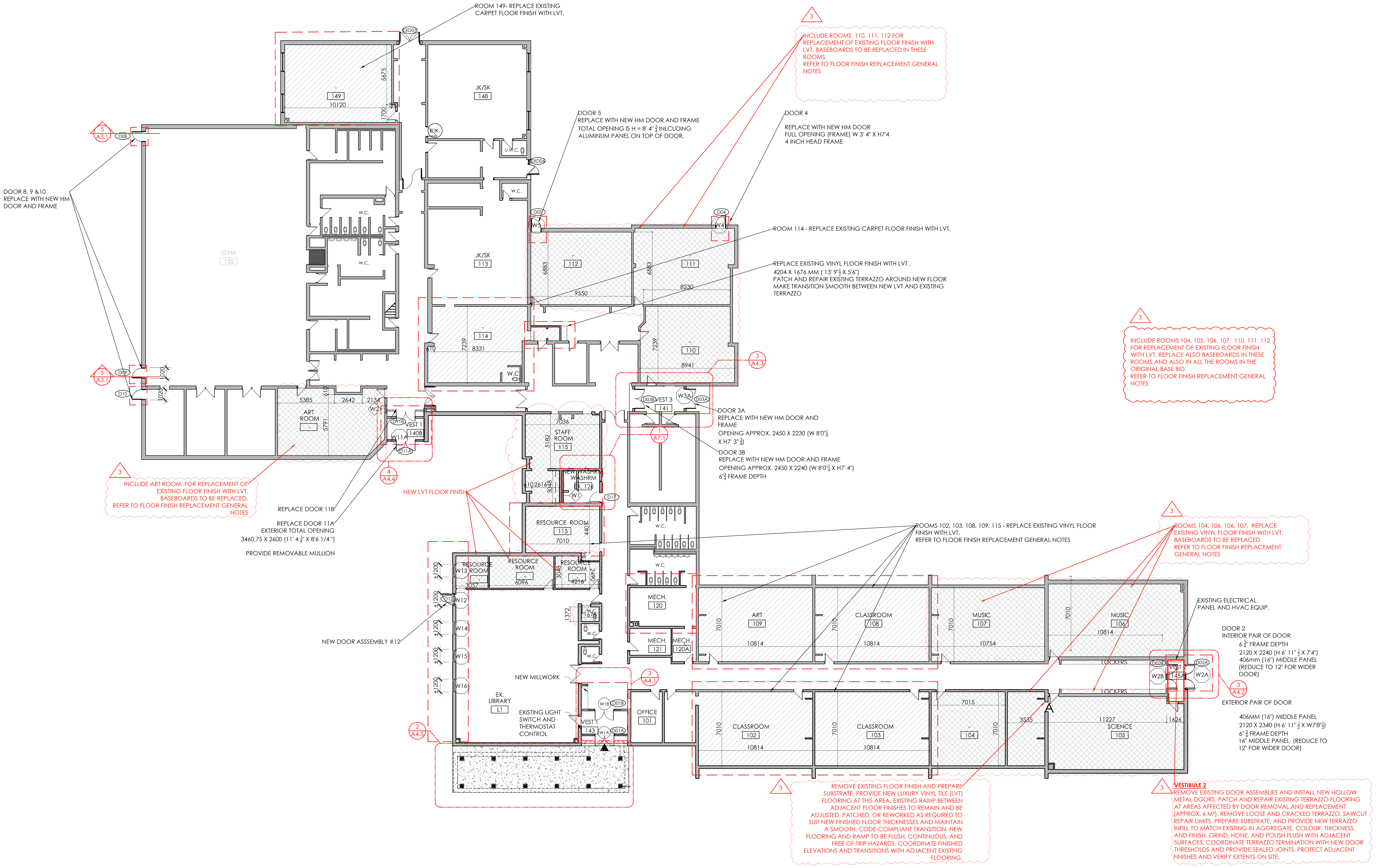
1. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interfaced with the work of this Section.

2. Install the work of this section in strict accordance with the original design, the approved Shop Drawings, pertinent requirements of government agencies having jurisdiction, and the manufacturer's recommended installation procedures as approved by the Architect, anchoring all components firmly into position for long life under hard use.

3. Install the work plumb, level, and in proper operating condition.

4. Touchup scratches and blemishes to be completely invisible to the unaided eye from a distance of five feet (1500 mm) or replace item.

END OF SECTION



1 FLOOR PLAN A2.1
0 2 4 10m

A) SCIENCE ROOM TRANSITION AND SLOPE

TERRAZZO IN VESTIBULE 2

FLOOR PLAN LEGEND

- AREA OF WORK
- DXXX — DOOR TAG - REFER TO DOOR SCHEDULE A8.1
- WXX — FRAME TAG - REFER TO FRAME SCHEDULE A8.2
- EX. DOOR TO REMAIN
- NEW DOOR

WALL IDENTIFICATION MARKER LEGEND

(COORD. W/ WALL TYPES)

- EX. WALL SYSTEM TO REMAIN
- INDICATES ROOM/AREA TO RECEIVE NEW FLOOR FINISH. REFER TO DEMOLITION DWG - FOR GENERAL AND SPECIFIC DEMOLITION NOTES NEW FLOOR FINISH TO BE LVT.
- INDICATES ROOM/AREA TO RECEIVE NEW FLOOR FINISH INCLUDED IN ADDENDUM 1. REFER TO DEMOLITION DWG - FOR GENERAL AND SPECIFIC DEMOLITION NOTES NEW FLOOR FINISH TO BE LVT.

FLOOR FINISH REPLACEMENT GENERAL NOTES

- BEFORE BEGINNING WORK, COVER AND PROTECT ALL EXISTING MILLWORK AND FIXED FIXTURES TO PREVENT DAMAGE DURING THE FLOORING REPLACEMENT PROCESS.
- CAREFULLY REMOVE EXISTING TILES WITHOUT DISTURBING ADJACENT FIXED MILLWORK. DISPOSE OF ALL DEBRIS ACCORDING TO LOCAL REGULATIONS. CUT FLOORING TIGHT TO FURNITURE, SHELVING, AND FIXTURES
- REMOVE EXISTING FLOOR BASE, CLEAN AND PREP TO RECEIVE NEW 4 INCH FLOOR BASE.
- INSPECT THE CONCRETE SUBFLOOR FOR ANY CRACKS, UNEVENNESS, OR MOISTURE ISSUES.
- REPAIR ANY DAMAGES AND LEVEL THE SUBFLOOR TO ENSURE IT IS SMOOTH AND EVEN.
- CLEAN THE SUBFLOOR THOROUGHLY TO REMOVE ANY DIRT, GREASE, OR RESIDUES THAT COULD IMPAIR ADHESIVE BONDING.
- NEW LVT FINISH FLOOR TO BE INSTALLED USING MANUFACTURER'S RECOMMENDATIONS.
- ENSURE PLACEMENT OF NEW LVT FLOORING ALIGNMENT AND LEVEL WITH EXISTING MILLWORK.
- INSTALL TRANSITION STRIPS AT THRESHOLDS AND WHERE NEW LVT MEETS OTHER FLOORING MATERIALS TO ENSURE A SEAMLESS APPEARANCE AND SAFETY.
- PROVIDE MAINTENANCE INSTRUCTIONS FOR THE NEW LVT TO SCHOOL MAINTENANCE STAFF TO ENSURE LONGEVITY AND APPEARANCE OF THE NEW FLOORING.
- ADAPT NEW RUBBER BASE TO EXISTING MILLWORK
- ALL INSTALLED WORK TO BE INSPECTED BY THE ARCHITECT/PROJECT MANAGER TO ENSURE COMPLIANCE WITH THE SPECIFIED REQUIREMENTS BEFORE FINAL ACCEPTANCE.
- WORK TO BE COORDINATED WITH SCHOOL ADMINISTRATION TO ENSURE COMPLETION DURING SUMMER BREAK. COORDINATE WITH SCHOOL BOARD FOR REMOVAL OF EXISTING MOVABLE ELEMENTS.

REVISIONS

NO.	DATE	PARTICULAR
1	2025.02.28	ISSUED FOR 80% PROGRESS SET
2	2025.12.10	ISSUED FOR BUILDING PERMIT
3	2026.02.02	ISSUED FOR ADDENDUM 1
4		

NOTES:

ALL DIMENSIONS MARKED TO AND FROM EXISTING BUILDING ELEMENTS ARE APPROXIMATE AND MUST BE CONFIRMED ON SITE BEFORE STARTING CONSTRUCTION AND ORDERING ASSEMBLIES.

MEASURE AND CONFIRM NEW DOORS, WINDOWS, CURTAINWALLS AND SCREENS REQUIRED FOR THIS RENOVATION BEFORE ORDERING AND ASSEMBLING

REFER TO HAZARDOUS BUILDING MATERIALS ASSESSMENT (PRE-CONSTRUCTION) DONE FOR THE KILBRIDE PUBLIC SCHOOL AT 6611 PANTON STREET, BURLINGTON, ONTARIO PREPARED FOR THE HALTON DISTRICT SCHOOL BOARD BY PINCHIN.

FOR PERMIT PURPOSES.

CLIENT:

HALTON DISTRICT SCHOOL BOARD

PROJECT:

22502

KILBRIDE PUBLIC SCHOOL RENOVATION

6611 PANTON STREET
KILBRIDE, ONTARIO

ORIGINAL PAGE SIZE ARCH D - 24" x 36"

KEY TO DETAIL LOCATION:
A - DETAIL NO.
B - DETAIL NO. ORIGIN

ARCHITECTS THE VENTIN GROUP LTD

Plot Date: Feb 02, 2026 - 11:54am By: amontisano Filename: K:\TVG-Brantford\Kilbride PS Renos-22502\Drawings\Wd-Current\A2.1 FLOOR PLAN.dwg

FLOOR PLAN

A2.1

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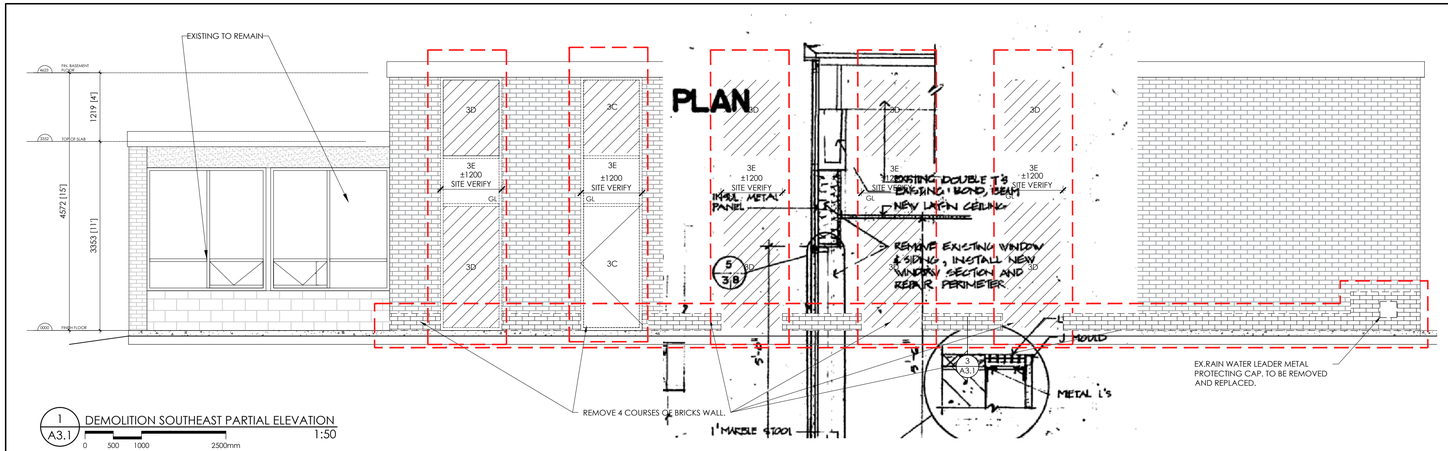
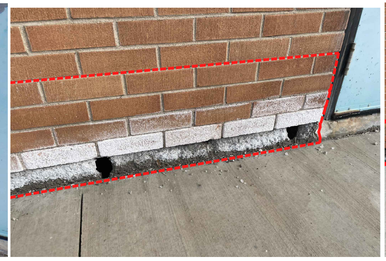
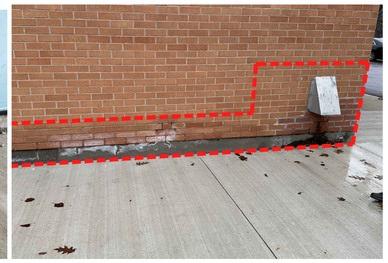
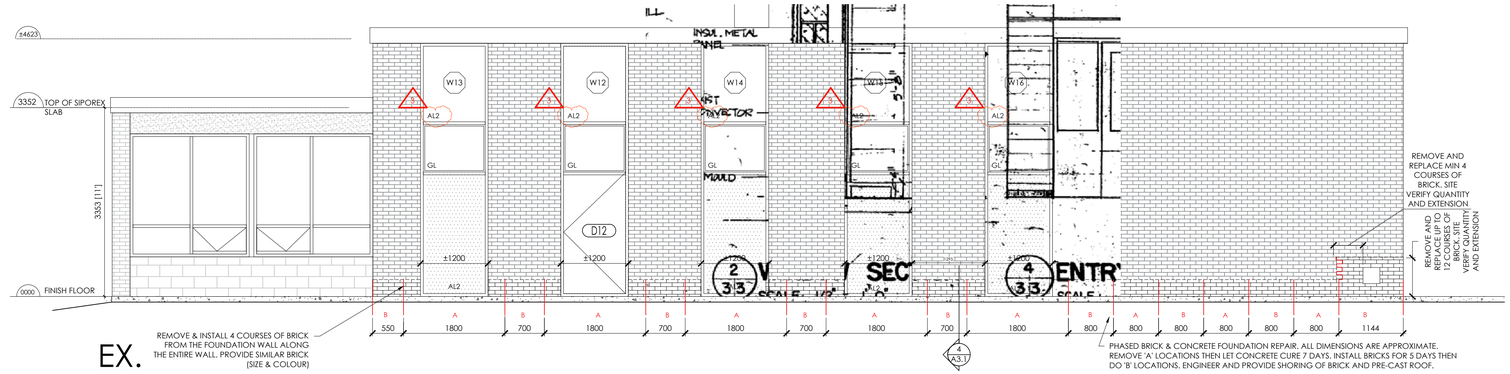


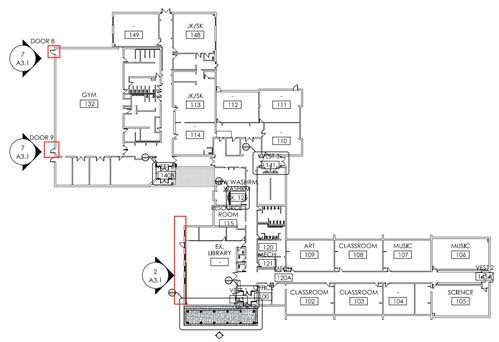
1 A3.1 DEMOLITION SOUTHEAST PARTIAL ELEVATION 1:50
0 500 1000 2500mm



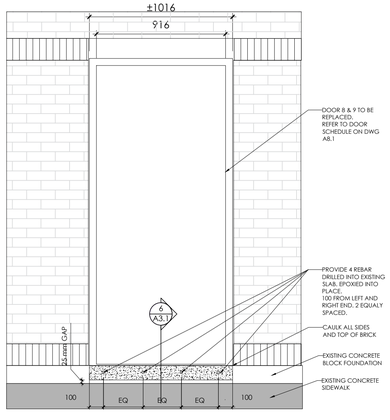




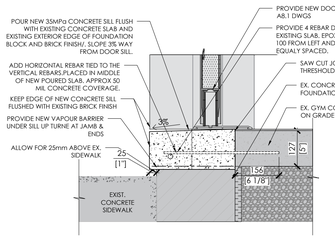
2 A3.1 NEW WORK SOUTHEAST PARTIAL ELEVATION 1:50
0 500 1000 2500mm



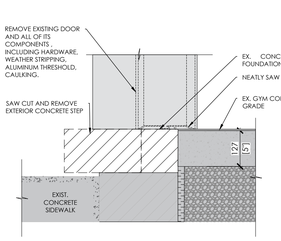
3 A3.1 TYP.
CONCRETE SILL TO BE REMOVED AND REBUILT



7 A3.1 NEW CONCRETE SILL ELEVATION ON DOORS 8 & 9
0 100 200 500mm



6 A3.1 NEW CONCRETE SILL SECTION
0 100 200 500mm



5 A3.1 DEMO - CONCRETE SILL
0 100 200 500mm

3

3C REMOVE AND REPLACE EXISTING WINDOW ASSEMBLY IN ITS ENTIRETY.
PROVIDE NEW ALUMINUM WINDOW ASSEMBLY, INCLUDING FRAMES, GLAZING, INSULATED ALUMINUM PANELS, FASTENERS, SEALANTS, AND ALL ASSOCIATED COMPONENTS. REMOVE AND DISPOSE OF EXISTING WINDOW FRAMES, GLAZING, CAPS, AND PANELS.
INSTALL NEW ALUMINUM WINDOW SYSTEM COMPLETE, FULLY WEATHER-TIGHT, AND COORDINATED WITH ADJACENT CONSTRUCTION. RE-CAULK AND SEAL ENTIRE ASSEMBLY. REFER TO GENERAL NOTES FOR EXTENT AND COORDINATION REQUIREMENTS

3D REMOVE AND REPLACE TOP AND BOTOM ALUMINUM PANELES WITH NEW INSULATED ALUMINUM PANELS. REMOVE EXISTING FRAME

3E REPLACE GLASS IN ALL 5 LIBRARY WINDOWS WITH NEW THERMAL PANE GLASS, PAINT, REPAIR AND CAULK ENTIRE ASSEMBLY. COLOUR TO BE SELECTED.

NEW ALUMINUM PANELS

BRICK REMOVAL

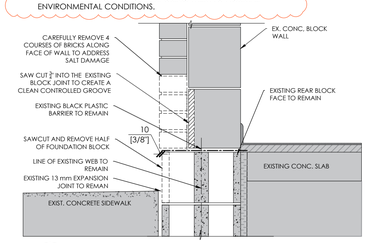
- REMOVE 4 COURSES OF BRICKS ALONG FACE OF WALL CAREFULLY TO AVOID FURTHERDAMAGE TO THE WALL.
- LEAVE EXISTING THE BACK HALF OF CONCRETE BLOCK INTACT
- CLEAN OUT DEBRIS FROM DAMAGED AREAS TO PREPARE FOR REPAIRS.

BRICK REPLACEMENT

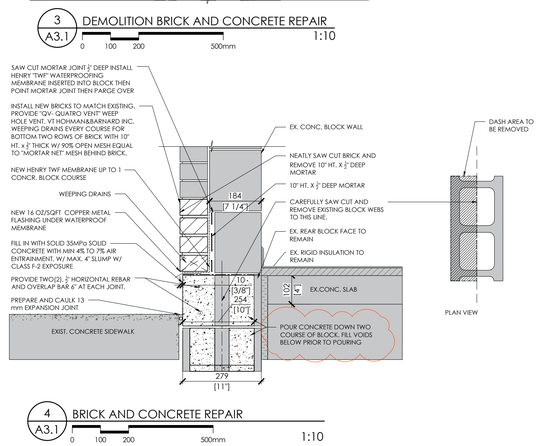
- SOURCE MATCHING BRICKS TO MAINTAIN AESTHETIC CONSISTENCY.
- INSTALL NEW BRICKS USING MORTAR THAT MATCHES THE EXISTING MORTAR IN COLOR AND COMPOSITION.
- ENSURE ALL JOINTS ARE FILLED AND TOOLED FOR A SEAMLESS FINISH.
- INSTALL WATERPROOFING MEMBRANE
- ADD WEEPING DRAINS ON EVERY OTHER BRICK COURSE USING HONEYCOMB INSERTS
- APPLY A PROTECTIVE "INTRAGUARD" COATING BY W.R. MEADOWS OR SIMILARBY PROSOCO ON THE FOUNDATION AND FIRST FOUR ROWS OF BRICK TO PREVENT WATER AND SALT PENETRATION
- INSTALL TWF MEMBRANE FLASHING FROM POUR CONCRETE TO ONE BLOCK HIGHT (8 INCHES)

CONCRETE REPAIR:

- REMOVE HALF PORTION OF DAMAGED CONCRETE BLOCK FOUNDATION
- FILL VOID WITH CONCRETE TO THE FIRST AND SECOND FOUNDATION CONCRETE BLOCK
- ADD 2 HORIZONTAL $\frac{1}{2}$" REBAR REINFORCEMENT TO
- APPLY A SEALANT TO THE REPAIRED BRICKWORK AND CONCRETE TO PREVENT FUTURE MOISTURE INGRESS.
- ALLOW ALL MATERIALS TO CURE AS PER MANUFACTURER RECOMMENDATIONS BEFORE EXPOSING THEM TO NORMAL ENVIRONMENTAL CONDITIONS.



3 A3.1 DEMOLITION BRICK AND CONCRETE REPAIR
0 100 200 500mm 1:10



4 A3.1 BRICK AND CONCRETE REPAIR
0 100 200 500mm 1:10

GENERAL DEMOLITION NOTES

- GC IS RESPONSIBLE FOR REMOVAL & DISPOSAL OF ALL MATERIALS THAT ARE DEMOLISHED & THAT ARE NOT INDICATED FOR RE-USE / RECLAIMING / SALVAGING OR AS OTHERWISE INDICATED BY THE OWNER. ALL COSTS ARE PART OF BASE BID SUBMISSION IN ACCORDANCE W/ BEST CONSTRUCTION PRACTICE, OBC, MUNICIPAL & PROVINCIAL LEGISLATURE REGARDING DEMOLITION & DISPOSAL METHODS (RECYCLE ALL MATERIALS WHERE ABLE)
- DEMOLITION INCLUDES PARTIAL OR ALL OF THE REMOVAL, DISPOSAL, RECYCLING OF ITEMS INDICATED.
- MAKE GOOD ALL DISTURBED SURFACES / ADJACENT SYSTEMS ARE DAMAGED THAT ARE TO STAY, PROVIDE CLEAN TRANSITIONS, TYP.
- PROTECT ALL EXISTING SURFACES AREAS / ELEMENTS DURING DEMOLITION, MAKE GOOD EXISTING TO REMAIN WHERE DISTURBED TO MATCH EXISTING TYP.

SALVAGING

- ALL SALVAGED / REUSED MATERIALS TO BE KEPT IN DRY PLACE FOR FUTURE USE & IMPLEMENTATION, TAG / NOTE WHERE MATERIALS ARE ORIGINALLY FROM IN THE BUILDING, TYP.
- ALL SALVAGED / REUSED MATERIALS TO BE REMOVED WITH GREAT CARE, TYP.
- ALL WINDOW PANELS TO BE CAREFULLY REMOVED, CLEANED AND STORED FOR REUSE IN NEW WINDOWS

AREA OF WORK

BRICK REPLACEMENT AND AMMELIORATION GENERAL NOTES.

- SAW CUT INTO THE BLOCK JOINT FOR MEMBRANE INSTALLATION
- INSTALL COUNTER FLASHING
- USE 35 MPA CONCRETE WITH AIR ENTRAINMENT
- CONSIDER USING HALF-INCH (OR 15 MIL) REBAR FOR REINFORCEMENT
- EXTEND THE INTERIOR FLASHING UP ONE BLOCK HEIGHT (APPROXIMATELY 8 INCHES)
- USE A HENRY TWF MEMBRANE
- WORK SHOULD BE CARRIED IN SECTIONS (AT LENGTHS: INDICATED 2/A3.1) TO MAINTAIN STRUCTURAL INTEGRITY
- APPLY A PROTECTIVE "INTRAGUARD" COATING BY W.R. MEADOWS OR SIMILARBY PROSOCO ON THE FOUNDATION AND FIRST FOUR ROWS OF BRICK TO PREVENT WATER AND SALT PENETRATION
- FOLLOW THE INDICATED SEGMENTATION OF A, B, C, TO ALLOW FOR ALWAYS HAVING PARTIAL SUPPORT UNDER THE EXISTING WINDOWS, THE SEGMENTS INDICATED DIMENSIONS ARE APPROXIMATE.
- ALLOW TO HAVE AT ALL MOMENTS 300MM FROM EACH EDGE OF WINDOW TOWARD THE CENTRE OF THE WINDOW ASSEMBLY.

REVISIONS

NO.	DATE	PARTICULAR
1	2025.02.28	ISSUED FOR 80% PROGRESS SET
2	2025.12.10	ISSUED FOR BUILDING PERMIT
3	2026.02.02	ISSUED FOR ADDENDUM 1
4		

NOTES:

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MEASURE AND CONFIRM NEW DOORS, WINDOWS, CURTAINWALLS AND SCREENS REQUIRED FOR THIS RENOVATION BEFORE ORDERING AND ASSEMBLING

REFER TO HAZARDOUS BUILDING MATERIALS ASSESSMENT (PRE-CONSTRUCTION) DONE FOR THE KILBRIDE PUBLIC SCHOOL AT 6611 PANTON STREET, BURLINGTON, ONTARIO
PREPARED FOR THE HALTON DISTRICT SCHOOL BOARD BY PINCHIN.

All dimensions and measurements must be checked and verified by the General Contractor

FOR PERMIT PURPOSES.

CLIENT:

Halton District School Board

HALTON DISTRICT SCHOOL BOARD

PROJECT:

22502

KILBRIDE PUBLIC SCHOOL RENOVATION

6611 PANTON STREET
KILBRIDE, ONTARIO

ORIGINAL PAGE SIZE ARCH D - 24" x 36"

KEY TO DETAIL LOCATION:
A/B A - DETAIL NO.
B - DETAIL NO. ORIGIN

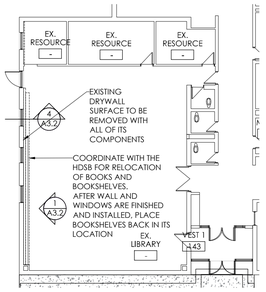
+VG ARCHITECTS
THE VENTIN GROUP LTD

DEMOLITION AND RENOVATION SOUTH ELEVATION

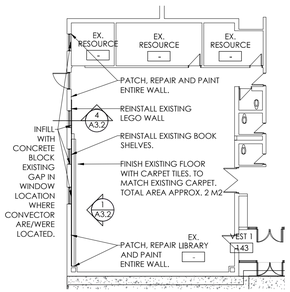
A3.1

DRAWN BY : AM CHECKED BY : KC

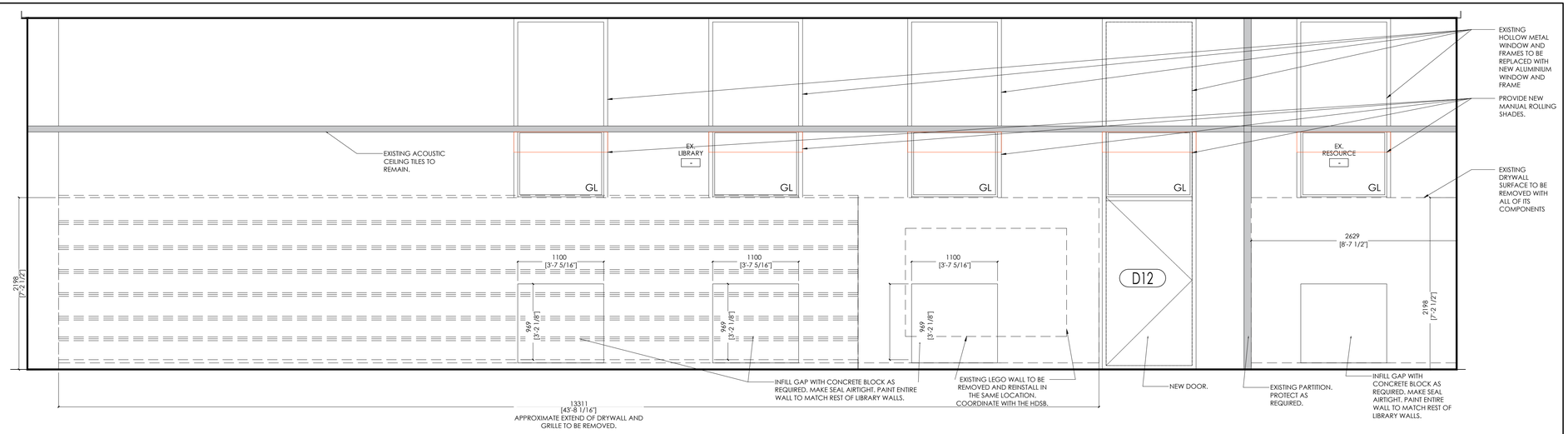
Plot Date: Feb 02, 2026 - 11:53am By: amontisano Filename: K:\TVG-Brantford\Kilbride PS Renos 22502\Drawings\Wd-Current\A3.1 - BRICK REPLACEMENT ELEV & DETAILS.dwg



1 A3.2 LIBRARY DEMOLITION PLAN
0 2 4 10m



2 A3.2 LIBRARY PLAN
0 2 4 10m



2 A3.2 LIBRARY INTERIOR WALL
0 300 600 1500mm

KILBRIDE PUBLIC SCHOOL RENOVATION – LIBRARY AREA

GENERAL SCOPE CLARIFICATION
1.1 WORK SHOWN ON DRAWINGS A3.1 AND A3.2 IS INTERIOR RENOVATION ONLY AND DOES NOT INCLUDE ANY INCREASE TO THE BUILDING FOOTPRINT OR GROSS FLOOR AREA.
1.2 ALL DIMENSIONS SHOWN ARE APPROXIMATE AND ARE TO BE VERIFIED ON SITE PRIOR TO CONSTRUCTION, ORDERING, OR FABRICATION.

DEMOLITION SCOPE
2.1 DEMOLITION INCLUDES REMOVAL OF:

EXISTING METAL STUD AND DRYWALL PARTITIONS WITHIN THE LIBRARY AS SHOWN

EXISTING GRILLES AND ASSOCIATED SUPPORTS BEHIND BOOKSHELVES

EXISTING BASEBOARDS IN AFFECTED AREAS

EXISTING DRYWALL SURFACES, INCLUDING ALL ASSOCIATED COMPONENTS, AS INDICATED

2.2 EXISTING ACOUSTIC CEILING TILES ARE TO REMAIN, EXCEPT WHERE TEMPORARY REMOVAL IS REQUIRED TO FACILITATE WINDOW REMOVAL AND INSTALLATION. TILES SHALL BE REINSTALLED AND MADE GOOD UPON COMPLETION.

2.3 CONTRACTOR IS TO PROTECT ALL EXISTING ADJACENT FINISHES, EXIT SIGNAGE, AND LIBRARY CONTENTS DURING DEMOLITION.

3. COORDINATION WITH OWNER (HDSB)
3.1 CONTRACTOR IS RESPONSIBLE FOR COORDINATION WITH THE HALTON DISTRICT SCHOOL BOARD (HDSB) FOR:

TEMPORARY RELOCATION AND PROTECTION OF BOOKS AND BOOKSHELVES

REMOVAL AND REINSTALLATION OF EXISTING LEGO WALL IN THE SAME LOCATION

3.2 BOOKSHELVES ARE TO BE REINSTALLED AFTER WALL, WINDOW, AND FINISH WORK IS COMPLETE, EXACTLY IN THEIR ORIGINAL LOCATIONS.

INFILL AND WALL CONSTRUCTION
4.1 GAPS CREATED BY REMOVAL OF EXISTING PARTITIONS AND/OR CONVECTORS ARE TO BE INFILLED WITH CONCRETE BLOCK AS REQUIRED.
4.2 ALL INFILL CONSTRUCTION SHALL BE: AIRTIGHT, PROPERLY SEALED, FINISHED FLUSH WITH ADJACENT EXISTING CONSTRUCTION
4.3 ALL PATCHED AND INFILLED WALL AREAS ARE TO BE PAINTED TO MATCH EXISTING LIBRARY WALL FINISHES, INCLUDING FULL-WALL PAINTING WHERE NOTED.

KILBRIDE PUBLIC SCHOOL RENOVATION – LIBRARY AREA

GENERAL SCOPE CLARIFICATION
1.1 WORK SHOWN ON DRAWINGS A3.1 AND A3.2 IS INTERIOR RENOVATION ONLY AND DOES NOT INCLUDE ANY INCREASE TO THE BUILDING FOOTPRINT OR GROSS FLOOR AREA.
1.2 ALL DIMENSIONS SHOWN ARE APPROXIMATE AND ARE TO BE VERIFIED ON SITE PRIOR TO CONSTRUCTION, ORDERING, OR FABRICATION.

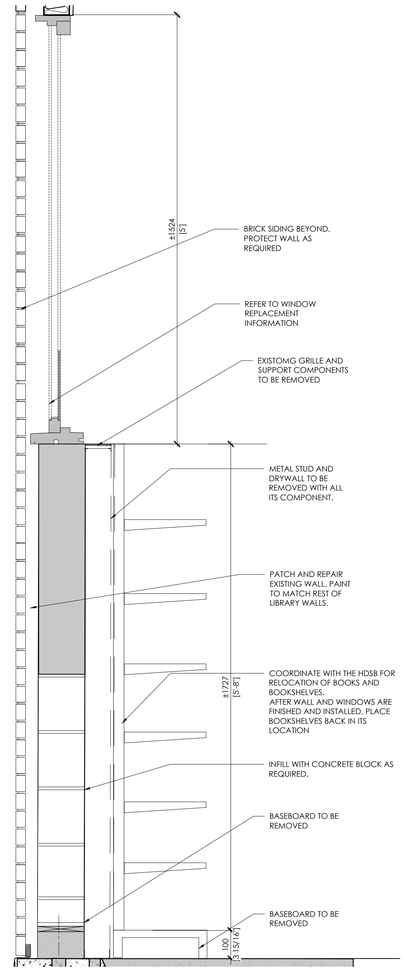
DEMOLITION SCOPE
WINDOW AND ENVELOPE WORK
5.1 REMOVAL OF EXISTING WINDOWS AND INSTALLATION OF NEW WINDOW ASSEMBLIES IS INCLUDED AS SHOWN.
5.2 CONTRACTOR SHALL COORDINATE CEILING REMOVAL/REINSTALLATION AS REQUIRED TO COMPLETE WINDOW WORK.
5.3 CONTRACTOR TO PROTECT EXTERIOR BRICK VENEER AND ADJACENT CONSTRUCTION DURING ALL OPERATIONS.

FINISHES
6.1 EXISTING CARPET TILES ARE TO BE EXTENDED AND FINISHED NEATLY TO THE EDGE OF THE NEW CONCRETE BLOCK WALL FOLLOWING REMOVAL OF DRYWALL PARTITIONS.
6.2 NEW CARPET TILES SHALL MATCH EXISTING CARPET IN THE LIBRARY.
6.3 APPROXIMATE FLOOR FINISH REPLACEMENT AREA IS 2 M² AND IS PROVIDED FOR REFERENCE ONLY.

MECHANICAL AND ELECTRICAL COORDINATION
7.1 EXISTING MECHANICAL GRILLES SHOWN TO BE REMOVED ARE INCLUDED IN THE SCOPE.
7.2 CONTRACTOR IS TO COORDINATE WITH MECHANICAL AND ELECTRICAL TRADES TO MAINTAIN CONTINUITY OF SERVICES AND ENSURE CODE COMPLIANCE FOLLOWING DEMOLITION AND INFILL.
7.3 REMOVE ALL MECHANICAL AND ELECTRICAL COMPONENTS THAT ARE DISCONNECTED.

HAZARDOUS MATERIALS
8.1 CONTRACTOR SHALL COMPLY WITH THE HAZARDOUS BUILDING MATERIALS ASSESSMENT PREPARED BY PINCHIN FOR THE PROJECT.
8.2 NO WORK SHALL PROCEED IN AFFECTED AREAS WITHOUT FOLLOWING THE REQUIRED ABATEMENT PROCEDURES.

EXISTING CONDITIONS
9.1 CONTRACTOR IS RESPONSIBLE FOR CONFIRMING ALL EXISTING CONDITIONS PRIOR TO BIDDING.
9.2 ANY DISCREPANCIES BETWEEN DRAWINGS AND SITE CONDITIONS SHALL BE REPORTED IMMEDIATELY TO THE CONSULTANT.



4 A3.2 LIBRARY DEMOLITION SECTION
0 100 200 500mm

REVISIONS

NO.	DATE	PARTICULAR
1	2025.02.28	
2	2025.12.10	
3	2026.02.02	ISSUED FOR ADDENDUM 1
4		

NOTES:
ALL DIMENSIONS MARKED TO AND FROM EXISTING BUILDING ELEMENTS ARE APPROXIMATE AND MUST BE CONFIRMED ON SITE BEFORE STARTING CONSTRUCTION AND ORDERING ASSEMBLIES.

MEASURE AND CONFIRM NEW DOORS, WINDOWS, CURTAINWALLS AND SCREENS REQUIRED FOR THIS RENOVATION BEFORE ORDERING AND ASSEMBLING

REFER TO HAZARDOUS BUILDING MATERIALS ASSESSMENT (PRE-CONSTRUCTION) DONE FOR THE KILBRIDE PUBLIC SCHOOL AT 6611 PANTON STREET, BURLINGTON, ONTARIO
PREPARED FOR THE HALTON DISTRICT SCHOOL BOARD BY PINCHIN.

FOR PERMIT PURPOSES.

CLIENT:

Halton District School Board

HALTON DISTRICT SCHOOL BOARD

PROJECT:
22502

KILBRIDE PUBLIC SCHOOL RENOVATION

6611 PANTON STREET
KILBRIDE, ONTARIO

ORIGINAL PAGE SIZE ARCH D - 24" x 36"

KEY TO DETAIL LOCATION:
A - DETAIL NO.
B - DETAIL NO. ORIGIN

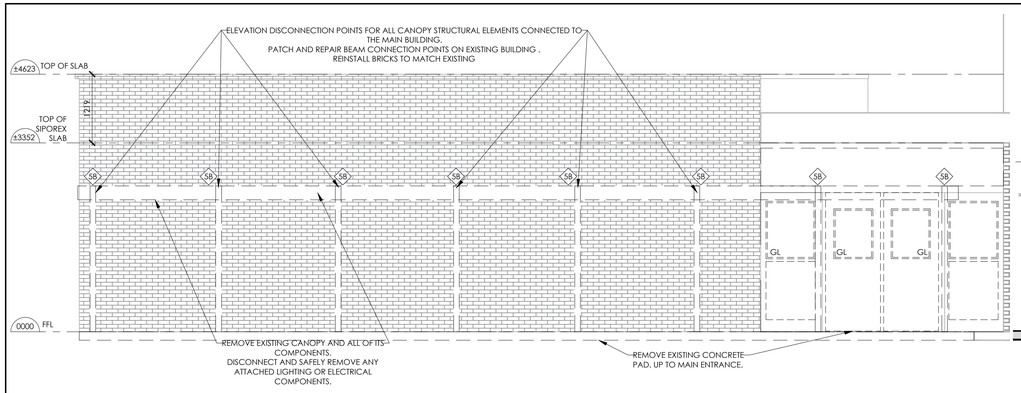
+VG ARCHITECTS
THE VENTIN GROUP LTD

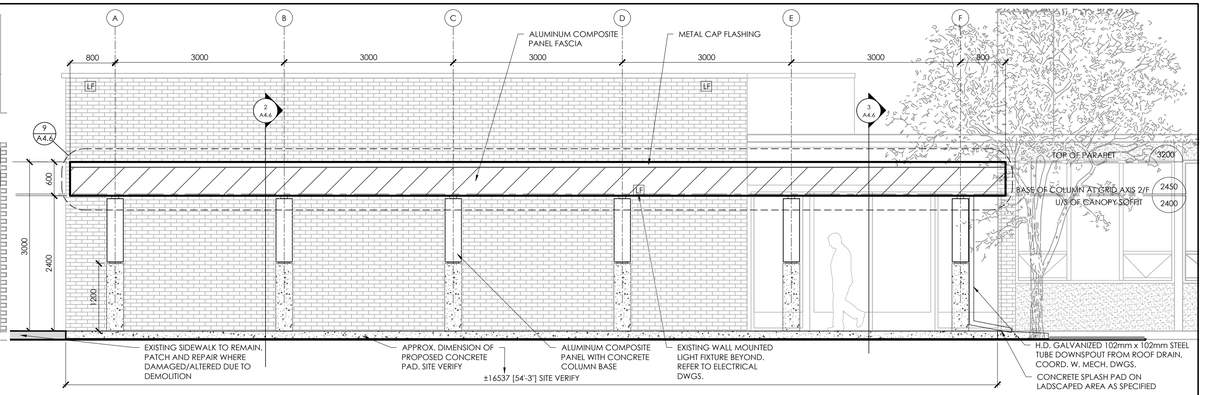
DEMOLITION AND RENOVATION LIBRARY INTERIOR WEST WALL

A3.2

DRAWN BY : AM CHECKED BY : KC

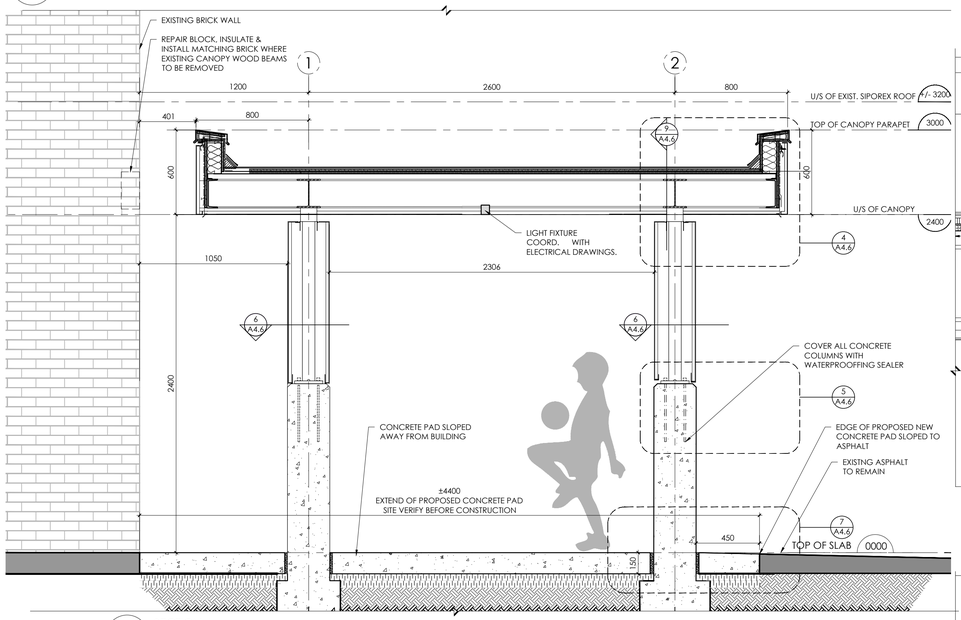
Plot Date: Feb 02, 2026 - 11:53am By: amontisano Filename: K:\YVG-Brantford\Kilbride PS Renos 22502\Drawings\Wd Current\A3.1 - BRICK REPLACEMENT ELEV & DETAILS.dwg





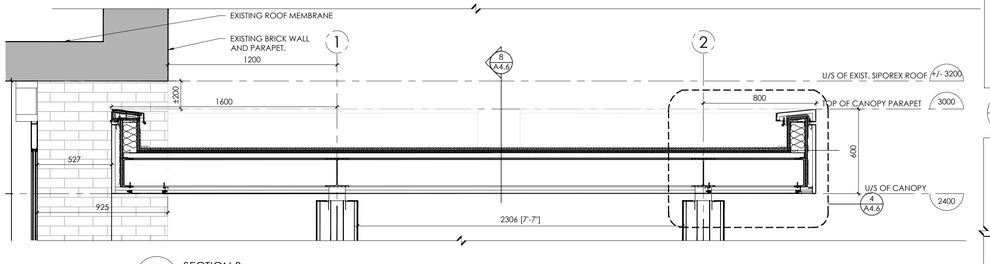
0 A4.6 CANOPY DEMOLITION ELEVATION

1:50



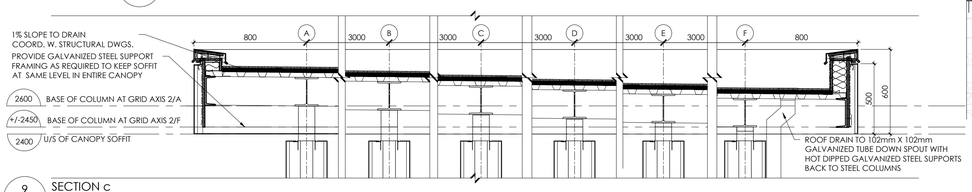
2 A4.6 SECTION A

1:20



3 A4.6 SECTION B

1:20

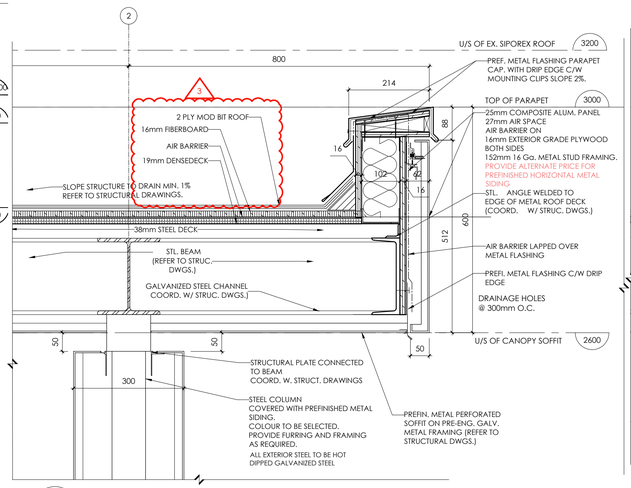


9 A4.6 SECTION c

1:20

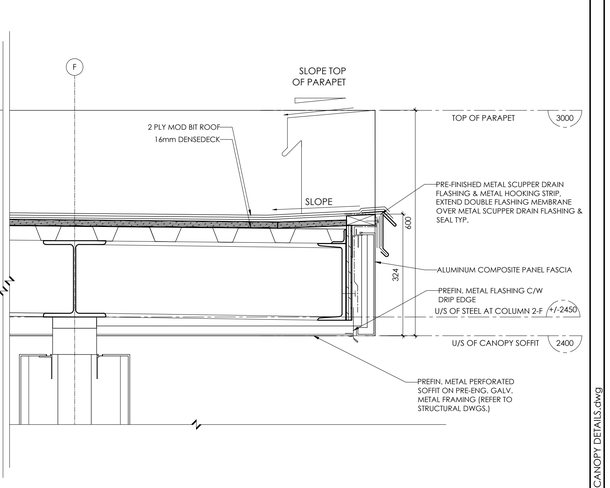
1 A4.6 PARTIAL SOUTHWEST ELEVATION

1:50



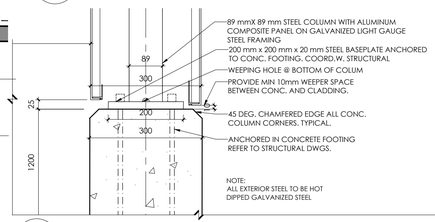
4 A4.6 PARAPET DETAIL

1:7.5



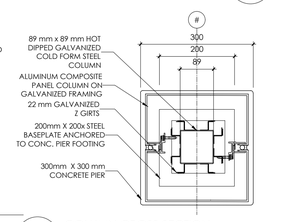
8 A4.6 OVERFLOW SCUPPER DETAIL

1:7.5



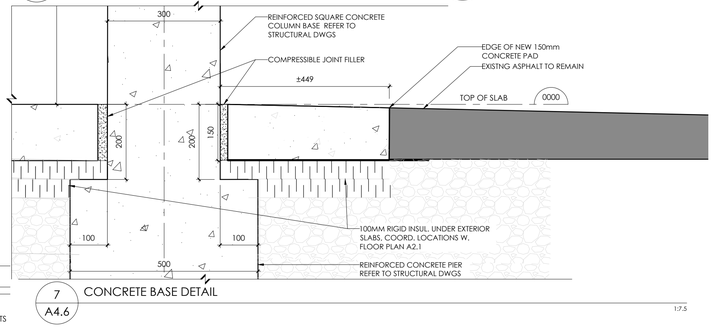
5 A4.6 COLUMN DETAIL

1:7.5



6 A4.6 COLUMN CROSS SECTION

1:7.5



7 A4.6 CONCRETE BASE DETAIL

1:7.5

REVISIONS

NO.	DATE	PARTICULAR
1	2025.02.28	ISSUED FOR 80% PROGRESS SET
2	2025.12.10	ISSUED FOR BUILDING PERMIT
3	2026.02.02	ISSUED FOR ADDENDUM 3
4		

NOTES:

ALL DIMENSIONS MARKED TO AND FROM EXISTING BUILDING ELEMENTS ARE APPROXIMATE AND MUST BE CONFIRMED ON SITE BEFORE STARTING CONSTRUCTION AND ORDERING ASSEMBLIES.

MEASURE AND CONFIRM NEW DOORS, WINDOWS, CURTAINWALLS AND SCREENS REQUIRED FOR THIS RENOVATION BEFORE ORDERING AND ASSEMBLING

REFER TO HAZARDOUS BUILDING MATERIALS ASSESSMENT (PRE-CONSTRUCTION) DONE FOR THE KILBRIDE PUBLIC SCHOOL AT 6611 PANTON STREET, BURLINGTON, ONTARIO
PREPARED FOR THE HALTON DISTRICT SCHOOL BOARD BY PINCHIN.

FOR PERMIT PURPOSES.

CLIENT:

Halton District School Board

HALTON DISTRICT SCHOOL BOARD

PROJECT:
22502

KILBRIDE PUBLIC SCHOOL RENOVATION

6611 PANTON STREET
KILBRIDE, ONTARIO

ORIGINAL PAGE SIZE ARCH D - 24" x 36"

KEY TO DETAIL LOCATION:
A - DETAIL NO.
B - DETAIL NO. ORIGIN

+VG ARCHITECTS
THE VENTIN GROUP LTD

CANOPY DEMOLITION - NEW ELEVATIONS - DETAILS

A4.6

DRAWN BY : AM/MT/AH/RT CHECKED BY :

Plot Date: Feb 02, 2026 - 12:13pm By: amontisano Filename: K:\TVG-Brantford\Kilbride PS Renos-22502\Drawings\Wd-Current\A4.5 - CANOPY DETAILS.dwg

DOOR & FRAME / SCREEN SCH. NOTES

IT IS THE RESPONSIBILITY OF THE DOOR, FRAME & HARDWARE MANUFACTURER TRADES TO CO-ORDINATE & EXECUTE THEIR WORK TOGETHER.

DIMENSIONS INDICATED FOR DOORS ARE NOMINAL - VERIFY ROUGH OPENING DIMENSIONS ON SITE PRIOR TO FRAMING, FABRICATION & ORDERING.

COORD. W/ TYP. DOOR & WINDOW DETAILS PROVIDED

1. COORD. W/ FLR. PLANS ON LIFE SAFETY DWG.('S) FOR FIRE SEPARATIONS REQUIRING FIRE RATED DOORS.
2HR. FIRE SEPARATION TO HAVE 1 ½ HR. FIRE RATED DOORS/FRAMES.
1HR. FIRE SEPARATIONS TO HAVE 3/4 HR. FIRE RATED DOORS/FRAMES.
1/2 HR. FIRE SEPARATIONS TO HAVE 20 MIN. FIRE RATED DOORS/FRAMES.

2. ALL NON RATED GLAZING TO BE TEMPERED TYP. ALL EXT. DOORS & SCREENS TO HAVE INSULATED DOUBLE GLAZING. INT. TO BE SINGLE GLAZING. PROVIDE TEMPERED FIRELITE GLASS AT ALL RATED DOOR LOCATIONS

3. ALL FRAMES FOR CONC. BLOCK WALLS & GYP. BD. WALLS / PARTITIONS SHALL BE WRAP AROUND TYPE FOR WALL THICKNESS' UP TO 190mm (TO BE SNUG / TIGHT FIT ON WALL SYSTEM THAT THEY ARE INSTALLED ON / IN) OVER 190mm WALLS TO RECEIVE 172mm FRAMES.
(COORD. W/ FLR. PLANS FOR WALL THICKNESS & LOCATIONS)
(COORD. W/ A8.2 DETAILS)

GENERAL NOTES:

COORD. W/ FLOOR PLANS & ELEVATIONS FOR LOCATIONS, REQ.'D FRAME WIDTH, 170° DOOR SWINGS & QUANTITY OF REQ.'D DOORS, FRAMES & SCREENS.

SEE FINISHING HARDWARE SCHEDULE BY "COMMERCIAL DOORS & HARDWARE LTD.", FOR NEW DOOR HARDWARE. ALL FINISH HARDWARE & INFO. TO BE COORDINATED & VERIFIED W/ THIS APPROVED HARDWARE SCH., INCLUDING BUT NOT LIMITED TO HOLD OPEN DEVICES, ELECTRIC STRIKES, SECURITY KEYPADS, AUTO DOOR OPENERS, CLOSERS, PANIC DEVICES, MAGNETIC HOLD-OPENS, OVERHEAD STOPS, PUSH PLATES, KICK PLATES & ANY OTHER DOOR HARDWARE REQ.'S.

COORD. W/ ELEC. DWG.'S FOR EXIT SIGN & ELEC. EQUIP. LOCATIONS.

ALL H.M. DOORS TO HAVE 3 BALLBEARING HINGES. ALL EXTERIOR H.M. NEW DOORS TO HAVE 4 HINGES.

ALL EXTERIOR HM. NEW DOORS TO BE INSULATED, 16 Ga., CONT. WELDED C/W STIFFENER PLATES C/W WEATHER STRIPPING, NEW FRAMES TO BE THERMALLY BROKEN

THERMAL BROKEN NEW FRAMES, FILL VOID SOLID W/ SPRAY-IN-PLACE INSUL. TYP. W/ WELDED 10mm TEE ANCHOR, SUPPLY 3 ANCHORS FOR EACH JAMB UP TO 2200mm HIGH, SUPPLY 4 IF JAMB EXCEEDS 2200mm

IN ALL CORRIDOR NEW DOORS & HIGH TRAFFIC AREAS, PROVIDE 16 GAUGE CONT. WELDED DOORS & HINGES.

ALL WASHROOM NEW DOORS TO BE UNDERCUT BY 25mm (1") UNLESS NOTED BY MECH. MAX. UNDERCUT FOR FIRE RATED DOORS IS 19mm (¾")

ALL NEW DOORS TO HAVE DOOR STOPS

ALL NEW GLAZING IN EXTERIOR NEW DOORS & SIDELITES TO BE MIN. TEMP., DOUBLE GLAZING, THERMALLY BROKEN, C/W LOW "E", UNLESS NOTED OTHERWISE.

ALL NEW GLAZING IN INTERIOR NEW DOORS & SIDELITES TO BE TEMPERED GLAZING, AND TEMPERED FIRELITE AT RATED DOOR LOCATIONS

ALL NEW GLASS AND GLAZING, CONTRACTOR SHALL VERIFY AND PROVIDE THICKNESS TO BE CONFIRMED BY MANUFACTURER FOR THE ASSEMBLY IN WHICH THE NEW GLAZING IS INSTALLED, TO BE SUBMITTED IN SHOP DRAWINGS STAMPED BY A PROFESSIONAL ENGINEER BEFORE ANY MANUFACTURING. GLAZING TAPE TO BE AS PER MANUFACTURER'S WRITTEN RECOMMENDATIONS. APPLY SILICON TO 1100mm A/F/F IN GLAZING CHANNEL TO STIFFEN EXTERIOR GLAZING .

ALL NEW AND EXISTING WINDOW & DOOR AND SIDELITE FRAMES THAT ARE INCLUDED IN THE SCOPE OF WORK SHALL RECEIVED NEW BACKER ROD & CAULKING ON INTERIOR AND EXTERIOR SIDE ALONG THE ENTIRE PERIMETER OF THE FRAME.
PRIOR TO APPLICATION, REMOVE AND CLEAN OFF ALL EXISTING CAULKING RESIDUE FROM THE EXISTING FRAME AND OPENING PERIMETER WALLS TO RECEIVE NEW BACKER ROD & CAULKING.

SHOP DRAWINGS

IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO ENSURE: DOOR(S), SCREEN(S), WINDOW(S), CURTAIN WALL(S), FRAME(S), & THEIR HARDWARE MANUF.'S TRADES COORD. & EXECUTE THEIR WORK TOGETHER & LABEL IDENTIFYING INFO. FOR ALL DOOR(S), SCREENS(S), WINDOW(S), CURTAIN WALL(S), FRAME(S) SCH.'S **TO MATCH THE IDENTIFICATION TAG LABELS** HERE, NOT HAVING DIFF. LABELS & DIM. UNITS ON SHOP DWG.'S THAN TENDERED DOCUMENTS TYP..
(REVISE & RESUBMIT SHOP DWG.'S WILL BE RETURNED IF THIS FORMAT IS NOT FOLLOWED W/ NO REVIEW UNDERTAKEN)

ABBREVIATION, MATERIALS, & SYMBOLS LEGEND

W x H x T	DOOR SIZE (NOT INCLUDING FRAME)
AL	ALUMINUM
IM	INSULATED METAL
HM	HOLLOW METAL
WD	SOLID WOOD
PM	PRESSED METAL
AN	ANODIZED FINISH
P / PTD	PRIMED / PAINTED FINISH
S&V	STAINED & VARNISHED FINISH
PLAM #	PLASTIC LAMINATE FINISH
CL	CLEAR FINISH
FRR	FIRE RESISTANCE RATING
SP	SPANDREL PANEL
EX	EXISTING
GL	VISION GLAZING
HOLLOW METAL	HOLLOW METAL INSULATED SANDWICH PANEL WITH 2" RIGID INSULATION BETWEEN PANELS
	B.F. SYMBOL OF ACCESSIBILITY BY SIGNAGE

FINISH COLOURS TO BE DETERMINED

NEW EXIT SIGNAGE AND NUMBERING TO BE REINSTALLED ON ALL DOORS TO MATCH ORIGINAL LOCATION, DIMENSION, COLOUR, TYPO ETC. TYP.

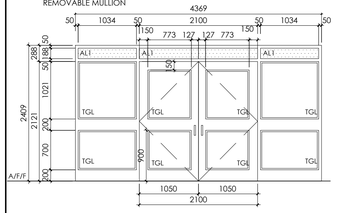
EXTERIOR DOOR & FRAME SCHEDULE

DESCRIPTION - ALUMINIUM EXTERIOR ENTRANCE DOORS

NO. D01A / W1A

ELEVATION

POWER DOOR OPERATOR / POWER DOOR OPENER BUTTONS / ELECTRIC STRIKE / DOOR CLOSER / PANIC HARDWARE / CARD READER / WEATHER STRIPPING / EXIT SIGN / ALUMINUM SILL / REMOVABLE MULLION



*REFER TO FLOOR PLAN FOR DOOR SWING COORDINATION

DOOR	
TYPE	ENTRANCE / THERMAL
SIZE	(2) 1050 x 2121 x 45
MAT'L	AL
FINISH	ANO
GLASS	NOTE 2
FRAME	
TYPE	EXTERIOR / THERMAL
SIZE	4369x2409
MAT'L	AL
HEAD	50
JAMB	50
DEPTH	NOTE 3
FINISH	ANO
GLASS	NOTE 2

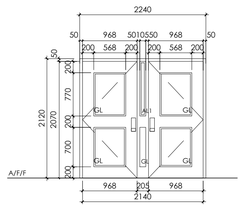
REMARKS: SEE GENERAL NOTES

DESCRIPTION - HOLLOW METAL EXTERIOR ENTRANCE DOORS

NO. D02A / W2A

ELEVATION

ELECTRIC STRIKE / DOOR CLOSER / PANIC HARDWARE / CARD READER / WEATHER STRIPPING / EXIT SIGN/ ALUMINUM SILL



*REFER TO FLOOR PLAN FOR DOOR SWING COORDINATION

DOOR	
TYPE	ENTRANCE / THERMAL
SIZE	(2) 967.5 x 2070 x 45
MAT'L	HM
FINISH	P/PTD
GLASS	NOTE 2
FRAME	
TYPE	EXTERIOR / THERMAL
SIZE	2120x2240
MAT'L	HM
HEAD	50
JAMB	50
DEPTH	NOTE 3
FINISH	P/PTD
GLASS	NOTE 2

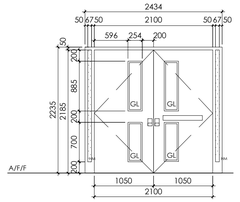
REMARKS: SEE GENERAL NOTES / HINGES BOLTED

DESCRIPTION - HOLLOW METAL EXTERIOR ENTRANCE DOORS

NO. D03A / W3A

ELEVATION

POWER DOOR OPERATOR / POWER DOOR OPENER BUTTONS / ELECTRIC STRIKE / DOOR CLOSER / PANIC HARDWARE / CARD READER / WEATHER STRIPPING / EXIT SIGN / ALUMINUM SILL / FIXED MULLION



*REFER TO FLOOR PLAN FOR DOOR SWING COORDINATION

DOOR	
TYPE	ENTRANCE / THERMAL
SIZE	(2) 1050 x 2180 x 45
MAT'L	HM
FINISH	P/PTD
GLASS	NOTE 2
FRAME	
TYPE	EXTERIOR
SIZE	2235x2434
MAT'L	HM
HEAD	50
JAMB	50
DEPTH	NOTE 3
FINISH	P/PTD
GLASS	NOTE 2

REMARKS: SEE GENERAL NOTES / HINGES BOLTED

DESCRIPTION - HOLLOW METAL EXTERIOR ENTRANCE DOORS

NO. D04

ELEVATION

DOOR CLOSER / PANIC HARDWARE / WEATHER STRIPING / EXIT SIGN/ ALUMINUM SILL

*REFER TO FLOOR PLAN FOR DOOR SWING COORDINATION

DOOR	
TYPE	ENTRANCE / THERMAL
SIZE	920 x 2190 x 45
MAT'L	HM
FINISH	P/PTD
GLASS	N/A
FRAME	
TYPE	EXTERIOR / THERMAL
SIZE	1020X2290
MAT'L	HM
HEAD	100
JAMB	50
DEPTH	NOTE 3
FINISH	P/PTD
GLASS	N/A

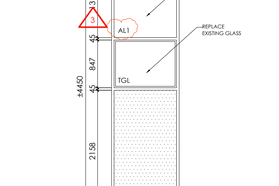
REMARKS: SEE GENERAL NOTES / NO EXTERIOR HARDWARE

DESCRIPTION - HOLLOW METAL EXTERIOR ENTRANCE DOORS

NO. D05 / W5

ELEVATION

DOOR CLOSER / PANIC HARDWARE / WEATHER STRIPING / EXIT SIGN / ALUMINUM SILL



*REFER TO FLOOR PLAN FOR DOOR SWING COORDINATION

DOOR	
TYPE	ENTRANCE / THERMAL
SIZE	910 x 2083 x 45
MAT'L	HM
FINISH	P/PTD
GLASS	N/A
FRAME	
TYPE	EXTERIOR / THERMAL
SIZE	1010x2560
MAT'L	HM
HEAD	50
JAMB	50
DEPTH	NOTE 3
FINISH	P/PTD
GLASS	N/A

REMARKS: SEE GENERAL NOTES

DESCRIPTION - HOLLOW METAL EXTERIOR ENTRANCE DOORS

NO. D08

ELEVATION

DOOR CLOSER / PANIC HARDWARE / WEATHER STRIPING / EXIT SIGN/ ALUMINUM SILL

*REFER TO FLOOR PLAN FOR DOOR SWING COORDINATION

DOOR	
TYPE	ENTRANCE / THERMAL
SIZE	920 x 2130 x 45
MAT'L	HM
FINISH	P/PTD
GLASS	N/A
FRAME	
TYPE	EXTERIOR / THERMAL
SIZE	1020X2180
MAT'L	HM
HEAD	50
JAMB	50
DEPTH	NOTE 3
FINISH	P/PTD
GLASS	N/A

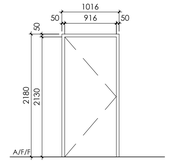
REMARKS: SEE GENERAL NOTES / HINGES BOLTED

DESCRIPTION - HOLLOW METAL EXTERIOR ENTRANCE DOORS

NO. D09

ELEVATION

DOOR CLOSER / PANIC HARDWARE / WEATHER STRIPING / EXIT SIGN /ALUMINUM SILL



*REFER TO FLOOR PLAN FOR DOOR SWING COORDINATION

DOOR	
TYPE	ENTRANCE / THERMAL
SIZE	916 x 2130 x 45
MAT'L	HM
FINISH	P/PTD
GLASS	N/A
FRAME	
TYPE	EXTERIOR / THERMAL
SIZE	1016x2180
MAT'L	HM
HEAD	50
JAMB	50
DEPTH	NOTE 3
FINISH	P/PTD
GLASS	N/A

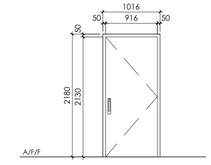
REMARKS: SEE GENERAL NOTES / NO EXTERIOR HARDWARE

DESCRIPTION - HOLLOW METAL EXTERIOR ENTRANCE DOORS

NO. D10

ELEVATION

DOOR CLOSER / PANIC HARDWARE / WEATHER STRIPING / EXIT SIGN ALUMINUM SILL



*REFER TO FLOOR PLAN FOR DOOR SWING COORDINATION

DOOR	
TYPE	ENTRANCE / THERMAL
SIZE	916x 2130 x 45
MAT'L	HM
FINISH	P/PTD
GLASS	N/A
FRAME	
TYPE	EXTERIOR / THERMAL
SIZE	1016x2180
MAT'L	HM
HEAD	50
JAMB	50
DEPTH	NOTE 3
FINISH	P/PTD
GLASS	N/A

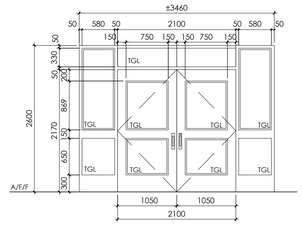
REMARKS: SEE GENERAL NOTES

DESCRIPTION - HOLLOW METAL EXTERIOR ENTRANCE DOORS

NO. D11A / W11A

ELEVATION

POWER DOOR OPERATOR / POWER DOOR OPENER BUTTONS / ELECTRIC STRIKE / DOOR CLOSER / PANIC HARDWARE / CARD READER / WEATHER STRIPPING / EXIT SIGN /ALUMINUM SILL / REMOVABLE MULLION



*REFER TO FLOOR PLAN FOR DOOR SWING COORDINATION

DOOR	
TYPE	ENTRANCE / THERMAL
SIZE	(2) 1050 x 2170 x 45
MAT'L	AL
FINISH	P/PTD
GLASS	NOTE 2
FRAME	
TYPE	EXTERIOR / THERMAL
SIZE	3461X2600
MAT'L	AL
HEAD	50
JAMB	50
DEPTH	NOTE 3
FINISH	ANO
GLASS	NOTE 2

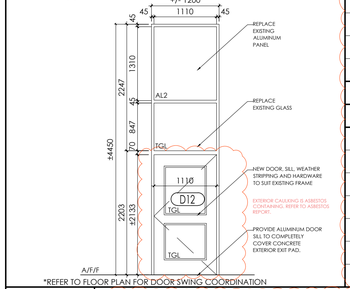
REMARKS: SEE GENERAL NOTES

DESCRIPTION - ALUMINIUM EXTERIOR ENTRANCE DOORS

NO. D12 / W12

ELEVATION

DOOR CLOSER / PANIC HARDWARE / WEATHER STRIPING / EXIT SIGN



*REFER TO FLOOR PLAN FOR DOOR SWING COORDINATION

DOOR	
TYPE	ENTRANCE / THERMAL (NEW)
SIZE	1110x2158
MAT'L	AL
FINISH	ANO
GLASS	N/A
FRAME	
TYPE	EXTERIOR / THERMAL
SIZE	1200x4450
MAT'L	AL
HEAD	45
JAMB	45
DEPTH	COORD. W. EX. WALL
FINISH	ANO
GLASS	REFER TO NOTES

REMARKS: REMOVE AND REPLACE EXISTING WINDOW ASSEMBLY IN ITS ENTIRETY. PROVIDE NEW ALUMINIUM WINDOW ASSEMBLY, INCLUDING FRAMES, GLAZING, INSULATED ALUMINIUM PANELS, FASTENERS, SEALANTS, AND ALL ASSOCIATED COMPONENTS. REMOVE AND DISPOSE OF EXISTING WINDOW FRAMES, GLAZING, CAPS, AND PANELS. INSTALL NEW ALUMINIUM WINDOW SYSTEM FULLY WEATHER-TIGHT, AND COORDINATED WITH ADJACENT CONSTRUCTION. RE-CAULK AND SEAL ENTIRE ASSEMBLY. REFER TO GENERAL NOTES FOR EXTENT AND COORDINATION REQUIREMENTS.

DESCRIPTION - EXTERIOR WALL WINDOWS

NO. W13 / W14 / W15 / W16

ELEVATION

DOOR	
TYPE	N/A
SIZE	
MAT'L	
FINISH	
GLASS	
FRAME	
TYPE	EXTERIOR / THERMAL
SIZE	1200x4450 (site verify)
MAT'L	AL
HEAD	45
JAMB	45
DEPTH	COORD. W. EX. WALL
FINISH	ANO
GLASS	REFER TO NOTES

REMARKS: REMOVE AND REPLACE EXISTING WINDOW ASSEMBLY IN ITS ENTIRETY. PROVIDE NEW ALUMINIUM WINDOW ASSEMBLY, INCLUDING FRAMES, GLAZING, INSULATED ALUMINIUM PANELS, FASTENERS, SEALANTS, AND ALL ASSOCIATED COMPONENTS. REMOVE AND DISPOSE OF EXISTING WINDOW FRAMES, GLAZING, CAPS, AND PANELS. INSTALL NEW ALUMINIUM WINDOW SYSTEM FULLY WEATHER-TIGHT, AND COORDINATED WITH ADJACENT CONSTRUCTION. RE-CAULK AND SEAL ENTIRE ASSEMBLY. REFER TO GENERAL NOTES FOR EXTENT AND COORDINATION REQUIREMENTS.

SITE VERIFY ALL ROUGH OPENING DIMENSIONS BEFORE ORDERING. CONFIRM DOOR DIMENSIONS BEFORE ORDERING

1 / A8.1 EXTERIOR DOOR & FRAME SCHEDULE

SCALE: 1:50

0 500 1000 2500mm

REVISIONS

NO.	DATE	PARTICULAR
1	2025.02.28	ISSUED FOR 80% PROGRESS SET
2	2025.12.10	ISSUED FOR BUILDING PERMIT
3	2026.02.02	ISSUED FOR ADDENDUM 3
4		

NOTES:

ALL DIMENSIONS MARKED TO AND FROM EXISTING BUILDING ELEMENTS ARE APPROXIMATE AND MUST BE CONFIRMED ON SITE BEFORE STARTING CONSTRUCTION AND ORDERING ASSEMBLIES.

MEASURE AND CONFIRM NEW DOORS, WINDOWS, CURTAINWALLS AND SCREENS REQUIRED FOR THIS RENOVATION BEFORE ORDERING AND ASSEMBLING

REFER TO HAZARDOUS BUILDING MATERIALS ASSESSMENT (PRE-CONSTRUCTION) DONE FOR THE KILBRIDE PUBLIC SCHOOL AT 6611 PANTON STREET, BURLINGTON, ONTARIO
PREPARED FOR THE HALTON DISTRICT SCHOOL BOARD BY PINCHIN.

FOR PERMIT PURPOSES.

CLIENT:

Halton District School Board

HALTON DISTRICT SCHOOL BOARD

PROJECT:
22502

KILBRIDE PUBLIC SCHOOL RENOVATION

6611 PANTON STREET
KILBRIDE, ONTARIO

ORIGINAL PAGE SIZE ARCH D - 24" x 36"

KEY TO DETAIL LOCATION:
A - DETAIL NO.
B - DETAIL NO. ORIGIN

+VG ARCHITECTS
THE VENTIN GROUP LTD

INTERIOR DOOR & FRAME SCHEDULE / DETAILS (TYP.)

A8.1

DRAWN BY : JCG/AM CHECKED BY : -

Plot Date: Feb 02, 2026 - 11:55am By: amontilcano Filename: K:\TVG-Branford\Kilbride PS Renos-22502\Drawings\Wd-Current\A8.1 - DOOR SCHEDULE.dwg

Halton District School Board, Kilbride Public School

The Ventin Group Architects Ltd (+VG)

Type of Document:
Electrical Specifications Issued for Permit & Tender

EXP Project:
ALL-25001986-A0; Halton District School Board, Kilbride Public School Renovation, 6611 Panton Street, Kilbride ON

Prepared and Reviewed By:
Justin Potalivo, P.Eng.
EXP Services Inc.
1266 South Service Road, Suite C1-1
Stoney Creek ON L8E 5R9
t: +1.905.525.6069
f: +1.905.528.7310

Date + Time Submitted:
2025-12-01

Section Number	Section Name	Pages
Division 26	**Electrical**	
26 05 00	Electrical Basic Materials Methods	19
26 05 19	Low Voltage Cables	6
26 05 19_01	Appendix to Low Voltage Cables	1
26 05 26	Grounding and Bonding	1
26 05 48	Vibration Isolation and Seismic Restraints	2
26 05 70	Electrical Work Analysis and Testing	1
26 09 00	Lighting Control	4
26 27 26	Wiring Devices	5
26 28 00	Low Voltage Circuit Protective Devices	4
26 50 00	Lighting	5
Division 27	**Communications**	
27 51 25	Emergency Call	3
Division 28	**Electronic Safety & Security**	
28 31 00	Existing Fire Alarm Work	8

END OF SECTION

Part 1 - General

1.1 REFERENCE

.1 Division 00 and Division 01 apply to and are a part of each Electrical Division Section.

1.2 APPLICATION

.1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Electrical Divisions. It is intended as a supplement to each Section of Electrical Divisions and is to be read accordingly.

1.3 SUBMITTALS

.1 Submit shop drawings for products of this Section.

.2 Additionally as part of shop drawing submission process, submit following to Consultant for review:

.1 sample of each proposed type of access door if supplied under work of this Division, as well as electronic copies of reflected ceiling plan drawings and wall elevation drawings showing proposed access door locations;

.2 dimensioned location drawings indicating required sleeves and formed openings in structural poured concrete or precast concrete construction or in roofing, and locations of cutting or drilling required for Electrical Divisions work;

.3 samples of materials and any other items as specified in succeeding Sections of Electrical Divisions;

.4 weight loads of selected equipment (upon request);

.5 equipment nameplate and warning sign proposed nomenclature, print type, symbols, sizing and colours;

.6 fire stopping installation drawings with ULC certifications;

.7 copies of prior to start of construction approvals from local governing authorities having jurisdiction.

.3 Prior to application for Substantial Performance of the Work, submit following to Consultant for review (note: funds will be withheld until each of following items have been completed and documented to satisfaction of Consultant):

.1 fire alarm system testing and verification report of each component of work; devices to be certified working and in proper order;

.2 final distribution system testing and arc flash study performed and documented to satisfaction of Consultant;

.3 structured network cabling system tested and verified to be operating and performing in accordance with specified standards.

1.4 CONTINUITY OF SUPPLY FOR STANDARDIZATION

.1 Utilize materials of one manufacturer for aspects of work, where practical. Utilize one common manufacturer for wiring devices, such as switches and receptacles, whether installed loose or in a pre-manufactured component. Coordinate with each supplier and ensure conformance with this requirement. Identify deviations to Consultant and obtain approval of change prior to proceeding with work.

1.5 HAZARDOUS MATERIALS

.1 Hazardous materials and infectious materials are known to be present on site in existing buildings, including but not limited to following:

.1 silica

.2 asbestos;

.3 PCBS;

.4 lead;

.5 mercury.

.2 Division 01 identifies specific requirements and if such materials are present, include for costs to be educated and trained on special working conditions, to work in areas with hazardous materials including protective clothing, gear, tenting, enclosures, etc., and perform necessary partitioning/tenting/ventilation work to isolate areas and maintain disturbances of such materials to a minimum. Comply with infection control requirements and those of governing local Health and Welfare authority. An asbestos abatement report is available for review from Consultant. Reference "Hazardous Building Materials Assessment (Pre-Construction" report by Pinchin Ltd. Unless otherwise noted, any abatement removal is responsibility of another Division of Work.

.3 If proper abatement procedures are not followed, be responsible for bearing full cost of a full time qualified abatement inspector chosen by Owner. In areas where work is being done above or below an area being occupied, any slab penetrations into vertically adjacent occupied space are to utilize a proper enclosure in area of that work on that occupied floor. Be responsible for failure to comply with special requirements in working in areas of hazardous materials.

.4 Include for company specializing in removal and disposal of materials containing PCB's to remove and dispose off-site luminaire ballasts containing PCB's. Check luminaires being deleted for ballasts containing PCB's. Disconnect and dispose off-site such ballasts. Only companies that are certified and comply with Ministry of Environment and Ministry of Transport regulations with regards to hazardous waste materials are to be used to perform this Work. Prior to start of Work, submit to Consultant a copy of PCB disposal certificate and identification of Ministry authorized and designated disposal site.

.5 Fluorescent lamps being replaced and containing mercury are to be properly transported offsite and disposed of as per local governing Ministry guidelines.

1.6 **PRODUCT REQUIREMENTS IN SPECIAL AREAS**

.1 Products in non-climate controlled areas are to include weatherproof provisions such as gasketted covers, corrosion resistant hardware, weatherproof finishes, etc. Devices to be manufactured to operate in extreme temperatures.

Part 2 - Products

2.1 **CONDUITS**

.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 steel couplers and steel set screw type connectors with insulated throats, and concrete tight where required.

.2 Rigid galvanized steel to CSA C22.2 No. 45, with exterior zinc and interior enamel coatings, galvanized threads where factory cut and 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 with rigid couplings, and concrete tight where required.

.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 Galvanized steel flexible metallic conduit to CSA C22.2 No. 56, complete with proper and suitable squeeze type connectors at terminations.

.5 CSA approved and labelled, FT-4 rated, rigid plastic (PVC) conduit complete with site made heat gun bends on conduit to 50 mm (2") diameter, factory made elbows in conduit larger than 50 mm (2") diameter, solvent weld joints, factory made expansion joints where required, and terminations made with proper and suitable connectors and adaptors.

2.2 **OUTLET BOXES**

.1 CSA approved stamped galvanized steel outlet boxes for all recessed device installations.

.2 CSA certified rigid plastic (PVC) outlet boxes.

.3 Standard general purpose service floor boxes: CSA approved, UL scrub water compliant, fully adjustable angular and vertically, formed steel/cast iron, round single gang / rectangular or square multi-gang as required, flush in concrete floor installation, boxes complete with conduit knockout openings, adjustable collars, hinged flip open brass covers with provisions for mounting of duplex power receptacles, telephone jacks and data jacks. Provide barriered boxes when boxes contain both power and communication outlets and different voltage levels. Size boxes to suit thickness of floor slab as confirmed with Consultant and also to suit required bending radii of conductors. Refer to drawings for number of gang requirements. Acceptable manufacturers are Hubbell, Legrand and Thomas & Betts. Special floor boxes are specified elsewhere in another Section.

.4 Each outlet box and back box to be suitable in respects for application and complete with suitable securing lugs, connectors suitable for connected conduit, knockouts and, where necessary, suitable plaster rings, concrete rings, covers, carpet flanges and any other required accessory.

.5 Electrical boxes exposed exterior of building or in non-climate controlled locations to be weatherproof boxes complete with gasketted covers/faceplates.

2.3 **PULL BOXES & JUNCTION BOXES**

.1 Galvanized or prime coat plated steel, suitable in respects for application and complete with screw-on or hinged covers as required, and connectors suitable for connected conduit.

.2 Eaton Crouse-Hinds, "Condulet", threaded cast Feraloy outlet boxes of an exact type to suit application, each complete with screw-on gasketted cover.

.3 Rigid plastic (PVC), CSA certified, junction boxes and access fittings with solvent weld type joints and screw-on PVC covers.

.4 Physical size of pull boxes to be as required by local governing electrical code to suit number and size of conduits and conductors.

.5 Each box to be suitable in respects for application and complete with suitable securing lugs, connectors suitable for connected conduit, knockouts and, where necessary, suitable plaster rings, concrete rings, covers and any other required accessory.

.6 Boxes exposed exterior of building or in non-climate controlled locations to be weatherproof boxes complete with gasketted covers.

2.4 **SLEEVES**

.1 Galvanized steel sleeves as follows:

.1 No. 24 gauge with an integral flange at one (1) end to secure sleeve to formwork construction;

.2 Schedule 40 pipe;

.2 Schedule 40 PVC sleeves.

2.5 FIRESTOPPING & SMOKE SEAL MATERIALS

.1 Asbestos-free, elastomeric materials and intumescent materials, tested, listed and labelled by ULC in accordance with CAN 4-S115-M85, and CAN/ULC-S101-M for installation in ULC designated firestopping, and smoke seal systems to provide a positive fire, water and smoke seal and a fire resistance rating (flame, hose stream and temperature) no less than fire rating for surrounding construction.

.2 Fire stopping and smoke seal material system to be specifically ULC certified with designated reference number for its specific installation. As part of shop drawing submission, submit copies of firestopping drawings with ULC certificate and number for each specific installation. Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance ratings.

.3 Systems to consist of both elastomeric and intumescent materials that are compatible with abutting dissimilar materials and finishes. Coordinate material requirements with trades supplying abutting areas of materials.

.4 Typically, for openings of up to 250 mm (10") in diameter, provide putty pad type firestop materials equivalent to Specified Technologies Inc. "SpecSeal" intumescent, non-hardening, water resistant putties containing no solvents, inorganic fibres or silicone compounds.

.5 Typically, for openings of greater than 250 mm (10") in diameter, and for rectangular openings, provide pillow type firestop materials equivalent to Specified Technologies Inc. "SpecSeal" re-enterable, non-curing, mineral fibre core encapsulated on six sides with intumescent coating contained in a flame retardant poly bag.

.6 Supply products of a single manufacturer for use on work of this Division.

.7 Installer to be manufacturer trained and certified on specific product. Submit copy of certificate with shop drawings.

.8 Include for manufacturer authorized representative to inspect and verify each installation and application. Submit test report signed and verified by system installer's authorized representative and manufacturer representative.

.9 Acceptable certification to also include certification by Underwriters Laboratories of Northbrook IL, using tests conforming to ULC-S115 and given cUL listing published by UL in their "Products Certified for Canada (cUL) Directory".

.10 Acceptable manufacturers are:

- .1 Hilti Canada;
- .2 Specified Technologies Inc.;
- .3 3M Canada Inc.;
- .4 Tremco;
- .5 A/D Fire Protection Systems;
- .6 Nelson.

2.6 FASTENING & SECURING HARDWARE

.1 Concrete inserts - Crane Canada Ltd., No. 4-M for concrete work for single or double conduit, cable tray, etc., runs and equipment. Unistrut Ltd. multiple type inserts for runs of three (3) or more conduits etc., or where a grid support system is required.

.2 Concrete fasteners - "WEJ-IT" anchors, lead cinch anchors and/or "STAR" or "PHILLIPS" self-drilling anchors.

.3 Masonry inserts - "WEJ-IT" expansion shields and machine bolts or, for light loads, fibre or lead plugs and screws.

.4 Drywall or plaster wall and/or ceiling fasteners - 2-wing spring toggles.

.5 Structural steel - Crane Canada Ltd., beam clamps.

.6 Metal framing channels - 40 mm (1-5/8") width, galvanized steel channels complete with required fittings and ancillary hardware; acceptable manufacturers are:

.1 Unistrut;

.2 Thomas & Betts;

.3 Hilti;

.4 Eaton B-Line.

.7 Metal "J" hooks or Panduit "J-Pro" cable support systems for communications system cabling in accessible ceiling spaces were conduit or cable tray is not being provided. Obtain written approval of Consultant for use of J-hooks.

.8 Velcro tie wraps for bundling and securing cables.

2.7 ACCESS DOORS

.1 Access doors to be provided under work of Division 08 by General Trades Contractor.

.2 Coordinate with Mechanical Contractor and General Trades Contractor to ensure that access doors on project are provided by a single manufacturer, installed as part of work of General Trades Contractor and that work involving both mechanical and electrical services to where possible be accessible from common access door. Coordinate work to ensure that same common location access doors are not supplied by more than one Division.

.3 Size access door to suit concealed work for which they are supplied and wherever possible they are to be of standard size for all applications, but in any case they are to be minimum 300 mm x 300 mm (12" x 12") for hand entry and 600 mm x 600 mm (24" x 24") for body entry.

.4 Access doors in fire rated ceilings, walls, partitions, structures, etc., to be ULC listed and labelled and of a rating to maintain fire separation integrity.

.5 Identify on reflected ceiling plans and wall elevation drawings, coordinated locations of proposed access door locations and submit to Consultant for review.

2.8 IDENTIFICATION NAMEPLATES

.1 Laminated plastic (Lamacoid) black-white-black with bevelled edges, stainless steel screws, and proper identification engraving. Each nameplate to be sized to suit equipment for which it is provided, and required wording. Confirm nomenclature with Consultant. Various colour configurations to be used to differentiate systems. Confirm exact colour scheme with Consultant and/or Owner.

.2 Brother "P-Touch", portable electronic labelling system complete with self-adhesive, permanent printed labels with required nomenclature.

2.9 SYSTEM BACKBOARDS

.1 FSC (Forest Stewardship Council), G1S (good one side) construction grade fir plywood, containing no added urea formaldehyde, flame retardant prime coat painted on exposed surfaces, minimum 20 mm (3/4") thick, as sized on drawings and with flame spread rating in accordance with local governing building code requirements.

2.10 MOTOR STARTER PANELS

.1 Minimum No. 14 gauge sheet steel panels complete with steel angle reinforcing, framing and suitable splitter trough, fully primed and enamel painted, sized to accommodate starters required with spare space and capacity for at least two additional units.

2.11 **SPRINKLER PROTECTION**

.1 Provide drip shields for protection of surface mounted equipment enclosures from water spray and dripping of liquids. Features of shields include:

.1 factory constructed by respective equipment manufacturers;

.2 constructed from non-combustible materials (sheet steel);

.3 enamel painted to match equipment;

.4 surfaces and edges filled/sanded smooth prior to painting;

.5 supported from equipment with structural steel rods/metal framing or other method approved by Consultant;

.6 structural support finish painted to match shield.

.2 Include with equipment shop drawings, detailed dimensions of drip shields and methods of supporting.

.3 Equipment with top cable/conduit entries to include additional sealing of entries with gasketting and/or waterproof sealant to prevent water from entering enclosure.

.4 Design ventilation louvers such that live components are not exposed to water spray and dripping liquids.

.5 Above requirements are additional minimum "sprinkler protection" standards for equipment specified as EEMAC/NEMA 1, 2 or 12.

.6 Obtain CSA approval where required by local governing authorities.

Part 3 - Execution

3.1 **GENERAL CONDUIT INSTALLATION REQUIREMENTS**

.1 Install conduit concealed in finished areas, and concealed to degree made possible by finishes in partially finished and unfinished areas. Conduit may be exposed in unfinished areas such as Electrical and Mechanical Rooms, unless otherwise noted on drawings or specified herein. Refer to and examine architectural drawings and room finish schedules to determine finished, partially finished or unfinished areas of building. Documents do not identify exact routing. Where shown, routing is diagrammatic, identifying general requirements of routing and locations. Include for necessary offsets, fittings, transformations and similar items required as a result of obstructions and other architectural or structural details not shown.

.2 Where conduits are exposed, arrange them to avoid interference with other work, parallel to building lines and install as high as possible. Do not install conduits within 150 mm (6") of "hot" pipes or equipment unless conduits are associated with equipment. Independently run conduit to be supported from wall/ceiling structure, not from ceiling hangers, ductwork, piping, cable trays, formed steel decking, etc. Do not run conduits within 900 mm (3') of equipment access opening covers.

.3 So as not to impair required strength of structure, following criteria to be generally followed but which is to be reviewed and coordinated with Consultant prior to start of Work:

.1 where conduits pass by a column, stay at least two times thickness of slab and drop away from column;

.2 where conduits terminate adjacent to a column or wall, bring conduit in toward column/wall as close to 90° to face of column as possible within two times thickness of slab and drop away from column;

.3 maximum size of conduit in structural slabs is 1/5 of solid portion of slab thickness;

.4 where more than two conduits are adjacent to each other, they are to be spaced greater of 3 diameters or 100 mm (4") apart;

.5 total of depth of conduits crossing over each other is to be less than one-third thickness of slab;

.6 place conduit in middle third of thickness of slab; do not lay conduit directly on reinforcing steel;

.7 do not run conduit adjacent to parallel reinforcing bars;

.8 do not run conduit longitudinally in beam without approval of Owner and review with Consultant; pass through beams at right angles to span of beam;

.9 where conduits pass through beams, maintain at least twice depth of beam separation away from supports;

.10 do not run conduits in slab beside a drop or beam within twice depth of slab from edge of drop or beam;

.11 do not run conduits through shear walls or columns without approval of Owner and review with Consultant;

.12 do not place conduit in structural elements in parking garage structures, water retaining structures or structures subjected to de-icing chemicals, without approval of Owner and review with Consultant.

.4 Conduits are sized on drawings, but in absence of type and sizing, type and size to suit intended application in accordance with applicable local governing electrical code requirements. Sizes identified on drawings are minimum sizes and are not to be decreased unless approved by Owner and reviewed with Consultant.

.5 Minimum conduit size shall be 3/4" unless otherwise noted.

.6 Where receptacle type devices are located in existing floors and/or where feeds are required to furniture systems in open spaces, and where chasing of floor slab to run conduit is not acceptable to Owner after review with Consultant provide fire rated "poke-thru" assembly installed through floor and feed from conduit runs provided in ceiling space of floor below.

.7 Mounting heights of devices may be typically identified on drawings, but such dimensions are for general pricing only. Review exact mounting heights with Consultant prior to roughing-in, refer to Architectural drawings and comply with local governing codes and standards including building code barrier free requirements.

3.2 INSTALLATION OF CONDUIT

.1 Provide conduit for conductors except armoured cable and copper sheathed mineral insulated conductors, and except where duct or similar raceway materials are provided.

.2 Provide conduit as follows:

.1 for interior building surface mounted services greater than 600 V - rigid galvanized steel;

.2 for branch circuit conductors underground inside building, and underground outside building beneath concrete, asphalt, and similar paving material-rigid PVC;

.3 for exposed conduit mounted at a height of less than 1200 mm (4') in electrical, mechanical or other service areas - rigid galvanized steel;

.4 for short branch circuit connectors to motorized equipment and distribution transformers (minimum length 450 mm (18"), maximum length 600 mm (24") with 180° loop where possible) - galvanized steel flexible liquid-tight conduit;

.5 for branch circuit conductors associated with isolated power systems and located in a concealed space in a wall or in a concrete floor slab-rigid PVC with separate insulated ground conductor;

.6 at points, where conductors cross building expansion joints - galvanized steel flexible conduit with no less than 600 mm (24") of extra curve;

.7 for branch circuit conductors in poured concrete slab - rigid PVC;

.8 for interior conduit above 50 mm (2") diameter containing distribution conductors or communication systems conductors (fire alarm, telephone etc.) (except as noted above) - EMT with separate insulated ground conductor;

.9 for corrosive environments - epoxy coated rigid steel;

.10 for conductors except as noted above or elsewhere in this Specification - EMT.

.3 Run rigid conductors in rigid type conduits suitable for application. Do not use flexible conduit.

.4 Secure conduit located in poured concrete work in place in a manner such that conduit will not float or move when concrete is poured. Adequately protect such conduit from damage prior to and during concrete pour, and from concrete and water penetration.

.5 Review with Consultant prior to Start of Work, maximum allowable size of conduit for installation in poured concrete. Placement of reinforcing steel in structural concrete work will take precedence over placement of conduit. Spaced adequately multiple runs of conduit in poured concrete work, as reviewed with Consultant.

.6 Install flexible polyethylene conduit in continuous lengths wherever possible and "snake" conduit in trench. Where joints are necessary, make same with nylon inserts and stainless steel gear type clamps. Terminate with rigid conduit threadless connectors. Grade bed to provide proper drainage of conduits.

.7 Support underground conduit on a well-tamped flat bed of earth, free from rocks or protrusions of any kind. Grade and slope bed to provide conduits and ducts with proper drainage. Coordinate with General Trades Contractor for provision of means to carry away drainage water. Obtain required approvals of work from local governing electrical utility and review with Consultant prior to back filling and covering. Provide pull cord in each duct run.

.8 Provide manufactured expansion joints in rigid PVC plastic conduit at spacing as recommended by conduit manufacturer.

.9 Provide a separate ground conductor in plastic conduits.

.10 Support and secure surface mounted and suspended single or double runs of metal conduit at support spacing in accordance with local governing electrical code requirements by means of galvanized pipe straps, conduit clips, ringbolt type hangers, or by other proper manufactured devices.

.11 Support multiple mixed size metal conduit runs with Unistrut Ltd., Electrovert Ltd. "CANTRUSS" or Burndy Ltd. "FLEXIBLE" conduit racks spaced to suit spacing requirements of smallest conduit in group.

.12 Unless otherwise noted, provide conduit fittings constructed of same materials as conduit and which are suitable in respects for application.

.13 Provide proper adaptors for joining conduits of different materials.

.14 Cut square and properly ream site cut conduit ends.

.15 Provide conduit as sized on drawings. Size conduit not sized on drawings in accordance with latest edition of local governing electrical code with consideration that sizes of branch circuit conductors indicated are minimum sizes and must be increased as required to suit length of run and voltage drop in accordance with voltage drop schedule found on drawings or at end of this section. Where conductor sizes are increased to suit voltage drop requirements, increase scheduled or specified conduit size to suit. Unless otherwise noted on drawings or required by local governing electrical code or specified elsewhere, conduit to be of minimum size 13 mm (1/2") diameter. Structured network cabling system conduit to be of minimum 19 mm (3/4") diameter, unless otherwise noted.

.16 Site made bends for conduit to maintain full conduit diameter with no kinking, and conduit finishes are not flake or crack when conduit is bent.

.17 Plug ends of roughed-in conduits which are exposed during construction with approved plugs.

.18 Ensure that 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 wires in such conduits.

.19 Provide empty conduits to ceiling spaces from flush mounted panelboards located below and/or near hung ceiling. Refer to drawing detail.

.20 Conduits shall be colour coded with paint located at junction boxes and every 5 feet along each run as follow:

.1 Yellow - Line voltage
.2 Red - Fire alarm
.3 Blue - Low voltage emergency lighting
.4 Green - Network cabling

3.3 EXPANSION FACILITIES FOR CONDUIT CROSSING BUILDING EXPANSION JOINTS

.1 Wherever concealed or surface mounted conduits cross building expansion joints, provide expansion facilities to permit free movement without imposing additional stress or loading upon support system, and to prevent excessive movement at joints and connections, in accordance with drawing details and local governing inspection approvals.

3.4 INSTALLATION OF OUTLET BOXES & 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 each other such outlet.

.2 Size boxes to accommodate exact supplied components and for bending radii of installed cables. Confirm requirements with respective system vendors.

.3 Outlet boxes flush mounted in interior construction, surface mounted in concealed interior locations, to be stamped and galvanized steel outlet boxes unless otherwise noted.

.4 Provide sealing around boxes in walls where insulation and vapour barrier is present or for walls of rooms that are sealed. Maintain sealing system of wall.

.5 Outlet boxes in underground plastic conduit systems to be rigid PVC plastic outlet boxes, unless otherwise noted.

.6 Outlet boxes for flush floor mounted devices to be concrete tight formed galvanized steel fully adjustable flush floor boxes. Locate in to position and install in accordance with manufacturer instructions. Coordinate installation with trades pouring concrete floor slab or trade responsible for floor construction.

.7 Provide a barriered outlet box for switches connected to normal and emergency power and share a common faceplate.

.8 Provide outlet boxes for special wiring devices, for special equipment and special applications. Refer to requirements specified in other Sections and/or on drawings.

.9 Size and arrangement of outlet boxes to suit device which they serve.

.10 Mounting heights and locations for outlet boxes are typically indicated on drawings, however confirm exact location and arrangement of outlets prior to roughing-in. Architectural drawings and Consultant's instructions have precedence over electrical drawing diagrammatic layouts and specified mounting heights and locations.

.11 Do not install outlet or back boxes "back-to-back" in walls and partitions. Stagger such outlets and seal against noise transmission in accordance with drawing details. "Thru-wall" type boxes will not be permitted for any application.

.12 Provide blank coverplates on existing obsolete boxes which are to remain in position.

.13 Provide blank coverplates over boxes left empty for future installation of devices. Clearly identify each box as to its intended use, to Owner's approval and reviewed with Consultant.

3.5 INSTALLATION OF PULL BOXES & JUNCTION BOXES

.1 Provide pull boxes in conduit systems wherever shown on drawings, and/or wherever necessary to facilitate conductor installations. Generally, conduit runs exceeding 30 m (100") in length, or with more than two - 90° bends, are to be equipped with a pull box installed at a convenient and suitable intermediate accessible location.

.2 Size boxes to accommodate exact supplied system and for bending radii of installed cables. Confirm requirements with respective system vendors.

.3 Provide junction boxes wherever required and/or indicated on drawings and as required by local governing electrical code.

.4 Provide sealing around boxes in walls where insulation and vapour barrier is present or for walls of rooms that are sealed. Maintain sealing system of wall.

.5 Boxes in rigid conduit and EMT inside building to be stamped galvanized or prime coated steel.

.6 Boxes in exterior rigid conduit and boxes in perimeter wall where insulation and vapour barrier is present, to be "Condulet" cast gasketted boxes, unless otherwise noted.

.7 Boxes in plastic conduit to be rigid PVC plastic boxes complete with required couplings.

.8 Pull boxes and junction boxes to be accessible after work is completed.

.9 Accurately locate and identify concealed pull boxes and junction boxes on "As-built" record drawings.

.10 Clearly identify main pull or junction boxes (excluding obvious outlet boxes) with painted cover plate and machine printed labels. Text shall be minimum 3/8" high bold text font for legibility. Labelling to identify system, and source panel circuits for power wiring. Junction box covers to be colour coded as follow:

- .1 Yellow - line voltage
- .2 Red - Fire alarm
- .3 Blue - Low voltage emergency lighting

.11 Cover boxes in fire walls with aluminium tape and seal with caulking.

3.6 INSTALLATION OF SLEEVES

.1 Where conduits, round ducts and conductors pass through structural poured concrete, provide sleeves of type suitable for application, and approved by local governing codes.

.2 Sleeves in concrete slabs, except as noted below, are to be No. 24 gauge or equivalent, with an integral flange to secure sleeves for formwork construction.

.3 Sleeves in waterproof concrete slabs and in other slabs where waterproof sleeves are required are to be lengths of Schedule 40 pipe sized to extend 100 mm (4'') above floor.

.4 Sleeves in poured concrete walls and foundation are to be Schedule 40 pipe.

.5 Size sleeves, unless otherwise noted, to leave 13 mm (1/2") clearance around conduit, duct, conductor, etc. Void between sleeves and conduit, duct, conductors, etc., to be packed and sealed for length of sleeves as in accordance with article titled "Firestopping and Smoke Seal Materials" specified here in this Section. Ensure that sleeves set in exterior walls are packed and sealed with governing authority approved materials suitable for application and that both ends of sleeves are packed watertight with approved permanently flexible and water tight materials. Exact responsibility of work to be coordinated with General Trades Contractor.

.6 Submit to concrete reinforcement detailer at proper time, drawings indicating required sleeves, recesses and formed openings in poured concrete work. Completely and accurately dimension such drawings and relate sleeves, recesses and formed openings to suitable grid lines and elevation datum.

.7 Supply sleeves of a water protecting type in accordance with detail found on drawings for installation in following locations:

.1 in Mechanical and Fan Room floor slabs, except where on grade;

.2 in slabs over Mechanical, Fan, Electrical and Telephone Equipment Rooms or closets;

.3 in floors equipped with waterproof membranes.

.8 "Gang" type sleeving to be permitted only with approval of Owner and reviewed with Consultant.

.9 Terminate sleeves for work which is exposed, so that sleeve is flush at both ends with wall, partition, or slab surface such that sleeve may be covered completely by escutcheon plates.

3.7 INSTALLATION OF FIRESTOPPING & SMOKE SEAL MATERIALS

.1 Where electrical work penetrates or punctures fire rated construction, provide ULC certified, listed and labelled firestopping and smoke sealing packing material systems to seal openings and voids around and within raceway and to ensure that continuity and integrity of fire separation is maintained. Submit to Consultant, copies of certificates of compliance from an independent testing agency, attesting that fire stopping and smoke seal materials meet ULC requirements. Openings not in immediate vicinity of working areas are to be firestopped and sealed same day as being opened.

.2 Install fire stopping and smoke seal materials for each installation in strict accordance with specific ULC certification number and manufacturer instructions. Comply with local governing building code requirements and obtain approvals from local building inspection department. Ensure that openings through fire separations do not exceed maximum size wall opening, and maximum and minimum dimensions indicated in ULC Guide No. 40 U19 for Service Penetration Assemblies and fire stopping materials.

.3 Ensure that continuity and integrity of fire separation is maintained and conform to requirements of latest edition of ULC publication "List of Equipment and Materials, Volume II, Building Construction".

.4 Comply with following requirements:

.1 Manufacturer’s installation instruction for each specific application.

.2 Clean areas and surfaces before materials are installed.

.3 Examine substrates, openings, voids, adjoining construction and conditions under which firestop and smoke seal system is to be installed. Confirm compatibility of surface.

.4 Verify penetration items are securely fixed and properly located with proper space allowance between penetrations and surfaces of openings.

.5 Report any unsuitable or unsatisfactory conditions to Consultants in writing, prior to commencement of work. Commencement of work will mean acceptance of conditions and surfaces.

.6 Mask where necessary to avoid spillage and over coating onto adjoining surfaces. Remove stains on adjacent surfaces.

.7 Prime substrates in accordance with product manufacturer's written instructions.

.8 Provide temporary forming as required and remove only after materials have gained sufficient strength and after initial curing.

.9 Tool or trowel exposed surfaces to neat, smooth, and consistent finish.

.10 Remove excess compound promptly as work progresses and upon completion.

.5 Notify Consultant when work is complete and ready for inspection, and prior to concealing or enclosing firestopping and smoke seal materials and service penetration assemblies. Arrange for final inspection of work by local governing authority inspector prior to concealing or enclosing work. Make any correction required.

.6 On completion of firestopping and smoke sealing installation, submit a letter of Assurance to Consultant certifying the firestopping and smoke sealing installation has been carried out throughout the building to service penetrations and that installation has been performed in strict accordance with requirements of local governing building code, any applicable local municipal codes, ULC requirements, and manufacturer's instructions.

.7 Manufacturer's authorized representative to inspect and verify each installation and provide a test report signed by installing trade and manufacturer's representative. Test report to list each installation and respective ULC certification and number.

.8 Where work requires removal of existing firestopping materials and replacement of firestopping materials after cabling changes have been made, ensure that replacement material is same material and manufacturer of existing if any remains in place, or ensure that all existing material is removed before installation of replacement material.

3.8 **INSTALLATION OF FASTENING & SECURING HARDWARE**

.1 Provide fasteners and similar hardware required for conduit, duct, raceway, conductors, etc. and for equipment hanger and/or support material unless otherwise noted.

.2 Accurately and properly set concrete inserts in concrete framework. Where multiple type inserts are used, space same to suit requirements of smallest conduit, etc., in group.

.3 Fasten hanger and support provisions to masonry with expansion shields and machine bolts, or, for light loads, use plugs, and screws.

.4 In drywall or plaster walls and/or ceilings use two wing toggles and for heavy loads, provide steel anchor plates with two or more toggles to spread load.

.5 Provide beam clamps for attaching hanging and/or support provisions to structural steel, or where approved by Owner and reviewed with Consultant, weld hanging and support provisions to structural steel.

.6 Install devices in accordance with manufacturer's instructions to suit each respective application.

.7 Explosive powder actuated fasteners are not permitted unless specific written approval for their use and type has been obtained from Consultant.

.8 Under no circumstances use ceiling suspension hangers or grids for suspension of conduit and conductors. Install supports to permanent structure of building, limited to areas that will not damage structural stability.

.9 Provide "J" hooks in accessible ceiling spaces where conduit is not provided for structured cabling runs or other telecommunication cabling, as approved by Consultant.

.10 Comply with J-hook manufacturer loading limitations and spacing criteria. Do not exceed 1.2 m (4') spacing interval. Add additional J-hooks if cabling sags, at discretion of Consultant. Drill anchors for J-hooks into slab not into post tensioned beams. Do not install more than one system on each J-hook.

.11 Install Velcro tie wraps on bundled telecommunication cables and do not over tighten. Provide FT6/CMP rated wraps in plenum type spaces as per local building code requirements.

.12 Comply with Structural Engineer's limitations for maximum penetrations of securing hardware into concrete slabs.

3.9 INSTALLATION OF IDENTIFICATION NAMEPLATES

.1 For each piece of electrical distribution equipment from 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 to indicate source of electrical supply and include Consultant's equipment identification number.

.2 Equip large multiple cell or component apparatus such as switchboards and distribution panels with main nameplates identifying equipment, voltage characteristics, capacity and source of supply, and with sub-nameplates clearly identifying each cell or component and panel tag and location.

.3 Panelboard nameplates to identify panelboard number as designated on drawings, unless otherwise instructed. Nameplates for disconnect switches, control panels, and cabinets to outline their service and source of supply.

.4 In areas where equipment having removable doors that can be commonly installed on different equipment, ensure that each door is identified to which piece of equipment it is associated with, such that nameplates are with correct equipment.

.5 Faceplates for all wiring devices shall include source panel/circuit on machine printed clear self-adhesive label.

.6 Nameplates to be mechanically secured lamacoid and be colour coded as follows:

.1	Normal Power	Black with white letters;
.2	Emergency Power	Red with white letters;
.3	Isolated Power	Red with white letters;
.4	Vital Power	Yellow with white letters;
.5	UPS Power	Orange with white letters.

.7 Above identification nameplate and nomenclature requirements are for typical requirements for pricing only.

.8 In pull boxes, junction boxes and at terminations, identify feeders by use of plastic plates indicating system voltage and circuit designations. Plates to be 25 mm (1") in diameter and have letter stamped 9 mm (5/8") high. Colour coding to be:

.1 Phase A - red;
.2 Phase B - black;
.3 Phase C - blue;
.4 Neutral - white;
.5 Ground - green.

.9 Review print size type and size, colours, sizing and nomenclature of nameplates with Consultant prior to ordering. Submit sample board.

3.10 INSTALLATION OF TERMINAL BACKBOARDS

.1 Provide specified terminal backboards for communication systems and electrical distribution equipment.

.2 Securely wall mount each backboard with proper fasteners to suit wall construction.

.3 Unless otherwise noted, size backboards to sufficiently provide adequate terminal space for each system, plus 20% space for future additions.

3.11 BRANCH CIRCUIT BALANCING

.1 Connect branch lighting and power circuits to panelboards so as to balance actual loads (wattage) within 5%. If required, transpose branch circuits when work is complete to meet this requirement.

.2 Perform necessary tests to show compliance with above requirement. Make such tests after building is occupied.

3.12 DISCONNECTION, REMOVAL & RELOCATION WORK

.1 Where indicated on drawings or where required to perform Work of this Project, disconnect and remove items of existing obsolete electrical work. Relocate required devices as required to accommodate work of other Divisions. Where luminaires, switches, receptacles, and other devices and/or equipment is removed, disconnect at point of electrical supply, remove obsolete wiring and conduit up to source, unless otherwise noted, and make system safe to Owner satisfaction and as reviewed with Consultant. Remove obsolete conduit/raceways in accessible ceiling spaces, exposed locations, etc. Where existing obsolete conduit and similar raceway material cannot be removed, such as embedded in concrete, cut back and cap obsolete conduit and raceways. Refer to specific notes on drawings.

.2 When respective work is deleted, such deletions are to in no way affect operation of any existing interconnected mechanical or electrical components that remain. When existing circuits are being disconnected, maintain supervision of area to ensure that such circuits do not affect essential existing circuits being retained.

.3 Refer to architectural drawings which define extent of areas being demolished in existing building. Review drawings and site and include for demolition and/or renovation of services as required to accommodate alterations detailed.

.4 Unless otherwise noted, obsolete materials which are removed and are not to be relocated or reused are to become your property. Remove from site and properly dispose. Obtain from Owner and coordinate with Consultant, a list of existing electrical items which are to be removed and turned over to Owner. Said items are to remain property of Owner.

.5 Where existing services pass through or are in an area to serve items which are to remain, or pass through areas that are to be deleted, maintain services, but re-route as required. Include for rerouting existing services concealed behind existing finishes and which become exposed during renovation work, so as to be concealed behind new or existing finishes. Confirm with Owner services which are to be kept in service and operational.

.6 Revise panelboard directories accordingly, if affected by any renovation, disconnection, or removal of work. Use Owner's actual room names/numbers.

.7 Protect existing devices being relocated or deleted to ensure that they are not damaged. Test such devices prior to disconnection and de-energization, to ensure that each device is in proper working condition. Ensure that motors are in proper rotation direction. Examine each device for damage. Report devices not working or with damage to Consultant prior to initiating any work. It will be assumed that devices are in proper working order and good condition if not reported.

.8 Provide junction boxes, outlet boxes, wiring, plates, etc., as necessary for complete relocation of devices. Clean relocated or temporary removed devices and equipment, and ensure that they are in good operating condition before being reinstalled. Where existing luminaires are relocated, clean luminaires and inspect for damage. Re-lamp relocated luminaires. Report defects or damages to Consultant. Do not splice conductors unless approved by Owner and reviewed with Consultant. Utilize junction boxes and terminal devices for proper extension of circuits where approved. Otherwise replace circuits with home run continuous run of suitable lengths.

.9 Provide blank coverplates on existing obsolete boxes which are to remain in position.

.10 After installation is complete, test parts of re-used or relocated electrical equipment and correct faults and grounds. Include for fire alarm verification company to verify any relocated devices and downstream affected devices, and verify system as required by local fire authority to suit actual relocation work. For other existing systems, engage manufacturers authorized representative or Owner's system maintenance contractor, to inspect and verify relocated devices. Coordinate and confirm exact requirements with Owner and/or Consultant. Document testing in test reports, signed by testing technician. Submit copies to Consultant.

.11 Interior, exterior or underground electrical services (including auxiliary services, telephone, fire alarm, P.A. System, etc.) to operating parts of building are not to be hampered under any conditions and to that effect, necessary work may have to be carried out on an overtime basis, at no additional cost to this project. Existing risers are to be maintained in service as required to feed other areas of building(s). Do not interrupt any services without prior written approval by Owner and reviewed with Consultant. Submit formal requests to Consultant outlining in detail requirements of proposal and wait for instructions from Consultant.

.12 Be present when new doors or openings are being cut into existing walls and ceilings. Should any damage occur to electrical system, restore system to a safe and sound condition.

.13 Where references are made on drawings that existing receptacles, etc., be extended and/or relocated to suit new construction, receptacles, etc., are to be tested and if found defective, be replaced with new devices. Cracked or broken cover plates are to be replaced and match Architectural finishes. Contractor may optionally replace existing basic receptacles, switches, and faceplates with devices matching existing devices.

.14 Be responsible for disconnecting power supply to branch circuits controlling lighting, receptacles, panels, mechanical equipment, etc., for safe removal of equipment, conduit, wiring, boxes, etc., affected by demolition.

.15 Close openings in boxes, panels, etc., that result from removal of equipment, conduit, wiring, fixtures, etc. Close openings in a proper manner and properly terminate and insulate cables to restore system to a safe operating condition, to Consultant's satisfaction.

.16 Be present and supervise removal of electrical equipment, P.A. speakers, etc., during demolition of ceilings, walls, floors, etc. Existing equipment which is not to be relocated but interferes with demolition, are to be temporarily relocated until demolition work is completed. Services to temporarily relocated equipment are to be maintained at all times.

.17 Remove and re-install existing ceiling tiles as required to perform work. Prior to removal, inspect tiles for damage and report any to Owner and Consultant. Any loose cabling is to be secured, and luminaires additionally supported with cables secured to ceiling slab. After work has been completed and successfully inspected, re-install ceiling tiles to existing standards and re-install devices. Be responsible for replacement of tiles and grid members damaged during work of Electrical Division. Comply with applicable governing authority requirements with regards to ceiling work in special areas.

.18 Where existing surfaces are damaged by Electrical Divisions work and/or where existing devices are removed from wall, ceilings, floors and other surfaces, and such deleted devices are not being replaced in same locations, patch locations of these removed devices and re-finish. Patching and finishing is to be provided by tradesmen skilled in particular trade or application worked on, to Consultant's approval. Where openings are left in existing ceiling tiles, replace ceiling tiles with new matching tiles approved by Consultant. Unless otherwise included for in other Divisions, include for:

.1 preparing existing surfaces to be filled and repainted to be cleaned as required to remove dirt, dust, oil, grease, loose paint, rust and any other foreign matter which would prevent proper bonding of new finish; sand glossy surfaces to uniform dull texture;

.2 filling in and patching surfaces with same material as existing surfaces; finished surfaces to match and line with existing adjoining surfaces;

.3 providing fire stopping materials to maintain fire rating of the existing surfaces; refer to specification article titled - Firestopping and Smoke Seal Materials.

.4 using paint rollers and/or brushes to apply and extend paint finish over full height and/or width of area affected, to a straight line in location determined by Consultant;

.5 applying sufficient number of coats such that patched area is indistinguishable to surrounding area;

.6 materials used to be of equivalent quality to existing finishes standards and be compatible with finishes to which they are applied;

.7 finishes to be approved by Owner and reviewed with Consultant.

.19 Check luminaires to be deleted for PCB ballasts. Disconnect and remove such ballasts. As specified previously, include for company specialized in such hazardous materials to remove and dispose such materials off-site in compliance with Ministry of Environment, Ministry of Transport and any other governing authority regulations.

.20 If at any time during course of building work, asbestos containing materials are encountered or suspected, cease work in area in question and immediately notify Consultant. Comply with local governing authority regulations. Do not resume work in affected area without approval from Consultant.

3.13 INTERRUPTIONS TO & SHUT-DOWNS OF SERVICES & SYSTEMS

.1 Shutdowns and interruptions to existing systems and services are to be coordinated fully with and performed at times acceptable to Owner and reviewed with Consultant. Generally, shutdown may be performed only between hours of 12:00 midnight Sunday until 6:00 a.m. Monday morning. Include for costs of premium time to perform work during nights, weekends or other times outside of normal working hours, which may be necessary to comply with stipulations specified herein this Article. Services for operation of existing non-renovated areas of building are to be maintained.

.2 Upon award of contract, submit to Consultant for review and approval, a list of anticipated shut-down times and their maximum duration.

.3 Prior to each shut-down or interruption, inform Consultant and Owner in writing 5 working days in advance of proposed shut-down or interruption and obtain written consent to proceed. Do not shut down or interrupt any system or service without written consent. Note that shutdowns of some essential services may require additional advance notification time.

.4 Work associated with shut-downs and interruptions are to be carried out as continuous operations to minimize shut-down time and to reinstate systems as soon as possible. Prior to any shut-down, ensure that materials and labour required to complete work for which shut-down is required are available at site.

3.14 EQUIPMENT BASES & SUPPORTS

.1 Provide equipment bases and supports. Coordinate concrete pour for housekeeping pads and luminaire poles bases with Division 03. Ensure that applicable seismic restraint provisions are provided as per local governing building code.

.2 Secure floor mounted equipment in place on minimum 100 mm (4") high concrete housekeeping pads, minimum 100 mm (4") wider and longer than equipment base dimensions.

.3 Supply dimensioned drawings, templates, and anchor bolts for proper setting of equipment on bases and pads. Be responsible for required levelling, alignment, and grouting of equipment.

.4 Submit to Consultant for review, dimensioned shop drawings of structurally designed bases for support of large, heavy equipment. Indicate on shop drawings total weight of base, reinforcement, and equipment for which it is required.

.5 Unless otherwise noted, support equipment suspended above floor level with suitable welded or bolted prime coat painted structural steel angles or channels bracketed to wall or secured by hanger rods.

3.15 CONCRETE WORK

.1 Unless otherwise noted, concrete required for electrical work is to be provided as part of Work of Division 03. Coordinated exact requirements (sizes, locations) with General Trades Contractor.

.2 Layout, mark, coordinate and work with Division 03 contractor as required for installation of concrete necessary for duct banks, housekeeping pads, cubed openings, etc.

3.16 EXCAVATION & BACKFILL

.1 Unless otherwise noted, excavation and backfill work required for electrical work is to be done as part of work of Division 02 or 31, except for final hand grading work and backfill to 450 mm (18") above service which is to be done as part of electrical work. Mark out location and routing of excavation required for work as well as required depth. Ensure that bedding is graded to provide proper drainage for ducts as directed by Consultant.

.2 Inverts and locations of existing site services may have been site surveyed and approximate location may be shown on drawings. Confirm that local utilities have performed locates and marking out. Ensure inverts and locations are correct, prior to commencement of work. Where discrepancies are found, immediately inform Consultant, and await direction.

.3 Ensure that work is inspected by Consultant before covering and backfilling. Failure to do so prior to backfilling will require re-excavating work and re-backfill at no additional cost to Owner.

3.17 CUTTING, PATCHING & CORE DRILLING

.1 Unless otherwise noted, General Trades Contractors are responsible for cutting, patching, and core drilling of existing building required for installation of Work.

.2 Where added conduits and/or conductors penetrate existing construction, identify, and mark out locations for openings. Size openings to leave 13 mm (1/2") clearance around conduit and/or conductors. Coordinate work with General Trades Contractor.

.3 Ensure that openings in fire rated construction are sealed as per requirements of article titled "Firestopping And Smoke Seal Materials" specified herein this Section and as per Division 07, as applicable.

.4 Fire stop and seal openings as specified, and patch as required before end of workday. No openings are to be left open overnight unless approved by Owner and coordinated with Consultant.

3.18 FINISH PAINTING OF ELECTRICAL WORK

.1 Unless otherwise noted, finish painting of exposed Electrical Divisions work is to be performed as part of work of Division 09.

.2 Provide identification painting for electrical distribution equipment in accordance with application requirements of Division 09. Confirm exact finish colours with Consultant. Equipment requiring special colour identification painting to include but not be limited to following:

.1 pull boxes and junction boxes;

.2 communication system conduit;

.3 genset exhaust piping.

.3 Spray painting is not permitted unless approved in writing by Owner and reviewed by Consultant.

3.19 CONDUIT PROVISIONS FOR MISCELLANEOUS SYSTEMS

.1 Provide following components to accommodate future installation of various miscellaneous systems by system installers who are to provide equipment and wiring:

.1 conduit - diameters as sized on drawings with non-metallic fish wires or pull cords and suitable bushings for conduit terminations, and as specified in Part 2; provide labelling at each end to clearly identify each conduit run with respect to system and path;

.2 outlet boxes - standard galvanized steel, each complete with a blank type faceplate, and as specified in Part 2;

.3 pull boxes, junction boxes, back boxes and sleeves - and as specified in Part 2.

.2 Miscellaneous systems are typically as shown on drawings. Unless otherwise noted on drawings, provide dedicated conduit runs for each system. Coordinate sizes of boxes with respective system vendors to ensure proper sizing to accommodate components and that allows for wiring bending radii. Confirm conduit and box requirements also with system vendors.

.3 Provide pull boxes in conduit runs longer than 30 m (100') or having more than two - 90 bends. Size pull boxes to be at least 8 times entering conduit in length. Pull box sizes to comply with respective system standards.

.4 Leave conduits free and clear of all obstructions and terminate as required. Equip terminations with bushing, and clearly identify each run. Provide fish wires in all empty conduits. Run telecommunications conduits to comply with separation from sources of electromagnetic radiation as per standard ANSI/TIA/EIA-569. Site bend telecommunications conduit elbows to comply with system conduit bending radii requirements.

.5 Review exact requirements and locations of equipment with Consultant and respective system installers prior to roughing-in.

.6 Refer to system riser diagrams on drawings.

.7 Quantities for outlets to be as per floor plan drawings and not riser diagrams.

3.20 DOOR HARDWARE

.1 Generally, Division 08 or another Division not under scope of electrical Contractor, is responsible for supply and installation of door alarm contacts, door holders, electric strikes, electromagnetic locks, door operator controls, power supplies, door controllers, central electromagnetic lock release controller and other door hardware. Coordinate and confirm with General Trades Contractor and respective equipment vendors (door hardware / security) exact responsibility of each Division of the Work.

.2 Confirm product and wiring requirements, back box requirements and wiring installation requirements with door hardware trades and with equipment vendors. Provide required wiring in conduit from each device to respective controllers, between each device, and to central control panel and for power connection to such controls and devices. Provide line level voltage power feeds to equipment as required.

.3 For controls and interconnections between devices, when such device terminations are responsibility of others, supply and run interconnecting wiring in conduit to devices and allow spare length of 1.8 m (6') coiled wiring at each end for final termination to devices by others.

.4 For applications of electro- magnetically held closed doors, engage fire alarm system vendor to provide fire alarm type pull station with auxiliary contacts as required for interconnection of electro- magnetic door hardware and fire alarm system for release of doors. Provide required wiring in conduit and connections. Coordinate pull station requirements with fire alarm system vendor.

.5 Exact type of door alarm contacts to be coordinated with door construction and finishes. Contacts to generally be recessed mounted and wiring be installed in concealed conduits. Confirm exact requirements with door hardware / security vendor and General Trades Contractor.

.6 Where controls are located remotely from door locations, such as in closets, provide wiring in conduit and extend from local above door junction boxes and devices as required with homeruns back to closet location of equipment and leave slack wiring for terminations by others. Confirm exact requirements with door hardware / security vendor and General Trades Contractor.

.7 Drawing details issued with electrical drawings are for pricing reference only and are based on assumptions. Obtain detailed design drawings from successful door hardware / security vendors and provide wiring in conduit to coordinate with and accommodate final systems designs. Coordinate with General Contractor.

.8 Submit as part of shop drawing submission, detailed responsibility matrix identifying wok and responsibilities of each trade and required interconnections.

.9 After installation is complete, test and verify operation of components in coordination with General Contractor and door hardware vendor.

END OF SECTION

Part 1 - General

1.1 SUBMITTALS

.1 Submit shop drawings for products and accessories.

.2 Submit samples of conductors, when requested by Consultant.

Part 2 - Products

2.1 GENERAL POWER CABLES

.1 CSA approved, ULC labelled and certified. Unless otherwise noted, conductors to be copper and be suitable for applications as noted in governing local electrical code.

.2 RW90 CSA certified, single copper conductor to CSA C22.2 No. 38, 600/1000 volts, maximum 90°C (194°F) conductor temperature, -40°C (-40°F) minimum installation temperature, X-link polyethylene (XLPE) insulation, colour coded.

.3 T90 Nylon, CSA certified, single copper conductor to CSA C22.2 No. 75, 600 volts, maximum 90°C (194°F) dry conductor temperature, -10°C (-14°F) minimum installation temperature, PVC insulated, nylon covered.

.4 AC90 flexible armoured cable with "RW90" conductors and bare copper ground conductor and overall interlocked aluminium tape armour, to CSA C22.2 No. 51 (R2004).

.5 AC90 ISO-BX flexible armoured cable with "RW90" conductors with low temperature Exelene insulation and two additional solid copper bonding conductors (one bare, one insulated) and overall interlocked aluminium tape armour, to CSA C22.2 No. 51 (R2004).

.6 DLO stranded tinned copper conductor, to CSA type RW90, with 90°C rated ethylene propylene rubber insulation and black chlorinated polyethylene overall jacket; flame retardant and suitable for wet locations; rated for up to 2000 volts.

.7 Solid conductors to and including No. 10 AWG; stranded conductors in sizes larger than No. 10 AWG; branch circuit conductors constructed of 98% conductive copper; and approved for minimum 600 volts, with minimum 1000 volts where noted.

2.2 CONNECTORS

.1 Armoured cable connectors must be proper squeeze type connectors and plastic anti-short bushings at terminations.

.2 Connectors for conductors connecting to devices as per local governing electrical requirements to be equal to IDI Electric (Canada) Ltd., "Ideal" No. 451, No. 452 and No. 453, "Wing-Nut", CSA certified, 600 volts, rated pressure type connectors.

2.3 FIRE RATED CABLES

.1 Pentair - Pyrotenax, model "System 1850", CSA certified, ULC listed and labelled, FM Specifications tested, 600 V, type MI, 2 hour fire rated, copper sheathed, copper conductor, highly compressed magnesium oxide mineral insulated power cable. Connectors for copper-sheathed mineral conductors to be cable manufacturer proper connectors and accessories as recommended by manufacturer to suit specific applications.

.2 Pentair - Pyrotenax, model "System 1850 Twisted Pair", CSA certified as FAS, FAS 90 and FAS 105 cable, ULC listed and labelled, 300 V, type MI, 2 hour fire rated, copper sheathed, copper conductor, highly compressed magnesium oxide mineral insulated fire alarm and voice communication cable. Connectors for copper-sheathed mineral conductors to be cable manufacturer proper connectors and accessories as recommended by manufacturer to suit specific applications.

.3 Manufacturer termination kits: Pyropak epoxy sealing compound kits and "Quick Term" connectors; connectors for MI conductors to be cable manufacturer proper connectors and accessories as recommended by the manufacturer to suit specific applications.

.4 Cable clips and straps as recommended by cable manufacturer to suit specific installation application. In applications of dissimilar materials, provide tape to insulate cabling and hardware.

.5 Brass plates for cable openings in ferrous metal enclosures.

.6 Include for required cable manufacturer accessories and identification labelling.

.7 Include for manufacturer authorized technician to be present on site for initial coordination with installing personnel on review of proper installation of cabling runs and termination of cabling. After completion of Work, manufacturer technician to review installation work and provide in writing that installation work has been performed to satisfaction of cable manufacturer.

.8 Acceptable manufacturer of fire rated MI type cables is Pentair Thermal Management.

2.4 STANDARD CONTROL & COMMUNICATIONS CABLES

.1 ULC listed and labelled, CSA certified to C22.2 No. 127, No. 18 AWG "TEW" thermoplastic insulated, solid copper wire rated for 600 volts service, and 105°C (220°F) conductor temperature, complete with required number of copper conductors and colour coding.

.2 Nexans, "Securex II", FAS 105, 300 volts, 105˚C (220˚F) conductor temperature rated fire alarm system flexible armoured cable with solid copper conductor, shielding, flame retardant PVC insulation and red colour outer overall jacket, ULC listed and labelled and CSA certified to C22.2 No. 208.

2.5 CONDUCTOR PULLING LUBRICANT

.1 IDI Electric (Canada) Ltd., "Ideal Yellow 77" or "Wire Lube" as required.

2.6 TECK CABLES

.1 Nexans, "Firex II Teck" cables as follows:

.1 certified to CAN/CSA C22.2 No.131, Type TECK 90 Cable;

.2 rated for outdoor, weather resistant and wet locations applications;

.3 600/1000 V rated;

.4 Conductor: Bare, Soft drawn, Class B Compact or Compressed Stranded Copper conductors per ASTM;

.5 insulation: chemically cross linked thermosetting polyethylene (XLPE);

.6 bonding conductor (1/C Cable): Soft drawn bare copper;

.7 inner jacket: sunlight resistant PVC jacket tightly applied over assembly, to prevent slipping of core in a vertical position;

.8 armour: flexible interlocked aluminum armour, over inner jacket for mechanical protection;

.9 overall PVC jacket rated -40°C (-40°F).

.10 barrier tape over shield.

.2 Acceptable manufacturers are:

.1 Nexans;

.2 Prysmian Cables (Pirelli);

.3 General Cable;

.4 Aetna Cables;

.5 Kerite Company.

Part 3 - Execution

3.1 PROJECT CONDITIONS

.1 If identified in documents, verify that field measurements and conditions are as identified.

.2 Cable routing on drawings is schematic and approximate. Route cable as required to meet project conditions. Determine exact routing and lengths on site.

.3 Confirm fire protection ratings of construction to ensure that rooms and paths of conductors are fire rated in accordance with local governing codes requirements. Include fire rated conductors as required to meet local governing codes requirements.

3.2 CO-ORDINATION

.1 Co-ordinate work with work provided under other electrical work and work of other trades.

.2 Determine required separation between cable and other work.

.3 Determine cable routing to avoid interference with other work.

.4 Submit any alternative cable routing to Consultant for review prior to proceeding with work.

3.3 INSTALLATION OF CONDUCTORS

.1 Provide required conductors. Ensure fire rated conductors are provided for applications as required by local governing codes, standards and local governing authorities.

.2 In applications where multiple conductors in conduit are being run, provide a trapeze configuration of metal C-channels and threaded rod hangers to support cable/conduit from ceiling slab. Wall mounted cable/conduit brackets and ring type conduit hangers may also be permitted in applications approved by Consultant. Provide required cable support system accessories which are not specified herein or shown on drawings but are required for proper installation.

.3 Conductors, unless otherwise noted, to be as follows:

.1 for connections to electric heating coils in supply air ductwork systems, and for connections to other electric heating equipment where use of 90 degrees C. rated conductors are recommended by heating equipment manufacturer - "RW90";

.2 for conductors requiring fire rating by current regulations and local codes including feeders for emergency systems, fire fighter's elevators, fire alarm systems, other life safety systems and for applicable signal and control circuits of these systems - type "MI" CSA approved, ULC listed and labelled, 2 hour fire rated, copper sheathed mineral insulated copper conductors;

.3 climate controlled areas branch circuit wiring in accessible ceiling spaces and within stud wall construction consisting of drops down to luminaries and drops down stud walls to devices and in furniture systems - "AC90" flexible armoured cable ("BX") (maximum 6m (20') run permitted);

.4 for climate controlled areas wiring except as noted above or specified elsewhere in Specification or as noted on drawings - "T90 Nylon" or "RW90".

.4 Support flexible armoured cable in ceiling spaces and in stud wall construction with steel 2 hole cable straps to "Code" requirements. Flexible armoured cables must run in a neat manner parallel to building lines. Utilize centralized conduit runs to maintain maximum permitted runs of flexible armoured cables as specified. Provide insulating grommet at cut ends of flexible armoured cable to protect conductor insulation.

.5 Install compression connectors with proper dies and compression tool as per connector manufacturer instructions. Install cold shrink tubing and associated materials as per manufacturer instructions.

.6 Low voltage conductors to typically be No. 18 AWG "TEW" except for use in fire alarm system applications, 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. Conductors not installed in conduit or raceways to be fire insulated rated in accordance with latest governing Code Flame Spread requirements.

.7 When installing type NMD90 conductors through metal studs, provide insulating grommets on stud openings to protect conductor insulation.

.8 Generally, conductor sizes are indicated on drawings. Such sizes are minimum requirements and must be increased, where required, to suit length of run and voltage drop in accordance with applicable conductor voltage drop schedule appended to end of this Section.

.9 Do not use conductors smaller than No. 12 AWG in systems over 30 volts, unless otherwise noted. Do not use conductors smaller than No. 6 AWG for exterior luminaire wiring unless otherwise noted.

.10 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, 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.

.11 When pulling wires into conduit use lubricant and ensure that wires are kept straight and are not twisted or abraded.

.12 Control conductors, in addition, to be numbered with Brady Ltd. or Electrovert Ltd. Z type markers.

.13 Colour code conductors for communications systems in accordance with system component manufacturer recommendations.

.14 Neatly secure exposed wire in apparatus enclosures with approved supports or ties.

.15 Install low voltage conductors in conduits, unless otherwise noted within Documents.

3.4 INSTALLATION OF FIRE RATED CONDUCTORS

.1 Submit with shop drawings, copy of manufacturer detailed installation manual and testing procedures. Provide minimum 2 hour fire rated type "MI" CSA approved, ULC listed and labelled, mineral insulated copper conductors for following:

.1 feeders to emergency lighting panel boards;
.2 feeders to fire alarm control panels and transponders;
.3 feeders as required by Code requirements;
.4 fire alarm system feeders as shown interconnecting existing fire alarm system and additional system;
.5 applicable local governing code required applications for control and signalling conductor circuits of and between life safety equipment and systems;
.6 feeders and conductors as noted on drawings.

.2 Provide fire rated type "MI" conductors for specific feeders as required and as noted. Install type "MI" copper sheathed, mineral insulated conductors for applications noted above and as shown on drawings in strict accordance with the manufacturer instructions and recommendations. Refer to latest issue of Pyrotenax MI cable Commercial Wiring Installation Manual. Installation must be in a neat and professional manner as per manufacturer approval. Make arrangements for manufacturer technician to provide onsite services as specified.

.3 Provide Unistrut C-channels, clips, wall brackets, etc., as required and as recommended by cable manufacturer to suit the on-site installation conditions. Provide system of Unistrut hangers and rods spaced at minimum 1.2 m (4') but which must be confirmed with cable manufacturer, for running of cables. Where clips and other hardware are in contact with cables, insulate cables/hardware with suitable tape as per cable manufacturer recommendations for applications of dissimilar metals.

.4 Make terminations of "MI" conductors with manufacturer approved components and "Pyropak" or "Quick Term" connectors in accordance with the manufacturer recommendations. Obtain proper tools for cable terminals from the cable manufacturer. Terminations must be completed immediately once started to avoid moisture ingress from the surrounding air. Connections to ferrous cabinets for single conductor cables shall incorporate brass plates sized as required and as per cable manufacturer requirements. Brass plates shall be complete with required drilled and tapped holes. For 99°C applications, cable lugs shall be temperature rated as such.

.5 When pulling cable, apply pulling tension to the conductor not in the sheath of the cable. Limit cable pulling tension to as recommended by cable manufacturer.

.6 Terminate cable in the equipment with termination kits as per cable manufacturer instructions.

.7 Ground cabling as per cable manufacturer instructions and as per local governing electrical code requirements.

.8 Take necessary precautions when handling cable on reel to ensure that no damage will result in the uncoiling process.

.9 Where cables penetrates fire rated construction, provide ULC listed and labelled, fire stopping and smoke seal materials or fittings to protect integrity of fire rated construction. Install work in compliance with ULC standards and where required by local governing codes, provide tray type suitable for plenum environments.

.10 Test MI cables after installation, in strict accordance with cable manufacturer instructions. Megger terminations to check that insulation resistance is acceptable to cable manufacturer. Prior to completing each termination, test insulation resistance and follow cable manufacturer drying procedures until resistance reaches cable manufacturer listed acceptable level.

.11 Provide for cable manufacturer authorized representative to review the installation, termination, splicing and testing of installed cables. Prepare report consisting of test sheets with results of cables tested and a certificate of verification signed by testing engineer/technician. Report to include copy of cable manufacturer signed inspection letter documenting that work was performed to satisfaction of manufacturer. Submit minimum 3 hard copies and electronic copy to Consultant.

3.5 **INSTALLATION OF TECK CABLES**

.1 Provide cables as required for specific applications. Handle, install, and terminate in accordance with manufacturer recommendations and instructions and as herein specified.

.2 When pulling cable, apply pulling tension to conductor not in sheath of cable. Limit cable pulling tension to as recommended by cable manufacturer.

.3 Terminate cable in equipment with lugs and termination kits as per cable manufacturer instructions.

.4 Installation of cable splices and terminations to be made by personnel skilled in this type of work.

.5 Ground shielding as per cable manufacturer instructions.

.6 Take necessary precautions when handling cable on reel to ensure that no damage will result in uncoiling process.

.7 No splices are allowed unless justified by cable pulling tension calculations and approved in writing by Consultant. Obtain approval of splice location from Consultant.

END OF SECTION

Maximum Branch Wiring Distance for 120 Volt System At 3% Voltage Drop

WIRE SIZE	**BREAKER SIZE (AMPERES)**	**15**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**100**
	MAX LOAD AT 80% (AMPERES)	**12**	**16**	**24**	**32**	**40**	**48**	**56**	**68**	**80**
No. 12	-	24.4	18.3	-	-	-	-	-	-	-
No. 10	-	38.1	29.0	19.1	-	-	-	-	-	-
No. 8	-	59.4	44.2	30.5	22.9	-	-	-	-	-
No. 6	-	91.4	70.1	47.2	35.1	28.2	23.6	-	-	-
No. 4	-	-	109.7	73.2	54.9	42.7	38.1	32.0	27.4	-
NO. 2	-	-	-	114.3	85.3	68.6	57.9	50.3	41.1	35.0
No. 1	-	-	-	-	103.6	85.3	73.2	61.0	54.9	43.4
No. 1/0	-	-	-	-	128.0	102.9	85.3	73.2	64.0	48.8
No. 2/0	-	-	-	-	-	121.9	100.6	86.9	74.7	60.9
No. 3/0	-	-	-	-	-	-	118.1	102.1	88.4	70.1
No. 4/0	-	-	-	-	-	-	-	120.4	102.9	83.8
250 MCM	-	-	-	-	-	-	-	-	114.3	91.4
300 MCM	-	-	-	-	-	-	-		-	103.6

Note: Distances indicated in metres from panel to load for single phase.

END OF APPENDIX

Part 1 - General

1.1 SUBMITTALS

.1 Submit shop drawings for products and accessories.

Part 2 - Products

2.1 BASIC MATERIALS

.1 Ground Conductors: Solid copper, insulated and bare to suit application and code requirements; and bond conductors.

.2 Ground Connections:

.1 When making ground and bonding connections, apply a corrosion inhibitor to contact surfaces. Use corrosion inhibitor appropriate for protecting a connection between metals used.

.3 Miscellaneous ancillary components to complete grounding and bonding work to requirements of local governing electrical authority and codes.

Part 3 - Execution

3.1 GENERAL GROUNDING & BONDING REQUIREMENTS

.1 Provide required grounding and bonding work in accordance with drawings, local governing electrical authority, governing authorities having jurisdiction and local governing electrical inspection authority.

.2 Connect grounding conductors to motors 10 hp and above or circuits 20A or above, with a solderless terminal and a bolt tapped to motor frame or equipment housing. Connect to smaller motors or equipment by fastening terminal to a connection box. Connect junction boxes to equipment grounding system with grounding clips mounted directly on box or with machine screws. Completely remove paint, dirt, or other surface coverings at grounding conductor connection points so good metal-to-metal contact is made.

.3 Provide service conductors exceeding 400 amperes with minimum No. 3/0 AWG grounding conductors, unless otherwise noted.

.4 Ground and bond various telecommunications, audio visual systems, security, life safety and control systems in accordance with respective system manufacturers recommendations and in accordance with local governing electrical code requirements.

.5 Ground conductors not sized on drawings are to be sized in accordance with local governing electrical authority requirements. Ground conductor size is to be no smaller than requirements specified herein this article or on drawings.

END OF SECTION

Part 1 - General

1.1 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.

Part 2 - Products

2.1 VIBRATION CONTROL & 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 isolation package, be responsible for improving isolation to an acceptable standard at no additional cost to contract. Isolation product Manufacturer 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 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;

.4 Eaton B-Line.

Part 3 - Execution

3.1 INSTALLATION

.1 Comply with seismic restraint Engineer and manufacturer installation recommendations.

.2 Obtain required training from Manufacturer representative on any special installation procedures. Install components in accordance with Manufacturer instructions to suit specific installation requirements.

.3 Test, adjust, and certify installation. Submit copies of test report to Consultant.

.4 Refer to Part 2 for specific installation requirements.

3.2 INSPECTION

.1 Inspect for removal of break away hardware to ensure proper torques of installed systems.

.2 For non-visually verifiable product, manufacturers to verify proper torque for a minimum 10% of application. Document torques for applications per Manufacturer instructions.

END OF SECTION

Part 1 - General

1.1 SUBMITTALS

.1 Submit shop drawings of major electrical distribution equipment. Allow in shop drawing process, sufficient time for Consultant to review and make comments and for Contractor and equipment vendors to incorporate Consultant comments, necessary revisions and results of reports into equipment shop drawings. Do not order equipment until shop drawings are acceptable to Consultant. Time for this shop drawing review process will be at Consultant's discretion, but typically allow for 15 working days for initial review submission with additional 10 working days added to accommodate each resubmission.

Part 2 - Products

2.1 GENERAL SCOPE OF WORK

.1 Include for, but not be limited, to following:

.1 product manufacturers providing equipment inspection, testing, start-up, adjustments and verification;

.2 electricians/trades people on site to handle equipment, make temporary connections, operate equipment and make repairs and adjustments and assist Manufacturer / testing organization's personnel during on-site inspection, testing, calibration, start-up, verification work and where supplementary commissioning;

.3 coordination of work with testing company and equipment/system Manufacturer authorized technician in performing adjustments and start-up procedures to equipment/systems;

.4 preparing testing reports and documentation for submission to Consultant.

Part 3 - Execution

3.1 GENERAL ELECTRICAL WORK TESTING

.1 In addition to tests required by local governing authorities having jurisdiction, local codes and regulations, perform following:

.1 after luminaires, switches, receptacles, motors, signals, etc., are installed, whether same are installed as part of this Division or by other Divisions (telephone systems excepted), test work to ensure that there are no leaks, grounds or crosses;

.2 establish and ensure proper motor rotation - measure full load running currents and check overload elements - report to Consultant any discrepancies which are found; existing motors which have been worked on (disconnected and reconnected) must be checked with rotation meter to ensure proper rotation; be responsible for any damage caused by reverse rotation;

.3 demonstrate to Consultant that branch circuit voltage drop is within specified units;

.4 ensure that devices are commissioned and operable.

.2 Document results into distribution system testing report. Report must state that testing was successful and Work complies with project documents, applicable CSA standards, and other applicable governing codes and requirements.

END OF SECTION

Part 1 - General

1.1 SUBMITTALS

.1 Submit shop drawings for products specified in this Section.

1.2 PRODUCT COMPATIBILITY

.1 Lighting controls and luminaires when integrated together for control purposes must be 100% compatible with each other. Coordinate with ballast/driver and lamp manufacturers, dimmer/occupancy control manufacturers to ensure that components are compatible with each other and that interconnections do not affect performance, life or any warranties.

Part 2 - Products

2.1 WALL BOX DIMMERS

.1 Lutron Electronics Co. "Nova-T" Series, ULC listed and labelled, CSA approved wall box dimmers as follows:

- .1 of type and size to suit intended loads;
- .2 air gap accessible without removing faceplate, to meet UL20 and UL1472 short circuit test requirement for snap switches;
- .3 withstand voltage surges up to 600 V and current surges up to 200 A as per ANSI/IEEE C62.41;
- .4 voltage regulated;
- .5 power failure memory;
- .6 LC filtering to minimize RFI;
- .7 linear slide with smooth and continuous square law dimming curve operation;
- .8 snap on faceplate (seamless multi-gang at locations with multiple devices);
- .9 finish to Consultant's direction.

.2 Where noted for applications of multiple wall box dimmers located in one location, provide CSA approved, NEMA 2 type, flush wall mounting, electrical cabinet with hinged locking front door, of painted enamel painted steel construction, complete with conduit knockout entries, flush trim and sized to accommodate dimmers. Refer to applicable drawing detail.

.3 Generally, acceptable manufacturers are:

- .1 Lutron;
- .2 Legrand-Watt Stopper;
- .3 Hubbell (supplied by Omnilumen);
- .4 Sensor Switch;
- .5 Leviton;
- .6 NX Lighting Controls;
- .7 Acuity Brands Controls.

2.2 OCCUPANCY SENSORS (STANDARD)

.1 Legrand - Watt Stopper, CSA approved devices to provide automatic control of lighting with following components:

- .1 power and slave packs;
- .2 dual technology occupancy sensors;
- .3 controls and daylight sensors;

.4 wiring in conduit and mounting hardware.

.2 Where required, power packs to be self-contained, 347/120 VAC/24 VDC (or of voltage shown on drawings) transformer relay system. Slave packs to contain isolated relay. System to allow one sensor to control luminaires circuited to both essential power circuits and normal power circuits.

.3 For applications in general areas: ceiling mounted, DT-355, dual technology type sensors as follows:

.1 combination passive infrared and ultrasonic technologies;

.2 when both PIR and ultrasonic technologies detect occupancy, lights turn ON automatically; once lights are ON, detection by either technology holds lights ON until occupancy is no longer detected and time delay elapses;

.3 can be set so that only one technology is needed to trigger;

.4 low voltage operation;

.5 360° lens area coverage, extending out up to 6 m (20') and area of 92.9 m^2 (1000 ft^2);

.6 low profile ceiling mounting design;

.7 integral light sensor;

.8 adjustable sensitivity and digital time delay;

.9 walk-through mode;

.10 LED indication of occupancy detection;

.11 isolated relay for interconnection to auxiliary control systems where required.

.4 For sensors mounted in ceiling/wall corners: series DT-200 with features as follows:

.1 combination passive infrared and ultrasonic technologies;

.2 when either or both (user set option) PIR and ultrasonic technologies detect occupancy, lights turn ON automatically; once lights are ON, detection by either technology holds lights ON until occupancy is no longer detected and time delay elapses;

.3 complete with adjustable swivel mounting bracket;

.4 wide dispersion lens area coverage, extending out up to 16 m (55') and area of 185 m^2 (2000 ft^2);

.5 low voltage operation;

.6 low profile design;

.7 integral light sensor;

.8 adjustable sensitivity and digital time delay;

.9 walk-through mode;

.10 LED indication of occupancy detection;

.11 isolated relay for interconnection to auxiliary control systems where required.

.5 For applications in washrooms and small storage rooms: wall mounted "DW-100" Series dual technology sensors as follows:

.1 wall switch sensor turns lights OFF and ON based on occupancy;

.2 factory default operation is for Manual-ON mode, so that users turn light on only when needed;

.3 variety of control options including Auto-ON operation, walk-through and test mode; additional settings allow choice of which sensing technologies hold ON or retrigger lighting;

.4 colour matched lens and low profile design;

.5 wide dispersion lens area coverage, extending out up to 10 m (35') and area of 37 m^2 (400 ft^2);

.6 infrared and ultrasonic technologies;

.7 adjustable time delays and sensitivity;

.8 manual pushbutton operation (override);

.9 low voltage or line voltage operation to suit specific applications;

.10 complete with required mounting accessories.

.6 For corridors or wide space coverage: Ceiling mounted, WT series, ultrasonic technology type sensors as follows:

.1 ultrasonic technologies;

.2 when ultrasonic technology detects occupancy, lights turn ON automatically; once lights are ON, detection holds lights ON until occupancy is no longer detected and time delay elapses;

.3 low voltage operation;

.4 corridor applications to include linear lens area coverage, extending out up to 13.5 m (45') in 2 directions;

.5 wider spaces applications to include wide dispersion coverage to suit space, up to 200 m^2 (2200 ft^2);

.6 low profile ceiling mounting design;

.7 integral light sensor;

.8 adjustable digital time delay;

.9 LED indication of occupancy detection;

.10 isolated relay for interconnection to auxiliary control systems where required.

.7 Override switches to be wall mounting in single gang recessed outlet boxes.

.8 Wiring in conduit, mounting hardware and ancillary devices to be provided as per Manufacturer requirements.

.9 System to be complete with initial 1 year parts and labour warranty, with additional extended 5 years parts warranty.

.10 Where sensors are interconnected to dimming system, ensure that they are 100% compatible with respective control systems, dimmers and ballasts. Confirm with respective equipment manufacturers and obtain in writing that such integrations are acceptable to each manufacturer.

.11 Generally, acceptable manufacturers are:

.1 Legrand-Watt Stopper;

.2 Hubbell (supplied by Omnilumen);

.3 Sensor Switch;

.4 Leviton;

.5 NX Lighting Controls;

.6 Acuity Brands Controls.

Part 3 - Execution

3.1 INSTALLATION OF WALL BOX DIMMERS

.1 Provide flush wall box dimmers in locations and connect to control lighting as indicated. Confirm exact locations prior to roughing-in. Equip each dimmer with a faceplate. Confirm faceplate colour prior to ordering.

.2 Install components in accordance with Manufacturer instructions to suit specific installation requirements.

.3 Where identified, provide central enclosure cabinet for mounting dimmers within and connect complete. Clearly identify each dimmer and enclosure with engrave Lamacoid nameplates. Confirm exact nomenclature with Consultant prior to ordering.

.4 When installation is complete, check and test operation of each dimmer and adjust as required.

.5 Ensure that each dimmer is properly sized to suit connected load.

3.2 **INSTALLATION OF OCCUPANCY SENSORS**

.1 Provide occupancy sensors and daylight sensors and associated devices to control lighting in areas as required. Provide power packs as required with suitable voltage and power ratings.

.2 Exact type of occupancy sensors and type of lenses to be verified by manufacturer/supplier to ensure proper coverage in sensed areas only, and compatibility to interconnected systems. Confirm with respective manufacturers.

.3 Be responsible for providing, locating, and aiming appropriate sensors in correct location required for complete and proper volumetric coverage within range of coverage(s) of controlled areas per Manufacturer recommendations. Rooms to have 90-100% coverage to completely cover controlled area to accommodate occupancy habits of single or multiple occupants at any location within room(s). Locations and quantities of sensors shown and/or noted are illustrations only and should only be used as guidelines. Provide additional sensors if required to properly and completely cover respective room.

.4 Verify with Manufacturer factory authorized representative, exact type of sensor to be used in each area, placement of sensors and installation criteria, to best meet requirements of end user. Manufacturer representative should be consulted for more non-typical installation types. Ensure that sensors connected to dimming system are 100% compatible with dimming system.

.5 Where luminaires in rooms/areas are fed from normal and emergency power circuits, provide suitable relays and provisions to ensure that operation of luminaires on emergency power are maintained during loss of normal power.

.6 Proper judgement must be exercised in executing installation so as to ensure that best possible installation in available space and to overcome local difficulties due to space limitations or interference of structural components. Also provide, at Owner's facility, training necessary to familiarize Owner personnel with operation, use, adjustment, and problem solving diagnosis of occupancy sensing devices and systems.

.7 Install devices in accordance with Manufacturer instructions. Provide wiring in conduit. Provide required power connections and interconnection to luminaires and power panels. Provide manual switches to override control system in each area/room as shown.

.8 Confirm finishes of sensors with Consultant prior to ordering.

.9 Confirm mounting heights with Architect and manufacturer prior to roughing-in and installation.

.10 Adjust sensitivity and time delays to best suit Owner furniture layout drawings. Allow for minor adjustments of locations (1 m [3.3']) of sensors.

.11 Refer also to testing and verification requirements in Section titled Electrical Work Analysis and Testing and include applicable requirements.

END OF SECTION

Part 1 - General

1.1 SUBMITTALS

.1 Submit shop drawings for products specified in this Section.

.2 Do not order any device unless finishes have been reviewed and approved by Consultant.

Part 2 - Products

2.1 SWITCHES

.1 Switches to be CSA approved, ULC listed and labelled devices.

.2 Hubbell Canada Inc., HBL 1221 Series, CSA approved, heavy duty, industrial grade, back, and side wired, AC quiet action toggle type, 20 ampere, 120-277 V switches. Switches to include steel-nickel plated bridge, nylon toggle, one piece rivet-less copper alloy spring contact arm and terminal plate, silver cadmium oxide contacts, brass binding head screws, one piece integral grounding terminal and stainless steel automatic grounding clips. Provide single way, 2-way, 3-way, and key type to suit specific application requirements.

.3 Hubbell Canada Inc. No. 1221-IL, CSA approved, heavy duty, specification grade, AC quiet action, illuminated polycarbonate handle toggle type, 20 ampere, 120-277 V switches.

.4 Acceptable manufacturers are:

.1 Hubbell Canada Inc.;

.2 Cooper Wiring Devices (Arrow Hart);

.3 Leviton.

2.2 RECEPTACLES

.1 Receptacles to be CSA approved, ULC listed, certified and labelled devices.

.2 Hubbell Canada Inc., No. HBL5262 / HBL5362 CSA approved, ULC listed, extra heavy duty, specification grade, back and side wired, flush, nylon face/body construction, duplex U-ground, 15/20 ampere, 125 V, 2-pole, 3-wire grounding receptacles complete with one piece nickel-plated brass mounting strip with integral grounding clips, ground retention clips, nickel-plated brass wiring clamps with nickel-plated brass screws, front circuit identification area and reinforced thermoplastic base.

.3 Hubbell Canada Inc., No. BR15TR series, commercial specification grade, 15 ampere, 125 V, 2-pole, 3-wire grounding, tamper-resistant (safety shutter) duplex receptacles.

.4 Hubbell Canada, No. GFR 5262SG / GFR 5362SG "AUTOGUARD" Series, extra heavy duty grade, 15/20 ampere, 125 V, duplex, ULC Class "A", Group One, tamper resistant, weather resistant ground fault circuit interrupting receptacles complete with automatic self-test diagnostics, green power ON LED, red ground fault LED and 10 kA short circuit current rating.

.5 Hubbell Canada Inc., No. USB 15X2 "Style Line" series, CSA approved, ULC listed, 2-USB ports (3.8 A, 5V DC, type A, class 2.0) and 15 ampere, 125 V rated duplex decorative power receptacles, tamper resistant, back and side wired.

.6 Hubbell Canada Inc., No. BR15C2GRY/BR20C2GRY “Permanently marked” plug load controlled series, industrial grade, permanently marked with two controlled faces symbol identifying controlled receptacle, CSA approved, ULC listed, back and side wired, nylon face/body construction, 15/20 ampere, 125 V, grounding, duplex receptacles; for use with automatic outlet control systems, and with factory broken split circuit tab allowing control of half of receptacle; interconnected to control module relays of lighting control system or other building control systems;

.7 Hubbell Canada Inc., No. 9430, EEMAC type 14-30R, 30 ampere, 125/250 V, 3-pole, 4-wire single electric clothes dryer receptacles with steel faceplates.

.8 Hubbell Canada Inc., No. 9450, EEMAC type 14-50R, 50 ampere, 125/250 V, 3-pole, 4-wire single electric range receptacles with steel faceplates.

.9 Hubbell Canada, No. IG 5262, heavy duty, specification grade, 15 ampere, 125 V, duplex, orange colour, nylon construction, back, and side wired isolated receptacles.

.10 Hubbell Canada, No. BR15TR series, specification grade, 15 ampere, 125 V, 2-pole, 3-wire, tamper resistant, safety shutter receptacles.

.11 Hubbell Canada, No. 4710, specification grade, 15 ampere, 125 V, single, 2-pole, 3-wire grounding twist lock receptacle.

.12 Hubbell Canada, No. 15 ampere and 50 ampere receptacles complete with neutral and ground conductors required for indicated number of phases as shown.

.13 Acceptable manufacturers are:

.1 Hubbell Canada Inc.;

.2 Cooper Wiring Devices (Arrow Hart);

.3 Leviton.

2.3 FACEPLATES

.1 Grade 18 8, type 430, 1 mm (0.032") thick stainless steel, satin, brushed or natural finish, complete with a peel off protective plastic film, and stainless steel screws.

.2 Hubbell Canada Inc., No. WP26E/WP26EH, NEMA 3R rated, CSA approved, ULC listed and labelled, single gang, vertical/horizontal mounting, weather-proof in-use, gasketted, cast aluminium faceplates for GFI receptacles in wet locations.

.3 Hubbell Canada Inc., No. HBL1795, ULC listed and labelled, single gang, vertical mounting, weather proof in-use, gasketted, clear bubble plate, silicone rubber faceplates for standard AC toggle switches in wet locations.

.4 Galvanized steel stamped faceplates.

.5 Acceptable manufacturers are as per switches and receptacles.

2.4 PUSHBUTTONS OPERATORS

.1 Rockwell Automation (Allen-Bradley) Ltd., 800T Series operators as follows:

.1 emergency off pushbuttons: oversized 60 mm (2-1/2") diameter red plastic mushroom head pushbutton with shroud, thrust washer, and an aluminum faceplate with "EMERGENCY POWER OFF" identification lettering or other nomenclature as required to suit application;

.2 pushbuttons: standard 30 mm (1-1/4") diameter plastic pushbuttons in Red/Green colours as required for application, momentary/maintained/2 position push-pull operations as required, flush/extended/mushroom heads; non-illuminated/illuminated, with aluminum faceplate with identification lettering nomenclature as required to suit application;

.3 key operated switches: standard 30 mm (1-1/4") diameter key cylinder lock operator, 2 or 3 position operations; non-illuminated, with aluminum faceplate with identification lettering nomenclature as required to suit application;

.4 with enamel painted steel or stainless steel faceplate for flush mounting onto recessed wall boxes or in millwork, suitable for mounting of devices;

.5 with NEMA 1 box for surface mounting applications in climate controlled areas, CSA approved for application and of size suitable for mounting of devices;

.2 Exact type and ratings of devices are to suit specific applications.

.3 Acceptable manufacturers:

.1 Rockwell Automation (Allen-Bradley);

.2 Eaton (Cutler-Hammer);

.3 Square D;

.4 GE.

2.5 **RETRACTABLE REELS**

.1 Gleason Reel, ACA Cord Reel, ACA Industrial series, CSA approved, ULC listed and labeled, designed for indoor and outdoor applications. Hazardous location types are to be provided in areas designated as hazardous locations. Requirements for end receptacles and boxes are to be as per drawing notes.

.2 ACA series features include:

.1 maximum operating capacity of 30A, 250V AC;

.2 Durable, corrosion resistant cast aluminum construction;

.3 Yellow or white powder coat finish;

.4 Movable guide arm can be mounted in two positions;

.5 Positive latch mechanism automatically maintains desired cord length;

.6 Ratchet lock can be disengaged in field for constant tension applications;

.7 16-10AWG, 3&4 conductor cord;

.8 10AWG fully rated at 30 amps;

.9 Bare SJO cable, length of 35ft;

.10 Dual Receptacle module complete with two (2) back-to-back, 120V, 15/20A, T-Slot, GFCI receptacles with two (2) USB Charging ports per receptacle

.3 Where applicable, determine classification of hazardous location and provide properly rated reel to suit classification requirements. Ensure that connecting conduits and boxes comply with hazardous location rating requirements.

.4 Acceptable Manufacturers:

.1 Appleton Electric;

.2 Crouse-Hinds;

.3 Thomas & Betts;

.4 Cooper Wiring.

Part 3 - Execution

3.1 **INSTALLATION OF SWITCHES**

.1 Provide switches and install in electrical outlet boxes. Refer to drawings to determine flush or surface mounting requirements. Generally, flush mount devices in finished areas. Size electrical boxes to suit device requirements as per device manufacturer recommendations. Properly ground device to box and ground system as per code requirements and manufacturer instructions.

.2 For pricing only, switches to be ivory for devices connected to normal power circuits, red for devices connected to essential power circuits including isolated power centres.

.3 Illuminated operation of lighted switches to suit specific applications as confirmed with Consultant.

.4 Ensure that switches located adjacent to doors are located at strike side of door. Confirm door swing requirements on architectural drawings, not on electrical drawings.

.5 Coordinate installation of door switches with trades responsible for provision of doors and frames. Confirm exact locations of switches with Consultant to ensure optimum operation of switch to door position.

.6 Additionally, refer to testing and verification requirements in Section titled Electrical Work Analysis and Testing and include applicable requirements.

3.2 **INSTALLATION OF RECEPTACLES**

.1 Provide receptacles and install in electrical outlet boxes. Refer to drawings to determine flush or surface mounting requirements. Generally, flush mount devices in finished areas. Size electrical boxes to suit device requirements as per device manufacturer recommendations. Properly ground device to box and ground system as per code requirements and manufacturer instructions.

.2 Install USB charger receptacles in extra deep boxes in accordance with manufacturer recommendations.

.3 Provide machine printed clear label with black lettering identifying circuit number and panelboard from where each device is fed, and secure to device faceplates at all outlets. Review exact location for identification with Consultant.

.4 Where receptacles are indicated in counters and benches, box cut-out to be provided in counter and bench. Provide a box, receptacle, plate and branch circuit wiring. Branch circuit wiring within counters and benches to be flexible armoured cable, under requirements of local governing electrical code and standards. Install and connect complete.

.5 Install plug load controlled receptacles of type compatible with and coordinated with connected control system. Confirm compatibility of receptacle with control system vendor. Circuit split controlled receptacles as per local governing electrical code requirements.

.6 Review final device finishes with Consultant. Do not order any devices unless final finishes have been approved by Owner and reviewed with Consultant.

.7 Additionally, refer to testing and verification requirements in Section titled Electrical Work Analysis and Testing and include applicable requirements.

3.3 **INSTALLATION OF FACEPLATES**

.1 Provide each switch and receptacle with a faceplate with an opening or openings suitable for device it conceals and covers openings around boxes. Secure faceplates to device frames with screws to match faceplates. Provide larger than standard type faceplates for devices that require engraved nomenclature to define special purpose for that device.

.2 Provide galvanized stamped steel faceplates in service areas and equipment rooms where devices are surface mounted.

.3 Provide stainless steel type standard size faceplates for flush mounted devices.

.4 For flush mounted devices, provide oversized faceplates as required to properly cover wall opening around recessed boxes.

.5 Provide faceplates with suitable identification labels. Review exact locations for labelling with Consultant.

.6 In addition to identification requirements specified with devices, provide faceplates with printed self-adhesive clear label with black lettering on outside face identifying circuit number and panel feeding device.

.7 Review exact material, finish, and colour of faceplates for devices in any particular area with Consultant prior to ordering.

3.4 INSTALLATION OF PUSHBUTTON OPERATORS

.1 Provide specified and suitable pushbutton operators and pilot lamps to suit various applications.

.2 Where flush mounted, provide faceplate for mounting onto recessed boxes.

.3 Where surface mounted climate controlled areas, provide suitable NEMA 1 box. In non-climate controlled areas, surface mounted devices to be mounted within minimum NEMA 3R rated boxes.

.4 Install devices in accordance with manufacturer instructions to suit application requirements of Owner. Connect complete to respective equipment being controlled. Provide required wiring in conduit.

.5 Test and verify operation of each device. Provide engraved lamacoid nameplate to identify system being operated and any special instructions. Confirm exact nomenclature with Consultant prior to ordering.

3.5 INSTALLATION OF RETRACTABLE REELS

.1 Provide retractable reels and secure to construction in accordance with manufacturer instructions. Ceiling box to be secured to ceiling slab or ceiling structure in manner to provide adequate support to entire assembly.

.2 Install devices in accordance with manufacturer instructions.

.3 Provide receptacles and boxes in required configuration and types.

.4 Ground and bond devices as per local electrical code requirements.

.5 Refer to and provide additional applicable testing requirements of distribution system testing and coordination study article.

.6 Provide engraved lamacoid nameplates for equipment and components. Prior to manufacture of nameplates, confirm exact nomenclature with Consultant in writing. During installation on site, provide temporary labelling until permanent nameplates are installed.

.7 Label outlets with circuit number and source panel.

.8 Test each device and assembly. Verify proper operation. Adjust as required.

END OF SECTION

Part 1 - General

1.1 SUBMITTALS

.1 Submit shop drawings for products specified in this Section.

Part 2 - Products

2.1 DISCONNECT SWITCHES

.1 Eaton, heavy duty, CSA approved, disconnect (safety) switches. Features include:

- .1 front operated with a handle suitable for padlocking in "OFF" position and arranged so that enclosure cover cannot be opened while handle is in "ON" position
- .2 operating mechanisms: quick-break, positive acting with visible blades and a line terminal shield;
- .3 fusible units with fuse clips suitable for HRC fuses, unless otherwise noted;
- .4 ampere rating, number of poles and fuse requirements as indicated on drawings;
- .5 factory primed and painted switch enclosures.

.2 Disconnects for variable speed drives to be suitable for use with such drives and include auxiliary switch/contact to de-energize control power circuit, as required and as applicable.

.3 Enclosures for disconnects mounted in interior climate controlled areas and standard non-climate controlled areas to be NEMA 3R. For corrosive environmental applications, enclosures to be minimum NEMA 4X.

.4 Acceptable manufacturers are:

- .1 Eaton;
- .2 Siemens Electric Ltd.;
- .3 Schneider Electric (Square D).

2.2 FUSES

.1 Unless otherwise indicated, fuses to be Form I, Class "J" HRC fuses for constantly running equipment, and Form II, Class "C" HRC fuses for motorized equipment that cycle "ON" and "OFF".

.2 Fuses to be of type suitable for applications as required by local governing electrical codes and in coordination with respective equipment Manufacturer recommendations in which fuses are required. Coordinate also with Mechanical Division Contractor for requirements for Mechanical Division equipment.

.3 Fuses to be of product of one manufacturer.

.4 Acceptable manufacturers are:

- .1 Mersen (Ferraz Shawmut);
- .2 English Electric Ltd.;
- .3 Noram;
- .4 Cooper Bussmann.

Part 3 - Execution

3.1 INSTALLATION OF DISCONNECT SWITCHES

.1 Provide disconnects switches and install into locations and connect complete. Ensure adequate clearance is provided as per local code requirements and as required for access for operation and maintenance. Install as follows:

.1 wherever shown on drawings and/or specified herein;

.2 wherever required by MCC/VFD/starter schedule drawings;

.3 for motorized equipment which cannot be seen from motor starter location or is more than 9 m (30') from starter location (in accordance with local governing electrical code requirements);

.4 for "packaged" equipment fed from a motor starter panel.

.2 Ensure enclosure ratings are suitable for intended applications.

.3 Provide engraved Lamacoid nameplate with nomenclature reviewed with Consultant.

3.2 INSTALLATION OF FUSES

.1 Install fuses in mounting devices immediately before energizing circuit.

.2 Ensure correct fuses fitted to physically matched mounting devices.

.3 Ensure correct fuses fitted to assigned electrical circuit.

.4 Provide a complete set of fuses for each fusible disconnect, motor starter, and similar fusible equipment provided or supplied.

.5 Supply 3 spare fuses of each size and type used on project, mount fuses in cabinet. Secure cabinet in wall location as reviewed with Consultant.

3.3 ELECTRICAL CONNECTIONS FOR MECHANICAL, OWNER, ETC., EQUIPMENT

.1 Provide required electrical connections to apparatus provided and/or supplied by Electrical Divisions. Review shop drawings and coordinate with each equipment vendor, requirements for power feeds and control/communication interconnections and provide these requirements to complete installations work.

.2 In addition to providing electrical feeders and connections to equipment provided by Electrical Divisions, provide required electrical connections to apparatus provided and/or supplied by Mechanical Divisions, Owner and as part of other Divisions.

.3 Unless otherwise noted, provide electrical connections including power and control wiring for equipment supplied by Owner or by other Divisions, and except where specified for control wiring of Mechanical Divisions automatic control systems specification Section. Provide complete wired and empty conduit systems with fish cord, junction boxes, pull boxes, outlet boxes, faceplates, sleeves, etc. Provide disconnect switches, receptacles and other required wiring and connection accessories. Coordinate work with respective Consultants and suppliers of equipment to be provided with electrical connections.

.4 Refer to Division 11, and include for coordination and interconnections of Division 11 requirements and equipment schedule.

.5 Coordinate with trades of other Divisions to ensure provision of proper electrical requirements. Unless otherwise noted or reviewed with Consultant, be responsible for provision of interconnect wiring between remote operator devices, controllers, and equipment being controlled by operator devices, whether or not such devices/controllers are supplied by Electrical Divisions. Where equipment is of split unit design and line voltage is required to both units, be responsible for feeders to each unit as coordinated with equipment manufacturer and Division responsible for equipment. Provide disconnect switches, receptacles and other required wiring and connection accessories. Provide system/equipment power feeds with hard wired or receptacle type connections, as required. Coordinate exact requirements prior to start of work, at time of shop drawing submissions and prior to roughing-in of work. Coordinate work with suppliers of equipment to be provided with electrical connections which may include but not be limited to following:

.1 laboratory equipment;

.2 audio visual systems;

.3 telecommunication systems;

.4 mechanical systems and equipment.

.6 Provide coordination of alarm connections of equipment with Mechanical Divisions BAS Contractor. Refer to drawings of both Electrical Divisions and Mechanical Divisions for BAS points to be connected. Include for wiring in conduit, contacts, termination/junction boxes, etc., as required for inter connection.

.7 Mechanical Divisions are responsible for supply of motor starters and variable frequency drives (VFDs) (also known as variable speed drives -VSDs) and harmonic filters for motorized apparatus supplied by them and is to provide Lamacoid identification throughout. Motor starters, VFDs and/or MCCs are generally to be as scheduled. Generally starters are supplied in following manner:

.1 loose starters for mounting adjacent to apparatus or on motor starter panels;

.2 mounted starters in factory assembled and pre-wired motor control centres;

.3 mounted starters on factory assembled and pre-wired packaged equipment.

.8 VFDs (with harmonic filters where required) are to be supplied and set in position by Mechanical Divisions. Coordinate installation and connection requirements with Mechanical Divisions and respective equipment manufacturers. Obtain required wiring diagrams.

.9 Be responsible for following work:

.1 mounting loose starters and providing "line" and "load" power connections;

.2 making "line" side power connections to panelboards and "load" side connections to motors;

.3 making "line" side power connections to starters on "packaged" equipment;

.4 coordinating feeder entries to starters and starter assemblies with Mechanical Divisions;

.5 providing additional disconnect switches (complete with identification) detailed on drawings, or required by Code, or for apparatus which cannot be seen from its starter or is in excess of 9 m (30') from its starter;

.6 connections to thermistors and provision of additional relays as required for connections to starters; generally, Mechanical Divisions are to supply required thermistors and relays necessary for starters; review Mechanical Divisions specifications and/or drawings defining these requirements and include necessary work, wiring, conduit and components not being supplied by Mechanical Divisions;

.7 performing required motor starter interlocking in accordance with requirements specified and as outlined on starter schedules; coordinate interlocking requirements with Mechanical Divisions;

.8 ensure that an identification nameplate is provided on each motor starter or disconnect;

.9 ensure that an identification nameplate is provided on each disconnect switch nameplate is to identify name and voltage;

.10 ensure that an identification nameplate is provided and attached with stainless steel screws to each separately mounted 3-phase motor starter or group of 3-phase motor starters a suitably sized black-white-black Lamacoid nameplate engraved to read:
"MOTOR(S) IS CAPABLE OF MAKING TWO (2) STARTS IN SUCCESSION, COASTING TO REST WITH APPROXIMATELY 15 MINUTES ELAPSED TIME BETWEEN STARTS, WITH MOTOR INITIALLY AT AMBIENT TEMPERATURE, OR OF MAKING ONE (1) START WITH MOTOR INITIALLY AT A TEMPERATURE NOT EXCEEDING ITS RATED LOAD OPERATING TEMPERATURE, IF ΩK^2 OF LOAD, LOAD TORQUE DURING ACCELERATION, APPLIED VOLTAGE AND METHOD OF STARTING ARE THOSE FOR WHICH MOTOR WAS DESIGNED."

.11 Where supplied by Mechanical Divisions and connected by Electrical Divisions, connect VFDs and harmonic filters in strict accordance with manufacturer instructions. Provide manufacturer recommended conductors and connectors to suit respective connected equipment. Provide required upstream fused disconnects or breakers and overload protection. Maintain separation of power and control conductors as per Manufacturer requirements to minimize effects of electromagnetic interference. Properly ground and bond equipment. Coordinate exact installation requirements with Mechanical Division and equipment vendors.

END OF SECTION

Part 1 - General

1.1 SUBMITTALS

.1 Submit shop drawings for products of this Section, and on Schedule of Luminaires on drawings.

.2 Include photometric data, lamp, and ballast information for each luminaire. Include ballast data identifying maximum circuit loading limitations.

.3 Photometric data to include: total input watts, candlepower summary, candela distribution zonal lumen summary, luminaire efficiency, CIE type, coefficient of utilization, lamp type and lumen rating in accordance with IESNA testing procedures.

.4 Include copy of certification that lenses and louvers comply with local governing building code requirements for flame spread ratings.

1.2 WARRANTY

.1 Warranty requirements are as follows:

.1 unless otherwise noted, LED and LED drivers for a period of five (5) years from date of acceptance of Work by Owner for its intended use;

1.3 SUBSTITUTIONS

.1 Provide luminaires as specified in Schedule of Luminaires and as per documented List of Manufacturers, where applicable. During construction period, no substitutions are permitted unless compelling reasons are given and accepted by Owner and Consultant. A delay caused by Contractor's failure to order luminaires to meet construction schedule is not a valid reason.

.2 Make requests for proposed substitutions as per requirements of Section titled Electrical Work General Instructions and Division 01.

.3 Consideration of any proposed substitutions after Bid Period to be at Consultant's sole discretion.

Part 2 - Products

2.1 LUMINAIRES

.1 Provide luminaires in accordance with Schedule of Luminaires found on drawings. Luminaires are to be CSA approved or have special local electrical authority approval.

.2 Some luminaires as noted or directed by Consultant or identified in other Division documents may be supplied by Owner or under another Division of Work. Include in Bid, Work and materials to accommodate such fixtures, including:

.1 receiving and inspecting fixtures;
.2 complete installation;
.3 providing basic installation hardware not supplied by luminaire manufacturer;
.4 aiming and connecting;
.5 providing power feeders and conduit/boxes;
.6 cleaning, adjusting and testing;
.7 providing lamps where documented or as scheduled, unless otherwise noted or directed by Consultant or supplied with fixture by fixture manufacturer;
.8 provide required power connections and where luminaires are controlled via remote low voltage controller;
.9 include for installation of controller and providing required low voltage wiring in conduit and necessary connections;

.10 coordination of exact requirements with supplier of fixtures and Consultant prior to installation.

.3 Provide thickness of metal as indicated in Schedule of Luminaires and details, or as required so that luminaires are rigid, stable and resists deflection, twisting, warping or bending under normal installation procedures, re-lamping etc., or no less than requirements specified herein the specifications.

.4 Unless otherwise noted, construct fluorescent luminaire bodies from minimum 20 gauge cold rolled prime steel and of rigid construction to permit any suspension method without sag. Unless otherwise noted, provide body finishes of corrosion resistant, chemically treated and electrostatically spray painted baked white enamel. Reflecting surfaces to be white with an average reflectance of not less than 85%. Provide adjustable mounting brackets for troffers mounted in ceilings.

.5 Unless otherwise noted, linear and continuous linear architectural LED luminaires bodies to be constructed of extruded aluminum and of rigid construction. Unless otherwise noted, provide body finishes of corrosion resistant, chemically treated and electrostatically applied post powder coat finish. Efficiency not to be less than 69%.

.6 Unless otherwise noted, vandal resistant luminaires to be constructed of heavy duty extruded aluminum rails and die cast end caps, complete with stainless steel Torx with centre reject pin and Allen head set screws. Screw heads to be mounted and concealed under lens. Lens to be extruded UV stabilized polycarbonate lens with internal linear ribbed design.

.7 Provide neoprene or silicone gasketting, barriers and stops where required to prevent light leaks or water/water vapour penetration.

.8 Fabricate housings to allow for easy accessibility and replacement of parts.

.9 Fabricate fixtures with a minimum number of joints. Make unexposed joints by acceptable method such as welding, brazing, screwing or bolting. Soldered joints are unacceptable. Do not use blind metal tapping methods or rivets for fastening parts which must be removed during service, or for fastening electrical components and supports. Cast parts, including die-cast members, to be of uniform quality, close grained, rigid, true to pattern, free from blow holes, pores, discoloration, hard spots, shrinkage defects, and cracks or other imperfections that affect strength and appearance or are indicative of inferior metals or alloys.

.10 Reflectors and reflecting cones or baffles to be free of any tooling marks, spinning lines or marks by other assembly techniques. For fluorescent sources, iridescence to be low. Finishes to be equal to first quality polished, baffled, and anodized "Alzak".

.11 Lenses and louvres to comply with local governing building code and other local governing code flame spread rating requirements.

.12 Unless otherwise noted, construct acrylic lens from 100% virgin acrylic and not less than 3.22 mm (0.125") thick. Glass lenses to be minimum 9.5 mm (0.375") thick.

.13 Luminaires to be factory assembled and tested prior to delivery on site.

.14 Exposed parts and hardware of luminaires located in non-climate controlled areas to be corrosion resistant and weather resistant. Hardware to be tamper-proof. Manufacturer exterior luminaire poles with corrosion resistant finish and construction. Pole suppliers to ensure that poles supplied are suitable for steady wind velocity and gust velocity of area of installation, and suitable for total effective projected area of lighting equipment. Submit verification of this with shop drawings.

.15 When requested, submit luminaire samples.

.16 Dimensions for coves, valances, and strips as shown on drawings are for bidding purposes only. Job measure for exact dimensions of louvres, lenses and strips.

.17 Dimensions for linear and continuous linear LED as shown on drawings are for bidding purposes only. Job measure for exact dimensions requirements to suit installation location.

.18 Confirm exact colours and finishes of luminaires with Consultant after award of contract but prior to ordering. Obtain information in time to meet installation schedule.

.19 Acceptable Luminaires Manufacturer/Supplier.

.1 GS Lighting Group;

.2 Medgar Lighting;

.3 Salex SW;

.4 WSC Lighting Systems.

2.2 **LEDS & DRIVERS**

.1 General features include:

.1 CSA approved, ULC listed and labelled;

.2 Operating temperature:

.1 Luminaires for applications in non-climate controlled area: operating temperature range through -40°C (-40°F) to 60°C (140°F);

.2 Luminaires for applications in climate controlled area: operating temperature range through -20°C (-4°F) to 50°C (122°F);

.3 With rapid and changing development of LED technology, provide most technically proven and most advanced and successfully tested LED technology at time of installation;

.4 Specification standards to meet requirements of IES LM 79 and LM-80.

.5 Be 100% compatible with connected dimmer controls to provide dimming down to 5%.

.2 Light emitting diodes (LEDs) features to include:

.1 LEDs to be selected from same colour bin size for consistency in chromaticity and meet ANSI C78 377A as a minimum;

.2 generally, colour temperature range to be from 2700 K to 6500 K; specific temperature requirements to be identified on Schedule of Luminaires;

.3 minimum CRI of 80 ;

.4 rated life (based on 70% lumen depreciation level) from 50,000 to 70,000 hours.

.3 Driver (ballast) features to include:

.1 Operate from 60 Hz input source of 120 VAC with sustained variations of ± 10% (voltage and frequency) with no damage to driver;

.2 Output regulated to ±5% across load range;

.3 Power factor greater than 0.90;

.4 Total harmonic distortion less than 20%;

.5 Class A sound rating;

.6 Comply with ANSI C62.41 Category A for transient protection.

.4 Acceptable manufacturers to be as recommended by luminaire manufacturers.

Part 3 - Execution

3.1 **INSTALLATION**

.1 Provide luminaires as required. Obtain required training from manufacturer representative on any special installation procedures. Install products in accordance with manufacturer instructions to suit specific installation requirements.

.2 Before placing luminaire orders:

.1 verify quantity requirements;

.2 thoroughly review ceiling types, finishes and construction details; verify ceiling types with latest Architectural Drawings; order luminaires to suit correct ceiling type;

.3 ensure that required mounting assemblies, frames, rings and similar features are included;

.4 confirm colours and finishes with Consultant.

.3 Include for assembly and mounting of luminaires and lamps, complete with:

.1 wiring and connections;

.2 fittings and hangers;

.3 aligners;

.4 box covers;

.5 other accessories required for a complete, safe and fully operational assembly.

.4 Where outlet boxes locations are shown on drawings, they are diagrammatic only. Position outlet boxes to coincide with suspension hangers and knockouts.

.5 Install ceiling fixtures in centre of tiles unless dimensioned otherwise on Reflected Ceiling Plans. Locate hangers on tile centres or intersections. Mount recessed downlights, troffers, and surface mounted luminaires in or on full tiles. Install fixtures in and on acoustical tile ceilings in alignment with tile joints.

.6 Cut holes for recessed luminaires to exact size so that gaps are not visible or luminaire trims cover gaps.

.7 Mount surface ceiling luminaires perfectly level or plumb, tightly to ceiling without showing a space or light leak between frame and ceiling.

.8 Carefully align linear luminaires shown in continuous lines or rows, so that rows appear as straight lines. Variation in alignment not to exceed 6 mm (1/4") for any 5 m (16') run.

.9 Provide spacers for fixtures mounted on low density ceiling material.

.10 Provide plaster frames for recessed fixtures in plaster or gypsum board ceilings.

.11 Prepare fixtures, trim and poles and standards required to be painted.

.12 Wiring between fluorescent lamp holders and associated operating and starting equipment to be of similar or heavier gauge than leads furnished with approved types of ballasts with equal or better insulating and heat-resistant characteristics.

.13 Protect wiring with tape or tubing at all points where abrasion may occur. Conceal wiring within fixture construction except where design or mounting dictates otherwise.

.14 Splices:

.1 Minimize number of splices.

.2 Make with approved mechanical insulated steel spring type connectors, suitable for temperature and voltage conditions to which splices are to be subjected.

.3 Splices are not to be made unless properly terminated in accessible identified junction boxes.

.15 Support luminaires directly by ceiling slab structure and not to formed steel decking, ceiling hangers, ductwork, piping, cable trays, etc.

.16 Do not tighten wing nuts, bolts, or screws that allow fixture adjustment for recessed adjustable fixtures.

.17 Install spread lenses only where called out on Schedule of Luminaires and Specifications.

.18 Use cloth gloves when handling reflector cones, louvers, halogen lamps, glass, sconces and all exposed surfaces of fixtures.

.19 Co-ordinate luminaire installation with work of other trades to ensure that necessary recessing depths and mounting spaces are provided.

.20 Install luminaires in accordance with applicable architectural drawing reflected ceiling plans and/or wall elevations and/or field instructions issued by Consultant. Confirm luminaire locations prior to roughing-in. In equipment rooms, shafts and similar secondary areas, install luminaires after mechanical and other major work is roughed in and adjust luminaire locations as required.

.21 Align and position all adjustable luminaires, and ensure that luminaires with adjustable lamp holders are properly positioned to correspond to lamps specified.

.22 Comply with requirements of local governing electrical code regarding support of luminaires in suspended ceilings.

.23 Independently suspend luminaires in suspended ceilings from ceiling slab. For each luminaire, provide minimum two (2) cable supports secured to ceiling slab and to luminaire. Confirm with local governing authorities and review with Consultant if a variance to this requirement can be made for specific luminaires of low weight.

.24 Connect luminaires to power circuits and controls as required. Refer to drawings notes and schedules. Include for both normal and emergency power circuits as required.

.25 Locate exit signs in final locations confirmed with Consultant and approved by local building code authority. Connect to power circuits as required. Where applicable for emergency power requirements, connect to emergency battery units. Relocate exit sign and re-direct direction arrows to suit local building code authority requirements and Consultant's directions.

.26 Notify Consultant immediately and relocate if necessary as directed by Consultant, if:

- .1 fixture placement is in conflict with a structural beam, mechanical duct, plumbing pipe, etc.;
- .2 space above ceiling is not sufficient;
- .3 any reason that a fixture cannot be located where it is dimensioned or shown on construction documents.

.27 Provide seismic restraints to suspended luminaires, in accordance with latest local governing building code requirements.

.28 Ground and bond luminaires as per local governing electrical code requirements.

.29 Prior to turn over of Work to Owner, clean luminaires in manner recommended by manufacturer and to satisfaction of Consultant.

.30 Lamps to be new and intact when project is complete and ready for acceptance.

.31 Include a full lamp listing in Operating and Maintenance Instruction Manuals.

.32 Additionally, refer to testing and verification requirements in Section titled Electrical Work Analysis and Testing and include applicable requirements.

END OF SECTION

Part 1 - General

1.1 SUBMITTALS

.1 Submit shop drawings for products specified in this Section.

1.2 SOFTWARE NOMENCLATURE REPROGRAMMING

.1 Include additional costs for system Manufacturer to make necessary on site final changes to applicable system/equipment software. Make such changes after successful testing and verification of the systems, but prior to turn over to Owner. After successful final verification of the work, confirm and obtain approval of final nomenclature in writing from Owner and Consultant. Software revisions to incorporate final room names/area names/building names and equipment identification.

1.3 SYSTEM SUPPLIER/INSTALLER QUALIFICATIONS

.1 System supplier/installer to be an established communications and electronics contractor that currently maintains locally run and operated business for at least 5 years and holds applicable provincial and local licenses.

.2 Supplier/installer to be valid authorized distributor for product/system proposed with full Manufacturer warranty privileges.

.3 Supplier/installer to employ technicians who have attended and successfully completed Manufacturer technical certification training for proposed system.

.4 Supplier/installer to show satisfactory evidence, upon request, that they maintain a fully equipped service organization capable of furnishing adequate inspection and service to system. Supplier/installer to maintain at their facility, necessary spare parts in proper proportion as recommended by system manufacturer to maintain and service equipment being supplied.

Part 2 - Products

2.1 WASHROOM EMERGENCY CALL SYSTEMS

.1 Provide an emergency call system consisting of CSA approved and/or ULC listed components to provide system in compliance with local governing codes and standards, with following operations:

.1 activated emergency call station in ADA designated washroom sends signal to audible and visual devices that indicate that someone in washroom needs assistance;

.2 audible devices and visual devices located over washroom door illuminate and sound tone when remote call stations are activated; visual and audible signals to be distinct and of different types of signals from other building systems;

.3 call stations, audible devices and visual devices to only be reset when call has been responded to and activated station locally reset.

.2 Remote stations to be tamper-proof, vandal-proof and with call pushbutton of minimum 32 mm (1-1/2") dia., but of greater size if required by local governing codes. Stations include reset button, call tone and call assurance LED light. Stations to include user able reset feature. Call tone to have adjustable sound level.

.3 Remote stations to be tamper-proof, vandal-proof and with 1.8 m (6') long PVC call cord. Stations include reset button, call tone and call assurance LED light. Stations to include user able reset feature. Call tone to have adjustable sound level.

.4 Signage: engraved lamacoid emergency sign that contains wording - "IN EVENT OF EMERGENCY PUSH EMERGENCY BUTTON AND AUDIBLE AND VISUAL SIGNAL WILL ACTIVATE" in letters at least 25 mm (1") high with 5 mm (3/16") 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.

.5 Visual devices to be flashing LED type with Lexan lens and audible signal tone, mounted onto single gang stainless steel faceplate, and suitable for mounting onto recessed electrical box. Signals to be distinct from other building systems. Confirm LED colour with Consultant prior to ordering.

.6 Subject to approval of local governing inspection authority, interior audible and visual signals may be devices remote from call station but still within room and also must meet performance requirements specified herein. Flush mount in recessed boxes.

.7 Provide power supplies, wiring and mounting hardware as required and as recommended by system manufacturer.

.8 Wiring to be of type in accordance with applicable local governing codes and standards, and as recommended by system vendor.

.9 Provide system to suit application as shown and as required. 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.

.10 Verify system sequence of operation with local governing authority inspector and coordinated with Consultant.

.11 Manufacturer authorized vendor to supply, install, test, start-up and certify complete systems as required.

.12 Acceptable manufacturers are:

.1 GE (Chubb Edwards);
.2 Aiphone;
.3 TOA;
.4 Telecor;
.5 Rauland;
.6 Mircom;
.7 Jeron.

Part 3 - Execution

3.1 **INSTALLATION OF WASHROOM EMERGENCY CALL SYSTEM**

.1 Provide specified emergency call systems components and connect complete. Program sequence of operation as required and confirmed with Owner and Consultant. Exact programming requirements to be verified with local governing authority and coordinated with Consultant and/or Owner.

.2 Obtain required training from Manufacturer representative on any special installation procedures.

.3 Install devices in locations as coordinated with Consultant prior to roughing-in. Install components at mounting heights as noted on drawings and confirmed with Consultant. Generally, mount devices on recessed back boxes. Typically locate audible/visual devices above doorframe. Locate power supplies in service room accessible location confirmed with Consultant.

.4 Set sound level of interior audible devices at level acceptable to Owner and coordinated with Consultant. Adjust as required.

.5 Provide required system wiring. Wiring to be copper conductor, colour coded, and in accordance with system Manufacturer recommendations and instructions. Connect equipment in accordance with system Manufacturer certified wiring diagrams and instructions and under direct supervision of manufacturer. Run conductors in conduit.

.6 Install devices and perform work in accordance with Manufacturer instructions and requirements and in accordance to applicable codes of local governing bodies having jurisdiction.

.7 Confirm locations of devices prior to roughing-in.

.8 Provide a lamacoid identification nameplate for each enclosure. Confirm wording of identification nameplates and colour finishes of devices with Owner prior to ordering.

.9 Install signage as required. Locate in position and secure to wall with proper mechanical fasteners. Confirm exact nomenclature, sizing and locations with Consultant with shop drawing submissions.

.10 After installation is complete, test, adjust and verify operation of system. Demonstrate system operation and maintenance with Owner staff.

.11 Obtain approvals from local governing inspection authorities.

3.2 TESTING & VERIFICATION OF SYSTEM

.1 After completion of installation work, make arrangement with Consultant and Owner and manufacturer of equipment to have a final functional witness acceptance test, giving minimum 7 working days' notice to each party concerned to be present. Exact schedule of testing work to be approved in writing by Consultant.

.2 Include minimally the following:

.1 check of devices to ensure proper connections and supervision;

.2 operation of an initiating device on each circuit to verify required operation of alarm devices, annunciator and other installations;

.3 testing of signal devices for correct operation and function;

.4 testing of each secured door access control components and review of events reported at head end;

.5 testing of sequence of operation of system with integrated systems and equipment;

.6 start-up procedures;

.7 submission of detailed test report of system performance, signed by authorized testing technician.

.3 Include for system Manufacturer authorized technician to test this work and provide minimum one hard copy and electronic copy of signed report of the documented test results.

.4 Additionally, refer to testing, coordination and verification requirements in Section titled Electrical Work Analysis and Testing and include applicable requirements.

3.3 TRAINING

.1 Manufacturer trained technician to perform onsite training of each user (including the provision of user guides) prior to project completion to ensure that users are properly trained in the operation and maintenances of system.

.2 Refer to Instructions to Owner specified in Section titled Electrical Work General Instructions.

END OF SECTION

Part 1 - General

1.1 SUBMITTALS

.1 Submit shop drawings for products specified in this Section. Include annunciator schedules, revised system programming and sample of revised graphic annunciator layout and nomenclature.

.2 Submit copies of final system testing and verification reports and certificates of approval from local governing inspection authority.

Part 2 - Products

2.1 EXISTING FIRE ALARM SYSTEM

.1 Existing fire alarm system serving complex is Mircom, Model FX-2000. Provide additional devices and work to extend system to serve additional and renovated areas. Additional devices to be 100% compatible with and of same manufacture as per existing system. Include provision of necessary control panel and annunciator work of existing system to accommodate integration of additional devices.

.2 Include for and engage Owner existing system manufacturer authorized technicians to provide and perform required system products and work.

.3 Verify with existing fire alarm system manufacturer during Bid period, exact requirements needed to provide renovation work. If necessary, visit site with manufacturer to review existing conditions. Confirm and coordinate exact work responsibilities with system vendor. Items of clarification or proposed revisions to Bid Documents must be reviewed with Consultant during Bid Period.

2.2 ADDITIONAL FIRE ALARM SYSTEM WORK

.1 System work to include but not be limited to provision of following:

.1 modifications to existing head end equipment including provision of additional device connection modules, zone modules, amplifiers and system re-programming;

.2 additional initiating devices (pull stations, heat/smoke/flame detectors);

.3 additional alarm indicating devices (horns, strobes);

.1 All new horns sound pattern shall match sound pattern of existing-to-remain horns throughout the existing school.

.4 additional interfaces and interconnections to auxiliary building systems;

.5 review of existing battery backup capacity and amplifiers (as applicable) and increasing capacities to accommodate additional device loading and to meet applicable governing local code requirements;

.6 additional wiring in conduit and/or fire rated cables.

.2 Additional system components to be listed as products of a single manufacturer under appropriate category, by Underwriters Laboratories of Canada and bear ULC label. System components and work in conjunction with system installation to meet specific application requirements of local governing authorities, codes, standards, regulations and requirements of following:

.1 CAN/ULC-S524, Standard For Installation Of Fire Alarm Systems;

.2 CAN/ULC-S527, Control Units For Fire Alarm Systems;

.3 CAN/ULC-S537, Standard For Verification Of Fire Alarm Systems ;

.4 local governing building code;

.5 local governing building permit applications for approvals;

.6 other requirements of local governing authorities.

2.3 **MODIFICATIONS & DEVICES**

.1 Modify control panels and annunciators to supervise and annunciate additional and relocated devices. Additional initiating devices shall be devices that are 100% compatible with existing controls and be ULC listed and labelled for connecting to respective control units. Include costs for manufacturer authorized representative to perform control panel/transponder work and to reprogram system software to accommodate renovation work. Provide additional zone modules as required and additional batteries as required to supply back-up battery capacity to the additional components.

.2 Additional devices to be ULC listed and labelled devices suitable for fire alarm applications. Power supplies and other components to be CSA approved where required by local governing authorities and codes.

.3 Exact type of device to be used in each area of installation to be as recommended by system manufacturer to suit specific applications and to be approved for such use as per ULC standards. Devices in non-climatic controlled areas to be weatherproof, corrosion resistant and ULC listed for use in below freezing temperatures. System manufacturer to be responsible for ensuring compliance with these requirements.

.4 Devices:

.1 Additional smoke detectors and heat detectors: to be of type and rating to suit specific application as per existing system Manufacturer recommendations.

.2 Audible devices: of type to match existing system standards.

.3 Strobes and combinations strobes/audible devices: of type to match existing system standards; include additional strobes to meet latest governing building code requirements.

.4 Addressable modules as required for connection of additional devices.

.5 Ancillary devices as required to complete system.

.6 Refer to drawings for additional device requirements.

.5 End-Of-Line Resistors and Isolators:

.1 End-of-line resistors for standard alarm and signalling circuits to be sized to ensure correct supervisory current flows in each circuit.

.2 End-of-line resistors to be mounted on a stainless steel plate for mounting on a standard single gang box and bear ULC label.

.3 Isolators to be provided in accordance with code requirements and installed as per system Manufacturer requirements to isolate/monitor zones, loops, group of devices within building and between buildings.

.6 Wiring:

.1 CSA approved and ULC listed wire and cable, approved for fire alarm circuits; with colour coded, insulated solid copper conductors; of type as per local governing electrical code and local governing fire authority requirements.

.2 Sized and installed in accordance with system Manufacturer instructions and local governing electrical code.

.3 Fire rated MI for wiring as required by local governing building code, local governing authorities and as noted on drawings, for connections and interconnections to equipment for life safety applications.

.4 To be mechanically protected to satisfaction of local fire authority.

.5 Pentair "Pyrotenax" type "MI" ULC listed and labelled, 2 hour fire rated, mineral insulated, copper sheathed, copper conductors for power, control and signal wiring to and between each transponder/control panel, and for other local code required or local governing authority required applications with regards to life safety equipment.

2.4 **TESTING & VERIFICATION WORK**

.1 Refer to Part 3 for system testing, verification and certification Work.

Part 3 - Execution

3.1 **INSTALLATION - GENERAL**

.1 Prior to start of Work as part of shop drawing submission process, review with system manufacturer following:

.1 device types to ensure that selected type is suitable for intended application on project;

.2 locations of devices to ensure proper operation and coverage are in compliance with requirements of local fire authorities;

.3 device mounting heights to ensure proper operation and coverage are in compliance with requirements of local fire authorities;

.4 device back box requirements to ensure size and depth suit system Manufacturer recommendations for specific devices;

.5 types of system wiring and required sizing taking into consideration applications and voltage drop;

.6 system circuiting and device quantities per circuit while maintaining limitations in Specifications;

.7 proposed revisions required to existing system sequence of operation.

.2 Immediately advise Consultant of any requirements of above that may necessitate revisions to design documents.

.3 Install fire alarm system components and connect complete.

.4 Perform Work in conjunction with this installation to meet requirements of latest editions of local governing building code, local governing electrical code, ULC Standards including Installation Standard CAN/ULC-S524, and any applicable local governing codes. If any requirements of these specifications are different, omitted or contrary to ULC-S524 Standard, then ULC Standard governs and overrides these specifications, but in no instance will standards established by drawings and specifications be reduced by any of Codes referred to previously. Control units and annunciators to be in accordance to latest requirements of ULC Standard CAN/ULC-S527 "Control Units for Fire Alarm Systems.

.5 In addition, work to meet Owner’s standards, and recommendations and instructions from system manufacturer.

.6 During work to existing fire alarm system, proposed time and duration of interruption to be approved by Consultant. At any time due to emergency situations, Owner may request by-passed zone(s) to be re-instated immediately. In all areas where renovation work requires shutdown of any part of fire alarm protection system, provide manual fire alarm protection (Fire Warden) by means of supervising area as approved by local governing authorities. At no time allow fire alarm system or any one (1) zone to be left inoperative overnight. Provide required bypass wiring and temporary wiring to maintain all parts of fire alarm system operative during construction and alterations.

.7 Fire alarm system Manufacturer authorized technician to supervise control panel, transponder, and annunciator work.

.8 Provide sequence of operation for fire alarm system as approved by local fire authority and reviewed by Consultant. Refer to additional requirements on drawings.

.9 Demonstrate system to local Fire Department and obtain their approval for complete system.

3.2 **INSTALLATION OF DEVICES**

.1 Install required devices. Do not install devices in locations that may hamper proper operation of devices including adjacent devices.

.2 Obtain required training from manufacturer representative on any special installation procedures. Install devices and perform work in accordance with Manufacturer instructions and requirements and in accordance to applicable codes of local governing authorities having jurisdiction.

.3 Review device finishes with Consultant prior to ordering.

.4 Install manual pull stations in boxes as required, recessed outlet boxes with plaster rings, except in unfinished areas where pull stations are surface mounted, in which case, install stations in surface mounted boxes. Comply with mounting height requirements for local governing building code barrier free access.

.5 Install mounting plate of thermal detectors to ceiling mounted boxes as required. Secure detectors to plates. Refer to floor plans and drawing symbol list to determine rating of detectors in any given area. Generally, do not install rate-of-rise type detectors in areas subject to sudden changes in temperatures, such as entrance vestibules. Confirm application requirements with system manufacturer and ensure that devices are ULC listed for such applications and are approved by local fire authority for such use.

.6 Secure base of each ceiling mounted products of combustion detectors to boxes as required, either flush or surface mounted as required. Secure detector heads to bases.

.7 Install cross zoned connection of detectors and remote indicating devices for areas of raised floors or within accessible ceiling spaces or for applications detailed on drawings.

.8 In application with hold open devices on doors, ensure compliance with NFPA regarding smoke detectors tied to hold open devices such that a signal received directly from smoke detector to cause release of door. Where electromagnetic locks are used on doors of egress, provide required automatic release of locks upon activation of fire alarm (i.e. via connection to auxiliary contact of adjacent pull station). Provide required conductors and connections to fire alarm system and to electromagnetic locks.

.9 Generally, audible device locations are indicated on drawings, however, exact audible device quantities and locations to be in accordance with results of audibility device coverage site tests. Provide suitable sound detection metering and personnel to make necessary tests. Relocate audible devices and/or provide additional audible devices as required.

.10 Typically, Install visual notification appliances 2400 mm (8') above floor or 300 mm (12") below finished ceiling line. Provide visual notification devices in areas subject to high ambient noise levels, such as mechanical equipment rooms, computer equipment rooms, parking garage, etc., and areas designated for hearing impaired as per local building code requirements. Provide minimum 2 circuits per floor and connect devices in alternating scheme.

.11 Provide required additional devices and install existing devices as required. Circuit devices to existing standards and in compliance with local governing codes and authorities. Determine exact quantities of circuits based on requirements of governing codes and standards, and recommendations of system manufacturer.

.12 Unless otherwise noted in Contract Documents, do not load device circuits more than 80% capacity.

.13 Devices in non-climate controlled areas to be weatherproof, corrosion resistant, ULC listed for operation in below freezing temperatures, and as recommended by system manufacturer for use for each specific application. Where electronics are not recommended for cold temperature applications, include for Manufacturer recommendations and directions in remotely locating addressable modules in closest heated areas and connecting to respective device in non-climate controlled areas.

3.3 **REQUIREMENTS FOR INTEGRATED SYSTEMS & EQUIPMENT**

.1 Perform required fire alarm system wiring connections to mechanical equipment and other building systems to perform required interrelated functions. Provide required wiring, relays and/or contactors between fire alarm system and various equipment to achieve automatic or manual control of equipment, to perform required integrated to fire alarm system functions. Provide shunt trip breakers as required. Provide fire rated conductors where required by local codes and local authorities.

.2 Provision of fire alarm supervisory wiring connections to include but not be limited to following (where applicable):

.1 fan equipment starters;

.2 pumps;

.3 door holders/releases and electromagnetic locks;

.4 devices as shown on drawings.

3.4 **ADDITIONAL REQUIREMENTS**

.1 Provide required system wiring in accordance to requirements of applicable governing electrical code, other local governing code and standards requirements, system manufacturer's recommendations and based on specific applications and consideration of voltage drop.

.2 Install wiring in conduit unless otherwise directed by Consultant. Perform wiring connections associated with fire alarm system on terminal strips in junction boxes and colour coded. Provide wiring colour coding consistent for entire length of each run. When pulling wires into conduit, use lubricant and run wires straight and not twisted or abraded. Neatly secure exposed wires in apparatus enclosures with approved supports or ties. Clearly identify wiring at each termination point. In addition, number wiring with Brady Ltd. or Electrovert Ltd. Z-type markers. Colour conductors for each part of system in accordance with system equipment Manufacturer recommendations. Paint conduit couplings red of paint type suitable for application to standards of Division 09.

.3 Where existing devices are relocated and existing wiring is of insufficient length to connect to relocated position, provide replacement wiring and conduit of sufficient length.

.4 Where required by local governing codes and/or local governing authorities, provide ULC listed, fire rated conductors (MI) for connections to and interconnections between equipment for life safety applications requiring fire rating. Install MI type conductors in accordance with manufacturer's instructions and requirements in Specification.

.5 Run alarm indicating circuits (speakers) and alarm receiving circuits (pull stations, detectors) in separate conduits from each other.

.6 Provide engraved Lamacoid identification nameplates for each equipment or wiring housing and secure to front of housing. Confirm exact wording designations and sizes to with Consultant prior to manufacture.

.7 Review nomenclature of annunciator identification with Consultant prior to ordering.

.8 Install end-of-line resistors to electrically supervise wiring. Generally, locate end-of-line resistors at ceiling lines above a pull station location. Provide isolators and install in accordance with ULC standards. Properly label and identify. Do not locate end-of-line resistors and isolators in concealed locations. Generally install in equipment rooms.

.9 Refer to drawing riser diagram. Riser drawings are diagrammatic and are not to be used for determining quantities or lengths. Quantities of components to be as per floor plans. Determine exact quantities of circuits based on drawings information, connected devices, requirements of governing codes and standards, and recommendations of system manufacturer.

.10 Review exact location of components prior to roughing-in.

.11 Ground and bond system as required by local governing electrical code and authority and system manufacturer.

3.5 **SYSTEM TESTING, VERIFICATION & CERTIFICATION**

.1 Submit to Consultant for approval, proposed schedule for testing and verification of system. Obtain such approvals prior to start of testing. Consultant and/or other Owner representatives to have option to witness all or part of testing and verification work. Notify Consultant and Owner minimum 7 working days in advance of testing.

.2 Include for fire alarm system manufacturer to inspect, test, verify and certify system components and wiring, individually and as a complete system, in accordance with requirements of CAN/ULC S537. Work to include but not be limited to provision of following:

.1 to ensure that type of equipment installed is that designated by Contract Documents;

.2 to ensure that wiring connections to equipment components show that installer observed ULC and CSA requirements;

.3 to ensure that equipment was installed in accordance manufacturer recommendations, and that signalling devices of whatever manufacture were operated or tested to verify their operation;

.4 to ensure that supervisory wiring of those items of equipment connected to a supervised circuit is operating and that governmental regulations, if any, concerning such supervisory wiring, have been met to satisfaction of inspecting officials;

.5 to ensure that sequence of operation is in accordance with existing sequence of operation and any modifications identified on documents and are approved by local fire authority;

.6 to ensure that devices are commissioned and operable.

.3 System manufacturer to also be responsible for, but not be limited to, provision of following additional work to existing systems:

.1 coordinate with local fire authority inspector and Electrical Division Contractor, required testing and verification work in order to obtain certification and meet local fire code and local fire authority requirements;

.2 test system battery power supplies and demonstrate compliance with local governing building code and local fire authority requirements that battery supplies are capable of providing required 24 hours of supervisory power followed by local governing building code required time (or time directed by local fire authority) of full load power; exact method of testing to be approved by local fire authority, Consultant and Owner; confirm exact procedures with previously named parties prior to testing; include for sufficient sound measurement devices and personnel in order to successfully comply with this requirement;

.3 full review, testing, and verification of operation of building ventilation and smoke exhaust system and its integrated operation with fire alarm system and various pieces of air handling equipment;

.4 full review, testing and verification of operation of integrated systems such as elevators and their emergency sequence of operation, supervisory annunciation of sprinkler/standpipe monitor switches, pressure switches and flow switches, diesel genset alarms, security alarms, BAS alarms, release of door holders and electromagnetic locks, and any other integrated components; coordinate requirements with trades responsible for integrated components and systems who will be present at time of testing and verification work;

.5 test that system audible devices provide alarm sound levels in areas as per local governing building code and local fire authority requirements; site adjust tap settings of audible devices as required to achieve required audibility levels; also test that emergency voice communication system meets or exceed intelligibility requirements of local governing building code and is approved by local fire authority;

.6 assist in testing and verification of electromagnetic door locks to meet requirements of authorities having jurisdiction and to obtain overall approval of installation;

.7 coordination with Electrical Divisions and local fire authority to provide requirements to obtain certificates of approvals from local fire authority;

.8 provide full detailed test sheets of tested components and provide certification that system work has been fully tested, that devices have passed testing and that system is in proper work order in compliance to local governing code requirements and project documents; testing report documents to be additionally provided in electronic format as confirmed with Owner and Consultant.

.4 Where project work is phased and Owner requires occupancy at various stages, include for providing system testing, verification and certification after completion of each phase of work, to approval of local governing authorities. Upon Substantial Performance of the Work, include for providing system testing, verification and certification of entire system work.

.5 Contact local fire authority inspector and coordinate and arrange for Fire Inspector to perform required inspections. Integrate local fire authority inspection requirements with testing and verification work to extent as per Fire Inspector's directions. Obtain full approval and certification by local fire authority.

.6 Local fire authority inspector, Consultant and Commissioning Agent to at their discretion test system or parts of system in their review of test reports. Correct/repair any failures or deficiencies found in system, whether or not identified in test reports of manufacturer. Re-test and re-verify until successfully passed, at no extra cost to Owner.

.7 Obtain from local fire authority required certificate of approval of system and forward to Consultant.

.8 Arrange for manufacturers to supply reasonable amounts of technical assistance with respect to any changes required to conform to paragraphs above. During period of inspection, testing and verification, make Electricians available to do any required correction work and to assist during this Work. Include for trades responsible for integrated components (i.e. exhaust fans, sprinklers, elevators, gensets, etc.) and systems to be present at time of testing and verification work.

.9 On completion of verification, inspection and testing of system, obtain from manufacturer and forward to Consultant, a verification certificate together with detailed inspection reports listing each and every system component, its location in building and its acceptability. Verification certificate and inspection reports to be prepared and signed by certified testing technicians of manufacturer. Signed test reports to confirm that systems are installed and perform in accordance with requirements specified above.

.10 Obtain from system manufacturer and testing agency and forward to Consultant a certificate of liability insurance of minimum amount of Two Million Dollars ($2,000,000.00) that is to be registered for this project to show satisfactory proof of manufacturer liability coverage for both their product and personnel.

.11 Include for re-verification of any failed device repaired or replaced, until successful testing and verification.

.12 Unless approved in writing by Consultant and Owner, do not use open flame and/or smoke for testing.

.13 Testing technician to be certified and approved for fire alarm system testing by Canadian Fire Alarm Association (CFAA) and or be a Certified Fire Alarm Electrician (CFAE) with Electrical Contractors Association of Ontario (ECAO) as deemed acceptable to Ontario Fire Marshall.

.14 Additionally, refer to testing, coordination and verification requirements in Section titled Electrical Work Analysis and Testing and include applicable requirements.

.15 The Electrical Contractor shall warrant that the components of the fire alarm system installed as part of this work shall remain in good working order for a period of one year from the date of verification. Should components of the system fail to perform as intended under normal operating conditions at any time during this one year period, the Client shall notify the Electrical Contractor in writing. The Electrical Contractor shall repair or replace the failed equipment/devices to maintain a fully operational fire alarm system.

3.6 MONITORING OF SYSTEMS

.1 In areas that remain occupied and used by Owner during Work, daily monitor and supervise existing fire alarm system serving renovation/working areas. Ensure that system is left in proper operating condition at end of each working day. Include for but not be limited to performing following:

.1 under presence of Owner representative, check each morning and evening (start and end of work) of each day, system to ensure that it is in proper working condition;

.2 if portions of system are not in proper working order, provide temporary bypass wiring (if fire alarm system, must be subject to approval of local fire authority), and/or provide supervisory personnel to monitor systems for area affected;

.3 document and sign off with Owner representative signing off also, each respective daily check condition;

.4 ensure that work to system does not affect portion of system serving areas outside of renovation/working areas.

.2 Maintain fire protection of areas which may include fire watch during temporary shutdowns of existing systems, in accordance with requirements of local governing code and local governing authorities.

END OF SECTION

Halton District School Board, Kilbride Public School

The Ventin Group Architects Ltd (+VG)

Type of Document:
Mechanical Specifications Issued for Permit & Tender

EXP Project:
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Prepared and Reviewed By:
Eric Verhoeven, P.Eng.
EXP Services Inc.
1266 South Service Road, Suite C1-1
Stoney Creek ON L8E 5R9
t: +1.905.525.6069
f: +1.905.528.7310

Date + Time Submitted:
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END OF SECTION

Drawing No.	**Drawing Title**
M0.0	MECHANICAL LEGEND, DRAWING LIST AND KEY PLAN
M1.0	PARTIAL FLOOR PLAN - UNIVERSAL WASHROOM - DEMOLITION PLANS
M1.1	PARTIAL FLOOR PLAN - BOILER ROOM - MECHANICAL -DEMOLITION PLAN
M2.0	PARTIAL FLOOR PLAN - UNIVERSAL WASHROOM - NEW PLANS
M2.1	PARTIAL FLOOR PLAN - BOILER ROOM - MECHANICAL - NEW PLAN
M3.0	MECHANICAL CANOPY AND DOOR PLANS
M4.0	MECHANICAL SCHEMATICS
M5.0	MECHANICAL DETAILS
ME1.0	MECHANICAL AND ELECTRICAL SCHEDULES

END OF SECTION

Part 1 - General

1.1 RELATED SECTIONS

.1 Divisions 21, 22, 23, 25

1.2 SUBMITTALS

.1 Shop drawings to show:

- .1 Mounting arrangements.
- .2 Operating and maintenance clearances.

.2 Shop drawings and product data accompanied by:

- .1 Detailed drawings of bases, supports, and anchor bolts.
- .2 Acoustical sound power data, where applicable.
- .3 Points of operation on performance curves.
- .4 Manufacturer to certify current model production.
- .5 Certification of compliance to applicable codes.
- .6 Approvals:
  - .1 Submit two (2) copies of draft Operation and Maintenance Manual to Consultant for review. Submission of individual data will not be accepted unless directed by Consultant.
  - .2 Make changes as required and re-submit as directed by Consultant.

1.3 DELIVERY, STORAGE & HANDLING

.1 Transport, store and handle the materials in conformance with the manufacturer's instructions.

.2 Delivery and receipt:

- .1 Deliver the materials to the job site in their original packaging. The name and the address of the manufacturer marked must be labelled on the packaging.

.3 Storage and protection:

- .1 Store the materials in a dry environment.
- .2 Store the materials in the temperature and humidity conditions recommended by the manufacturer, and protect them from exposure to extreme weather conditions.

.4 Packaging waste management: recover the packaging waste so that it may be re-used or recycled, or reclaimed by the manufacturer. This includes pallets, lockers, packing and other packing material.

1.4 RELATED WORK

.1 It is the intent of these specifications to furnish and install all materials and equipment as hereinafter specified and/or as shown on the drawings in such a manner as to leave each of the systems of the mechanical trades complete and in satisfactory condition.

.2 Where used, words "Section" and "Division" shall also include other Sub-Contractors engaged on site to perform work to make building and site complete in all respects.

.3 Where used, word "supply" shall mean furnishing to site in location required or directed complete with accessory parts.

.4 Where used, word "install" shall mean secured in place and connected up for operation as noted or directed.

.5 Where used, word "provide" shall mean supply and install as each is described above.

.6 Where used, word "Authorities", shall mean any agency that enforces the applicable laws, ordinances, rules, regulations or code of the place of the work.

.7 Where used, word "work" shall mean all equipment, permits, materials and labour to provide a complete mechanical installation as required and detailed in the Drawings and Specifications.

.8 Where used, word "Consultant" shall mean the project architect.

.9 Where used, words "Drawings" and "Specifications" are referred to; it means the "Contract Documents".

.10 Where used, words "Prime Mechanical Contractor" shall mean the supervisory Mechanical Contractor of all Mechanical Sub-Contractors.

.11 The terms "instructions" or "as instructed" or "where instructed" mean as instructed by the Consultant, including supplementary instruction notices; job site instruction notices; job site instructions by a field representative/ inspector appointed by the Consultant and including all comments made regarding submittal of shop drawings and samples for review.

.12 The term "exposed" means, within the line of sight of any person standing or sitting in the occupied space, unless defined otherwise in the following sections.

.13 The term "concealed" means, not exposed.

.14 The term "listed" means, that the materials or equipment are tested in accordance with applicable standards, and are approved and listed for their intended use by a testing company approved by the Authorities having jurisdiction.

.15 The term "approved", "approvals", etc., means, approved by Authorities having jurisdiction as conforming to the requirements of the Contract Documents.

.16 The term "acceptable" or "acceptance", etc., means, acceptable to the Consultant as conforming to the requirements of the Contract Documents.

.17 The term "submit for review" or "submit notice", etc., means, submit to the Consultant.

.18 The term "subject to review" means, work or materials laid out for review by the Consultant. Obtain instruction from the Consultant before proceeding with the work. Submit further information, shop drawings, samples etc., as specified and/or as may be reasonably requested by the Consultant.

.19 The term "accessible" used alone means, readily accessible by a person using tools as required without cutting or breaking out materials.

.20 The term "noted" means, notes on the drawings, the detail drawings and on the Schedules.

1.5 **DISCREPANCIES & OMISSIONS**

.1 The specifications are to be considered as an integral part of the plans which accompany them; neither the plans nor the specifications shall be used alone. Any item or subject omitted from one, but which is mentioned or reasonably implied in the other, shall be considered as properly and sufficiently specified, and must therefore, be provided. Notify the Consultant in wiring of any discrepancy between the drawings and the Specifications. Misinterpretations of either the plans or the specifications shall not relieve this Division of responsibility.

1.6 **INSPECTION OF PREMISES & SITE**

.1 Visit the site of the building and become thoroughly familiar with all the conditions to be met in carrying out the work covered by these specifications. No extras will be allowed for failure to properly evaluate conditions which affect the scope of the work included in Divisions 21, 22, 23 and 25.

1.7 **INTERPRETATION OF DRAWINGS**

.1 The drawings upon which this contract is based show the arrangements, general design and extent of the piping, ductwork and other systems. These systems are suitably outlined on the drawings with regard to sizes, locations, general arrangement and installation details. The mains and connections thereto are shown more or less in diagram, except where in certain cases, the drawings may include details giving the exact locations and arrangements required. All piping and ductwork shall be concealed unless shown otherwise. The Mechanical Contract Drawings do not intend to show Architectural or Structural details.

.2 Where any parts of the system and/or pieces of equipment are located by dimensions on the drawings, said dimensions shall be checked and verified in the field. Each Division shall make without additional charge or expense to the Owner, any necessary changes, additions or offsets to the runs to accommodate structural conditions. The Consultant shall be notified immediately and his authority secured in writing for such revisions before proceeding with the work.

.3 As the work progresses, and before installing fixtures and other fittings and equipment which may interfere with the work of other trades, each Contractor shall consult with the Consultant and obtain detail drawings or instructions for the exact location of such equipment.

1.8 **RECORD DRAWINGS**

.1 As the project progresses, record, on a set of white prints, all addenda, changes to and deviations from the plans made during the Construction period. Also, record the location of all light fixtures and other electrical equipment and wiring for same.

.2 Make these Progress Record Drawing white prints available to the Consultants for their review at all times during the Construction period.

.3 At the conclusion of the project, transfer all Record Drawing information to a USB.

.4 The Consultant shall provide to the Contractor, a USB containing graphic (electronic) representation of the Drawings. Complete and return the release form "Transfer of Files on Electronic Media" in order to receive and use the electronic files.

.5 Before Substantial Performance of the Contract, comply with the following:

.1 Provide USB containing all updated record Drawing information as specified herein.

1.9 **INTERFERENCE DRAWINGS**

.1 Before shop fabrication begins or undertaking installation work inside the building, prepare an integrated set of mechanical interference sketches, where indicated on the drawings.

.2 These sketches shall be prepared by the Prime Mechanical Contractor with the co-operation of other trades and shall show the location or space allocated for the work of each trade.

.3 Submit two (2) copies of detailed interference sketches, showing structural members, electrical conduits, devices and all Mechanical elements to the Consultant for review and general approval before proceeding with the work.

.4 Copies of these reviewed interference drawings shall be submitted to all trades, the General Contractor, the Architect, and the Consultant, and general approval shall be obtained before the space allotment and installation.

.5 As a minimum, interference drawings shall be made for all areas of mechanical equipment rooms, duct shafts, Corridors and ceiling spaces.

.6 Work that has been installed before review of interference drawings, and has been determine that it is in conflict with the building, shall be removed from the site at no extra cost to the Owner. The work, approved by the Consultant, shall be installed at no extra cost to the Owner.

1.10 **MANUFACTURERS SHOP DRAWINGS & SUBMITTALS**

.1 Before fabrication of any materials and/or equipment, submit shop drawings and data sheets covering all items of equipment listed as requiring shop drawings. Shop drawings to be submitted are listed in each section under SUBMITTALS. These will be reviewed and returned to the Contractor. Materials shall not be ordered until "accepted" review has been given.

.2 The Prime Mechanical Contractor is to consult with the Consultant on the manner in which drawings will be handled. Supply metric information for metric projects.

.3 Equipment requiring electrical wiring by Division 26 will have the electrical wiring diagrams submitted with the shop drawings. Shop drawings will not be reviewed unless wiring diagrams accompany the equipment drawings.

.4 For electronic submissions, one (1) copy is required.

.5 The Prime Mechanical Contractor is to keep track of the shop drawings and the subsequent equipment delivery using a Review Summary Form. This form is to be updated and presented at each job meeting until all the equipment is on the job.

.6 The shop drawings must apply to the equipment under consideration. Advertising literature and comprehensive data sheets are not acceptable.

.7 The shop drawings must contain the following information: job name, equipment tag, actual dimensions of unit and dimensioned location and size of all field connections, model, performance curves, capacity, HP, voltage and all accessories listed in the specifications and/or being provided, and the operating points of the proposed equipment. Room schedules are to be provided for multiple units.

.8 The shop drawings submitted for review must first be carefully checked by the Prime Mechanical Contractor and bear the Contractor's identification review stamp or signature. Drawings will not be considered otherwise.

.9 Shop drawing review is for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Any action shown is subject to the requirements of the contract documents. Contractor is responsible for the dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction; coordination of his or her work with that of all other trades; and the satisfactory performance of his or her work.

.10 Shop drawings will be returned "No Exception Taken", "Revise & Resubmit", "Make Corrections Noted, Resubmission Not Required" or "Rejected, Submit Compliant Product/System".

.1 "No Exception Taken" Drawings shall be considered as conforming with the design concept.

.2 "Make Corrections Noted, Resubmission Not Required" Drawings shall be considered as conforming with the design concept once corrections have been made as noted on the drawings. This notation shall not hold up manufacture. These drawings shall be corrected for final submission with project Maintenance/Operation manuals.

.3 "Revise & Resubmit" Drawings shall be considered as conforming with the design concept once corrections have been made as noted on the drawings. These drawings shall be corrected and resubmitted for final review but such resubmission shall not hold up manufacture.

.4 "Rejected, Submit Compliant Product/System" These drawings are rejected and work shall not proceed on the manufacture of this equipment. The drawings shall be re-drawn or corrected, and resubmitted with corrections as noted on the drawings or a letter attached thereto.

.11 All shop drawings must be submitted promptly.

1.11 MAINTENANCE & MAINTENANCE MANUALS

.1 During the one (1) year guarantee period, commencing after Substantial Completion Letter has been issued by the Consultant's Office, maintain all equipment installed as part of this Division. This is to include lubrication of bearings, cleaning of strainers, etc., except the replacement of air filters and water treatment. This agreement shall be part of the written guarantee. This work shall be carried out in the presence of the owner's representative, and a letter shall be sent to the Consultant stating that this work was carried out. Three (3) maintenance inspections must be carried out by the Prime Mechanical Contractor during this one (1) year period, evenly spaced over the time frame. (after Substantial Completion Letter issued by the Architect). Submit written report to Owner and Consultant after each inspection.

.2 This maintenance shall continue up to the date of instruction of the Owner's designated representatives, at which time each piece of equipment is to be lubricated and checked in the presence of the Owner's representative(s).

.3 Not later than three (3) weeks prior to application for inspection by Consultant for Substantial Performance, submit records and maintenance manuals to Consultant.

.4 Prepare two (2) sets of "letter" sized, hard-cover, three-ring, black, maintenance manuals, containing dimensioned certified prints of each piece of mechanical equipment and Manufacturer's recommended maintenance instructions, air balancing reports, and wiring diagrams. Tabulated at the front of this binder is to be a maintenance schedule for each piece of equipment, and lubricant to be used, and a tabulation of things to be checked at each piece of equipment.

.5 Maintenance Manuals will be requested by the Consultant shortly after the final submission of all shop drawings. Maintenance manuals must be submitted and reviewed before training of the Owner's personnel and before a final inspection will be carried out.

1.12 ELECTRICAL WIRING & WIRING DIAGRAMS

.1 All motors for equipment under this Division will be by this Division. All starters, switches and power wiring will be provided by Division 26, as noted. Where electrical requirements for equipment exceed the provisions described in electrical specifications, this Contractor shall provide labour and material as required to complete the installation. All motors, switches and equipment shall be of Canadian manufacture: Westinghouse Canada, Canadian General Electric, Allen-Bradley, Square 'D', Robins & Meyers, Lincoln, Tamper.

.2 Provide with shop drawings, a comprehensive wiring diagram for all mechanical equipment requiring review. Shop drawings will not be reviewed unless accompanied by the wiring diagrams.

1.13 ACCESS PANELS & DOORS

.1 Supply and install access panels in ceilings, walls, etc., as required and as indicated. Size panels as required and as indicated.

.2 Access panels shall be prime coated steel with hinged, latched door. Latch shall be keyless, i.e. opened with screwdriver only.

.3 Access doors, whose locations are such that they will be visible to public and staff (with the exception of those located within service rooms such as Mechanical, Electrical, Sprinkler, Janitor, Storages and Elevator Machine Room) shall be Mifab CAD Series recessed-type access door, suitable for receiving gypsum wall board, wood panel and/or tile for a flush finish at walls and ceilings. Coordinate access door depth with depth of wall and ceiling finish. Provide fire-rated type access door when access door is located in fire-rated walls.

1.14 **CONCRETE WORK & SUPPORTS**

.1 Installation of concrete bases for all mechanical equipment shall be by the General Division.

.2 Prime Mechanical Contractor shall provide accurate templates for the concrete trade to pour the bases.

.3 For equipment suspended from the building structure, provide all structural members, platforms, brace and hanger rods as required. Method of attachment to be reviewed with the Structural Consultant before proceeding with the installation.

1.15 **FLASHING**

.1 The Prime Mechanical Contractor shall provide flashings for the work of this Division. If not specified, a description is to be supplied for approval.

.2 Generally, all pipes and small ducts or stacks passing through the roof shall be flashed with an 18 gauge steel sleeve soldered watertight and fastened to the roof deck before the roofing is applied with a minimum of 8" (200 mm) overlap along the roof deck and extending 8" (200 mm) up the pipe or duct, sealed with a weather skirt.

.3 Vent stacks may be flashed with patented flashing cones provided with the equipment.

.4 Where large ducts pass through roof, curbs and flashing shall be by the General Division where shown on the roofing plan. If not shown, all curbs, flashings and counter flashing are by this Division.

1.16 **PAINTING**

.1 Mechanical equipment, grilles, fans, shall be shop prime coated unless noted to be finish coated. Where the prime coat or finish coat has been marred, touch up the surface.

.2 Equipment exposed to the exterior weather conditions are to be shop finished with rust-resistant paint or as specified in equipment specification.

.3 Leave all work in a clean, paintable condition.

.4 All exposed structural members required for supporting piping, ductwork and equipment shall be galvanized. Where threaded rods are used, they shall be cadmium plated including washers and nuts.

.5 Paint pipe sleeves one (1) coat primer.

.6 Paint all relief and drain pipes serving Mechanical equipment, flat black.

1.17 **CUTTING & PATCHING**

.1 It is the responsibility of the Prime Mechanical Contractor to install sleeves for piping and ducts, and provide frames for opening for grilles, louvres, fans and similar equipment to be built into the existing building. All structural components must have the location, size and proposed method of cutting approved before proceeding.

.2 Should damage occur to the work of other trades and Divisions, remedial work will be done by the trade who originally installed the work, at the expense of the sub-contractor who caused the damage.

.3 Co-ordinate work with Section 07 85 00 - Firestopping & Smoke Seals.

1.18 **SLEEVES**

.1 Provide pipe sleeves at points where pipes (plumbing, heating, sprinkler, gas, etc.) pass through masonry of minimum 22 gauge thickness galvanized sheet steel with lock seam joints. Where ducts pass through masonry provide suitable 18 gauge galvanized steel sleeves. Size sleeves on insulated piping or ducts to permit insulation to continue through. Where piping or ducts pass through concrete or frame construction, provide 1/8" (3 mm) thick galvanized iron sleeves. On copper pipe provide copper pipe sleeves.

.2 Use cast iron or steel pipe sleeves with annular fin continuously welded at midpoint, through foundation walls and where sleeve extends above finished floor.

.3 Provide 1/8" (3 mm) clearance all around, between sleeve and pipes or between sleeve and insulation and where piping passes below footings, provide minimum clearance of 2" (50 mm) between sleeve and pipe. Backfill up to underside of footing with concrete of same strength as footing.

.4 Terminate sleeves flush with surface of concrete and masonry and 2" (50 mm) above floors. Not applicable to concrete floors on grade.

.5 For pipes passing through roofs, use cast iron sleeves with caulking recess and flashing clamp device. Anchor sleeves in roof construction; caulk between sleeve recess and pipe; fasten roof flashing to clamp device; make watertight durable joint.

.6 Fill voids around pipes.

.1 Where sleeves pass through walls or floors, caulk space between insulation and sleeve or between pipe and sleeve with waterproof, fire-retardant, non-hardening mastic. Seal space at each end of sleeve with waterproof, fire-retardant, non-hardening mastic.

.2 Ensure no contact between copper pipe and ferrous sleeve.

.7 Co-ordinate work with Section 07 85 00 - Firestopping & Smoke Seals.

1.19 **ESCUTCHEONS & PLATES**

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

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

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

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

.5 Secure to pipe or finished surface.

1.20 **TESTING & ADJUSTING**

.1 Test all piping systems for leaks providing gauges, materials and labour as required. Equipment furnished as part of the permanent installation shall not be used for testing purposes. Before testing, remove all equipment which is not designed to withstand the test pressures. All piping is to be tested before covering is applied, and before backfilling or concealing.

.2 Hydrostatic Tests: All pressure pipe is to be tested as described in each Section. Test pressure shall be maintained for the times noted, during which time the pressure test shall remain constant without pumping.

.3 Gravity Piping: All gravity drainage piping shall be given a ball test and a water test, which must be supervised and inspected by the local Plumbing Inspector.

.4 Before final payment, test the operation of each system and all equipment installed, make all necessary adjustments and replacements, and demonstrate to the satisfaction of the Consultant that all equipment is operating as intended and without undue noise and vibration.

.5 All tests must be witnessed by the Owner's Authorized Representative. Failure to do so will result in a re-test.

.6 If system pumps are used during the system flushing, Prime Mechanical Contractor shall supply and install replacement pump seals in each pump, once flushing is complete and tests results accepted.

1.21 **START-UP & INSTRUCTION**

.1 The Prime Mechanical Contractor shall start-up equipment and operate for a minimum of five (5) days. During this time, adjust controls, clean strainers, replace faulty gauges and thermometers, fasten loose equipment and reduce noise.

1.22 **OPERATE & ADJUST SYSTEMS**

.1 Operate all systems to full capacity and verify proper, safe, efficient operation of all parts and each complete system. Oil motors and grease bearings before operating equipment.

.2 When work is complete and systems are in operation, adjust valves, belt drives, controls and thermostats so that there is an even distribution of cooling and heating throughout. Turn over to Owner necessary keys, handles and operating devices for each system.

.3 Test for both heating and cooling days. Refer to Section 23 05 93 - Testing, Adjusting and Balancing.

1.23 **COMPLETION**

.1 Keep the premises in a clean and orderly condition during construction. All waste and unusable materials shall be promptly removed from the site.

.2 Upon completion of this work, go over the entire installation, clean and polish all fixtures and equipment, and remove all surplus materials and rubbish of every description incidental to this work, leaving the installation neat and orderly.

.3 Before final payment is made, the following items must be completed:

.1 Present to the Consultant "Maintenance Manuals" complete with air and water balancing reports, wiring diagrams and certified equipment prints.

.2 Present to the Consultant an as-built record set of drawings and USB.

.3 Instruction of Owner's personnel in the maintenance and operation of all new equipment.

.4 Present to the Consultant Test Certificates and results.

.5 Present to the Consultant Valve Tag Charts.

.6 Spare filters and frames, labelled and located where directed by the Owner.

.7 Present to the Consultant complete controls commissioning report.

.8 Submit water treatment report for heating water systems.

.9 Submit Start-up Reports for all HVAC equipment including, but not limited to:

.1 Rooftop Units

.10 Maintain a set of approved drawings on site available for review by authorities.

.11 Perform the above work in a timely manner so as not to interfere with the progress of the project.

.12 A value of 3% of the total contract price shall be withheld until points .1 to .11 are completed to the satisfaction of the Consultant.

1.24 **PROTECTION**

.1 Protect work from damage. Securely plug or cap open ends of conduits, pipes, ducts or equipment to prevent entry of dirt, dust, debris, water, snow or ice. Cover all items cast into concrete floors/walls such as floor drains, cleanouts, etc., prior to pour, with heavy plastic tape or duct tape. Clean all piping, ducting, conduits and equipment inside and outside before testing.

.2 Material stored on site shall be protected from weather and kept dry and clean at all times. Take care to avoid corrosion of metal parts. Protect all bearings and motors from damage due to moisture and dust. Equipment not yet in operation shall be turned over at least at monthly intervals to prevent bearing deterioration.

1.25 **TEMPORARY OR TRIAL USAGE**

.1 Do not use any permanent Mechanical Systems during construction unless specific written approval is obtained from the Consultant.

.2 Temporary or trial usage of any mechanical device, machinery, apparatus, equipment or materials shall not be construed as evidence of acceptance of same and no claim for damage shall be made for injury to or breaking of any part of such work which may so be used.

.3 Where the Owner permits the use of a system the Prime Mechanical Contractor shall be in charge of and maintain all equipment in accordance with manufacturers instruction at all times the systems are in operation.

.4 The use of permanent systems shall not invalidate the guarantee or warranty.

.5 Prior to final acceptance, return all equipment to as new condition and provide supplier certification of same.

1.26 **LIABILITY**

.1 Each Section and Trade shall:

.1 Assume full responsibility for laying out his work and for any damage caused to other Sections or Owner by improper location or carrying out of same.

.2 Be responsible for prompt installation of work in advance of concrete pouring, ceiling installation or similar work.

.3 Protect finished and unfinished work of this Division and work of other Sections from damage due to work of this Division.

.4 Be responsible for condition of material and equipment supplied. Be responsible for protection and maintenance of work completed until termination and acceptance.

1.27 **DIELECTRIC COUPLINGS**

.1 Provide wherever pipes of dissimilar metals are joined.

.2 Provide insulating unions for pipe sizes 2"Ø (50 mm) and smaller, and flanges for pipe sizes 2-1/2" (65 mm) and larger. Brass adaptors and bronze valves will not be accepted.

.3 Provide an isolating separation wherever piping may touch dissimilar metal studs, joists, concrete, etc.

1.28 **PERMITS & FEES**

.1 Pay all permit and inspection fees in order to complete the work contained in Divisions 21, 22, 23 and 25.

1.29 **RIGGING OF EQUIPMENT**

.1 Provide all rigging, hoisting and handling of equipment as necessary in order to place the equipment in the designated area in the building.

.2 Direct this work by qualified people normally engaged in rigging, hoisting and handling of equipment.

1.30 **RIGHTS RESERVED**

.1 Rights are reserved to furnish any additional detail drawings which, in the judgement of the Consultant, may be necessary to clarify the Work and such drawings shall form a part of the Contract.

1.31 **SUPERINTENDENCE**

.1 Maintain at this 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.

1.32 **CO-ORDINATION**

.1 The Prime Mechanical Contractor is responsible for co-ordinating the mechanical work herein to suit Project Phasing Schedule.

.2 Co-ordinate all Mechanical Work with the work of any other Divisions to avoid conflicts. Be responsible for modifying the work of this Division to accommodate space conflicts.

.3 Failure to co-ordinate will result in installed work being removed and new work put in place without cost to the Owner.

.4 Refer to the Architectural Specification for project phasing plans and description.

1.33 **FIRE STOPPING**

.1 The Prime Mechanical Contractor is responsible for all fire stopping related to the work of Divisions 21, 22, 23 and 25 including, but not limited to, the ductwork, piping and control wiring.

1.34 **PROJECT CO-ORDINATION/PHASING OF THE WORK**

.1 The Prime Mechanical Contractor shall refer to the Architectural Drawings and Specifications for co-ordination requirements and completion dates for various portions of the Project.

1.35 **MOVING, HOISTING & SCAFFOLDING**

.1 The prime mechanical contractor is responsible for moving, hoisting and demurrage for all equipment and materials to be furnished and installed under this Division. Include for the cost of dismantling and reassembling equipment, where required, to the manufacturer's approval.

1.36 **TIME FOR COMPLETION**

.1 Review the general contract requirement for completion dates. Identify at the time of tender any items which may affect the time for completion.

.1 Advise the Consultant if materials and equipment involves longer delivery times than indicated in the schedule.

.2 Monitor and expedite delivery of equipment and materials. If necessary, inspect at source of manufacture.

.3 Be responsible for failure of, or delay in, the delivery of specified equipment.

1.37 **IMPELLER, SHEAVE & BELT CHANGES**

.1 The Prime Mechanical Contractor to carry the costs to supply and install pump impeller, fan sheave and belt changes. See Section 23 05 93 - Testing, Adjusting and Balancing.

1.38 **CO-OPERATION OF TRADES**

.1 The Prime Mechanical Contractor is to co-operate with all other trades on the job so that all equipment can be satisfactorily installed, and so that no delay is caused to any other trade. Any reworking of installed equipment, piping, or ducting to accommodate the installation of other trades Work shall be performed at no extra cost.

1.39 **CHARGES FOR EXTRAS & CREDITS**

.1 Extras and credits for Division 22, 23 and 25 Contractors and Sub-Contractors shall be charged on the following basis:

.1 Materials - trade price[1] plus overhead plus profit as outlined in the General Conditions.

.2 Labour - Journeyman's and foreman's labour at current local union rates plus worker's compensation plus unemployment insurance plus overhead plus profit as outlined in the General Conditions.

.3 Labour hour charges shall be within 10% of the unit prices in the National Labour Calculator.

.2 Credits shall be the same as above, except no overhead and profit.

.3 Disputes shall be settled by arbitration.

.4 All submittals must include a detailed breakdown showing lengths, sizes, quantities of materials, unit labour charges with labour rates, mark ups, overhead and profits with totals. Submittals that do not include a detailed breakdown cannot be reviewed.

1.40 **LOCAL UTILITIES**

.1 The Prime Mechanical Contractor, before tendering, to contact all utilities to determine the local procedures and policies concerning services, and portions of that service which would be supplied or available through the utilities and incur any cost. The Prime Mechanical Contractor to ensure no delays in construction or service connections.

1.41 **EXISTING SERVICES**

.1 Where Work involves breaking into or connecting existing services, carry out Work at times directed by governing authorities, with minimum of disturbance to the premises and its operation.

.2 Before commencing Work, establish location and extent of service lines in area of Work and notify Consultant of finding.

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

.4 Remove abandoned service lines. Cap or otherwise seal lines at cut-off points, in manner approved by authorities having jurisdiction over service.

.5 Record locations of maintained, re-routed and abandoned service lines. The sub-Contractors concerned shall provide this Division with all necessary dimensions required to accurately locate those services.

1 Trade price means the price at which the Contractor or his Sub-Contractor pays for the materials including all discounts.

.6 Where the location of any of these utilities has been shown on the plans, such information is not guaranteed. It is the responsibility of this Division to verify locations and elevations, immediately after they move on the site. If for any reason the information obtained necessitates changes in procedures or design, they must advise the Consultant at once. If this verification of existing conditions is not done at the outset and any problems arise, the responsibility for same is entirely this Contractor's.

.7 Where it is necessary to temporarily shut down equipment or services serving essential areas, this Division shall include premium costs to ensure the Work force is scheduled for "round the clock" operation in order to minimize disruption and equipment downtime.

1.42 **STORAGE & PROTECTION OF MATERIALS**

.1 Proper facilities for storage and protection of material and equipment are to be provided at the job site by this Division.

.2 All pipe to be used on the job to be carefully stacked off the floor with ends capped or suitably plugged to prevent the entry of dirt and debris until such time the piping is being installed. Similarly all openings in pressure vessels, tanks, etc., to be kept closed until ready for use. Any piping not suitably protected to be removed from the site and replaced with new.

.3 Equipment located on site must also be suitably protected to prevent damage from abuse or misuse. Protect all bearings and motors from damage due to moisture and dust. Equipment not yet in operation shall be turned over at least monthly to prevent bearing deterioration. Equipment and/or materials damaged after delivery to site is to be replaced or repaired to the satisfaction of the Consultant.

.4 Make known any hazardous or flammable materials to be used and method of application, before using. This Division shall be responsible for proper storage and all necessary safety requirements in the storage and use of all hazardous and flammable materials used in the execution of their Work.

1.43 **DELIVERY**

.1 Transport and handle the material in conformance with the Manufacturers instructions.

.2 Deliver the materials to the job site in their original packaging. The name and address of the manufacturer must be labelled on the packaging.

.3 Packing Waste Management:

.1 Recover the packaging waste so that it may be reused, recycled or reclaimed by the Manufacturer. This includes, but is not limited to, pallets, packing, and other packing material.

1.44 **FIELD WELDING**

.1 Only persons who have passed welding tests to the satisfaction of the Authorities having jurisdiction and who are certified by them to be qualified welders, shall be permitted to do any welding on this Contract.

1.45 **COLD WEATHER WORK**

.1 Wherever Work is performed in surrounding air temperatures below 40°F (4°C) special approved precautions shall be taken to prevent damage to mortar, concrete or materials. All such materials used at such times shall be heated. Right is reserved to suspend Work at any time should climatic conditions be deemed unsuitable for proper execution of Work.

1.46 **PROVISION FOR FUTURE**

.1 Provide valves and piping as shown or required to extend plumbing and heating systems in future. Valves and piping shall be arranged so extensions can be made without shutting off existing systems.

1.47 **THERMAL EXPANSION AND CONTRACTION OF PIPING:**

.1 The Contractor to be responsible for expansion and contraction of all pipework. Erect all pipe in such a manner that the strain and weight does not come upon pipe connections of apparatus. Provide bends, or swing joints except where corrugated bellows type expansion joints are shown or required.

.2 On steel piping up to 2" (50 mm) size, use stainless steel bellows, screwed, compensator type, 150 lb (1035 Pa) design (similar for brass or copper pipe, except all-bronze construction).

.3 Piping 2-1/2" (65 mm) and larger 150 lb (1035 kPa) flanged, self-equalizing, corrugated packless, stainless steel bellows, tie rods.

.4 Select for expansion between anchor points plus 25% safety factor with 0°F (-18°C) ambient temperature and applicable fluid temperature.

.5 Flexible hose, where called for, shall be Type 'RW'.

.6 In wall fin, all runs over 40'-0" (12000 mm) shall have Flexonics Type 'L' in middle of run.

.7 Pipe anchors and guides shall be fabricated of structural steel channels, angles or plates well secured to the building structure. Cylindrical type guides to be sized for full pipe insulation.

.8 Acceptable Products:

.1 Flexonics
.2 Adsco
.3 United Flexible

1.48 **PLACING IN OPERATION**

.1 Upon completion of the Work and before turning over the job, the Contractor is to make a complete test of the various systems.

.2 Flush and sterilize domestic water mains in accordance with the procedures established by AWWA Specification C601.

.3 Flush all other domestic water piping in accordance with Local and Provincial Codes.

1.49 **PIPE GRADING**

.1 Piping: Heating and chilled water piping is to run level. Domestic water piping is to grade to low points. Branch piping to heating units below the main shall be off the bottom, and off the top to units above.

.2 Steam piping to be graded down in direction of flow 1" in 40'-0" (25 mm in 12,000 mm).

.3 Condensate piping to be graded down in direction of flow 1" in 20'-0" (25 mm in 6,000 mm).

.4 Equipment drain piping to be graded down in the direction of flow 1" in 4'-0" (25 mm in 1,200 mm).

1.50 **EQUIPMENT DRAINS**

.1 Supply and install drain piping from all relief valves, and backflow preventers. Piping to be installed to spill into hub drains or funnel floor drains. Provide traps as required.

1.51 EXCAVATION, TRENCHING, BACKFILLING & BEDDING (INDOORS)

.1 This Division shall do all excavation, trenching, backfilling and bedding in connection with this Work. Refer to the soil reports for details on rock relief, water table and soil material. Excavation is to be based on soil with random pieces up to 12" (300 mm) diameter. Foundations, large concrete pieces, slabs, rock layers and unstable soils that are not shown on the Drawings or soils reports will be treated as a site condition. Blasting is not permitted, except by permission of the Consultant. Rock material is to be broken by a hydraulic ram. All trenching and excavation shall be done in strict accordance with the Occupational Health and Safety Act latest revision thereof.

.2 All excavations shall be protected with fencing, timber sheeting, bracing or shoring as required.

.3 Remove all timber and protective devices before backfilling or when the necessity of protection ceases. Keep excavated areas free of water by providing pumps, hoses, strainer, other appurtenances, power, labour and maintenance as required. All piping and equipment shall be tested, inspected and approved before backfilling.

.4 All piping and equipment shall have adequate bedding. Trenches shall be excavated 6" (150 mm) below the intended grade of the piping. The pipe bedding granular 'A' of which at least 50% will pass a 1/4" (8 mm) sieve and 100% will pass a 1/2" (15 mm) sieve, backfilled by hand from the centre line of the pipe to 6" (150 mm) above up to 18" (450 mm) diameter, and 12" (300 mm) above for larger diameter pipes. Compact in 6" (150 mm) layers by tamping. The subgrade beneath the pipe shall be within .03 ft. (9 mm) of a straight line between joints. Bell holes shall be made at each joint to permit the joint to be properly made. Debris is to be kept out of the piping. No backfill is permitted until the test is witnessed. Bedding shall be compacted to 95% modified Proctor test.

.5 Backfill shall be non-cohesive ballast material of which at least 50% will pass a 1/4" (8 mm) sieve and 100% will pass a 1/2" (15 mm) sieve. The backfill shall be placed in layers not exceeding 12" (300 mm) loose measurement.

.6 Compaction of the backfilled material shall be to 95% Proctor density. Where Proctor tests are called for, these will be paid for out of the allowance in Division 2. Proctor tests as a result of re-testing shall be paid for by this Division. Protect the pipe during backfilling and compaction so that damage or a movement of the pipe is avoided. The pipe must be protected with a minimum of 20" (500 mm) of compacted cover before backfill by mechanical means.

.7 The backfill shall be compacted by mechanical hand compaction equipment to achieve the specified density. Water may be used as an aid to compaction, but not as the sole means of compaction. Backfilling shall not be done in freezing weather, except by permission of the Consultant.

.8 Carefully backfill both sides of piping and equipment simultaneously to prevent movement or displacement. All excess materials shall be removed from the premises as directed and legally disposed of by this Division. In no case shall piping be installed over backfill. Special supports, bridges etc. are to be provided.

1.52 DRAIN VALVES

.1 Supply and install 3/4" (20 mm) ball valve and hose end at main low points to drain each water type system, at pumps, coils, strainers and at each piece of equipment.

1.53 ELECTRICAL MOTORS

.1 Unless otherwise specified motors shall be squirrel cage induction type with standard drip proof enclosure.

.2 Motors unless otherwise specified shall meet all requirements of EEMAC and CSA standards for electrical motors and where possible shall be of Canadian Manufacturer.

.3 Generally, all motors shall have starting current-torque characteristics in accordance with EEMAC, Design 8 unless otherwise specified or unless load characteristics require a higher starting torque. Each motor shall have sufficient starting torque to start the driven equipment and to accelerate it to full speed within 10 seconds. Motor horsepower's shown are minimums. Submit starting times for review.

.4 All motors shall be nominal 1750 rpm, unless otherwise specified.

.5 Unless noted otherwise, all motors shall have Class 8 insulation and shall be designed for continuous operation at 40 deg. C. (deg. F.) Motors controlled from variable speed drives shall have Class H windings and Class F insulation.

.6 Motor connection boxes shall be located on side of motor most easily accessible for maintenance and remote from belts, gears or driven equipment. If boxes are factory installed on wrong side of motor they shall be relocated.

.7 Each multi-speed motor and associated switching device shall 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. Multi-speed motors shall be single winding variable torque for 50% motor speed reduction and double winding, two speed for all other speed reductions.

.8 Motors shall have the following electrical characteristics:

.1 For 0.375 kW (1/2 HP) and larger 600 Volt, 3 phase, 60 cycle

.2 For 0.25 kW (1/3 HP) and smaller 120 Volt, 1 phase, 60 cycle

.9 Single phase motors 0.25 kW (1/3 HP) and smaller shall be capacitor start.

.10 All motors 22.4 kW (30 HP) and larger shall have heat detector protection embedded in the windings for connection into the motor control circuit. Protection shall be Siemens thermistor.

.11 Motor enclosures shall be as follows:

.1 If protected from the weather and entraining moisture, use open drip-proof, service factor 1.15.

.2 Motors located in air streams shall be selected to operate satisfactorily at maximum temperature and moisture levels of surrounding air.

.3 For all other locations, use totally-enclosed fan-cooled, service factor 1.0.

.4 Use explosion proof motors where scheduled.

.12 High efficiency motors shall be T frame, A.C., three phase, meet or exceed the Ontario Hydro Enermark Motor Efficiency Levels as tested to either CSA 390M or IEEE-1128, meet or exceed ASHRAE Standard 90.1 (latest edition) motor high efficiency level and be approved under the Canadian Electrical Safety Code:

.1 High efficiency motors shall be used on all fans and pumps having motors 0.75 kW (1 HP) or larger.

.13 Each electric motor shall be complete with a lamacoid nameplate securely fastened in a conspicuous place on the motor. The nameplate shall be a minimum of 2 mm (3/32") thick laminated phenolic plastic 100 mm (4") long x 50 mm (2") wide with black face and white centre, 5 mm (7/32") high letters shall be engraved through to the white lamination with the following:

.1 Motor No.

.2 Mechanical Equipment Driven

.3 Circuit No.

.4 Panel No.

.5 Panel Location

.14 Electric motors shall be manufactured by Canadian General Electric, Westinghouse, Lincoln, U.S. Motors, Baldor or Weg.

1.54 **SEISMIC BRACING (MECHANICAL SYSTEMS)**

.1 All mechanical systems shall be installed to comply with the requirements of the Ontario Building Code, Paragraph 4.1.8.18 and Table 4.1.8.18.

.2 Provide seismic bracing for all mechanical systems to meet the requirements of Table 4.1.8.18.

.3 For the purposes of calculating seismic forces, and as per sentence 4.1.8.5.(2), building seismic category is to be considered as SC3.

.4 Provide flexible pipe and duct connections at the inlet and outlet connections for mechanical equipment as required.

.5 For all floor mounted equipment, Provide lateral seismic resistance.

.6 Divisions 22 and 23 shall retain a Professional Structural Engineer and/or a qualified Company specializing in seismic constraints to design, supply and install seismic bracing as required. Engineer/Company shall review the installation of seismic support for all mechanical equipment and provide documentation (Drawings, calculations and details) to the Consultant which states that the installation complies with the requirements of Ontario Building Code 4.1.8.18. Reports to be issued by a Structural Engineer licensed in Ontario.

.7 Prime Mechanical Contractor to provide Supplier Shop Drawings of all mechanical equipment and co-ordinate fully with seismic restraint installation.

.8 Acceptable Products:

.1 Vibro Acoustics

.2 E.H. Price

.3 Kinetic Noise Control

Part 2 - Products

2.1 **MATERIALS & EQUIPMENT - APPROVED EQUALS, BASIS OF DESIGN, BASE BID, APPROVED ALTERNATES, UNSOLICITED ALTERNATES.**

.1 Provide material and equipment in accordance with Section 01 60 00 - Product Requirements.

.2 Material and equipment to be CSA certified. Where CSA certified material and equipment is are not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.

.3 Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Inspection Department.

.4 Factory assemble control panels and component assemblies.

.5 The Specification indicates Approved Equal manufacturers (or Approved Manufacturers) for various Products, materials and systems which make up the electrical Work. The Contract Price shall be based on any of the "Approved Equals".

.6 The Specifications may also indicate Base Bid and Approved Alternate manufacturers for various Products, materials and systems. For such cases, the Contract Price **MUST** be based on the "Base Bid" manufacturer/system. The net dollar addition or deduction to/from the Contract Price for each "Approved Alternate" shall be indicated on a separate form or letter attached to the Bid Form for consideration by the Consultant.

.7 Basis of Design:

.1 The Specifications may also indicate a Basis of Design manufacturer/model or system. For such cases, the specification is based on the product, equipment and/or system of the Manufacturer so named in the Specification.

.2 Products, equipment and/or systems proposed by the Approved Equal manufacturers and Suppliers named in the Specifications shall be acceptable, provided all functions and operations are provided as specified.

.3 Other products and/or systems shall also be accepted provided they are; equal in aesthetic (i.e. share the same geometric form), are of the same material, are manufactured to the same level of quality, provide equal or better performance and are offered with the same accessories and finish options as specified for the Basis of Design product/system.

.4 The Owner and Consultant reserve the right to request alternatives for any product/system submittals that do not share the same qualities, as noted above, as those of the Basis of Design product/system listed, at no additional cost to the Owner.

.8 Unsolicited Alternate manufacturer/systems which do not appear in the Contract Documents may also be proposed, provided the following conditions are met:

.1 They appear separately in an accompanying letter attached to the Bid Form.

.2 The net dollar deduction from the Contract Price if the alternate is accepted. This value shall reflect all costs associated with the incorporation of the alternate into the Work, including any required changes in Architectural, Structural, Mechanical and other Electrical Sections as well as the Consultants costs of revising their designs and documents to suit.

.9 The Owner reserves the right to accept or reject any or all "Approved Alternates" or "Unsolicited Alternate" manufacturers/systems.

Part 3 - Execution

3.1 **PAINTING REPAIRS & RESTORATION**

.1 Prime and touch up marred finished paintwork to match original.

.2 Restore to new condition, finishes which have been damaged.

3.2 **CLEANING**

.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.3 **PROTECTION**

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION

Part 1 - General

1.1 SECTION INCLUDES

.1 Pipe, pipe fittings, valves, and connections for piping systems sanitary sewer, domestic water, storm water, and natural gas.

1.2 RELATED SECTIONS

.1 Section 23 05 48 - Vibration Isolation.

.2 Section 23 05 53 - Mechanical Identification.

.3 Section 23 07 19 - Piping Insulation.

.4 Division 26: Electrical characteristics and wiring connections.

1.3 REFERENCES

.1 Unless noted otherwise, comply with latest edition, including Amendments, of the following Codes and Standards.

.2 Ontario Building Code (OBC)

.3 ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

.4 ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

.5 ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.

.6 ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.

.7 ASME B16.29 - Wrought Copper & Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.

.8 ASME B16.50 - Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings.

.9 ASME B31.2 - Fuel Gas Piping.

.10 ASME B31.9 - Building Services Piping.

.11 ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

.12 ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.

.13 ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

.14 ASTM B32) - Standard Specification for Solder Metal.

.15 ASTM B75/B75M - Standard Specification for Seamless Copper Tube.

.16 ASTM B88M - Standard Specification for Seamless Copper Water Tube.

.17 ASTM B88 - Standard Specification for Seamless Copper Water Tube.

.18 ASTM B306 - Standard Specification for Copper Drainage Tube (DWV).

.19 ASTM B837 - Standard Specification for Seamless Copper Tube for Natural Gas and Liquified Petroleum (LP) Gas Fuel Distribution Systems.

.20 ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

.21 ASTM - D1784 Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

.22 ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.

.23 ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).

.24 ASTM D2464 - Standard Specification for Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

.25 ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.

.26 ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.

.27 ASTM F442 - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR).

.28 AWWA C651 - Disinfecting Water Mains.

.29 CAN/CSA-B70 - Cast Iron Soil Pipe, Fittings, and Means of Joining.

.30 CAN/CSA-B1800 - Thermoplastic Nonpressure Piping Compendium.

.31 CAN/CSA-B137 - Thermoplastic Pressure Piping Compendium.

.32 CAN/CSA-B602 - Mechanical Couplings for Drain, Waste and Vent Pipe and Sewer Pipe.

.33 CAN/ULC-S102.2 - Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings and Miscellaneous Materials and Assemblies.

.34 ANSI Z21.22-2015/CSA 4.4 - Relief Valves for Hot Water Supply Systems.

.35 NSF 61 - Drinking Water System Components - Health Effects.

1.4 **CLOSEOUT SUBMITTALS**

.1 Record Documentation: Record actual locations of valves.

1.5 **QUALITY ASSURANCE**

.1 Products of This Section: Manufactured to ISO 9000 certification requirements.

.2 Perform Work to local Municipality standards. Maintain one (1) copy of document on site.

.3 Valves: Manufacturer's name and pressure rating marked on valve body.

.4 Welding Materials and Procedures: Conform to ASME BPVC-Section IX applicable provincial labour regulations.

1.6 **REGULATORY REQUIREMENTS**

.1 Perform Work to applicable plumbing code.

.2 Conform to applicable code for installation of backflow prevention devices.

.3 Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.7 **DELIVERY, STORAGE, & PROTECTION**

.1 Accept valves on site in shipping containers with labelling in place. Inspect for damage.

.2 Provide temporary protective coating on cast iron and steel valves.

.3 Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

.4 Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.8 **SITE CONDITIONS**

.1 Ambient Conditions: Do not install underground piping when bedding is wet or frozen.

Part 2 - Products

2.1 SANITARY SEWER PIPING, BURIED, INSIDE BUILDING

.1 Cast Iron Pipe: CAN/CSA-B70.

.1 Fittings: Cast iron, FSWW-P-401, hubless cast iron pipe fittings ASTM A74, hub and spigot.

.2 Joints: ASTM C564, rubber or compression gaskets.

.2 ABS Pipe: CAN/CSA-B1800, Type DWV.

.1 Fittings: ASTM D2465, ABS threaded type, Schedule 80 ASTM D2468, ABS socket type, Schedule 40.

.2 Joints: ASTM D2235, solvent cement and primer for fittings; ASTM D3138, solvent cement and primer for transition joints.

.3 PVC Pipe: CAN/CSA-B182.1, SDR 35 pipe.

.1 Fittings: CAN/CSA-B182.2, ASTM D2729, socket type, SDR 35

.2 Joints: ASTM D2564 solvent cement and primer.

.4 PVC PIPE: CAN/CSA-B182.2, SDR 35 pipe.

.1 Fittings: CAN/CSA-B182.2, ASTM D3034, ASTM F1336

.2 Joints: Gasketed Joints.

.5 PVC Pipe: CAN/CSA-B181.2, Schedule 40 pipe.

.1 Fittings: CAN/CSA-B181.2, Schedule 40.

.2 Joints: ASTM D2564 solvent cement and primer.

.6 Copper Tube: ASTM B306, DWV.

.1 Fittings: ASME B16.23, cast bronze ASME B16.29, wrought copper.
Joints: ASTM B32, soldered, AWS A5.8/A5.8M brazed.

2.2 SANITARY SEWER PIPING, ABOVE GROUND

.1 Cast Iron Pipe: CAN/CSA-B70.

.1 Fittings: Hubless Cast Iron Pipe Fittings: FSWW-P-401.

.2 Joints: ASTM C564, rubber or compression gaskets.

.2 Copper Tube: ASTM B306, DWV.

.1 Fittings: ASME B16.23 cast bronze ASME B16.29 wrought copper.

.2 Joints: Joints: ASTM B32, soldered AWS A5.8/A5.8M brazed.

.3 PVC DWV Pipe:

.1 PVC DWV for Low-Buildings: Equal to IPEX System 15 DWV pipe and fittings certified to CAN/CSA-B181.2, with a Flame Spread Rating not more than 25 in accordance with CAN/ULC-S102.2, with solvent welded joints or MJ Grey mechanical joint couplings.

.2 PVC DWV for High Buildings and inside plenums: Equal to IPEX System XFR DWV pipe and fittings certified to CAN/CSA-B181.2, with a Flame Spread Rating not more than 25 and Smoke Developed Classification not more than 50 in accordance with CAN/ULC-S102.2, with solvent welded joints or MJ Grey mechanical joint couplings.

.3 PVC DWV solvent welded joints for IPEX System 15 and System XFR:

.1 For sizes 1-1/2" through to 6" (40 mm through to 150 mm): IPEX System 15/XFR One-Step Cement (Primer optional).

.2 For sizes 8" through to 12" (200 mm through to 300 mm): IPEX System 15/XFR Two-Step Cement with Primer required.

.3 For sizes 14" (350 mm) and larger: IPEX Xirtec19 Cement with Primer required.

.4 PVC DWV mechanical joints for IPEX System 15 and System XFR:

.1 For sizes 1-1/2" through to 18" (40 mm through to 450 mm): IPEX MJ Grey mechanical joint couplings certified to CAN/CSA-B602, with a Flame Spread Rating not more than 25 and Smoke Developed Classification not more than 50 in accordance with CAN/ULC-S102.2.

2.3 BRANCH SUPPLY PIPING (25 MM AND LESS)

.1 Copper Tubing: ASTM B88M (ASTM B88)

.1 Fittings: ASME B16.18 cast copper alloy, ASME B16.22 wrought copper and bronze, ASME B16.26 cast copper alloy ASME B16.50 wrought copper.

.2 Joints: ASTM B32 soldered, AWS A5.8/A5.8M brazed.

.3 Note: General Contractor is responsible for providing fire stopping material required at all pipe penetrations though rated (FRR) fire separations.

2.4 NATURAL GAS PIPING, INSIDE BUILDING/EXPOSED OUTDOORS

.1 Steel Pipe: ASTM A53/A53M, Schedule 40, Grade B black steel pipe, electric resistance welded.

.1 Fittings: ASME B16.3, malleable iron threaded fittings (for pipe diameters up to 50 mm (2 inches)) or ASME B16.9, wrought steel butt welding fittings.

.2 Joints: Steel flanges and fittings to ASME B16.5; unions to ASME B16.9.

2.5 STORM WATER PIPING, ABOVE GROUND

.1 Cast Iron Pipe: CAN/CSA-B70.

.1 Fittings: Hubless Cast Iron Pipe Fittings: FSWW-P-401.

.2 Joints: ASTM C564, rubber or compression gaskets.

.2 Copper Tube: ASTM B306, DWV.

.1 Fittings: ASME B16.23, cast bronze ASME B16.29, wrought copper.

.2 Joints: Joints: ASTM B32, soldered AWS A5.8/A5.8M brazed.

.3 PVC Pipe: CAN/CSA-B1800, and CAN/ULC-S102.2 flame spread rating 15.

.1 Fittings: CAN/CSA-B1800, socket type, and CAN/ULC-S102.2 flame spread rating 15.

.2 Joints: ASTM D2564, solvent cement and primer.

2.6 FLANGES, UNIONS, & COUPLINGS

.1 Ferrous Pipe Size 75 mm (3 inches) and Under: Class 150 malleable iron threaded unions.

.2 Copper Tube and Pipe Size 75 mm (3 inches) and Under: Class 150 bronze unions with soldered joints.

.3 Ferrous Pipe Size Over 25 mm (1 inch): Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.

.4 Copper Tube and Pipe Size Over 25 mm (1 inch): Class 150 slip-on bronze flanges; preformed neoprene gaskets.

.5 Grooved and Shouldered Pipe End Couplings:

.1 Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.

.2 Sealing gasket: C-shape composition sealing gasket.

.6 Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.7 PIPE HANGERS & SUPPORTS

.1 Plumbing Piping - Drain, Waste, and Vent:

.1 Conform to ASME B31.9, ASTM F708.

.2 Hangers for Pipe Sizes 13 to 38 mm (1/2 to 1-1/2 inch): Malleable iron, Carbon steel, adjustable swivel, split ring.

.3 Hangers for Pipe Sizes 50 mm (2 inches) and Over: Carbon steel, adjustable, clevis.

.4 Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

.5 Wall Support for Pipe Sizes to 75 mm (3 inches): Cast iron hook.

.6 Wall Support for Pipe Sizes 100 mm (4 inches) and Over: Welded steel bracket and wrought steel clamp.

.7 Vertical Support: Steel riser clamp.

.8 Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

.9 Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

.2 Plumbing Piping - Water:

.1 Conform to ASME B31.9, ASTM F708.

.2 Hangers for Pipe Sizes 13 to 38 mm (1/2 to 1-1/2 inch): Carbon steel Malleable iron, adjustable swivel, split ring.

.3 Hangers for Cold Pipe Sizes 50 mm (2 inches) and Over: Carbon steel, adjustable, clevis.

.4 Hangers for Hot Pipe Sizes 50 to 100 mm (2 to 4 inches): Carbon steel, adjustable, clevis.

.5 Multiple or Trapeze Hangers: Steel channels with welded supports or spacers and hanger rods.

.6 Multiple or Trapeze Hangers for Hot Pipe Sizes 150 mm (6 inches) and Over: Steel channels with welded supports or spacers and hanger rods, cast iron roll.

.7 Wall Support for Pipe Sizes to 75 mm (3 inches): Cast iron hook.

.8 Wall Support for Pipe Sizes 100 mm (4 inches) and Over: Welded steel bracket and wrought steel clamp.

.9 Vertical Support: Steel riser clamp.

.10 Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

.11 Floor Support for Hot Pipe Sizes to 100 mm (4 inches): Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.

.12 Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

.13 Adjust pipe hanger spacing to accommodate CPVC piping.

2.8 GATE VALVES

.1 Gate Valves Up To and Including 75 mm (3 inches): Class 125 or Class 150, bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, solder or threaded ends. Acceptable products are:

.1 Crane
.2 Newman-Hattersley
.3 Grinnell
.4 Milwaukee
.5 Kitz
.6 Bray

.2 Gate Valves 50 mm (2 inches) and Larger: Class 125, iron body, bronze trim, outside screw and yoke, handwheel, solid wedge disc, flanged ends. Provide chain-wheel operators for valves 150 mm (6 inches) and larger mounted over 2400 mm (8 ft.) above floor. Acceptable products are:

.1 Crane
.2 Newman-Hattersley
.3 Grinnell
.4 Milwaukee
.5 Kitz
.6 Bray

2.9 **GLOBE VALVES**

.1 Globe Valves Up To and Including 75 mm (3 inches): Class 125, bronze body, bronze trim, handwheel, bronze teflon disc, solder threaded ends. Acceptable products are:

.1 Crane
.2 Newman-Hattersley
.3 Grinnell
.4 Milwaukee
.5 Kitz
.6 Bray

.2 Globe Valves 50 mm (2 inches) and Larger: Class 125, iron body, bronze trim, handwheel, outside screw and yoke, renewable bronze plug-type disc, renewable seat, flanged ends. Provide chain-wheel operators for valves 150 mm (6 inches) and larger mounted over 2400 mm (8 ft.) above floor. Acceptable products are:

.1 Crane
.2 Newman-Hattersley
.3 Grinnell
.4 Milwaukee
.5 Kitz
.6 Bray

2.10 **BALL VALVES**

.1 Ball Valves 100 mm (4 inches) and Smaller: Class 150, 2760 kPa (400 psi) CWP, bronze, two-piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder or threaded ends with union. Acceptable products are:

.1 Crane
.2 Newman-Hattersley
.3 Grinnell
.4 Milwaukee
.5 Kitz
.6 Bray

2.11 **PLUG VALVES**

.1 Plug Valves 65 mm (2-1/2 inches) and Larger: 1200 kPa (175 psi) CWP, cast iron body and plug, pressure lubricated, teflon or Buna N packing, flanged or grooved ends. Provide lever operator with set screw. Acceptable products are:

.1 Crane
.2 Newman-Hattersley
.3 Grinnell
.4 Milwaukee
.5 Kitz
.6 Bray

2.12 **BUTTERFLY VALVES**

.1 Butterfly Valves 38 mm (1-1/2 inches) and Larger: 1380 kPa (200 psi) CWP, cast or ductile iron body, nickel-plated ductile iron, aluminum bronze, elastomer coated ductile iron disc, resilient replaceable EPDM, Buna N, EPT seat, wafer, lug, grooved ends, extended neck, 10 position lever handle or infinite position lever handle with memory stop. Provide gear operators for valves 150 mm (6 inches) and larger, and chain-wheel operators for valves mounted over 2.4 m (8 ft.) above floor. Acceptable products are:

.1 Crane
.2 Newman-Hattersley
.3 Grinnell
.4 Milwaukee
.5 Kitz
.6 Bray

2.13 **SWING CHECK VALVES**

.1 Swing Check Valves Up To and Including 75 mm (3 inches): Class 125, bronze body and cap, bronze swing disc with rubber seat, solder or threaded ends. Acceptable products are:

.1 Crane
.2 Newman-Hattersley
.3 Grinnell
.4 Milwaukee
.5 Kitz
.6 Bray

.2 Swing Check Valves 50 mm (2 inches) and Larger: Class 125, iron body, bronze swing disc, renewable disc seal and seat, flanged or grooved ends. Acceptable products are:

.1 Crane
.2 Newman-Hattersley
.3 Grinnell
.4 Milwaukee
.5 Kitz
.6 Bray

2.14 **SPRING LOADED CHECK VALVES**

.1 Spring Loaded Check Valves: Class 125, Class 150, iron body, bronze trim, stainless steel springs, bronze disc, Buna N seals, wafer style ends. Acceptable products are:

.1 Crane

.2 Newman-Hattersley
.3 Grinnell
.4 Milwaukee
.5 Kitz
.6 Bray

2.15 **WATER PRESSURE REDUCING VALVES**

.1 Water Pressure Reducing Valves Up to 50 mm (2 inches): bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded and single union or double union ends. Acceptable products are:

.1 Crane
.2 Newman-Hattersley
.3 Grinnell
.4 Milwaukee
.5 Kitz
.6 Bray

.2 Water Pressure Reducing Valves Over 50 mm (2 inches): cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged. Acceptable products are:

.1 Crane
.2 Newman-Hattersley
.3 Grinnell
.4 Milwaukee
.5 Kitz
.6 Bray

2.16 **RELIEF VALVES**

.1 Pressure Relief Valves: ANSI Z21.22/CSA 4.4, certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated. Acceptable products are:

.1 Crane
.2 Newman-Hattersley
.3 Grinnell
.4 Milwaukee
.5 Kitz
.6 Bray

.2 Temperature and Pressure Relief Valves: ANSI Z21.22/CSA 4.4 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 98.9 degrees C (210 degrees F), capacity, certified and labelled. Acceptable products are:

.1 Crane
.2 Newman-Hattersley
.3 Grinnell
.4 Milwaukee
.5 Kitz
.6 Bray

2.17 **STRAINERS**

.1 Strainers 50 mm (2 inch) and Under: Class 150 threaded brass body for 1200 kPa (175 psi) or 2070 kPa (300 psi) CWP, Y pattern with 0.8 mm (1/32 inch) stainless steel perforated screen.

.2 Strainers 38 mm (1-1/2 inch) to 100 mm (4 inch): Class 125, flanged iron body, Y pattern with 1.6 mm (1/16 inch) stainless steel perforated screen.

.3 Strainers 125 mm (5 inch) and Larger: Class 125, flanged iron body, basket pattern with 3.2 mm (1/8 inch) stainless steel perforated screen.

2.18 **FIRE STOP SYSTEMS**

.1 General Purpose Fire Stopping Sealant: Water based, nonslumping, premixed sealant with intumescent properties, rated for 3 hours to ASTM E814 and UL 1479.

.2 General Purpose Vibration Resistant Fire Stopping Sealant: Silicone based, nonslumping, premixed sealant with intumescent properties, vibration and moisture resistant, rated for three (3) hours per ASTM E814 and UL 1479.

.3 DWV Plastic Pipe Systems Fire Stopping Sealant: Silicone based, premixed sealant with intumescent properties, vibration and moisture resistant, rated for three (3) hours per ASTM E814 and UL 1479 with metal collars.

2.19 **DOUBLE CHECK VALVE ASSEMBLY BACKFLOW PREVENTER**

.1 Shall consist of two independently acting swing check valves located in a ductile iron body that has an internal and external fusion epoxy coating. The assembly shall be complete with inlet and outlet full ported (NRS or OS&Y) resilient seated shut off valves with four resilient seated test cocks. The main body shall be two piece design, joined with a grooved coupling. Device shall be certified in compliance with CAN/CSA B64.5.

.2 Acceptable Products:

.1 Zurn Wilkins 950XL

.2 Watts Series 709

.3 Febco Model 850

2.20 **BACKFLOW PREVENTER - DESIGNATED BFP**

.1 Supply and install backflow preventer where shown on the Drawings and where required by Code on potable water connections to equipment. Supply and install for each backflow assembly, a by-pass assembly complete with isolation valve and pipe, size equal to assembly.

.2 Valve shall be complete with bronze body, check seals, stainless steel trim, durable tight-seating rubber discs and bronze valve test cocks.

.3 Severe hazard connections such as trap seal primer shall have an air gap "AG".

.4 Minor hazard connections such as hose bibbs and flexible shower heads, shall have atmosphere vacuum breaker "AVB".

.5 Moderate hazard connections such as vending machines and ice making machines, shall have pressure vacuum breaker "PVB".

.6 Acceptable Products:

.1 Watts

.2 Apollo

.3 Zurn Williams

2.21 **TRAP SEAL PRIMING TUBE, ABOVE GROUND AND BURIED**

.1 Thermostatic pipe "PEX": flexible tubing may be used in lieu of copper piping provided that the Flame Spread Rating is not greater than 25 and a Smoke Developed Classification is not greater that 50, when tested in accordance with CAN4 S102.2 test methods.

2.22 **NATURAL GAS VALVES**

.1 Isolation Valves:

.1 Ball Type: CGA certified, minimum 3100 kPa (450 psi) WOG rated, 1/4 turn, full port non-lubricated brass ball valves, each complete with a Teflon PTFE seat, chrome plated solid ball, removable lever handle, and screwed ends. Acceptable products are:

.1 Neo Valves Inc. #425;

.2 Kitz Corp. Code 58;

.3 Toyo Valve Co. Fig. 5044A;

.4 FlowTek S85.

.2 Pressure Reducing Valves (PRV):

.1 Vented type: spring-loaded self-operated design, tight closing, selected for the facility gas pressure and piping pressure loss, and connected equipment load at full firing rate plus 20% spare, and complete with:

.1 035 kPa (150 psi) rated cast iron body finished with corrosive resistant epoxy enamel;

.2 aluminum diaphragm and spring case with Nitrile diaphragm, disc, and body O-ring;

.3 throttling type, high flow rate, tight shut-off relief valve selected to protect equipment downstream of the regulator in coordination with regulator capacity.

.2 Acceptable manufacturers are:

.1 Maxitrol Co.;

.2 Fisher Controls;

.3 Leslie Controls Inc.;

.4 Lakeside Process Controls.

Part 3 - Execution

3.1 **EXAMINATION**

.1 Verify existing conditions before starting work.

.2 Verify that excavations are to required grade, dry, and not over-excavated.

3.2 **PREPARATION**

.1 Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

.2 Remove scale and dirt, on inside and outside, before assembly.

.3 Prepare piping connections to equipment with flanges or unions.

3.3 **INSTALLATION**

.1 Install to manufacturer's written instructions.

.2 Provide non-conducting dielectric connections wherever jointing dissimilar metals.

.3 Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

.4 Install piping to maintain headroom, conserve space, and not interfere with use of space.

.5 Group piping whenever practical at common elevations.

.6 Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 23 05 16.

.7 Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 23 07 19.

.8 Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with General Division.

.9 Install vent piping penetrating roofed areas to maintain integrity of roof assembly.

.10 Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

.11 Provide support for utility meters to requirements of utility companies.

.12 Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.

.13 Excavate to Section 31 00 00 - Earthwork for work of this Section.

.14 Backfill to Section 31 00 00 - Earthwork for work of this Section.

.15 Install bell and spigot pipe with bell end upstream.

.16 Install valves with stems upright or horizontal, not inverted.

.17 Install water piping to ASME B31.9.

.18 Sleeve pipes passing through partitions, walls and floors.

.19 Inserts:

.1 Provide inserts for placement in concrete formwork.

.2 Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

.3 Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 100 mm (4 inches).

.4 Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

.5 Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of, above, or recessed into and grouted flush with slab.

.20 Pipe Hangers and Supports:

.1 Install to ASME B31.9, ASTM F708.

.2 Support horizontal piping as scheduled.

.3 Install hangers to provide minimum 15 mm (1/2 inch) space between finished covering and adjacent work.

.4 Place hangers within 300 mm (12 inches) of each horizontal elbow.

.5 Use hangers with 40 mm (1-1/2 inch) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

.6 Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.

.7 Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

.8 Provide copper plated hangers and supports for copper piping sheet lead packing between hanger or support and piping.

.9 Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

.10 Provide hangers adjacent to motor driven equipment with vibration isolation; refer to Section 23 05 48.

.11 Support cast iron drainage piping at every joint.

.21 DO NOT use PVC type piping when pipe is complete with pipe insulation and electrical heat tracing.

.22 Natural Gas Piping:

.1 Provide all required natural gas distribution piping and connect gas fired or operated equipment, and provide all required vent piping to atmosphere, including vent piping from pressure regulators. Do all piping work in accordance with requirements of CAN/CSA-B149.1, Natural Gas and Propane Installation Code, as amended by local Gas Codes.

.2 Ensure that supports for roof mounted piping are sized (height) to accommodate the roof slope and the required piping slope, and to permit the installation of low point dirt pockets.

.3 Provide full pipe diameter 150 mm (6") long drip pockets at the bottom of all vertical risers, at all piping low points, and wherever else shown and/or required.

.4 Identify all natural gas piping with two coats of safety yellow enamel applied over primer, and SMS Ltd. or equal coil type vinyl identification makers with arrows.

.23 Natural Gas Valves:

.1 Isolation Valves:

.1 Provide CSA approved ball type or lubricated plug type shut-off valves to isolate equipment, and wherever else shown.

.2 Ensure that valves are located for easy accessibility and maintenance.

.2 Pressure Regulating Valves:

.1 Provide pressure regulators in gas distribution piping where indicated and/or required.

.2 Install regulating stations in accordance with requirements of CAN/CSA-B149.1.

.3 Indicate operating set-points, relief settings and vent arrangements for each regulating station on as-built record drawings.

3.4 **APPLICATION**

.1 Use grooved mechanical couplings and fasteners only in accessible locations.

.2 Install unions downstream of valves and at equipment or apparatus connections.

.3 Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

.4 Install valves for shut-off and to isolate equipment, part of systems, or vertical risers.

.5 Install valves for throttling, bypass, or manual flow control services.

.6 Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.

.7 Provide spring loaded check valves on discharge of water pumps.

.8 Provide plug valves in natural gas systems for shut-off service.

.9 Provide flow controls in water recirculating systems where indicated.

3.5 **DISINFECTION OF NEW DOMESTIC WATER PIPING SYSTEM**

.1 Disinfect water distribution system.

.2 Prior to starting work, verify system is complete, flushed and clean.

.3 Ensure Ph of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

.4 Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.

.5 Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15% of outlets.

.6 Maintain disinfectant in system for twenty-four (24) hours.

.7 If final disinfectant residual tests less than 25 mg/L, repeat treatment.

.8 Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

.9 Take samples no sooner than twenty-four (24) hours after flushing, from 10%, 5%, 2% of outlets and from water entry, and analyze to AWWA C651.

.10 Submit final report.

3.6 **STORM WATER PIPING, OUTSIDE BUILDING**

.1 Bedding:

.1 Excavate pipe trench for work of this section. Hand trim excavation for accurate placement of pipe to elevations indicated.

.2 Place bedding material at trench bottom, level materials in continuous layer not exceeding 150 mm (6 inches) 200 mm (8 inches) compacted depth.

.3 Maintain optimum moisture content of bedding material to attain required compaction density.

.2 Installation - Pipe:

.1 Install pipe, fittings, and accessories in accordance with and manufacturer's written instructions ASTM C12 ASTM D2321. Seal joints watertight.

.2 Lay pipe to slope gradients noted on drawings with maximum variation from true slope of 3 mm in 3 m (1/8 inch in 10 ft).

.3 Install aggregate at sides and over top of pipe. Provide top cover to minimum compacted thickness of 300 mm (12 inches), compact to 95%.

.3 Install trace wire continuous; Buried 150 mm (6 inches) below finish grade, above pipe line

3.7 **SCHEDULES**

.1 Pipe Hanger Schedule:

.1 Metal Piping:

.1 Pipe size: 15 to 32 mm (1/2 to 1-1/4 inches):

.1 Maximum hanger spacing: 2 m (6.5 ft.).

.2 Hanger rod diameter: 9 mm (3/8 inches).

.2 Pipe size: 40 to 50 mm (1-1/2 to 2 inches):

.1 Maximum hanger spacing: 3 m (10 ft.).

.2 Hanger rod diameter: 10 mm (3/8 inch).

.3 Pipe size: 65 to 75 mm (2-1/2 to 3 inches):
.1 Maximum hanger spacing: 3 m (10 ft.)
.2 Hanger rod diameter: 13 mm (1/2 inch).
.4 Pipe size: 100 to 150 mm (4 to 6 inches):
.1 Maximum hanger spacing: 3 m (10 ft.).
.2 Hanger rod diameter: 15 mm (5/8 inch).
.5 Pipe size: 200 to 300 mm (8 to 12 inches):
.1 Maximum hanger spacing: 4.25 m (14 ft.).
.2 Hanger rod diameter: 22 mm (7/8 inch).
.6 Pipe size: 350 mm and Over (14 inches and Over):
.1 Maximum hanger spacing: 6 m (20 ft.).
.2 Hanger rod diameter: 25 mm (1 inch).

.2 Plastic Piping:
.1 All Sizes:
.1 Maximum hanger spacing: 1.8 m (6 ft.).
.2 Hanger rod diameter: 9 mm (3/8 inch).

3.8 **VALVES**

.1 Ensure all valves serving potable water are of lead-free construction.

END OF SECTION

Part 1 - General

1.1 SECTION INCLUDES

.1 Floor drains.

.2 Cleanouts.

.3 Backflow preventers.

.4 Water hammer arrestors.

.5 Trap Seal Primer.

1.2 RELATED SECTIONS

.1 Section 22 10 00 - Plumbing Piping.

.2 Section 22 42 02 - Plumbing Fixtures.

.3 Section 22 47 00 - Plumbing Equipment.

1.3 REFERENCES

.1 Conform the latest edition, including Amendments of the following Codes and Standards.

.2 Local bylaws and standards.

.3 Ontario Electrical Safety Code (latest edition).

.4 Ontario Building Code (OBC)

.5 ACNBC Canadian Plumbing Code.

.6 ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.

.7 AWWA C510 - Double Check Valve Backflow Prevention Assembly.

.8 AWWA C511 - Reduced-Pressure Principle Backflow Prevention Assembly.

.9 ASSE (Plumbing) 1011 - Performance Requirements for Hose Connection Vacuum Breakers.

.10 ASSE (Plumbing) 1012 - Performance Requirements for Backflow Preventer with Intermediate Atmospheric Vent.

.11 ASSE (Plumbing) 1013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers.

.12 ASSE (Plumbing) 1019 - Performance Requirements for Wall Hydrants with Backflow Protection and Freeze Resistance.

.13 PDI-G 101 - Testing and Rating Procedure for Hydro Mechanical Grease Interceptors with Appendix of Installation and Maintenance.

.14 PDI-WH 201 - Water Hammer Arrestors.

1.4 SUBMITTALS FOR REVIEW

.1 Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

1.5 SUBMITTALS FOR INFORMATION

.1 Certificates: Certify that grease oil interceptors meet or exceed specified requirements.

.2 Installation Data: Manufacturer's special installation requirements including assembly and support requirements.

1.6 **CLOSEOUT SUBMITTALS**

.1 Operation & Maintenance Data: Indicate frequency of treatment required for interceptors. Include installation instructions, spare parts lists, exploded assembly views.

.2 Record Documentation: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors.

.3 Submit inspection certificates obtained from local inspection authorities.

.4 Submit certificates indicating that all required testing has been completed.

1.7 **QUALITY ASSURANCE**

.1 Products of This Section: Manufactured to ISO 9000 certification requirements.

.2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

1.8 **DELIVERY, STORAGE, & PROTECTION**

.1 Section 01 60 00: Transport, handle, store, and protect products.

.2 Accept specialties on site in original factory packaging. Inspect for damage.

Part 2 - Products

2.1 **FLOOR DRAINS - DESIGNATED FD**

.1 In finished areas, floor drains shall be cast iron body with 5" (127 mm) Type "B" nickel bronze strainer, and trap primer connection. Zurn ZN-211-B-P. In waterproof membrane areas, use Zurn ZN-415 body.

.2 In unfinished concrete floor areas, floor drains shall be cast iron body with 5" (127 mm) Type "A" nickel bronze heavy duty strainer and trap primer connection. Zurn ZXN-211-A-P. In waterproof membrane areas, use ZXN-415-A-P.

.3 In quarry tile or ceramic tile floor areas, floor drains shall be cast iron body with 6" x 6" (150 mm x 150 mm) square nickel bronze strainer. Zurn ZXN-211-H-P. In waterproof membrane areas, use Zurn ZXN-401-H-P.

.4 Hub drains shall be installed next to equipment where only one (1) pipe has to relieve to drain and shall be cast iron body with 4" (100 mm) polished nickel bronze round strainer and trap primer connection. Zurn ZN-211BE-P-YS. In waterproof membrane areas, use Zurn ZN-415-BE-P-YS bucket and trap primer connection. DESIGNATED HD

.5 Funnel floor drains shall be installed next to equipment where more than one (1) pipe has to relieve to drain and shall be cast iron body with 4" x 8" (100 mm x 200 mm) polished nickel bronze round strainer and trap primer connection. Zurn ZN-211-BF-P. In waterproof membrane areas, use ZN-401-BF-P. DESIGNATED FFD

.6 In areas with sheet floor and vinyl plank floor, floor drains shall be epoxy coated cast iron body with 175 mm type "FC7-1" nickel bronze strainer, anchor flange, reversible membrane clamp and trap primer connection. Watts Drainage, Model FD-100-C-FC.

.7 In quarry tile or ceramic tile floor areas, floor drains shall be cast iron body with 6" x 6" (150 mm x 150 mm) square nickel bronze strainer. Zurn ZXN-211-HP. In waterproof membrane areas, use Zurn ZXN-401-HP.

.8 Acceptable Products:

.1 Zurn

.2 Watts
.3 Jay R. Smith
.4 Mifab

.9 Before construction begins, the Prime Mechanical Contractor shall obtain from the General Division the "Room Finish Schedule" for the Project. The Prime Mechanical Contractor and the floor drain manufacturer and/or vendor shall coordinate the type and installation of the various floor drains listed in the Specifications for each Room. If there is a discrepancy, advise the Consultant before submitting the approval drawings for review. Failure to do so will result in the Prime Mechanical Contractor bearing the total cost for replacing the floor drains and repairing the floor to match the existing conditions.

2.2 CLEANOUTS - DESIGNATED CO

.1 Provide at the base of each vertical stack and rainwater leader, Zurn Z-1445.

.2 Provide on exposed wall areas, accessible pipe chases, and outside grade, Zurn Z-1440.

.3 Provide on plaster walls, Zurn Z-1446-Z-VP.

.4 Provide on finished floor areas, Zurn ZN-1602-T, square nickel bronze access cover and frame to suit floor finish.

.5 Provide in ceramic or quarry tile floor areas, Zurn ZN-1602-T square nickel bronze access cover and frame.

.6 Provide on unfinished floor areas, Zurn Z-1602-T with cast iron scoriated top.

.7 Provide on vinyl tile floor areas, Zurn ZN-1614 with nickel bronze top recessed for tile.

.8 Provide for terrazzo floor areas, Zurn ZN-1607-ST with nickel bronze top recessed for terrazzo.

.9 Cleanouts installed in water-proofed areas shall be supplied with flashing flange and clamp collar.

.10 Provide for urinals, Zurn ZSS-1666-1-VP with round stainless steel access cover and neoprene plug.

.11 Provide in carpeted floor areas, Zurn ZN-1602 CM round nickel bronze top and carpet marker.

.12 Cleanouts installed in vinyl sheet flooring shall be Enpoco E3000R5FC.

.13 Acceptable Products:

.1 Zurn
.2 Watts
.3 Jay R. Smith
.4 Enpoco
.5 Mifab

.14 Before construction begins, the Prime Mechanical Contractor shall obtain from the General Division the "Room Finish Schedule" for the Project. The Prime Mechanical Contractor and the cleanout manufacturer and/or vendor shall coordinate the type and installation of the various cleanouts listed in the Specifications for each Room. If there is a discrepancy, advise the Consultant before submitting the approval drawings for review. Failure to do so will result in the Prime Mechanical Contractor bearing the total cost for replacing the cleanouts and repairing the floor to match the existing conditions.

2.3 **TRAP SEAL PRIMERS - DESIGNATED TSP**

.1 For multiple installation, trap seal primer shall be gravity feed, prime time electronic priming manifold equal to Precision Plumbing Products, Model PT. Manifold openings to be determine on site.

.2 Unit shall be factory assembled and pre-piped complete with vacuum breaker, bronze body valve, water hammer arrestor, solenoid valve and calibrated type 'L' copper manifold. Manifold complete with brass compression fittings with orificed openings.

.3 Unit shall be complete with manual over-ride switch, breaker and 24 hour geared timer.

.4 All components shall be installed in a 16 gauge enclosure complete with access door for surface mounting.

.5 Install unit to Manufactures instructions.

.6 For individual installation, supply and install trap seal primer equal to Precision Plumbing Products, Model P-2-500.

.7 Acceptable Products:

.1 Precision Plumbing Products
.2 Mifab
.3 Zurn

2.4 **DIELECTRIC UNIONS**

.1 Provide wherever pipes of dissimilar metals are joined.

.2 Provide insulating unions for pipe sizes 2" (50 mm) and under and flanges for pipe sizes 2-1/2" (65 mm) and over.

.3 Cast brass adapters may be used where approved by the Consultant.

.4 Provide an isolating separation wherever piping may touch dissimilar metal studs, joists, concrete, etc.

2.5 **SHOCK ABSORBERS**

.1 At each group of fixtures supply and install shock absorber, Zurn Model Z-1700. Contractor shall guarantee no water hammer for one (1) year. for shock absorbers concealed in walls Provide access door for servicing.

.2 Acceptable Products:

.1 Zurn
.2 Watts
.3 J.R. Smith
.4 PPP Inc.
.5 Mifab

2.6 **BACKFLOW PREVENTER - DESIGNATED BFP**

.1 Supply and install backflow preventer where shown on the drawings and where required by Code on potable water connections to equipment. Supply and install for each backflow assembly, a by-pass assembly complete with isolation valve and pipe, size equal to assembly.

.2 Valve shall be complete with bronze body, check seals, stainless steel trim, durable tight-seating rubber discs and bronze valve test cocks.

.3 Severe hazard connections such as heating and cooling systems shall have reduced pressure backflow prevention assembly "RP".

.4 Severe hazard connections such as trap seal primer shall have an air gap "AG".

.5 Minor hazard connections such as hose bibbs and flexible shower heads, shall have atmosphere vacuum breaker "AVB".

.6 Moderate hazard connections such as vending machines and ice making machines, shall have pressure vacuum breaker "PVB".

.7 Acceptable Products:

.1 Watts

.2 Febco

.3 Conbraco

Part 3 - Execution

3.1 **INSTALLATION**

.1 Install to manufacturers written instructions.

.2 Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

.3 Encase exterior cleanouts in concrete flush with grade.

.4 Install floor cleanouts at elevation to accommodate finished floor.

.5 Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibs.

.6 Pipe relief from backflow preventer to nearest drain.

.7 Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to sinks lavatories washing machine outlets.

.8 Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or 20 mm (3/4 inch) minimum, and minimum 450 mm (18 inches) long.

3.2 **CLEANOUT LOCATIONS**

.1 Supply and install cleanouts to conform to Ontario Building Code (Chapter 7). Grease cleanout plugs and covers before installation. Open and clean each cleanout after floors are finished to ensure easy access for cleaning.

.2 Make each cleanout full size of drain up to and including 4" (100 mm) and 4" (100 mm) size for drains over 4" (100 mm). Extend buried cleanouts up to floor with "Y", 1/8 bend and recessed brass plug.

.3 Make each cleanout accessible and wherever necessary, extend branch connections to finished surfaces of walls and fit with cleanout cover and access door.

.4 Provide "Y" type line cleanout on each waste pipe and stack 2" (50 mm) size and larger extending vertically above grade floor immediately before same becomes buried.

.5 Floor cleanouts shall be flush with floor to prevent tripping hazard.

.6 Install cleanouts downstream of all Kitchen sinks.

3.3 **FLOOR DRAINS**

.1 Install floor drains, funnel floor drains, hub drains and floor sinks of types noted, where shown or directed, complete with strainer and accessories noted or required to complete the installation. Set each drain to required level to approval.

.2 Trap and vent each floor and hub drain as required by the Ontario Building Code (Chapter 7). Trap seal each with 3/8" (10 mm) copper water line from nearest sanitary fixtures or by automatic trap seal primer and strainer on cold water line. Where more than one (1) drain unit is fed from common water supply, provide equalizing header.

.3 See Section 22 42 02, Fixture Schedule for trap and vent and cold water sizing.

.4 Ensure drains are located at low point in floor. This Contractor shall perform a water test on all drains in the presence of the Consultant and Owner.

.5 Floor drains shall be flush with finished floor to prevent a tripping hazard.

3.4 **BACKFLOW PREVENTER**

.1 Protect potable water distribution system against contamination due to backflow to CAN/CSA-B64.10 Standards.

.2 Discuss backflow preventer types with certified tester prior to installation. Provide necessary backflow preventer as required. Advise Consultant of any changes.

.3 The checking of drawings and approval of water system shall be performed by a certified tester, licensed to carry out work for the Region and local Municipality.

.4 Obtain necessary certificate and turn over to Consultant prior to project completion.

3.5 **TRAP SEAL PRIMER UNIT**

.1 Pipes from trap seal primer unit shall be gravity feed to floor drain below unit.

END OF SECTION

Part 1 - General

1.1 SECTION INCLUDES

.1 Water closets.

.2 Lavatories.

.3 Sinks.

.4 Showers.

.5 Eye/Face wash fountains.

1.2 RELATED SECTIONS

.1 Section 22 10 00 - Plumbing Piping.

.2 Section 22 42 01 - Plumbing Specialties.

.3 Section 22 47 00 - Plumbing Equipment.

.4 Section 23 05 29 - Supports & Anchors.

.5 Division 26: Electrical characteristics and wiring connections.

1.3 REFERENCES

.1 Unless noted otherwise, comply with latest edition, including Amendments, of the following Codes and Standards.

.2 Ontario Building Code (OBC)

.3 ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use.

.4 ASME A112.18.1/CSA-B125.1 - Plumbing Supply Fittings.

.5 ASME A112.19.1/CSA B45.2 - Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures.

.6 ASME A112.19.2/CSA-B45.1 - Ceramic Plumbing Fixtures.

.7 ASME A112.19.5/CSA-B45.15 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks.

.8 ISEA Z358.1 - Emergency Eye Wash and Shower Equipment.

.9 CSA (Canadian Standards Association).

1.4 SUBMITTALS FOR REVIEW

.1 Product Data: Provide catalogue illustrations of fixtures, sizes, rough-in dimensions, trim, utility sizes, finishes.

1.5 SUBMITTALS FOR INFORMATION

.1 Manufacturer's Instructions: Indicate installation methods and procedures.

1.6 CLOSEOUT SUBMITTALS

.1 Maintenance Data: Include fixture trim exploded view and replacement parts lists.

.2 Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.7 **MAINTENANCE MATERIAL SUBMITTALS**

.1 Spare Parts: Supply two (2) sets of faucet washers flush valve service kits lavatory supply fittings shower heads toilet seats.

1.8 **QUALITY ASSURANCE**

.1 Products of This Section: Manufactured to ISO 9000 certification requirements.

.2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

1.9 **DELIVERY, STORAGE, & PROTECTION**

.1 Accept fixtures on site in factory packaging. Inspect for damage.

.2 Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

Part 2 - Products

2.1 **PLUMBING FIXTURES**

.1 All plumbing fixtures are based on Roca. Acceptable Products are Roca , Kohler, American Standard, except where specifically noted as a special manufacture. Water closets shall be certified to CAN/CSA-B45.0. All plumbing fixtures to be supported, level and square.

.2 Water Closet seats shall be Acceptable Products: Centoco, Olsonite and Bemis.

.3 All fittings shall be brass, chrome plated finish. Plastic fittings are not acceptable. Zurn fittings are specified. Acceptable products are Zurn, Delta Teck, American Standard, Moen and Chicago Faucet, except where specifically noted as special manufacture. Fittings and trim serving Lavatory, stainless steel sinks and showers shall be certified to CAN/CSA-B125 and be of lead-free construction.

.4 This section shall caulk all gaps between porcelain plumbing fixture and finished wall/floor and counter top with white silicone caulking. Engage the respective trade on site to do this work.

.5 All vitreous china fixtures are white unless specified otherwise.

.6 Fixture carriers shall be: Acceptable Products: Can Aqua, Zurn, Watts and J.R. Smith.

.7 Provide each fixture with separate waste and trap, vent and water, as shown or required in accordance with the following schedule:

Fixture	Trap (mm)	Vent (mm)	Cold (mm)	Hot (mm)
Lavatory	1-1/4" (32)	1-1/4" (32)	1/2" (15)	1/2" (15)
Water Closet (Tank)	3" (80)	1-1/2" (40)	1/2" (15)	--
Floor & Hub Drain; Funnel Drain & Floor Sink	3" (80 min.)	1-1/2" (40)	3/8" (10)	--
Shower Mixing Valve	--	--	3/4" (20)	3/4" (20)

Note: Exposed drain pipe serving sink, lavatory and laundry tub, is to be finished chrome plate complete with deep cup escutcheon.

.8 Water Closet - DESIGNATED WC-1

.1 Bowl - Roca Milano A34848B000/A34148700
.2 Seat - Roca A8019F200P
.3 Valve - Zurn Z8804-XL-LKQ-8870-12-PC/Z8952-58

.9 Lavatory - DESIGNATED L-1

.4	Bowl	-	Roca Debba A32799300A
.5	Faucet	-	Zurn ZG6913-CWB-F C/W P6000-HW6 power converter.
.6	Tail Piece	-	Sioux 290-20514C04
.7	Trap	-	Zurn Z8700-8BD-PC
.8	Supplies	-	Zurn ZW1070XL
.9	Carrier	-	Can Aqua CA-1224/Debba A32799300A

Part 3 - Execution

3.1 **EXAMINATION**

.1 Verify existing conditions before starting work.

.2 Verify that walls and floor finishes are prepared and ready for installation of fixtures.

.3 Verify that electric power is available and of the correct characteristics.

.4 Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.2 **PREPARATION**

.1 Rough-in fixture piping connections to minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3 **INSTALLATION**

.1 Install to manufacturer's written instructions.

.2 Install each fixture with trap, easily removable for servicing and cleaning.

.3 Provide chrome plated rigid or flexible supplies to fixtures with screwdriver stops, reducers, and escutcheons.

.4 Install components level and plumb.

.5 Install and secure fixtures in place with wall supports wall carriers and bolt, washer, nut fasteners.

.6 Seal fixtures to wall and floor surfaces with approved sealant .

.7 Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

3.4 **INTERFACE WITH OTHER PRODUCTS**

.1 Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation. Co-ordinate the installation of stainless steel sinks and lavatories with the millwork. If there is a discrepancy, advise the Consultant before submitting approval drawings. Failure to do this will result in the Contractor bearing the total cost for replacing sinks that do not fit properly in counter tops.

3.5 **ADJUSTING**

.1 Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.6 **CLEANING**

.1 Clean plumbing fixtures and equipment.

3.7 **PROTECTION OF FINISHED WORK**

.1 Protect installed work.

.2 Do not permit use of fixtures.

3.8 **SCHEDULES**

.1 Fixture Heights: Install fixtures to heights above finished floor as indicated.

.1 Set lavatory (Designated L-1) from floor to rim of sink at 31" (790 mm).

END OF SECTION

Part 1 - General

1.1 SECTION INCLUDES

.1 Expansion tanks.

.2 Pumps.

1.2 RELATED REQUIREMENTS

.1 Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

.1 Unless noted otherwise, comply with latest edition, including Amendments, of the following Codes and Standards.

.2 Ontario Building Code (OBC)

.3 ASME Boiler and Pressure Vessels Code (BPVC), Section VIII - Rules for Construction of Pressure Vessels.

.4 CSA-B51 - Boiler, Pressure Vessel, and Pressure Piping Code.

.5 NEMA 250 - Enclosures for Electrical Equipment (1000 Volt Maximum).

.6 NFPA 30 - Flammable and Combustible Liquids Code.

.7 NFPA 31 - Standard for the Installation of Oil-Burning Equipment.

.8 NFPA 54/ANSI Z223.1 - National Fuel Gas Code.

.9 NFPA 58 - Liquefied Petroleum Gas Code.

.10 UL 1453 - Standard for Electric Booster and Commercial Storage Tank Water Heaters.

.11 UL 174 - Standard for Household Electric Storage Tank Water Heaters.

.12 CSA (Canadian Standards Association).

.13 UL (Underwriters Laboratories Inc.).

1.4 ACTION SUBMITTALS

.1 Section 01 33 00: Submission procedures.

.2 Product Data:

.1 Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.

.2 Indicate pump type, capacity, power requirements.

.3 Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.

.4 Provide electrical characteristics and connection requirements.

.3 Shop Drawings: Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.

1.5 INFORMATIONAL SUBMITTALS

.1 Section 01 33 00: Submission procedures.

.2 Installation Data: Manufacturer's special installation requirements.

1.6 CLOSEOUT SUBMITTALS

.1 Record Documentation: Record actual locations of components.

.2 Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

.3 Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.7 **MAINTENANCE MATERIAL SUBMITTALS**

.1 Extra Stock Materials: Provide two (2) sets of pump seals for each pump. Provide two (2) sets of cartridges for each side-stream filter.

1.8 **QUALITY ASSURANCE**

.1 Products of This Section: Manufactured to ISO 9000 certification requirements.

.2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

.3 Provide pumps with manufacturer's name, model number, and rating/capacity identified.

.4 Ensure products and installation of specified products are to recommendations and requirements of the following organizations:

.1 American Gas Association (AGA).

.2 National Sanitation Foundation (NSF).

.3 American Society of Mechanical Engineers (ASME).

.4 National Board of Boiler and Pressure Vessel Inspectors (NBBPVI).

.5 National Electrical Manufacturers' Association (NEMA).

.6 Underwriters Laboratories (UL).

.5 Ensure pumps operate at specified system fluid temperatures without vapour binding and cavitation, are non-overloading in parallel or individual operation, operate within 25% of midpoint of published maximum efficiency curve.

1.9 **REGULATORY REQUIREMENTS**

.1 Conform to NFPA 54/ANSI Z223.1, NFPA 58, UL 1453 requirements for water heaters.

.2 Conform to ASME BPVC-Section VIII for tanks.

.3 Products Requiring Electrical Connection: Listed and classified by CSA UL testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.10 **DELIVERY, STORAGE, & HANDLING**

.1 Transport, handle, store, and protect products.

.2 Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.11 **WARRANTY**

.1 Provide a five (5) year warranty to include coverage for failure to meet specified requirements, for domestic water heaters, water storage tanks, packaged water heating systems, in-line circulator, submersible sump pumps, sump pumps, sewage ejectors.

Part 2 - Products

2.1 **DIAPHRAGM-TYPE COMPRESSION TANKS - ET-1**

.1 Manufacturers:

.1 Amtrol

.2 Taco
.3 Watts
.4 Bell & Gossett

.2 **Construction:** Welded steel, tested and stamped to ASME BPVC-Section VIII; supplied with National Board Form U-1, rated for working pressure of 860 kPa (125 psig), with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.

.3 **Accessories:** Pressure gauge and air-charging fitting, tank drain; pre-charge to 80 kPa (12 psig).

.4 For Model Number and tank size, refer to Mechanical Drawings.

2.2 **CLOSE COUPLED, IN-LINE CENTRIFUGAL PUMPS DESIGNATED P-3A, P-3B**

.1 Description: Factory-assembled and -tested, centrifugal, overhung-impeller, horizontal, close-coupled, in-line pump as defined in HI 14.1, HI 14.2 and HI 14.3; designed for installation with motor shaft mounted horizontally.

.2 Pump Construction:

.1 Casing: Radially split, cast iron flanged connections.
.2 Impeller: ASTM A351/A351M stainless steel; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. For pumps that are not variable-frequency-drive controlled, trim impeller to match specified performance.
.3 Pump Stub Shaft: Type 416 stainless steel.
.4 Seal: Mechanical seal consisting of carbon rotating ring against a ceramic seat held by a stainless steel spring, and EPDM rubber bellows and gasket. Include water slinger on shaft between motor and seal.

.3 Motor: Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified.

.1 Enclosure: Open, drip proof
.2 NEMA Premium Efficient motors as defined in NEMA MG 14.
.3 Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 14.0.
.4 Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.
.5 Variable speed motor.
.6 Provide integral pump motor variable-frequency controller.

.4 Capacities and Characteristics: Design based on Taco

.5 Acceptable Products:

.1 Taco
.2 Bell & Gossett
.3 Armstrong
.4 Grundfos

Part 3 - Execution

3.1 **INSTALLATION**

.1 Install water heaters to manufacturer's instructions and to AGA NSF NFPA 54/ANSI Z223.1 UL requirements.

.2 Coordinate with plumbing piping and related fuel piping gas venting electrical work to achieve operating system.

.3 **Pumps - General:**

.1 Provide air cock and drain connection on horizontal pump casings.

.2 Provide line sized isolating valve and strainer on suction and line sized soft seated check valve and balancing valve on discharge.

.3 Decrease from line size with long radius reducing elbows or reducers.

.4 Support piping adjacent to pump such that no weight is carried on pump casings.

.5 Provide supports under elbows on pump suction and discharge line sizes 100 mm (4 inches) and over.

.6 Ensure pumps operate at specified system fluid temperatures without vapour binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25% of midpoint of published maximum efficiency curve.

.7 Align and verify alignment of base mounted pumps prior to start-up.

.4 **Centrifugal Pumps**

.1 Provide centrifugal pumps where and as indicated and install the pumps in accordance with Manufacturer's installation instruction.

.2 Ensure pumps are adequately supported and suitable vibration devices installed.

.3 Division 26 to Provide power wiring and all necessary electrical power connections.

.4 Make all necessary piping connections to pump.

.5 Make all necessary requirements to allow removal of pump for servicing.

.6 Grout bases of all base-mounted circulating pumps.

.5 **Impeller Adjustment:** Include in the Contract the amount necessary to have the Pump Supplier Service Representative visit site and machine down or replace impellers for circulating and vertical in-line pumps as requested by the Balancing Contractor.

.6 **Replacement Seals:**

.1 Supply and install in each of the in-line circulating pumps and vertical pumps, a new set of mechanical seals. These shall be installed after the cleaning and flushing operation but prior to the addition of the final chemical treatment.

.2 If the seals removed are in good condition, they will be turned over to the Owner.

END OF SECTION

Part 1 - General

1.1 SECTION INCLUDES

.1 Flexible pipe connectors.

.2 Expansion joints and compensators.

.3 Pipe loops, offsets, and swing joints.

1.2 RELATED SECTIONS

.1 Section 22 10 00 - Plumbing Piping.

.2 Section 23 21 00 - Hydronic Piping.

1.3 PERFORMANCE REQUIREMENTS

.1 Provide structural work and equipment required to control expansion and contraction of piping. Verify that anchors, guides, and expansion joints provided, adequately protect system.

.2 Expansion Calculations:

.1 Installation Temperature: 10 degrees C (50 degrees F).

.2 Hot Water Heating: 99 degrees C (210 degrees F).

.3 Domestic Hot Water: 60 degrees C (140 degrees F).

.4 Safety Factory: 30%.

1.4 SUBMITTALS FOR REVIEW

.1 Product Data:

.1 Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, fundamental frequency of assembly, braid structure, and total number of wires in braid.

.2 Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.

.2 Samples: Submit two (2) samples of low pressure compensators: 19 mm (3/4 inch), 25 mm (1 inch), 30 mm (1-1/4 inch) in size.

1.5 CLOSEOUT SUBMITTALS

.1 Record Documentation: Record actual locations of flexible pipe connectors, expansion joints, anchors, and guides.

1.6 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Stock Materials: Provide two (2), 340 gm (12 oz.) containers of packing lubricant and cartridge style grease gun.

1.7 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

.2 Design expansion compensating system under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed at the place where the Project is located.

1.8 **DELIVERY, STORAGE, & PROTECTION**

.1 Accept expansion joints on site in factory packing with shipping bars and positioning devices intact. Inspect for damage.

.2 Protect equipment from exposure by leaving factory coverings, pipe end protection, and packaging in place until installation.

1.9 **WARRANTY**

.1 Warranty: Include coverage for leak free performance of packed expansion joints.

Part 2 - Products

2.1 **FLEXIBLE PIPE CONNECTORS**

.1 Steel Piping:

.1 Manufacturers:

.1 Flexonics

.2 Kinetics

.3 Flexcraft

.2 Inner Hose: Stainless Steel.

.3 Exterior Sleeve: Braided, stainless steel.

.4 Pressure Rating: 1380 kPa (200 psig) WOG and 121 degrees C (250 degrees F).

.5 Joint: As specified for pipe joints.

.6 Maximum offset: 20 mm (3/4 inch) on each side of installed centre line.

.2 Copper Piping:

.1 Manufacturers:

.1 Flexonics

.2 Kinetics

.3 Flexcraft

.2 Inner Hose: Bronze.

.3 Exterior Sleeve: Braided bronze.

.4 Pressure Rating: 1380 kPa (200 psig) WOG and 121 degrees C (250 degrees F).

.5 Joint: Flanged As specified for pipe joints.

.6 Size: Use pipe sized units.

.7 Maximum offset: 20 mm (3/4 inch) on each side of installed centre line.

2.2 **ACCESSORIES**

.1 Pipe Alignment Guides: Two-piece welded steel with enamel paint, bolted, with spider to fit standard pipe, frame with four mounting holes, clearance for minimum 25 mm (1 inch) thick insulation, minimum 75 mm (3 inch) travel.

.2 Swivel Joints: Fabricated steel.

Part 3 - Execution

3.1 **INSTALLATION**

.1 Install to manufacturer written instructions.

.2 Construct spool pieces to exact size of flexible connection for future insertion.

.3 Install flexible pipe connectors on pipes connected to equipment supported by vibration isolation. Provide line size flexible connectors.

.4 Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.

.5 Rigidly anchor pipe to building structure where necessary. Provide pipe guides so movement is directed along axis of pipe only. Erect piping such that strain and weight is not on cast connections or apparatus.

.6 Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required indicated.

.7 Provide Victaulic piping with minimum one joint per 25 mm (1 inch) pipe diameter instead of flexible connector supported by vibration isolation. Victaulic piping need not be anchored.

.8 Provide expansion loops as indicated on drawings.

END OF SECTION

Part 1 - General

1.1 SECTION INCLUDES

.1 Pressure gauges and pressure gauge taps.

.2 Thermometers and thermometer wells.

.3 Test plugs and kits.

1.2 RELATED SECTIONS

.1 Section 25 50 02 - Digital Control Equipment.

.2 Section 25 90 00 - Sequence of Operation.

.3 Section 23 21 00 - Hydronic Piping: Installation of thermometer wells.

1.3 REFERENCES

.1 Unless noted otherwise, comply with latest edition, including Amendments, of the following Codes and Standards.

.2 Ontario Building Code (OBC)

.3 ASME B40.100 - Pressure Gauges and Gauge Attachments.

.4 ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers.

.5 ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers.

1.4 SUBMITTALS FOR REVIEW

.1 Product Data: Provide list which indicates use, operating range, total range and location for manufactured components.

1.5 CLOSEOUT SUBMITTALS

.1 Record Documentation: Record actual locations of components and instrumentation.

1.6 SITE CONDITIONS

.1 Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

1.7 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Stock Materials:

.1 Provide two (2) bottles of red gauge oil for static pressure gauges.

.2 Provide two (2) each, dial thermometers, pressure gauges with pulsation damper.

Part 2 - Products

2.1 PRESSURE GAUGES

.1 Manufacturers:

.1 Trerice

.2 Winters

.3 Baker

.4 Weiss

.2 Gauge: ASME B40.100, drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.

.1 Case: Cast aluminum with phosphor bronze bourdon tube.

.2 Size: 115 mm (4-1/2 inch) diameter.

.3 Mid-Scale Accuracy: 1%/2%/1/2%.

.4 Scale: Both kPa and psi.

2.2 **STEM TYPE THERMOMETERS**

.1 Manufacturers:

.1 Trerice

.2 Winters

.3 Baker

.4 Weiss

.2 Thermometer: ASTM E1, red appearing mercury, solar therm, lens front tube, cast aluminum case with enamel finish.

.1 Size: 175 mm (7 inch) scale.

.2 Window: Clear glass.

.3 Stem: 20 mm (3/4 inch) brass.

.4 Accuracy: ASTM E77, 2%.

.5 Calibration: Both degrees C and degrees F.

2.3 **DIAL THERMOMETERS**

.1 Manufacturers:

.1 Trerice

.2 Winters

.3 Baker

.4 Weiss

.2 Thermometer: ASTM E1, stainless steel case, adjustable angle with front recalibration, bimetallic helix actuated with silicone fluid damping, white with black markings and black pointer hermetically sealed lens, stainless steel stem.

.1 Size: 75 mm (3 inch) diameter dial.

.2 Lens: Clear Lexan.

.3 Accuracy: 1%.

.4 Calibration: Both degrees F and degrees C

2.4 **TEST PLUGS**

.1 Test Plug: 6 mm (1/4 inch), brass fitting and cap for receiving 3 mm (1/8 inch) outside diameter pressure or temperature probe with neoprene core for temperatures up to 93 degrees C (200 degrees F).

.2 Test Kit: Carrying case, internally padded and fitted containing one (1) pressure gauge.

Part 3 - Execution

3.1 **INSTALLATION**

.1 Install to manufacturer's written instructions.

.2 Provide one (1) pressure gauge per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gauge.

.3 Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 60 mm (2-1/2 inch) for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

.4 Install thermometers in air duct systems on flanges.

.5 Install thermometer sockets adjacent to controls systems thermostat, transmitter, or sensor sockets.

.6 Locate duct mounted thermometers minimum 3 m (10 ft.) downstream of mixing dampers, coils, or other devices causing air turbulence.

.7 Coil and conceal excess capillary on remote element instruments.

.8 Provide instruments with scale ranges selected according to service with largest appropriate scale.

.9 Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

.10 Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

.11 Locate test plugs adjacent thermometers and thermometer sockets, adjacent to pressure gauges and pressure gauge taps, adjacent to control device sockets where indicated.

END OF SECTION

Part 1 - General

1.1 SECTION INCLUDES

.1 Pipe and equipment hangers and supports.

.2 Equipment bases and supports.

.3 Sleeves and seals.

.4 Flashing and sealing equipment and pipe stacks.

1.2 RELATED SECTIONS

.1 Section 23 07 19 - Piping Insulation.

.2 Section 23 07 16 - Equipment Insulation.

.3 Section 22 10 00 - Plumbing Piping.

.4 Section 23 21 00 - Hydronic Piping.

1.3 REFERENCES

.1 Unless noted otherwise, comply with latest edition, including Amendments, of the following Codes and Standards.

.2 Ontario Building Code (OBC)

.3 ASME B31.2 - Fuel Gas Piping.

.4 ASME B31.5 - Refrigeration Piping and Heat Transfer Components.

.5 ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.

.6 MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

.7 MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

.8 UL 203 - Pipe Hanger Equipment for Fire-Protection Service.

1.4 SUBMITTALS FOR REVIEW

.1 Product Data: Provide manufacturers catalogue data including load capacity.

.2 Shop Drawings: Indicate system layout with location and detail of trapeze hangers.

1.5 SUBMITTALS FOR INFORMATION

.1 Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

.2 Installation Data: Indicate special installation procedures and assembly of components.

1.6 REGULATORY REQUIREMENTS

.1 Conform to applicable code for support of plumbing and hydronic piping.

Part 2 - Products

2.1 PIPE HANGERS & SUPPORTS

.1 Acceptable Manufacturers:

.1 Anvil

.2 Myatt

.3 Economec

.4 Substitutions: Refer to Section 01 60 00

.2 Plumbing Piping - DWV:

.1 Conform to ASME B31.9 ASTM F708 MSS SP-58 MSS SP-58.

.2 Hangers for Pipe Sizes 13 to 38 mm (1/2 to 1-1/2 inch): Malleable iron Carbon steel, adjustable swivel, split ring.

.3 Hangers for Pipe Sizes 50 mm (2 inches) and Over: Carbon steel, adjustable, clevis.

.4 Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

.5 Wall Support for Pipe Sizes to 75 mm (3 inches): Cast iron hook.

.6 Wall Support for Pipe Sizes 100 mm (4 inches) and Over: Welded steel bracket and wrought steel clamp.

.7 Vertical Support: Steel riser clamp.

.8 Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

.9 Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

.3 Plumbing Piping - Water:

.1 Conform to ASME B31.9 ASTM F708 MSS SP-58 MSS SP-58.

.2 Hangers for Pipe Sizes 13 to 38 mm (1/2 to 1-1/2 inch): Malleable iron Carbon steel, adjustable swivel, split ring.

.3 Hangers for Cold Pipe Sizes 50 mm (2 inches) and Over: Carbon steel, adjustable, clevis.

.4 Hangers for Hot Pipe Sizes 50 to 100 mm (2 to 4 inches): Carbon steel, adjustable, clevis.

.5 Hangers for Hot Pipe Sizes 150 mm (6 inches) and Over: Adjustable steel yoke, cast iron roll, double hanger.

.6 Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

.7 Multiple or Trapeze Hangers for Hot Pipe Sizes 150 mm (6 inches) and Over: Steel channels with welded spacers and hanger rods, cast iron roll.

.8 Wall Support for Pipe Sizes to 76 mm (3 inches): Cast iron hook.

.9 Wall Support for Pipe Sizes 100 mm (4 inches) and Over: Welded steel bracket and wrought steel clamp.

.10 Wall Support for Hot Pipe Sizes 150 mm (6 inches) and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.

.11 Vertical Support: Steel riser clamp.

.12 Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

.13 Floor Support for Hot Pipe Sizes to 100 mm (4 inches): Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

.14 Floor Support for Hot Pipe Sizes 150 mm (6 inches) and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

.15 Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

.4 Hydronic Piping:

.1 Conform to ASME B31.9 ASTM F708 MSS SP-58 MSS SP-58.

.2 Hangers for Pipe Sizes 13 to 38 mm (1/2 to 1-1/2 inch): Malleable iron Carbon steel, adjustable swivel, split ring.

.3 Hangers for Cold Pipe Sizes 50 mm (2 inches) and Over: Carbon steel, adjustable, clevis.

.4 Hangers for Hot Pipe Sizes 50 to 100 mm (2 to 4 inches): Carbon steel, adjustable, clevis.

.5 Hangers for Hot Pipe Sizes 150 mm (6 inches) and Over: Adjustable steel yoke, cast iron roll, double hanger.

.6 Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

.7 Multiple or Trapeze Hangers for Hot Pipe Sizes 150 mm (6 inches) and Over: Steel channels with welded spacers and hanger rods, cast iron roll.

.8 Wall Support for Pipe Sizes to 76 mm (3 inches): Cast iron hook.

.9 Wall Support for Pipe Sizes 100 mm (4 inches) and Over: Welded steel bracket and wrought steel clamp.

.10 Wall Support for Hot Pipe Sizes 150 mm (6 inches) and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.

.11 Vertical Support: Steel riser clamp.

.12 Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

.13 Floor Support for Hot Pipe Sizes to 100 mm (4 inches): Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

.14 Floor Support for Hot Pipe Sizes 150 mm (6 inches) and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

.15 Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.2 ACCESSORIES

.1 Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded and shall be rust resistant galvanized dipped.

2.3 INSERTS

.1 Acceptable Manufacturers:

.1 Midwest Tucson

.2 Copper Industries

.3 Flocor

.2 Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.4 FLASHING

.1 Metal Flashing: 0.50 mm (26 ga) galvanized steel.

.2 Metal Counterflashing: 0.80 mm (22 ga) galvanized steel.

.3 Flexible Flashing: 1.2 mm (47 mil) thick sheet butyl; compatible with roofing.

.4 Caps: Steel, 0.8 mm (22 ga) minimum; 1.5 mm (16 ga) at fire resistant elements.

2.5 SLEEVES

.1 Acceptable Manufacturers:

.1 Watts

.2 Metraflex

.3 GPT

.2 Sleeves for Pipes Through Non-fire Rated Floors: 1.2 mm thick (18 gauge) galvanized steel.

.3 Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 1.2 mm thick (18 gauge) galvanized steel.

.4 Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.

.5 Sleeves for Round Ductwork: Galvanized steel.

.6 Sleeves for Rectangular Ductwork: Galvanized steel or wood.

.7 Firestopping Insulation: Glass fibre type, non-combustible.

.8 Sealant: Acrylic.

Part 3 - Execution

3.1 INSTALLATION

.1 Install components to manufacturer written instructions.

3.2 INSERTS

.1 Provide inserts for placement in concrete formwork.

.2 Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

.3 Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 100 mm (4 inches).

.4 Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

.5 Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

3.3 PIPE HANGERS & SUPPORTS

.1 Support horizontal piping as scheduled.

.2 Install hangers to provide minimum 13 mm (1/2 inch) space between finished covering and adjacent work.

.3 Place hangers within 300 mm (12 inches) of each horizontal elbow.

.4 Use hangers with 38 mm (1-1/2 inch) minimum vertical adjustment.

.5 Support horizontal cast iron pipe adjacent to each hub, with 1.5 m (5 ft.) maximum spacing between hangers.

.6 Support vertical piping at every other floor. Support vertical cast iron pipe at each floor at hub.

.7 Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

.8 Support riser piping independently of connected horizontal piping.

.9 Provide copper plated hangers and supports for copper piping and sheet lead packing between hanger or support and piping.

.10 Design hangers for pipe movement without disengagement of supported pipe.

.11 Prime coat exposed steel hangers and supports as specified in Section 09 90 00. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

3.4 **FLASHING**

.1 Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

.2 Flash vent and soil pipes projecting 75 mm (3 inches) minimum above finished roof surface with lead worked 25 mm (1 inch) minimum into hub, 200 mm (8 inches) minimum clear on sides with 600 x 600 mm (24 x 24 inches) sheet size. for pipes through outside walls, turn flanges back into wall and caulk, metal counterflash, and seal.

.3 Flash floor drains in floors with topping over finished areas with lead, 250 mm (10 inches) clear on sides with minimum 910 x 910 mm (36 x 36 inch) sheet size. Fasten flashing to drain clamp device.

.4 Seal floor, shower, mop sink drains watertight to adjacent materials.

.5 Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms, installed to manufacturer's written instructions for sound control.

.6 Provide curbs for mechanical roof installations 350 mm (14 inches) minimum high above roofing surface. Flash and counterflash with sheet metal; seal watertight. Attach counterflashing mechanical equipment and lap base flashing on roof curbs. Flatten and solder joints.

.7 Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.5 **SLEEVES**

.1 Set sleeves in position in formwork. Provide reinforcing around sleeves.

.2 Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

.3 Extend sleeves through floors 25 mm (1 inch) above finished floor level. Caulk sleeves.

.4 Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and caulk air tight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

.5 Install chrome plated steel escutcheons at finished surfaces.

3.6 **SCHEDULES**

PIPE SIZE	MAX. HANGER SPACING	ROD DIAMETER
12 - 32 mm (1/2 - 1-1/4 inch)	2 m (6.5 ft.)	9 mm (3/8 inch)
38 - 50 mm (1-1/2 - 2 inch)	3 m (10 ft.)	9 mm (3/8 inch)
62 - 75 mm (2-1/2 - 3 inch)	3 m (10 ft.)	13 mm (1/2 inch)
100 - 150 mm (4 - 6 inch)	3 m (10 ft.)	15 mm (5/8 inch)
200 - 300 mm (8 - 12 inch)	4.25 m (14 ft.)	22 mm (7/8 inch)
350 and over mm (14 and over inch)	6 m (20 ft.)	25 mm (1 inch)
PVC (All Sizes)	1.8 m (6 ft.)	9 mm (3/8 inch)

END OF SECTION

Part 1 - General

1.1 SECTION INCLUDES

.1 Inertia bases.

.2 Vibration isolation.

1.2 RELATED SECTIONS

.1 Section 03 30 00 - Cast-in-place Concrete: Placement of isolators in floating floor slabs, Supply of concrete for placement by this section.

.2 Section 23 05 16 - Piping Expansion Compensation.

.3 Section 23 05 29 - Supports and Anchors.

.4 Division 26: Electrical characteristics and wiring connections.

1.3 PERFORMANCE REQUIREMENTS

.1 Provide vibration isolation on motor driven equipment over 0.35 kW (0.5 HP), plus connected piping and ductwork.

.2 Provide minimum static deflection of isolators for equipment as indicated.

.1 Basement, Under 15 kW (20 HP):

.1 400 - 600 rpm: 25 mm (1 inch).

.2 600 - 800 rpm: 12 mm (0.5 inch).

.3 800 - 900 rpm: 5 mm (0.2 inch).

.4 1100 - 1500 rpm: 4 mm (0.14 inch).

.5 Over 1500 rpm: 3 mm (0.1 inch).

.2 Basement, Over 15 kW (20 HP):

.1 400 - 600 rpm: 50 mm (2 inch).

.2 600 - 800 rpm: 25 mm (1 inch).

.3 800 - 900 rpm: 12 mm (0.5 inch).

.4 1100 - 1500 rpm: 5 mm (0.2 inch).

.5 Over 1500 rpm: 4 mm (0.15 inch).

.3 Upper Floors:

.1 600 - 800 rpm: 90 mm (3.5 inch).

.2 800 - 900 rpm: 50 mm (2 inch).

.3 1100 - 1500 rpm: 25 mm (1 inch).

.4 Over 1500 rpm: 12 mm (0.5 inch).

.3 Consider upper floor locations critical unless otherwise indicated.

.4 Use concrete inertia bases for fans with motors in excess of 30 kW (40 HP), and on base mounted pumps over 12 kW (15 HP).

1.4 SUBMITTALS FOR REVIEW

.1 Product Data: Provide schedule of vibration isolator type with location and load on each.

.2 Shop Drawings: Indicate inertia bases and locate vibration isolators, with static and dynamic load on each.

1.5 SUBMITTALS FOR INFORMATION

.1 Installation Data: Indicate special procedures and setting dimensions.

.2 Manufacturer Certificate: Certify that isolators are properly installed and adjusted to meet or exceed specified requirements.

1.6 **CLOSEOUT SUBMITTALS**

.1 Record Documentation: Record actual locations of hangers including attachment points.

Part 2 - Products

2.1 **MANUFACTURERS**

.1 Acceptable Manufacturers:

.1 Vibro Acoustics
.2 Vibron
.3 E.H. Price

2.2 **VIBRATION ISOLATORS**

.1 Open Spring Isolators:

.1 Spring Isolators:

.1 For Exterior and Humid Areas: Provide hot dipped galvanized housings and neoprene coated springs.

.2 Code: Colour code springs for load carrying capacity.

.2 Springs: Minimum horizontal stiffness equal to 75% vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.

.3 Spring Mounts: Provide with levelling devices, minimum 6 mm (1/4 inch) thick neoprene sound pads, and zinc chromate plated hardware.

.4 Sound Pads: Size for minimum deflection of 1.2 mm (1/16 inch); meet requirements for neoprene pad isolators.

.2 Restrained Spring Isolators:

.1 Spring Isolators:

.1 For Exterior and Humid Areas: Provide hot dipped galvanized housings and neoprene coated springs.

.2 Code: Colour code springs for load carrying capacity.

.2 Springs: Minimum horizontal stiffness equal to 75% vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.

.3 Spring Mounts: Provide with levelling devices, minimum 6 mm (1/4 inch) thick neoprene sound pads, and zinc chromate plated hardware.

.4 Sound Pads: Size for minimum deflection of 1.2 mm (1/16 inch); meet requirements for neoprene pad isolators.

.5 Restraint: Provide heavy mounting frame and limit stops.

.3 Closed Spring Isolators:

.1 Spring Isolators:

.1 For Exterior and Humid Areas: Provide hot dipped galvanized housings and neoprene coated springs.

.2 Code: Colour code springs for load carrying capacity.

.2 Type: Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.

.3 Springs: Minimum horizontal stiffness equal to 75% vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.

.4 Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 6 mm (1/4 inch) clearance.

.4 Restrained Closed Spring Isolators:

.1 Spring Isolators:

.1 For Exterior and Humid Areas: Provide hot dipped galvanized housings and neoprene coated springs.

.2 Code: Colour code springs for load carrying capacity.

.2 Type: Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.

.3 Springs: Minimum horizontal stiffness equal to 75% vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.

.4 Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 6 mm (1/4 inch) clearance and limit stops.

.5 Spring Hanger:

.1 Spring Isolators:

.1 For Exterior and Humid Areas: Provide hot dipped galvanized housings and neoprene coated springs.

.2 Code: Colour code springs for load carrying capacity.

.2 Springs: Minimum horizontal stiffness equal to 75% vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.

.3 Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators rubber hanger with threaded insert.

.4 Misalignment: Capable of 20 degree hanger rod misalignment.

.6 Neoprene Pad Isolators:

.1 Rubber or neoprene waffle pads:

.1 30 durometer.

.2 Minimum 13 mm (1/2 inch) thick.

.3 Maximum loading 275 kPa (40 psi).

.4 Height of ribs: maximum 0.7 times width.

.2 Configuration: Single layer.

.3 Configuration: 13 mm (1/2 inch) thick waffle pads bonded each side of 6 mm (1/4 inch) thick steel plate

.7 Glass Fibre Pads: Neoprene jacketed pre-compressed moulded glass fibre.

.8 Rubber Mount or Hanger: Moulded rubber designed for 13 mm (0.5 inches) deflection with threaded insert.

.9 Seismic Snubbers:

.1 Type: Non-directional and double acting unit consisting of interlocking steel members restrained by neoprene elements.

.2 Neoprene Elements: Replaceable, minimum of 18 mm (0.75 inch) thick.

.3 Capacity: 4 times load assigned to mount groupings at 10 mm (0.4 inch) deflection.

.4 Attachment Points and Fasteners: Capable of withstanding 3 times rated load capacity of seismic snubber.

Part 3 - Execution

3.1 INSTALLATION

.1 Install to manufacturers written instructions.

.2 Install isolation for motor driven equipment.

.3 Bases:

.1 Set steel bases for 25 mm (1 inch) clearance between housekeeping pad and base.

.2 Set concrete inertia bases for 50 mm (2 inch) clearance between housekeeping pad and base.

.3 Adjust equipment level.

.4 Install spring hangers without binding.

.5 On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.

.6 Prior to making piping connections to equipment with operating weights substantially different from installed weights, block up equipment with temporary shims to final height. When full load is applied, adjust isolators to load to allow shim removal.

.7 Provide pairs of horizontal limit springs on fans with more than 1.5 kPa (6 inch) static pressure, and on hanger supported, horizontally mounted axial fans.

.8 Support piping connections to isolated equipment resiliently for scheduled distance to nearest flexible pipe connector as follows.

.1 Up to 100 mm (4 inch) Diameter: First three points of support.

.2 125 to 200 mm (5 to 8 inch) Diameter: First four points of support.

.3 Select three hangers closest to vibration source for minimum 25 mm (1.0 inch) static deflection or static deflection of isolated equipment. Select remaining isolators for minimum 25 mm (1.0 inch) static deflection or 1/2 static deflection of isolated equipment.

.9 Connect wiring to isolated equipment with flexible hanging loop.

3.2 EQUIPMENT REQUIRING VIBRATION ISOLATION

.1 Provide vibration isolation for the following equipment:

.1 Exhaust fans over 1/2 HP

.2 Pumps over 15 HP

3.3 MANUFACTURER'S FIELD SERVICES

.1 Prepare and start components.

.2 Inspect isolated equipment after installation and submit report. Include static deflections.

3.4 PIPE ISOLATION SCHEDULE

PIPE SIZE	ISOLATED DISTANCE FROM EQUIPMENT
25 mm (1 inch)	120 diameters (3.0 m (10 ft.))
50 mm (2 inches)	90 diameters (4.5 m (15 ft.))
75 mm (3 inches)	80 diameters (6.0 m (20 ft.))
100 mm (4 inches)	75 diameters (7.5 m (25 ft.))
150 mm (6 inches)	60 diameters (9.0 m (30 ft.))
200 mm (8 inches)	60 diameters (12.0 m (40 ft.))

PIPE SIZE	ISOLATED DISTANCE FROM EQUIPMENT
250 mm (10 inches)	54 diameters (13.5 m (45 ft.))
300 mm (12 inches)	50 diameters (15.0 m (50 ft.))
400 mm (16 inches)	45 diameters (18.0 m (60 ft.))
600 mm (24 inches)	38 diameters (23.0 m (75 ft.))
Over 600 mm (24 inches)	

END OF SECTION

Part 1 - General

1.1 SECTION INCLUDES

.1 Nameplates.

.2 Tags.

.3 Stencils.

.4 Pipe Markers.

1.2 REFERENCES

.1 Unless noted otherwise, comply with latest edition, including Amendments, of the following Codes and Standards.

.2 Ontario Building Code (OBC)

.3 ASME A13.1 - Scheme for the Identification of Piping Systems.

1.3 SUBMITTALS FOR REVIEW

.1 Product Data: Provide manufacturers catalogue literature for each product required.

.2 Identification Information:

.1 Submit list of wording, symbols, letter size, and colour coding for mechanical identification.

.2 Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

1.4 SUBMITTALS FOR INFORMATION

.1 Installation Data: Indicate special procedures, and installation.

1.5 CLOSEOUT SUBMITTALS

.1 Record Documentation: Record actual locations of tagged valves.

Part 2 - Products

2.1 NAMEPLATES

.1 Manufacturers:

.1 Seton

.2 Brimar

.3 Brady

.2 Description: Laminated three-layer plastic with engraved black letters on light contrasting background colour.

2.2 TAGS

.1 Manufacturers:

.1 Seton

.2 Brimar

.3 Brady

.2 Metal Tags: Aluminum with stamped letters; round tags, with smooth edges.

.3 Chart: Typewritten letter size list in anodized aluminum frame. Locate in Mechanical Room.

2.3 **STENCILS**

.1 Manufacturers:

.1 Seton
.2 Brimar
.3 Brady

.2 Stencils: With clean cut symbols and letters of following size:

.1 20 to 30 mm (3/4 to 1-1/4 inch) Outside Diameter of Insulation or Pipe: 200 mm (8 inch) long colour field, 15 mm (1/2 inch) high letters.
.2 40 to 50 mm (1-1/2 to 2 inch) Outside Diameter of Insulation or Pipe: 200 mm (8 inch) long colour field, 20 mm (3/4 inch) high letters.
.3 65 to 150 mm (2-1/2 to 6 inch) Outside Diameter of Insulation or Pipe: 300 mm (12 inch) long colour field, 30 mm (1-1/4 inch) high letters.
.4 200 to 250 mm (8 to 10 inch) Outside Diameter of Insulation or Pipe: 600 mm (24 inch) long colour field, 65 mm (2-1/2 inch) high letters.
.5 Over 250 mm (10 inch) Outside Diameter of Insulation or Pipe: 800 mm (32 inch) long colour field, 90 mm (3-1/2 inch) high letters.
.6 Ductwork and Equipment: 65 mm (2-1/2 inch) high letters.

2.4 **PIPE MARKERS**

.1 Manufacturers:

.1 Seton
.2 Brimar
.3 Brady

.2 Colour: Conform to ASME A13.1.

.3 Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

.4 Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

.5 Underground Plastic Pipe Markers: Bright coloured continuously printed plastic ribbon tape, minimum 150 mm (6 inches) wide by 0.10 mm (4 mil) thick, manufactured for direct burial service.

2.5 **CEILING TACKS**

.1 Description: Steel with 20 mm (3/4 inch) diameter colour coded head.

.2 Colour code as follows:

.1 Yellow - HVAC equipment.
.2 Red - Fire dampers/smoke dampers.
.3 Green - Plumbing valves.
.4 Blue - Heating/cooling valves.

Part 3 - Execution

3.1 **PREPARATION**

.1 Degrease and clean surfaces to receive adhesive for identification materials.

.2 Prepare surfaces for stencil painting.

3.2 **INSTALLATION**

.1 Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

.2 Install tags with corrosion resistant chain.

.3 Install plastic pipe markers to manufacturer written instructions.

.4 Install plastic tape pipe markers complete around pipe to manufacturer's written instructions.

.5 Install underground plastic pipe markers 150 to 200 mm (6 to 8 inches) below finished grade, directly above buried pipe.

.6 Identify air handling units, heat transfer equipment with stencil painting.

.7 Identify control panels and major control components outside panels with plastic nameplates.

.8 Identify thermostats relating to terminal boxes or valves with nameplates.

.9 Identify valves in main and branch piping with tags.

.10 Identify air terminal units and radiator valves with numbered tags.

.11 Tag automatic controls, instruments, and relays. Key to control schematic.

.12 Identify all new piping, concealed or exposed, with stencilled painting. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 6 m (20 ft) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

.1 Use tags on piping 20 mm (3/4 inch) diameter and smaller.

.2 Identify service, flow direction, and pressure. Install in clear view and align with axis of piping.

.3 Locate identification not to exceed 6 m (20 ft) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

.13 Identify new ductwork with plastic nameplates or stencilled painting. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

.14 Provide ceiling tacks to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

Part 1 - General

1.1 SECTION INCLUDES

.1 Testing, adjustment, and balancing of air systems.

.2 Testing, adjustment, and balancing of hydronic systems.

.3 Measurement of final operating condition of HVAC systems.

.4 Sound measurement of equipment operating conditions.

.5 Vibration measurement of equipment operating conditions.

1.2 PRICE & PAYMENT PROCEDURES

.1 Allowances affecting this section.

.1 The Prime Mechanical Contractor shall engage a testing company specializing in this Work.

1.3 REFERENCES

.1 Unless noted otherwise, comply with latest edition, including Amendments, of the following Codes and Standards.

.2 Ontario Building Code (OBC)

.3 AABC-2002 - National Standards for Total System Balance.

.4 ADC 1062: GRD-84 - Test Code for Grilles, Registers and Diffusers.

.5 NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

1.4 SUBMITTALS FOR INFORMATION

.1 Submit name of adjusting and balancing agency for approval within thirty (30) days after award of Contract.

.2 Field Reports: Submit procedures for submitting Field Reports.

.1 Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

.2 Prior to commencing work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.

.3 Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Consultant and for inclusion in operating and maintenance manuals.

.4 Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

.5 Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty prior to commencing system balance.

.3 Test Reports: Indicate data on AABC National Standards for Total System Balance forms.

1.5 CLOSEOUT SUBMITTALS

.1 Record Documentation: Record actual locations of flow measuring stations balancing valves and rough setting.

1.6 **QUALITY ASSURANCE**

.1 Perform total system balance to AABC National Standards for Field Measurement and Instrumentation, Total System Balance and NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

.2 Maintain one (1) copy of document on site.

.3 Agency Qualifications: Company specializing in the testing, adjusting, and balancing of systems specified in this Section with minimum three (3) years documented experience certified by AABC.

.4 Perform Work under supervision of AABC Certified Test and Balance Engineer NEBB Certified Testing, Balancing and Adjusting Supervisor and registered Professional Engineer experienced in performance of this Work and licensed at the place where the Project is located.

Part 2 - Products

2.1 **NOT USED**

Part 3 - Execution

3.1 **ACCEPTABLE TAB COMPANIES**

.1 Dynamic Flow Balancing Ltd., Oakville, Ontario (Phone: 905-338-0808)

.2 Air Audit, Cambridge, Ontario (Phone: 519-740-0871)

.3 Flowset Balancing, Oakville (Phone: 416-410-9793)

.4 Clark Balancing & Hydronic Testing & Balancing, Milton (Phase: 905-693-1518)

3.2 **MECHANICAL CONTRACTOR RESPONSIBILITY**

.1 Mechanical Contractor shall co-ordinate and co-operate with the Balancing and Testing firm and perform the following as part of this Contract:

.1 Meet with the Testing and Balancing firm on the site during construction to discuss type and locations of all balancing devices.

.2 After installation is complete, equipment shall be tested by Mechanical Contractor. Check fan and pump rotation, wiring and belts.

.3 Provide in each fan, a clean set of filters, required for balancing of systems.

.4 Provide ladders, tools and mechanic to assist the Balancing and Testing firm in the balancing and testing.

.5 Install pitot tube covers and balancing devices as required by the Balancing and Testing firm.

.6 Clean all strainers prior to water balancing.

.7 Provide ladders, tools and mechanic to assist the Consultant and Balancing and Testing firm in the final check and demonstration of the system's performance.

.8 Provide one set of shop drawings for all equipment to be tested with pump and fan curves.

.9 Provide and replace fan sheaves and belts as required for all systems to meet performance.

3.3 **EXAMINATION**

.1 Verify existing conditions before starting work.

.2 Verify that systems are complete and operable before commencing work. Ensure the following conditions:

.1 Systems are started and operating in a safe and normal condition.

.2 Temperature control systems are installed complete and operable.

.3 Proper thermal overload protection is in place for electrical equipment.

.4 Final filters are clean and in place. If required, install temporary media in addition to final filters.

.5 Duct systems are clean of debris.

.6 Fans are rotating correctly.

.7 Fire and volume dampers are in place and open.

.8 Air coil fins are cleaned and combed.

.9 Access doors are closed and duct end caps are in place.

.10 Air outlets are installed and connected.

.11 Duct system leakage is minimized.

.12 Hydronic systems are flushed, filled, and vented.

.13 Pumps are rotating correctly.

.14 Proper strainer baskets are clean and in place.

.15 Service and balance valves are open.

.3 Submit field reports. Report defects and deficiencies noted during performance of services which prevent system balance.

.4 Beginning of work means acceptance of existing conditions.

3.4 PREPARATION

.1 Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Consultant to facilitate spot checks during testing.

.2 Provide additional balancing devices as required.

3.5 INSTALLATION TOLERANCES

.1 Air Handling Systems: Adjust to within plus or minus 5% of design for supply systems and plus or minus 5% of design for return and exhaust systems.

.2 Air Outlets and Inlets: Adjust total to within plus 10 % and minus 5% of design to space. Adjust outlets and inlets in space to within plus or minus 10% of design.

.3 Hydronic Systems: Adjust to within plus or minus 5% of design.

3.6 ADJUSTING

.1 Ensure recorded data represents actual measured or observed conditions.

.2 Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

.3 After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

.4 Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

.5 At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

.6 Check and adjust systems approximately six months after final acceptance and submit report.

3.7 **AIR SYSTEM PROCEDURE**

.1 Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

.2 Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

.3 Measure air quantities at air inlets and outlets.

.4 Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

.5 Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

.6 Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by branch damper regulation.

.7 Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

.8 Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50% loading of filters.

.9 Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

.10 Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

.11 Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating

.12 Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

.13 Check multi-zone units for motorized damper leakage. Adjust air quantities with mixing dampers set first for cooling, then heating, then modulating.

.14 For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

.15 Validate a minimum of 50% of air flow measurement for VAV terminals maximum and minimum air flows

3.8 **WATER SYSTEM PROCEDURE**

.1 Adjust water systems to provide required or design quantities.

.2 Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

.3 Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

.4 Effect system balance with automatic control valves fully open to heat transfer elements.

.5 Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

.6 Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.9 **SCHEDULES**

.1 Equipment requiring testing, adjusting and balancing:

.1 Fire Pumps
.2 Sprinkler Air Compressor
.3 Electric Water Coolers
.4 Plumbing Pumps
.5 HVAC Pumps
.6 Boilers
.7 Radiant Floor Heating
.8 Air Cooled Water Chillers
.9 Water Chillers
.10 Air Cooled Refrigerant Condensers
.11 Packaged Roof Top Heating/Cooling Units
.12 Packaged Terminal Air Conditioning Units
.13 Unit Air Conditioners
.14 Computer Room Air Conditioning Units
.15 Air Coils
.16 Terminal Heat Transfer Units
.17 Air Handling Units
.18 Fans
.19 Air Filters
.20 Air Terminal Units
.21 Air Inlets and Outlets

.2 Report Forms:

.1 Title Page:

.1 Name of Testing, Adjusting, and Balancing Agency
.2 Address of Testing, Adjusting, and Balancing Agency
.3 Telephone number of Testing, Adjusting, and Balancing Agency
.4 Project name
.5 Project location
.6 Project Architect
.7 Project Engineer
.8 Project Contractor
.9 Project altitude
.10 Report date

.2 Summary Comments:

.1 Design versus final performance
.2 Notable characteristics of system
.3 Description of systems operation sequence

.4 Summary of outdoor and exhaust flows to indicate amount of building pressurization
.5 Nomenclature used throughout report
.6 Test conditions

.3 Instrument List:
.1 Instrument
.2 Manufacturer
.3 Model number
.4 Serial number
.5 Range
.6 Calibration date

.4 Electric Motors:
.1 Manufacturer
.2 Model/Frame
.3 HP/BHP
.4 Phase, voltage, amperage; nameplate, actual, no load
.5 RPM
.6 Service factor
.7 Starter size, rating, heater elements
.8 Sheave Make/Size/Bore

.5 V-Belt Drive:
.1 Identification/location
.2 Required driven RPM
.3 Driven sheave, diameter and RPM
.4 Belt, size and quantity
.5 Motor sheave diameter and RPM
.6 Centre to centre distance, maximum, minimum, and actual

.6 Pump Data:
.1 Identification/number
.2 Manufacturer
.3 Size/model
.4 Impeller
.5 Service
.6 Design flow rate, pressure drop, BHP
.7 Actual flow rate, pressure drop, BHP
.8 Discharge pressure
.9 Suction pressure
.10 Total operating head pressure
.11 Shut off, discharge and suction pressures
.12 Shut off, total head pressure

.7 Combustion Test:
.1 Boiler manufacturer
.2 Model number
.3 Serial number
.4 Firing rate
.5 Overfire draft
.6 Gas meter timing dial size

.7 Gas meter time per revolution
.8 Gas pressure at meter outlet
.9 Gas flow rate
.10 Heat input
.11 Burner manifold gas pressure
.12 Percent carbon monoxide (CO)
.13 Percent carbon dioxide (CO_2)
.14 Percent oxygen (O_2)
.15 Percent excess air
.16 Flue gas temperature at outlet
.17 Ambient temperature
.18 Net stack temperature
.19 Percent stack loss
.20 Percent combustion efficiency
.21 Heat output

.8 Air Cooled Condenser:
.1 Identification/number
.2 Location
.3 Manufacturer
.4 Model number
.5 Serial number
.6 Entering DB air temperature, design and actual
.7 Leaving DB air temperature, design and actual
.8 Number of compressors

.9 Chillers:
.1 Identification/number
.2 Manufacturer
.3 Capacity
.4 Model number
.5 Serial number
.6 Evaporator entering water temperature, design and actual
.7 Evaporator leaving water temperature, design and actual
.8 Evaporator pressure drop, design and actual
.9 Evaporator water flow rate, design and actual
.10 Condenser entering water temperature, design and actual
.11 Condenser pressure drop, design and actual
.12 Condenser water flow rate, design and actual

.10 Cooling Coil Data:
.1 Identification/number
.2 Location
.3 Service
.4 Manufacturer
.5 Air flow, design and actual
.6 Entering air DB temperature, design and actual
.7 Entering air WB temperature, design and actual
.8 Leaving air DB temperature, design and actual
.9 Leaving air WB temperature, design and actual

.10 Water flow, design and actual
.11 Water pressure drop, design and actual
.12 Entering water temperature, design and actual
.13 Leaving water temperature, design and actual
.14 Saturated suction temperature, design and actual
.15 Air pressure drop, design and actual

.11 Heating Coil Data:
.1 Identification/number
.2 Location
.3 Service
.4 Manufacturer
.5 Air flow, design and actual
.6 Water flow, design and actual
.7 Water pressure drop, design and actual
.8 Entering water temperature, design and actual
.9 Leaving water temperature, design and actual
.10 Entering air temperature, design and actual
.11 Leaving air temperature, design and actual
.12 Air pressure drop, design and actual

.12 Air Moving Equipment
.1 Location
.2 Manufacturer
.3 Model number
.4 Serial number
.5 Arrangement/Class/Discharge
.6 Air flow, specified and actual
.7 Return air flow, specified and actual
.8 Outside air flow, specified and actual
.9 Total static pressure (total external), specified and actual
.10 Inlet pressure
.11 Discharge pressure
.12 Sheave Make/Size/Bore
.13 Number of Belts/Make/Size
.14 Fan RPM
.15 Return Air/Outside Air Data:
.16 Identification/location
.17 Design air flow
.18 Actual air flow
.19 Design return air flow
.20 Actual return air flow
.21 Design outside air flow
.22 Actual outside air flow
.23 Return air temperature
.24 Outside air temperature
.25 Required mixed air temperature
.26 Actual mixed air temperature
.27 Design outside/return air ratio

.28 Actual outside/return air ratio

.13 Exhaust Fan Data:
- .1 Location
- .2 Manufacturer
- .3 Model number
- .4 Serial number
- .5 Air flow, specified and actual
- .6 Total static pressure (total external), specified and actual
- .7 Inlet pressure
- .8 Discharge pressure
- .9 Sheave Make/Size/Bore
- .10 Number of Belts/Make/Size
- .11 Fan RPM

.14 Duct Traverse:
- .1 System zone/branch
- .2 Duct size
- .3 Area
- .4 Design velocity
- .5 Design air flow
- .6 Test velocity
- .7 Test air flow
- .8 Duct static pressure
- .9 Air temperature
- .10 Air correction factor

.15 Flow Measuring Station:
- .1 Identification/number
- .2 Location
- .3 Size
- .4 Manufacturer
- .5 Model number
- .6 Serial number
- .7 Design Flow rate
- .8 Design pressure drop
- .9 Actual/final pressure drop
- .10 Actual/final flow rate
- .11 Station calibrated setting

.16 Terminal Unit Data:
- .1 Manufacturer
- .2 Type, constant, variable, single, dual duct
- .3 Identification/number
- .4 Location
- .5 Model number
- .6 Size
- .7 Minimum static pressure
- .8 Minimum design air flow
- .9 Maximum design air flow
- .10 Maximum actual air flow

.11 Inlet static pressure

.17 Air Distribution Test Sheet:
- .1 Air terminal number
- .2 Room number/location
- .3 Terminal type
- .4 Terminal size
- .5 Area factor
- .6 Design velocity
- .7 Design air flow
- .8 Test (final) velocity
- .9 Test (final) air flow
- .10 Percent of design air flow

.18 Sound Level Report:
- .1 Location
- .2 Octave bands - equipment off
- .3 Octave bands - equipment on

.19 Vibration Test:
- .1 Location of points:
  - .1 Fan bearing, drive end
  - .2 Fan bearing, opposite end
  - .3 Motor bearing, centre (if applicable)
  - .4 Motor bearing, drive end
  - .5 Motor bearing, opposite end
  - .6 Casing (bottom or top)
  - .7 Casing (side)
  - .8 Duct after flexible connection (discharge)
  - .9 Duct after flexible connection (suction)
- .2 Test readings:
  - .1 Horizontal, velocity and displacement
  - .2 Vertical, velocity and displacement
  - .3 Axial, velocity and displacement
- .3 Normally acceptable readings, velocity and acceleration
- .4 Unusual conditions at time of test
- .5 Vibration source (if non-complying)

END OF SECTION

Part 1 - General

1.1 SECTION INCLUDES

.1 Equipment insulation.

.2 Covering.

1.2 RELATED SECTIONS

.1 Section 23 05 53 - Mechanical Identification.

.2 Section 22 10 00 - Plumbing Piping: Placement of hangers and hanger inserts.

.3 Section 23 21 00 - Hydronic Piping: Placement of hangers and hanger inserts.

1.3 REFERENCES

.1 Unless noted otherwise, comply with latest edition, including Amendments, of the following Codes and Standards.

.2 Ontario Building Code (OBC)

.3 ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

.4 ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.5 ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.6 ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

.7 ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.

.8 ASTM C240 - Standard Test Methods of Testing Cellular Glass Insulation Block.

.9 ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.

.10 ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

.11 ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.

.12 ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

.13 ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation.

.14 ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

.15 ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type).

.16 ASTM C612 - Standard Specification for Mineral Fiber Block and Board Insulation.

.17 ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.18 ASTM D1056 - Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.

.19 ASTM E84-15a - Standard Test Method for Surface Burning Characteristics of Building Materials.

.20 ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.

.21 NAIMA - National Insulation Standards.

.22 NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials

.23 UL 723-2008 - Tests for Surface Burning Characteristics of Building Materials

1.4 **SUBMITTALS FOR REVIEW**

.1 Product Data: Provide product description, thermal characteristics, list of materials and thickness for equipment scheduled.

.2 Samples: Submit two (2) samples of any representative size illustrating each insulation type.

1.5 **SUBMITTALS FOR INFORMATION**

.1 Installation Data: Indicate installation procedures which ensure acceptable workmanship and installation standards will be achieved.

1.6 **QUALITY ASSURANCE**

.1 Products of This Section: Manufactured to ISO 9000 certification requirements.

.2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

.3 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience and approved by the manufacturer.

1.7 **REGULATORY REQUIREMENTS**

.1 Materials: Flame spread/smoke developed rating of 25/50 to ASTM E84 and NFPA 255.

1.8 **DELIVERY, STORAGE, & PROTECTION**

.1 Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

.2 Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.9 **SITE CONDITIONS**

.1 Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

.2 Maintain temperature during and after installation for minimum period of twenty-four (24) hours.

Part 2 - Products

2.1 **GLASS FIBRE, FLEXIBLE**

.1 Calcium Silicate Insulation: ASTM C553, Type II - pipe, preformed, high temperature insulation.

.1 Thermal Conductivity (k-factor): 0.035 W/m.K at 24 degrees C (0.24 BTU.in/h.sq. ft. at 75 degrees F).

.2 Maximum Service Temperature: 121 degrees C (250 degrees F).

.3 Maximum Moisture Absorption: 0.2% by volume.

.4 Density: 16 kg/cu. m (1 lb/cu. ft.)

.2 Vapour Barrier Jacket:

.1 ASTM C921

.2 Moisture vapour transmission: ASTM E96/E96M, 0.04 perm.

.3 Secure with self-sealing longitudinal laps and butt strips.

.4 Secure with outward clinch expanding staples and vapour barrier mastic.

.3 Tie Wire: 1.22 mm (0.048 inch) stainless steel with twisted ends on maximum 300 mm (12 inch) centres.

.4 Vapour Barrier Lap Adhesive: compatible with insulation.

.5 Insulating Cement/Mastic: STM C195, hydraulic setting on mineral wool.

2.2 GLASS FIBRE, RIGID

.1 Insulation: ASTM C612, rigid, non-combustible.

.1 Thermal Conductivity (k-factor): ASTM C177, 0.035 W/m.K degrees C (0.24 BTU.in/h.sq. ft. at 75 degrees F).

.2 Maximum Service Temperature: 232 degrees C (450 degrees F), 343 degrees C (650 degrees F) or 454 degrees C (850 degrees F), as applicable to the application

.3 Maximum Moisture Absorption: 0.1% by volume.

.4 Density: 16 kg/cu. m (1.0 lb/cu. ft.).

.2 Vapour Barrier Jacket:

.1 Kraft paper reinforced with glass fibre yarn and bonded to aluminized film.

.2 Moisture vapour transmission: ASTM E96/E96M, 0.02 perm.

.3 Secure with self-sealing longitudinal laps and butt strips.

.4 Secure with outward clinch expanding staples and vapour barrier mastic.

.3 Facing: 25 mm (1 inch), hexagonal wire mesh stitched on one (1) face of insulation with expanded metal lath on other.

.4 Vapour Barrier Lap Adhesive: compatible with insulation.

.5 Insulating Cement/Mastic: ASTM C195, hydraulic setting on mineral wool.

2.3 CELLULAR GLASS

.1 Insulation: ASTM C552.

.1 Thermal Conductivity (k-factor): 0.039 W/m.K at 24 degrees C (0.35 BTU.in/h.sq. ft. at 75 degrees F).

.2 Maximum Service Temperature: 482 degrees C (900 degrees F).

.3 Maximum Water Vapour Transmission: 0.1 or 0.00 perm, as applicable to the application.

.4 Maximum Moisture Absorption: ASTM C240, 0.2% by volume.

.5 Density: 128 kg/cu. m (8.0 lb/cu. ft.).

2.4 HYDROUS CALCIUM SILICATE

.1 Insulation: ASTM C533; rigid moulded, asbestos free, gold colour.

.1 Thermal Conductivity (k-factor): ASTM C177 ASTM C518; 0.057 W/m.K at 148 degrees C (0.40 BTU.in/h.sq. ft. at 75 degrees F).

.2 Maximum Service Temperature: 649 degrees C (1200 degrees F).

.3 Density: 249 kg/cu. m (15 lb/cu. ft.).

.2 Tie Wire: 1.22 mm (0.048 inches) stainless steel with twisted ends on maximum 300 mm (12 inch) centres.

.3 Insulating Cement: ASTM C449.

2.5 **CELLULAR FOAM**

.1 Insulation: ASTM C534/C534M; flexible, cellular elastomeric, moulded or sheet.

.1 Thermal Conductivity (k-factor): ASTM C177; 0.032 W/m.K at 24 degrees C (0.25 BTU.in/h.sq. ft. at 75 degrees F).

.2 Minimum Service Temperature: -40 degrees C (-40 degrees F).

.3 Maximum Service Temperature: 104 degrees C (220 degrees F).

.4 Maximum Moisture Absorption: ASTM D1056; 1.0% by volume.

.5 Moisture Vapour Transmission: ASTM E96/E96M, 0.05 perm-inches.

.6 Connection: Waterproof vapour barrier adhesive.

.2 Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.6 **JACKETS**

.1 PVC Plastic Jacket: ASTM C921, Sheet material, off-white colour.

.1 Minimum Service Temperature: -40 degrees C (-40 degrees F).

.2 Maximum Service Temperature: 66 degrees C (150 degrees F).

.3 Moisture Vapour Transmission: ASTM E96/E96M, 0.002 perm-inches.

.4 Thickness: 0.375 mm (15 mil).

.5 Connections: Pressure sensitive colour matching vinyl tape, Brush on welding adhesive or Tacks, as applicable to the application.

.6 Covering Adhesive Mastic: compatible with insulation.

.2 Canvas Jacket: UL listed.

.1 Fabric: ASTM C921, 220 g/sq. m (6 oz./sq. yd.), plain weave cotton treated with dilute fire retardant lagging adhesive.

.2 Lagging Adhesive: compatible with insulation.

.3 Aluminum Jacket: ASTM B209M (ASTM B209).

.1 Thickness: 0.50 mm (0.020 inch) sheet.

.2 Finish: Embossed.

.3 Joining: Longitudinal slip joints and 50 mm (2 inch) laps.

.4 Metal Jacket Bands: 0.25 mm (0.010 inch) thick stainless steel or aluminum.

Part 3 - Execution

3.1 **EXAMINATION**

.1 Verify existing conditions before starting work.

.2 Verify that equipment has been tested before applying insulation materials.

.3 Verify that surfaces are clean and dry, with foreign material removed.

3.2 **INSTALLATION**

.1 Install components to manufacturer's written instructions.

.2 Factory Insulated Equipment: Do not insulate.

.3 Exposed Equipment: Locate insulation and cover seams in least visible locations.

.4 Apply insulation close to equipment by grooving, scoring, and bevelling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

.5 Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapour barrier cement.

.6 New insulated equipment containing fluids below ambient temperature: Insulate entire system.

.7 Fibre glass insulated equipment containing fluids below ambient temperature: Provide vapour barrier jackets, factory-applied or field-applied. Finish with glass cloth and vapour barrier adhesive.

.8 Fibre glass insulated equipment containing fluids above ambient temperature: Provide standard jackets, with or without vapour barrier, factory-applied or field-applied. Finish with glass cloth and adhesive.

.9 Inserts and Shields:

.1 Application: Equipment 50 mm (2 inch) diameter or larger.

.2 Shields: Galvanized steel between hangers and inserts.

.3 Insert location: Between support shield and equipment and under the finish jacket.

.4 Insert configuration: Minimum 150 mm (6 inches) long, of same thickness and contour as adjoining insulation; may be factory fabricated.

.5 Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

END OF SECTION

Part 1 - General

1.1 SECTION INCLUDES

.1 Piping insulation.

.2 Jackets and accessories.

1.2 RELATED SECTIONS

.1 Section 22 10 00 - Plumbing Piping: Placement of hangers and hanger inserts.

.2 Section 23 05 53 - Mechanical Identification.

.3 Section 23 21 00 - Hydronic Piping: Placement of hangers and hanger inserts.

1.3 REFERENCES

.1 Unless noted otherwise, comply with latest edition, including Amendments, of the following Codes and Standards.

.2 Ontario Building Code (OBC)

.3 ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.4 ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.5 ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

.6 ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.

.7 ASTM C335/C335M-10e1 - Standard Test Method for Steady-State Heat Transfer Properties of Pipe Insulation.

.8 ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.

.9 ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

.10 ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.

.11 ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

.12 ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.

.13 ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation.

.14 ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

.15 ASTM C585 - Standard Practice for Inner and Outer Diameters of Thermal Insulation for Nominal Sizes of Pipe and Tubing.

.16 ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.

.17 ASTM C610 - Standard Specification for Molded Expanded Perlite Block and Pipe Thermal Insulation.

.18 ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.19 ASTM D1056 - Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.

.20 ASTM D1667 - Standard Specification for Flexible Cellular Materials - Poly (Vinyl Chloride) Foam (Closed-Cell).

.21 ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.

.22 ASTM E84-15a - Standard Test Method for Surface Burning Characteristics of Building Materials.

.23 ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.

.24 NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

.25 UL 723-2008 - Tests for Surface Burning Characteristics of Building Materials

1.4 **SUBMITTALS FOR REVIEW**

.1 Product Data: Provide product description, list of materials and thickness for each service, and locations.

1.5 **SUBMITTALS FOR INFORMATION**

.1 Installation Data: Manufacturer's special installation requirements including procedures which ensure acceptable workmanship and installation standards will be achieved.

1.6 **QUALITY ASSURANCE**

.1 Products of This Section: Manufactured to ISO 9000 certification requirements.

.2 Materials: Flame spread/smoke developed rating of 25/50 or less to NFPA 255.

.3 Applicator: Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience.

1.7 **DELIVERY, STORAGE, & PROTECTION**

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

.2 Store insulation in original wrapping and protect from weather and construction traffic.

.3 Protect insulation against dirt, water, chemical, and mechanical damage.

1.8 **SITE CONDITIONS**

.1 Ambient Conditions:

.1 Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

.2 Maintain temperature during and after installation for minimum period of twenty-four (24) hours.

Part 2 - Products

2.1 **GLASS FIBRE**

.1 Insulation: ASTM C547, rigid moulded, non-combustible.

.1 Thermal Conductivity (K-factor): ASTM C335/C335M, 0.035 W/m.K at 24 degrees C (0.24 BTU.in/h.sq. ft. at 75 degrees F).

.2 Minimum Service Temperature: -28.9 degrees C (-20 degrees F)

.3 Maximum Service Temperature: 232 degrees C (450 degrees F).

.4 Maximum Moisture Absorption: 0.2% by volume.

.2 Vapour Barrier Jacket:

.1 ASTM C921, White kraft paper reinforced with glass fibre yarn and bonded to aluminized film.

.2 Moisture Vapour Transmission: ASTM E96/E96M, 0.03 ng/(Pa s sq. m) (0.02 perm inches).

.3 Secure with self sealing longitudinal laps and butt strips.

.4 Secure with outward clinch expanding staples and vapour barrier mastic.

.3 Tie Wire: 1.3 mm (18 ga) stainless steel with twisted ends on maximum 300 mm (12 inch) centres.

.4 Vapour Barrier Lap Adhesive: Compatible with insulation.

.5 Insulating Cement/Mastic: ASTM C195, hydraulic setting on mineral wool.

.6 Fibrous Glass Fabric:

.1 Cloth: Untreated; 305 g/sq. m (9 oz./sq. yd.) weight.

.2 Blanket: 16 kg/cu m (1 lb/cu ft.) density.

.7 Indoor Vapour Barrier Finish: Vinyl emulsion type acrylic, compatible with insulation, white colour.

.8 Outdoor Vapour Barrier Mastic: Vinyl emulsion type acrylic, compatible with insulation, white colour.

.9 Insulating Cement: ASTM C449.

2.2 **CELLULAR GLASS**

.1 Insulation: ASTM C552.

.1 Thermal Conductivity (K-factor): 0.058 W/m.K at 24 degrees C (0.40 BTU.in/h.sq. ft. at 75 degrees F).

.2 Maximum Water Vapour Transmission: 0.1 perm.

2.3 **JACKETS**

.1 PVC Plastic:

.1 Jacket: ASTM C921, One-piece moulded type fitting covers and sheet material, off white colour.

.1 Minimum Service Temperature: -40 degrees C (-40 degrees F).

.2 Maximum Service Temperature: 66 degrees C (150 degrees F).

.3 Moisture Vapour Transmission: ASTM E96/E96M; 0.002 perm inches.

.4 Maximum Flame Spread: ASTM E84, 25.

.5 Maximum Smoke Developed: ASTM E84, 50.

.6 Thickness: 0.25 mm (10 mil), 0.38 mm (15 mil), 0.5 mm (20 mil) 0.76 mm (30 mil) , as applicable to the application.

.7 Connections: Brush on welding adhesive, Tacks or Pressure sensitive colour matching vinyl tape, as applicable to the application.

.2 Covering Adhesive Mastic: Compatible with insulation.

.2 ABS Plastic:

.1 Jacket: One-piece moulded type fitting covers and sheet material, off white colour.

.1 Minimum Service Temperature: -40 degrees C (-40 degrees F).

.2 Maximum Service Temperature of 82 degrees C (180 degrees F).

.3 Moisture Vapour Transmission: ASTM E96/E96M, 0.012 perm inches.

.4 Thickness: 0.76 mm (30 mil).

.5 Connections: Brush on welding adhesive.

.3 Canvas Jacket: UL listed.

.1 Fabric: ASTM C921, 220 g/sq. m (6 oz./sq. yd.), plain weave cotton treated with dilute fire retardant lagging adhesive.

.2 Lagging Adhesive: Compatible with insulation.

.4 Aluminum Jacket: ASTM B209M/B209.

.1 Thickness: 0.40 mm (0.016 inch) sheet.

.2 Finish: Embossed or Smooth, as applicable to the application.

.3 Joining: Longitudinal slip joints and 50 mm (2 inch) laps.

.4 Fittings: 0.40 mm (0.016 inch) thick die shaped fitting covers with factory attached protective liner.

.5 Metal Jacket Bands: 10 mm (3/8 inch) wide or 0.25 mm (0.010 inch) thick aluminum.

2.4 MATERIALS

.1 Domestic Cold Water:

.1 Piping: Fibreglass heavy density fibreglass insulation with factory applied all service vapour barrier jacket lapped and adhered with Flintkote 203 adhesive or equal. Insulation conductivity shall be in the range of 0.22 - 0.28 BTU in/(h.ft³.°F) with mean temperature of 100°F. Seal all joints with 4" (100 mm) wide strip of all service jacket material. Finished with a smooth layer of asbestos free finishing cement and covered with canvas.

.2 Exception: Domestic cold water IPEX and XFR do not require insulation.

.3 Fittings and valves: Moulded or fabricated mitred segments of a thickness equal to that of the pipe insulation and finished with a layer of asbestos free finishing cement, trowelled smooth and covered with canvas.

.4 Alternative method for insulating fittings: Pre-moulded high impact PVC fitting covers with fibreglass inserts, end joints sealed with PVC tape.

.5 Exposed insulation: Finish with PVC vapour barrier jacket and adhere with cement adhesive. Seal all joints with 4" (100 mm) wide strip of PVC tape. Colour of tape to match PVC cover.

.6 Insulation shall be of thicknesses as follows:

Pipe Size	Insulation Thickness
1/2" (13 mm) - 1-1/4" (32 mm) ∅ pipe	1/2" (15 mm)
1-1/2" (40 mm) - 8" (200 mm) ∅ pipe	1" (25 mm)

.2 Domestic Hot Water (71°C), Tempered (49°C), All temperatures Domestic Hot Water Recirculation Piping:

.1 Piping: Fibreglass heavy density fibreglass insulation with factory applied all service jacket lapped and adhered with Flintkote #203 adhesive or equal. Seal all joints with 4" (100 mm) wide strip of all service jacket material. Insulation conductivity shall be in the range of 0.22 - 0.28 BTU in/(h.ft³.°F) with mean temperature of 100°F (38°C).

.2 Exception: domestic hot water IPEX and XFR pipe insulation to be same as pipe insulation as noted for domestic cold water piping insulation in Item 2.4.1.6.

.3 Fittings and Valves: Moulded or fabricated mitred segments of a thickness equal to that of the pipe insulation and finished with a layer of asbestos free finishing cement, trowelled smooth and covered with canvas.

.4 Alternative method for insulating fittings: Pre-moulded high impact PVC fitting covers with fibreglass inserts, end joints sealed with PVC tape.

.5 Exposed Insulation: Finish with PVC vapour barrier jacket and adhere with cement adhesive. Seal all joints with 4" (100 mm) wide strip of PVC tape.

.6 Insulation shall be of thicknesses as follows:

Pipe Size	Insulation Thickness
1/2" (15 mm) - 1-1/4" (32 mm) ∅ pipe	1" (25 mm)
1-1/2" (40 mm) - 4" (100 mm) ∅ pipe	1-1/2" (40 mm)

.3 Hot Water and Drain Piping at Handicapped Fixtures:

.1 Armstrong Armaflex 2000 self seal pipe insulation, closed cell elastomeric and flexible, 1/2" (15 mm) thickness. Secure joints with 3M #471 tape.

.2 Exposed Insulation: Finish with one (1) piece PVC vapour barrier jacket and adhere with adhesive.

.4 Heating Supply and Return Piping (System Temperature of 141 Deg. F - 200 Deg. F (61 Deg. C - 94 Deg. C)):

.1 Piping: Fibreglass heavy density fibreglass insulation with factory applied all service jacket lapped and adhered with Flintkote #203 adhesive or equal. Seal all joints with 4" (100 mm) wide strip of all service jacket material. Insulation conductivity shall be in the range of 0.25 - 0.29 BTU. in./(h.ft.^{3}Deg.F) with mean temperature of 125 Deg. F.

.2 Fittings Valves and Flanges: Moulded or fabricated segments of a thickness equal to that of the pipe insulation and finished with a layer of asbestos free finishing cement, trowelled smooth and covered with canvas.

.3 Alternative method for insulating fittings: Pre-moulded high impact PVC fitting covers with fibreglass inserts, end joints sealed with PVC tape.

.4 Exposed Insulation: Finish with PVC vapour barrier jacket and adhere with cement adhesive. Seal all joints with 4" (100 mm) wide strip of PVC tape.

.5 Insulation shall be of thicknesses as follows:

Pipe Size	Insulation Thickness
1/2" (15 mm) - 1-1/4" (32 mm) diameter pipe	1-1/2" (40 mm)
1-1/2" (40 mm) - 8" (200 mm) diameter pipe	2" (50 mm)

Part 3 - Execution

3.1 EXAMINATION

.1 Verify existing conditions before starting work.

.2 Verify that piping has been tested before applying insulation materials.

.3 Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

.1 Install materials to manufacturer's written instructions.

.2 On exposed piping, locate insulation and cover seams in least visible locations.

.3 Insulated dual temperature pipes or cold pipes conveying fluids below ambient temperature:

.1 Provide vapour barrier jackets, factory applied or field applied.

.2 Insulate fittings, joints, and valves with moulded insulation of like material and thickness as adjacent pipe.

.3 Finish with glass cloth and vapour barrier adhesive.

.4 PVC fitting covers may be used.

.5 Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations.

.6 Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies and expansion joints.

.4 For insulated pipes conveying fluids above ambient temperature:

.1 Provide standard jackets, with or without vapour barrier, factory applied or field applied.

.2 Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe.

.3 Finish with glass cloth and adhesive.

.4 PVC fitting covers may be used.

.5 For hot piping conveying fluids 60 degrees C (140 degrees F) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

.6 For hot piping conveying fluids over 60 degrees C (140 degrees F), insulate flanges and unions at equipment.

.5 Inserts and Shields:

.1 Application: Piping 50 mm (2 inch)diameter or larger.

.2 Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.

.3 Insert Location: Between support shield and piping and under the finish jacket.

.4 Insert Configuration: Minimum 150 mm (6 inches) long, of same thickness and contour as adjoining insulation; may be factory fabricated.

.5 Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

.6 Finish insulation at supports, protrusions, and interruptions.

.7 For pipe exposed in mechanical equipment rooms, finish with canvas jacket sized for finish painting.

.8 Exposed Pipe Finish (Indoors):

.1 All exposed insulated piping and fittings shall be finished with a fire retardant PVC jacket.

.2 PVC cover shall be minimum 0.02 gauge, hot rolled complete with self seal lap.

.3 All seams to be fused by Shurweld reinforcement. DO NOT USE TAPE.

.4 Provide PVC end caps for piping 1-1/2"Ø (40 mm Ø) and larger. Caulk end fittings with silicone sealant equal to Dow Corning 999-A on piping 1-1/4"Ø (32 mm Ø) or less.

.5 Joints for pipe fitting connections (Tees, Wyes, etc.) shall be sealed with silicone sealant as above.

.6 PVC fittings do not require jacketing.

.7 No additional finish need be applied to the concealed piping.

.8 No PVC finish shall be applied until the Consultant has inspected the insulation for type, adhesive and cracks.

.9 Pipe insulation concealed within structure, all joints and edges shall be taped with reinforced foil faced tape.

.9 PVC Fitting Cover:

.1 The factory pre-molded, one-piece PVC insulated fitting cover shall have the proper factory pre-cut insulation applied to the exposed fitting.

.2 The ends of the insulation shall be tucked snugly into the throat of the fitting and the edges adjacent to the pipe covering tufted and tucked in, fully insulating the pipe fitting.

.3 The one-piece PVC fitting cover is then sealed with Dow-Corning 999A silicone sealant.

.4 Cold and chilled water shall have all seam edges of the cover sealed with vapour barrier, pressure-sensitive, colour-matching tape.

.5 Steam and condensate pipe fitting shall be heavy gauge PVC.

3.3 **TOLERANCE**

.1 Substituted insulation materials: Thermal resistance within 10% at normal conditions, as materials indicated.

END OF SECTION

Part 1 - General

1.1 SECTION INCLUDES

.1 Pipe and pipe fittings for:

.1 Heating water piping system.

.2 Equipment drains and overflows.

.2 Valves:

.1 Gate valves.

.2 Globe or angle valves.

.3 Ball valves.

.4 Plug valves.

.5 Butterfly valves.

.6 Check valves.

1.2 RELATED SECTIONS

.1 Section 23 05 16 - Piping Expansion Compensation.

.2 Section 23 05 53 - Mechanical Identification.

.3 Section 23 05 48 - Vibration Isolation.

.4 Section 23 07 19 - Piping Insulation.

.5 Section 23 21 16 - Hydronic Specialties.

.6 Section 23 25 00 - Chemical Treatment for New Piping.

.7 Division 26: Electrical characteristics and wiring connections.

1.3 REFERENCES

.1 Unless noted otherwise, comply with latest edition, including Amendments, of the following Codes and Standards.

.2 Ontario Building Code (OBC)

.3 ASME Boiler and Pressure Vessel Code (BPVC), Section IX-2105 - Welding and Brazing Qualifications.

.4 ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300.

.5 ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

.6 ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

.7 ASME B31.5 - Refrigeration Piping and Heat Transfer Components.

.8 ASME B31.9 - Building Services Piping.

.9 ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

.10 ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

.11 ASTM B32 - Standard Specification for Solder Metal.

.12 ASTM B88M - Standard Specification for Seamless Copper Water Tube.

.13 ASTM B88 - Standard Specification for Seamless Copper Water Tube.

.14 ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

.15 ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.

.16 ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).

.17 ASTM D2310 - Standard Classification for Machine-Made "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.

.18 ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

.19 ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

.20 ASTM D2680 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping.

.21 ASTM D2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.

.22 ASTM D2751 - Standard Specification for Acrylonitrile Butadiene Styrene (ABS) Sewer Pipe and Fittings.

.23 ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.

.24 ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

.25 ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing.

.26 ASTM F877 - Standard Specification for Crosslinked Polyethylene (PEX) Plastic Hot and Cold Water Distribution Systems.

.27 AWS A5.8/A5.8M-AMD 1 - Specification for Filler Metals for Brazing and Braze Welding.

.28 AWS D1.1/D1.1M - Structural Welding Code - Steel.

.29 AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems.

.30 AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings for Water.

.31 AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

.32 AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast.

.33 MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

1.4 **SYSTEM DESCRIPTION**

.1 Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

.2 Use grooved mechanical couplings and fasteners in accessible locations.

.3 Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.

.4 Use non-conducting dielectric connections whenever jointing dissimilar metals in open systems.

.5 Provide pipe hangers and supports to ASME B31.9 unless indicated otherwise.

.6 Use isolating valves for shut-off and to isolate equipment, part of systems, or vertical risers.

.7 Use ball valves for throttling, bypass, or manual flow control services.

.8 Use spring loaded check valves on discharge of condenser water pumps.

.9 Use plug cocks for throttling service. Use non-lubricated plug cocks only when shut-off or isolating valves are also provided.

.10 Use lug end butterfly valves to isolate equipment.

.11 Use 20 mm (3/4 inch), ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. Pipe to nearest floor drain.

1.5 **SUBMITTALS FOR REVIEW**

.1 Product Data: Include data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.

1.6 **SUBMITTALS FOR INFORMATION**

.1 Welders Certificate: Include welders certification of compliance with ASME BPVC-Section IX or AWS D1.1/D1.1M, as applicable to the application.

.2 Installation Data: Manufacturers special installation requirements including hanging and support methods, joining procedures.

1.7 **CLOSEOUT SUBMITTALS**

.1 Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

.2 Record Documentation: Record actual locations of valves.

1.8 **MAINTENANCE MATERIAL SUBMITTALS**

.1 Extra Stock Materials: Provide two (2) repacking kits for each size and valve type.

1.9 **QUALITY ASSURANCE**

.1 Products of This Section: Manufactured to ISO 9000 certification requirements.

.2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

.3 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience.

.4 Welders: Certify to ASME BPVC-Section IX or AWS D1.1/D1.1M.

1.10 **REGULATORY REQUIREMENTS**

.1 Conform to ASME B31.9 code for installation of piping system.

.2 Welding Materials and Procedures: Conform to ASME BPVC-Section IX and applicable provincial labour regulations.

.3 Provide certificate of compliance from authority having jurisdiction indicating approval of welders.

1.11 **DELIVERY, STORAGE, & PROTECTION**

.1 Accept valves on site in shipping containers with labeling in place. Inspect for damage.

.2 Provide temporary protective coating on cast iron and steel valves.

.3 Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

.4 Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.12 **SITE CONDITIONS**

.1 Ambient Conditions: Do not install underground piping when bedding is wet or frozen.

Part 2 - Products

2.1 **HEATING WATER PIPING, ABOVE GROUND**

.1 Steel Pipe: ASTM A53/A53M, Schedule 40, 10 mm (3/8 inch) for wall for sizes 300 mm (12 inches) and over, black.

.1 Fittings: ASME B16.3, malleable iron or ASTM A234/A234M, forged steel welding type fittings.

.2 Joints: Threaded, or AWS D1.1/D1.1M, welded.

.2 Copper Tubing: ASTM B88M (ASTM B88).

.1 Fittings: ASME B16.18, cast brass, or ASME B16.22, solder wrought copper.

.2 Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.

.3 Joints:

.1 Solder, lead free, ASTM B32 tin-antimony, or tin and silver, with melting range 220-280 degrees C (430-535 degrees F).

2.2 **EQUIPMENT DRAINS & OVERFLOWS**

.1 Steel Pipe: ASTM A53/A53M, Schedule 40 galvanized.

.1 Fittings: Galvanized cast iron, or ASME B16.3, malleable iron.

.2 Joints: Threaded, or grooved mechanical couplings.

.2 Copper Tubing: ASTM B88M (ASTM B88), Type H (drawn).

.1 Fittings: ASME B16.18, cast brass, or ASME B16.22, solder wrought copper.

.2 Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 220 to 280 degrees C (430 to 535 degrees F).

.3 PVC Pipe: ASTM D1785, Schedule 40, and Schedule 80 for sizes 200 mm (8 inches) and larger or ASTM D2241, SDR 21 or 26.

.1 Fittings: ASTM D2466 ASTM D2467, PVC.

.2 Joints: ASTM D2855, solvent weld.

.4 ABS Pipe: ASTM D2680 ASTM D2751.

.1 Fittings: ASTM D2751.

.2 Joints: ASTM D2235, solvent weld.

2.3 **PIPE HANGERS & SUPPORTS**

.1 Conform to ASME B31.9, ASTM F708, MSS SP-58].

.2 Hangers for Pipe Sizes 13 to 38 mm (1/2 to 1-1/2 inch): Malleable iron or Carbon steel, adjustable swivel, split ring.

.3 Hangers for Cold Pipe Sizes 50 mm (2 inches) and Over: Carbon steel, adjustable, clevis.

.4 Hangers for Hot Pipe Sizes 50 to 100 mm (2 to 4 inches): Carbon steel, adjustable, clevis.

.5 Hangers for Hot Pipe Sizes 150 mm (6 inches) and Over: Adjustable steel yoke, cast iron roll, double hanger.

.6 Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

.7 Multiple or Trapeze Hangers for Hot Pipe Sizes 150 mm (6 inches) and Over: Steel channels with welded spacers and hanger rods, cast iron roll.

.8 Wall Support for Pipe Sizes to 76 mm (3 inches): Cast iron hook.

.9 Wall Support for Pipe Sizes 100 mm (4 inches) and Over: Welded steel bracket and wrought steel clamp.

.10 Wall Support for Hot Pipe Sizes 150 mm (6 inches) and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.

.11 Vertical Support: Steel riser clamp.

.12 Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

.13 Floor Support for Hot Pipe Sizes to 100 mm (4 inches): Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

.14 Floor Support for Hot Pipe Sizes 150 mm (6 inches) and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

.15 Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

.16 Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

.17 Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.4 UNIONS, FLANGES, & COUPLINGS

.1 Unions for Pipe 50 mm (2 inches) and Under:

.1 Ferrous Piping: 1034 kPa (150 psig) malleable iron, threaded.

.2 Copper Pipe: Bronze, soldered joints.

.2 Flanges for Pipe Over 50 mm (2 inches):

.1 Ferrous Piping: 1034 kPa (150 psig) forged steel, slip-on.

.2 Copper Piping: Bronze.

.3 Gaskets: 1.6 mm (1/16 inch) thick preformed neoprene.

.3 Grooved and Shouldered Pipe End Couplings:

.1 Housing Clamps: Malleable iron galvanized to engage and lock, designed to permit some angular deflection, contraction, and expansion.

.2 Sealing Gasket: C-shape elastomer composition for operating temperature range from -34 degrees C (-30 degrees F) to 110 degrees C (230 degrees F).

.3 Accessories: Steel bolts, nuts, and washers.

.4 Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.5 GATE VALVES

.1 Up To and Including 50 mm (2 inches):

.1 Manufacturers:

.1 Crane

.2 Grinnell

.3 Newman-Hattersley

.4 Milwaukee

.5 Kitz
.6 Victaulic

.2 Bronze body, bronze trim, screwed bonnet, rising stem, lockshield stem, inside screw with backseating stem, solid wedge disc, alloy seat rings, threaded ends.

.2 Over 50 mm (2 inches):

.1 Manufacturers:
.1 Crane
.2 Grinnell
.3 Newman-Hattersley
.4 Milwaukee
.5 Kitz
.6 Victaulic

.2 Iron body, bronze trim, bolted bonnet, rising stem, handwheel, outside screw and yoke, solid wedge disc with bronze seat rings, flanged or grooved ends.

2.6 **GLOBE OR ANGLE VALVES**

.1 Up To and Including 50 mm (2 inches):

.1 Manufacturers:
.1 Crane
.2 Grinnell
.3 Newman-Hattersley
.4 Milwaukee
.5 Kitz
.6 Victaulic

.2 Bronze body, bronze trim, bonnet, rising stem and handwheel, inside screw [with backseating stem], [renewable composition disc and bronze seat], renewable plug disc and stainless steel seat ring, threaded ends.

.2 Over 50 mm (2 inches):

.1 Manufacturers:
.1 Crane
.2 Grinnell
.3 Newman-Hattersley
.4 Milwaukee
.5 Kitz
.6 Victaulic

.2 Iron body, bronze trim, bolted bonnet, rising stem, handwheel, outside screw and yoke, rotating plug-type disc with renewable seat ring and disc, flanged ends.

2.7 **BALL VALVES**

.1 Up To and Including 50 mm (2 inches):

.1 Manufacturers:
.1 Crane
.2 Grinnell
.3 Newman-Hattersley
.4 Milwaukee
.5 Kitz

.6 Victaulic

.2 Bronze Stainless steel, one (1) body, stainless steel ball, teflon seats and stuffing box ring, lever handle with balancing stops, solder or threaded ends with union.

.2 Over 50 mm (2 inches):

.1 Manufacturers:

.1 Crane
.2 Grinnell
.3 Newman-Hattersley
.4 Milwaukee
.5 Kitz
.6 Victaulic

.2 Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle, or gear drive handwheel for sizes 250 mm (10) and over, flanged.

2.8 **PLUG VALVES**

.1 Up To and Including 50 mm (2 inches):

.1 Manufacturers:

.1 Crane
.2 Grinnell
.3 Newman-Hattersley
.4 Milwaukee
.5 Kitz
.6 Victaulic

.2 Bronze body, bronze tapered plug, full port opening, non-lubricated, teflon packing, threaded ends.

.3 Operator: One plug valve wrench for every ten plug valves minimum of one.

.2 Over 50 mm (2 inches):

.1 Manufacturers:

.1 Crane
.2 Grinnell
.3 Newman-Hattersley
.4 Milwaukee
.5 Kitz
.6 Victaulic

.2 Cast iron body and plug, full port opening, pressure lubricated, teflon packing, flanged ends.

.3 Operator: Each plug valve with a wrench with set screw.

2.9 **BUTTERFLY VALVES**

.1 Manufacturers:

.1 Crane
.2 Grinnell
.3 Newman-Hattersley
.4 Milwaukee
.5 Kitz
.6 Victaulic

.2 Body: Cast or ductile iron with resilient replaceable EPDM seat, wafer or lug ends, extended neck.

.3 Disc: Stainless steel

.4 Operator: Infinite position lever handle with memory stop.

2.10 **SWING CHECK VALVES**

.1 Up To and Including 50 mm (2 inches):

.1 Manufacturers:

.1 Crane
.2 Grinnell
.3 Newman-Hattersley
.4 Milwaukee
.5 Kitz
.6 Victaulic

.2 Bronze body, bronze trim, bronze rotating swing disc, with composition disc, threaded ends.

.2 Over 50 mm (2 inches):

.1 Manufacturers:

.1 Crane
.2 Grinnell
.3 Newman-Hattersley
.4 Milwaukee
.5 Kitz
.6 Victaulic

.2 Iron body, bronze trim, bronze or bronze faced rotating swing disc, renewable disc and seat, flanged ends.

2.11 **SPRING LOADED CHECK VALVES**

.1 Manufacturers:

.1 Crane
.2 Grinnell
.3 Newman-Hattersley
.4 Milwaukee
.5 Kitz
.6 Victaulic

.2 Iron body, bronze trim, split plate, hinged with stainless steel spring, resilient seal bonded to body, wafer or threaded lug ends.

Part 3 - Execution

3.1 **PREPARATION**

.1 Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

.2 Remove scale and dirt on inside and outside before assembly.

.3 Prepare piping connections to equipment with flanges or unions.

.4 Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

.5 After completion, fill, clean, and treat systems. Refer to Section 23 25 00.

3.2 **INSTALLATION**

.1 Install to manufacturer's written instructions.

.2 Install heating water, glycol, chilled water condenser water, and engine exhaust piping to ASME B31.9. Install chilled water piping to ASME B31.5.

.3 Route piping in orderly manner, parallel to building structure, and maintain gradient.

.4 Install piping to conserve building space, and not interfere with use of space.

.5 Group piping whenever practical at common elevations.

.6 Sleeve pipe passing through partitions, walls and floors.

.7 Slope piping and arrange to drain at low points.

.8 Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 23 05 16.

.9 Inserts:

.1 Provide inserts for placement in concrete formwork.

.2 Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

.3 Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 100 mm (4 inches).

.4 Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

.5 Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above flush with top of recessed into and grouted flush with slab.

.10 Pipe Hangers and Supports:

.1 Install to ASTM F708 ASME B31.9.

.2 Support horizontal piping as scheduled.

.3 Install hangers to provide minimum 13 mm (1/2 inch) space between finished covering and adjacent work.

.4 Place hangers within 300 mm (12 inches) of each horizontal elbow.

.5 Use hangers with 38 mm (1-1/2 inch) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

.6 Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.

.7 Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

.8 Provide copper plated hangers and supports for copper piping sheet lead packing between hanger or support and piping.

.9 Prime coat exposed steel hangers and supports. Refer to Section 09 90 00. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

.11 Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 23 07 19.

.12 Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.

.13 Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

.14 Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

.15 Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting.

.16 Install valves with stems upright or horizontal, not inverted.

3.3 **SCHEDULES**

.1 Hanger Rod:

Pipe Size	Max. Hanger Spacing	Diameter
12-32 mm (1/2-1-1/4 inch)	2 mm (6.5 inch)	9 mm (3/8 inch)
38-50 mm (1-1/2-2 inch)	3 mm (10 inch)	9 mm (3/8 inch)
62-75 mm (2-1/2-3 inch)	3 mm (10 inch)	13 mm (1/2 inch)
100-150 mm (4-6 inch)	3 mm (10 inch)	15 mm (5/8 inch)
200-300 mm (8-12 inch)	4.25 mm (14 inch)	22 mm (7/8 inch)
350 mm and over (14 inch and over)	6 mm (20 inch)	25 mm (1 inch)
PVC (All Sizes)	1.8 mm (6 inch)	9 mm (3/8 inch)

END OF SECTION

Part 1 - General

1.1 SECTION INCLUDES

.1 Air vents.

.2 Flow indicators, controls, meters.

.3 Relief valves.

1.2 RELATED SECTIONS

.1 Section 22 42 01 - Plumbing Specialties: Backflow Preventers.

.2 Section 23 21 00 - Hydronic Piping.

.3 Section 23 25 00 - Chemical Treatment for New Piping: Pipe Cleaning.

1.3 REFERENCES

.1 Unless noted otherwise, comply with latest edition, including Amendments, of the following Codes and Standards.

.2 Ontario Building Code (OBC)

.3 ASME Boiler and Pressure Vessels Code (BPVC), Section VIII-1-2105 - Rules for Construction of Pressure Vessels.

1.4 SUBMITTALS FOR REVIEW

.1 Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description, model and dimensions.

1.5 SUBMITTALS FOR INFORMATION

.1 Certificates: Submit inspection certificates for pressure vessels from authority having jurisdiction.

.2 Installation Data: Indicate hanging and support methods, joining procedures.

1.6 CLOSEOUT SUBMITTALS

.1 Maintenance Contracts:

.1 Provide service and maintenance of glycol system for one (1) year from date of substantial completion.

.2 Monthly visit to make glycol fluid concentration analysis on site with refractive index measurement instrument. Detail findings with maintenance personnel in writing of corrective actions needed including analysis and amounts of glycol or water added.

.2 Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

.3 Record Documentation: Record actual locations of flow controls flow meters.

1.7 QUALITY ASSURANCE

.1 Products of This Section: Manufactured to ISO 9000 certification requirements.

.2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

1.8 **DELIVERY, STORAGE, & PROTECTION**

.1 Accept valves on site in shipping containers with labeling in place. Inspect for damage.

.2 Provide temporary protective coating on cast iron and steel valves.

.3 Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

.4 Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

Part 2 - Products

2.1 **AIR VENTS**

.1 Manual Type: Short vertical sections of 50 mm (2 inch) diameter pipe to form air chamber, with 3 mm (1/8 inch) brass needle valve at top of chamber.

.2 Float Type:

.1 Manufacturers:

.1 Armstrong

.2 Braukmann

.3 Amtrol

.4 ITT

.2 Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.

.3 Cast iron body and cover, float, bronze pilot valve mechanism suitable for system operating temperature and pressure; with isolating valve.

.3 Washer Type:

.1 Manufacturers:

.1 Armstrong

.2 Braukmann

.3 Amtrol

.4 ITT

.2 Brass with hydroscopic fibre discs, vent ports, adjustable cap for manual shut-off, and integral spring loaded ball check valve.

2.2 **CIRCUIT BALANCING VALVES**

.1 Manufacturers:

.1 S. A. Armstrong

.2 Tour & Anderson

.3 Watts

.4 Newman-Hattersley

.2 Construction: Brass body with union on inlet and outlet, temperature and pressure test plug on outlet and blowdown/backflush drain.

.3 Calibration: Control flow within 5% of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 24 kPa (3.5 psig).

.4 Control Mechanism: Stainless steel or nickel plated brass piston or regulator cup, operating against stainless steel helical or wave formed spring.

.5 Accessories: In-line strainer on inlet and ball valve on outlet.

2.3 **RELIEF VALVES**

.1 Manufacturers:

.1 Watts
.2 S. A. Armstrong
.3 Bell & Gossett

.2 Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME BPVC certified and labelled.

2.4 **COMBINATION AUTOMATIC FLOW LIMITING VALVE/SHUT OFF VALVE**

.1 Manufacturers:

.1 Bell & Gossett Circuit Sentry
.2 Watts
.3 S. A. Armstrong

.2 Combination Automatic Flow Limiting Valve/Shut Off Valve

.1 Body - Brass C37710
.2 Ball - Brass
.3 Ball Seat - PTFE
.4 Cartridge - Brass C3600

2.5 **PRESSURE GAUGES**

.1 To be 4-1/2" (115 mm) black cast aluminum case, black figures on white dial face, phosphor bronze tube, brass rotary movement, ranges to suit pressure of medium being measured, complete with needle valve. Provide pressure snubbers on pump suction and discharge.

.2 Trerice series 600C, with type FFG - No. 740 needle valves and No. 872 snubbers.

.3 Acceptable Products

.1 Trerice
.2 Winter
.3 Weiss
.4 Baker

2.6 **TEMPERATURE GAUGES**

.1 To be 7" (175 mm) high, aluminum case, Bi-metal thermometer, solar powered, calibrated in both deg. F & deg. C to suit range of medium being measured. All thermometers to include separable well.

.2 Base Bid: Trerice SX9

.3 Alternate Products:

.1 Winters
.2 Baker
.3 Weiss

2.7 **EXPANSION JOINTS**

.1 For steel pipe to be self equalizing type with two-ply stainless steel bellows, carbon steel shrouds and internal positive anti-torque device.

.1 Flexonics Model H or H3, or Hydro-Flex.

.2 For copper pipe to be self equalizing type with two-ply bronze bellows, all bronze construction and internal positive anti-torque device.

.1 Flexonics model HB or HB3 or Hydro-Flex.

2.8 **FLEXIBLE CONNECTIONS**

.1 Provide flexible connectors with inner core or annularly corrugated stainless steel with an outer casing of two layers of braided high tensile steel. Hose to be complete with couplings and fittings of steel with threaded or flanged connections, depending on pipe size. Flexonics or Hydro-Flex.

2.9 **FLOW SWITCHES**

.1 To be single pole, double throw paddle type, stainless steel bearings, monel bellows, paddle, corrosion resistant with screw adjustment equal to McDonnell Miller Model FS4-3.

2.10 **FLEXIBLE METAL HOSE**

.1 Supply and install flexible metal hose equal to Senior Flexonics Inc., Type A1 and A6 high pressure braided metal hose constructed of T321 stainless steel hose and braid.

.2 Flexible hose not to exceed 12" (300 mm) in length.

Part 3 - Execution

3.1 **INSTALLATION**

.1 Install specialties to manufacturer written instructions.

.2 Where large air quantities can accumulate, provide enlarged air collection standpipes.

.3 Provide manual air vents at system high points and as indicated.

.4 For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.

.5 Provide valved drain and hose connection on strainer blow down connection.

.6 Select system relief valve capacity so that it is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.

.7 Pipe relief valve outlet to nearest floor drain.

.8 Where one line vents several relief valves, make cross sectional area equal to sum of individual vent areas.

END OF SECTION

Part 1 - General

1.1 SECTION INCLUDES

.1 Cleaning of pipe and fittings.

.2 Chemical treatment.

1.2 RELATED SECTIONS

.1 Section 23 21 00 - Hydronic Piping: Placement of water coupon rack, by-pass (pot) feeder.

.2 Section 25 50 02 - Digital Control Equipment.

.3 Division 26: Electrical characteristics and wiring connections.

1.3 REFERENCES

.1 Unless noted otherwise, comply with latest edition, including Amendments, of the following Codes and Standards.

.2 Ontario Building Code (OBC)

.3 CSA (Canadian Standards Association).

.4 UL (Underwriters Laboratories Inc.).

1.4 SUBMITTALS FOR REVIEW

.1 Shop Drawings: Indicate system schematic, equipment locations, and controls schematics, electrical characteristics and connection requirements.

.2 Product Data: Provide chemical treatment materials, chemicals, and equipment including electrical characteristics and connection requirements.

1.5 SUBMITTALS FOR INFORMATION

.1 Installation Data: Manufacturers special installation requirements including placement of equipment in systems, piping configuration, and connection requirements.

.2 Manufacturers Field Reports: Indicate start-up of treatment systems when completed and operating properly. Indicate analysis of system water after cleaning and after treatment.

.3 Submit certificate of compliance from authority having jurisdiction indicating approval of chemicals and their proposed disposal.

1.6 CLOSEOUT SUBMITTALS

.1 Maintenance Contracts:

.1 Provide service and maintenance of treatment systems for one year from Date of Substantial Completion.

.2 Provide four (4) monthly technical service visits to perform field inspections and make water analysis on site. Detail findings in writing on proper practices, chemical treating requirements, and corrective actions needed. Submit two copies of field service report after each visit.

.3 Provide laboratory and technical assistance services during this maintenance period.

.4 Include one (1) hour training course for operating personnel, instructing them on installation, care, maintenance, testing, and operation of water treatment systems. Arrange course at start up of systems.

.5 Coordinate with the Commissioning Agent.

.6 Provide onsite inspections of equipment during scheduled or emergency shutdown to properly evaluate success of water treatment program, and make recommendations in writing based upon these inspections.

.2 Record Documentation: Record actual locations of equipment and piping, including sampling points and location of chemical injectors.

.3 Operation and Maintenance Data: Include data on chemical feed pumps, agitators, and other equipment including spare parts lists, procedures, and treatment programs. Include step by step instructions on test procedures including target concentrations.

1.7 **MAINTENANCE MATERIAL SUBMITTALS**

.1 Extra Stock Materials: Provide sufficient chemicals for treatment and testing during warranty period.

1.8 **QUALITY ASSURANCE**

.1 Products of This Section: Manufactured to ISO 9000 certification requirements.

.2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) documented experience. Company to have local representatives with water analysis laboratories and full time service personnel.

.3 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience.

1.9 **REGULATORY REQUIREMENTS**

.1 Conform to applicable code for addition of non-potable chemicals to building mechanical systems, and for to public sewage systems.

Part 2 - Products

2.1 **MANUFACTURERS**

.1 Design is based on Precision Plumbign & Heating - 416-558-0993

.2 Acceptable Products:

.1 Jutzi Water Systems

.2 Specialty Chemicals

.3 Precision Plumbign & Heating

2.2 **MATERIALS**

.1 System Cleaner:

.1 Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products; sodium tri-poly phosphate and sodium molybdate.

.2 Biocide; Chlorine release agents such as sodium hypochlorite or calcium hypochlorite, or microbiocides such as quaternary ammonia compounds, tributyl tin oxide, methylene bis (thiocyanate), or isothiazolones.

.2 Closed System Treatment (Hot Water Heating):

.1 Sequestering agent to reduce deposits and adjust pH; polyphosphate.

.2 Corrosion Inhibitors: Liquid boron-nitrite, sodium nitrite and borax, sodium totyltriazole, low molecular weight polymers, phosphonates, sodium molybdate, or sulphites.

.3 Conductivity Enhancers: Phosphates or phosphonates.

2.3 **TEST EQUIPMENT**

.1 Provide white enamel test cabinet with local and fluorescent light, capable of accommodating 0.135 to 0.338 ml (4 to 10 oz.) zeroing titrating burettes and associated reagents.

.2 Provide the following test kits:

.1 Alkalinity titration test kit.
.2 Chloride titration test kit.
.3 Sulphite titration test kit.
.4 Total hardness titration test kit.
.5 Low phosphate test kit.
.6 Conductivity bridge, range 0 - 10,000 microohms.
.7 Creosol red pH slide complete with reagent.
.8 Portable electronic conductivity meter.
.9 High nitrite test kit.

2.4 **PRE-OPERATIONAL CLEANING OF NEW HEATING WATER SYSTEMS**

.1 Flush out piping systems after pressure test for a minimum of four (4) hours.

.2 Fill and back flush hot water heating pipe and radiation to mains.

.3 Fill and thoroughly flush new hot water heating pipe systems with a 1" (25 mm) diameter hose, every 100'-0" (30500 mm), connected to the domestic cold water system, complete with isolation valve and backflow preventer. Provide valved connections and all hoses. Upon completion of the flush out procedure, remove backflow preventer and cap pipe.

.4 When declared clean by the Water Treatment Company, circulate cleaner equal to Dearborn No. 345 cleaner at a dosage of 100 lb/1000 gallon (45 kg/4500L) system water for a period of 72 hours. This is cold water cleaner and can be used at water temperatures 50°F to 150°F (10°C to 65°C).

.5 At completion of a circulating period, system shall be drained and flushed with fresh water for a period of four (4) hours. Blow down drains of all duct mounted heat coils. Blow down drains at all system low points. The flushing of each low point shall be completed by flushing first with the supply valve open, return valve closed, and then the return valve open, supply valve closed. All strainers and filters shall be opened and cleaned. Chemical Treatment Company must approve flushing test at end of the cleaning period. Cleaning shall continue until system is accepted. Provide 24 hours advance notice.

.6 Each system shall be filled with clean water to give 7.6 pH in boiler system. Supply necessary chemicals to give above pH value. Chemicals must be approved by Ontario Ministry of Environment for this use and disposal.

.7 During cleaning operation, runtal units shall be disconnected and their hose connections used to by-pass water around each unit. Operate heating boiler to maintain 95°F (35°C) system water temperature. DO NOT EXCEED 109°F (43°C).

.8 Install treatment feeders for each piping system. Mount each feeder in by-pass around pumps in accordance with Manufacturer's directions. Provide valves and unions not supplied by Manufacturer.

.9 Charge system 20 lb/1000 gallons (9 kg/4500L) to give a Molybdate concentration of 70 ppm. Provide test kits for chemical treatment systems and instruct Owner's staff in their use. Provide monthly inspections over the Two-year warranty period to check system. Issue a monthly report to the Owner and the Consultant.

.10 Water Treatment Supplier to prepare final report on the system condition after all flushing and charging is complete.

2.5 **CLEANING & FLUSHING**

.1 The Water Treatment Company will supervise the entire cleaning and flushing operation of the system and witness the following:

.1 The system is flushed of all sand, gravel, and filings before cleaner is added.

.2 The proper strength of cleaner is added and circulated for the prescribed time.

.3 The system is thoroughly flushed again before chemicals are added.

.4 The proper dosage of chemicals is added.

.5 Cartridge filters are replaced at the proper intervals.

.2 Provide written confirmation to the Consultant that the above was completed.

Part 3 - Execution

3.1 **PREPARATION**

.1 Systems to be operational, filled, started, and vented prior to cleaning. Use water meter to record capacity in each system.

.2 Place terminal control valves in open position during cleaning.

.3 Verify that electric power is available and of the correct characteristics.

3.2 **CLEANING SEQUENCE**

.1 Concentration:

.1 As recommended by manufacturer.

.2 1 kg per 1000 L (1 lb per 100 gal) of water contained in the system.

.3 1 kg per 1000 L (1 lb per 100 gal) of water for hot systems and 1 kg per 500 L (1 lb per 50 gal) of water for cold systems.

.2 Hot Water Heating Systems:

.1 Apply heat while circulating, slowly raising temperature to 71 degrees C (160 degrees F) and maintain for twelve (12) hours minimum.

.2 Remove heat and circulate to 37.8 degrees C (100 degrees F) or less; drain systems as quickly as possible and refill with clean water.

.3 Circulate for six (6) hours at design temperatures, then drain.

.4 Refill with clean water and repeat until system cleaner is removed.

.3 Use neutralizer agents on recommendation of system cleaner supplier and approval of Consultant.

.4 Flush open systems and glycol filled closed systems with clean water for one (1) hour minimum. Drain completely and refill.

.5 Remove, clean, and replace strainer screens.

.6 Inspect, remove sludge, and flush low points with clean water after cleaning process is completed. Include disassembly of components as required.

3.3 **CLOSED SYSTEM TREATMENT**

.1 Provide one bypass feeder on each system. Install isolating and drain valves and necessary piping. Install around balancing valve downstream of circulating pumps unless indicated otherwise.

.2 Introduce closed system treatment through bypass feeder when required or indicated by test.

.3 Provide 19 mm (3/4 inch) water coupon rack around circulating pumps with space for four (4) test specimens.

3.4 **INSTALLATION**

.1 Provide adequate clearance to permit performance and servicing and maintenance of equipment.

.2 Pipe all drains and reliefs to nearest floor drain.

.3 Install pot feeder for each system. Mount each feeder in by-pass around pumps in accordance with manufacturer's direction. Provide valves and unions which are not supplied by manufacturer.

.4 Install cartridge filters for each system. Mount each filter in by-pass around pumps in accordance with manufacturer's directions. Provide valves and unions which are not supplied by manufacturer.

.5 Chemicals must be approved by the Ontario Ministry of the Environment for this use and disposal.

.6 Supply and install every 100'-0" (30 meters) on heating water pipe system, high capacity hose connections for high velocity flushing.

3.5 **WARRANTY PERIOD**

.1 Provide initial review of system connection and water analysis. Recommend treatment dosages.

.2 Provide the services of the Water Treatment Company representative for start-up assistance to instruct personnel in the use of chemicals.

.3 Provide system review and treatment analysis, reports, charts and log sheets every 90 calendar days during the warranty period.

.4 Provide all necessary laboratory and technical assistance.

END OF SECTION

Part 1 - General

1.1 SECTION INCLUDES

.1 Metal duct work.

.2 Duct cleaning.

.3 Kitchen Exhaust System

1.2 RELATED SECTIONS

.1 Section 23 05 29 - Supports and Anchors: Sleeves.

.2 Section 23 05 93 - Testing, Adjusting, and Balancing.

.3 Section 23 07 13 - Duct Insulation: External insulation and duct liner.

.4 Section 23 33 00 - Duct Work Accessories.

.5 Section 23 37 00 - Air Outlets & Inlets.

1.3 REFERENCES

.1 Unless noted otherwise, comply with latest edition, including Amendments, of the following Codes and Standards.

.2 Ontario Building Code (OBC)

.3 ASTM A90/A90M - Standard Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.

.4 ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

.5 ASTM A568/A568M - Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.

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

.7 ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

.8 ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

.9 ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.10 ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.11 NFPA 90A - Standard for Installation of Air Conditioning and Ventilating Systems.

.12 NFPA 90B - Standard Installation of Warm Air Heating and Air-Conditioning Systems.

.13 NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

.14 SMACNA 1884-2003 - Fibrous Glass Duct Construction Standards.

.15 SMACNA 016 - HVAC Air Duct Leakage Test Manual

.16 SMACNA 1966-2005 - HVAC Duct Construction Standards - Metal and Flexible.

.17 UL 181-2013 - Standard for Factory-Made Air Ducts and Air Connectors.

1.4 **PERFORMANCE REQUIREMENTS**

.1 No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts to ASHRAE table of equivalent rectangular and round ducts.

1.5 **SUBMITTALS FOR REVIEW**

.1 Product Data: Provide data for duct liner, duct connectors and duct materials.

.2 Shop Drawings: Indicate duct fittings, particulars such as gauges, sizes, welds, and configuration prior to start of work for the following systems.

.1 Kitchen hood exhaust.

1.6 **SUBMITTALS FOR INFORMATION**

.1 Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA 1966.

.2 Installation Data: Manufacturer's special installation requirements including special procedures for glass fibre ducts.

.3 Manufacturers Certificate: Certify that installation of glass fibre duct work meet or exceed specified requirements and recommended fabrication and installation requirements.

1.7 **CLOSEOUT SUBMITTALS**

.1 Record Documentation: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.8 **QUALITY ASSURANCE**

.1 Products of This Section: Manufactured to ISO 9000 certification requirements.

.2 Perform Work to - HVAC Duct Construction Standards - Metal and Flexible.

.3 Maintain one (1) copy of document on site.

.4 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

.5 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience.

1.9 **REGULATORY REQUIREMENTS**

.1 Construct duct work to NFPA 96 standards.

1.10 **ENVIRONMENTAL REQUIREMENTS**

.1 Ambient Conditions:

.1 Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

.2 Maintain temperatures during and after installation of duct sealants.

Part 2 - Products

2.1 RECTANGULAR LOW PRESSURE DUCT MATERIALS

.1 For the purpose of this specification low pressure ductwork is to be ducted for systems below 2" (500 Pa) static pressure. This includes all ductwork indicated on the Drawings with the exception of that indicated in other parts of this section. Duct shall be fabricated to SMACNA Duct Construction Standards, Section No. 1, and as follows:

.1 HVAC Duct Construction Standards - Metal and Flexible - latest edition.

.2 HVAC Duct Leakage Test Manual - latest edition.

.2 Ductwork shall be constructed to withstand 1-1/2 times the working static pressure with a leakage rate of 5% maximum and designed to operate at 1-1/2" w.g. (373 pa) maximum pressure.

.3 Fabricate ducts from smooth finish prime grade, new, open hearth, soft steel sheet, galvanized, conforming to manufacturer's standard thickness as specified herein.

.4 All sides of ducts over 10" (254 mm) in either dimension, to have all sides cross-broken or beaded at 12" (300 mm) spacing, except area of the duct where outlets are to be installed.

.5 Thickness & Reinforcing of Sheet Metal Ductwork, Material & Thickness:

Largest Duct Dimension	Steel Thickness Gauge (mm) Duct	Steel Thickness Gauge (mm) Slip	Aluminum Thickness Gauge (mm) duct	Recommend construction Transverse joints slip
Up to 12" (300 mm)	26 (0.551)	26 (0.551)	24	Flat drive cleat on side, flat s cleat on top and bottom. Joints on 96" (2440 mm) centres max.
13" to 20" (330 mm to 508 mm)	24 (0.701)	26 (0.551)	22	Flat drive cleat on side, 1" (25 mm) standing s cleat on top and bottom. Joints on 72" (1819 mm) centres max.
21" to 30" (533 mm to 762 mm)	24 (0.701)	26 (0.551)	22	Flat drive cleat on sides up to 20" (508 mm), and 1" (25 mm) standing drive slip over 20" (508 mm). Top and bottom 1" (25 mm) standing s cleat. Joints on 48" (1219 mm) centres maximum.
31" to 48" (787 mm to 1219 mm)	22 (0.853)	22 (0.853)	20 (1.01)	Flat drive cleat on sides up to 20" (508 mm), and 1" (25 mm) standing drive slip up to 30" (762 mm), and 1" gasketted and bolted formed flange over 30". Top and bottom 1" (25 mm) standing s cleat. Joints on 48" (1219 mm) centres maximum. *(* stays if required.)

Largest Duct Dimension	Steel Thickness Gauge (mm) Duct	Steel Thickness Gauge (mm) Slip	Aluminum Thickness Gauge (mm) duct	Recommend construction Transverse joints slip
49" to 60" (1245 mm to 1529 mm)	20 (1.01)	20 (1.01)	18 (1.16)	Flat drive cleat on sides up to 20" (508 mm), and 1" (25 mm) standing drive slip up to 30" (762 mm), and 1" gasketted and bolted formed flange over 30". Top and bottom 1-1/2" (40 mm) gasketted and bolted formed flange. Joints on 48" (1219 mm) centres maximum.

.6 The Contractor at his own discretion may also use flange duct joints; Ductmate or Nexxus.

.7 All bends or elbows shall be made with a radius of not less than 1-1/2 times the width of the duct. Where this is not possible, turning vanes shall be used. Vanes shall be of single vane construction with 1-1/2" (40 mm) space up to 24" (600 mm) width, and 3" (80 mm) spacing over 24" (600 mm).

.8 Branch mains shall be connected to the main duct as specified for ductwork. "T" connection shall be made using a clinch lock.

.9 Acoustical Liner: Ducts are to be increased in size by thickness of insulation added to maintain inside dimensions as per indicated duct sizes and to ensure no increase in duct design velocity.

2.2 MEDIUM PRESSURE DUCTWORK TO 6" (1500 PA) STATIC

.1 Medium Pressure Ductwork: To a maximum of 6" (1500 Pa) static pressure shall be fabricated to SMACNA High Pressure Duct Construction Standard, Section 4 (latest edition).

.2 Gauges of Ducts: To Chapter 1, Fig. 3.1 SMACNA High Velocity Standards.

.3 Joints: Shall be Exanno Nexus or Duct Mate 4 bolt duct connection system. Three feet on centre with gasket seals.

.4 Testing:

.1 Test all duct systems to withstand air pressures exceeding fan-listed static pressure by 1" (250 Pa), e.g. a fan listed at 3" (750 Pa) shall be tested at 4" (1000 Pa). Duct shall show less than 1% leakage on a calibrated velometer.

.2 Testing shall be carried out before ducts are concealed or insulated.

2.3 CIRCULAR DUCT & FITTINGS, SINGLE-WALL

.1 For the purpose of this specification low pressure ductwork is to be ducted for systems below 2" (500 Pa) static pressure. This includes all ductwork indicated on the Drawings with the exception of that indicated in other parts of this section. Duct shall be fabricated to SMACNA Duct Construction Standards Section No. 1 (latest edition).

.2 All round duct through 26" (660 mm) diameter shall be United Sheet Metal Spiral lock-seam Uni-Seal duct manufactured from galvanized steel meeting ASTM A-527-71 in the following gauges:

Diameter	Metal Thickness	
3" - 7" (76 - 175 mm)	28 ga.	0.01" (0.40 mm)
8" - 14" (203 - 350 mm)	26 ga.	0.022" (0.551 mm)
15" - 26" (381 - 660 mm)	24 ga.	0.028" (0.701 mm)

Diameter	Metal Thickness	
27" - 35" (685 - 875 mm)	22 ga.	0.022" (0.851 mm)
36" - 52" (900 - 1325 mm)	20 ga.	0.016" (1.0 mm)

.3 All fittings shall be United Sheet Metal standard Uni-Form fittings manufactured from galvanized steel meeting ASTM A-527-71 with continuous weld or standing seam construction with fitting gauge and thickness equal to or thicker than the downstream duct section with which they are mated.

.4 All 90 degree T Connections shall have machine formed radiused entrances (laminar flow) on tees to 16" (406 mm) diameter taps off of 18" (457 mm) diameter bodies and machine-rolled (pull-through) entrances on tees to 24" (600 mm) diameter taps off of 24" (600 mm) diameter bodies.

.5 All 45 degree laterals shall have machine rolled (pull through) entrances on laterals to 12" (300 mm) diameter taps.

.6 Elbows shall be fabricated to a centre-line radius of 1.5 times the cross-section diameter.

.7 Sleeve couplings to be used for pipe-to-pipe joints. Insertion length of sleeve couplings and fitting collar shall be 2" (50 mm) for ducts up to 9" (225 mm) diameter and 4" (100 mm) for ducts 10" (250 mm) and over in diameter.

.8 Longitudinal joints shall be lapped and pressure rolled air tight. All seams, end joints and fittings are to be sealed with duct sealer. Duct sealer to be "United" duct sealer, 3-M, Tough Bond or Duro Dyne S-2.

.9 All elbows, not die-stamped, shall be fabricated according to the following schedule:

Elbow Angle	Number of Gores
Less Than 35 Deg.	2
36 Deg. Through 71 Deg.	3
Over 71 Deg.	5

2.4 **FLEXIBLE DUCT**

.1 Flexible duct shall be acoustic type complete with perforated aluminum core, 1" (25 mm) insulation and outer mylar sleeve. OR

.2 The flexible duct shall be rated for a maximum working velocity of 2500 FPM (12.7 m/s) and 4" (1500 Pa) W.C. pressure and be listed by Underwriters Laboratories under their UL-181 Standards as Class I, Air Duct and shall comply with NFPA Standard No. 90A.

.3 Flexible duct shall be maximum 6'-0" (1800 mm) and minimum 3'-0" (900 mm). Install with a minimum number of bends.

.4 Connection to branch ducts shall be made with spin-in collars. Joints shall be sealed duct type and secured to the duct with metal screw-type bands. Spin-on collars shall be complete with balancing damper.

.5 Flexible ductwork sizes shall match diffuser neck size.

.6 Design based on Flexmaster Nova Flex Group - Type T/L-A

.7 Acceptable Products:

.1 Alpha-Flex
.2 Cana-Flex
.3 Automation Industries
.4 Nova Flex Group - Flexmaster

2.5 **HANGERS**

.1 Horizontal ductwork up to 29" (740 mm) wide shall be supported by galvanized 1" (25 mm) 16 gauge or heavier hangers placed not over 6'-0" (1800 mm) apart, with ends turned under the duct. Secure to duct with sheet metal screws, two (2) per side, and one (1) in bottom.

.2 Horizontal ductwork 30" (760 mm) wide and over shall rest on galvanized angle iron supports or Unistrut channels, with rod hangers at 6'-0" (1800 mm) spacing as follows:

Duct Size	Rod	Angle
30" to 48" (750 mm to 1200 mm)	1/4" (6 mm)	1-1/2" x 1-1/2" x 1/8" (40 mm x 40 mm x 3 mm)
49" to 72" (1225 mm to 1825 mm)	3/8" (9 mm)	1-1/2" x 1-1/2" x 1/8" (40 mm x 40 mm x 3 mm)
73" to 84" (1850 mm to 2130 mm)	3/8" (9 mm)	1-5/8" x 1-5/8" x 3/16" (45 mm x 45 mm x 5 mm)

.3 Flexible duct shall be hung as per horizontal ductwork up to 29" (740 mm) wide.

Part 3 - Execution

3.1 **DUCT INSTALLATION - GENERAL**

.1 In general, all ducts to be constructed that they may be dismantled and cleaned. All visible internal portions of duct outlets behind grilles and registers to be painted dull black.

.2 Before installing ductwork, registers, grilles and diffusers, this Contractor shall check for interference with the work of others, so that grouped ducts, pipes and conduits will not interfere with each other, and that registers, grilles and diffusers are correctly located. See Architect's Reflected Ceiling Plans for final location of grilles, diffusers and sprinkler heads. Prepare interference Drawings before fabricating ductwork. DO NOT USE FLEXIBLE DUCT IN ROOMS WITH NO CEILING.

.3 Install ductwork essentially as shown, in strict adherence to the ceiling heights indicated on the Architectural Drawings. Architect reserves the right to vary run and shape of ducts and make offsets during the progress of the work as required, to avoid structural or other interferences.

.4 Ductwork concealed in building construction shall be installed in time so as not to cause delay to the work of other trades, and in ample time to perform tests as required. Concealed ducts shall not be built-in until approval for them has been obtained from the Consultant. Make sheet metal connections to masonry as required for air inlets and exhaust, airtight and weathertight.

.5 Prepare Shop Drawings, dimensions and locating wall, floor and roof slab openings in ample time to meet the building construction schedule. Field check and approve the size and locations of openings prior to placement of concrete or masonry. Openings required at a later date shall be at this Contractor's expense.

.6 Interference Drawings shall be provided when the Contractor is supplying alternate equipment in lieu of the specified items in areas shown as Mechanical and Boiler Rooms, etc. He shall provide dimensioned Drawings of the equipment location, showing clearances to walls, ceiling, ducts etc., and also indicate clearances for filter and coil removal etc.

3.2 **DUCTWORK**

.1 Supply and install ductwork and plenums shown and required to complete duct systems and put each in operating condition. Mechanical Drawings indicate general location and route of ductwork to be installed. General layout of ducts may be taken from Drawings, but this Section is responsible for avoiding interferences with other Sections not specifically shown on Mechanical Drawings. Actual measurements shall be taken at building before ductwork is fabricated.

.2 Make without additional charge, any necessary changes or additions to layout of ductwork to accommodate structural, duct, piping, ceilings, electrical or equipment conditions. Where openings in walls for ductwork have been Provided by others, make full use of such openings by fabricating ductwork to fit them, or if necessary, Provide offsets and transitions to suit. Location of ducts may be altered if change is made before installation is approved by the Consultant, and does not cause Owner or other Sections any extra expense.

.3 Install in ductwork where shown or required, controls, motorized dampers, coils, filters, etc., in accordance with installation instructions supplied by Equipment Supplier.

.4 Supply and install where required to suit system balancing, Lawson-Taylor Pitot Tube openings covers in ductwork for each supply, return and exhaust system. Provide openings at all supply fan discharges and exhaust fan inlets. Locate 15 mm (1/2") openings in straight duct runs to facilitate entry of pitot tube. Provide a minimum of three (3) holes per duct at each of the above locations, and at not more than 18" (450 mm) centres. Openings shall be concealed after tests by this Division.

.5 After final adjustments are made for air handling systems, lock each control device in position and visually indicate required setting. for balancing dampers, Provide additional locking screw or bolt to approval.

.6 During construction, temporarily seal open ends of ductwork to exclude entry of foreign material and construction dust.

3.3 **HANGERS**

.1 Low pressure ductwork shall have substantial hangers attached to the structure with concrete inserts to secure the ducts in place and prevent vibration. No caddy clips or plumber's tape permitted for hanging ducts. DO NOT SUPPORT FROM METAL DECK.

3.4 **QUIET OPERATION**

.1 Each system has been designed to be quiet in operation, N.C. 35 maximum. It is the responsibility of this Section to supply equipment and to install same, ductwork, etc., to ensure noise levels will be maintained to the satisfaction of the Consultant.

3.5 **DUCTWORK CONSTRUCTION**

.1 Ducts up to 24" (600 mm) in either dimension to have reinforcing ribs, spaced not more than 8'-0" (2400 mm) apart.

.2 Ducts over 24" (600 mm) in either dimension to have reinforcing ribs, spaced not more than 4'-0" (1200 mm) apart. Ducts shall have supplemental stiffening as required to prevent drumming and provide a structurally sound assembly.

3.6 **CHANGES IN SHAPE OR DIMENSION**

.1 Slope requirements for transformations that either increase or decrease duct area to a minimum of 1:7.

.2 The angle of transformation at connections to heaters or other equipment is not to exceed 30 degrees from a line parallel to the airflow on the approaching side of the equipment, and 45 degrees on the leaving side of the equipment. The angle of approach may be increased to meet space conditions when the transformation section is provided with vanes.

3.7 CHANGES IN DIRECTION

.1 Changes in direction and shape shall be kept to the minimum, permitted by distribution requirements and building conditions. Turns to be made with these elbows as required in the following order of preference on all supply, return and exhaust ductwork.

.2 Unvaned elbow, throat radius 3/4 width of duct and full heel radius.

.3 Elbows with inside radius less than 3/4 width of duct but not less than 3" (80 mm) and full heel radius and single thickness turning vanes

.4 Square elbow with single thickness turning vanes spaced at 1-1/2" (40 mm) centres up to 24" (600 mm) duct and 3" (80 mm) centres over 24" (600 mm).

3.8 BALANCING DAMPERS

.1 Splitter or opposed blade dampers for adjustment of air distribution to respective branches to be located as indicated on Drawings, or as described in other parts of this specification.

3.9 SEAMS

.1 Sections to be assembled with Pittsburgh lock or grooved longitudinal seams, fully closed for tightness and appearance.

3.10 JOINTS & REINFORCEMENT

.1 Duct sections to be jointed by flat "S" or Standing "S" cleats which conform to following general requirements:

.1 Ducts up to 18" (450 mm) in width to have flat "S" cleats on top and bottom and drive cleats on sides.

.2 Ducts over 18" (450 mm) width to have standing "S" cleat on top and bottom and drive cleat on sides.

.3 Where length of drive cleat exceeds 24" (600 mm), a standing "S" or standing "T" cleat to be used and corners taped for tightness.

3.11 SUPPORTING OF DUCTS

.1 All ducts to be adequately supported. for ducts up to 18" (457 mm) in width, hangers to be placed on not more than 8'-0" (2400 mm) centres; ducts 19" (475 mm) and above in width on not more than 48" (1200 mm) centres. Hangers to be placed plumb and present a neat appearance.

.2 Hangers on ducts up to 36" (900 mm) in width to be constructed from galvanized band iron 1" x 16 gauge (25 mm x 1.6 mm). On ducts 37" (925 mm) and above in width, hangers to be constructed from galvanized iron angles not less than 1-1/2" x 1-1/2" x 1/8" (40 mm x 40 mm x 3 mm). Hangers to extend down the sides of the ducts to bottom of duct with angle bent around bottom for support. Fasten to duct with sheet metal screws on sides and bottom. Hangers on ducts to be of same material as ductwork. Supply and install high velocity sealant on all sheetmetal screws.

.3 Hangers bands to extend the full depth of duct with bottom of hanger being toed in under duct. Hangers to be attached to the duct using not less than three rivets or metal screws. Supply and install high velocity sealant on all sheetmetal screws.

.4 On reinforced concrete, all hangers for ductwork to be fastened to the concrete by Ram-Set studs or expansion shields and lag bolts.

.5 Ducts cannot in any location, be supported from the furring, ceiling construction, piping, conduit or other ducts.

.6 The use of perforated band iron for supporting of ducts is not permitted.

.7 In Mechanical Rooms, at approved locations where ducts are supported from the floor, install galvanized angle irons with base plates anchored to floor slab. Supports to be placed so as not to interfere with access to or around equipment and be attached to the floor slab.

3.12 **REINFORCING OF SHEET METAL**

.1 All ductwork 12" (300 mm) and over in either dimension to be cross broken except those to which internal rigid board insulation is applied. Where drive cleat is used, top and bottom corners to be caulked before cleat is turned over to make duct air tight.

.2 All other joints to be caulked at all corners before and after joint is made to make duct completely air tight.

.3 All standing "S" cleats referred to are to be machine made for purposes of extra reinforcing.

.4 All longitudinal seams are to be Pittsburgh lock seam hammered over and made air tight.

.5 Where a duct falls into certain maximum duct size classification the entire duct, sides top and bottom, is to be of the gauge specified.

.6 Sheet metal screws to be used on sides of ducts where standing "S" cleat is used or reinforcing angle on 12" (300 mm) centres or minimum 2 screws per side.

3.13 **SHEET METAL INSTALLATION**

.1 During installation, the open ends of ducts shall be protected to prevent debris and dirt from entering. The Prime Mechanical Contractor to install this work in accordance with the overall approved progress schedule and in co-operation with all other Contractors so there is no delay to other trades.

.2 All necessary allowances and provisions to be made in the installation of the ducts for the structural conditions of the building and other trades, and ducts to be transformed or divided as may be required. Ductwork to be altered or modified so as to give an effective sectional area equal to that originally shown without exceeding an aspect ratio of 4:1. All of these changes, however, must be approved and installed as directed at the site, or as approved on shop or erection Drawings, and at no additional cost.

.3 All exposed spiral ducting to be installed in a neat manner with each section overlapping the next and all exposed edges sealed.

.4 All exposed ducting to be supported from a single hanger rod with support plate on inside of duct.

3.14 **SPECIAL BRACKET**

.1 Where the method of support specified above is not applicable, vertical risers and other duct runs, in general, to be supported by substantial angle brackets designed to meet field conditions.

3.15 **DUCTS AT MASONRY**

.1 Where ducts are shown connecting to or terminating at masonry openings, and/or along the edges of all plenums at floors, walls, ceilings, etc. Provide a continuous 1-1/2" x 1-1/2" x 1/8" (40 mm x 40 mm x 6 mm) galvanized angle iron bolted to the construction and made air tight to same by applying approved caulking compound on the angle before they are drawn down tight. The sheet metal at these locations to be bolted to the continuous angle iron.

3.16 **LOCATION OF OUTLETS**

.1 The position of all outlets shown on the Drawings are approximate only and this Contractor is to check the location of all outlets with the Consultant and make such adjustments in position as are necessary to conform with architectural features, acoustic tile pattern, etc. and the outlets required by other trades without extra charge. Ceiling outlets and their assemblies to be constructed so that they fit the spacing and manufacture of the removable acoustic ceiling.

3.17 **OUTSIDE OPENINGS**

.1 Unless specifically noted otherwise, openings in the outside walls, roof, etc. to be left for this Contractor, where shown and required for fresh air intakes and exhausts.

.2 Louvres, birdscreens, etc. for these intakes and exhausts, to be supplied by Division 10 and installed by this Division. Supply and install all necessary ductwork and plenums for intakes and exhausts and patch around same to make a weather tight job. Co-operate with all other trades on exact location of these openings, ducts, and louvres, serving the air systems. Supply and install 14 ga. insulated louvre blank-offs where shown for blanking off unused portion of louvres.

3.18 **DUCT ACCESS DOORS**

.1 Install access doors to fire or other dampers, for service, inspection, any other normal maintenance requirements, and for cleanouts where required on specialty systems. Ensure that such access doors are of a size that equipment to be attended is accessible.

.2 Install an access door on the upstream side of each duct mounted heating coil.

3.19 **TURNING VANES**

.1 Install small arc air foil vanes in ducts at elbows where centre-line radius is less than 1-1/4 times turning dimension of duct.

.2 Square elbows with turning vanes equal to Duro Dyne single thickness vanes spaced at 1-1/2" (40 mm) centres up to 24" (600 mm) duct and 3" (80 mm) centres over 24" (600 mm). Rovane duct turning vanes are acceptable.

3.20 **FIRE DAMPERS**

.1 Fire dampers are to be installed in all locations shown or where required by the Fire Marshal and to local Authority. Fire dampers are to be labelled by Underwriter's Laboratories, Canada.

.2 Generally where any duct or any outlet passes through any required fire wall, fire separation with a fire resistance rating, or fire rated ceiling the duct to be Provided with an approved automatic fire damper built into the wall. Dampers to be supported from the structure and not from the ducts or grilles, to allow duct drop off under fire conditions.

.3 In addition, install in all systems where ducts service two or more stories, at each floor level approved dampers, leaf dampers, fitted with fusible links of an approved temperature rating to close air tight on linkage failure. Provide access to dampers for linkage replacement.

.4 The complete fire damper installation to be in strict accordance with manufacturers recommendations, NFPA-90A and meet the approval of all authorities having jurisdiction. All smoke and fire damper locations to be shown on Record Drawings.

3.21 **FAN-DUCT CONNECTIONS**

.1 Install Duro Dyne, Grip-Lock, Durolon duct connectors unless specified otherwise to suit system pressure between ductwork and all fan equipment on both sides to isolate where indicated and on all fan equipment.

3.22 **WATERTIGHT DUCT**

.1 Provide watertight ductwork for:

.1 Fresh air intakes.

.2 Exhaust air outlets.

.3 Outdoor applications.

.2 Form bottom of duct without longitudinal seams. Solder or weld joints of bottom sheets and sides. Solder or weld transverse joints and caulk.

.3 Slope duct back to exterior louvre and Provide weep holes for drainage.

3.23 **SUPPLY, RETURN & EXHAUST FANS**

.1 All connections to fans to be made utilizing canvas connections as specified under this Section.

.2 All fan systems are to be equipped with all accessories indicated in schedule.

.3 Refer to Division 25 Controls and Instrumentation and Division 26 Wiring Connections, and co-ordinate work.

3.24 **CURBS**

.1 All new prefabricated roof curbs supplied by this Division. All curbs flashed by Roofing Contractor. Refer to details on Drawings.

3.25 **SEALING OF DUCTS**

.1 Seal all seams and joints in all duct systems for an air-tight installation.

.2 Duct sealer shall be high pressure, high velocity water based duct sealer. Apply sealer with either brush or caulking tube.

.3 On exposed duct scheduled for painting, seal only with Product from caulking tube, taking care to maintain a neat, finished appearance to the duct.

END OF SECTION

Part 1 - General

1.1 SECTION INCLUDES

.1 Air turning devices/extractors.

.2 Backdraft dampers.

.3 Duct access doors.

.4 Duct test holes.

.5 Fire dampers.

.6 Flexible duct connections.

.7 Volume control dampers.

1.2 RELATED SECTIONS

.1 Section 23 05 48 - Vibration Isolation.

.2 Section 23 31 00 - Duct Work.

.3 Section 23 36 00 - Air Terminal Units: Pressure regulating damper assemblies.

.4 Division 26: Electrical characteristics and wiring connections.

1.3 REFERENCES

.1 Unless noted otherwise, comply with latest edition, including Amendments, of the following Codes and Standards.

.2 Ontario Building Code (OBC)

.3 NFPA 90A - Standard for Installation of Air Conditioning and Ventilating Systems.

.4 NFPA 90B, Installation of Warm Air Heating and Air Conditioning Systems.

.5 NFPA 92 - Standard for Smoke Control Systems.

.6 SMACNA 1966-2005 - HVAC Duct Construction Standards - Metal and Flexible.

.7 UL 33 - Standard for Heat Responsive Links for Fire-Protection Service.

.8 UL 555 - Standard for Fire Dampers.

.9 UL 555S - Standard for Smoke Dampers.

.10 CSA (Canadian Standards Association).

.11 UL (Underwriters Laboratories Inc.).

1.4 SUBMITTALS FOR REVIEW

.1 Product Data: Provide for shop fabricated assemblies including volume control dampers, duct access doors, duct test holes, duct silencers and hardware used. Include electrical characteristics and connection requirements.

.2 Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers, duct access doors and duct test holes.

.3 Duct Silencers:

.1 Performance Data: Silencer manufacturer to provide submittal drawings detailing all duct silencer data specified in the mechanical drawing schedule.

.2 Source quality-control reports: Silencer manufacturer to provide a copy of their laboratory NVLAP accreditation certificate for the ASTM E477-13 test standard with the submittals. Data from non-NVLAP accredited test facilities will not be accepted.

1.5 **SUBMITTALS FOR INFORMATION**

.1 Installation Data: Manufacturers special installation requirements including fire dampers and/or combination fire and smoke dampers.

1.6 **CLOSEOUT SUBMITTALS**

.1 Record Documentation: Record actual locations of access doors, test holes.

1.7 **MAINTENANCE MATERIAL SUBMITTALS**

.1 Extra Stock Materials: Provide two (2) of each size and type of fusible link.

1.8 **QUALITY ASSURANCE**

.1 Products of This Section: Manufactured to ISO 9000 certification requirements.

.2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

.3 Source quality-control reports: Silencer manufacturer to provide a copy of their laboratory NVLAP accreditation certificate for the ASTM E477-13 test standard with the submittals. Data from non-NVLAP accredited test facilities will not be accepted.

1.9 **REGULATORY REQUIREMENTS**

.1 Products Requiring Electrical Connection: Listed and classified by CSA UL and testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.10 **DELIVERY, STORAGE, & PROTECTION**

.1 Transport, handle, store, and protect products.

.2 Protect dampers from damage to operating linkages and blades.

Part 2 - Products

2.1 **AIR TURNING DEVICES/EXTRACTORS**

.1 Multi-blade device with blades aligned in short dimension; steel aluminum construction; with individually adjustable blades, mounting straps.

.2 Multi-blade device with radius blades attached to pivoting frame and bracket, steel construction, with the following:

.1 Push-pull operator strap.

.2 Ceiling mounted rotary operator knob.

.3 Worm drive mechanism with 450 mm (18 inches) long removable key operator.

2.2 **BACKDRAFT DAMPERS**

.1 Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: galvanized steel, with centre pivoted blades of maximum 150 mm (6 inch) width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.3 DUCT ACCESS DOORS

.1 Fabricate to SMACNA 1966, and as indicated.

.2 Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. for insulated duct work, install minimum 25 mm (one inch) thick insulation with sheet metal cover.

.1 Less Than 300 mm (12 inches) Square: Secure with sash locks.

.2 Up to 450 mm (18 inches) Square: Provide two (2) hinges and two (2) sash locks.

.3 Up to 600 x 1200 mm (24 x 48 inches): Three (3) hinges and two (2) compression latches with outside and inside handles.

.4 Larger Sizes: Provide an additional hinge.

.3 Access doors with sheet metal screw fasteners are not acceptable.

2.4 DUCT TEST HOLES

.1 Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

.2 Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.5 FIRE DAMPERS

.1 Fabricate to NFPA 90A, and as indicated.

.2 Ceiling Dampers: Galvanized steel, 0.76 mm (22 ga) frame and 1.5 mm (16 gauge) flap, two layers 3.2 mm (0.125 inch) ceramic fibre on top side and one layer on bottom side for round flaps, with locking clip.

.3 Horizontal Dampers: Galvanized steel, 0.76 mm (22 ga) frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.

.4 Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations closure under air flow conditions. Configure with blades out of air stream except for 250 Pa (1.0 inch) pressure class ducts up to 300 mm (12 inches) in height.

.5 Multiple Blade Dampers: 1.5 mm (16 ga) galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 3.2 x 12.7 mm (1/8 x 1/2 inch) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.

.6 Fusible Links: UL 33, separate at 71 degrees C (160 degrees F) with adjustable link straps for combination fire/balancing dampers.

.7 Include in the Contract for the supply and installation of an additional ten (10) 600 mm x 400 mm (24" x 16") type A fire dampers to be located at the discretion of the Consultant.

2.6 FLEXIBLE DUCT CONNECTIONS

.1 Fabricate to SMACNA 1966, and as indicated.

.2 Connector: Fabric crimped into metal edging strip.

.1 Fabric: UL listed fire-retardant neoprene coated woven glass fibre fabric to NFPA 90A, minimum density 1.0 kg/sq. m (30 oz./sq. yd.).

.2 Net Fabric Width: Approximately 50 mm (2 inches) wide.

.3 Metal: 75 mm (3 inch) wide, galvanized steel 0.6 mm thick (24 gauge).

2.7 **VOLUME CONTROL DAMPERS.**

.1 Fabricate to SMACNA 1966, and as indicated.

.2 Splitter Dampers:

.1 Material: Same gauge as duct to 600 mm (24 inches) size in either direction, and two gauges heavier for sizes over 600 mm (24 inches).

.2 Blade: Fabricate of [single] [double] thickness sheet metal to streamline shape, secured with continuous hinge or rod.

.3 Operator: Minimum 6 mm (1/4 inch) diameter rod in self aligning, universal joint action, flanged bushing with set screw.

.3 Single Blade Dampers: Fabricate for duct sizes up to 300 x 1220 mm (12 x 48 inch).

.4 Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 200 x 1825 mm (8 x 72 inch). Assemble centre and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

.5 End Bearings: Except in round duct work 300 mm (12 inches) and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.

.6 Quadrants:

.1 Provide locking, indicating quadrant regulators on single and multi-blade dampers.

.2 On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

.3 Where rod lengths exceed 750 mm (30 inches) provide regulator at both ends.

2.8 **ACOUSTIC DUCT LINER**

.1 Insulation to be flexible, edge coated, tightly bonded, mat-faced and shall be made from inorganic glass fibres bonded by a thermosetting resin.

.2 Insulation shall be 1" (25 mm) thick, 1.4 lb/ft^3 (22 kg/m^3) density, where designated on the drawings by diagonal hatching or where noted.

.3 Liner shall be treated so that the maximum flame spread rating is 25 or less and the smoke development is 50 or less according to local bylaws.

2.9 **DUCT SEALING**

.1 All duct joints during manufacture shall be sealed with high velocity sealer, equal to Baker Duck-Seal, or Duro Dyne DWN high velocity sealer, and on the faces of the joints after cleats are installed.

.2 DUCT TAPE IS NOT ACCEPTABLE.

2.10 **FILTER GAUGES**

.1 Supply and install across filter section of each indoor supply air unit, a Dwyer Minihelic II air filter gauge.

2.11 **FAN SHEAVES**

.1 Supply as requested by the Balancing Agency, replacement sheaves and fan belts for each supply, return, and exhaust fan blower as required during the system air balancing.

.2 Replacement of sheaves and belts shall be by Division 23 as requested by the Balancing Agency and Consultant.

Part 3 - Execution

3.1 PREPARATION

.1 Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

.1 Install accessories to manufacturers written instructions, NFPA 90A, and follow SMACNA 1966. Refer to Section 23 31 00 for duct construction and pressure class.

.2 Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

.3 Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust duct work to NFPA 96. Provide minimum 200 x 200 mm (8 x 8 inch) size for hand access, 450 x 450 mm (18 x 18 inch) size for shoulder access, and as indicated. Provide 100 x 100 mm (4 x 4 inch) for balancing dampers only. Review locations prior to fabrication.

.4 Provide duct test holes where indicated and required for testing and balancing purposes.

.5 Provide fire dampers at locations indicated, where ducts and outlets pass through fire rated components and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

.6 Demonstrate re-setting of fire dampers to Owner representative.

.7 Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment and supported by vibration isolators. Refer to Section 23 05 48. for fans developing static pressures of 1250 Pa (5.0 inches) and over, cover connections with leaded vinyl sheet, held in place with metal straps

.8 Use splitter dampers only where indicated.

.9 Provide balancing dampers on high velocity systems where indicated. Refer to Section 23 36 00.

.10 Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

3.3 BALANCING DAMPERS

.1 Splitter or opposed blade dampers for adjustment of air distribution to respective branches to be located as indicated on Drawings, or as described in other parts of this Specification.

3.4 DUCTS AT MASONRY

.1 Where ducts are shown connecting to or terminating at masonry openings, and/or along the edges of all plenums at floors, walls, ceilings, etc. Provide a continuous 1-1/2" x 1-1/2" x 1/8" (38 mm x 38 mm x 3 mm) galvanized angle iron bolted to the construction and made air tight to same by applying approved caulking compound on the angle before they are drawn down tight. The sheet metal at these locations to be bolted to the continuous angle iron.

3.5 **LOCATION OF OUTLETS**

.1 The position of all outlets shown on the Drawings are approximate only and this Contractor is to check the location of all outlets with the Consultant and make such adjustments in position as are necessary to conform with architectural features, acoustic tile pattern, etc. and the outlets required by other trades without extra charge. Ceiling outlets and their assemblies to be constructed so that they fit the spacing and manufacture of the removable acoustic ceiling.

3.6 **DUCT ACCESS DOORS**

.1 Install removable access doors to fire dampers or other dampers, humidifier manifolds, heating coils (both sides), main ducts for cleaning purposes, for service, inspection, any other normal maintenance requirements, and for cleanouts where required on specialty systems. Ensure that such access doors are of a size that equipment to be attended is accessible.

.2 Access doors are to be fully accessible.

3.7 **TURNING VANES**

.1 Install small arc air foil vanes in ducts at elbows where centre-line radius is less than 1-1/4 times turning dimension of duct.

.2 Square elbows with turning vanes equal to Hart and Cooley double thickness vanes spaced at 1-1/2" (40 mm) centres up to 24" (600 mm) duct and 3" (75 mm) centres over 24" (610 mm). Rovane duct turning vanes are acceptable.

3.8 **WATERTIGHT DUCT**

.1 Provide watertight ductwork for:

.1 Fresh air intakes.

.2 Exhaust air outlets.

.2 Form bottom of duct without longitudinal seams. Solder or weld joints of bottom sheets and sides. Solder or weld transverse joints and caulk.

.3 Slope duct back to exterior louvre outlet and Provide weep holes for drainage.

3.9 **SUPPLY, RETURN & EXHAUST FANS**

.1 All connections to fans to be made utilizing canvas connections as specified under this Section.

.2 All fan systems are to be equipped with all accessories indicated in schedule.

.3 Refer to Division 25 Controls and Instrumentation and Division 26 Wiring Connections, and co-ordinate Work.

3.10 **CURBS**

.1 All new prefabricated roof curbs supplied by this Division. All curbs flashed by Roofing Contractor. Refer to details on Drawings.

3.11 **ACOUSTIC DUCT LINER**

.1 Install acoustic duct liner in all ducts shown diagonally-hatched, or otherwise specified with duct liner.

.2 Apply adhesive to the interior of the duct and supplement the adhesive with welding pins and clips, the pins shall be spaced no further than 12" apart, no more than 4" in from a corner or edge of the duct. Duct 8" wide and smaller does not require adhesive supplement.

.3 Trim all pieces of liner such that all corners and joints fit tight, without bulges.

.4 Apply liner adhesive to all joints, seams, and exposed edges, including all traverse joints as the duct is assembled.

.5 At the upstream leading edge of exposed liner, Provide a step collar or insulation stop to cover the entire edge of the exposed liner.

.6 Interrupt the duct liner installation at fire dampers.

.7 Where dampers (motorized or manual), turning vane, or other interior duct device is to be mounted, Provide a metal hat section or other build out to secure the damper or device. Fire dampers may not be mounted to a hat section, oversize fire dampers to the outside duct dimensions or Provide step collars on either side of the fire damper.

END OF SECTION

Part 1 - General

1.1 SECTION INCLUDES

.1 Diffusers.

.2 Registers/grilles.

1.2 REFERENCES

.1 Unless noted otherwise, comply with latest edition, including Amendments, of the following Codes and Standards.

.2 Ontario Building Code (OBC)

.3 ADC 1062: GRD-84 - Test Code for Grilles, Registers and Diffusers.

.4 AMCA 500-L-12 - Laboratory Methods of Testing Louvers for Rating.

.5 AMCA 500-D-12 - Laboratory Methods of Testing Dampers for Rating.

.6 ASHRAE 70-2006 (RA 2011) - Method of Testing the Performance of Air Outlets and Air Inlets.

.7 NFPA 90A -Standard for Installation of Air Conditioning and Ventilating Systems.

.8 SMACNA 1966-2005 - HVAC Duct Construction Standards - Metal and Flexible.

1.3 SUBMITTALS FOR REVIEW

.1 Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.4 SUBMITTALS FOR INFORMATION

.1 Installation Data: Manufacturer special installation requirements.

1.5 CLOSEOUT SUBMITTALS

.1 Record Documentation: Record actual locations of air outlets and inlets.

1.6 QUALITY ASSURANCE

.1 Products of This Section: Manufactured to ISO 9000 certification requirements.

.2 Test and rate louvre performance to AMCA 500-L.

.3 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

Part 2 - Products

2.1 CEILING EXHAUST & RETURN REGISTERS/GRILLES

.1 Type: Streamlined blades, 19 mm (3/4 inch) minimum depth, 19 mm (3/4 inch) maximum spacing, with blades set at 45 degrees.

.2 Frame: 25 mm (1 inch) margin with countersunk screw concealed mounting.

.3 Fabrication: Steel with 0.9 mm (20 ga) minimum frames and 0.8 mm (22 ga) minimum blades, steel and aluminum with 0.9 mm (20 ga) minimum frame, or aluminum extrusions, with factory off-white enamel/baked enamel/prime coated/ clear lacquer finish colour to be selected.

.4 Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face where not individually connected to exhaust fans.

.5 Gymnasiums: Provide front pivoted or welded in place blades, securely fastened to be immobile.

2.2 **MANUFACTURER**

.1 Design is based on E.H. Price

.2 Acceptable Products:

.1 E.H. Price
.2 Nailor
.3 Titus
.4 Krueger

Part 3 - Execution

3.1 **INSTALLATION**

.1 Install to manufacturer written instructions.

.2 Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

.3 Install diffusers to duct work with air tight connection.

.4 Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

.5 Paint ductwork visible behind air outlets and inlets matte black.

END OF SECTION

Part 1 - General

1.1 SECTION INCLUDES

.1 Heating Boilers.

.2 Controls.

.3 Hot water connections.

.4 Fuel burning system.

1.2 RELATED SECTIONS

.1 Section 03 30 00 - Cast-in-place Concrete.

.2 Section 23 21 16 - Hydronic Specialties.

.3 Section 25 50 02 - Digital Control Equipment.

.4 Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

1.3 REFERENCES

.1 Unless noted otherwise, comply with latest edition, including Amendments, of the following Codes and Standards.

.2 Ontario Building Code (OBC)

.3 AGA - Directory of Certified Appliances and Accessories.

.4 CSA 4.9/ANSI Z21.13 - Gas-Fired Low Pressure Steam and Hot Water Boilers.

.5 ASME Boiler and Pressure Vessels Code (BPVC), Section I - Rules for Construction of Power Boilers.

.6 ASME Boiler and Pressure Vessels Code (BPVC), Section IV - Rules for Construction of Heating Boilers.

.7 ASME Boiler and Pressure Vessels Code (BPVC), Section VIII - Rules for Construction of Pressure Vessels.

.8 NEMA 250 - Enclosures for Electrical Equipment (1000 Volt Maximum).

.9 NFPA 31 - Standard for the Installation of Oil-Burning Equipment.

.10 NFPA 54/ANSI Z223.1 - National Fuel Gas Code.

.11 NFPA 58 - Liquefied Petroleum Gas Code.

.12 CSA (Canadian Standards Association).

.13 UL (Underwriters Laboratories Inc.).

.14 UL 726-1995 - Standard for Oil-Fired Boiler Assemblies.

1.4 SUBMITTALS FOR REVIEW

.1 Product Data: Provide data indicating general assembly, components, controls, safety controls, and wiring diagrams with electrical characteristics and connection requirements, and service connections.

.2 Shop Drawings: Indicate general assembly, components, controls, safety controls, and wiring diagrams with electrical characteristics and connection requirements, and service connections.

1.5 **SUBMITTALS FOR INFORMATION**

.1 Test Reports: Indicate specified performance and efficiency is met or exceeded. Provide combustion test that includes boiler firing rate, overfire draft, gas flow rate, heat input, burner manifold gas pressure, percent carbon monoxide (CO), percent oxygen (O), percent excess air, flue gas temperature at outlet, ambient temperature, net stack temperature, percent stack loss, percent combustion efficiency, and heat output.

.2 Submit manufacturers installation instructions: Indicate assembly, support details, connection requirements, and include start-up instructions.

.3 Manufacturers Certificates: Certify that units meet or exceed specified requirements.

.4 Manufacturers Field Reports: Indicate condition of equipment after start-up including control settings and performance chart of control system.

1.6 **CLOSEOUT SUBMITTALS**

.1 Maintenance Contracts: Provide service and maintenance of boilers for one (1) year from Date of Substantial Completion.

.2 Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, cleaning procedures, replacement parts list, and maintenance and repair data.

.3 Warranty Documentation.

1.7 **MAINTENANCE MATERIAL SUBMITTALS**

.1 Tools: Provide wire brush and [hinged] [one-piece] handle for tube cleaning.

1.8 **QUALITY ASSURANCE**

.1 Products of This Section: Manufactured to ISO 9000 certification requirements.

.2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

.3 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience and approved by the manufacturer.

1.9 **REGULATORY REQUIREMENTS**

.1 Conform to ASME BPVC-Section IV for boiler construction.

.2 Units: "AGA certified", "UL labeled".

.3 Conform to "applicable code" "NFPA 70" for internal wiring of factory wired equipment.

.4 Products Requiring Electrical Connection: Listed and classified by CSA UL and testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.10 **DELIVERY, STORAGE, & PROTECTION**

.1 Transport, handle, store, and protect products.

.2 Protect boilers from damage by leaving factory inspection openings and shipping packaging in place until final installation.

1.11 **WARRANTY**

.1 Provide warranties as listed below.

Part 2 - Products

2.1 MANUFACTURERS

.1 Design is based on Patterson Kelly

.2 Acceptable Products:

.1 Lochinvar

.2 RBI

.3 Patterson Kelly

2.2 CONDENSING BOILERS - DESIGNATED B-1, B-2

.1 Furnish and install factory "packaged" low pressure hot water boiler(s) as manufactured by Patterson Kelley or as approved and accepted by the Engineer as defined in the table below:

Model Number	Fuel Type	Vent Category	Max Input High Fire (BTU/Hr)	Min Input Low Fire (BTU/Hr)	Turndown Ratio	Max Output (BTU/Hr)	AHRI Efficiency
SC650	NG or LP	II or IV	650,000	125,000	5.2 : 1	611,650	94.1%

.2 Each factory "packaged" boiler shall be complete with all components and accessories necessary for a complete and operable boiler as hereinafter specified. Each boiler shall be furnished factory assembled with the required wiring and piping as a self contained unit. Each boiler shall be readily transported and ready for installation.

.3 **Components:**

.1 Cabinet Enclosure:

.1 Each boiler shall feature a fully assembled cabinet enclosure fabricated from Carbon Steel or Aluminum sheet metal (minimum 18 Gauge) with powder coat finish.

.2 The boiler's cabinet enclosure shall not exceed 28" in width and the completed boiler shall fit through a standard 32" wide doorway.

.3 The boiler's cabinet enclosure shall feature removable access panels / doors with quarter-turn type latches that can be easily opened with a coin or flathead screwdriver.

.4 The boiler's cabinet enclosure shall eliminate the use of refractory or other insulating materials outside the heat exchanger and the enclosure's surface temperature shall not exceed 20°F above ambient temperature.

.5 The boiler's cabinet enclosure shall prominently display all required safety, instruction, compliance and factory runout labels.

.2 Heat Exchanger

.1 Each water-tube boiler shall contain an ASME Section IV heat exchanger with an "H" stamp designed for a maximum allowable working pressure of 160 PSIG and a maximum allowable temperature of 210°F.

.2 The completed heat exchanger shall consist of welded 316L SS helical water tubes and provide no less than the total fireside heating surface area defined in the table below:

	SC650
Heating Surface Area	76.2 ft^2

.3 Each completed heat exchanger shall include an integral stainless steel condensate pan/collector, condensate drain, removable burner assembly, inlet temperature sensor, outlet temperature sensor, flue gas temperature sensor, heat exchanger temperature sensor, automatic air vent, thermowell for high temperature limit capillary, low water cutoff probe or flow switch, and all necessary assembly hardware.

.4 Each Stainless Steel heat exchanger shall be designed to maintain water turbulence at the full published range of acceptable flow rates at various boiler conditions as described below:

.1 The maximum allowable flow rate will generate a 20°F ΔT when the boiler is operating at full capacity.

.2 The minimum allowable flow rate will generate a 60°F ΔT when the boiler is operating at full capacity.

.5 The boiler's completed heat exchanger shall be capable of operating with a minimum outlet water temperature of 42°F.

.6 Each heat exchanger must be hydrostatically tested by the manufacturer to a minimum of 1-1/2 times the maximum allowable working pressure for a minimum of 5 minutes. During this hydrostatic pressure test, the operator will inspect the pressure gauge and visually verify there are no water leaks.

.3 Main Gas Train:

.1 Boilers configured for single fuel operation shall be equipped with an integral main gas valve train capable of burning either Natural Gas or Propane Gas.

.2 Each single fuel gas valve train shall include at least the following:

.1 One (1) upstream manual shutoff valve for field-connection.

.2 One (1) combination Air-Gas ratio control and safety shutoff valve with dual solenoids (in-series) that can be independently energized for leak testing and integrated into a single body design. The combination gas valve shall operate as a "Zero Governor" and control to a neutral gas pressure inside the gas valve.

.3 One (1) low gas pressure switch (manual reset).

.4 One (1) high gas pressure switch (manual reset).

.5 Two (2) gas pressure test ports.

.6 One (1) downstream manual shutoff valve.

.3 Boilers configured for dual fuel operation shall be equipped with two integral gas valve trains; the first capable of burning Natural Gas and the second capable of burning Propane Gas. Dual fuel boiler types shall feature a NG / LP toggle switch allowing the user to quickly change between the two fuel types. Operation of this switch shall not require the boiler to be powered off prior to changeover.

.4 Each gas train shall be completely independent and include dedicated safety devices, shutoff valves, etc. Each gas train shall be individually identified by the manufacturer with labels and dedicated paint colors (Yellow = Natural Gas & Red = Propane Gas).

.5 Each dual fuel gas valve train shall include at least the following:

.1 One (1) upstream manual shutoff valve for field-connection to Natural Gas.

.2 One (1) upstream manual shutoff valve for field-connection to Propane Gas.

.3 One (1) Natural Gas combination Air-Gas ratio control and safety shutoff valve with dual solenoids (in-series) that can be independently energized for leak testing and integrated into a single body design. The combination gas valve shall operate as a "Zero Governor" and control to a neutral gas pressure inside the gas valve.

.4 One (1) Propane Gas combination Air-Gas ratio control and safety shutoff valve with dual solenoids (in-series) that can be independently energized for leak testing and integrated into a single body design. The combination gas valve shall operate as a "Zero Governor" and control to a neutral gas pressure inside the gas valve.

.5 One (1) low gas pressure switch (manual reset) for Natural Gas.

.6 One (1) low gas pressure switch (manual reset) for Propane Gas.

.7 One (1) high gas pressure switch (manual reset) for Natural Gas.

.8 One (1) high gas pressure switch (manual reset) for Propane Gas.

.9 Two (2) gas pressure test ports for Natural Gas.

.10 Two (2) gas pressure test ports for Propane Gas.

.11 One (1) downstream manual shutoff valve for Natural Gas.

.12 One (1) downstream manual shutoff valve for Propane Gas.

.6 The main gas valve train(s) shall be factory assembled, piped, and wired and allow for operation at full rated boiler capacity from 3.5" W.C. up to the maximum inlet gas pressure of 14.0" W.C.

.7 If the supplied gas pressure exceeds 14" W.C., the contractor shall supply a suitable intermediate gas pressure regulator of the lock-up type to reduce the gas pressure to acceptable levels.

.4 Power Burner:

.1 The boiler manufacturer must furnish an integral power type fuel burner with each boiler. The complete power fuel burner assembly must consist of a gas burner, combustion air blower, main gas valve train, and ignition system. The burner manufacturer must fully coordinate the burner design with the boiler's heat exchanger and the boiler control system in order to provide the required capacities, efficiencies, and performance specified. Boilers shipped without a power burner and field-equipped with a 3rd party power burner are not acceptable.

.2 Each burner must be installed horizontally inside the combustion chamber with combustion gases flowing downward through the heat exchanger. The burner must consist of a stainless steel flange and woven fiber mesh cylindrical design.

.3 The burner must incorporate fuel/air ratio control system to preserve exhaust oxygen levels as per boiler schedule, maintaining consistent flue dew point.

.4 The system must be linkage-less without the use of electronic control loops and electronic oxygen sensors requiring calibration and renewal.

.5 Low NOx burner must be certified by SCAQMD for NOx levels listed on schedule when O_2 is corrected to 3%. No additional setup or adjustment, such as increasing excess air, will be necessary to achieve level listed

.6 Each boiler must be equipped with direct spark ignition. Main flame must be monitored and controlled by a flame rod / ionization probe (rectification) system.

.5 Boiler Safety and Trim Devices

.1 The boiler manufacturer shall furnish and test the following safety and trim devices with each boiler:

.1 Safety relief valve shall be provided in compliance with the ASME code. Contractor is required to pipe the relief valve discharge piping to an acceptable drain.

.2 Water pressure/temperature gauge.

.3 Low Water / Flow cutoff switch.

.4 Manual reset high limit water temperature controller.

.5 Operating temperature control to control the sequential operation of the burner.

.6 High and Low Gas Pressure switches.

.7 Flame rod / ionization probe flame detection.

.2 The boiler manufacturer shall provide a CSD-1 form identifying each safety and trim device.

.3 The boiler shall be capable of interfacing with the following external safety devices:

.1 Auxiliary Low Water Cutoff device.

.2 Combustion Air Damper End Limit Switch.

.3 Emergency Stop (E-Stop) switch.

.4 External Safety Device w/ contact closure.

.4 **Boiler Control System**

.1 Each boiler shall be provided with all necessary controls, all necessary programming sequences, and all safety interlocks. Each boiler control system shall be properly interlocked with all safeties.

.2 Each boiler shall be provided with a "Full Modulating" firing control system whereby the firing rate is infinitely proportional at any firing rate between low fire and high fire as determined by the pulse width modulation input control signal. Both fuel input and air input must be sequenced in unison to the appropriate firing rate without the use of mechanical linkage.

.3 The boiler's control system shall provide the minimum capabilities:

.1 7" color touchscreen display with one or more USB ports.

.2 Standard on-board Ethernet port for wired internet connectivity and embedded wireless driver for optional wireless internet connectivity to remote monitoring and software update services.

.3 Parameter uploads and downloads via external USB flash drive.

.4 Software updates via external USB flash drive.

.5 Capture screen shots from the control's display by saving digital image files to external USB flash drive.

.6 Local Representative Screen can be programmed to provide contact information for the local boiler manufacturer's representative.

.7 Programmable Relay Outputs for direct control of pumps, control valves, dampers and other auxiliary devices.

.8 Multiple boiler "cascade" network up to 24 boilers without any external control panel. The installation of external sequencing control panels is not acceptable.

.9 Automatic hybrid system control for multiple boiler "cascade" systems with both condensing and non-condensing boilers. This control logic prioritizes condensing boilers at low water temperatures and prioritizes non-condensing boilers at high water temperatures.

.10 Auxiliary Boiler Relay for multiple boiler "cascade" systems which can be used to enable a 3rd party boiler platform in the event the "cascade" system is unable to satisfy the heating load.

.11 Programmable Boiler and System pump control for multiple boiler "cascade" systems installed in a Primary-Secondary piping arrangement.

.12 Programmable Control Valve logic for multiple boiler "cascade" systems installed in a Primary-Only piping arrangement.

.13 Integration with external Building Management Systems (BMS) via MODBUS® RTU protocol. NOTE: Optional Protocol Converter for communication via LONWORKS® and BACnet® must be available for purchase from the boiler manufacturer.

.14 Hardwire integration with Building Management Systems (BMS) via 4-20mA analog control signal for temperature or firing rate control.

.15 Intuitive "Setup Wizards" ask the user a series of questions and allow for step-by-step configuration of the boiler control.

.16 On-Screen error notifications with a comprehensive description of all alarm conditions and several troubleshooting steps.

.17 Automatic flue gas temperature and outlet (supply) temperature compensation to prevent over-firing of the boiler equipment.

.18 Automatic differential temperature compensation to prevent over-firing of the boiler equipment in a low flow condition.

.19 Automatically adjust the temperature set point and shutdown the boiler based on the outdoor air temperature conditions.

.20 Night Setback functionality via external point of closure (or BMS integration) for unique "Occupied" and "Unoccupied" temperature setpoint values.

.21 Maintain single temperature set point with a minimum outlet (supply) water temperature of 42°F up to a maximum outlet (supply) water temperature of 194°F.

.22 On-Board DHW Priority capable of seamless transition between Comfort Heat (CH) and Domestic Hot Water (DHW) operation.

.23 On-Board CH&DHW operation for simultaneous Comfort Heat (CH) and Domestic Hot Water (DHW) operation.

.24 Alarm Relay Output to announce alarm conditions which require manual reset.

.25 Programmable Low Fire Delay to prevent excessive short-cycling of the boiler equipment.

.26 Local Manual Operation.

.4 The boiler control system shall be capable of interfacing with the following external control devices:

.1 Building Management System (MODBUS®). NOTE: Optional Protocol Converter for communication via LONWORKS® and BACnet® must be available for purchase from the boiler manufacturer.

.2 Domestic Hot Water Break-on-Rise Aquastat (Normally Closed).

.3 Domestic Hot Water Tank Temperature Sensor (12kΩ).

.4 External Header Temperature Sensor (12kΩ).

.5 Outdoor Air Temperature Sensor (12kΩ).

Part 3 - Execution

3.1 INSTALLATION

.1 Install to manufacturer's written instructions.

.2 Install to NFPA 58.

.3 Install boilers and tanks on concrete housekeeping base, sized minimum 100 mm (4 inches) larger than boiler base. Refer to Section 03 30 00.

.4 Provide connection of natural gas service.

.5 Provide piping connections and accessories as indicated; refer to Section 23 21 00.

.6 Pipe relief valves to nearest floor drain.

.7 Install circulator on boiler.

.8 Provide for connection to electrical service. Refer to Section 26 05 83.

3.2 **MANUFACTURER'S FIELD SERVICES**

.1 Prepare and start components.

.2 Provide field representative for starting unit and training operator.

.3 Submit start-up report to the Consultant.

3.3 **SCHEDULES**

.1 Refer to Schedule on Drawings.

END OF SECTION

Part 1 - General

1.1 SECTION INCLUDES

.1 Sequence of operation:

.1 Heating Boiler System

1.2 RELATED SECTIONS

.1 Section 25 50 02 - Digital Control Equipment.

.2 Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

1.3 SYSTEM DESCRIPTION

.1 This section defines the manner and method by which controls function.

.2 Requirements for each type of control system operation are specified.

.3 Equipment, devices, and system components required for control systems are specified in other Sections.

1.4 SUBMITTALS FOR REVIEW

.1 Shop Drawings: Indicate mechanical system controlled and control system components.

.1 Label with settings, adjustable range of control and limits. Include written description of control sequence.

.2 Include flow diagrams for each control system, graphically depicting control logic.

.3 Include draft copies of graphic displays indicating mechanical system components, control system components, and controlled function status and value.

1.5 CLOSEOUT SUBMITTALS

.1 Record Documentation: Record actual locations of components and set points of controls, including changes to sequences made after submission of shop drawings.

1.6 QUALITY ASSURANCE

.1 Products of This Section: Manufactured to ISO 9000 certification requirements.

.2 Design system under direct supervision of a Professional Engineer experienced in design of this Work and licensed at the place where the Project is located.

Part 2 - Products

2.1 MATERIALS

.1 Refer to Section 25 50 02.

Part 3 - Execution

3.1 ELECTRICAL WIRING

.1 All equipment installed under this Section shall be installed complete with all required electrical control wiring. Control wiring shall be #22 TWSH or #18 TWSH as required. Conduit shall conform to the electrical specification standards. All power wiring will be by Electrical Division 26.

.2 Power for control panels and other control equipment shall be from the nearest normal power electrical distribution panel.

3.2 **MOTORIZED COMBINATION SMOKE AND FIRE DAMPERS (SFDs)**

.1 Dampers shall remain open at all times except when sensing smoke and or high temperature in the duct or signal from Fire Alarm annunciation. Dampers shall close till the fire or smoke hazard has been cleared and shall be open automatically on clearing the smoke and fire alarm signal.

SEQUENCES OF OPERATION

Note: "Adjustable" shall refer to adjustments to be at the BAS.

3.3 **EXISTING HEATING PLANT**

.1 General:

.1 System components:

.1 Two boilers and their respective primary pumps.

.2 Two secondary pumps.

.3 3-Way mixing valve.

.2 The plant will provide heating to: Hydronic heating coils, radiant heating.

.2 Integration with Other Systems

.1 Run requests will be received to start the plant between the dates of March 31 and December 14. The plant will run for at least 4 hours.

.3 Safeties and Limits

.1 The boilers will be equipped with factory mounted hardwired safety limits.

.2 If the heating system is enabled and the boiler alarm contact indicates a failure, the lag boiler will start. Command to the lead boiler will be off.

.3 If the lead pump is running and fails, an alarm will be issued, and the controller will start the lag pump. Command to the failed pump will remain on. Pump alarm will be cleared (still archived on the BAS) once lag pump status has been on for more than 10 seconds. If the failed lead pump restarts the lag pump will shut down.

.4 If the lead secondary pump is commanded to start and status is not received within 15 seconds, an alarm will be issued, and the controller will start the lag pump. Command to the failed pump will remain on. Pump alarm will be cleared (still archived on the BAS) once lag pump status has been restored. If the failed lead pump restarts the lag pump will shut down.

.5 Minimum run time for a boiler will be 5 minutes.

.4 Alternation of Equipment

.1 Boilers and pumps will be rotated every Tuesday at 6:00 AM.

.5 Modes of Operation

.1 Between December 15 and March 31: The system will be continuously active in the Heating Mode.

.2 Between March 31 and December 14: The system will be active in the Heating Mode under either of the following conditions (disabled when outdoor air temperature exceeds 18°C):

.3 Between March 31 and May 31 and under either of the following:

.1 The outdoor air temperature is less than 5°C for more than 12 hours.

.2 is a run request.

.3 The system will be put into the Disabled Mode by the operator.

.6 Heating Mode

.1 Lead secondary pump will start.

.2 Heating plant will be controlled to maintain the boilers HWR temperature at setpoint. HWR setpoint is automatically reset based on the outdoor air temperature as follows:

Outdoor Air Temperature	HWR Temperature Setpoint
15.6°C (60°F)	32.2°C (90°F)
-17.8°C (0°F)	82.2°C (180°F)

.3 The boilers and 3-way hot water valve will be controlled to maintain the lead HWR temperature at setpoint.

.7 Disabled Mode

.1 The system will be off. All boilers and pumps will be off.

.8 Low Priority Alarms (Alarm visible in Alarm Console, and visually on graphics)

.1 Boiler alarm received.

.2 Secondary pump failure.

.9 Trends

.1 HWS temperature.

.2 HWR temperature setpoint.

.3 Boiler alarm and status.

.4 Boiler pump command and amps.

.5 Lead secondary pump status and command.

END OF SECTION