Project Title: Fit Up for a Public Safety Client
105 Christina Street South
Sarnia, Ontario
Issued for Tender

Project Number: R.073089.040 & R.073089.052

Project Date: 2016-10-07

END OF SECTION

Consultant for Building Code Review:

Building Code Designation Number (BCDN):

END OF SECTION

END OF SECTION

PART 1 - GENERAL

1.1 DRAWINGS

.1 Refer to 'Drawing A001 - Cover Sheet and Location Plan' for the full list of drawings for Work of this Project, including architectural, mechanical, electrical and structural discipline drawings.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.

END OF SECTION

PART 1 - GENERAL

1.1 SCHEDULES

.1 The Schedules, appended to this Section, that the Bid and Contract Documents are based upon include the following:
- .1 Room finish schedule.
- .2 Door and lock schedule.
- .3 Window Schedule.

.2 Refer to Section 08 71 11 for hardware schedule.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.

END OF SECTION

Room Finish Schedule

Room No.	Walls									Floor	Ceiling
	North		East		South		West		Base		
	MATERIAL	FINISH	MATERIAL	FINISH	MATERIAL	FINISH	MATERIAL	FINISH			MATERIAL
200	GWB	PT1	GWB	PT1	GWB	PT1	GWB	PT1	RB	CPT1	GWB
201	GWB	PT1	GWB	PT1	GWB	PT1	GWB	PT1	RB	CPT1	ACT
202	GWB	PT1	GWB	PT1	GWB	PT1	GWB	PT1	RB	CPT1	ACT
203	GWB	PT1	GWB	PT1	GWB	PT1	GWB	PT1	RB	CPT1	ACT
204	GWB	PT1	GWB	PT1	GWB	PT1	GWB	PT1	RB	CPT1	GWB
205	GWB	PT1	GWB	PT1	GWB	PT1	GWB	PT1	RB	CPT1	ACT
206	EX	PT3	GWB	PT1	GWB	PT1	GWB	PT1	RB	CPT1	ACT
207	GWB	PT1	GWB	PT2	GWB	PT1	GWB	PT2	RB	CPT1	ACT
208	GWB	PT1	GWB	PT1	GWB	PT1	GWB	PT1	RB	ESD	ACT
209	GWB	PT1	GWB	PT1	GWB	PT1	GWB	PT1	RB	ESD	ACT
210	GWB	PT1	GWB	PT1	GWB	PT1	EX	PT3	RB	CON	GWB
211	GWB	PT1	GWB	PT1	GWB	PT1	EX	PT3	RB	CON	GWB
212	GWB	PT1	GWB	PT1	GWB	PT1	EX	PT3	RB	CPT1	ACT
213	GWB	PT2	GWB	PT2	GWB	WT1	GWB	PT1	RB	VCT	GWB
214	GWB	PT1	GWB	PT1	GWB	PT1	GWB	PT1	RB	CPT1	ACT
215	GWB	PT1	GWB	PT1	GWB	PT1	GWB	PT1	RB	CPT1	ACT

All existing column enclosures, all radiator covers, all window surrounds and surfaces to remain and to be painted are to be painted with three coats; All metal surfaces to have paint applied that is suitable for metal

Finish Legend

PT1	*General Paint*		***TBD***
PT2	*Accent Colour Paint*		***TBD***
PT3	*Convector Cover Paint*		***TBD***
WT1	*Wall Tile*		***TBD***
CPT1	*Carpet Tile*		***TBD***
VCT	*Vinyl Flooring*		***TBD***
ESD	*Electro Static Dissipating (ESD) tile system*		The electro static dissipating tile system must meet ANSI/ESD S20.20 and ANSI/ESD S7.1-2005 standards. The minimum standard of acceptance for static dissipating tile system is 3M 8400 Series ESD floor tile or equivalent. Flooring to be grounded.

Door and Lock Schedule

Door No.	Door and Frame	STC Rating	Dooor	Frame	Fire Rating	Push Side	Pull Side	Door Height	Door Width	Door Stop	Comments	Lock Type and Part No.	Card Reader Alarm	Door and Hardware Comments	PTSS Reference Spec. Documents
200	Door: Acoustic 45mm thick steel STC rated, 45mm thick with 1.2mm CRS. Frame: 1.6mm steel having a strike bucket to accept 25 mm throw deadbolt. Grout or wedge in the area of strike bucket to prevent spreading. Hinges: McKinney T4A3386 Stainless Steel Heavy Weight Non Removable Pins	51	HM PT	HM PT	1hr	Building Corridor	Room 200 (Lobby)	2134 mm	96 5mm	Yes	RH	Mortise ANSI F13 - Schlage L9456P 06B 626	Alarm Key Pad	Single steel door and frame opening. Door to have mortise Type 86 Cutout and factory prep'd to accept Schlage L9456 mortise lock. Heavy Duty LCN 4041XP door closer, Pemko 4131CRL Door Bottom and Pemko 171A Threshold to be installed.	
201A	Door: Acoustic 45mm thick steel STC 46. Frame: Acoustic steel frame STC 46 having a strike bucket to accept 25 mm throw deadbolt. Grout or wedge in the area of strike bucket to prevent spreading. Hinges: McKinney T4A3386 Stainless Steel Heavy Weight Non Removable Pins	46	HM PT	HM PT		Room 200 (Lobby)	Room 201	2134 mm	965 mm	Yes	LH	Mortise ANSI F07 - Schlage L9080P 06B 626		Single steel Acoustical door and frame opening. Door to have mortise Type 86 Cutout and factory prep'd to accept Schlage L9080 mortise lock. Heavy Duty LCN 4041XP door closer, STC 46 sound seals, STC 46 threshold and STC 46 door bottom to be installed.	
201B	Door: Acoustic 45mm thick steel STC 46. Frame: Acoustic steel frame STC 46 having a strike bucket to accept 25 mm throw deadbolt. Grout or wedge in the area of strike bucket to prevent spreading. Hinges: McKinney T4A3386 Stainless Steel Heavy Weight Non Removable Pins	46	HM PT	HM PT		Room 202	Room 201	2134 mm	965 mm	Yes	RHR	Mortise ANSI F15 - Schlage L9485P 06B 626		Single steel acoustical door and frame opening. Door to have mortise Type 86 Cutout and factory prep'd to accept Schlage L9485 mortise lock. Heavy Duty LCN 4041XP door closer, STC 46 sound seals, STC 46 threshold and STC 46 door bottom to be installed.	
202	Door: Metal hollow core 45mm thick with 1.2mm CRS. Frame: 1.6mm steel having a strike bucket to accept 25 mm throw deadbolt. Grout or wedge in the area of strike bucket to prevent spreading. Hinges: McKinney T4A3386 Stainless Steel Heavy Weight Non Removable Pin. Wire Transfer: Securitron EPT. Power Cable: ElectroLynx QC-C1500P 15'2" 12 Conductor cable, molex one end, pin other end prewired through door with molex end connection remaining inside the door mortise pocket.		HM PT	HM PT		Room 200 (Lobby)	Room 202 (Open Workspace)	2134 mm	965 mm	Yes	RH	Electrified Mortise ANSI F15 - Sargent RX DX LC 8271 x 24VDC x LNB x 26D x RH	Card reader	Single steel door and frame opening. Door to have mortise Type 86 Cutout and factory prep'd to accept Sargent 8271 Electrified Mortise Lock. Door and Frame must be factory prep'd to accept Securitron EPT Wire Transfer and have the ElectroLynx QC-C1500P 15'2" 12 Conductor cable prewired through the door with the molex connection remaining inside the mortise lockset pocket. Heavy Duty LCN 4041XP door closer, Pemko 4131CRL Door Bottom and Pemko 171A Threshold to be installed.	1) F15 Card Access Door with Sargent Mortise and QC Wire.pdf 2) Security Door C.pdf 3) Security Door E.pdf
203	Door: acoustic 45mm thick steel STC 46. Frame: acoustic steel frame STC 46 having a strike bucket to accept 25 mm throw deadbolt. Grout or wedge in the area of strike bucket to prevent spreading. Hinges: McKinney T4A3386 Stainless Steel Heavy Weight Non Removable Pins	46	HM PT	HM PT		Room 202 (Corridor)	Room 203	2134 mm	915 mm	Yes	LH	Mortise ANSI F15 - Schlage L9485P 06B 626	Alarm Key Pad	Single steel acoustical door and frame opening. Door to have mortise Type 86 Cutout and factory prep'd to accept Schlage L9485 mortise lock. Heavy Duty LCN 4041XP door closer, STC 46 sound seals, STC 46 threshold and STC 46 door bottom to be installed.	
204	Door: Metal hollow core 45mm thick with 1.2mm CRS. Frame: 1.6mm steel having a strike bucket to accept 25 mm throw deadbolt. Grout or wedge in the area of strike bucket to prevent spreading. Hinges: McKinney T4A3386 Stainless Steel Heavy Weight Non Removable Pins		HM PT	HM PT	1hr	Room 202 (Corridor)	Room 204	2134 mm	915 mm	Yes	LH	Mortise ANSI F15 - Schlage L9485P 06B 626	Alarm Key Pad	Single steel door and frame opening. Door to have mortise Type 86 Cutout and factory prep'd to accept Schlage L9485 mortise lock. Heavy Duty LCN 4041XP door closer, Pemko 4131CRL Door Bottom and Pemko 171A Threshold to be installed.	
205	Door: Metal hollow core 45mm thick with 1.2mm CRS. Frame: 1.6mm steel having a strike bucket to accept 25 mm throw deadbolt. Grout or wedge in the area of strike bucket to prevent spreading. Hinges: McKinney T4A3386 Stainless Steel Heavy Weight Non Removable Pins		HM PT	HM PT		Room 202 (Corridor)	Room 205	2134 mm	915 mm	Yes	RH	Mortise ANSI F13 - Schlage L9456P 06B 626		Single steel door and frame opening. Door to have mortise Type 86 Cutout and factory prep'd to accept Schlage L9456 mortise lock. Heavy Duty LCN 4041XP door closer, Pemko 4131CRL Door Bottom and Pemko 171A Threshold to be installed.	
206	Door: Solid wood core 45mm thick. Frame: 1.6mm steel having a strike bucket to accept 25 mm throw deadbolt. Hinges: McKinney T4A3786 Steel Heavy Weight		WD PT	WD PT		Room 202 (Corridor)	Room 206	2134 mm	965 mm	Yes	RH - Wood Door	Cylindrical ANSI F82 - Schlage ND50PD RHO 626		Single door and frame opening. Door to have bored lock Type 161 Cutout and factory prep'd to accept Schlage ND50 cylindrical lockset.	
207	Door: Solid wood core 45mm thick. Frame: 1.6mm steel having a strike bucket to accept 25 mm throw deadbolt. Hinges: McKinney T4A3786 Steel Heavy Weight		WD PT	WD PT		Room 202 (Open Workspace)	Room 207	2134 mm	965 mm	Yes	LH - Wood Door	Cylindrical ANSI F82 - Schlage ND50PD RHO 626		Single door and frame opening. Door to have bored lock Type 161 Cutout and factory prep'd to accept Schlage ND50 cylindrical lockset.	
208	Door: Metal hollow core 45mm thick with 1.2mm CRS. Frame: 1.6mm steel having a strike bucket to accept 25 mm throw deadbolt. Grout or wedge in the area of strike bucket to prevent spreading. Hinges: McKinney T4A3386 Stainless Steel Heavy Weight Non Removable Pins		HM PT	HM PT		Room 202 (Corridor)	Room 208	2134 mm	915 mm	Yes	LH	Mortise ANSI F15 - Schlage L9485P 06B 626		Single steel door and frame opening. Door to have mortise Type 86 Cutout and factory prep'd to accept Schlage L9485 mortise lock. Heavy Duty LCN 4041XP door closer, Pemko 4131CRL Door Bottom and Pemko 171A Threshold to be installed.	
209B	Door: Metal hollow core 45mm thick with 1.2mm CRS. Frame: 1.6mm steel having a strike bucket to accept 25 mm throw deadbolt. Grout or wedge in the area of strike bucket to prevent spreading. Hinges: McKinney T4A3386 Stainless Steel Heavy Weight Non Removable Pins		HM PT	HM PT		Room 209 (east)	Room 209	2134 mm	915 mm	Yes	LH	Mortise ANSI F15 - Schlage L9485P 06B 626	Alarm Key Pad	Single steel door and frame opening. Door to have mortise Type 86 Cutout and factory prep'd to accept Schlage L9485 mortise lock. Heavy Duty LCN 4041XP door closer, Pemko 4131CRL Door Bottom and Pemko 171A Threshold to be installed.	
210	Door: Metal hollow core 45mm thick with 1.2mm CRS. Frame: 1.6mm steel having a strike bucket to accept 25 mm throw deadbolt. Grout or wedge in the area of strike bucket to prevent spreading. Hinges: McKinney T4A3386 Stainless Steel Heavy Weight Non Removable Pin. Wire Transfer: Securitron EPT. Power Cable: ElectroLynx QC-C1500P 15'2" 12 Conductor cable, molex one end, pin other end prewired through door with molex end connection remaining inside the door mortise pocket.		HM PT	HM PT		Room 202 (Corridor)	Room 210	2134 mm	915 mm	Yes	RH	Electrified Mortise ANSI F15 - Sargent RX DX LC 8271 x 24VDC x LNB x 26D x RH	Card reader and Alarm Key Pad	Single steel door and frame opening. Door to have mortise Type 86 Cutout and factory prep'd to accept Sargent 8271 Electrified Mortise Lock. Door and Frame must be factory prep'd to accept Securitron EPT Wire Transfer and have the ElectroLynx QC-C1500P 15'2" 12 Conductor cable prewired through the door with the molex connection remaining inside the mortise lockset pocket. Heavy Duty LCN 4041XP door closer, Pemko 4131CRL Door Bottom and Pemko 171A Threshold to be installed.	1) F15 Card Access Door with Sargent Mortise and QC Wire.pdf 2) Security Door C.pdf 3) Security Door E.pdf
211	Door: Metal hollow core 45mm thick with 1.2mm CRS. Frame: 1.6mm steel having a strike bucket to accept 25 mm throw deadbolt. Grout or wedge in the area of strike bucket to prevent spreading. Hinges: McKinney T4A3386 Stainless Steel Heavy Weight Non Removable Pins		HM PT	HM PT		Room 210	Room 211	2134 mm	915 mm	Yes	RH	Mortise ANSI F15 - Schlage L9485P 06B 626	Alarm Key Pad	Single steel door and frame opening. Door to have mortise Type 86 Cutout and factory prep'd to accept Schlage L9485 mortise lock. Heavy Duty LCN 4041XP door closer, Pemko 4131CRL Door Bottom and Pemko 171A Threshold to be installed.	
212	Door: Metal hollow core 45mm thick with 1.2mm CRS. Frame: 1.6mm steel having a strike bucket to accept 25 mm throw deadbolt. Grout or wedge in the area of strike bucket to prevent spreading. Hinges: McKinney T4A3386 Stainless Steel Heavy Weight Non Removable Pins		HM PT	HM PT		Room 202 (Corridor)	Room 212	2134 mm	915 mm	Yes	LH	Mortise ANSI F07 - Schlage L9080P 06B 626		Single steel door and frame opening. Door to have mortise Type 86 Cutout and factory prep'd to accept Schlage L9080 mortise lock. Heavy Duty LCN 4041XP door closer, Pemko 4131CRL Door Bottom and Pemko 171A Threshold to be installed.	
214	Door: Metal hollow core 45mm thick with 1.2mm CRS. Frame: 1.6mm steel having a strike bucket to accept 25 mm throw deadbolt. Grout or wedge in the area of strike bucket to prevent spreading. Hinges: McKinney T4A3386 Stainless Steel Heavy Weight Non Removable Pins		HM PT	HM PT		Room 202 (Corridor)	Room 214	2134 mm	965 mm	Yes	LH	Mortise ANSI F07 - Schlage L9080P 06B 626	Alarm Key Pad	Single steel door and frame opening. Door to have mortise Type 86 Cutout and factory prep'd to accept Schlage L9080 mortise lock. Heavy Duty LCN 4041XP door closer, Pemko 4131CRL Door Bottom and Pemko 171A Threshold to be installed.	
215A	Door: Metal hollow core 45mm thick with 1.2mm CRS. Frame: 1.6mm steel having a strike bucket to accept 25 mm throw deadbolt. Grout or wedge in the area of strike bucket to prevent spreading. Hinges: McKinney T4A3386 Stainless Steel Heavy Weight Non Removable Pin. Wire Transfer: Securitron EPT. Power Cable: ElectroLynx QC-C1500P 15'2" 12 Conductor cable, molex one end, pin other end prewired through door with molex end connection remaining inside the door mortise pocket.		HM PT	HM PT		Room 202 (Corridor)	Room 215	2134 mm	965 mm	Yes	LHR	Electrified Mortise ANSI F15 - Sargent RX DX LC 8271 x 24VDC x LNB x 26D x RHR	Card reader	Single steel door and frame opening. Door to have mortise Type 86 Cutout and factory prep'd to accept Sargent 8271 Electrified Mortise Lock. Door and Frame must be factory prep'd to accept Securitron EPT Wire Transfer and have the ElectroLynx QC-C1500P 15'2" 12 Conductor cable prewired through the door with the molex connection remaining inside the mortise lockset pocket. Heavy Duty LCN 4041XP door closer, Pemko 4131CRL Door Bottom and Pemko 171A Threshold to be installed.	1) F15 Card Access Door with Sargent Mortise and QC Wire.pdf 2) Security Door C.pdf 3) Security Door E.pdf
215B	Door: Metal hollow core 45mm thick with 1.2mm CRS. Frame: 1.6mm steel having a strike bucket to accept 25 mm throw deadbolt. Grout or wedge in the area of strike bucket to prevent spreading. Hinges: McKinney T4A3386 Stainless Steel Heavy Weight Non Removable Pins	51	HM PT	HM PT	1hr	Room 215	Building Corridor	2134 mm	965 mm		LHR	Mortise ANSI F15 - Schlage L9485P 06B 626	Alarm Key Pad	Single steel door and frame opening. Door to have mortise Type 86 Cutout and factory prep'd to accept Schlage L9485 mortise lock. Heavy Duty LCN 4041XP door closer, Pemko 4131CRL Door Bottom and Pemko 171A Threshold to be installed.	

General Notes

1) All Door, Frame and Hardware substitutions must be discussed with and accepted by PTSS.
2) Provide coordinating seals as required to meet identified STC and Fire Ratings.
3) All Door and Door Frame installations will be as per the manufacturers specifications.
4) All lock hardware installations will be as per manufacturer specifications and proper lock functions are to be verified with construction lock cylinders.
5) All lock hardware to be installed correctly to match door frame strike bucket location to achieve complete latch and deadbolt engagement.

Window Schedule

Window No.	Window Type	Window Finish
W01	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W02	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W03	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W04	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W05	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W06	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W07	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W08	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W09	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W10	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W11	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W12	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W13	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W14	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W15	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W16	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W17	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W18	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W19	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W20	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W21	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W22	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W23	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W24	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W25	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W26	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W27	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W28	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W29	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W30	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W31	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W32	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W33	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W34	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W35	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W36	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W37	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W38	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior
W39	Fixed (Top)/ Movable (Bottom)	Reflective Security Film applied to Interior

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Title and description of Work.

.2 Contract Method.

.3 Work by others.

.4 Work sequence.

.5 Contractor use of premises.

.6 Owner occupancy.

.7 Alterations to existing building.

1.2 PRECEDENCE

.1 For Federal Government projects, Division 01 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this Contract comprises the interior fit-up of an existing area for a public safety client, located at 105 South Christina Street, Sarnia, Ontario; and further identified as PWGSC Project Number R.073089.002.

1.4 CONTRACT METHOD

.1 Construct work under lump sum contract.

1.5 COST BREAKDOWN

.1 Within five days of the kick-off meeting, provide a cost breakdown by Section aggregating contract amount.

.2 Within 48 hours of acceptance of bid, submit a full list of Subcontractors for review and approval by the Owner. Re-submit for Owner's records, the list of Subcontractors a week before the work by that Subcontractor commences.

1.5 WORK BY OTHERS

.1 Work of Project executed during Work of this Contract, and which is specifically excluded from this Contract:
.1 Movers and systems furniture installers.
.2 Security devices.

.2 The Contractor shall for the purpose of the Ontario Occupational Health and Safety Act and Regulations for Construction Projects, and for the duration of the Work of the Contract:
.1 Assume the role of Constructor in accordance with the Authority Having Jurisdictions.
.2 Agree, in the event of two or more Contractors working at the same time and space at the work site, without limiting the General Conditions GC3.7, to the Departmental Representative's order to:
.1 Assume, as the Constructor, the responsibility for the Departmental Representative's other Contractors.

1.6 WORK SEQUENCE

.1 Construct Work in stages to accommodate Owner's continued use of premises during construction.

.2 Coordinate Progress Schedule with Departmental Representative during construction.

.3 Maintain fire access/control.

1.7 CONTRACTOR USE OF PREMISES

.1 Contractor shall limit use of premises for Work, for storage and for access, to allow;
.1 Owner occupancy.
.2 Work by other contractors.

.2 Coordinate use of premises under direction of Departmental Representative.

.3 The Contractor and their Subcontractors must enter and exit the Site through designated doors.

.4 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.

1.8 OWNER OCCUPANCY

.1 Owner will occupy the building during the entire construction period but not the specific work area of focus for this Project.

.2 Cooperate with Departmental Representative in scheduling operations to minimize conflict and to facilitate Owner usage of the building and areas adjacent to the intended construction area.

.3 Interruptions to Owner's operations will not be permitted.

1.9 ALTERATIONS TO EXISTING BUILDING

.1 Provide new openings required in existing construction.

.2 Block in openings where items removed with material and finish to match existing adjoining construction.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.

END OF SECTION

PART 1 - GENERAL

1.1 ACCESS AND EGRESS

.1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

1.2 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.

.2 Maintain existing services to building and provide for personnel and vehicle access.

.3 Where security is reduced by work provide temporary means to maintain security.

.4 Use only elevators, dumbwaiters, conveyors or escalators existing in building for moving workers and material.
.1 Protect walls of passenger elevators, to approval of Departmental Representative prior to use.
.2 Accept liability for damage, safety of equipment and overloading of existing equipment.

.5 Closures: Protect work temporarily until permanent enclosures are completed.

.6 Parking and washroom restrictions: Refer to Section 01 52 00 for parking and washroom restrictions for Work of this Project.

1.3 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

.1 Execute work with least possible interference or disturbance to building operations, occupants, public and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.

1.4 EXISTING SERVICES

.1 Notify, Departmental Representative utility companies of intended interruption of services and obtain required permission.

.2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.

.3 Provide for personnel and pedestrian traffic.

.4 Construct barriers in accordance with Section 01 56 00.

1.5 SPECIAL REQUIREMENTS

.1 Contractor submission requirements: Refer to the Document appended to this Section for the list of Contractor submissions required before work can begin on-Site.

.2 Carry out noise generating Work Monday to Friday from 18:00 to 07:00 hours and on Saturdays, Sundays, and statutory holidays.

.3 Submit schedule in accordance with Section 01 32 16.

.4 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.

.5 Keep within limits of work and avenues of ingress and egress.

.6 Deliver materials outside of peak traffic hours 17:00 to 07:00 and 13:00 to 15:00 unless otherwise approved by Departmental Representative.

1.5 SPECIAL REQUIREMENTS (Cont'd)

.7 Prior to cutting or drilling horizontal or vertical surfaces including concrete, concrete block or other structural substrate, determine location of reinforcing, service lines, pipes, conduits or other items by x-ray, ground penetrating radar or other appropriate method. Submit findings to Departmental Representative prior to cutting or drilling.

1.6 SECURITY

.1 Where security has been reduced by Work of Contract, provide temporary means to maintain security.

.2 Security clearances:
.1 Personnel employed on this project will be subject to security check. Obtain clearance, as instructed, for each individual who will require to enter premises.
.2 Personnel will be checked daily at start of work shift and provided with pass which must be worn at all times. Pass must be returned at end of work shift and personnel checked out.
.3 Contractor's personnel will require satisfactory security screening in order to complete Work in premises and on site.

1.7 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions. Smoking is not permitted.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

LIST OF CONTRACTOR SUBMISSIONS REQUIRED BEFORE WORK BEGINS ON-SITE

1. The winning general contractor to submit all necessary documentation for personnel screening (all contractors and sub-contractors are to be security cleared at once). Contractor is responsible to obtain necessary security clearance on time. Details are attached below. Personnel who currently have security clearance has a faster chance of getting security screened in than new applicants. See attachment below for further details required by the client.

2. Contractor shall submit a draft schedule within ten days of award.

3. Cost breakdown: A cost breakdown shall be submitted within five days after the kick-off meeting

4. Cash Flow: A cash flow shall be submitted within five days after the kick-off meeting

5. Contractor shall submit list of sub-contractors a week before the work by that subcontractor commences

6. Contractor shall submit the site specific safety plan, company's safety program and policy within five working days after the kick-off meeting. Work on site can only begin when the site specific safely plan is approved by the Department.

7. Contractor shall submit the site specific environmental protection plan.

8. Contractor shall read and understand the contract conditions on the Invitation to Tender form. SACC manual can be found at :

   https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual

Company Address and
Name:_____ Trade:_____

Government of Canada / Gouvernement du Canada

PROTECTED (when completed)

OFFICE USE ONLY		
Reference number	Department/Organization number	File number

PERSONNEL SCREENING, CONSENT AND AUTHORIZATION FORM

NOTE: For *Privacy Act* Statement refer to Section C of this form and for completion instructions refer to attached instructions.
Please typewrite or print in block letters.

A ADMINISTRATIVE INFORMATION (To be completed by the Authorized Departmental/Agency/Organizational Official)

☐ **New** ☐ **Update** ☐ **Upgrade** ☐ **Transfer** ☐ **Supplemental** ☐ **Re-activation**

The requested level of reliability/security check(s)

☐ Reliability Status ☐ Level I (CONFIDENTIAL) ☐ Level II (SECRET) ☐ Level III (TOP SECRET)

☐ Other _____

PARTICULARS OF APPOINTMENT/ASSIGNMENT/CONTRACT

☐ Indeterminate ☐ Term ☐ Contract ☐ Industry ☐ Other (specify secondment, assignment, etc.) _____

Justification for security screening requirement

Position/Competition/Contract number	Title		Group/Level (Rank if applicable)
Employee ID number/PRI/Rank and Service number (if applicable)	If term or contract, indicate duration period ▶	From	To
Name and address of department / organization / agency	Name of official	Telephone number ( )	Facsimile number ( )

B BIOGRAPHICAL INFORMATION (To be completed by the applicant)

Surname (Last name)	Full given names (no initials) underline or circle usual name used	Family name at birth

All other names used (i.e. Nickname)	Sex ☐ Male ☐ Female	Date of birth Y M D	Country of birth	Date of entry into Canada if born outside Canada Y M D

RESIDENCE (provide addresses for the last five years, starting with the most current) Home address	Daytime telephone number ( )	E-mail address

1	Apartment number	Street number	Street name		Civic number (if applicable)	From Y M	To present
	City		Province or state	Postal code	Country	Telephone number ( )	
2	Apartment number	Street number	Street name		Civic number (if applicable)	From Y M	To Y M
	City		Province or state	Postal code	Country	Telephone number ( )	

Have you previously completed a Government of Canada security screening form? ☐ Yes ☐ No	If yes, give name of employer, level and year of screening. Y

CRIMINAL CONVICTIONS IN AND OUTSIDE OF CANADA (see instructions)

Have you ever been convicted of a criminal offence for which you have not been granted a pardon? ☐ Yes ☐ No	If yes, give details. (charge(s), name of police force, city, province/state, country and date of conviction) ▼	
Charge(s)	Name of police force	City
Province/State	Country	Date of conviction ▶ Y M D

Government of Canada | Gouvernement du Canada

PERSONNEL SCREENING, CONSENT AND AUTHORIZATION FORM

PROTECTED (when completed)

Surname and full given names	Date of birth Y M D

C CONSENT AND VERIFICATION (To be completed by the applicant and authorized Departmental/Agency/Organizational Official)

Checks Required (See Instructions)	Applicant's initials	Name of official (print)	Official's initials	Official's Telephone number
1. ☐ Date of birth, address, education, professional qualifications, employment history, personal character references				( )
2. ☐ Criminal record check				( )
3. ☐ Credit check (financial assessment, including credit records check)				( )
4. ☐ Loyalty (security assessment only)				
5. ☐ Other (specify, see instructions) Law Enforcement Records Checks				( )

The Privacy Act Statement
The information on this form is required for the purpose of providing a security screening assessment. It is collected under the authority of subsection 7(1) of the *Financial Administration Act* and the Government Security Policy (GSP) of the Government of Canada, and is protected by the provisions of the *Privacy Act* in institutions that are covered by the *Privacy Act*. Its collection is mandatory. A refusal to provide information will lead to a review of whether the person is eligible to hold the position or perform the contract that is associated with this Personnel Screening Request. Depending on the level of security screening required, the information collected by the government institution may be disclosed to the Royal Canadian Mounted Police (RCMP) and the Canadian Security Intelligence Service (CSIS), which conduct the requisite checks and/or investigation in accordance with the GSP and to entities outside the federal government (e.g. credit bureaus). It is used to support decisions on individuals working or applying to work through appointment, assignment or contract, transfers or promotions. It may also be used in the context of updating, or reviewing for cause, the reliability status, security clearance or site access, all of which may lead to a re-assessment of the applicable type of security screening. Information collected by the government institution, and information gathered from the requisite checks and/or investigation, may be used to support decisions, which may lead to discipline and/or termination of employment or contractual agreements. The personal information collected is described in Standard PIB PSU 917 (Personnel Security Screening) which is used by all government agencies, except the Department of National Defence PIB DND/PPE 834 (Personnel Security Investigation File), RCMP PIB CMP PPU 065 (Security/Reliability Screening Records), CSIS PIB SIS PPE 815 (Employee Security), and PWGSC PIB PWGSC PPU 015 (Personnel Clearance and Reliability Records) used for Canadian Industry Personnel. Personal information related to security assessments is also described in the CSIS PIB SIS PPU 005 (Security Assessments/Advice).

I, the undersigned, do consent to the disclosure of the preceding information including my photograph for its subsequent verification and/or use in an investigation for the purpose of providing a security screening assessment. By consenting to the above, I acknowledge that the verification and/or use in an investigation of the preceding information may also occur when the reliability status, security clearance or site access are updated or otherwise reviewed for cause under the Government Security Policy. My consent will remain valid until I no longer require a reliability status, a security clearance or a site access clearance, my employment or contract is terminated, or until I otherwise revoke my consent, in writing, to the authorized security official.

Signature _____ Date (Y/M/D) _____

D REVIEW (To be completed by the authorized Departmental/Agency/Organizational Official responsible for ensuring the completion of sections A, B and C)

Name and title	Telephone number
Address	Facsimile number

E APPROVAL (To be completed by authorized Departmental/Agency/Organizational Security Official only)

I, the undersigned, as the authorized security official, do hereby approve the following level of screening.

Reliability Status

☐ Approved Reliability Status ☐ Not approved

Name and title _____

Signature _____ Date (Y/M/D) _____

Security Clearance (if applicable)

☐ Level I ☐ Level II ☐ Level III ☐ Not recommended

Name and title _____

Signature _____ Date (Y/M/D) _____

Comments

PHOTO (for Level III T.S., and/or upon request - see instructions)

PART 1 - GENERAL

1.1 ADMINISTRATIVE

.1 Schedule and administer project meetings throughout the progress of the work at the call of Departmental Representative.

.2 Prepare agenda for meetings.

.3 Distribute written notice of each meeting 4 days in advance of meeting date to Departmental Representative.

.4 Provide physical space and make arrangements for meetings.

.5 Preside at meetings.

.6 Unless directed otherwise by Departmental Representative, record minutes of meetings. Minutes shall be circulated to attending parties and affected parties not in attendance within 3 days after meeting.

.7 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.2 PRECONSTRUCTION MEETING

.1 Within 15 days after award of Contract, request meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

.2 Departmental Representative, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.

.3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.

.4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.

.5 Agenda to include:

1.2 PRECONSTRUCTION MEETING (Cont'd)

.5 (Cont'd)

.1 Appointment of official representative of participants in the Work.

.2 Schedule of Work: in accordance with Section 01 32 16.

.3 Schedule of submission of shop drawings, samples, mock-ups, colour chips. Submit submittals in accordance with Section 01 33 00.

.4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00.

.5 Delivery schedule of specified equipment in accordance with Section 01 61 00.

.6 Site security in accordance with Section 01 56 00.

.7 Health and safety in accordance with Section 01 35 29.

.8 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.

.9 Owner provided products.

.10 Record drawings and specifications in accordance with Sections 01 33 00 and 01 78 00.

.11 Maintenance manuals in accordance with Section 01 78 00.

.12 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00.

.13 Monthly progress claims, administrative procedures, photographs, hold backs.

.14 Appointment of inspection and testing agencies or firms.

.15 Insurances, transcript of policies.

1.3 PROGRESS MEETINGS

.1 During course of Work and three weeks prior to project completion, schedule progress meetings. every two weeks.

.2 Contractor, major Subcontractors involved in Work and Departmental Representative are to be in attendance.

.3 Notify parties minimum 5 days prior to meetings.

.4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 3 days after meeting.

.5 Agenda to include the following:

1.3 PROGRESS MEETINGS (Cont'd)

.5 (Cont'd)

.1 Review, approval of minutes of previous meeting.

.2 Review of Work progress since previous meeting.

.3 Field observations, problems, conflicts.

.4 Problems which impede construction schedule.

.5 Review of off-site fabrication delivery schedules.

.6 Corrective measures and procedures to regain projected schedule.

.7 Revision to construction schedule.

.8 Progress schedule, during succeeding work period.

.9 Review submittal schedules: expedite as required.

.10 Maintenance of quality standards.

.11 Review proposed changes for affect on construction schedule and on completion date.

.12 Other business.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 DEFINITIONS

.1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.

.2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.

.3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.

.4 Construction Work Week: Monday to Friday, inclusive, will provide five day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.

.5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.

.6 Master Plan: summary-level schedule that identifies major activities and key milestones.

.7 Milestone: significant event in project, usually completion of major deliverable.

.8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.

1.1 DEFINITIONS (Cont'd)

.9 Project Planning, Monitoring and Control System: overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.

1.2 REQUIREMENTS

.1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.

.2 Plan to complete Work in accordance with prescribed milestones and time frame.

.3 Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.

.4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Certificate of Substantial Performance and Certificate of Completion as defined times of completion are of essence of this contract.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Submit to Departmental Representative within ten working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.

.3 Submit Project Schedule to Departmental Representative within ten working days of receipt of acceptance of Master Plan.

1.4 MASTER PLAN

.1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).

.2 Departmental Representative will review and return revised schedules within 5 working days.

1.4 MASTER PLAN (Cont'd)

.3 Revise impractical schedule and resubmit within 5 working days.

.4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

1.5 PROJECT SCHEDULE

.1 Develop detailed Project Schedule derived from Master Plan.

.2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
.1 Award.
.2 Shop Drawings, Samples.
.3 Permits.
.4 Mobilization.
.5 Interior alterations.
.6 Plumbing.
.7 Lighting.
.8 Electrical.
.9 Piping.
.10 Controls.
.11 Heating, Ventilating, and Air Conditioning.
.12 Millwork.
.13 Fire Systems.
.14 Testing and Commissioning.
.15 Supplied equipment long delivery items.

1.6 PROJECT SCHEDULE REPORTING

.1 Update Project Schedule on weekly basis reflecting activity changes and completions, as well as activities in progress.

.2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

1.7 PROJECT MEETINGS

.1 Discuss Project Schedule at regular site meetings specified in Section 01 31 19, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.

.2 Weather related delays with their remedial measures will be discussed and negotiated.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.

END OF SECTION

PART 1 - GENERAL

1.1 ADMINISTRATIVE

.1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

.2 Do not proceed with Work affected by submittal until review is complete.

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

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

.5 Review submittals prior to submission to Departmental Representative. 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 considered rejected.

.6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.7 Verify field measurements and affected adjacent Work are co-ordinated.

.8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.

.9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.

1.1 ADMINISTRATIVE (Cont'd)

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

.11 Submit number of hard copies specified for each type and format of submittal and also submit in electronic format as pdf files. Forward pdf, NMSEdit Professional spp, MS Word, MS Excel and Autocad dwg files on USB compatible with PWGSC encryption requirements or through email or alternate electronic file sharing service such as ftp, as directed by Departmental Representative.

1.2 SHOP DRAWINGS AND PRODUCT DATA

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

.2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario of Canada.

.3 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 co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.4 Allow 5 working days for Departmental Representative's review of each submission.

.5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Amount. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

1.2 SHOP DRAWINGS AND PRODUCT DATA (Cont'd)

.6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.

.7 Accompany submissions with transmittal letter, in duplicate, 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.

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

.9 After Departmental Representative's review, distribute copies.

.10 Submit three hard copies and one electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.

1.2 SHOP DRAWINGS AND PRODUCT DATA (Cont'd)

.11 Submit three hard copies and one electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.

.12 Submit three hard copies and one electronic copy of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
.1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
.2 Testing must have been within 3 years of date of contract award for project.

.13 Submit three hard copies and one electronic copy of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
.1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
.2 Certificates must be dated after award of project contract complete with project name.

.14 Submit three hard copies and one electronic copy of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative.
.1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

.15 Submit three hard copies and one electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.

.16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

1.2 SHOP DRAWINGS AND PRODUCT DATA (Cont'd)

.17 Submit three hard copies and one electronic copy of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.

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

.19 If upon review by Departmental Representative, 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.

.20 The review of shop drawings by Public Works and Government Services Canada (PWGSC) is for sole purpose of ascertaining conformance with general concept.
.1 This review shall not mean that PWGSC 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 requirements of construction and Contract Documents.
.2 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 sub-trades.

1.3 SAMPLES

.1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.

.2 Deliver samples prepaid to Departmental Representative's business address.

.3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.

1.3 SAMPLES (Cont'd)

.4 Where colour, pattern or texture is criterion, submit full range of samples.

.5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

.6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.

.7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.4 MOCK-UPS

.1 Erect mock-ups in accordance with Section 01 45 00.

1.5 PHOTOGRAPHIC DOCUMENTATION

.1 Submit electronic and hard copy of colour digital photography in jpg format, standard resolution, monthly with progress statement and as directed by Departmental Representative.

.2 Project identification: name and number of project and date of exposure indicated.

.3 Number of viewpoints: 4 locations.
.1 Viewpoints and their locations as determined by Departmental Representative.

.4 Frequency of photographic documentation: as directed by Departmental Representative.

1.6 FEES, PERMITS AND CERTIFICATES

.1 Provide authorities having jurisdiction with information requested.

.2 Pay fees and obtain certificates and permits required.

.3 Furnish certificates and permits.

1.6 FEES, PERMITS AND CERTIFICATES (Cont'd)

.4 Submit acceptable certificate stating that suspended ceiling systems provide adequate support for electrical fixtures, as required by current bulletin of Electrical Safety Authority (ESA).

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA): Canada
.1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.

.2 National Building Code 2015 (NBC):
.1 NBC 2015, Division B, Part 8 Safety Measures at Construction and Demolition Sites.

.3 National Fire Code 2010 (NFC):
.1 NFC 2010, Division B, Part 5 Hazardous Processes and Operations, subsection 5.6.1.3 Fire Safety Plan.

.4 Province of Ontario:
.1 Occupational Health and Safety Act Revised Statutes of Ontario 1990, Chapter O.1 as amended, and Regulations for Construction Projects, O. Reg. 213/91 as amended.
.2 O. Reg. 490/09, Designated Substances.
.3 Workplace Safety and Insurance Act, 1997.
.4 Municipal statutes and authorities.

.5 Treasury Board of Canada Secretariat (TBS):
.1 Treasury Board, Fire Protection Standard April 1, 2010 www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=17316&section=text.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Submit site-specific Health and Safety Plan, company's safety program and policy within 5 working days after the kick-off meeting. Refer to Section 01 14 00 for additional requirements. Health and Safety Plan must include:
.1 Results of site specific safety hazard assessment.
.2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
.3 Measures and controls to be implemented to address identified safety hazards and risks.

1.2 ACTION AND INFORMATIONAL SUBMITTALS (Cont'd)

.3 Provide a Fire Safety Plan, specific to the work location, in accordance with NBC, Division B, Article 8.1.1.3 prior to commencement of work. The plan shall be coordinated with, and integrated into, the existing Emergency Procedures and Evacuation Plan in place at the site. Departmental Representative will provide Emergency Procedures and Evacuation Plan. Deliver two copies of the Fire Safety Plan to the Departmental Representative not later than 14 days before commencing work.

.4 Contractor's and Sub-contractors' Safety Communication Plan.

.5 Contingency and Emergency Response Plan addressing standard operating procedures specific to the project site to be implemented during emergency situations. Coordinate plan with existing Emergency Response requirements and procedures provided by Departmental Representative.

.6 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within five days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within five days after receipt of comments from Departmental Representative.

.7 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.

.8 Submit names of personnel and alternates responsible for site safety and health.

.9 Submit records of Contractor's Health and Safety meetings when requested.

.10 Submit two copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative and authority having jurisdiction, weekly.

1.2 ACTION AND INFORMATIONAL SUBMITTALS (Cont'd)

.11 Submit copies of orders, directions or reports issued by health and safety inspectors of the authorities having jurisdiction.

.12 Submit copies of incident and accident reports.

.13 Submit Material Safety Data Sheets (MSDS).

.14 Submit Workplace Safety and Insurance Board (WSIB)- Experience Rating Report.

1.3 FILING OF NOTICE

.1 File Notice of Project with Provincial authorities prior to commencement of Work.

1.4 WORK PERMIT

.1 Obtain building permits related to project prior to commencement of Work.

.2 Obtain Hot Work Permit from Property Manager.

1.5 SAFETY ASSESSMENT

.1 Perform site specific safety hazard assessment related to project.

1.6 MEETINGS

.1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.

1.7 REGULATORY REQUIREMENTS

.1 Comply with the Acts and regulations of the Province of Ontario.

.2 Comply with specified standards and regulations to ensure safe operations at site.

1.8 GENERAL REQUIREMENTS

.1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.

1.8 GENERAL REQUIREMENTS (Cont'd)

.2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns either accepting or requesting improvements.

.3 Relief from or substitution for any portion or provision of minimum Health and Safety standards specified herein or reviewed site-specific Health and Safety Plan shall be submitted to Departmental Representative in writing.

1.9 COMPLIANCE REQUIREMENTS

.1 Comply with Ontario Occupational Health and Safety Act, R.S.O. 1990 Chapter 0.1, as amended.

1.10 RESPONSIBILITY

.1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.

.2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

.3 Where applicable the Contractor shall be designated "Constructor", as defined by Occupational Health and Safety Act and Regulations for Construction Projects for the Province of Ontario.

1.11 UNFORSEEN HAZARDS

.1 Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of Work, immediately stop work and advise Departmental Representative verbally and in writing.

.2 Follow procedures in place for Employees Right to Refuse Work as specified in the Occupational Health and Safety Act for the Province of Ontario.

1.12 HEALTH AND SAFETY CO-ORDINATOR

.1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:

.1 Have working knowledge of occupational safety and health regulations.

.2 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.

.3 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.

.4 Be on site during execution of Work and report directly to and be under direction of site supervisor.

1.13 POSTING OF DOCUMENTS

.1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province of Ontario, and in consultation with Departmental Representative.

.1 Contractor's Safety Policy.

.2 Constructor's Name.

.3 Notice of Project.

.4 Name, trade, and employer of Health and Safety Representative or Joint Health and Safety Committee members (if applicable).

.5 Ministry of Labour Orders and reports.

.6 Occupational Health and Safety Act and Regulations for Construction Projects for Province of Ontario.

.7 Address and phone number of nearest Ministry of Labour office.

.8 Material Safety Data Sheets.

.9 Written Emeregency Response Plan.

.10 Site Specific Safety Plan.

.11 Valid certificate of first aider on duty.

.12 WSIB "In Case of Injury At Work" poster.

.13 Location of toilet and cleanup facilities.

1.14 CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.

1.14 CORRECTION OF NON-COMPLIANCE (Cont'd)

.2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.

.3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.15 BLASTING

.1 Blasting or other use of explosives is not permitted.

1.16 POWDER ACTUATED DEVICES

.1 Use powder actuated devices only after receipt of written permission from Departmental Representative.

1.17 WORK STOPPAGE

.1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

.2 Assign responsibility and obligation to Health and Safety Coordinator to stop or start Work when, at Health and Safety Coordinator's discretion, it is necessary or advisable for reasons of health or safety. Departmental Representative may also stop Work for health and safety considerations.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.

END OF SECTION

PART 1 - GENERAL

1.1 SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Before commencing construction activities, submit Environmental Protection Plan for review and approval by Departmental Representative.

.3 Environmental Protection Plan must include comprehensive overview of known or potential environmental issues to be addressed during construction.

.4 Address topics at level of detail commensurate with environmental issue and required construction tasks.

1.2 FIRES

.1 Fires and burning of rubbish on site is not permitted.

1.3 DISPOSAL OF WASTES

.1 Do not bury rubbish and waste materials.

.2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

1.4 POLLUTION CONTROL

.1 Control emissions from equipment and plant in accordance with local authorities' emission requirements.

.2 Prevent sandblasting and other extraneous materials from contaminating air beyond application area.
.1 Provide temporary enclosures where required and as directed by Departmental Representative.

.3 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.5 NOTIFICATION

.1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws, regulations, or permits.

.2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.
.1 Take action only after receipt of written approval by Departmental Representative.

.3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.

.4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.

.2 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.4 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES AND CODES

.1 Perform Work in accordance with National Building Code of Canada (NBC) 2010, National Fire Code of Canada (NFC) 2010 and Ontario Building Code (OBC) 2012, including all amendments up to bid closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply as directed by the Departmental Representative.

.2 Meet or exceed requirements of:
.1 Contract documents.
.2 Specified standards, codes and referenced documents.

1.2 HAZARDOUS MATERIAL DISCOVERY

.1 Stop work immediately and notify Departmental Representative if materials which may contain designated substances or PCB's, are discovered in course of work.

1.4 RELICS AND ANTIQUITIES

.1 Relics and antiquities, and items of historical or scientific interest such as cornerstones and contents, commemorative plaques, inscribed tables, and similar objects found on site shall remain the property of Parks Canada. Protect such articles and request directives from Departmental Representative.

1.5 IAQ - INDOOR AIR QUALITY

.1 Comply with CSA-Z204-94(R1999), Guideline for Managing Indoor Air Quality in Office Buildings and CSA B651-12 including Annex A.

1.6 ACCESSIBLE DESIGN

.1 Comply with CSA B651-12, Accessible Design for the Built Environment, unless specified otherwise. In any case of conflict or discrepancy between the building codes and CSA B651, the requirements of CSA B651 shall apply.

1.7 TAXES

.1 Pay applicable Federal, Provincial and Municipal taxes.

1.8 EXAMINATION

.1 Examine existing conditions and determine conditions affecting work.

.2 Conduct concrete floor moisture testing using Calcium Chloride moisture tests.
.1 Submit test results to Departmental Representative for approval prior to installing any flooring. Conduct one test per 100 m^2 of area being covered.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 ABBREVIATIONS AND ACRONYMS

.1 The abbreviations and acronyms are commonly found in the Project Manual and represent the associated organizations or terms.

1.2 MATERIALS, EQUIPMENT AND METHODS

.1 A:
- .1 AB: anchor bolt.
- .2 AC: acoustic.
- .3 AC PAN: acoustic panel.
- .4 ACU: acoustic unit ceiling.
- .5 AFF: above finished floor.
- .6 AC PLAS: acoustic plaster.
- .7 ACT: acoustic tile.
- .8 ACR CU LVR: acrylic cube louvre.
- .9 ADH: adhesive.
- .10 ADJ: adjustable.
- .11 A/C: air conditioner.
- .12 AHU: air handling unit.
- .13 AL: aluminum.
- .14 ANOD: anodized.
- .15 APPROX: approximate.
- .16 ARCH: architecture.
- .17 ARCH BLK: architectural block.
- .18 AVB: air vapour barrier.

.2 B:
- .1 B: base.
- .2 BEAST: benthic assessment of sediment.
- .3 BH: bore hole.
- .4 BHP: brake horse power.
- .5 BL: bottom layer.
- .6 BLK: block.
- .7 BLKD: bulkhead.
- .8 BM: beam.
- .9 BOT: bottom.
- .10 BMP: best management practice.
- .11 B PL: base plate.
- .12 BRG: bearing.
- .13 BRK: brick.
- .14 BSMT: basement.
- .15 BTEX: benzene, toluene, ethylbenzene and xylenes.
- .16 BUR: built-up roof.

.3 C:
- .1 CAL: caliper.

1.2 MATERIALS, EQUIPMENT AND METHODS (Cont'd)

.3 (Cont'd)

.2 CANTIL: cantilever.
.3 CB: catch basin.
.4 CC: centre to centre.
.5 CCN: contemplated change notice.
.6 CDF: controlled density fill.
.7 CEC: Canadian Electical Code.
.8 CF: chair fabric.
.9 CHAN: channel.
.10 CHS: Canadian hydrographic service.
.11 CJ: construction joint.
.12 CL: centreline.
.13 CK: cork.
.14 CLG: ceiling.
.15 CLR: clear.
.16 COL: column.
.17 CONC: concrete.
.18 CONC BLK: concrete block.
.19 CONC BRK: concrete brick.
.20 CONT: continuous.
.21 CONT J: control joint.
.22 COMPL: complete.
.23 CM: centimetre. (Nursery stock).
.24 CP: circulating pump.
.25 CPL: cement plaster.
.26 CPM: critical path method.
.27 CPT: carpet.
.28 CPTT: carpet tile.
.29 CT: ceramic tile.
.30 CTE: connect to existing.
.31 CV: control valve.
.32 CVT: conductive vinyl tile.
.33 C/W: complete with.

.4 D:

.1 D: deep.
.2 dB: decibels.
.3 DB: dry-bulb.
.4 DD: dutch door.
.5 DEG: degree.
.6 DF: drinking fountain.
.7 DIA: diameter.
.8 DIM: dimension.
.9 DL: dead load.
.10 DMNT: demountable.
.11 DP: dampproofing.
.12 DR: door.
.13 DRP: drapery.
.14 DWL: dowel.

.5 E:

1.2 MATERIALS, EQUIPMENT AND METHODS (Cont'd)

.5 (Cont'd)
- .1 EA: each.
- .2 EC: epoxy coating.
- .3 ECF: engineered containment facility.
- .4 EE: each end.
- .5 EF: each face (architectural/structural).
- .6 EF: exhaust fan (mechanical/electrical).
- .7 EL: elevation.
- .8 ELEC: electric.
- .9 ELEV: elevator.
- .10 EM: expanded metal.
- .11 ENCL: enclosure.
- .12 EQ: equal.
- .13 ET: expansion tank.
- .14 EXH: exhaust.
- .15 EXIST: existing.
- .16 EXPJ: expansion joint.
- .17 EXP STRUCT: exposed structure.
- .18 EXT: exterior.
- .19 EW: each way.
- .20 EWT: entering water temperature.

.6 F:
- .1 FC: fuel contributed.
- .2 FD: floor drain.
- .3 FDN: foundation.
- .4 FEAT W: feature wall.
- .5 FEXT: fire extinguisher.
- .6 FH: fire hose.
- .7 FHC: fire hose cabinet.
- .8 FHR: fire hose rack.
- .9 FIN: finish.
- .10 FIP: federal identity program.
- .11 FL: floor.
- .12 FLD: field.
- .13 FLUOR: fluorescent.
- .14 FR: frame.
- .15 FRR: fire resistance rating.
- .16 FTG: footing.

.7 G:
- .1 GALV: galvanized steel.
- .2 GB: grab bar.
- .3 GBD: gypsum board.
- .4 GC: General Conditions.
- .5 GF: ground floor.
- .6 GFCI: ground fault circuit interrupter.
- .7 GL: glass or glazing.
- .8 GL BLK: glass block.
- .9 GPC: gypsum plaster ceiling.
- .10 GPW: gypsum plaster wall.

1.2 MATERIALS, EQUIPMENT AND METHODS (Cont'd)

.7 (Cont'd)
.11 GT: glass tile.

.8 H:
.1 HB: hose bib.
.2 HC: hollow core.
.3 HCWD: hollow core wood door.
.4 HD: hand dryer.
.5 HDW: hardware.
.6 HDWD: hardwood.
.7 HEX: heat exchanger.
.8 HM: hollow metal.
.9 HOR: horizontal.
.10 HOR EF: horizontal each face.
.11 HP: hydro pole.
.12 HPA: Hamilton Port Authority.
.13 HR: hour.
.14 HRV: heat recovery ventilator.
.15 HT: height.
.16 HTR: heater.
.17 HUM: humidifier.
.18 HWT: hot water tank.
.19 HYD: hydrant.
.20 HZ: Hertz frequency, cycles per second.

.9 I:
.1 ICF: insulated concrete formwork.
.2 ID: inside diameter.
.3 INS: insulation.
.4 INTLK: interlock.

.10 J:
.1 JT: joint.

.11 K:
.1 KPL: kick plate.

.12 L:
.1 LAT: leaving air temperature.
.2 LAV: lavatory.
.3 LDG: landing.
.4 LG: long.
.5 LINO: linoleum.
.6 LL: live load.
.7 LT: light.
.8 LWT: leaving water temperature.

.13 M:
.1 MAS: masonry.
.2 MAS FL: masonry flashing.
.3 MAX: maximum.

1.2 MATERIALS, EQUIPMENT AND METHODS (Cont'd)

.13 (Cont'd)
- .4 MBG: metal bar grating.
- .5 MCL: metal cube louvre.
- .6 MECH: mechanical.
- .7 MET: metal.
- .8 MET DK: metal deck.
- .9 MET FL: metal flashing.
- .10 MET GRID CLG: metal grid ceiling.
- .11 MET GRTG: metal grating.
- .12 MET LIN CLG: metal linear ceiling.
- .13 MET T PTN: metal toilet partition.
- .14 MH: maintenance hole.
- .15 MIN: minimum.
- .16 MLP: metal lath and plaster.
- .17 MO: masonry opening.
- .18 MR: marble.
- .19 MT: metal threshold.
- .20 MWP: membrane waterproofing.

.14 N:
- .1 NBC: national building code.
- .2 NC: normally closed.
- .3 NF: near face.
- .4 NFC: national fire code.
- .5 NIC: not in contract.
- .6 NO: number.
- .7 NRC: noise reduction coefficient.
- .8 NRP: non removable pin.
- .9 NTS: not to scale.

.15 O:
- .1 OA: outside air.
- .2 OBC: Ontario building code.
- .3 OC: on centre.
- .4 OD: outside diameter.
- .5 OPNG: opening.
- .6 OPR: operator.
- .7 OVHD: overhead.
- .8 OWSJ: open web steel joist.

.16 P:
- .1 P: prefinished.
- .2 PAH: polynuclear aromatic hydrocarbons.
- .3 PARG: parging.
- .4 PCC: precast concrete.
- .5 PCT: porcelain ceramic tile.
- .6 PED ACS FLG: pedestal access flooring.
- .7 PF: panel fabric.
- .8 PH: phase.
- .9 PL: plate.
- .10 PLAM: plastic laminate.

1.2 MATERIALS, EQUIPMENT AND METHODS (Cont'd)

.16 (Cont'd)
- .11 PLAS: plaster.
- .12 PLYWD: plywood.
- .13 PR: pair.
- .14 PREFAB: prefabricated.
- .15 PREFIN: prefinished.
- .16 PRESS: pressure.
- .17 PRFL: profile.
- .18 PRV: pressure regulating valve.
- .19 PT: paint.
- .20 PTD: paper towel dispenser.
- .21 PTN: partition.
- .22 PVC: polyvinyl cholide.

.17 Q:
- .1 QTB: quarry tile base.
- .2 QTF: quarry tile floor.
- .3 QTR: quarry tile roof.

.18 R:
- .1 R: radius.
- .2 RA: return air.
- .3 RAD: return air damper.
- .4 RB: resilient base.
- .5 RC: reinforced concrete.
- .6 RCPT: receptacle.
- .7 RD: roof drain.
- .8 REINF: reinforced/reinforcing.
- .9 REQD: required.
- .10 REQT: requirement.
- .11 RFT: rubber floor tile.
- .12 RM: room.
- .13 RO: rough opening.
- .14 RP: radiant panel.
- .15 RRS: recycled rubber sheet.
- .16 RRT: recycled rubber tile.
- .17 RSD: rolling steel door.
- .18 RSF: rubber sheet flooring.
- .19 RT: rubber tile.
- .20 RTU: roof top unit.
- .21 RWL: rain water leader.

.19 S:
- .1 SA: supply air.
- .2 SAN SEW: sanitary sewer.
- .3 SCHED: schedule.
- .4 SC: solid core.
- .5 SCRN: screen.
- .6 SCWD: solid core wood door.
- .7 SD: smoke developed.
- .8 SDT: static dissipative tile.

1.2 MATERIALS, EQUIPMENT AND METHODS (Cont'd)

.19 (Cont'd)
- .9 SECT: section.
- .10 SH: sill height.
- .11 SIM: similar.
- .12 SL: sliding.
- .13 SLR: sealer.
- .14 SPEC: specification.
- .15 SS: stainless steel.
- .16 STD: standard.
- .17 STL: steel.
- .18 STL BM: steel beam.
- .19 STC: sound tranmission class.
- .20 STL FL DK: steel floor deck.
- .21 STL PL: steel plate.
- .22 STN: stone.
- .23 STR: structure or structural.
- .24 ST SEW: storm sewer.
- .25 S&U: stain and urethane.
- .26 S&V: stain and varnish.
- .27 SVT: solid vinyl tile.

.20 T:
- .1 T: top.
- .2 T&B: top and bottom.
- .3 TCB: turbidity control plan.
- .4 TEL: telephone.
- .5 TER: terrazzo.
- .6 TERT: terrazzo tile.
- .7 THKNS: thickness.
- .8 THR: threshold.
- .9 TMPD: tempered.
- .10 TOPG: topping.
- .11 TRANSV: transverse.
- .12 TYP: typical.

.21 U:
- .1 U: urethane.
- .2 U/C: undercut.
- .3 UGRD: underground.
- .4 UNO: unless noted otherwise.
- .5 UOS: unless otherwise specified.
- .6 U/S: underside.
- .7 UR: urinal.

.22 V:
- .1 V: volt.
- .2 VCF: vinyl coated fabric.
- .3 VCT: vinyl compositition tile.
- .4 VEL: velocity.
- .5 VERT: vertical.
- .6 VERT B: vertical blinds.

1.2 MATERIALS, EQUIPMENT AND METHODS (Cont'd)

.22 (Cont'd)
.7 VERT EF: vertical each face.
.8 VSF: vinyl sheet flooring.
.9 VPT: vinyl plank flooring.
.10 VT: vinyl tile.
.11 VWC: vinyl wall covering.

.23 W:
.1 WB: wet-bulb.
.2 WC: water closet.
.3 W-C: wall connectors.
.4 WD: wood.
.5 WDV: wood veneer.
.6 WG: water gauge.
.7 WH: wall hydrant.
.8 WHMIS: workplace hazardous materials information system.
.9 WP: waterproofing.
.10 WR: washroom.
.11 WSIB: workplace safety and insurnace board.
.12 WT: weight.
.13 WTP: water treatment plant.

1.3 STANDARDS ORGANIZATIONS

.1 Standards writing organizations:
.1 AA - Aluminum Association.
.2 ACPA - American Concrete Pipe Association.
.3 ANSI - American National Standards Institute.
.4 ASHRAE - American Society of Heating and Refrigerating and Air-Conditioning Engineers.
.5 ASTM - American Society for Testing and Materials.
.6 AWI/AWMAC - Architectural Woodwork Institute/Architectural Woodwork Manufacturers Association of Canada.
.7 AWPA - American Wood Preservers' Association.
.8 AWWA - American Water Works Association.
.9 BHMA - Builders Hardware Manufacturers Association.
.10 CCDC - Canadian Construction Documents Committee.
.11 CCMPA - Canadian Concrete Masonry Producers Association.
.12 CGSB - Canadian General Standards Board.
.13 CNTA - Canadian Nursery Trades Association.
.14 CPCA - Canadian Painting Contractors Association.

1.3 STANDARDS ORGANIZATIONS (Cont'd)

.1 (Cont'd)

.15 CRCA - Canadian Roofing Contractors Association.
.16 CSA - Canadian Standards Association.
.17 CSC - Construction Specifications Canada.
.18 CSDMA - Canadian Steel Door Manufacturers Association.
.19 CSI - Construction Specifications Institute.
.20 CSSBI - Canadian Sheet Steel Building Institute.
.21 CRCA - Canadian Roofing Contractors Association.
.22 DHI - Door and Hardware Insitute.
.23 EEMAC - Electrical and Electronic Manufacturer's Association of Canada.
.24 ESA - Electrical Safety Authority.
.25 FCC - Fire Commissioner of Canada.
.26 FSC - Forest Stewardship Council.
.27 GANA - Glass Association of North America.
.28 HMMA - Hollow Metal Manufacturers Association.
.29 IEEE - Institute of Electrical and Electronics Engineers Inc.
.30 ISO - International Organization for Standardization.
.31 IWFA - International Window Film Association.
.32 LEED - LEED Canada, Leadership in Energy and Environmental Design.
.33 MPI - Master Painters Insitute.
.34 NAAMM - National Association of Architectural Metal Manufacturers.
.35 NCPI - National Clay Pipe Institute.
.36 NEMA - National Electrical Manufacturers Association.
.37 NFPA - National Fire Protection Association.
.38 OPSD - Ontario Provincial Standard Drawings.
.39 OPSS - Ontario Provincial Standard Specifications.
.40 PPI - Plasctics Pipe Institute.
.41 SDI - Steel Door Intitute.
.42 SCAQMD - South Coast Air Quality Management District.
.43 TIA - Telecommunications Industry Association.
.44 TIAC - Thermal Insulation Association of Canada.

1.3 STANDARDS ORGANIZATIONS (Cont'd)

.1 (Cont'd)
.45 TTMAC - Terrazzo Tile and Marble Association of Canada.
.46 UL - Underwriters Laboratories.
.47 ULC - Underwriters Laboratories of Canada.
.48 US EPA - United States Environmental Protection Agency.
.49 WH - Warnock Hersey.

1.4 FEDERAL GOVERNMENT DEPARTMENTS AND AGENGIES

.1 Departments, agencies and crown corporations.
.1 CEAA - Canadian Environmental Assessment Agency.
.2 CSC - Correctional Service Canada.
.3 CRA - Canada Revenue Agency.
.4 DND - Department of National Defence.
.5 EC - Environment Canada.
.6 FHBRO - Federal Heritage Buildings Review Office.
.7 HC - Health Canada.
.8 HCD - Heritage Conservation Directorate.
.9 LC - Labour Canada.
.10 PC - Parks Canada.
.11 PWGSC - Public Works and Government Services Canada.
.12 RCMP - Royal Canadian Mounted Police.
.13 TBS - Treasury Board Secretariat.
.14 TC - Transport Canada.

1.5 PROVINCIAL GOVERNMENT DEPARTMENTS AND AGENGIES

.1 MOEE - Ontario Ministry of Environment and Energy.

.2 MOL - Ontario Ministry of Labour.

.3 MTO and MOT - Ontario Ministry of Transportation.

.4 TSSA - Technical Standards and Safety Authority.

1.6 INTERNATIONAL GOVERNMENT DEPARTMENTS AND AGENCIES

.1 DOHMH - New York City Department of Health and Mental Hygiene, USA.

.2 GSA - Government Services Administration, USA.

1.7 UNITS OF MEASURE METRIC

.1 The following abbreviations of units of measure are commonly found in the Project Manual:

.1 C: Celsius.
.2 cm: centimetre.
.3 kg: kilogram.
.4 kg/m^3: kilogram per cubic metre.
.5 kN: kilonewton.
.6 kPa: kilopascals.
.7 kw: kilowatts.
.8 l/s: litre per second.
.9 m: metre.
.10 m^3: cubic metre.
.11 mg/kg: milligrams per kilogram.
.12 mg/L: milligrams per litre.
.13 mm: millimetres.
.14 MPa: megapascal.
.15 NTU: nephelometric turbidity unit.
.16 ppm: parts per million.
.17 ug/L: micrograms per litre.
.18 ug/m^3: micrograms per cubic metre.

1.8 UNITS OF MEASURE IMPERIAL

.1 The following abbreviations of units of measure are commonly found in the Project Manual:

.1 BTU: British thermal units.
.2 CFM: cubic feet per minute.
.3 F: Fahrenheit.
.4 ft: foot/feet.
.5 FPI: fins per inch.
.6 FPM: feet per minute.
.7 ga: gauge.
.8 gpm: gallons per minute.
.9 in: inches.
.10 lbs: pounds.
.11 NTU: nephelometric turbidity unit.
.12 psi: pounds-force per square inch.
.13 PSIG: PSI gauge.
.14 ppm: parts per million.
.15 RPM: revolutions per minute.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Inspection and testing, administrative and enforcement requirements.

.2 Tests and mix designs.

.3 Mock-ups.

.4 Mill tests.

.5 Equipment and system adjust and balance.

1.2 INSPECTION

.1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.

.2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.

.3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

.4 Departmental Representative may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

1.3 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work, above and beyond those required of the Contractor. Cost of such services will be borne by Departmental Representative.

.2 Provide equipment required for executing inspection and testing by appointed agencies.

.3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.

.4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and reinspection.

1.4 ACCESS TO WORK

.1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.

.2 Co-operate to provide reasonable facilities for such access.

1.5 PROCEDURES

.1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.

.2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in Work.

.3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.6 REJECTED WORK

.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 Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

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

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

1.7 REPORTS

.1 Submit 4 copies of inspection and test reports to Departmental Representative.

.2 Provide copies to Subcontractor of work being inspected or tested, manufacturer or fabricator of material being inspected or tested.

1.8 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as may be requested.

.2 The cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work shall be appraised by Departmental Representative and may be authorized as recoverable.

1.9 MOCK-UPS

.1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of all Sections required to provide mock-ups.

.2 Construct in all locations acceptable to Departmental Representative.

1.9 MOCK-UPS (Cont'd)

.3 Prepare mock-ups for Departmental Representative's review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.

.4 Failure to prepare mock-ups 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.

.5 If requested, Departmental Representative will assist in preparing a schedule fixing dates for preparation.

.6 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

1.10 MILL TESTS

.1 Submit mill test certificates as required of specification Sections.

1.11 EQUIPMENT AND SYSTEMS

.1 Submit testing, adjusting and balancing reports for mechanical, electrical and building equipment systems.

.2 Submit Commissioning Documentation in accordance with Section 01 91 00.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

1.2 INSTALLATION AND REMOVAL

.1 Provide temporary utilities controls in order to execute work expeditiously.

.2 Remove from site all such work after use.

1.3 WATER SUPPLY

.1 Departmental Representative will supply potable water for construction use.

.2 Water supply to be metered and charged back to the Contractor based on their usage.

.3 Be responsible for the careful and reasonable use of supplied water.

1.4 TEMPORARY HEATING AND VENTILATION

.1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.

.2 Provide temporary heat and ventilation in enclosed areas as required to:
.1 Facilitate progress of Work.
.2 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
.3 Provide adequate ventilation to meet health regulations for safe working environment.

.3 Ventilating:
.1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
.2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
.3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.

1.4 TEMPORARY HEATING AND VENTILATION (Cont'd)

.3 (Cont'd)
.4 Ventilate storage spaces containing hazardous or volatile materials.
.5 Ventilate temporary sanitary facilities.
.6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.

.4 Permanent heating system of building, may be used when available. Be responsible for damage to heating system if use is permitted.

.5 On completion of Work for which permanent heating system is used, replace filters and clean and service heating system as required.

.6 Pay costs for maintaining temporary heat, when permanent heating system is used.

.7 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
.1 Conform with applicable codes and standards.
.2 Enforce safe practices.
.3 Prevent abuse of services.
.4 Prevent damage to finishes.
.5 Vent direct-fired combustion units to outside.

.8 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.5 TEMPORARY POWER AND LIGHT

.1 Arrange for connection with Departmental Representative. Pay all costs for installation, maintenance and removal.

.2 Temporary power for electric equipment requiring in excess of above is responsibility of Contractor.

.3 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx.

1.5 TEMPORARY POWER AND LIGHT (Cont'd)

.4 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of Departmental Representative provided that guarantees are not affected. Make good damage to electrical system caused by use under this Contract. Replace lamps which have been used for more than 3 months.

1.6 FIRE PROTECTION

.1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws.

.2 Burning rubbish and construction waste materials is not permitted on site.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Construction aids.

.2 Elevator use.

.3 Parking.

.4 Sanitary facilities.

.5 Construction signage, such as warning signs.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
.1 CAN/CSA-Z321-96(R2006), Signs and Symbols for the Occupational Environment, withdrawn but still available from CSA, CCOHS and Techstreet.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

1.4 INSTALLATION AND REMOVAL

.1 Prepare site plan indicating proposed location and dimensions of area to be hoarded and used by Contractor, number of trailers to be used, avenues of ingress/egress to hoarded area and details of hoarded installation.

.2 Indicate use of supplemental or other staging area.

.3 Provide construction facilities in order to execute work expeditiously.

.4 Remove from site all such work after use.

1.5 HOISTING

.1 Provide, operate and maintain hoists/cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for use thereof.

1.5 HOISTING (Cont'd)

.2 Hoists/cranes shall be operated by qualified operator.

1.6 ELEVATORS

.1 Designated existing elevators may be used by construction personnel. Co-ordinate use with Departmental Representative.

.2 Provide protective coverings for finish surfaces of cars and entrances.

1.7 SITE STORAGE/LOADING

.1 Confine work and operations of employees to areas defined by Contract Documents. Do not unreasonably encumber premises with products.

.2 Do not load or permit to load any part of Work with a weight or force that will endanger the Work.

1.8 CONSTRUCTION PARKING

.1 Parking will not be permitted on site. The Contractor and their Subcontractors must make their own arrangements for parking.

.2 Provide and maintain adequate access to project site.

.3 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractors' use of roads.

.4 Clean construction runways and taxi areas where used by Contractor's equipment.

1.9 EQUIPMENT, TOOL AND MATERIALS STORAGE

.1 Provide and maintain, in a clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.

.2 Locate materials not required to be stored in weatherproof sheds on site in a manner to cause least interference with work activities.

1.10 SANITARY FACILITIES

.1 Use of Owner's existing washroom facilities will not be permitted. Provide sanitary facilities for work force in accordance with governing regulations and ordinances.

.2 Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.

1.11 CONSTRUCTION SIGNAGE

.1 No other signs or advertisements, other than warning signs, are permitted on site.

.2 Signs and notices for safety and instruction shall be in both official languages. Graphic symbols shall conform to CAN/CSA-Z321.

.3 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or earlier if directed by Departmental Representative.

1.12 CLEAN-UP

.1 Remove construction debris, waste materials, packaging material from work site daily.

.2 Clean dirt or mud tracked onto paved or surfaced roadways.

.3 Store materials resulting from demolition activities that are salvageable.

.4 Stack stored new or salvaged material.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Barriers.

.2 Environmental Controls.

.3 Fire Routes.

1.2 INSTALLATION AND REMOVAL

.1 Provide temporary controls in order to execute Work expeditiously.

.2 Remove from site all such work after use.

1.3 HOARDING

.1 Erect temporary site hoarding enclosures using 15.9 mm thick Type X gypsum wall board on each side of steel studs, spaced at 400 mm o.c., unless otherwise indicated, spanning to the underside of the deck.

.2 Hoarding partitions to meet required fire rating and ULC design.

.3 Hoarding partitions to be complete with signs and electrical lighting as required by law.

.4 Hoarding materials made of curtains and plastic tarps are not acceptable.

.5 Hoarding to be painted in colours as selected by the Departmental Representative in accordance with Section 09 91 23.

1.4 DUST TIGHT SCREENS

.1 Provide dust tight screens to localize dust generating activities, and for protection of workers, finished areas of Work.

.2 Maintain and relocate protection until such work is complete.

1.5 ACCESS TO SITE

.1 Provide and maintain access routes as may be required for access to Work.

1.6 FIRE ROUTES

.1 Maintain access to property including overhead clearances.

1.7 PROTECTION OF BUILDING FINISHES

.1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.

.2 Provide necessary screens, covers, and hoardings.

.3 Confirm with Departmental Representative locations and installation schedule 3 days prior to installation.

.4 Be responsible for damage incurred due to lack of or improper protection.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Product quality, availability, storage, handling, protection, and transportation.

.2 Manufacturer's instructions.

.3 Quality of Work, coordination and fastenings.

.4 Existing facilities.

1.2 REFERENCES

.1 Within text of specifications, reference may be made to reference standards.

.2 Conform to these standards, in whole or in part as specifically requested in specifications.

.3 If there is question as to whether any product or system is in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.

.4 The cost for such testing will be born by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

.5 Conform to latest date of issue of referenced standards in effect on date of submission of Bids, except where specific date or issue is specifically noted.

1.3 QUALITY

.1 Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of Products provided.

1.3 QUALITY (Cont'd)

.2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

.3 Should any dispute arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.

.4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.

.5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.4 AVAILABILITY

.1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

.2 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Amount or Contract Time.

1.5 METRIC SIZED MATERIALS

.1 SI metric units of measurement are used exclusively on the drawings and in the specifications for this project.

1.5 METRIC SIZED MATERIALS (Cont'd)

.2 The Contractor is required to provide metric products in the sizes called for in the Contract Documents except where a valid claim can be made that a particular product is not available on the Canadian market.

.3 Claims for exemptions from use of metric sized products shall be in writing and fully substantiated with supportive documentation. Promptly submit application to Departmental Representative for consideration and ruling. Non-metric sized products may not be used unless Contractor's application has been approved in writing by the Departmental Representative.

.4 Difficulties caused by the Contractor's lack of planning and effort to obtain modular metric sized products which are available on the Canadian market will not be considered sufficient reasons for claiming that they cannot be provided.

.5 Claims for additional costs due to provision of specified modular metric sized products will not be considered.

1.6 STORAGE, HANDLING AND PROTECTION

.1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

.3 Store products subject to damage from weather in weatherproof enclosures.

.4 Store cementitious products clear of earth or concrete floors, and away from walls.

.5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

1.6 STORAGE, HANDLING AND PROTECTION (Cont'd)

.6 Store sheet materials, lumber and gypsum board on flat, solid supports and keep clear of ground. Slope to shed moisture.

.7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

.8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

.9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.7 TRANSPORTATION

.1 Pay costs of transportation of products required in performance of Work.

1.8 MANUFACTURER'S INSTRUCTIONS

.1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

.2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative may establish course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Amount or Contract Time.

1.9 QUALITY OF WORK

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.

.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

1.10 CO-ORDINATION

.1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.

.2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.11 CONCEALMENT

.1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.

.2 Before installation, inform Departmental Representative if there is interference. Install as directed by Departmental Representative.

1.12 REMEDIAL WORK

.1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.

.2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.13 LOCATION OF FIXTURES

.1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.

.2 Inform Departmental Representative of conflicting installation. Install as directed.

1.14 FASTENINGS

.1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.

.2 Prevent electrolytic action between dissimilar metals and materials.

.3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing humid area work, unless stainless steel or other material is specifically requested in affected specification Section.

.4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.

.5 Keep exposed fastenings to a minimum, space evenly and install neatly.

.6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.15 FASTENINGS - EQUIPMENT

.1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.

.2 Use heavy hexagon heads, semi-finished unless otherwise specified.

.3 Bolts may not project more than one diameter beyond nuts.

.4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.16 PROTECTION OF WORK IN PROGRESS

.1 Prevent overloading of any part of building. Do not cut, drill or sleeve any load bearing structural member, unless specifically indicated without written approval of Departmental Representative.

1.17 EXISTING UTILITIES

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and/or building occupants.

.2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Field engineering survey services.

1.2 SURVEY REQUIREMENTS

.1 Establish lines and levels, locate and lay out, by instrumentation.

.2 Establish lines and levels for mechanical and electrical work.

1.3 EXISTING SERVICES

.1 Before commencing work, establish location and extent of service lines in area of Work and notify Departmental Representative of findings.

.2 Remove abandoned service lines within 2 m of structures. Cap or otherwise seal lines at cut-off points as directed by Departmental Representative.

1.4 LOCATION OF EQUIPMENT AND FIXTURES

.1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.

.2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.

.3 Inform Departmental Representative of impending installation and obtain approval for actual location.

.4 Submit field drawings to indicate relative position of various services and equipment when required by Departmental Representative.

1.5 RECORDS

.1 Maintain a complete, accurate log of control and survey work as it progresses.

1.5 RECORDS (Cont'd)

.2 Record locations of maintained, re-routed and abandoned service lines.

1.6 SUBMITTALS

.1 Submit name and address of Surveyor to Departmental Representative.

.2 On request of Departmental Representative, submit documentation to verify accuracy of survey work.

.3 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform and do not conform with Contract Documents.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00.

.2 Submit written request in advance of cutting or alteration which affects:
.1 Structural integrity of elements of project.
.2 Integrity of moisture-resistant elements.
.3 Efficiency, maintenance, or safety of operational elements.
.4 Visual qualities of sight-exposed elements.
.5 Work of Owner or separate contractor.

.3 Include in request:
.1 Identification of project.
.2 Location and description of affected Work.
.3 Statement on necessity for cutting or alteration.
.4 Description of proposed Work, and products to be used.
.5 Alternatives to cutting and patching.
.6 Effect on Work of Owner or separate contractor.
.7 Written permission of affected separate contractor.
.8 Date and time work will be executed.

1.2 MATERIALS

.1 Required for original installation.

.2 Change in Materials: Submit request for substitution in accordance with Sections 01 33 00 and 01 61 00.

1.3 PREPARATION

.1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.

.2 After uncovering, inspect conditions affecting performance of Work.

1.3 PREPARATION (Cont'd)

.3 Beginning of cutting or patching means acceptance of existing conditions.

.4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.

1.4 EXECUTION

.1 Execute cutting, fitting, and patching to complete Work.

.2 Fit several parts together, to integrate with other Work.

.3 Uncover Work to install ill-timed Work.

.4 Remove and replace defective and non-conforming Work.

.5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.

.6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.

.7 Employ original installer to perform cutting and patching for sight-exposed surfaces.

.8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.

.9 Restore work with new products in accordance with requirements of Contract Documents.

.10 Submit proposed materials, finishes and installation method for patching to Departmental Representative for approval, prior to patching.

.11 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.

1.4 EXECUTION (Cont'd)

.12 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

.13 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material in accordance with Section 07 84 00, full thickness of the construction element.

.14 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse, recycling, and composting in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Progressive cleaning.

.2 Final cleaning.

1.2 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Owner or other Contractors.

.2 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.

.3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.4 Provide on-site containers for collection of waste materials and debris.

.5 Provide and use clearly marked separate bins for recycling. Refer to Section 01 74 20.

.6 Remove waste material and debris from site at end of each working day.

.7 Dispose of waste materials and debris off site.

.8 Clean interior areas prior to start of finish work, and maintain areas free of dust and other contaminants during finishing operations.

.9 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

.10 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

1.2 PROJECT CLEANLINESS (Cont'd)

.11 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

.12 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.3 FINAL CLEANING

.1 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.

.3 Prior to final review, remove surplus products, tools, construction machinery and equipment.

.4 Remove waste products and debris other than that caused by Owner or other Contractors.

.5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.

.6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.7 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

.8 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls and floors.

.9 Clean lighting reflectors, lenses, and other lighting surfaces.

1.3 FINAL CLEANING (Cont'd)

.10 HEPA vacuum clean and dust building interiors, behind grilles, louvres and screens.

.11 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.

.12 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

.13 Clean equipment and fixtures to a sanitary condition; clean or replace filters of mechanical equipment.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 CONSTRUCTION & DEMOLITION WASTE

.1 Carefully deconstruct and source separate materials/equipment and divert, from D&C waste destined for landfill to maximum extent possible. Target for this project is 75% diversion from landfill. Reuse, recycle, compost, anaerobic digest or sell material for reuse except where indicated otherwise. On site sales are not permitted.

.2 Source separate waste and maintain waste audits in accordance with the Environmental Protection Act, Ontario Regulation 102/94 and Ontario Regulation 103/94.
.1 Provide facilities for collection, handling and storage of source separated wastes.
.2 Source separate the following waste:
.1 Brick and portland cement concrete.
.2 Corrugated cardboard.
.3 Wood, not including painted or treated wood or laminated wood.
.4 Gypsum board, unpainted.
.5 Steel.
.6 Items indicated in Deconstruction and Waste Products Workplan Summary.

.3 Submit a waste reduction workplan indicating the materials and quantities of material that will be recycled and diverted from landfill.
.1 Indicate how material being removed from the site will be reused, recycled, composted or anaerobically digested using Deconstruction and Waste Products Workplan Summary.

.4 Submit proof that all waste is being disposed of at a licensed land fill site or waste transfer site. A copy of the disposal/waste transfer site's license and a letter verifying that said landfill site will accept the waste must be supplied to Departmental Representative prior to removal of waste from the demolition site.

1.2 WASTE PROCESSING SITES

.1 Province of: Ontario.
.1 Ministry of Environment and Energy, 135 St. Clair Avenue West, Toronto, ON, M4V 1P5.
.2 Telephone: 800-565-4923 or 416-323-4321.
.3 Fax: 416-323-4682.

.2 Recycling Council of Ontario: 215 Spadina Avenue, #225, Toronto, ON, M5T 2C7.
.1 Telephone: 416-657-2797.
.2 Fax: 416-960-8053.
.3 Email: rco@rco.on.ca.
.4 Internet: http://www.rco.on.ca/.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT

.1 Government Chief Responsibility for the Environment.

Province	Address	General Inquiries	Fax
Ontario	Ministry of Environment and Energy 135 St Clair Avenue West Toronto, ON M4V 1P5	(416) 323-4321 (800) 565-4923	(416) 323-4682
	Environment Canada Toronto, ON	(416) 734-4494	

END OF SECTION

PART 1 - GENERAL

1.1 INSPECTION AND DECLARATION

.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.
.1 Notify Departmental Representative in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
.2 Request Departmental Representative's Inspection.

.2 Departmental Representative's Inspection: Departmental Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor to correct Work accordingly.

.3 Completion: submit written certificate that following have been performed:
.1 Work has been completed and inspected for compliance with Contract Documents.
.2 Defects have been corrected and deficiencies have been completed.
.3 Equipment and systems have been tested, adjusted and balanced and are fully operational.
.4 Certificates required by PWGSC Fire Protection Engineer and Utility companies have been submitted.
.5 Operation of systems have been demonstrated to Owner's personnel.
.6 Work is complete and ready for final inspection.

.4 Final Inspection: when items noted above are completed, request final inspection of Work by Departmental Representative and Contractor. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request reinspection.

1.2 CLEANING

.1 In accordance with Section 01 74 11.

1.2 CLEANING (Cont'd)

.2 Remove waste and surplus materials, rubbish and construction facilities from the site in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 As-built, samples, and specifications.

.2 Equipment and systems.

.3 Product data, materials and finishes, and related information.

.4 Operation and maintenance data.

.5 Spare parts, special tools and maintenance materials.

.6 Warranties and bonds.

.7 Final site survey.

1.2 SUBMISSION

.1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.

.2 Copy will be returned after final inspection, with Departmental Representative's comments.

.3 Revise content of documents as required prior to final submittal.

.4 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, four final copies of maintenance manuals and commissioning documentation in English and French.

.5 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.

.6 If requested, furnish evidence as to type, source and quality of products provided.

.7 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.

.8 Pay costs of transportation.

1.3 FORMAT

.1 Organize data in the form of an instructional manual.

.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.

.3 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.

.4 Cover: Identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.

.5 Arrange content by systems, under Section numbers and sequence of Table of Contents.

.6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

.7 Text: Manufacturer's printed data, or typewritten data.

.8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

.9 Provide 1:1 scaled CAD files in dwg format. Forward pdf, NMSEdit Professional spp, MS Word, MS Excel, and Autocad dwg files on USB compatible with PWGSC encryption requirements or through email or alternate electronic file sharing service such as ftp, as directed by Departmental Representative.

1.4 CONTENTS - EACH VOLUME

.1 Table of Contents: provide title of project;
.1 Date of submission; names,
.2 Addresses, and telephone numbers of Contractor with name of responsible parties;
.3 Schedule of products and systems, indexed to content of volume.

.2 For each product or system:
.1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

1.4 CONTENTS - EACH VOLUME (Cont'd)

.3 Product Data: mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.

.4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

.5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00.

.6 Training: Refer to Section 01 79 00.

1.5 AS-BUILTS AND SAMPLES

.1 In addition to requirements in General Conditions, maintain at the site for Departmental Representative one record copy of:
.1 Contract Drawings.
.2 Specifications.
.3 Amendments and addenda.
.4 Change Orders and other modifications to the Contract.
.5 Reviewed shop drawings, product data, and samples.
.6 Field test records.
.7 Inspection certificates.
.8 Manufacturer's certificates.

.2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.

.5 Keep record documents and samples available for inspection by Departmental Representative.

1.5 AS-BUILTS AND SAMPLES (Cont'd)

.6 Turn one set, paper copy and electronic copy, of AS-BUILT drawings and specifications over to Departmental Representative on completion of work. Submit files on USB compatible with PWGSC encryption requirements or through email or alternate electronic file sharing service such as ftp, as directed by Departmental Representative.

.7 If project is completed without significant deviations from Contract drawings and specifications submit to Departmental Representative one set of drawings and specifications marked "AS-BUILT".

1.6 RECORDING ACTUAL SITE CONDITIONS

.1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by Departmental Representative.

.2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.

.3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.

.4 Contract Drawings and shop drawings: legibly mark each item to record actual construction, including:
.1 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
.2 Field changes of dimension and detail.
.3 Changes made by change orders.
.4 Details not on original Contract Drawings.
.5 References to related shop drawings and modifications.

.5 Specifications: legibly mark each item to record actual construction, including:
.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
.2 Changes made by Amendments and change orders.

1.6 RECORDING ACTUAL SITE CONDITIONS (Cont'd)

.6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

1.7 FINAL SURVEY

.1 Submit final site survey certificate in accordance with Section 01 71 00, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

1.8 EQUIPMENT AND SYSTEMS

.1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

.2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.

.3 Include installed colour coded wiring diagrams.

.4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

.5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

.6 Provide servicing and lubrication schedule, and list of lubricants required.

.7 Include manufacturer's printed operation and maintenance instructions.

.8 Include sequence of operation by controls manufacturer.

1.8 EQUIPMENT AND SYSTEMS (Cont'd)

.9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

.10 Provide installed control diagrams by controls manufacturer.

.11 Provide Contractor's coordination drawings, with installed colour coded piping diagrams.

.12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

.13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

.14 Include test and balancing reports as specified in Section 01 45 00.

.15 Additional requirements: As specified in individual specification sections.

1.9 MATERIALS AND FINISHES

.1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.

.2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.3 Moisture-protection Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.4 Additional Requirements: as specified in individual specifications sections.

1.10 SPARE PARTS

.1 Provide spare parts, in quantities specified in individual specification sections.

1.10 SPARE PARTS (Cont'd)

.2 Provide items of same manufacture and quality as items in Work.

.3 Deliver to location as directed; place and store.

.4 Receive and catalogue all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.

.5 Obtain receipt for delivered products and submit prior to final payment.

1.11 MAINTENANCE MATERIALS

.1 Provide maintenance and extra materials, in quantities specified in individual specification sections.

.2 Provide items of same manufacture and quality as items in Work.

.3 Deliver to location as directed; place and store.

.4 Receive and catalogue all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.

.5 Obtain receipt for delivered products and submit prior to final payment.

1.12 SPECIAL TOOLS

.1 Provide special tools, in quantities specified in individual specification section.

.2 Provide items with tags identifying their associated function and equipment.

.3 Deliver to location as directed; place and store.

.4 Receive and catalogue all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.

1.13 STORAGE, HANDLING AND PROTECTION

.1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.

.2 Store in original and undamaged condition with manufacturer's seal and labels intact.

.3 Store components subject to damage from weather in weatherproof enclosures.

.4 Store paints and freezable materials in a heated and ventilated room.

.5 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

1.14 WARRANTIES AND BONDS

.1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.

.2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

.3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.

.4 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Certificate of Substantial Performance is determined.

.5 Verify that documents are in proper form, contain full information, and are notarized.

.6 Co-execute submittals when required.

.7 Retain warranties and bonds until time specified for submittal.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Procedures for demonstration and instruction of equipment and systems to Owner's O&M personnel.

.2 O&M personnel includes property facility manager, building operators, maintenance staff, security staff and technical specialists, as applicable.

1.2 DESCRIPTION

.1 Demonstrate operation and maintenance of equipment and systems to Departmental Representative's personnel two weeks prior to date of substantial performance.

.2 Departmental Representative will provide list of personnel to receive instructions, and will coordinate their attendance at agreed-upon times.

1.3 QUALITY CONTROL

.1 When specified in individual Sections, require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct Owner's personnel, and provide written report that demonstration and instructions have been completed.

.2 Submit training schedule of time and date for demonstration and training of each item of equipment and each system in accordance with the training plan four weeks prior to designated dates, for Departmental Representative's approval.

.3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.

.4 Report shall give time and date of each demonstration and training, with list of persons present.

1.4 CONDITIONS FOR DEMONSTRATIONS

.1 Equipment has been inspected and put into operation in accordance with appropriate Section.

.2 Testing, adjusting, and balancing has been performed in accordance with Section 01 91 00 and equipment and systems are fully operational.

.3 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.5 PREPARATION

.1 Verify that conditions for demonstration and instructions comply with requirements.

.2 Verify that designated O&M personnel are present.

1.6 DEMONSTRATION AND INSTRUCTIONS

.1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at agreed upon times, at the designated location.

.2 Instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.

.3 Review contents of manual in detail to explain all aspects of operation and maintenance.

.4 Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.

.5 Refer to individual Sections for specific demonstration and training requirements.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Includes general requirements for commissioning facilities and facility systems.

1.2 QUALITY ASSURANCE

.1 Provide System Commissioning Administrator for Work of this Contract.

.2 Comply with applicable procedures and standards of the certification sponsoring association.

.3 Perform services under direction of supervisor qualified under certification requirements of sponsoring association.

1.3 REFERENCES

.1 Associated Air Balance Council (AABC): National Standards For Field Measurements and Instrumentation, Total Systems Balance, Air Distribution-Hydronics Systems, 2002.

.2 ASHRAE Guideline 1.1-2007, HVAC&R Technical Requirements for the Commissioning Process.

.3 ASHRAE Guideline 4-2008, Preparation of Operating and Maintenance Documentation for Building System.

.4 NEBB Procedural Standards for Building Systems Commissioning (2014).

.5 NETA Standard for Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (2013).

1.4 SUBMITTALS

.1 Within 15 working days of Award of Contract, submit name of System Commissioning Administrator proposed to perform services who has managerial responsibilities for coordination of all commissioning activities.

1.4 SUBMITTALS (Cont'd)

.2 Submit documentation to confirm System Commissioning Administrator compliance with quality assurance provision.

.3 Submit 3 preliminary specimen copies of each type of startup checklist, product information and performance verification report forms proposed for use.

.4 Submit completed report forms within 3 days after completion of each testing to the Departmental Representative for review and verification.

.5 Fifteen days prior to Substantial Performance, submit 3 copies of final reports on applicable forms for functional performance verification.

.6 Submit post-commissioning reports of testing, adjusting, and balancing postponed due to seasonal, climatic, occupancy, or other reasons beyond Contractor's control, promptly after execution of those services.

1.5 REPORT FORMS

.1 System Commissioning Administrator shall make reports.

.2 Report forms shall include:
.1 Startup Checklists.
.2 Product Information (PI) Report forms.
.3 Performance Verification (PV) Report forms.

.3 Ensure each form bears signature of recorder, and that of supervisor of reporting organization.

.4 Submit signed form to Departmental Representative for review, approval and signature.

.5 Identify each instrument used for testing, adjusting and balancing and its latest date of calibration.

1.6 CONTRACTOR'S RESPONSIBILITIES

.1 Prepare each system for testing and balancing.

.2 Cooperate with testing organization and provide access to equipment and systems.

.3 Provide personnel and operate systems at designated times, and under conditions required for proper testing, adjusting, and balancing.

.4 Notify testing organization and Departmental Representative 7 days prior to time project will be ready for testing, adjusting, and balancing.

.5 Accurately record data for each step.

.6 Report to Departmental Representative any deficiencies or defects noted during performance of services.

.7 Correct deficiencies identified in accordance with Departmental Representative's written instructions.

1.7 PREPARATION

.1 Provide instruments required for testing, adjusting, and balancing operations.

.2 Make instruments available to Departmental Representative to facilitate spot checks during testing and functional performance verification.

.3 Retain possession of instruments and remove at completion of services.

.4 Verify systems installation is complete and in continuous operation.

.5 Verify lighting is turned on when lighting is included in cooling load.

.6 Verify equipment such as computers, laboratory and electronic equipment are in full operation when these equipment are included in cooling load.

1.8 EXECUTION

.1 Demonstration and training of required equipment and systems to be in accordance with Section 01 79 00.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Methods and procedures for deconstruction of structures and parts of structures.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).
.1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.

.2 Federal Legislation.
.1 Canadian Environmental Assessment Act (CEAA), 1992, c. 37.
.2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
.3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

1.3 DEFINITIONS

.1 Alternate Disposal: reuse and recycling of materials by designated facility, user or receiving organization which has valid Certificate of Approval to operate. Alternative to landfill disposal.

.2 Deconstruction: systematic dismantling of structure in a manner that achieves safe removal/disposal of hazardous materials and maximum salvage/recycling of materials.
.1 Ultimate objective is to recover potentially valuable resources while diverting from landfill what has traditionally been significant portion of waste system.

.3 Demolition: rapid destruction of structure with or without prior removal of hazardous materials.

.4 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, including but not limited to: corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health, well being or environment if handled improperly.

1.3 DEFINITIONS (Cont'd)

.5 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

.6 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form.
.1 Recycling does not include burning, incinerating, or thermally destroying waste.

.7 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:
.1 Salvaging reusable materials from remodelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
.2 Returning reusable items including pallets or unused products to vendors.

.8 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.

.9 Source Separation: acts of keeping different types of waste materials separate, beginning from first time they became waste.

.10 Waste Management Coordinator (WMC): contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.

1.4 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00.

.2 Submit pre-demolition audit and deconstruction/disassembly plan prior to starting work in accordance with Section 01 33 00.

1.4 SUBMITTALS (Cont'd)

.3 Submit copies of receipts from authorized disposal sites and reuse and recycling facilities for material removed from site to Departmental Representative monthly upon request.
.1 Written authorization from Departmental Representative is required to deviate from facilities listed in Waste Reduction Workplan.

.4 Include following information:
.1 Time and date of removal.
.2 Description of materials.
.3 Quantity of material.
.4 Breakdown of reuse, recycling and landfill quantities.
.5 End destination of materials.

.5 Workers, haulers and subcontractors must possess current, applicable Certificates of Approval to remove, handle and dispose of wastes categorized Provincially and Municipally as hazardous.
.1 Provide proof of compliance within 24 hours upon written request of Departmental Representative.

1.5 QUALITY ASSURANCE

.1 Ensure Work is performed in compliance with CEPA, CEAA, TDGA, and applicable provincial regulations.

1.6 STORAGE, HANDLING AND PROTECTION

.1 Do in accordance with Section 01 61 00.

1.7 ENVIRONMENTAL REQUIREMENTS

.1 Do Work in accordance with Section 01 35 43.

1.8 SITE CONDITIONS

.1 Existing Conditions.
.1 Should materials resembling spray or trowel applied asbestos or other designated substances be encountered in course of deconstruction, stop work, take preventative measures, and notify Departmental Representative immediately. Do not proceed until written instructions have been received.
.2 Label and package component parts of mechanical and electrical material specified for salvage in accordance with Departmental Representative's instructions to prevent damage or loss.

.2 Protection.
.1 Prevent movement, settlement or damage of adjacent structures, services, and parts of existing structure to remain. Provide bracing as required. Repair damage caused by deconstruction as directed by Departmental Representative.
.2 Support affected structures and, if safety of structure being deconstructed or adjacent structures or services appear to be endangered, take preventative measures. Cease operations and immediately notify Departmental Representative.
.3 Prevent debris from blocking surface drainage system, elevators, mechanical and electrical systems.

PART 2 - PRODUCTS

2.1 EQUIPMENT

.1 Leave equipment and machinery running only while in use, except where extreme temperatures prohibit shutting down.

.2 Wherever possible, use water efficient wetting equipment/trucks/attachments when minimizing dust.

.3 Demonstrate that tools are being used in manner which allows for salvage of materials in best condition possible.

PART 3 - EXECUTION

3.1 PREPARATION

.1 Do Work in accordance with Section 01 71 00.

.2 Disconnect and re-route electrical, telephone and communication service lines entering buildings to be deconstructed. Post warning signs on electrical lines and equipment which must remain energized to serve other products during period of demolition.

.3 Locate and protect utility lines. Do not disrupt active or energized utilities designated to remain undisturbed.

.4 Disconnect and cap designated mechanical services.
.1 Natural gas supply lines: remove in accordance with utility company requirements.
.2 Water lines: remove in accordance with requirements of authority having jurisdiction

3.2 DISASSEMBLY

.1 Materials removed from as a result of remedial demolition work are property of Contractor, unless otherwise indicated.

.2 Throughout course of deconstruction pay close attention to connections and material assemblies. Employ workmanship procedures which minimize damage to materials and equipment.

.3 Ensure workers and subcontractors are trained to carry out work in accordance with appropriate deconstruction techniques.

.4 Project supervisor must be present on site throughout project.

.5 Perform demolition with extreme care. Confine effects of demolition to those parts which are to be demolished.

.6 Perform work and prevent inconveniece to persons outside those parts which are to be demolished.

3.2 DISASSEMBLY (Cont'd)

.7 Deconstruct in accordance with CSA S350 and other applicable safety standards.

.8 Workers must utilize adequate fall protection where required by authorities having jurisdiction or where the Departmental Representative considers it necessary.

.9 Maintain structural integrity of structure.

.10 Systematically remove finishes, furnishings, and mechanical and electrical equipment as indicated.

.11 Carefully remove doors and frames from structure.

.12 Disassemble non-loadbearing interior partitions and remove materials from structure.

.13 Disassemble in sequence: interior loadbearing partitions, floor finishes.

.14 Remove interior finishes, such as ceiling and floor finishes, where new finishes are indicated on the Contract Drawings.
.1 Removal of ceilings shall include complete removal including bulkheads and suspension system.
.2 Removal of adhesive applied finishes shall include complete removal to substrate including adhesive. Take adequate care to prevent damage to substrate.
.3 Remove existing floor finishes, include mortar bed, underlayment or other cleavage membranes, underpad, base, floor moulding and transition strips.

.15 Wherever possible, transfer material assemblies from heights to ground level for easier disassembly. Take appropriate measures to ensure safety.

.16 Separate from waste stream, material in condition suitable for reuse and/or recycling.

.17 Remove and store materials to be salvaged, in manner to prevent damage.

3.2 DISASSEMBLY (Cont'd)

.17 (Cont'd)

.1 Store and protect in accordance with requirements for maximum preservation of material.

.2 Handle salvaged materials as new materials.

.3 Salvaged items must not be chipped, cracked, stained or damaged.

.4 Materials and items to be salvaged include the following:

.1 Convector panels.

.2 Additional items as indicated on the drawings or by the Departmental Representative.

.18 Source separate for recycling materials that cannot be salvaged for reuse including wood, metal, and concrete.

.19 Remove materials that cannot be salvaged for reuse or recycling and dispose of in accordance with applicable codes at licensed facilities.

.20 Where existing materials are to be re-used in Work, use special care in removal, handling, storage and re-installation to assure proper function in completed work.

3.3 PROCESSING

.1 Designate location for processing of materials which eliminates double handling and provides adequate space to maintain efficient material flow.

.2 Denail, strip, and separate materials to ensure best possible condition of salvaged materials.

.3 Keep processing area clean and free of excess debris.

.4 Supply separate, marked disposal bins for categories of waste material. Do not remove bins from site until inspected and approved by Departmental Representative. Notify Departmental Representative prior to removal of bins from site.

3.3 PROCESSING (Cont'd)

.5 Separate processed materials into organized piles for stockpiling. Provide collection area for materials processed and designated for alternate disposal. Pile materials on pallets to facilitate transport to storage areas.

3.4 STOCKPILING

.1 Label stockpiles, indicating material type and quantity.

.2 Designate appropriate security resources/measures to prevent vandalism, damage and theft.

.3 Locate stockpiled materials convenient for use in new construction. Eliminate double handling wherever possible.

.4 Stockpile materials designated for alternate disposal in location which facilitates removal from site and examination by potential end markets, and which does not impede disassembly, processing, or hauling procedures.

3.5 REMOVAL FROM SITE

.1 Transport material designated for alternate disposal to facilities listed in waste reduction workplan and in accordance with applicable regulations. Do not deviate from facilities listed in waste reduction workplan without prior written authorization from Departmental Representative.

.2 Dispose of materials not designated for alternate disposal in accordance with applicable regulations. Disposal facilities must be approved of and listed in waste reduction workplan. Do not deviate from disposal facilities listed in waste reduction workplan without prior written authorization from Departmental Representative.

3.6 CLEANING AND RESTORATION

.1 Keep site clean and organized throughout deconstruction.

3.6 CLEANING AND RESTORATION (Cont'd)

.2 Upon completion of project, remove debris, trim surfaces and leave work site clean.

.3 Upon completion of project, reinstate areas affected by Work to condition which existed prior to beginning of Work.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 07 90 00: Sealing of control joints.

1.2 REFERENCES

.1 American Society for Testing and Materials, (ASTM):
.1 ASTM A1064/A1064M-16a, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
.2 ASTM F593a-13a, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

.2 Canadian Standards Association (CSA) International:
.1 CSA A23.1-14/A23.2-14, Concrete materials and methods of concrete construction/Test methods and standard practices for concrete.
.2 CSA A165 Series-14, (CSA A165.1 Concrete Masonry Units) (CSA A165.2 Concrete Brick Units) CSA A165.3 Prefaced Concrete Masonry Units Units).
.3 CSA A179-14, Mortar and Grout for Unit Masonry.
.4 CAN/CSA-A370-14, Connectors for Masonry.
.5 CAN/CSA A371-14, Masonry Construction for Buildings.
.6 CAN/CSA-A3000-13, Cementitious Materials Compendium.
.7 CSA G30.18-14, Carbon Steel Bars for Concrete Reinforcement.
.8 CSA S304-14, Design of Masonry Structures.

1.3 SUBMITTALS

.1 Submit product data sheet for each item in accordance with Section 01 33 00 indicating VOC's mortar, grout, and admixtures.

.2 Indicate % recycled content indicating Total Cement Reduction Factor.

.3 Shop drawings: Submit shop drawings in accordance with Section 01 33 00 indicating:

1.3 SUBMITTALS (Cont'd)

.3 (Cont'd)
.1 Interface with existing masonry and details, reinforcing and anchors, special detailing, patterning and locations of control joints.

.4 Samples:
.1 Submit duplicate samples of concrete masonry unit.
.2 Submit duplicate samples of masonry anchors and ties.

1.4 QUALITY ASSURANCE

.1 Provide masonry as required for patching work in accordance with CAN/CSA A370, CAN/CSA A371 and CSA S304.1.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Delivery, store and handle materials in accordance with Section 01 61 00 and manufacturer`s written instructions.

.2 Delivery and Acceptance requirements: Deliver materials to site in original factory packaging, labelled with manufacturer`s name and address.
.1 Offload concrete unit masonry packages using equipment that will not damage the surfaces.
.2 Do not use brick tongs to move or handle masonry.

.3 Storage and Handling Requirements:
.1 Store materials indoors in dry location and in accordance with manufacturer`s recommendations in a clean, dry, well-ventilated area.
.2 Do not double stack cubes of concrete unit masonry.
.3 Cover masonry units with non-staining waterproof membrane covering.
.4 Allow air circulation around units.
.5 Installation of wet or stained masonry units is prohibited.
.6 Keep concrete unit masonry in individual cardboard packaging provided by manufacturer until units are ready to be installed.
.7 Store and protect concrete unit masonry from nicks, scratches, and blemishes.

1.5 DELIVERY, STORAGE AND HANDLING (Cont'd)

.3 (Cont'd)
.8 Replace defective or damaged materials with new.

.4 Packaging Waste Management: Remove for reuse and return of pallets, crates, padding and packaging materials in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Concrete block to CSA A165.1: To match existing block material as required for patching work required by this Section.
.1 Special shapes: provide units for exposed corners where required to match existing. Provide purpose-made shapes for lintels and bond beams. Provide additional special shapes as indicated.

.2 Concrete fill and grout: 20 MPa concrete in accordance with CSA A23.1/A23.2.

.3 Mortar: to CSA A179, Proportion specification. Select type from table below.
.1 Interior:
.1 Type N: loadbearing walls and non-loadbearing partitions.
.2 Fine grout to Table 3.

.4 Connectors: to CAN/CSA-A370, minimum Level 2 corrosion protection.

.5 Reinforcement: to CAN/CSA A370, CAN/CSA A371, and ASTM A1064/A1064M, hot dip galvanized.

.6 Reinforcing bars: to CSA G30.18, Grade 400, deformed.

.7 SS bolts, nuts and washers: stainless steel to ASTM F593.

.8 Concrete aggregate: to CSA A23.1/A23.2, 10 mm maximum size.

2.1 MATERIALS (Cont'd)

.9 Fibre firestopping: bearing ULC label, mineral fibre material capable of being compressed into space at top of masonry partitions where required for remedial work of this Project.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for masonry installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 MIXING AND APPROVAL

.1 In accordance CSA-A179.

.2 Do not commence masonry work until mortar is tested and approved by Departmental Representative.

.3 Concrete mix shall attain:
.1 25 MPa compressive strength at 28 days.
.2 100 mm slump at time of deposit.

3.3 PROTECTION

.1 Protect in accordance with CAN/CSA A371, except following requirements supplement Clause 6.7.2:
.1 Maintain temperature of mortar between 5°C and 50°C until used.

3.4 INSTALLATION AND WORKMANSHIP

.1 In accordance with CAN/CSA A371.

.2 Remove and replace masonry units which are loose, chipped, broken, cracked, or otherwise damaged. Supply and install new units to match adjoining units and install in fresh mortar and point to eliminate evidence of replacement.

.3 Joints of uniform thickness. Tolerances suggested in notes to Clause 7.1 of CAN/CSA A371 apply.

.4 Align vertical joints.

.5 Cut masonry with power saw.

.6 Where required for this remedial work, fill space between top of non-bearing partitions, underside of deck and underside of structural members with fibre firestopping compressed as recommended by manufacturer and requirements of ULC tests. Neatly trim on each side of partitions.

.7 Do masonry reinforcing, tying and connecting in accordance with CAN/CSA-A370 and CAN/CSA A371. If there is conflict in the requirements of these two standards, the more stringent requirement shall apply.

.8 Lightly wet set masonry surfaces before laying abutting masonry.

.9 Remove surplus mortar and mortar droppings as work progresses.

.10 Lay masonry in pattern to match existing.

.11 Install a full bed of mortar for first courses of masonry, for masonry units 100 mm thick and between solid units.

.12 Install special shaped and sized concrete block units as indicated and as required for a complete and coordinated assembly and to minimize cut units.

.13 Build in items supplied by other sections.

.14 Control joints:

3.4 INSTALLATION AND WORKMANSHIP (Cont'd)

.14 (Cont'd)
.1 Provide continuous vertical control joints in block partitions in following locations:
.1 Where new partitions abutt existing partitions.
.2 In new partitions in indicated locations and not spaced farther than 7.5 m o.c.
.3 On each side of column.
.2 Stop masonry reinforcement each side of control joint. Keep joint free of mortar.

.15 Reinforced lintels:
.1 Install reinforced block lintels at openings.
.2 Provide minimum bearing of 200 mm at each side of opening.
.3 Install reinforcing bars and fill with concrete.
.4 Set block lintels in place using specified mortar.

3.5 CLEANING

.1 Remove excess mortar and smears.

.2 Point or replace defective mortar.

.3 Scrub surfaces clean.

.4 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work areas clean at end of each day.

.5 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.6 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

.1 Protect installed products and components from damage during during construction.

3.6 PROTECTION (Cont'd)

.2 Repair damage to adjacent materials caused by masonry installation.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

1. Section 05 50 00: Metal Fabrications.
2. Section 07 81 00: Applied Fireproofing.
3. Section 09 91 00: Painting.

1.2 REFERENCES

1. Canadian Standards Association (CSA International):
   .1 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
   .2 CSA S16-14, Limit States Design of Steel Structures.
   .3 CSA S136-12, North American Specifications for the Design of Cold Formed Steel Structural Members.
   .4 CSA W47.1-09 (R2014), Certification of Companies for Fusion Welding of Steel.
   .5 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding.
   .6 CSA W55.3-08 (R2013), Certification of Companies for Resistance Welding of Steel and Aluminum.
   .7 CSA W59-13, Welded Steel Construction (Metal Arc Welding).
   .8 CSA W186-M1990 (R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction.

2. ASTM International Inc.:
   .1 ASTM A123/A123M-15, Standard Specification for Zinc (Hot Dip Galvanized) coating on Iron and Steel Products.
   .2 ASTM A36/A36M-14, Standard Specification for Carbon Structural Steel.
   .3 ASTM A325-14, Standard Specification for Structural Bolts, Steel, Heat Treated, 830 MPa (120/105 ksi) Minimum Tensile Strength.
   .4 ASTM A490M-14a, Standard Specification for High-Strength Steel Structural Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints.
   .5 ASTM A500-13, Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
   .6 ASTM A1011/A1011M-15, Standard Specifications for Steel, Sheet and Strip, Hot Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability and Ultra High Strength.
   .7 ASTM A992-11 (2015), Standard Specifications for Structural Steel Shapes.

.8 ASTM F1554-15e1, Standard Specification for Anchor Bolts, Steel 36, 55 and 105 ksi Yield Strength.

3. Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturers Association (CPMA):
.1 CISC Handbook of Steel Construction.
.2 CISC/CPMA Standard 1-73a, A Quick-drying One-coat Paint for Use on Structural Steel.
.3 CISC/CPMA Standard 2-75, Quick-drying Primer for Use on Structural Steel.
.4 CISC Code of Standard Practice, Appendix I, Architecturally Exposed Structural Steel (AESS).

4. The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers (NACE) International:
.1 SSPC-SP 1, Solvent Cleaning.
.2 NACE No. 3 / SSPC-SP 6, Commercial Blast Cleaning.
.3 NACE No.4 / SSPC-SP 7, Brush Off Blast Cleaning.
.4 NACE No.2 / SSPC-SP 10, Near White Blast Cleaning.
.5 SSPC Technology Guide No.14 – Guide for the Repair of Imperfections in Galvanized, Organic or Inorganic Zinc-Coated Steel Using Organic Zinc Rich Coating.
.6 SSPC Paint Specification No. 20 – Zinc Rich Coating, Type I – Inorganic and Type II - Organic.

1.3 QUALITY ASSURANCE

1. Engage a Professional Engineer licensed in the place where the project is located to be responsible for design, detailing and installation of all connections related to structural steel work.

2. The Professional Engineer designing connections to hold a Certificate of Authorization, and to carry min. $1,000,000.00 in liability insurance (per occurrence).

3. Welders to be Canadian Welding Bureau (CWB) approved, working under the supervision of a CWB approved firm.

1.4 QUALITY CONTROL

1. Submit in accordance with Section 01 45 00.

2. Source Quality Control Submittals:
.1 Submit mill test reports 4 weeks prior to fabrication of structural steel.
.1 Mill test reports to show chemical and physical properties and other details of steel to be incorporated in project.
.2 The reports to be correlated to the

materials or products to which they pertain.

3. Tolerances
.1 Conform to the fabrication and erection tolerances of CSA S16.
.2 If more stringent tolerances are specified elsewhere to suit interfacing materials or AESS members, the latter shall govern.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

1. Provide submittals in accordance with Section 01 33 00.

2. Structural steel fabricator to submit 1 week prior to submittal of shop drawings proof of certification by the Canadian Welding Bureau under the requirements of CSA W47.1, Division 1 or 2 for fusion welding and/or CSA W55.3 for resistance welding of structural steel components

3. Shop Drawings:
.1 Provide drawings stamped and signed by the Professional Engineer responsible for steel connections.
.2 Before submitting shop drawings, provide a letter signed and sealed by that Engineer stating that he has been engaged to undertake the responsibility for the above. Also submit a copy of that Engineer’s Certificate of Authorization, and proof of his liability insurance.
.3 If additional information is required from the Departmental Representative, allow a minimum of five working days for the Departmental Representative to review and respond to the request for information.
.4 It is advisable to submit erection diagrams for review before preparing shop details. Copies of plans and section details developed by the Departmental Representative will not be accepted as erection diagrams.

4. Erection drawings:
.1 Submit erection drawings indicating details and information necessary for assembly and erection purposes including:
.1 Description of erection methods.
.2 Sequence of erection.
.3 Temporary bracings.
.4 Beam sizes (in addition to beam marks).
.5 Connections where threads must be excluded from shear plane.
.6 Members which are considered AESS and their category.
.7 Type and finish of bolts in AESS connections.
.8 Side where bolt heads should be placed

in AESS connections.
.9 Weld grinding, finish and profile in AESS field connections.

5. Fabrication drawings:
.1 Submit fabrication drawings showing designed assemblies, member sizes, components and connections. Show on drawings:
.1 Material specifications.
.2 Surface preparation.
.3 Shop painting / galvanizing.
.4 Section splices.
.5 Types of shop and field connections.
.6 Net weld lengths.
.7 Precautions which will be taken to exclude threads from shear planes of bearing type bolted connections (where applicable).
.8 Protected zones.
.9 Vent holes required for galvanizing process.
.10 Camber.
.11 Architectural clearance lines and finishes where connections could encroach other works.
.12 Beam and column web holes required for services and reinforcing around them.
.2 Indicate members which are considered AESS, and their category. Refer to AESS Category Matrix as shown in Table 1 of the CISC Code of Standard Practice, Appendix I.
.1 For AESS bolted connections, indicate bolt type, finish and which side of the connection bolt heads should be placed.
.2 For AESS welded connections, show grinding, profile and weld finish.
.3 Show details by which steel assemblies, which are set in concrete, are to be connected to the formwork.
.4 Substitution of alternative sections will only be allowed provided the new members have equal or greater capacity and stiffness and their dimensions are approved by the Departmental Representative.

6. On completion of erection, submit a letter signed and sealed by the Professional Engineer responsible for structural steel connections certifying that the work has been completed in accordance with all contract documents.

PART 2 - PRODUCTS

2.1 DESIGN REQUIREMENTS

1. Design details and connections in accordance with requirements of CSA S16 and CSA S136 to resist forces

and to allow for movements indicated. Consider load effects due to fabrication, erection and handling.

2. When requested, submit sketches and design calculations stamped and signed by the Professional Engineer responsible for connection design.

3. Beam end connections:
.1 Select beam end connections from CISC "Handbook of Steel Construction" when connection for shear only (standard connection) is required.
.2 When shears are not indicated, select or design non composite beam end connections to resist reaction due to maximum uniformly distributed load capacity of the beam in bending.
.3 When shears are not indicated, select or design composite beam end connections to resist one and a half times the reaction due to maximum uniformly distributed load capacity of the non composite beam section in bending.

4. Seated beam connections to have top clip angles.

5. Provide all spandrel beams and all floor beams not fully braced by floor construction with top and bottom flange connections for torsional restraint.

6. Assume that bolt threads are intercepted by shear plane, unless special measures are indicated on shop drawings to exclude threads from shear plane.

7. Connection design to include consideration of all pass-through forces, including tension, compression, moment or shear. Provide local reinforcement at connection or joint as required.

8. Where axial forces occur in beams framing to opposite sides of a supporting member, design connections for a pass-through force equal to the smaller axial force. If beam sizes differ, assume the axial force is centred in the smaller beam. Where beams frame into columns, connect each beam for the axial force shown.

9. Follow conceptual connection details if shown on structural drawings. Do not change without the Departmental Representative’s written approval. If welds are defined on drawings, the sizes shown are minimum requirements which might need to be increased to suit connection design.

10. Pretension all high-strength bolts used in:
.1 All elements resisting crane loads.
.2 Connections where bolts are subject to tensile loads.
.3 Connections using oversized or slotted holes

unless finger-tight bolts are required to accommodate movement.
.4 Connections required by CSA S16 to be pre-tensioned.

11. Where moment connections are called for but values are not indicated, design for moment capacity of the smaller member in the connection.

12. Install web and flange stiffener plates at moment connections as required by connection design and detail but in every case when indicated on the drawings. If the shear generated in column web exceeds its shear capacity, reinforce the web.

13. For beams continuous over supports and for beams supporting columns, provide min. 6mm (1/4”) stiffener plates at each side of web at point of concentrated load, unless thicker stiffeners are required by connection design or different details are shown on drawings.

14. Shape and size gusset plates to accommodate required finishes and clearances, refer to Architectural and Mechanical drawings.

15. Design gusset plates and bracing connections for members which are parts of seismic force resisting system to allow ductile rotation and to satisfy requirements of CSA S16. Design gusset plates for other compression members for the force equivalent to twice the specified compression member force, or provide stiffeners to prevent gusset plate buckling.

16. Provide moment connections at splices to maintain continuity of cranked beams. Provide header plates or stiffener plates to resist unbalanced flange forces at splices.

17. Provide all wall supporting members (shelf angles, hangers, stubs, back braces, etc.) which are attached to floor beams with adjustable connections capable to compensate for the deflection of the floor beams due to self weight of concrete. Anticipate beam deflection to be equivalent to the camber shown, or 20 mm (whichever is more). Alternatively, fabricate based on actual deflected shape of the beams as measured after concrete is poured.

18. Detail and erect vertical diagonal plate and rod bracings to provide a prestress of approximately 15 MPa. Prestress to be effective when building ambient temperature has stabilized.

19. Provide slotted holes long enough to allow for

deflection indicated on drawings plus construction tolerance, assuming bolts are centred in slots. Bolts are to be finger-tight with burred threads to allow for movement during the life of structure without bolts loosening.

20. Do not oversize anchor rod holes for site tolerances. Use hole sizes suggested in the CISC Handbook of Steel Construction.

21. Connect new steel members to existing concrete using drilled concrete anchors, refer to Post Installed Anchors and Dowels notes on drawings. Do not field weld at connections with adhesive anchors.

2.2 MATERIALS

1. Structural steel:
   .1 Rolled shapes: to CSA G40.20/G40.21, Grade 300W.
   .2 Hollow structural sections: to ASTM A500 345W Grade C or CSA G40.20/G40.21 Grade 350W Class C.
   .3 Structural Pipe: to ASTM A53, Grade 240W.

2. Anchor rods: CSA G40.20/G40.21, Grade 300W, unless ASTM F1554 Grade 105 is indicated on drawings.

3. Bolts, nuts and washers: to ASTM A325.

4. Welding materials: to CSA W48 and CSA W59, certified by Canadian Welding Bureau.

5. Weldable reinforcing steel: to CSA G30.18, deformed bars.

6. Shop paint: to CISC/CPMA 1.

7. Shop paint primer: to CISC/CPMA 2, solvent reducible alkyd, red oxide, compatible with specified topcoat.

8. Zinc-rich coating: to SSPC Paint Specification No.20, compatible with top coat (where specified).

9. Hot dip galvanizing: to ASTM A123/A123M, Coating Grade 85, minimum zinc coating of 600 g/m².

2.3 FABRICATION

1. Fabricate structural steel in accordance with CSA S16 and with reviewed shop drawings.

2. Install shear studs in accordance with CSA W59.

3. Continuously seal members by intermittent welds and plastic filler unless continuous welds are indicated on drawings.

4. Provide holes in beam flanges or weld threaded studs

as required for attachment of wood nailers.

5. Position beams having permissible mill camber so that the camber is up.

6. Install stud anchors in shop with end welds in accordance with the recommendations of the stud manufacturer. Lengths of studs given on drawings are the lengths after welding. Replace studs that crack in the weld or shank.

7. Increase specified section thickness at no extra cost if required for fabrication (bending) or galvanizing, Alternatively, fabricate curved sections from plates.

8. Provide 16mm (5/8″) diameter weep holes in base plates of HSS columns which are not made watertight.

9. HSS members which require galvanizing to either be per CSA G40.20/G40.21, grade 350W, Class H, or to be stress relieved prior to galvanizing.

10. Provide vent holes in HSS sections where required for galvanizing process. Located so that any water inside HSS will drain away when HSS is in its final position. Maximum size – 16mm (5/8″) diameter. Fill holes with vent hole plugs after galvanizing.

11. Provide 12 (1/2″) dia. holes in HSS columns to be filled with concrete. Locate at opposing column faces 150mm (6″) from each end.

12. Connect together double beams and double channels at not more than 1200mm (4 ft) centres unless the members are welded toe to toe.

13. Connect together axially loaded built-up members in accordance with the requirements of CSA S16. In addition, interconnect compression members for trusses and bracing at least at the one-third points.

14. Connect cover plates of built-up members to develop the capacity of the built-up member.

15. Provide minimum 200 (8″) long bearing for members supported by masonry or concrete.

16. Weld beams to bearing plates unless otherwise noted on drawings. Extend beams for full length of bearing plates. Set bearing plates 10mm (3/8″) back from edge of support.

17. Anchor roof beams bearing on walls with a minimum of two 16mm (5/8") diameter x 380mm (1'-3") long anchor rods, unless otherwise noted on the Drawings.

18. Provide cap plates at tops of columns where required for support of deck, slab, joists, beams or safety anchors.

19. Provide connection for tie joist bottom chord at all columns supporting joists, coordinate with joist supplier.

20. Provide closure plates for all exposed and for all exterior tubular members.

21. Provide diagonal or cantilevered angles at sides of columns where required to support deck or slab.

22. Connect steel lintels in masonry walls to columns where openings are adjacent to columns.

23. Unless otherwise noted on drawings, provide 102 x 102 x 9.5 (4" x 4" x 3/8") seat angles attached to sides of columns to support masonry lintels adjacent to columns. Length of seat to equal width of lintel minus 25 mm (1").

24. Complete welded shop connections prior to galvanizing.

25. Mark materials in accordance with CSA G40.20/G40.21. Do not use die stamping. When steel is to be left unpainted, place marking at locations not visible from exterior.

26. Match marking: shop mark bearing assemblies and splices for fit and match.

27. Where shop inspection is required, do not ship material to the site before it has been inspected.

28. Fabricate in stages complex members for which steel inspection is impossible or difficult once completed, and arrange for the Inspection and Testing Agency to do intermediate shop inspections.

29. Fabricate AESS with tolerances and surface quality consistent with AESS category.

2.3 SHOP PAINTING

1. Clean all members to SSPC-SP 1, Remove loose mill scale, rust, oil, dirt and foreign matter.

2. In addition for members receiving shop primer paint: Clean steel to SSPC-SP 7 Brush-Off Blast Cleaning.

3. In addition for members receiving intumescent coating: Clean steel to SSPC-SP 6 Commercial Blast Cleaning

4. In addition for members receiving zinc-rich coating: Clean steel to SSPC-SP 10 Near White Blast Cleaning.

5. Apply one coat of shop paint CISC/CPMA 1 to steelwork in the shop with the exception of:
   .1 Members to receive spray fireproofing.
   .2 Members to receive a finish coat of paint on site for which a CISC/CPMA 2 shop primer is required.
   .3 Members to receive intumescent coating for which a compatible shop primer is required.
   .4 Members to receive zinc-rich coating.
   .5 Galvanized members.
   .6 Shear connectors and top flanges of composite beams with field welded shear connectors.
   .7 Surfaces encased in or in contact with cast-in-place concrete including top flanges of beams supporting slabs.
   .8 Surfaces and edges to be field welded for a distance of 50 mm (2") from joints.
   .9 Faying surfaces of slip-critical connections.

6. Apply one coat of contrasting colour shop paint to all protected zones indicated on structural drawings to clearly delineate their extent.

7. Apply one coat of compatible primer paint CISC/CPMA 2-75 in the shop to steelwork to receive a finish coat of paint on site.

8. Apply one coat of compatible primer paint in the shop for steel to receive intumescent coating on site, see section 07 81 00.

9. Apply galvanizing in the shop to all structural steel located beyond the vapour barrier, including:
   .1 Shelf angles and hangers in exterior walls.
   .2 Spandrel angles to which precast panels are attached.
   .3 Lintels in exterior walls.
   .4 Exposed exterior steel members.
   .5 Exposed anchor rods.
   .6 Other steel noted on drawings.

10. If galvanized steel is to be painted, use only non passivated galvanizing process (without chromate coating).

11. Apply paint under cover, on dry surfaces when surface and air temperatures are above 5ºC.

12. Maintain dry condition and 5ºC minimum temperature until paint is thoroughly dry.

13. Strip paint from bolts, nuts, sharp edges and corners before prime coat is dry.

PART 3 - EXECUTION

3.1 GENERAL

1. Structural steel work: in accordance with CSA S16.
2. Welding: in accordance with CSA W59.

3.2 CONNECTION TO EXISTING WORK

1. Verify dimensions and condition of existing work prior to start of fabrication. Determine any potential interference with existing services. Report discrepancies and potential problem areas to the Departmental Representative for direction before commencing work.
2. Take precautions to protect existing works from damage. Repair damage to adjacent materials caused by structural steel installation.

3.3 MODIFICATION / REMOVAL OF EXISTING STEEL WORK

1. Dismantle and cut existing structural steel as required. Provide temporary shoring and bracing required for these operations. Retain a Professional Engineer to design the temporary shoring and to review this work on site.
2. Remove from site existing steel which is dismantled but not designated for reuse.
3. Clean existing structural steel, which is affected by the work and is to remain in place, down to bare metal, prior to its inspection so that its condition may be ascertained. Notify the Departmental Representative when members are ready for inspection.

3.4 ERECTION

1. Erect structural steel in accordance with CSA S16 and reviewed erection drawings.
2. Do not field cut or alter any members without the Departmental Representative’s approval.
3. Make adequate provision for all loads acting on the structure during erection. Provide erection bracing to keep the structure stable, plumb and in true alignment during construction. Bracing members or connections shown on Structural Drawings are those required for the completed structure, and may not be sufficient for erection purposes. Do not remove erection bracings without written approval from the Engineer who designed it.

4. Set column base plates to the elevation required for grouting using steel shims or leveling screws attached to sides of base plates. Do not fasten leveling nuts to anchor rods. Alternatively, for base plates equal or smaller than 350mm x 350mm (14″ x 14″), leveling plates set with grout and level to within 1.5 mm (1/16") across the plate can be used. Do not erect columns upon plates exceeding this tolerance. Lift base plates for inspection when directed.

5. Grout under column base plates and beam bearing plates as soon as steelwork is completed. Do not add load on steelwork until grouting is completed and grout strength has reached at least 20 MPa.

6. Do not make permanent connections until structure has been properly aligned.

7. Adjust and finalize connections at wall supporting elements affected by floor beam deflections after concrete is poured.

8. Report ill-fitting connections to the Departmental Representative before taking corrective measures.

9. When welding after galvanizing is in place, grind away galvanizing at areas to be welded.

10. Do not weld in an ambient temperature below -17ºC. Preheat material adjacent to welding areas when ambient temperature is between -17ºC and +4ºC.

11. Remove slag from all completed welds so that they may be visually inspected.

12. Seal members by continuous welds where indicated.

13. AESS members:
.1 Erect using softened slings or other methods to prevent damage.
.2 Provide padding as required to protect while rigging and aligning.
.3 Weld tabs for temporary bracings and safety cabling only at points concealed from view in the complete structure or where approved by the Departmental Representative.
.4 Remove all field connection aids added to allow alignment, fit up and welding.
.5 Remove welds at run-out tabs to match adjacent surface.
.6 Plug weld holes for erection bolts.

3.5 FIELD QUALITY CONTROL

1. Refer to Section 01 45 00.

2. Bring to the attention of the Departmental Representative any defects or deficiencies in the work together with a proposal for remedy. The Departmental Representative will decide what corrective action may be taken, and will issue the necessary instructions.

3. Construction Review:
.1 General review during construction by the Departmental Representative will be carried out by examination of representative samples of the work.
.2 Construction review reports will outline any deficiencies found.

4. Inspection and testing:
.1 An Inspection and Testing Agency certified to CSA W178.1 & 2 will be appointed to carry inspection and testing of all structural steel.
.2 Do not commence fabrication until details of inspection have been worked out with the Agency.
.3 The Inspection Agency will submit reports to the Departmental Representative, Contractor and Municipal Authorities covering the Work inspected and provide details of errors or deficiencies observed.
.4 Work will be inspected in the shop and when erected. Store fabricated members in the shop so that they are accessible for inspection. Items to be cast into concrete will be inspected on site before being installed.
.5 Inspection will include:
.1 Checking that the mill test certificates or producer’s certificates are properly correlated to materials and products supplied for the project or that legible markings were made on the material and products by the producers in accordance with the applicable standards. Where this is not possible, notify the Departmental Representative and if requested carry out sample tests as described below.
.2 Confirming that all materials meet specifications.
.3 Sampling fabrication and erection procedures for general conformity with the requirements of the Contract.
.4 Checking welders' CWB Certification.
.5 Checking fabricated members against specified member shapes.
.6 Checking fabricated members against allowable mill sweep and camber.
.7 Checking fabricated members against specified camber.
.8 Visual inspection of all welded connections including spot checking of joint preparation and fit up.

.9 Sample checking bolted joints.
.10 Sample checking stud anchors.
.11 Sample checking drilled concrete and masonry anchors.
.12 Sample checking that tolerances are not exceeded during erection including fit-up of field welded joints.
.13 Inspection of field cutting.
.14 Inspection of sliding bearings.
.15 Inspection of surface preparation, shop paint and field touch-up.
.16 Inspection of galvanizing and field touch-up.
.17 Inspection of grouting under base plates and bearing plates.
.18 Checking levelness of leveling plates.

.6 Arrange for the Inspector to be present during welding of 10% of moment connections and 10% of butt welds in direct tension.

.7 Sample testing: When required, test coupons will be taken and tested in accordance with CSA G40.20/G40.21 to establish identification. Cut samples from member locations selected by the Departmental Representative and provide to the Inspection and Testing Agency. Make good the locations if requested, at no extra cost, by adding new plates and welds acceptable to the Departmental Representative. The Agency will have the samples tested for mechanical properties and for chemical composition and will classify the steel as to specification.

.8 Arrange for the Inspector to start field inspection as soon as each section of the Work is completed, plumbed, bolts tightened and field welding finished.

.9 The Inspector will check the specified camber of all beams. Do not place steel deck until this has been done and approved in writing by the inspector.

.10 The Inspector will visually check all bolts in bearing connections. Where erection drawings indicate bolts with threads excluded from the shear plane, he will remove nuts from 1% of all bearing bolts and check that thread is excluded from the shear planes.

.11 The Inspector will visually check all stud shear connectors on composite steel beams. At least on stud in every 150 and all studs which do not have a complete end weld, which are repaired by welding or which show less than the normal reduction in height due to welding will be bent 15 degrees from their axis towards the nearest support, as specified in CSA W59. Bent studs that show no sign of failure will be accepted and shall remain in the bent position. Studs that crack in weld, base metal or shank will be rejected. Studs with end welds

covering less that 85% of the perimeter will be rejected even if they pass the bend test.

.12 The Inspector will provide full time inspection during installation of post installed adhesive anchors subject to sustained tension loads.

.13 The Inspector will randomly select and pull test 5% of all types and sizes of post installed anchors installed on a weekly basis, but not less than one anchor of each type, size and orientation. Pull test to twice the allowable tensile load, or 1.5 times the factored resistance of the anchor given by the manufacturer. Chose anchor locations where proximity to concrete edge does not affect anchor capacity, or use reduced anchor loads per manufacturer’s recommendation. Submit reports to the Departmental Representative within one week of testing. Reports to indicate each anchor location, test load and mode of failure, if applicable. Notify the Departmental Representative immediately if any anchor fails the pull test.

.14 The Inspector will visually check all the adjustable connections at wall supporting members to ensure the connections have been finalized after the concrete is poured.

3.6 FIELD PAINTING

1. Paint in accordance with Section 09 91 00.

2. Touch up damaged surfaces with the same paint as the shop primer.

3. Repair any galvanized or zinc rich painted surfaces which have been damaged or field welded in accordance with SSPC Technology Guide No.14.

4. Clean and prepare surfaces of bolts, which will receive a finished coat of paint in the same manner as the connected steelwork.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials International, (ASTM):
.1 ASTM A123/A123M-15, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
.2 ASTM A480/A480M-16a, Standard Specification for General Requirements for Flat-Rolled Stainless Steel and Heat-Resisting Steel Plate, Sheet and Strip.
.3 ASTM A653/A653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
.4 ASTM F593-13a, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

.2 Canadian General Standards Board (CGSB):
.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.3 Canadian Standards Association (CSA):
.1 CSA B651-12, Accessible Design for the Built Environment.
.2 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
.3 CSA W59-13, Welded Steel Construction (Metal Arc Welding).

.4 EcoLogo Program Certification Criteria Document
.1 CCD-047a-05, Architectural Surface Coatings.

.5 The Master Painters Institute (MPI)/Architectural Painting Specification Manual - latest edition.
.1 MPI #79 - Primer, Alkyd, Anti-Corrosive for Metal.

1.2 DESIGN REQUIREMENTS

.1 Design metal fabrications in accordance with CSA B651.

1.3 SUBMITTALS

.1 Submit shop drawings and product data of each item specified in accordance with Section 01 33 00.
.1 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details and accessories.
.2 Indicate each item's conformance with CSA B651.
.3 Each shop drawing submission shall bear signature and stamp of qualified professional engineer registered or licensed in province of Ontario.

1.4 QUALITY ASSURANCE

.1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle material in accordance with Section 01 61 00 and with manufacturer's written instructions.

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

.3 Storage and handling requirements:
.1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return of pallets, crates, padding and packaging materials in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 SS bolts, nuts and washers: stainless steel to ASTM F593, minimum 75% recycled content.

.2 Steel: to CSA G40.20/G40.21, Grade 300W, minimum 30% recycled content.

.3 Hollow Structural Sections (HSS): to CSA G40.20/G40.21, Grade 350W, Class H, minimum 30% recycled content.

.4 Stainless steel sheet, strip, plate and flat bar: to ASTM A480/A480M, type 304, AISI No. 4 finish, minimum 75% recycled content.

.5 Alkyd primer: to MPI#79, E3 environmental rating.

.6 Galvanizing: hot dip, unpassivated, to ASTM A123/A123M, Coating Grade 85, minimum 600 g/m^2.

.7 Zinc rich primer for galvanized surfaces: zinc rich, readymix to CAN/CGSB-1.181, Ecologo certified.

.8 Grout: non-shrink, non-metallic, flowable, 24 h, 15 MPa, pullout strength 7.9 MPa.

.9 Security fasteners:
.1 Provide security screws, security nuts, rivets, spanner screws or other equally secure approved devices for affixing various items, ie torx pin head, socket pin head, phillips pin head, hex pin head or equivalent.
.2 Spanner screws to have slots that require a special spanner tool to remove screws.
.3 Round head screws not acceptable except at locations approved where material is not thick enough to permit counter-sinking.
.4 Standard screws not acceptable.

.10 Mesh:
.1 Mesh (Type 1, typical): 3.25 mm thick galvanized, flattened, expanded steel diamond mesh, diamond size 25 x 25 mm, to ASTM F1267, Type II, Class 1. Steel: minimum 25% recycled content.

2.1 MATERIALS (Cont'd)

.10 (Cont'd)

.2 Mesh (Type 2, mesh window panels): Galvanized, flattened, expanded steel diamond mesh to pattern as indicated, conforming to ASTM F1267, Type II, Class 1. Steel: minimum 25% recycled content. Mesh to meet the below requirements:

.1 Weight: 188 lbs/100 sq.ft.

.2 Mesh opening size: Diamond mesh opening size of approximately 14 mm x 43 mm.

.3 Strand size: Width at 4.2 mm and thickness at 3.048 mm.

.4 Open area: 63%.

2.2 FABRICATION

.1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.2 Use self-tapping shake-proof flat headed screws on items requiring assembly by screws or as indicated.

.3 Weld to CSA W59. Ensure exposed welds are continuous for length of each joint. File or grind welds smooth and File or grind welds smooth and flush with adjoining surface.

.4 Shop assemble work.

2.3 FINISHES

.1 Galvanizing: Hot dipped galvanizing with zinc coating 600 g/sq.m., Coating Grade 85, to ASTM A123/A123M.

.2 Shop coat primer: In accordance with chemical component limits and restrictions requirements and VOC limits of CCD-047a.

.3 Zinc primer: Zinc rich, ready mix in accordance with chemical component limits and restrictions requirements and VOC limits of CCD-047a.

.4 Stainless steel: Type 304, No. 4 finish.

2.4 SHOP PAINTING

.1 Primer: VOC limit 250 g/L maximum to CCD-047a.

2.4 SHOP PAINTING (Cont'd)

.2 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.

.3 Use primer unadulterated, as prepared manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 degrees C.

.4 Clean surfaces to be field welded; do not paint.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for metal fabrications installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Supply other sections with templates, instructions and built-in items.

.2 Install work straight, plumb and level to a tolerance of 1:600.

.3 Provide required reinforcing and anchorage.

.4 Touch-up burnt, scratched or chipped primer.

3.3 SECURITY DUCT GRILLES

.1 Install security grilles in duct applications as indicated and as required for a rigid and secure installation and to maintain security barrier.

3.3 SECURITY DUCT GRILLES (Cont'd)

.2 Fabricate security grilles from 3 mm x 50 mm steel plate secured to duct opening with lag bolts, complete with specified expanded steel mesh welded on inside face wall to steel plate.

3.4 LOOSE ANGLE LINTELS

.1 Supply masonry section with steel loose angle lintels of sizes required to suit masonry openings.

.2 Apply alkyd primer to interior lintels.

.3 Provide 150 mm bearing at ends.

.4 Weld or bolt together back-to-back angles.

3.5 MISCELLANEOUS STEEL BRACKETS, SUPPORTS AND ANGLES

.1 Supply and install or supply for installation by trades responsible, all loose steel brackets, supports and angles where such brackets, supports and angles are specified under work of other Sections. Drill for countersunk screws, expansion anchors and anchor bolts.

.2 Unless otherwise specified, prime paint for interior installation; galvanized finish for humid areas.

3.6 STAINLESS STEEL LAMINATE

.1 Provide minimum 3 mm thick stainless steel laminate for backsplash location as indicated.

.2 Provide cut-outs as required in sheet material.

.3 Adhesive type to be as recommended by board manufacturer under Section 09 21 16. Coordinate with noted Section as required for sizing, required cut-outs and installation.

.4 Install stainless steel laminate material straight, smooth, free of wrinkles, buckles and defects in appearance.

3.7 SECURITY WINDOW MESH PANELS

.1 Install framed security mesh panels at intended window applications and as required for a rigid and secure installation and to maintain security barrier.

.2 Security mesh panels to be demountable type, complete with specified security mesh and angle steel framing as shown on Contract Drawings.

.3 Angle framing to be sized at 5 mm x 44 mm (3/16" x 1-3/4"). Height to cover window.

.4 Attachment:
.1 Mesh window panels to be atatched to partition walls and slab. Attachment to window frames or sill is not permitted, unless otherwise approved by the Owner.
.2 Minimum 9.5 mm(3/8") mechanical fasteners on 200 mm centres along vertical edges.

3.8 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work areas clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.9 PROTECTION

.1 Protect installed products and components from damage during during construction.

.2 Repair damage to adjacent materials caused by metal fabrications installation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 American Wood Protection Association (AWPA):
- .1 AWPA P5-15, Standard for Waterborne Preservatives.
- .2 AWPA P8-14, Standard for Oil-Borne Preservatives.

.2 Canadian Standards Association (CSA):
- .1 CSA O80 Series-15, Consolidation, Wood Preservation.
- .2 CAN/CSA-O86-14, Consolidation, Engineering Design in Wood.
- .3 CSA O112 Series M1977(R2006), CSA Standards for Wood Adhesives.
- .4 CSA O121-08(R2013), Douglas Fir Plywood.

.3 National Building Code of Canada, NBC 2015.

.4 South Coast Air Quality Management District (SCAQMD):
- .1 SCAQMD Rule 1168-05, Adhesive and Sealant Applications, Amended January 7, 2005.

.5 National Lumber Grades Authority Standard Grading Rules for Canadian Lumber, 2014:
- .1 Special Product Standard SP-1.
- .2 Special Product Standard SP-2.

1.2 QUALITY ASSURANCE

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

.2 Plywood in accordance with CSA and ANSI standards.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Wood: S-DRY, graded and stamped to National Lumber Grades Authority, Standard Grading Rules for Canadian Lumber, S4S.
- .1 Blocking, furring, strapping, curbs, nailers, bracing, and cants: spruce, pine or fir (SPF), 121d. and pine, 113d.

2.1 MATERIALS (Cont'd)

.2 Fastenings: to CAN/CSA-086.

.3 Field applied wood preservative: copper napthenate to AWPA P8, green colour.

.4 Preservative treated plywood: Douglas Fir to CSA O121, G1S good one side, pressure treated with CCA to CAN/CSA O80.9, minimum retention 4.0 kg/m^3 by assay.
.1 Preservative: chromated copper arsenate (CCA) to AWPA P5 as amended by CAN/CSA-O80-Series.

.5 Fire retardant treated plywood: Douglas Fir to CSA O121, G1S, fire retardant treated to CSA O80.27, maximum flame spread 25, maximum smoke developed 25.
.1 Backboard: Thickness as indicated, sanded, to Table E-1.

.6 Construction adhesive: to CSA O112 Series, cartridge loaded.
.1 Maximum allowable VOC limit 140 g/L.
.2 SCAQMD Rule 1168, Adhesives and Sealants Applications.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Apply wood preservative to wood in contact with concrete and masonry.

.2 Treat surfaces of pressure treated wood and plywood which are cut or bored after pressure treatment with field applied wood preservative.

.3 Set items in place plumb, straight and level to a tolerance of 1:600 and rigidly secure in place.

.4 Construct continuous members from pieces of longest practical length.

.5 Select exposed framing for appearance. Install lumber and panel materials so that grade-marks and other defacing marks are concealed or are removed by sanding where materials are left exposed.

3.1 INSTALLATION (Cont'd)

.6 Backboards for security equipment in equipment room:
.1 Install plywood backboards with short dimension mounted vertically, complete with 50 x 100 mm (2 x 4) spacers creating an 89 mm cavity. Run spacers vertically and stop above and below the plywood edges as indicated.
.2 Prime and paint plywood panels with fire retardant paint in white colour in accordance with Section 09 91 23.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work areas clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Protect installed products and components from damage during during construction.

.2 Repair damage to adjacent materials caused by carpentry installation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 American National Standards Institute/Builders Hardware Manufacturers Association (ANSI/BHMA):
- .1 ANSI/BHMA A156.9-2010, Cabinet Hardware.
- .2 ANSI/BHMA A156.11-2014, Cabinet Locks.
- .3 ANSI/BHMA A156.16-2013, Auxiliary Hardware.

.2 Architectural Woodwork Manufacturers Association of Canada (AWMAC):
- .1 AWI/AWMAC/WI AWS-2014.

.3 Canadian Standards Association (CSA):
- .1 CSA B651-12, Accessible Design for the Built Environment.
- .2 CSA O112 Series M1977(R2006), CSA Standards for Wood Adhesives.
- .3 CSA O121-08(R2013), Douglas Fir Plywood.
- .4 CSA O132.2 Series-90 (R2003), Wood Flush Doors.
- .5 CSA O153-13, Poplar Plywood.
- .6 CSA Z204-94(R1999), Guideline for Managing Indoor Air Quality in Office Buildings.

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

.5 National Electrical Manufacturers Association (NEMA)
- .1 NEMA LD 3-2005, High-Pressure Decorative Laminates.

.6 National Lumber Grades Authority Standard Grading Rules for Canadian Lumber, 2014.

.7 South Coast Air Quality Management District (SCAQMD):
- .1 SCAQMD Rule 1168-05, Adhesive and Sealant Applications, Amended January 7, 2005.

1.2 IAQ - INDOOR AIR QUALITY

.1 Comply with CSA Z204, Guideline for Managing Indoor Air Quality in Office Buildings and CSA B651.

1.3 ACTION AND INFORMATIONAL

.1 Submit in accordance with Section 01 33 00 and AWS Section 1.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for architectural woodwork and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Submit two copies of WHMIS MSDS.

.3 Shop Drawings:
.1 Indicate details of construction, profiles, jointing, fastening and other related details.
.1 Scales: profiles full size, details.
.2 Indicate materials, thicknesses, finishes and hardware.
.3 Indicate locations of service outlets in casework, typical and special installation conditions, and connections, attachments, anchorage and location of exposed fastenings.

.4 Samples:
.1 Submit for review and acceptance of each unit.
.2 Samples will be returned for inclusion into work.
.3 Submit duplicate samples of hardwood backing and plywood: sample size 300 x 300 mm.
.4 Submit duplicate samples of laminated plastic for colour selection.
.5 Submit duplicate samples of laminated plastic joints, edging, cutouts and postformed profiles.

.5 Certifications: submit AWMAC GIS certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
.1 Architectural woodwork shall be manufactured and/or installed to the current AWMAC Architectural Woodwork Standards and shall be subject to an inspection at the plant and/or site by an appointed AWMAC Certified Inspector.
.2 Inspection costs shall be included in the bid price for this project. Contact your local AWMAC Chapter for details of inspection costs.
.3 Shop drawings shall be submitted to the AWMAC Chapter office for review before work commences.

1.3 ACTION AND INFORMATIONAL (Cont'd)

.5 (Cont'd)

.4 Work that does not meet the AWMAC Architectural Woodwork Standards, as specified, shall be replaced, reworked and/or refinished by the architectural woodwork contractor, to the approval of AWMAC, at no additional cost to the. Departmental Representative.

.5 If the woodwork contractor is an AWMAC Manufacturer member in good standing, a two (2) year AWMAC Guarantee Certificate will be issued.

.6 The AWMAC Guarantee shall cover replacing, reworking and/or refinishing any deficient architectural woodwork due to faulty workmanship or defective materials supplied by the woodwork contractor, which may appear during a two (2) year period following the date of issuance.

.7 If the woodwork contractor is not an AWMAC Manufacturer member they shall provide the Departmental Representative with a two (2) year maintenance bond, in lieu of the AWMAC Guarantee Certificate, to the full value of the architectural woodwork contract.

1.4 ACCESSIBILITY

.1 Comply with CSA B651, Accessible Design for the Built Environment.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Concealed blocking and framing: S-DRY, graded and stamped to National Lumber Grades Authority, Standard Grading Rules for Canadian Lumber, SPF, 121c. "STUD" and 101d. "D" FINISH.

.2 Exposed plywood: hardwood plywood to AWI/AWMAC/WI AWS, Section 4 Sheet Products, Premium Grade, wood species and cut to match existing base building standard.

.3 Concealed plywood: douglas fir to CSA 0121, Good One Side, urea formaldehyde free.

.4 High pressure decorative laminate (HDPL): to AWI/AWMAC/WI AWS, Section 4, and ANSI/NEMA LD3 as follows:

.1 Flatwork face sheet: 1.2 mm thick, heavy wear resistance.

2.1 MATERIALS (Cont'd)

.4 (Cont'd)
.2 Vertical interior face sheets: 0.8 mm thick.
.3 Postformed face sheet: 0.8 mm thick.
.4 Backing sheet: Thickness to match face sheet, high pressure laminate, manufactured by same manufacturer as face sheet.
.5 Plastic laminate colour and finish to be selected from manufacturer's standard range by the Departmental Representative.

.5 HDPL panel core: to AWI/AWMAC/WI AWS Section 4, 1.2.31 and 4.2c.
.1 Lumber core: poplar plywood to CSA 0153, Standard Construction, Interior Bond, BB Grade, urea formaldehyde free, unless otherwise indicated.

.6 Panel adhesive: to AWI/AWMAC/WI AWS Section 4, Ecologo certified.

.7 Sealant: In accordance with Section 07 90 00.

.8 Bituminous paint: acid and alkali resistant, Ecologo certified.

.9 Construction adhesive: to CSA O112 Series, cartridge loaded.
.1 Maximum allowable VOC limit 140 g/L.
.2 SCAQMD Rule 1168, Adhesives and Sealants Applications.

2.2 HARDWARE

.1 Cabinet hinge: to ANSI/BHMA-A156.9, type B81602.

.2 Magnetic catch: to ANSI/BHMA-A156.9, type B13171, heavy duty.

.3 Recessed pull: to ANSI/BHMA-A156.9, type B02201, oval shape as approved by the Departmental Representative.

.4 Adjustable shelf standard: to ANSI/BHMA-A156.9, type B84061, surface application, open shelf rest type B84091.

2.2 HARDWARE (Cont'd)

.5 Drawer slide set: heavy duty to ANSI/BHMA-A156.9, type B05051, with zinc plate finish and AWI/AWMAC/WI AWS Section 10 and Appendix B Section 10-Casework, Drawer Slide Selection Guide, full extension, positive stop, self closing.
.1 AWS Heavy Duty:
.1 Static load capacity: 45.359 kg (100 lbs.) Commercial.
.2 Dynamic load capacity: 34.019 kg (75 lbs.) 50,000 cycles.

.6 Cam locks: to ANSI/BHMA-A156.11, key removable in locked and unlocked position, cam attached with screw or nut, type E07261, Grade 1.

.7 Coat hooks: to ANSI/BHMA-A156.16, type L13111.

.8 Closet bar: to ANSI/BHMA-A156.16, attached by surface screws, round type.

.9 Sliding door hardware: Top hung, aluminum trackand components suitable for closet application. Sliding door hardware system consisting of: extruded aluminum upper track, double roller running gear, track stopper, suspension plate and floor mounted guide.

.10 Draw bolts: type recommended by laminated plastic manufacturer.

.11 Field painting: Paint finish on closet shelves in accordance with Section 09 91 23.

2.3 FABRICATION

.1 Finished millwork shall be free from bruises, blemishes, mineral marks, knots, shakes and other defects and shall be selected for uniformity in colour, grain and texture.

.2 Perform plastic laminate work in accordance with AWS Quality Standards and ANSI/NEMA LD3.

.3 Casework: to AWI/AWMAC/WI Architectural Woodwork Standards, Section 10, Type: High Pressure Decorative Laminate, Custom Grade: Section 10 and CSA B651.

2.3 FABRICATION (Cont'd)

.4 Countertops: to AWI/AWMAC/WI Architectural Woodwork Standards, Section 11 and Appendix B Section 11, Custom Grade, HDPL Option 6 post formed edge with coved splash and CSA B651.
.1 Sink cutouts: to 4.3.6 and radius corners to Appendix B.

.5 Shop assemble units in size to allow passage to installed location.

.6 Match grain and colour of adjoining exposed natural finished wood.
.1 Before finishing exposed surfaces of woodwork: remove handling marks or effects of exposure to moisture by thorough final sanding over all surfaces of exposed portions, using appropriate grit sandpaper and clean before applying sealer or finish.

.7 Cover exposed faces and edges with laminated plastic where indicated.

.8 Edging of plastic laminate faced millwork to be done using straight self-edging laminate strip to match colour, finish, gloss and pattern to cover exposed edge of core material.

.9 Shop apply laminated plastic with hairline joints, chamfer exposed edges.

.10 Apply bituminous paint to edge of cutouts in laminated plastic tops at sinks.

.11 HDPL covered shelves and shelf gables, unless otherwise indicated.

.12 Seal all surfaces for site finishing to WDI/AWMAC/WI AWS Section 5.

2.4 SHOP FINISHING

.1 Shop finish exposed hardwood backing materials with water based polyurethane to WDI/AWMAC/WI AWS Section 5, System 12.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for architectural woodwork installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 HARDWARE SCHEDULE

.1 Swinging cabinet doors:
- .1 1 pair cabinet hinges.
- .2 1 cabinet pull.
- .3 1 magnetic catch.
- .4 1 door lock.

.2 Drawers:
- .1 1 drawer slide set.
- .2 1 cabinet pull.
- .3 1 drawer lock.

.3 Adjustable shelves:
- .1 4 shelf standards.
- .2 4 rests per shelf.

.4 Sliding closet doors: Sliding door hardware.

3.3 INSTALLATION

.1 Set items in place, plumb, straight and level to a tolerance of 1:400 and rigidly secure in place in accordance with AWI/AWMAC/WI Architectural Woodwork Standards.

.2 Completely assemble units.

3.3 INSTALLATION (Cont'd)

.3 Coordinate cut-outs for plumbing fixtures, inserts, appliances, outlet boxes, and other fixtures, in finish carpentry. Round internal corners of cut-outs and seal exposed cores.

.4 Join abutting laminated plastic tops with draw bolts.

.5 Apply sealant to junction of backsplash and adjacent wall finish in accordance with Section 07 90 00.

.6 Adjust hardware after cabinets and closets are installed for smooth effortless operation.

.7 Install doors and hardware to CAN/CSA-O132.2, Appendix A.

.8 Install doors hardware in accordance with CAN/CSA-O132.2.4 Series. Adjust hardware after doors installed for smooth effortless operation.

.9 Fastening:
.1 Coordinate wall securement, anchorage, and blocking for finish carpentry items.
.2 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.
.3 Design and select fasteners to use to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.
.4 Provide heavy duty fixture attachments for wall mounted cabinets.
.5 Set finishing nails to recieve filler. Where screws are used to secure members, countersink screw in round cleanly cut hole and plug with wood plug to match material being secured.

.10 Remove and replace damaged, marked, or stained finish carpentry.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work areas clean at end of each day.

3.4 CLEANING (Cont'd)

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

.1 Protect installed products and components from damage during during construction.

.2 Repair damage to adjacent materials caused by architectural woodwork installation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

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

.2 Underwriter's Laboratories of Canada (ULC)
.1 CAN/ULC-S101-14, Standard Methods of Fire Endurance Tests of Building Construction and Materials.
.2 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.2 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets.

.3 Quality assurance submittals: submit following in accordance with Section 01 45 00.
.1 Test Reports:
.1 Submit product data including certified copies of test reports verifying fireproofing applied to substrate as constructed on project will meet or exceed requirements of Specification.
.2 Submit test results in accordance with CAN/ULC-S101 for fire endurance and CAN/ULC-S102 for surface burning characteristics.
.3 For assemblies not tested and rated, submit proposals based on related designs using accepted fireproofing design criteria.
.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.2 SUBMITTALS (Cont'd)

.3 (Cont'd)
.3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.
.4 Manufacturer's Field Reports: submit to manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.3 QUALITY ASSURANCE

.1 Quality assurance requirements - installer and manufacturer:
.1 Installer: company that is approved by manufacturer.
.2 All fire stopping material shall be from one manufacturer.
.3 All fire stopping installation work for entire project shall be by a single contractor experienced in firestopping. Individual disciplines shall NOT fire stop their own work.

.2 Site Meetings: as part of Manufacturer's Services described in PART 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.
.1 After delivery and storage of products, and when preparatory Work is complete but before installation begins.
.2 Twice during progress of Work at 25% and 60% complete.
.3 Upon completion of Work, after cleaning is carried out.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:
.1 Deliver, store and handle materials in accordance with Section 01 61 00.
.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
.3 Deliver packaged materials in original unopened containers, marked to indicate brand name, manufacturer, and ULC markings.

.2 Storage and Protection:
.1 Store materials indoors in dry location.

1.4 DELIVERY, STORAGE AND HANDLING (Cont'd)

.2 (Cont'd)
.2 Store and protect materials from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.
.3 Damaged or opened containers will be rejected.
.4 Packaging to indicate shelf-life and materials to be applied prior to expiration of shelf-life.
.5 Provide temporary enclosures to prevent spray from contaminating air beyond application area.
.6 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of fireproofing materials.

.3 Waste Management and Disposal:
.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

1.5 AMBIENT CONDITIONS

.1 At temperatures less than 5°C, ensure that 5°C air and substrate temperature is maintained during and for 24 hours after application. Ensure that natural ventilation to properly dry the fireproofing during and subsequent to its application is provided. In enclosed areas lacking openings for natural ventilation, ensure that interior air is circulated and exhausted to the outside.

.2 Maintain relative humidity within limits recommended fireproofing manufacturer.

.3 Ensure that natural ventilation to properly dry fireproofing during and subsequent to its application is provided.

.4 In enclosed areas lacking openings for natural ventilation, provide minimum of 4 air exchanges per hour by forced air circulation.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Sprayed fireproofing: ULC certified cementitious fireproofing qualified for use in ULC Designs specified and fungus resistant for 28 days.

.2 Curing compound: type recommended by fireproofing manufacturer, qualified for use in ULC Designs specified.

.3 Sealer: type recommended by fireproofing manufacturer, qualified for use in ULC Design specified.
.1 Colour: As selected by the Departmental Representative.

.4 Fireproofing: minimum dry density and cohesion/adhesion properties as follows:
.1 Fireproofing for existing structural open web steel joists concealed above ceiling, or within wall, chase, or furred space: minimum applied dry density of 240 kg per cubic meter and cohesion/adhesion strength of 9.57 kPa.
.2 Fireproofing for structural components located in mechanical rooms and storage areas: minimum applied dry density of 640 kg per cubic meter and cohesion/adhesion strength of 350 kPa.
.3 Ensure spray-applied fireproofing: does not crack, spall or delaminate under downward deflection conditions over 3 m clear span.
.4 Minimum compressive strength: 48 kPa.
.5 Spray-Applied fireproofing material: not contribute to corrosion of test panels.
.6 Dust removal: not exceed 0.25 gram per square meter.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PREPARATION

.1 Substrate: free of material, which would impair bond.

.2 Verify that painted substrates are compatible and have suitable bonding characteristics to receive fireproofing.

.3 Remove incompatible materials.

.4 Ensure that items required to penetrate fireproofing are placed before installation of fireproofing.

.5 Ensure that ducts, piping, equipment, or other items which would interfere with application of fireproofing are not positioned until fireproofing work is completed.

3.3 APPLICATION

.1 Apply bonding adhesive or primer to substrate if recommended by manufacturer.

.2 Apply fireproofing to correspond with tested assemblies, or acceptable calculation procedures to provide intended fire resistance ratings.

.3 Apply fireproofing over substrate, building up to required thickness to cover substrate with monolithic blanket of uniform density and texture.

.4 Apply fireproofing directly to open web joists without use of expanded lath.

.5 Tamp smooth, surfaces to provide dense, medium smooth surface.

.6 Apply curing compound to surface of cementitious fireproofing as required by manufacturer.

.7 Apply sealer to surface of cementitious fireproofing as required by manufacturer.

3.4 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:
.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

.2 Inspection and Site Tests:
.1 Inspection and testing of fireproofing will be carried out by Testing Laboratory designated by Departmental Representative.

3.5 PATCHING

.1 Patch damage to fireproofing caused by testing or by other trades before fireproofing is concealed, or if exposed, before final inspection.

3.6 CLEANING

.1 Proceed in accordance with Section 01 74 11.

.2 Clean surfaces not indicated to receive fire-proofing of sprayed material within 24 hours period after application.

.3 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

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

.2 National Building Code of Canada, NBC 2015.

.3 Underwriter's Laboratories of Canada (ULC)
.1 CAN/ULC-S101-14, Standard Methods of for Fire Endurance Tests of Building Construction and Materials.
.2 CAN/ULC-S102-11, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
.3 CAN/ULC-S115-11, Standard Method of Fire Tests of Firestop Systems.

1.2 DEFINITIONS

.1 Fire Stop Material: device intended to close off opening or penetration during fire or materials that fill openings in wall or floor assembly where penetration is by cables, cable trays, conduits, ducts and pipes and poke-through termination devices, including electrical outlet boxes along with their means of support through wall or floor openings.

.2 Single Component Fire Stop System: fire stop material that has Listed Systems Design and is used individually without use of high temperature insulation or other materials to create fire stop system.

.3 Multiple Component Fire Stop System: exact group of fire stop materials that are identified within Listed Systems Design to create on site fire stop system.

.4 Continuity of Fire Separations: NBC 2010, Division B, Parts 3.1.8 and 3.1.9.1, 9.10.9):
.1 Wall, partition or floor assemblies required to be a fire separation shall be: constructed as a continuous element; have a fire resistance rating; have openings protected by a closure; and have penetrations sealed by a firestop.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00.

.3 Shop Drawings:
.1 Submit shop drawings to show location, proposed material, reinforcement, anchorage, fastenings and method of installation.
.2 Construction details should accurately reflect actual job conditions.

.4 Quality assurance submittals: submit following in accordance with Section 01 45 00.
.1 Test reports: in accordance with CAN/ULC-S101 for fire endurance and CAN/ULC-S102 for surface burning characteristics.
.1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with specifications for specified performance characteristics and physical properties.
.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
.3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.
.4 Manufacturer's Field Reports: submit to manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.4 QUALITY ASSURANCE

.1 Quality assurance requirements - installer and manufacturer:
.1 Installer: company that is approved by manufacturer.

1.4 QUALITY ASSURANCE (Cont'd)

.1 (Cont'd)
.2 All fire stopping material shall be from one manufacturer.
.3 All fire stopping installation work for entire project shall be by a single contractor experienced in firestopping. Individual disciplines shall NOT fire stop their own work.

.2 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section, with contractor's representative and Departmental Representative in accordance with Section 01 31 19 to:
.1 Verify project requiments.
.2 Review installation and substrate conditions.
.3 Co-ordination with other building subtrades.
.4 Review manufacturer's installation instructions.

.3 Site Meetings: as part of Manufacturer's Services described in PART 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.
.1 After delivery and storage of products, and when preparatory Work is complete, but before installation begins.
.2 Twice during progress of Work, initial phase and near completion.
.3 Upon completion of Work, after cleaning is carried out.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:
.1 Deliver, store and handle materials in accordance with Section 01 61 00.
.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
.3 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, ULC markings.

.2 Storage and Protection:

1.5 DELIVERY, STORAGE AND HANDLING (Cont'd)

.2 (Cont'd)
.1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Replace defective or damaged materials with new.

.3 Waste Management and Disposal:
.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Fire stopping and smoke seal systems: in accordance with CAN/ULC-S115.
.1 Asbestos-free materials and systems capable of maintaining effective barrier against flame, smoke and gases in compliance with requirements of CAN/ULC-S115 and not to exceed opening sizes for which they are intended and conforming to specified special requirements described in PART 3.
.2 Fire stop system rating: F.

.2 Service penetration assemblies: systems tested to CAN/ULC-S115.

.3 Service penetration fire stop components: certified by test laboratory to CAN/ULC-S115.

.4 Fire-resistance rating of installed fire stopping assembly in accordance with NBC.

.5 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.

.6 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.

.7 Primers: to manufacturer's recommendation for specific material, substrate, and end use.

2.1 MATERIALS (Cont'd)

.8 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.

.9 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

.10 Sealants for vertical joints: non-sagging.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for firestopping installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 PREPARATION

.1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.
.1 Ensure that substrates and surfaces are clean, dry and frost free.

.2 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.

3.3 PREPARATION (Cont'd)

.3 Maintain insulation around pipes and ducts penetrating fire separation.

.4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.4 INSTALLATION

.1 Install fire stopping and smoke seal material and components in accordance with manufacturer's certified tested system listing.

.2 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.

.3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.

.4 Tool or trowel exposed surfaces to neat finish.

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

3.5 SEQUENCES OF OPERATION

.1 Proceed with installation only when submittals have been reviewed by Departmental Representative.

.2 Install floor fire stopping before interior partition erections.

.3 Mechanical pipe insulation: certified fire stop system component.
.1 Ensure pipe insulation installation precedes fire stopping.

3.6 FIELD QUALITY CONTROL

.1 Inspections: notify Departmental Representative when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.

3.6 FIELD QUALITY CONTROL (Cont'd)

.2 Manufacturer's Field Services:
.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.7 CLEANING

.1 Proceed in accordance with Section 01 74 11.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

.3 Remove temporary dams after initial set of fire stopping and smoke seal materials.

.4 Progress Cleaning: Clean in accordance with Section 01 74 11.
.1 Leave Work areas clean at end of each day.

.5 Final Cleaning: Upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.6 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.8 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by firestopping installation.

3.9 SCHEDULE

.1 Fire stop and smoke seal at:

.1 Penetrations through fire-resistance rated masonry, concrete and gypsum board partitions and walls.

.2 Top of fire-resistance rated masonry and gypsum board partitions.

.3 Intersection of fire-resistance rated masonry and gypsum board partitions.

.4 Control joints in fire-resistance rated masonry partitions and walls.

.5 Penetrations through fire-resistance rated floor slabs and ceilings.

.6 Openings and sleeves installed for future use through fire separations.

.7 Around mechanical and electrical assemblies penetrating fire separations.

.8 Rigid ducts: greater than 129 cm^2: fire stopping to consist of bead of fire stopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 ASTM International (ASTM):
.1 ASTM C920-14a, Standard Specification for Elastomeric Joint Sealants.
.2 ASTM E90-09, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

.2 Environmental Choice Program (ECP):
.1 ECP/PCE-45-92, Sealants and Caulking.

1.2 ENVIRONMENTAL CHOICE PROGRAM

.1 Provide sealant products bearing the 'Ecologo' of the Environmental Choice Program, Department of the Environment, Canadian Environmental Protection Act, Environmental Choice Product Guidelines ECP/PCE-45 for Sealants and Caulking Compounds, except maximum VOC 60 g/L during application and curing.

.2 For primers and sealants, indicate VOC in g/L during application and curing.

1.3 PRODUCT DATA

.1 Submit manufacturer's literature indicating recommended surface preparation, sealant selection and primer for each substrate in accordance with Section 01 33 00.

1.4 DESIGN REQUIRMENTS

.1 Minimum sound transmission rating of installed partition, floor and ceiling to intended STC rating, tested to ASTM E90.

PART 2 - PRODUCTS

2.1 SEALANTS

.1 Provide sealant products bearing Ecologo to ECP/PCE-45 with maximum VOC 60 g/L.

2.2 SEALANT MATERIAL DESIGNATIONS

.1 Silicones One Part 'Type A'.
.1 To ASTM C920, primerless, Type S, Grade NS, Class 50, SWRI validated.

.2 Silicones One Part 'Type B'.
.1 To ASTM C920, Type S, Grade NS, mildew, resistant silicone.

.3 Acoustical Sealant 'Type C'.
.1 One part silicone to ASTM C920, primerless, Type S, Grade NS, Class 25, SWRI validated.

.4 Preformed compressible and non-compressible back-up materials 'Type B', CFC free.
.1 Polyethylene, urethane, neoprene or vinyl foam. Extruded open cell foam backer rod. Size: oversize 30 to 50%.
.2 Neoprene or butyl rubber. Round solid rod, Shore A hardness 70.
.3 High density foam. Extruded closed cell polyvinyl chloride (PVC) or extruded polethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m^3 density, or neoprene foam backer, size as recommended by manufacturer.
.4 Bond breaker tape. Polyethylene bond breaker tape which will not bond to sealant.

2.3 SEALANT SELECTION

.1 Perimeters of exterior openings where frames meet exterior facade of building (ie. brick, block, precast masonry): Designation Type A.

.2 Seal interior perimeters of exterior openings as detailed on drawings: Designation Type A.

.3 Interior control and expansion joints in floor surfaces: Designation Type B.

.4 Perimeters of interior frames, as detailed and itemized: Designation Type A.

.5 Interior masonry vertical control joints (block-to-block, block-to-concrete, and intersecting masonry walls): Designation Type A.

.6 Joints at tops of non-load bearing masonry walls: Firestopping work to be provided by Section 07 84 00.

2.3 SEALANT SELECTION (Cont'd)

.7 Perimeter of fixtures (e.g. sinks): Designation Type B.

.8 Between tile and adjacent materials: Designation Type B.

.9 Partitions and penetrations requiring acoustic sealant: Type C.

2.4 JOINT CLEANER

.1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.

.2 Primer: to manufacturer's recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sealant installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION OF JOINT SURFACES

.1 Protect adjacent exposed surfaces to prevent smearing, staining or other damage, by masking or other means, prior to performing work. Make good any damage caused by sealant application. Remove protection upon completion and clean adjacent, exposed surfaces of any compound deposited upon such surfaces.

.2 Sealant removal work:

3.2 PREPARATION OF JOINT SURFACES (Cont'd)

.2 (Cont'd)

.1 Remove all existing sealant, loose rust and mill scale by hand cutting, power grinding or wire brushing at existing windows as shown on Contract Drawings.

.2 Clean substrate surfaces so that they are free from caulking, dust, grease, soiling or extraneous matter, which are detrimental to the adhesion of sealant.

.3 Chemically clean all non-porous surfaces, such as aluminum and glass, by solvent wipe and drying with a clean cloth.

.4 Patch, repair and smooth minor substrate defects and deficiencies. Clean porous surfaces such as masonry and concrete by mechanical abrading.

.5 Where fasteners are loose, tighten or replace as required.

.6 Substrate moisture tests:

.1 Test for moisture content over areas where sealant is to be applied.

.2 If any test registers above 10% allow entire substrate surfaces, within the plane, to dry further before sealant system application. Install temporary drying fans if necessary.

.3 After drying of the substrate, re-test employing same criteria.

.7 Mildew removal: Scrub with solution of TSP and rinse with water, and allow to dry completely.

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

.4 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair work.

.5 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.

.6 Ensure joint surfaces are dry and frost free.

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

3.3 PRIMING

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

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

3.4 BACKUP MATERIAL

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

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

3.5 MIXING

.1 Mix materials in accordance with sealant manufacturer's instructions.

3.6 APPLICATION

.1 Ventilate interior spaces during application and curing of sealants to maintain VOCs less than 50 g/l. Coordinate with building manager to ensure existing ventilation system or temporary ventilation supplies sufficient outside air.

.2 Sealant.
.1 Protect installed work of other trades from staining or contamination.
.2 Apply sealant in accordance with manufacturer's application manual and written instructions. Maintain STC rating of assemblies.
.3 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint. remove tape after sealant applied.
.4 Apply sealant in continuous beads.
.5 Apply sealant using gun with proper size nozzle.
.6 Use sufficient pressure to fill voids and joints solid.
.7 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
.8 Tool exposed surfaces before skinning begins to give slightly concave shape.

.3 Curing.

3.6 APPLICATION (Cont'd)

.3 (Cont'd)
.1 Cure sealants in accordance with sealant manufacturer's instructions.
.2 Do not cover up sealants until proper curing has taken place.

3.7 CLEANING

.1 Cleanup:
.1 Clean adjacent surfaces immediately and leave work neat and clean.
.2 Remove excess and droppings, using recommended cleaners as work progresses.
.3 Remove masking tape after initial set of sealant.

.2 Progress Cleaning: Clean in accordance with Section 01 74 11.
.1 Leave Work areas clean at end of each day.

.3 Final Cleaning: Upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.4 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.8 PROTECTION

.1 Protect installed products and components from damage during during construction.

.2 Repair damage to adjacent materials caused by sealant installation.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 04 01 25: Building-in and grouting frames in masonry.

.2 Section 07 90 00: Caulking of joints between frames and other building components.

.3 Section 08 71 11: Hardware.

.4 Section 08 80 00: Glazing.

.5 Section 09 21 16: Building-in frames into steel stud walls

.6 Division 26: Wiring for electronic hardware in steel doors and frames.

.7 Division 28: Security requirements in steel doors and frames, such as alarm key pad and card readers.

1.2 DESIGN REQUIREMENTS

.1 Design doors and frames as required to meet Owner's security requirements and to accommodate hardware, wiring and controls as required for work of this Project.

1.3 REFERENCES

.1 American Society for Testing and Materials International (ASTM):
.1 ANSI/BHMA A156.16-2013, Auxiliary Hardware.

.2 American Society for Testing and Materials International (ASTM):
.1 ASTM A480/A480M-16a, Standard Specification for General Requirements for Flat-Rolled Stainless Steel and Heat-Resisting Steel Plate, Sheet and Strip.
.2 ASTM A568/A568M-15, Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
.3 ASTM A653/A653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

1.3 REFERENCES (Cont'd)

.2 (Cont'd)
.4 ASTM E90-09, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

.3 Canadian General Standards Board (CGSB):
.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.4 Canadian Steel Door Manufacturers Association (CSDMA) www.csdma.org/english/publications.html
.1 Fire Labelling Guide 2009.
.2 Recommended Dimensional Standards For Commercial Steel Doors and Frames 2000.
.3 Recommended Selection and Usage Guide for Commercial Steel Door and Frame Products 2009.
.4 Recommended Specifications for Sound Retardant Steel Doors and Frames 2006.

.5 National Fire Protection Association (NFPA)
.1 NFPA 80-2016, Standard for Fire Doors and Other Opening Protectives.
.2 NFPA 252-2012, Standard Methods of Fire Tests of Door Assemblies.

.6 Underwriters Laboratories Canada (ULC)
.1 CAN/ULC-S104-10, Standard Method for Fire Tests of Door Assemblies.
.2 CAN/ULC-S105-09, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC-S104.
.3 CAN/ULC-S702-14, Standard for Mineral Fibre Thermal Insulation for Buildings.

1.4 SUBMITTALS

.1 Submit product data sheets and shop drawings in accordance with Section 01 33 00.

.2 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, glazing, louvres, arrangement of hardware and fire rating.

.3 Indicate each type of frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and finishes.

1.4 SUBMITTALS (Cont'd)

.4 Acoustic door assemblies: submit manufacturer's data for tested assembly indicating assembly meets STC specified.

.5 Submit member certificate to prove membership with the Canadian Steel Door and Frame Manufacturers Association.

1.5 QUALITY ASSURANCE

.1 The manufacturer of steel doors and frames supplied under this section will be a member of the Canadian Steel Door and Frame Manufacturers Association.

1.6 REQUIREMENTS OF REGULATORY AGENCIES

.1 Steel fire rated doors and frames: labelled and listed by an organization accredited by Standards Council of Canada in conformance with CAN/ULC-S104, or NFPA 252 for ratings specified or indicated.

.2 Provide fire labelled frame products for those openings requiring fire protection ratings, as scheduled. Test products in strict conformance with CAN/ULC-S104, or NFPA 252 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/ Factory Inspection Manuals issued by listing agency to individual manufacturers.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00.

.2 Waste Management and Disposal:
.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Metal: tension levelled sheet steel to ASTM A568/A568M, Class 1, with ZF275 (G90) zinc coating on both sides designation to ASTM A653/A653M.

2.1 MATERIALS (Cont'd)

.2 Door cores: continuous interlocking steel ribs: 0.9 mm thick continuous interlocking steel stiffeners at 150 mm O.C., securely welded to each face sheet 150 mm O.C. maximum. Voids between stiffeners Fibreglass: loose batt type, density: 24 kg/m^3 minimum, to CAN/ULC-S702, Type 1, Ecologo certified.

.3 Filler: polyester based.

.4 Primer: zinc rich, organic, ready mix to CAN/CGSB-1.181, Ecologo certified.

.5 Door bumpers: to ANSI/BHMA-A156.16, type L03011.

.6 Gasket: self-adhering, closed cell foam of black vinyl copolymers.

.7 Stainless Steel: to ASTM A480/A480M AISI No. 4 finish.

.8 Glass and glazing materials: In accordance with Section 08 80 00.

2.2 FABRICATION

.1 To Canadian Steel Door Manufacturers Association (CSDMA), "Specifications for Commercial Steel Door and Frames", "Canadian Metric Conversion Guide for Steel Doors and Frames" and CAN/ULC-S105 "Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC-S104".

.2 Doors: material thickness, opening classification and duty rating to CSDFMA "Recommended Selection and Usage Guide For Commercial Steel Doors", hollow steel construction, filled with insulation, edges continuously welded and sanded flush with no visible seams. Close bottom edge of doors where indicated.
.1 Security door: face sheets minimum 1.2 mm thick CRS.

.3 Frames: 1.6 mm steel, welded type, except welded type at doors in secure partitions. Anchors adjustable, type to suit each jamb condition.

2.2 FABRICATION (Cont'd)

.4 Sound retardant door and frame assembly: 44 mm thickness, STC 46 when tested to ASTM E90, 61T/E90-66T, complete with sound seals and automatic door bottom. Use only components that have been tested as an assembly and certified as to STC rating by independent laboratory tests.

.5 Glass mouldings: formed steel.

.6 Install 3 door bumpers on strike jamb of single doors and 2 bumpers at head of double doors.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for door and frame installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Install frames and doors in accordance with reviewed shop drawings, manufacturer's written instructions and to meet Owner's security requirements.

.2 Install frames and doors secure and plumb in accordance with manufacturer's instructions and templates.

.3 Install labelled steel fire rated doors and frames to NFPA 80.

.4 Provide even margins between doors and jambs and doors and flooring as follows:
.1 Hinge side: 1.0 mm.
.2 Latch side and head: 1.5 mm.
.3 Flooring: 13 mm.

3.2 INSTALLATION (Cont'd)

.5 Secure anchorages and connections to adjacent construction.

.6 Adjust doors installed for smooth effortless operation.

.7 Touch-up with primer scratched or damaged zinc finish.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work areas clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Protect installed products and components from damage during during construction.

.2 Repair damage to adjacent materials caused by door and frame installation.

END OF SECTION

PART 1 - GENERAL

1.1 WARRANTY

.1 For wood doors specified in this Section 08 14 11 the 12 month warranty period prescribed in General Conditions GC3.13 is extended to three years.

1.2 REFERENCES

.1 American National Standards Institute (ANSI):
.1 ANSI/BHMA A156.16-2013, Auxiliary Hardware.

.2 American Society for Testing and Materials International (ASTM):
.1 ASTM E90-09, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

.3 Architectural Woodwork Manufacturers Association of Canada (AWMAC):
.1 AWI/AWMAC/WI AWS, Edition 2-2014.

.4 Canadian Standards Association (CSA):
.1 CAN/CSA-O132.2 SERIES-90(R2003), Wood Flush Doors.

.5 National Fire Protection Association (NFPA):
.1 NFPA 80-2016, Standard for Fire Doors and Other Opening Protectives.

.6 Underwriters Laboratories Canada (ULC):
.1 CAN/ULC-S104-10, Standard Method for Fire Tests of Door Assemblies.
.2 CAN/ULC-S105-09, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC-S104.

1.3 PRODUCT DATA SHEETS

.1 Submit product data sheets and shop drawings in accordance with Section 01 33 00.

.2 Indicate thicknesses, core construction, veneers, finish, door sizes, quantities, fastenings, finishes, glazing, louvres, arrangement of hardware and fire rating.

1.3 PRODUCT DATA SHEETS (Cont'd)

.3 Acoustic door assemblies: submit manufacturer's data for tested assembly indicating assembly meets STC specified.

1.4 QUALITY ASSURANCE

.1 Perform work in accordance with AWMAC, Quality Standards, Premium Grade, except as indicated otherwise.

.2 Label and list fire rated doors by an organization accredited by the Standards Council of Canada in conformance with CAN/ULC-S104 and CAN/ULC-S105 for ratings indicated.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle wood doors in accordance with Section 01 61 00 and AWMAC Quality Standard amended as follows:
.1 Wrap wood doors individually in protective wrapping for shipment and Site storage.
.2 Handle wood doors carefully to prevent damage; replace damaged doors.
.3 Store doors flat on a dry, level surface. Ventilate and maintain recommended relative humidity before, during and after installation.

.2 Waste Management and Disposal:
.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MATERIALS AND FABRICATION

.1 Wood doors to CAN/CSA-0132.2 Series, flush:
.1 Interior Type II bond adhesive plywood faced, Grade 1 Premium, solid, mat-formed wood particleboard core, 35 mm hardwood stiles including 19 mm hardwood edge, 35 mm wood rails, solid wood lock reinforcing, and glass mouldings. Wood species and cut for door facing and mouldings to match existing base building standard.

2.1 MATERIALS AND FABRICATION (Cont'd)

.2 Sound retardant door and frame assembly: 44 mm thickness, STC 46 when tested to ASTM E90, 61T/E90-66T, complete with sound seals and automatic door bottom. Use only components that have been tested as an assembly and certified as to STC rating by independent laboratory tests.

.3 Door bumpers: to ANSI A156.16, type L03011.

.4 Metal frames: In accordance with Section 08 11 14.

.5 Glass and glazing materials: In accordance with Section 08 80 00.

2.2 FIRE RATED WOOD DOORS

.1 Wood doors: tested in accordance with CAN/ULC-S104 to achieve rating as scheduled.
.1 Fire-rated wood doors: Conforming to ULC or WHI listed and labelled.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for door installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Install doors in accordance with CAN/CSA-O132.2 Series, Appendix A.

.2 Install labelled fire rated doors to NFPA 80.

.3 Provide even margins between doors and jambs and doors and flooring as follows:

3.2 INSTALLATION (Cont'd)

.3 (Cont'd)
.1 Hinge side: 1.0 mm.
.2 Latch side and head: 1.5 mm.
.3 Flooring: 13 mm.

.4 Adjust doors installed for smooth effortless operation.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work areas clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Protect installed products and components from damage during during construction.

.2 Repair damage to adjacent materials caused by door installation.

END OF SECTION

PART 1 - GENERAL

1.1 DESIGN REQUIREMENTS

.1 Design interior acoustic windows to meet an STC rating of 35 in accordance with ASTM E90.

1.2 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Sections 01 33 00 and 01 78 00.

1.3 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)

.1 ASTM E90-09, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

1.4 SAMPLE

.1 Submit one window, conforming to contract documents in all respects, to job site for review by Departmental Representative.

.2 Fabricate remaining windows following review.

.3 Remaining windows to match reviewed sample.

.4 Sample window may be installed after review.

1.5 TEST REPORT

.1 Submit test reports from window manufacturer, demonstrating that storm window meets intended sound rating when tested in accordance with ASTM E90.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle units on site in accordance with manufacturer's written instructions.

.2 Packaging Waste Management: Remove for reuse and return of pallets, crates, padding and packaging materials in accordance with Section 01 74 20.

1.7 WARRANTY

.1 For the work of this Section 08 51 15 the 12 month warranty period prescribed in General Conditions GC3.13 is extended to three years.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Acoustic storm window:
.1 New interior storm windows to be installed in conjunction with existing windows as shown on Contract Drawings.
.2 Window panes: Made from 100% virgin, optical-grade acrylic, non-yellowing, complete with flexible magnet molded into the edging, sealing out dust and keeping acrylic panes firmly in place.
.3 Window frame: Fabricated from lightweight steel and finished in manufacturer's standard finish, in colour as approved by the Departmental Representative.
.4 Steel angles: Steel angles, fabricated with hairline joints to suit intended condition.

.2 Fasteners: stainless steel, type 304.

.3 Sealant: Clear silicone adhesive sealant, type as recommended by window manufacturer.

2.2 FABRICATION

.1 Acoustic performance: to ASTM E90.
.1 Interior STC rating of 35.

.2 Face dimensions detailed are maximum permissible sizes.

.3 Build in structural deflection allowance to prevent transfer of structural load to windows.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for acoustic window installation in accordance with manufacturer's written instructions.

3.1 EXAMINATION (Cont'd)

.1 (Cont'd)
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Install acoustic storm windows in accordance with review shop drawings, manufacturer's written instructions and as required to meet intended STC ratings.

.2 Units plumb, square and level; free of warp, twist and superimposed loads.

.3 Securely anchor units in place with concealed fasteners.

.4 Seal angles and perimeter of window units in accordance manufacturer's written instructions.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work areas clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Protect installed products and components from damage during during construction.

.2 Repair damage to adjacent materials caused by window installation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 American Architectural Manufacturers Association(AAMA):
.1 AAMA 611-12, Voluntary Specification for Anodized Architectural Aluminum.

.2 ASTM International (ASTM):
.1 ASTM A480/A480M-16a, Standard Specification for General Requirements for Flat-Rolled Stainless Steel and Heat-Resisting Steel Plate, Sheet and Strip.
.2 ASTM B221-14, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

1.2 DESIGN REQUIREMENTS

.1 Design aluminum channel window assembly complete with speak-thru with approximately 125 mm diameter for voice transmission with window, shelf assembly having dealer tray with recess for passage of small items. Shelf to be minimum 50 mm thick and 450 mm deep.

1.3 SUBMITTALS

.1 Submit product data and shop drawings in accordance with Section 01 33 00.

.2 Indicate each type of frame material, reinforcements, glazing stops, location of anchors and exposed fastenings and finishes.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00.
.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

.2 Protect surfaces with strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather. Do not remove before final cleaning of building.

.3 Deliver windows crated to provide protection during transit and job storage.

1.4 DELIVERY, STORAGE AND HANDLING (Cont'd)

.4 Inspect windows upon delivery for damage. Unless minor defects can be made to meet the Departmental Representative's specifications and satisfaction, damaged parts should be removed and replaced.

.5 Store windows at building site under cover in dry location.

1.5 SITE CONDITIONS

.1 Field measurements: Check opening by accurate field measurement before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Aluminum extrusions: to ASTM B221 and Aluminum Association Designation AA6063-T5 in accordance with AAMA 611 with a clear anodized finish.

.2 Stainless Steel: to ASTM A480/A480M AISI No. 4 finish.

.3 Fasteners: stainless steel, Type 304.

.4 Bituminous paint: epoxy solution or acid and alkali resistant bituminous paint, Ecologo certified.

.5 Glass and glazing materials: In accordance with Section 08 80 00.

2.2 FABRICATION

.1 To profiles and dimensions shown.

.2 Fabricate sections true to detail, free from defects impairing appearance, strength and durability. Fabricate extrusions with sharp, well defined corners.

.3 Fabricate, fit and secure framing joints and corners accurately, with flush surfaces and hairline joints.

2.2 FABRICATION (Cont'd)

.4 Conceal anchors, reinforcement and attachments from view. Fabricate reinforcement in accordance with design requirements.

.5 No visible nameplates.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for aluminum glazed systems installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Apply bituminous paint to aluminum in contact with concrete or masonry.

.2 Units plumb, square and level, free of warp, twist and superimposed loads.

.3 Install closures and trims.

.4 Securely anchor units in place with concealed fasteners.

.5 Sealant: Install joint backing and sealant at glazed system work and perimeter joints for sound tight installation. Sealant work to be in accordance with Section 07 90 00.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work areas clean at end of each day.

3.3 CLEANING (Cont'd)

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Protect installed products and components from damage during during construction.

.2 Repair damage to adjacent materials caused by aluminum glazed system installation.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 08 11 14: Hollow metal door frames.

.2 Section 08 14 11: Hardware for wood doors.

1.2 REFERENCES

.1 American National Standards Institute/Builders Hardware Manufacturers Association (ANSI/BHMA):
- .1 ANSI/BHMA-A156.1-13, Butts and Hinges.
- .2 ANSI/BHMA-A156.4-13, Door Controls - Closers.
- .3 ANSI/BHMA-A156.5-10, Cylinders and Input Devices for Locks.
- .4 ANSI/BHMA-A156.6-10, Architectural Door Trim.
- .5 ANSI/BHMA-A156.8-10, Door Controls - Overhead Stops and Holders.
- .6 ANSI/BHMA- A156.13-12, Mortise Locks.
- .7 ANSI/BHMA-A156.16-13, American National Standard for Auxiliary Hardware.
- .8 ANSI/BHMA-A156.21-14, Thresholds.
- .9 ANSI/BHMA-A156.28-13, Recommended Practices for Mechanical Keying Systems.
- .10 ANSI/BHMA-A156.115-14, Hardware Preparation in Steel Doors or Steel Frames.
- .11 ANSI/BHMA-A156.115W-06, Hardware Preparation in Wood Doors with Wood or Steel Frames.

.2 Canadian Standards Association (CSA):
- .1 CSA B651-12, Accessible Design for the Built Environment.

.3 Canadian Steel Door Manufacturers Association (CSDMA).

.4 Door Hardware Institute (DHI).

.5 Underwriter's Laboratory (UL):
- .1 UL 437-13, Standard for Key Locks.

1.3 SUBMITTALS

.1 Submit submittals in accordance with Section 01 33 00.

.2 Product data:

1.3 SUBMITTALS (Cont'd)

.2 (Cont'd)
.1 Submit one copy of product data sheets.
.2 Product data sheets shall consist of catalogue cuts, manufacturer's name and number, finish and reference identification to specified standard.

1.4 SCHEMATIC DIAGRAMS

.1 Submit schematic diagrams of electrical components for inclusion in maintenance manual specified in Sections 01 33 00 and 01 78 00.

1.5 QUALITY ASSURANCE

.1 Standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by CSDMA - Canadian Steel Door Manufacturers' Association and CSA B651, Accessible Design for the Built Environment.

.2 Use abbreviations and symbols recommended in "Abbreviations and Symbols as used in Architectural Door and Hardware Schedules and Specifications", published by the Door and Hardware Institute.

.3 Use hardware schedule format recommended in "Sequence and Format for the Hardware Schedule", published by the Door and Hardware Institute.

1.6 DEFINITIONS

.1 Master Key (MK):
.1 A key which operates all the master keyed locks or cylinders in a group, each lock or cylinder usually operated by its own change key.
.2 To combinate a group of locks or cylinders such that each is operated by its own key as well as by a master key for the entire group.

.2 Master Key System:
.1 Any keying arrangement which has two or more levels of keying.
.2 A keying arrangement which has exactly two levels of keying.

.3 Grand Master Key (GMK): The key which operates two or more separate groups of locks, each operated by a different master key.

1.6 DEFINITIONS (Cont'd)

.4 Grand Master Key System: A master key system which has exactly three levels of keying.

.5 Great Grand Master Key (GGMK): The key which operates two or more separate groups of locks, which are each operated by a different grand master key.

.6 Great Grand Master Key System: A master key system which has exactly four levels of keying.

.7 Top Master Key (TMK): The highest level master key in a master key system.

1.7 REGULATORY REQUIREMENTS

.1 Use ULC listed and labelled hardware for doors in fire rated partitions and fire exits.

.2 Use UL 437 listed cylinders in locking devices to high security rating indicated.

1.8 HARDWARE LIST

.1 Submit hardware schedule in accordance with Section 01 33 00.

.2 Submit literature cuts, indicating hardware proposed, including make, model, base material, function, ANSI Function where ANSI used in this specification, Grade, Type, Series, BHMA finish, trim, ULC listing, UL listing, manufacturer and other pertinent information. Indicate which model or accessory is being provided where more than one model or accessory appears on a page.

1.9 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

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

.3 Package items of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.

.4 Storage and Handling Requirements:

1.9 DELIVERY, STORAGE AND HANDLING (Cont'd)

.4 (Cont'd)
.1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect door hardware from nicks, scratches, and blemishes.
.3 Protect prefinished surfaces with wrapping.
.4 Replace defective or damaged materials with new.

.5 Packaging Waste Management: remove for reuse and return of pallets, crates, padding and packaging materials as specified in in accordance with Section 01 74 20.

1.10 WASTE DISPOSAL AND MANAGEMENT

.1 Separate waste materials for reuse, recycling, and composting in accordance with Section 01 74 20.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Dispose of corrugated cardboard, polystyrene plastic packaging material in appropriate on-site bin for recycling in accordance with site waste management program.

PART 2 - PRODUCTS

2.1 KEYING, ACCESSORIES AND FINISH

.1 Keying system to meet intended security requirements for this Project.
.1 Keying systems: to ANSI/BHMA-A156.28.

.2 Provide accessories with hardware.

.3 Finish: As indicated in appended hardware schedule.

.4 Finish fasteners to match the exposed surface on which they appear.

.5 Provide temporary construction keying.

.6 Final keying: to ANSI/BHMA-A156.5, Grade 1.

2.1 KEYING, ACCESSORIES AND FINISH (Cont'd)

.7 High security cylinder (mortise lock): Rated high security to UL 437, material purchase by authorized signature only.

.8 Use lock and latch sets with solid metal, U shape, lever handles meeting requirements of CSA B651, Accessible Design for the Built Environment, clause 5.2.7 Door Hardware and Figure 20, unless specified otherwise.

.9 Provide lever handles of same style for bored and mortise locksets.

.10 Door prep: to ANSI/BHMA-A156.115 for steel doors and frames and ANSI/BHMA-A156.115-W for wood doors and frames.

2.2 MATERIALS

.1 General: Provide all components and accessories as required for work of this Project.

.2 Hinge: to ANSI/BHMA-A156.1.

.3 Door closer: to ANSI/BHMA-A156.4.

.4 Overhead stop: to ANSI/BHMA-A156.8.

.5 Lock and latch set (mortised): to ANSI/BHMA-A156.13.

.6 Dead lock (mortised): to ANSI/BHMA-A156.5.

.7 High security dead lock (mortised): to ANSI/BHMA-A156.5, function indicated, dead bolt, UL 437 listed cylinder with guard, thumb turn.

.8 Electronic lock: touchpad combination lock, entry by combination or key bypass.

.9 Door pull: to ANSI/BHMA-A156.6.

.10 Kick plate: to ANSI/BHMA-A156.6.

.11 Wall type door stop: to ANSI/BHMA-A156.16.

.12 Threshold: to ANSI/BHMA-A156.21, 3.2 mm thick, extruded aluminum rabbeted threshold with extruded bulb/finger gasket for double seal protection, 127 mm long, unless otherwise indicated.

2.2 MATERIALS (Cont'd)

.13 Door gasketing: Adjustable head and jamb-applied gasket, to suit door type and meet intended STC ratings.

.14 Automatic door bottom (surface mounted): operable and automatic door seal of aluminum frame and double neoprene seal, automatic retract mechanism when door is open. Unit to allow for a maximum drop of 25 mm and be rated for 5 million cycles.

.15 Offset security astragal: 4.8 mm thick steel.

.16 Card reader: In accordance with Division 28.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

.2 Furnish manufacturers' instructions for proper installation of each hardware component.

3.2 INSTALLATION

.1 Install hardware to standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association and to meet Owner's intended security requirements.

3.3 ADJUSTING

.1 Provide services of competent mechanic to inspect installation of hardware furnished under this Section and to supervise all adjustments (by the trade responsible for fixing) which are necessary to leave hardware in perfect working order.

.2 Adjust door hardware, operators, closures and controls for optimum, smooth operating condition, safety and for weather tight closure.

3.3 ADJUSTING (Cont'd)

.3 Lubricate hardware, operating equipment and other moving parts.

.4 Adjust door hardware to provide tight fit at contact points with frames.

3.4 CLEANING

.1 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacture's instructions.

.3 Remove protective material from hardware items where present.

.4 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

3.5 HARDWARE SCHEDULE

.1 Hardware schedule: Refer to hardware schedule appended to this Section.

END OF SECTION

HARDWARE SCHEDULE

SET: 1.0

SG 204, ROOM 202 (CORRIDOR) TO ROOM 204, 965.0 X 2150.0 X 45.0, HOLLOW METAL X HOLLOW METAL, LH
SG 208, CORRIDOR TO ROOM 208, 965.0 X 2150.0 X 45.0, HOLLOW METAL X HOLLOW METAL, LH
SG 209B, ROOM 208 TO ROOM 209, 965.0 X 2150.0 X 45.0, HOLLOW METAL X HOLLOW METAL, LH
SG 211, ROOM 210 TO ROOM 211, 965.0 X 2150.0 X 45.0, HOLLOW METAL X HOLLOW METAL, RH

3	HINGE	T4A3386 NRP SIZE TO SUIT	US32D	MK
1	MORTISE LOCK (PRISON)	L9485 P 06B CMK	626	SC
1	CLOSER	4041XP (REGULAR ARM)		LC
1	KICK PLATE	K1050 200MM HIGH X WIDTH SA 4BE	US26D	RO
1	DOOR STOP	446	US26D	RO
1	THRESHOLD	171A		PE
1	DOOR BOTTOM	4131CRL WIDTH TO SUIT		PE
1	ALARMED KEYPAD	BY OTHERS		00

SET: 2.0

SG 200, BUILDING CORRIDOR TO ROOM 200 (LOBBY), 965.0 X 2150.0 X 45.0, HOLLOW METAL X HOLLOW METAL, RH

3	HINGE	T4A3386 NRP SIZE TO SUIT	US32D	MK
1	MORTISE LOCK (CORRIDOR)	L9456 P 06B CMK	626	SC
1	CLOSER	4041XP (REGULAR ARM)		LC
1	KICK PLATE	K1050 200MM HIGH X WIDTH SA 4BE	US26D	RO
1	DOOR STOP	446	US26D	RO
1	THRESHOLD	171A		PE
1	DOOR BOTTOM	4131CRL WIDTH TO SUIT		PE
1	ALARMED KEYPAD	BY OTHERS		00

SET: 3.0

SG 215B, BUILDING CORRIDOR FROM ROOM 215, 965.0 X 2150.0 X 45.0, HOLLOW METAL X HOLLOW METAL, LHR

3	HINGE	T4A3386 NRP SIZE TO SUIT	US32D	MK
1	MORTISE LOCK (PRISON)	L9485 P 06B CMK	626	SC
1	CONCEALED OVERHEAD STOP	1-SERIES SIZE TO SUIT	630	RF
1	CLOSER	4041XP (PARALLEL ARM)		LC
1	KICK PLATE	K1050 200MM HIGH X WIDTH SA 4BE	US26D	RO
1	THRESHOLD	171A		PE
1	DOOR BOTTOM	4131CRL WIDTH TO SUIT		PE
1	ALARMED KEYPAD	BY OTHERS		00

SET: 4.0

SG 214, ROOM 202 (CORRIDOR) TO ROOM 214, 965.0 X 2150.0 X 45.0, HOLLOW METAL X HOLLOW METAL, LH

3	HINGE	T4A3386 NRP SIZE TO SUIT	US32D	MK
1	MORTISE LOCK (STOREROOM)	L9080 P 06B CMK	626	SC
1	CLOSER	4041XP (PARALLEL ARM)		LC
1	KICK PLATE	K1050 200MM HIGH X WIDTH SA 4BE	US26D	RO
1	DOOR STOP	446	US26D	RO
1	THRESHOLD	171A		PE
1	DOOR BOTTOM	4131CRL WIDTH TO SUIT		PE
1	ALARMED KEYPAD	BY OTHERS		00

SET: 5.0

SG 202, ROOM 202 (OPEN WORKSPACE) TO ROOM 200 (LOBBY), 965.0 X 2150.0 X 45.0, HOLLOW METAL X HOLLOW METAL, RH

3	HINGE	T4A3386 NRP SIZE TO SUIT	US32D	MK
1	FAIL SECURE ELECTRIC LOCK	DX RX 21 8271-24V OL LC	US26D	SA
1	CLOSER	4041XP (REGULAR ARM)		LC
1	KICK PLATE	K1050 200MM HIGH X WIDTH SA 4BE	US26D	RO
1	DOOR STOP	446	US26D	RO
1	THRESHOLD	171A		PE
1	DOOR BOTTOM	4131CRL WIDTH TO SUIT		PE
1	ELECTROLYNX HARNESS	QC-C1500P(THRU-DOOR CABLE)		MK
1	ELECTRIC POWER TRANSFER	EPT		YA
1	CARD READER	BY SECURITY		00

SET: 6.0

SG 215A, ROOM 202 (CORRIDOR) TO ROOM 215, 965.0 X 2150.0 X 45.0, HOLLOW METAL X HOLLOW METAL, LHR

3	HINGE	T4A3386 NRP SIZE TO SUIT	US32D	MK
1	FAIL SECURE ELECTRIC LOCK	DX RX 21 8271-24V OL LC	US26D	SA
1	CLOSER	4041XP (PARALLEL ARM)		LC
1	KICK PLATE	K1050 200MM HIGH X WIDTH SA 4BE	US26D	RO
1	DOOR STOP	446	US26D	RO
1	THRESHOLD	171A		PE
1	DOOR BOTTOM	4131CRL WIDTH TO SUIT		PE
1	ELECTROLYNX HARNESS	QC-C1500P(THRU-DOOR CABLE)		MK
1	ELECTRIC POWER TRANSFER	EPT		YA
1	CARD READER	BY SECURITY		00

SET: 7.0

SG 210, ROOM 202 (CORRIDOR) TO ROOM 210, 965.0 X 2150.0 X 45.0, HOLLOW METAL X HOLLOW METAL, RH

3	HINGE	T4A3386 NRP SIZE TO SUIT	US32D	MK
1	FAIL SECURE ELECTRIC LOCK	DX RX 21 8271-24V OL LC	US26D	SA
1	CLOSER	4041XP (REGULAR ARM)		LC
1	KICK PLATE	K1050 200MM HIGH X WIDTH SA 4BE	US26D	RO
1	DOOR STOP	446	US26D	RO
1	THRESHOLD	171A		PE
1	DOOR BOTTOM	4131CRL WIDTH TO SUIT		PE
1	ELECTROLYNX HARNESS	QC-C1500P(THRU-DOOR CABLE)		MK
1	ELECTRIC POWER TRANSFER	EPT		YA
1	ALARMED KEYPAD	BY OTHERS		00
1	CARD READER	BY SECURITY		00

SET: 8.0

SG 201A, ROOM 200 (LOBBY) TO ROOM 201, 965.0 X 2150.0 X 45.0, HOLLOW METAL X HOLLOW METAL, LH

3	HINGE	T4A3386 NRP SIZE TO SUIT	US32D	MK
1	MORTISE LOCK (STOREROOM)	L9080 P 06B CMK	626	SC
1	CLOSER	4041XP (REGULAR ARM)		LC
1	KICK PLATE	K1050 200MM HIGH X WIDTH SA 4BE	US26D	RO
1	DOOR STOP	446	US26D	RO

NOTES: DOOR AND FRAME TO BE CONSTRUCTED TO STC 46 SOUND RATING STANDARD.
ALL SOUND GASKETING TO BE SUPPLIED BY THE DOOR SUPPLIER.

SET: 9.0

SG 212, ROOM 202 (CORRIDOR) TO ROOM 212, 965.0 X 2150.0 X 45.0, HOLLOW METAL X HOLLOW METAL, LH

3	HINGE	T4A3386 NRP SIZE TO SUIT	US32D	MK
1	MORTISE LOCK (STOREROOM)	L9080 P 06B CMK	626	SC
1	CLOSER	4041XP (REGULAR ARM)		LC
1	KICK PLATE	K1050 200MM HIGH X WIDTH SA 4BE	US26D	RO
1	DOOR STOP	446	US26D	RO
1	THRESHOLD	171A		PE
1	DOOR BOTTOM	4131CRL WIDTH TO SUIT		PE

SET: 10.0

SG 201B, ROOM 201 FROM ROOM 202, 965.0 X 2150.0 X 45.0, HOLLOW METAL X HOLLOW METAL, RHR

3	HINGE	T4A3386 NRP SIZE TO SUIT	US32D	MK
1	MORTISE LOCK (PRISON)	L9485 P 06B CMK	626	SC
1	CLOSER	4041XP (REGULAR ARM)		LC
1	KICK PLATE	K1050 200MM HIGH X WIDTH SA 4BE	US26D	RO
1	DOOR STOP	446	US26D	RO

NOTES: DOOR AND FRAME TO BE CONSTRUCTED TO STC 46 SOUND RATING STANDARD.
ALL SOUND GASKETING TO BE SUPPLIED BY THE DOOR SUPPLIER.

SET: 11.0

SG 203, ROOM 202 (CORRIDOR) TO ROOM 203, 965.0 X 2150.0 X 45.0, HOLLOW METAL X HOLLOW METAL, LH

3	HINGE	T4A3386 NRP SIZE TO SUIT	US32D	MK
1	MORTISE LOCK (PRISON)	L9485 P 06B CMK	626	SC
1	CLOSER	4041XP (REGULAR ARM)		LC
1	KICK PLATE	K1050 200MM HIGH X WIDTH SA 4BE	US26D	RO
1	DOOR STOP	446	US26D	RO
1	ALARMED KEYPAD	BY OTHERS		00

NOTES: DOOR AND FRAME TO BE CONSTRUCTED TO STC 46 SOUND RATING STANDARD.
ALL SOUND GASKETING TO BE SUPPLIED BY THE DOOR SUPPLIER.

SET: 12.0

SG 206, ROOM 202 (CORRIDOR) TO ROOM 206, 965.0 X 2150.0 X 45.0, WOOD X HOLLOW METAL, RH
SG 207, ROOM 202 (OPEN WORKSPACE) TO ROOM 207, 965.0 X 2150.0 X 45.0, WOOD X HOLLOW METAL, LH

3	HINGE	T4A3786 NRP SIZE TO SUIT	US26D	MK
1	CYLINDRICAL LOCK (OFFICE)	ND50 RHO CMK	626	SC
1	CLOSER	4041XP (REGULAR ARM)		LC
1	KICK PLATE	K1050 200MM HIGH X WIDTH SA 4BE	US26D	RO
1	DOOR STOP	446	US26D	RO

SET: 13.0

SG 205, ROOM 202 (CORRIDOR) TO ROOM 205, 965.0 X 2150.0 X 45.0, HOLLOW METAL X HOLLOW METAL, RH

3	HINGE	T4A3386 NRP SIZE TO SUIT	US32D	MK
1	MORTISE LOCK (CORRIDOR)	L9456 P 06B CMK	626	SC
1	CLOSER	4041XP (REGULAR ARM)		LC
1	KICK PLATE	K1050 200MM HIGH X WIDTH SA 4BE	US26D	RO
1	DOOR STOP	446	US26D	RO
1	THRESHOLD	171A		PE
1	DOOR BOTTOM	4131CRL WIDTH TO SUIT		PE

END OF SECTION 080671

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 08 11 13: Glazing for hollow metal doors.

.2 Section 08 14 11: Glazing for wood doors.

.3 Section 08 56 88: Glazing for aluminum channel framed window.

1.2 REFERENCES

.1 ASTM International (ASTM):
.1 ASTM C542-11, Standard Specification for Lock-Strip Gaskets.
.2 ASTM C920-14a, Standard Specification for Elastomeric Joint Sealants.
.3 ASTM D2240-15, Standard Test Method for Rubber Property - Durometer Hardness.

.2 Canadian General Standards Board (CGSB):
.1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.

1.3 SUBMITTALS

.1 Submit one representative sample of each type of glass in accordance with Section 01 33 00.

.2 Submit maintenance data for glazing to Departmental Representative in accordance with Sections 01 33 00 and 01 78 00.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:
.1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

1.4 DELIVERY, STORAGE AND HANDLING (Cont'd)

.3 (Cont'd)
.2 Store and protect glazing and frames from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and returnof pallets, crates, padding and packaging materials in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Temperated/laminated safety glass: to CAN/CGSB-12.1-M, Type 1-laminated, Class B, clear, laminated film thickness 0.8 mm, sandwiching tempered glass panes. Total thicknesses as follows:
.1 Aluminum channel window: Approximate total thickness of 13 mm.
.2 Door vision panels: Approximate total thickness of 7 mm.

.2 Setting blocks: neoprene, Shore "A" 80 durometer hardness to ASTM D2240, 100 x 6 mm x width to suit glass.

.3 Glazing tape: preformed butyl with continuous spacer, Shore "A" 10-15 durometer hardness, paper release, black colour, 3 x 9.5 mm.

.4 Gasket: black neoprene to ASTM C542, "U" cavity type with lock strip.

.5 Sealant: one part silicone to ASTM C920, Type S, Grade NS, Class 50.

.6 Glass film: In accordance with Section 08 87 54.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for glazing installation in accordance with manufacturer's written instructions.

3.2 PREPARATION

.1 Clean contact surfaces with solvent and wipe

.2 Seal porous glazing channels or recesses with

.3 Prime surfaces scheduled to receive sealant.

3.3 INSTALLATION

.1 Glass:
- .1 Clean and dry surfaces.
- .2 Apply glazing tape to fixed stops.
- .3 Place setting blocks at 1/3 points.
- .4 Set glass on setting blocks against tape.
- .5 Apply glazing tape to glass.
- .6 Install stops.
- .7 Apply sealant behind stop and tool to smooth surface.
- .8 Install glass in wood and hollow metal doors and aluminum windows, secure fastened and rigid.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
- .1 Leave Work area clean at end of each day.
  - .1 Remove traces of primer, caulking.
  - .2 Remove glazing materials from finish surfaces.
  - .3 Remove labels.
  - .4 Clean glass using approved non-abrasive cleaner in accordance with manufacturer's instructions.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

3.4 CLEANING (Cont'd)

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 After installation, mark each light with an "X" by using removable plastic tape or paste.
.1 Do not mark heat absorbing or reflective glass units.

.3 Repair damage to adjacent materials caused by glazing installation.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 08 80 00 - Glazing.

1.2 SAMPLES

.1 Submit samples in accordance with Section 01 33 00.

.2 Submit one representative sample of glazing film in accordance with Section 01 33 00. Submit one 100 x 100 mm sample of film installed on 7 mm thick clear plate glass. Submit 300 mm long sample of glazing film frame.

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00.

1.4 MAINTENANCE DATA

.1 Provide operation and maintenance data for window film for incorporation into manual specified in Section 01 78 00.

1.5 QUALITY ASSURANCE

.1 Qualifications of glazing film and frame applicator: trained, approved and certified by glazing film manufacturer. Submit proof of certification in writing to Departmental Representative in accordance with Sections 01 33 00 and 01 78 00.

.2 Glazing film inspection: manufacaturer's representative shall view the film at a distance of 3 m (10 feet) at angles up to 45 degrees from either side of the glass during regular daylight conditions (not in direct sunlight). To be accepted the film itself shall not appear distorted. Submit manufacturer's written inspection report to Departmental Representative in accordance with Sections 01 33 00 and 01 78 00.

1.6 TEST REPORTS

.1 Submit test reports from approved independent testing laboratories, certifying compliance with specifications, for film applied to glass.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00.

.2 Provide and maintain dry, off-ground weatherproof storage.

.3 Store rolls of security film flat on cross supports. Do not stand rolls of film on end.

.4 Remove only in quantities required for same day use.

.5 Store materials in accordance with manufacturers written instructions.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 20 and with Waste Reduction Workplan.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

1.9 ENVIRONMENTAL AND SAFETY REQUIREMENTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of material safety data sheets acceptable to Canada Labour Code.

1.10 WARRANTY

.1 Work of this Section 08 87 54 the 12 months warranty period prescribed in GC3.13 of General Conditions is extended to 5 years.

.2 Ensure warranty includes items as follows:
.1 Maintain adhesion properties without blistering, bubbling or delaminating from glass.

1.10 WARRANTY (Cont'd)

.2 (Cont'd)
.2 Maintain appearance without discolouration.
.3 Remove, replace and reapply defective materials.
.4 In event of product failure under warranty terms, remove and re-apply film without glass replacement at no cost to Departmental Representative.

PART 2 - PRODUCTS

2.1 MANUFACTURER

.1

2.2 MATERIALS

.1 Glazing Film: Glazing film fabricated from carbon fibre polyester, with scratch resistant hard top coat, and having low reflectivity.

.1 Film thickness: 0.038 mm.
.2 Colour: Anthracite.
.3 Film to meet the following performance criteria:
  .1 Visible light transmission: 15%.
  .2 Total solar energy rejected: 71%.
  .3 Solar heat gain coefficient: 0.29.
  .4 U value: 0.98.
  .5 Solar heat reduction: 64%.
  .6 UV light rejected: 99.9%.
  .7 Glare reduction: 83%.
.4 Adhesive: high mass pressure sensitive, acrylic base.

PART 3 - EXECUTION

3.1 INSTALLERS

.1

3.2 PREPARATION

.1 Clean glass before beginning installation using neutral cleaning solution.

3.2 PREPARATION (Cont'd)

.2 Ensure no deleterious material adheres to glass by balding surface of glass using industrial razors.

.3 Ensure dust, grease, and chemical residue are removed from surface of glass before installation of film.

.4 Examine glass under natural daylight and identify cracks, blisters, bubbles, discoloration, edge defects or other anomalies that may cause, film to delaminate, or vision transparency or distortion problems. Report findings to Departmental Representative.

.5 Proceed with Work only after receipt of written approval from Departmental Representative.

.6 Before beginning Work, place absorbent material on window sill or at sash frame to absorb moisture accumulation generated by film application.

3.3 INSTALLATION

.1 Install glass film with adhesive, applied in accordance with manufacturer's written instructions.

.2 Place without air bubbles, creases or visible distortion.

.3 Fit tight to glass perimeter with razor cut edge.

.4 Remove left over material from work area and return work area to original condition.

3.4 INSPECTION

.1 Return to work place after 30 days but no longer than 40 days for final cleaning and inspection of installed film.

.2 Ensure finished surface of film is vision free of blisters, bubbles, tears, scratches, edge defects, delaminating or vision distortion when viewed under natural daylight from 2.0 m minimum.

3.4 INSPECTION (Cont'd)

.3 Remove and replace film that continues to show blisters, bubbles, tears, scratches, edge defects or vision distortion in film when viewed under natural daylight from 2.0 m minimum after 30 day period.

3.5 FINAL CLEANING

.1 Wash interior and exterior of each window and film using cleaning solution recommended by film manufacturer.

3.6 MAINTENANCE

.1 Follow manufacturers written instructions for care and maintenance of glass film.

.2 Use only cleaning solution recommended by manufacturer for regularly scheduled cleaning of glass film.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 The Aluminum Association Inc. (AAI):
.1 AAI DAF-45-2003(R2009), Designation System for Aluminum Finishes - 9th Edition.

.2 American National Standards Institute (ANSI):
.1 ANSI H35.1/H35.1M-13, American National Standard Alloy and Temper Designation Systems for Aluminum.

.3 American Society for Testing and Materials International (ASTM):
.1 ASTM B209-14, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.4 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-1.213-2004, Etch Primer (Pretreatment Coating of Tie Coat) for Steel and Aluminum.

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

.5 Underwriters Laboratories of Canada (ULC):
.1 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.

1.2 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Submit WHMIS MSDS - Material Safety Data Sheets.

.3 Shop Drawings:
.1 Indicate fabrication and erection details, including anchorage, accessories, and finishes.

1.2 SUBMITTALS (Cont'd)

.4 Samples:
.1 Submit duplicate samples of blank-off panel showing colour and finish.
.2 Where colour is not indicated, submit manufacturer's standard colours to Departmental Representative for selection.

.5 Quality Assurance Submittals: submit following in accordance with Section 01 45 00.
.1 Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:
.1 Deliver, store and handle in accordance with Section 01 61 00.
.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
.3 Deliver materials to the site in undamaged condition.

.2 Storage and Protection:
.1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Protect panels from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

.3 Waste Management and Disposal:
.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Blank-off panels:
.1 Aluminum sheet metal, insulated, laminated sandwich panel finished to match existing louvre. Laminate sheet metal on both sides of insulation.
.2 Aluminum sheet: to ASTM B209 and ANSI H35.1/H35.1M, alloy 1100-H14, with temper as required for forming, 1.5 mm thick.

2.1 MATERIALS (Cont'd)

.1 (Cont'd)
.3 Blank-off panel insulation: CAN/ULC S701,Type 3; 50 mm thick, extruded polystyrene insulation.

.2 Nails and fasteners: same material as fabricated items.

.3 Primer: to CAN/CGSB-1.213 for aluminum surfaces.

2.2 FINISHES

.1 Finish exposed surfaces of aluminum components in accordance with AAI DAF-45 for Aluminum Finishes. Finish to match existing louvre.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for blank-off panel installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 INSTALLATION

.1 Install blank-off panels where indicated and as necessary to accommodate mechanical work, fasten securely.

3.3 INSTALLATION (Cont'd)

.2 Seal blank-off panel perimeter with sealant and joint backing for weather tight seal in accordance with Section 07 90 00.

.3 Repair damage to blank-off panels to match original finish.

3.4 CLEANING

.1 Proceed in accordance with Section 01 74 11.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

.1 Where aluminum contacts metal other than zinc, paint dissimilar metal with primer and two coats of aluminum paint.

.2 Protect installed products and components from damage during during construction.

.3 Repair damage to adjacent materials caused by panel installation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 ASTM International (ASTM):
.1 ASTM C475/C475M-15, Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
.2 ASTM C840-13, Standard Specification for Application and Finishing of Gypsum Board.
.3 ASTM C1002-14, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
.4 ASTM C1047-14a, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
.5 ASTM C1396/C1396M-14a, Standard Specification for Gypsum Board.
.6 ASTM E90-09 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
.7 ASTM E2638-10 Standard Test Method for Objective Measurement of the Speech Privacy Provided by a Closed Room.

.2 Association of the Wall and Ceilings Industries International (AWCI)
.1 AWCI Levels of Gypsum Board Finish 101a-97.

.3 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

.4 Underwriters' Laboratories of Canada (ULC)
.1 CAN/ULC-S102-10, Standard Method of Test of Surface Burning Characteristics of Building Materials and Assemblies.

1.2 DESIGN REQUIREMENTS

.1 Partition assembly to be both non-combustible construction and fire resistance rated.

.2 Minimum sound transmission rating of installed panel partition to be STC 48, tested to ASTM E90.

1.2 DESIGN REQUIREMENTS (Cont'd)

.3 Minimum speech privacy category SPC Standard Speech Privacy 60-65 tested to ASTM E2638.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for gypsum board assemblies and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:
.1 Submit for review and acceptance of each unit.
.2 Samples will be returned for inclusion into work.
.3 Submit duplicate 300 mm long samples of corner and casing beads.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:
.1 Store gypsum board assemblies materials level indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect gypsum board assemblies from nicks, scratches, and blemishes.
.3 Protect from weather, elements and damage from construction operations.
.4 Handle gypsum boards to prevent damage to edges, ends or surfaces.
.5 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return of pallets, crates, padding and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 20.

1.5 AMBIENT CONDITIONS

.1 Maintain temperature 10 degrees C minimum, 21 degrees C maximum for 48 hours prior to and during application of gypsum boards and joint treatment, and for 48 hours minimum after completion of joint treatment.

.2 Apply board and joint treatment to dry, frost free surfaces.

.3 Ventilation: ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment material immediately after its application.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Standard board and Type X: to ASTM C1396/C1396M, regular, 12.7 and 15.9 thicknesses scheduled and indicated, fire-rated where indicated and as required, 1200 mm wide x maximum practical length, ends square cut, edges squared.

.2 Backing board and coreboard: to ASTM C1396/C1396M regular, 12.7 mm thick, unless otherwise indicated, squared edges.

.3 Metal furring runners, hangers, tie wires, inserts, anchors: to ASTM C645.

.4 Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.

.5 Resilient clips: 0.5 mm base steel thickness galvanized steel for resilient attachment of gypsum board.

.6 Steel drill screws: to ASTM C1002.

.7 Laminating compound: Types as recommended by manufacturer, asbestos-free, suitable for each condition such as laminating gypsum board panels together, on concrete or block or metal laminate to a gypsum board partition.

2.1 MATERIALS (Cont'd)

.8 Casing beads, corner beads, control joints and edge trim: to ASTM C1047, zinc-coated by hot-dip process, 0.5 mm base thickness, perforated flanges, one piece length per location.

.9 Sealants: in accordance with Section 07 90 00.

.10 Polyethylene: to CAN/CGSB-51.34, Type 2.

.11 Joint compound: to ASTM C475/C475M, asbestos-free.

.12 Joint tape: to ASTM C475/C475M.
.1 Paper tape for standard gypsum board.

.13 Access doors: Supplied by other Sections for installation as part of the work of this Section.

.14 Stainless steel laminate: In accordance with Section 05 50 01.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for gypsum board assemblies installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 ERECTION

.1 Do application and finishing of gypsum board to ASTM C840 except where specified otherwise.

.2 Erect hangers and runner channels for suspended gypsum board ceilings to ASTM C840 except where specified otherwise.

3.2 ERECTION (Cont'd)

.3 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm aound perimeter of fixture.

.4 Install work level to tolerance of 1:1200.

.5 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, and grilles.

.6 Install furring channels parallel to, and at exact locations of steel stud partition header track.

.7 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.

.8 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.

.9 Install wall furring for gypsum board wall finishes to ASTM C840, except where specified otherwise.

.10 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.

.11 Furr duct shafts, beams, columns, pipes and exposed services where indicated.

.12 Erect drywall resilient furring transversely across studs, spaced maximum 600 mm on centre and not more than 150 mm from ceiling/wall juncture. Secure to each support with drywall screw.

.13 Install continuous strip of gypsum board along base of partitions where resilient furring installed.

3.3 APPLICATION

.1 Apply gypsum board after bucks, anchors, blocking, sound attenuation, electrical and mechanical work have been approved.

3.3 APPLICATION (Cont'd)

.2 Apply single and double layer gypsum board as scheduled to metal furring or framing using screw fasteners. Where double layers of gypsum board are shown, screw first layer to studs and laminate the second layer to the first. Maximum spacing of screws 300 mm on centre.

.1 Single-Layer Application:

.1 Apply gypsum board on ceilings prior to application of walls to ASTM C840.

.2 Apply gypsum board vertically or horizontally, providing sheet lengths that will minimize end joints.

.2 Double-Layer Application:

.1 Install gypsum board for base layer and exposed gypsum board for face layer.

.2 Apply base layer to ceilings prior to base layer application on walls; apply face layers in same sequence. Offset joints between layers at least 250 mm.

.3 Apply base layers at right angles to supports unless otherwise indicated.

.4 Apply base layer on walls and face layers vertically with joints of base layer over supports and face layer joints offset at least 250 mm with base layer joints.

.3 Apply gypsum board to concrete or concrete block surfaces, where indicated, using laminating adhesive.

.1 Comply with gypsum board manufacturer's recommendations.

.2 Brace or fasten gypsum board until fastening adhesive has set.

.3 Mechanically fasten gypsum board at top and bottom of each sheet.

.4 Apply 12 mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, and ducts, in partitions where perimeter sealed with acoustic sealant.

.5 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints at least 250 mm.

3.3 APPLICATION (Cont'd)

.6 Install gypsum board on walls vertically to avoid end-butt joints. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs, except where local codes or fire-rated assemblies require vertical application.

.7 Install gypsum board with face side out.

.8 Do not install damaged or damp boards.

.9 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

.10 Stainless steel laminate material: Coordinate with Section 05 50 01 as required for lamination of stainless steel sheet material at intended backsplash location and wall assembly.

3.4 INSTALLATION

.1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm on centre.

.2 Install casing beads around perimeter of suspended ceilings.

.3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.

.4 Construct control joints of preformed units set in gypsum board facing and supported independently on both sides of joint.

.5 Provide continuous polyethylene dust barrier behind and across control joints.

.6 Locate control joints where indicated and at changes in substrate construction.

.7 Install control joints straight and true.

3.4 INSTALLATION (Cont'd)

.8 Construct expansion joints at building expansion and construction joints. Provide continuous dust barrier.

.9 Install expansion joint straight and true.

.10 Splice corners and intersections together and secure to each member with 3 screws.

.11 Install access doors to electrical and mechanical fixtures specified in respective sections.
.1 Rigidly secure frames to furring or framing systems.

.12 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.

.13 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with AWCI Levels of Gypsum Board Finish:
.1 Levels of finish:
.1 Level 4: embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.
.2 Level 5: embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; apply a thin skim coat of joint compound to entire surface; surfaces smooth and free of tool marks and ridges.

.14 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.

.15 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.

3.4 INSTALLATION (Cont'd)

.16 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.

.17 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.

.18 Mix joint compound slightly thinner than for joint taping.

.19 Apply thin coat to entire surface using trowel or drywall broad knife to fill surface texture differences, variations or tool marks.

.20 Allow skim coat to dry completely.

.21 Remove ridges by light sanding or wiping with damp cloth.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.
.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by gypsum board assemblies installation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 ASTM International (ASTM):
.1 ASTM C645-14e1, Standard Specification for Nonstructural Steel Framing Members.
.2 ASTM C754-15, Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
.3 ASTM C920-14a, Standard Specification for Elastomeric Joint Sealants.
.4 ASTM E90-09, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
.5 ASTM E2638-10, Standard Test Method for Objective Measurement of the Speech Privacy Provided by a Closed Room.
.6 ASTM F1267-15, Standard Specification for Metal, Expanded, Steel.

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

.3 Underwriters Laboratories of Canada (ULC)
.1 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.2 DESIGN REQUIREMENTS

.1 Partition assembly to be both non-combustible construction and fire resistance rated.

.2 Minimum sound transmission rating of installed panel partition to be STC 48, tested to ASTM E90.

.3 Minimum speech privacy category SPC Standard Speech Privacy 60-65 tested to ASTM E2638.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for metal framing and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:
.1 Submit duplicate 300 mm long samples of non-structural metal framing.
.2 Submit duplicate 300 mm x 300 mm samples of each steel blocking and security mesh.

1.4 QUALITY ASSURANCE

.1 Retain a Professional Engineer, licensed in the Province of Ontario, with experience in work of comparable complexity and scope, to perform the following services as part of work of this Section:
.1 Design of wall systems.
.2 Design of suspended gypsum board ceilings.
.3 Review, stamp, and sign shop drawings and design calculations.
.4 Conduct shop and on-site inspections, prepare and submit written inspection reports verifying that part of work is in accordance with Contract Drawings and reviewed shop drawings.

.2 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

.3 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.4 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Section 01 31 19.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:
.1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect metal framing from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return of packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Non-load bearing channel stud framing: to ASTM C645, 32 mm stud size, roll formed from 0.53 mm thickness, unless otherwise recommended by Professional Engineer, hot dipped galvanized steel sheet, for screw attachment of gypsum board.

.2 Floor and ceiling tracks: to ASTM C645, in widths to suit stud sizes, 32 mm flange height.

.3 Metal channel stiffener: 1.4 mm thick cold rolled steel, coated with rust inhibitive coating.

.4 Acoustic insulation: mineral fibre batt, 40 kg/m^3, Ecologo certified, conforming to CAN/ULC-S102.

.5 Acoustical sealant: one part silicone to ASTM C920, primerless, Type S, Grade NS, Class 25, SWRI validated, Ecologo certified, maximum VOC 60 g/L.

2.1 MATERIALS (Cont'd)

.6 Mesh: #9/10 galvanized, rolled, flattened, expanded steel diamond mesh, to ASTM F1267. Steel: minimum 25% recycled content.

.7 Strap: 1.897 mm thick x 100 mm wide galvanized steel strap. Steel: minimum 25% recycled content.

.8 Sheet sheet blocking:
.1 Galvanized sheet steel conforming to ASTM A653/A653M, Grade A, Z275 Commercial Quality zinc coating. Thicknesses as follows:
.2 Type 1: 1.91 mm (14 ga.) hot rolled steel, prepared with 9.5 mm holes for installation.
.3 Type 2: 1.52 mm (16 ga.) hot rolled steel, matte finish, sheet steel filet welded.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for non-structural metal framing application in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 ERECTION

.1 Align partition tracks at floor and ceiling and secure at 400 mm on centre maximum.

.2 Place studs vertically at scheduled spacing intervals and not more than 50 mm from abutting walls, and at each side of openings and corners.
.1 Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.

3.2 ERECTION (Cont'd)

.3 Erect metal studding to tolerance of 1:1000.

.4 Attach studs to bottom track using screws.

.5 Provide galvanized sheet blocking in wall assemblies as scheduled.

.6 Security mesh:
.1 Prior to installing gypsum wallboard, install security mesh to partition framing from floor to underside of structure with self-drilling, self-tapping flat head metal screws and washers at 300 mm. o.c. at perimeter and field locations.
.2 Provide 38 mm end and side laps. Locate end laps over supporting members. Cut security mesh around penetrations and duct openings. Security plate material and mesh at duct openings to be provided in accordance with Section 05 50 01.
.3 Provide additional framing as required to secure security mesh and maintain security barrier.
.4 Install security mesh in locations as indicated on drawings.

.5 Co-ordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.

.6 Co-ordinate erection of studs with installation of door/window frames and special supports or anchorage for work specified in other Sections.

.7 Install heavy gauge single jamb studs at openings.

.8 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs.
.1 Secure track to studs at each end, in accordance with manufacturer's instructions.
.2 Install intermediate studs above and below openings in same manner and spacing as wall studs.

.9 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.

3.2 ERECTION (Cont'd)

.10 Provide 32 mm stud or furring channel secured between studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, and other fixtures including grab bars and towel rails, attached to steel stud partitions.

.11 Install steel studs or furring channel between studs for attaching electrical and other boxes.

.12 Extend partitions to ceiling height except where noted otherwise on drawings.

.13 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs.
.1 Use 50 mm leg ceiling tracks.

.14 Install two continuous beads of acoustical sealant under studs and tracks around perimeter of sound control partitions.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by non-structural metal framing application.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

.1 American National Standards (ANSI) for the Installation of Ceramic Tile/ Ceramic Tile Institute of America (CTIOA):

.1 ANSI A108/A118/A136.1-2013, Installation of Ceramic Tile.

.1 ANSI A108.1A, Installation of Ceramic Tile in Wet-Set Method, with Portland Cement Mortar.

.2 ANSI A108.1B, Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.

.3 ANSI A108.1C, Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex Portland Cement Mortar.

.4 ANSI A108.4, Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile Setting Epoxy Adhesive.

.5 ANSI A108.5, Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.

.6 ANSI A108.6, Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy.

.7 ANSI A108.8, Installation of Ceramic Tile with Chemical Resistant Furan Mortar and Grout.

.8 ANSI A108.9, Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout.

.9 ANSI A108.10, Installation of Grout in Tilework.

.10 ANSI A108.11, Interior Installation of Cementitious Backer Units.

.11 ANSI A118.1, Dry-Set Portland Cement Mortar.

.12 ANSI A118.3, Chemical Resistant Water Cleanable Tile-Setting and Grouting Epoxy and Water cleanable tile Setting Epoxy Adhesive.

.13 ANSI A118.4, Latex Portland Cement Mortar.

1.1 REFERENCE STANDARDS (Cont'd)

.1 (Cont'd)
.1 (Cont'd)
.14 ANSI A118.5, Chemical Resistant Furan Mortars and Grouts For Tile Installation.
.15 ANSI A118.6, Ceramic Tile Grouts.
.16 ANSI A118.8, Modified Epoxy Emulsion Mortar Grout.
.17 ANSI A118.9, Cementitious Backer Units.
.18 ANSI A136.1, Organic Adhesives for Installation of Ceramic Tile.
.2 ANSI A137.1-2012, American National Standard Specification for Ceramic Tile.

.2 International Standards Organization (ISO):
.1 ISO 13007- Part 1: 2014: Ceramic tiles -- Grouts and adhesives; performance requirements for tile adhesives.
.2 ISO 13007- Part 2: 2013: Ceramic tiles -- Grouts and adhesives; test methods for adhesives.
.3 ISO 13007- Part 3: 2010: Ceramic tiles -- Grouts and adhesives; terms, definitions and specifications for grouts.
.4 ISO 13007- Part 4: 2013: Ceramic tiles -- Grouts and adhesives; Test methods for grouts.

.3 American Society for Testing and Materials International (ASTM):
.1 ASTM C207-06(2011), Standard Specification for Hydrated Lime for Masonry Purposes.

.4 Canadian Standards Association (CSA International)
.1 CAN/CSA-A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
.2 CAN/CSA-A179-14, Mortar and Grout for Unit Masonry.

.5 Terrazzo Tile and Marble Association of Canada (TTMAC) 1-800-201-8599, 905-660-9640, www.ttmac.com.
.1 Hard Surface Maintenance Guide.
.2 TTMAC Specification Guide 09 30 00 - Tile Installation Manual 2012/2014.

1.2 SUBMITTALS

.1 Submit TTMAC Installation Detail No. or Tile Council of America Installation Detail No. or shop drawing showing installation for each tile specified.

.2 Samples:
.1 One full-size sample of tile to be used.
.2 One 300 mm sample of trims to be used.

1.3 EXTRA MATERIALS

.1 Submit extra tile amounting to 3% of gross area covered, allowing proportionately for each pattern and type specified and which are part of the same production run as installed products. Store maintenance products as directed by the Departmental Representative.

PART 2 - PRODUCTS

2.1 MATERIAL

.1 Ceramic wall tile (WT):
.1 Conforming to ANSI A137.1.
.2 Wall tile to be selected by the Departmental Representative.

.2 Portland cement: to CAN/CSA-A3001, type GU Normal, white at grout.

.3 Sand: to CSA A179.

.4 Hydrated Lime: to ASTM C207.

.5 Latex: formulated for use in cement mortar.

.6 Water: potable.

.7 Thin set bond coat (interior): dry set mortar, pre-mixed, thin set mortar formulated with Portland cement, sand and latex additive. Complying with ANSI A118.4 and ISO 13007.

.8 Wall grout (thin set system): pre-mixed, dry set grout. Colour to match tile colour.

.9 Edge trims: Aluminum edge with satin anodized finish, continuous at all exposed tile edges, depth as required to suit tile thickness.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

.1 Do not proceed with installation unless substrate is structurally sound, solid and well fastened.

.2 Surfaces must be clean and free from dust, dirt, oil, grease, paint, wax, sealers, curing compounds or any other substances which may reduce or prevent adhesion.

3.2 SYSTEM REQUIREMENTS

.1 Provide assemblies composed of compatible materials from the same manufacturer.

.2 The completed assembly will meet the service requrements Heavy Duty described in Handbook For Ceramic Tile Installation.

3.3 MIXING

.1 To ANSI A108.1A.

.2 Levelling coat (by volume):
.1 1 part portland cement.
.2 4 parts sand.
.3 1/10 part latex.
.4 1 part water (includes latex additive).
.5 Adjust water volume to suit water content of sand.

.3 Thin set bond coat and grout: dry set mortar; mix to manufacturer's instructions.

3.4 WORKMANSHIP

.1 Minimum surface and air temperature 12°C, before and during application and during curing period.

.2 Provide back-buttering in addition to the usual notch-trowel-applied bond coat in the following applications:
.1 With rib-backed tiles and heavy lug-backed tiles.
.2 In hot, dry or windy weather or where motched mortar bed was prepared too far in advance.

3.4 WORKMANSHIP (Cont'd)

.3 Backbuttering: remove residual dust, wipe the back of the tile with a damp cloth or sponge, apply a full coverage 2 mm thick coat of mortar, apply no more than 10-15 minutes before tiles are set so that both back-butter and mortar are wet at time of setting.

.4 Use Box Screed jig with large sized tiles which are not of uniform thickness.

.5 Trowel in one direction and press the tile into the mortar with a sliding motion perpendicular to the trowel ridges. Twist, vibrate or beat the tiles to compress the trowel ridges to comply with requirements of ANSI A108.5.

.6 Perimeter tile minimum 1/2 size.

.7 Cut tile around corners and built-in objects smooth, even, chip and split free.

.8 Accurately form intersections, corners and returns.

.9 Joints uniform:
.1 Walls: 1.5-3.0 mm wide.

.10 Surfaces plumb, straight, true, even and flush to a tolerance of 1:1000.

.11 Replace broken or hollow sounding tile.

.12 Allow 24 hours before grouting.

.13 Fill joints solid with grout, free of voids, cracks, excess mortar or grout.

.14 Clean surfaces after curing.

3.5 SETTING BACK-BUTTERED TILE

.1 Firmly push, twist and immediately beat or vibrate the tiles or stone units.

3.6 WALL TILE

.1 Install in accordance with:
.1 TTMAC details 305W, Tile Installed on Cementitious Backer Unit (CBU) Thin Set Method/Walls.

3.6 WALL TILE (Cont'd)

.1 (Cont'd)
.2 Bond coat and grout manufacturer's written instructions.

3.7 EXPANSION AND CONTROL JOINTS

.1 Install movement joints in accordance with TTMAC detail 301MJ, applicable details and in accordance with joint manufacturer's recommendations and as follows:
.1 Interior: 4.8 m to 6 m each direction.
.2 Interior exposed to sunlight or moisture: 3.659 m to 4.878 m in both directions.
.3 Where tile abutts restraining surfaces (walls, pipes, ceilings and where changes occur in backing materials).

.2 Provide expansion joints where tile spans cold joints, construction joints, saw-cuts and seismic joints.

.3 Construct during installation of mortar beds and/or tile, rather than saw-cutting joints after installation.

3.8 CLEANING

.1 Clean off excess grout with soft burlap or sponge moistened with clean water.

.2 Polish wall tile after grout has cured in accordance with TTMAC recommendations in the Maintenance Guide; do not use acid for cleaning.

.3 Re-point joints after cleaning as required to eliminate imperfections, then re-clean as necessary. Avoid scratching tile surfaces.

3.9 PROTECTION

.1 Protect tiled assemblies after final installation.

.2 Prevent direct impact, vibration and heavy hammering on adjacent and opposite walls for 24 hours minimum, after final installation.

3.9 PROTECTION (Cont'd)

.3 Cover work temporarily with building paper properly lapped and taped at joints until work has been approved by Departmental Representative.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials (ASTM):
.1 ASTM C635/C635M-13a, Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
.2 ASTM C636/C636M-13, Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
.3 ASTM E1264-14, Classification for Acoustical Ceiling Products.

.2 Underwriters Laboratories Canada (ULC):
.1 CAN/ULC S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.2 DESIGN REQUIREMENTS

.1 Design ceiling suspension systems in accordance with ASTM C636/C636M and manufacturer's printed directions.

.2 Design tile ceiling system for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority. Acoustic panel system is not designed to carry the weight of electrical equipment.

.3 Design hanger anchor and entire suspension system static loading not to exceed 25% of their ultimate capacity including lighting fixture dead loads.

.4 Design tile suspension system to support weight of mechanical and electrical items such as air handling boots and lighting fixtures, and with adequate support to allow rotation/relocation of light fixtures. Acoustic panel system is not designed to carry the weight of mechanical and electrical equipment.

.5 Design subframing as necessary to accommodate, to avoid conflicts and interferences where ducts or equipment prevent regular spacing of hangers.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit submittals in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for acoustical suspension and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop drawings:
.1 Submit reflected ceiling plans for special grid patterns as indicated.
.2 Indicate lay-out, insert and hanger spacing and fastening details, access door dimensions, and locations and acoustical unit support at ceiling fixture.

.4 Samples:
.1 One full-size sample of each type of tile panels to be used.
.2 One of each type of suspension system members.

.5 Certificates: Submit certificate stating that suspended ceiling systems provide adequate support for electrical fixtures, as required by current bulletin of Electrical Inspection Department of Ontario Hydro.

.6 Closeout submittals:
.1 Operation and Maintenance Data: submit operation and maintenance data for acoustical suspension for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:
.1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect acoustical ceiling tiles and tracks from nicks, scratches, and blemishes.

1.4 DELIVERY, STORAGE AND HANDLING (Cont'd)

.3 (Cont'd)
.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return of pallets, crates, padding and packaging materials in accordance with Section 01 74 20.

1.5 EXTRA MATERIALS

.1 Provide extra materials of acoustic units in accordance with Section 01 78 00.

.2 Provide acoustical units amounting to 2% of gross ceiling area for each pattern and type required for project.

.3 Extra materials to be from same production run as installed materials.

.4 Clearly identify each type of acoustic unit, including colour and texture.

.5 Deliver to Departmental Representative, upon completion of the work of this section.

.6 Store where directed by Departmental Representative.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Heavy duty system to ASTM C635/C635M as required to support intended loads.

.2 Acoustic ceiling tile:
.1 Conforming to ASTM E1264.
.2 Mineral fibre tile sized at 600 x 1200 x 16 mm thick, flat, tegular edge, unless otherwise indicated, white colour, fissured pattern, maximum flame spread rating 25 to CAN/ULC-S102, STC minimum 35.

.3 Suspension system: non-fire rated, two directional exposed tee bar grid, including wall moulding.

2.1 MATERIALS (Cont'd)

.4 Exposed tee bar grid components for ceiling tile: cold rolled steel, zinc coated, shop painted, satin sheen, white, interlocking, main and cross tee of double web with rectangular bulb, depth governed by span, 14 mm exposed face, unless otherwise indicated, with high recycled content of up to 63%.

.5 Hangers: 3.6 mm galvanized soft annealed steel wire.

.6 Accessories: splices, clips, wire ties, retainers and wall moulding flush, to complement suspension system components, as recommended by system manufacturer.

.7 Hold down clips: Manufacturer's standard clip for use with specified grid.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for acoustical ceiling tile and track installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

.1 Install acoustical ceilings in accordance with ASTM C636/C636M, reviewed shop drawings and manufacturer's written instructions.

.2 Install suspension system to manufacturer's instructions and Certification Organizations tested design requirements.

.3 Co-ordinate suspension system with related components.

3.2 INSTALLATION (Cont'd)

.4 Do not erect ceiling suspension system until work above ceiling has been inspected and approved by Departmental Representative.

.5 Support suspension system main runners at 1200 mm oc maximum with hangers from structure. Assembly shall support super-imposed loads. Maximum permissible deflection, 1/360th of span to ASTM C635/C635M deflection test.

.6 Attach cross member to main runner to provide rigid assembly.

.7 Acoustic lay-in tiles:
.1 Install acoustic tiles in grid system openings supported by bottom flanges of members. Provide special shapes and sizes to provide a complete installation by cutting tile to fit into openings. Fit tile moderately tight between upright legs of members.
.2 Carefully cut and trim acoustic tiles to accommodate items piercing the finished ceiling plane.
.3 Cut acoustic units to fit adjacent work. Butt joints tight, terminate edges with moulding.
.4 Secure each panel into grid opening with concealed hold down clips.

.8 Install flush edge molding at junction of acoustic unit ceiling and other materials around entire length of joint.

3.3 CLEANING

.1 Cleaning:
.1 Leave work area clean at end of each day.
.2 Upon completion, remove surplus materials, rubbish, tools and equipment.
.3 Touch up scratches, abrasions, voids and other defects in painted surfaces.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by acoustical suspension installation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 American National Standards Institute (ANSI):
.1 ANSI/ESD S7.1-2005, Floor Materials - Resistive Characterization of Materials.
.2 ANSI/ESD S20.20-2007, For the Development of an Electrostatic Discharge Control Program for - Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices).

.2 ASTM International:
.1 ASTM F1861-08(2012)e1, Standard Specification for Resilient Wall Base.
.2 ASTM F2982-13, Standard Specification for Polyester Composition Floor Tile.

.3 Canadian General Standards Board (CGSB):
.1 CGSB-25.20-95, Surface Sealer for Floors.

.4 Canadian Standards Association (CSA):
.1 CSA B651-12, Accessible Design for the Built Environment.

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

.6 Scientific Certification Systems (SCS):
.1 SCS-EC10.2-2007, Indoor Air Quality Performance.

1.2 SUBMITTALS

.1 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 and acceptable to Labour Canada and acceptable to Labour Canada and Health Canada for primer, cement and adhesive. Indicate VOC content.

.2 Samples:
.1 Submit samples in accordance with Section 01 33 00.
.2 Submit duplicate 300 x 300 mm sample pieces of sheet material and 300 mm long base.

.3 Submit copy of flooring manufacturer's installation procedures in accordance with Section 01 33 00.

1.2 SUBMITTALS (Cont'd)

.4 Submit letter stating that the moisture content of concrete slab and the ph of the surface is within manufacturer's written guidelines for proposed flooring system.

.5 Do not proceed with flooring installation if the concrete slab moisture content is over 3.0 lbs/1000 S.F for vinyl. Contact the manufacturer's representative and inform the Departmental Representative immediately.

.6 Provide maintenance data for resilient flooring for incorporation into operation and maintenance manual specified in Section 01 78 00.

1.3 MAINTENANCE MATERIALS

.1 Provide lineal metres of resilient base of matching colour for each profile in addition to the resilient base required to complete the present installation.

.2 Submit extra 5% or to nearest full carton of each colour, pattern and type of flooring material required for maintenance use.

.3 Deliver to job site in boxes clearly marked with information on contents and include address and date of installation.

.4 Unload and store within building where directed by Departmental Representative.

1.4 AIR QUALITY

.1 Select materials and off gas flooring products off site in accordance with CSA B651, including Annex A Environmental Considerations, A.5 Indoor Air Quality and FloorScore certified to SCS-EC10.2.

.2 No detectable odour after installation from flooring, adhesive or accessories.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Resilient polyester composition floor tile (VCT): to ASTM F2982, sized at 305 x 305 x 3.2 mm, non-PVC floor tile made from rapidly renewable US-grown plant ingredients.
.1 Colours: To be selected by the Departmental Representative.

.2 Electrostatic dissipating tile system (ESD):
.1 Must meet ANSI/ESD S20.20 and ANSI/ESD S7.1.
.2 Tiles are abrasion resistant, micro-edged and fabricated from pure vinyl.

.3 Resilient base (RB): to ASTM F1861, Type TP rubber thermoplastic, Group 1 solid homegeneous, 100 mm high, continuous, Style A-Straight, preformed inside and outside corners at coved base.

.4 Primer, cement, and adhesive: type recommended by flooring and base manufacturer to suit substrate and installation, Ecologo certified.
.1 Composite floor tile adhesive: zero VOC, low odour, no alcohol, glycol or amonia, Ecologo certified.

.5 Sub-floor filler: premixed latex modified cement mixed with water to produce cementitious paste.

.6 Concrete floor sealer: to CAN/CGSB-25.20, Type 1.

.7 Wax and sealer: type recommended by flooring manufacturer.

.8 Reducing strip: same material as flooring.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for resilient flooring installation in accordance with manufacturer's written instructions.

3.1 EXAMINATION (Cont'd)

.1 (Cont'd)
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 SUB-FLOOR TREATMENT

.1 Remove ridges and bumps.

.2 Apply sub-floor filler to low spots and cracks to achieve floor level to a tolerance of 1:500, allow to cure.

.3 Prepare and seal porous and powdery concrete surfaces in accordance with flooring manufacturer's written instructions.

.4 Remove dust, old adhesive, paint, dirt, wax, sealer and foreign matter from existing surfaces.

3.3 PREPARATION AND INSTALLATION

.1 Maintain room and material temperature at approximately 20°C for 3 days before laying, and minimum 2 days after laying.

.2 Test subfloor for moisture content in accordance with flooring manufacturer's instructions using the Vaprecision vapour emission test.
.1 Perform moisture condition test in each major area. A minimum of 1 test per 1000 sq. ft., prior to installation. Moisture condition shall not exceed 3 pounds per 1000 sq. ft. per 24 hour day in accordance with the Rubber Manufacturers Association Test Method. Do not proceed with work until results of moisture condition tests are acceptable.

.3 Do not proceed with work until results of moisture condition tests are acceptable.

.4 Prepare floor and install flooring in accordance with flooring manufacturer's instructions.

.5 Roll surface with 45 kg roller.

3.3 PREPARATION AND INSTALLATION (Cont'd)

.6 Wrap around straight base at external corners.

.7 Base joints at maximum length available or at internal or preformed corners.

.8 Install reducing strip at exposed edges, centre under doors at doorways.

3.4 CLEANING AND WAXING

.1 Clean, seal and wax flooring to manufacturer's instructions.

.2 Cleaning:
.1 Leave work area clean at end of each day.
.2 Upon completion, remove surplus materials, rubbish, tools and equipment.
.3 Touch up scratches, abrasions, voids and other defects in painted surfaces.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by resilient flooring installation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials International(ASTM)
.1 ASTM C109/C109M-16a, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens).
.2 ASTM C156-11, Standard Test Method for Water Loss from a Mortar Specimen Through Liquid Membrane-Forming Curing Compounds for Concrete.

1.2 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00.

.2 Submit product data indicating:
.1 Two copies of manufacturer's Product data on characteristics, performance criteria, and limitations.
.2 Preparation, installation requirements and techniques, Product storage, and handling criteria.

1.3 SAMPLES

.1 Submit samples in accordance with Section 01 33 00.

.2 Submit samples indicating coating and final concrete finish.

1.4 REPORTS

.1 Submit reports in accordance with Section 01 33 00.

.2 Submit manufacturer's acceptance of substrate prior to installation in writing. Submit verification of moisture content of floor prior to installation.

1.5 CLOSEOUT SUBMITTALS

.1 Submit maintenance data for incorporation into manuals in accordance with Section 01 78 00.

1.6 QUALITY ASSURANCE

.1 Perform work of this Section by a company that is approved by manufacturer. Submit to the Departmental Representative, applicator's current certificate of approval by the material manufacturer as proof of compliance.

.2 Mock-up:
.1 Construct one 2 sq. m. mock-up of floor sealer in location acceptable to the Departmental Representative.
.2 Arrange for the Departmental Representative's review and acceptance, allow 48 hours after acceptance before proceeding with Work.
.3 Mock-up may remain as part of Work if accepted by Departmental Representative. If sealer application is unacceptable to Departmental Representative, rework sealer in accordance with manufacturer's recommendations to provide a sealed concrete surface acceptable to Departmental Representative.
.4 Upon acceptance, mock-up shall serve as a minimum standard of quality for the balance of the work of this Section.

.3 Pre-installation meetings: Arrange with manufacturer's representative and the Departmental Representative to inspect substrates, and to review Mock-up and installation procedures 48 hours in advance of installation.

1.7 SITE CONDITIONS

.1 Do not install the work of this Section outside of environmental ranges as recommended by the manufacturer without Product manufacturer's written acceptance.

.2 Install temporary protection and facilities to maintain the Product manufacturer's, and the above specification, environmental requirements for 24 hours before, during, and 24 h after installation.

.3 Post do not enter and appropriate warning signs at conspicuous locations.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Each material used in the application of each flooring system shall be as recommended or manufactured by the supplier of the flooring system.

.2 Concrete floor sealer: Alkali-silicate, water-soluble, inorganic concrete hardener and dustproofer, meeting the following criteria:
.1 Compressive strength: ASTM C109/C109M, 41.4 MPa.
.2 Moisture retention: ASTM C156, 63 gloss.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verify condition of previously installed Work upon which this Section depends. Report defects to the Departmental Representative. Commencement of Work means acceptance of existing conditions.

3.2 PREPARATION

.1 Prepare substrate in accordance with manufacturer's written instructions. Diamond grind and vacuum substrate free of debris and dust.

3.3 APPLICATION

.1 Apply concrete floor sealer in accordance with manufacturer's written instructions.

.2 Spray apply concrete sealer to entire surface and keep from drying for 30 minutes as recommended by manufacturer.

.3 Sprinkle surface with water as sealer begins to penetrate (after 30 minutes).

.4 Flush surface with water and drying begins to remove excess material. Allow to harden for 24 hours.

3.3 APPLICATION (Cont'd)

.5 Lightly buff floor with a commercial floor buffer and non-aggressive pad to bring up required sheen.

.6 Apply second coat of concrete sealer following same procedures as first layer.

3.4 CLEANING

.1 Remove promptly as work progresses spilled or spattered materials from surfaces of work performed under other Sections. Clean floors on completion of work. Do not mar surfaces while removing.

3.5 PROTECTION

.1 Erect barriers to prevent the entry and presence of personnel not performing work of this Section during application of floor sealer, and for 48 hours following completion of application.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials International, (ASTM):
.1 ASTM D1335-12, Standard Test Method for Tuft Bind of Pile Yarn Floor Coverings.

.2 Canadian General Standards Board (CGSB):
.1 CAN/CGSB-4.129-93, Carpet for Commercial Use.

.3 Contract Carpet Manual, Canadian Carpet Institute, (613) 232-7183.

.4 Carpet and Rug Institute www.carpet-rug.org and Canadian Carpet Institute, www.canadiancarpet.org.
.1 CRI Carpet Installation Standard 2011.

.5 Canadian Standards Association (CSA):
.1 CSA B651-12, Accessible Design for the Built Environment.

.6 Environmental Choice Program (ECP):
.1 ECP/PCE-44-92, Adhesives.

.7 Underwriters Laboratories Canada (ULC):
.1 CAN/ULC-S102.2-10, Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings and Miscellaneous Materials and Assemblies.

1.2 PRODUCT DATA

.1 Submit product data sheet for each carpet tile, adhesive, concrete floor sealer, Ecologo products in accordance with Section 01 33 00.

.2 For adhesives, indicate VOC in g/L during application and curing.

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00.

.2 Indicate nap, open edges and other details required by Departmental Representative to clarify work.

1.4 SAMPLES

.1 Submit for Departmental Representative's review, duplicate full size samples of carpet tile in selected colours in accordance with Section 01 33 00.

1.5 DESIGN DATA, TEST REPORTS, CERTIFICATES, MANUFACTURER'S INSTRUCTIONS

.1 Submit evidence of prequalification compliance.

.2 Submit a report by an independent testing laboratory verifying tuft bind meets requirements specified when tested to ASTM D1335.

.3 Submit WHMIS MSDS - Material Safety Data Sheets acceptable to Labour Canada and Health Canada for carpet adhesive. Indicate VOC content.

1.6 MAINTENANCE DATA

.1 Provide maintenance data for carpet tile for incorporation into Operation and Maintenance Manual specified in Section 01 78 00.

1.7 MAINTENANCE MATERIALS

.1 Deliver extra 3% of each type, pattern and colour of carpet tile required for this project for maintenance use. Identify each roll. Store where directed.

.2 Maintenance materials to be full size piece of same production run as installed materials.

1.8 AIR QUALITY

.1 Off gas carpet products off site in accordance with CSA B651 including Annex A.

1.9 ENVIRONMENTAL CHOICE PROGRAM

.1 Provide adhesive products bearing the 'Ecologo' of the Environmental Choice Program, Department of the Environment, Canadian Environmental Protection Act, Environmental Choice Product Guidelines ECP/PCE-44 for Adhesives.

1.10 QUALITY ASSURANCE

.1 Applied by installer trained and certified by carpet tile manufacturer for application of its products.

.2 Manufacturer's representative:
.1 Inspect substrate prior to commencement of work, during application of materials and upon completion of work.
.2 Provide technical assistance to the installer and assist where required in correct installation of carpet tile.

1.11 GUARANTEE

.1 Provide a manufacturer's written material guarantee stating that the carpet will remain free of manufacturing defects and deterioration for a period of twenty years. Non-pro-rated guarantee.

.2 Provide a manufacturer's written material guarantee stating that the carpet tile will remain free of manufacturing defects and deterioration for a period of fifteen years. Non-pro-rated guarantee.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Carpet tile: to CAN/CGSB-4.129, except as noted, to match existing carpet types as indicated.

.2 Carpet tile adhesive: water based.
.1 Acrylic release type: low VOC, recommended by carpet tile manufacturer.

.3 Resilient base: In accordance with Section 09 65 00.

.4 Reducing edge strips, thresholds: Nitrile rubber plasticized vinyl, 80-95 Shore A Durometer, adhesive as recommended by manufacturer.

.5 Sub-floor filler: premixed latex mixed with water to produce cementitious paste.

PART 3 - EXECUTION

3.1 SUB-FLOOR TREATMENT

.1 Remove ridges and bumps.

.2 Apply sub-floor filler to low spots and cracks to achieve floor level to a tolerance of 1:500; allow to cure.

.3 Remove dust, old adhesive, dirt, sealer and wax from existing surfaces.

3.2 INSTALLATION

.1 Prepare floor surfaces in accordance with CRI Carpet Installation Standard.

.2 Commence work after finishing work is completed.

.3 Install to CRI Carpet Installation Standard.

.4 Cut and fit around projections through floor.

.5 Finish installation to present smooth wearing surface free from burring or embedded foreign matter.

.6 HEPA Vacuum finished area with commercial grade vacuum with a beater bar head.

.7 Ensure colour, pattern and texture match within any one area.

.8 Fit carpet tile tight to abutting vertical surfaces.

3.3 CARPET TILE

.1 Apply adhesive and install carpet tile in accordance with manufacturer's instructions with acrylic release type adhesive.

.2 Lay tiles with seams within manufacturer's tolerances.

3.4 RESILIENT BASE

.1 Resilient base installation to be in accordance with Section 09 65 00.

3.5 CLEANING AND PROTECTION

.1 Vacuum carpets clean immediately after completion of installation. Protect traffic areas.

.2 Prohibit traffic on carpet until adhesive is cured.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Architectural Painting Specifications Manual, Master Painters Institute (MPI), 2014.

.2 Systems and Specifications Manual, SSPC Painting Manual, Volume Two, Society for Protective Coatings (SSPC).

.3 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA).

.4 National Fire Code of Canada 2010 (NFC).

1.2 QUALITY ASSURANCE

.1 Qualified journeymen who have a "Tradesman Qualifications Certificate of Proficiency" shall be engaged in painting work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with trade regulations.

.3 Conform to latest MPI requirements for interior painting work including preparation and priming.

.4 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) shall be in accordance with MPI Painting Specification Manual "Approved Product" listing and shall be from a single manufacturer for each system used.

.5 Other paint materials such as linseed oil, shellac, turpentine, etc. shall be the highest quality product of an approved manufacturer listed in MPI Painting Specification Manual and shall be compatible with other coating materials as required.

.6 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Departmental Representative.

1.2 QUALITY ASSURANCE (Cont'd)

.7 Standard of Acceptance:
.1 Walls: No defects visible from a distance of 1000 mm at 90° to surface.
.2 Ceilings: No defects visible from floor at 45° to surface when viewed using final lighting source.
.3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

1.3 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

.1 Provide paint products meeting MPI "Environmentally Friendly" E2 or E3 ratings based on VOC (EPA Method 24) content levels.

.2 Where indoor air quality (odour) is a problem, use only MPI listed materials having a minimum E2 or E3 rating.

1.4 INSPECTION REQUIREMENTS

.1 Interior painting and decorating work shall be inspected by a Paint Inspection Agency (inspector) acceptable to the specifying authority and local Painting Contractor's Association. Painting contractor shall notify Paint Inspection Agency a minimum of one week prior to commencement of work and provide a copy of project painting specification, plans and elevation drawings (including pertinent details) as well as a Finish Schedule.

.2 Interior surfaces requiring painting shall be inspected by Paint Inspection Agency who shall notify Departmental Representative and General Contractor in writing of defects or problems, prior to commencing painting work, or after prime coat shows defects in substrate.

.3 Where "special" painting, coating or decorating system applications (i.e. elastomeric coatings) or non-MPI listed products or systems are to be used, paint or coating manufacturer shall provide as part of this work, certification of surfaces and conditions for specific paint or coating system application as well as on site supervision, inspection and approval of their paint or coating system application as required at no additional cost to Owner.

1.5 SCHEDULING OF WORK

.1 Submit work schedule for various stages of painting to Departmental Representative for approval. Submit schedule minimum of 48 hours in advance of proposed operations.

.2 Obtain written authorization from Departmental Representative for any changes in work schedule.

.3 Schedule painting operations to prevent disruption of occupants in and about the building.

1.6 SUBMITTALS

.1 Submit product data and manufacturer's installation/application instructions for each paint and coating product to be used in accordance with Section 01 33 00.

.2 Submit WHMIS MSDS.- Material Safety Data Sheets in accordance with Section 01 33 00.

.3 Upon completion, submit records of products used. List products in relation to finish system and include the following:
.1 Product name, type and use.
.2 Manufacturer's product number.
.3 Colour numbers.
.4 MPI Environmentally Friendly classification system rating.
.5 Manufacturer's Material Safety Data Sheets (MSDS).

1.7 SAMPLES

.1 Submit full range colour sample chips in accordance with Section 01 33 00. Indicate where colour availability is restricted.

.2 Submit duplicate 200 x 300 mm sample panels of each paint finish with specified paint or coating in colours, gloss/sheen and textures required to MPI Painting Specification Manual standards submitted on the following substrate materials:
.1 3 mm plate steel for finishes over metal surfaces.
.2 13 mm plywood for paint finishes over plywood substrates.

1.7 SAMPLES (Cont'd)

.2 (Cont'd)
.3 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.

.3 When approved, sample panels shall become acceptable standard of quality for appropriate on-site surface with one of each sample retained on-site.

1.8 QUALITY CONTROL

.1 Provide mock-up in accordance with Section 01 45 00.

.2 When requested by Departmental Representative, prepare and paint designated surface, area, room or item (in each colour scheme) to requirements specified herein, with specified paint or coating showing selected colours, gloss/sheen, textures and workmanship to MPI Painting Specification Manual standards for review and approval. When approved, surface, area, room and/or items shall become acceptable standard of finish quality and workmanship for similar on-site work.

1.9 EXTRA MATERIALS

.1 Submit maintenance materials in accordance with Section 01 78 00.

.2 Submit one - one litre can of each type and colour of primer and finish coating. Identify colour and paint type in relation to established colour schedule and finish system.

.3 Deliver to Contractor and store where directed.

1.10 DELIVERY, HANDLING AND STORAGE

.1 Deliver, store and handle materials in accordance with Section 01 61 00.

.2 Labels shall clearly indicate:
.1 Manufacturer's name and address.
.2 Type of paint or coating.
.3 Compliance with applicable standard.
.4 Colour number in accordance with established colour schedule.

1.10 DELIVERY, HANDLING AND STORAGE (Cont'd)

.3 Remove damaged, opened and rejected materials from site.

.4 Provide and maintain dry, temperature controlled, secure storage.

.5 Observe manufacturer's recommendations for storage and handling.

.6 Store materials and supplies away from heat generating devices.

.7 Store materials and equipment in a well ventilated area with temperature range 7°C to 30°C.

.8 Store temperature sensitive products above minimum temperature as recommended by manufacturer.

.9 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Departmental Representative. After completion of operations, return areas to clean condition to approval of Departmental Representative.

.10 Remove paint materials from storage only in quantities required for same day use.

.11 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.

.12 Fire Safety Requirements:
.1 Provide one 9 kg Type ABC fire extinguisher adjacent to storage area.
.2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
.3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

1.11 SITE REQUIREMENTS

.1 Heating, Ventilation and Lighting:

.1 Ventilate enclosed spaces in accordance with Section 01 51 00.

.2 Perform no painting work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above 10°C for 24 hours before, during and after paint application until paint has cured sufficiently.

.3 Where required, provide continuous ventilation for seven days after completion of application of paint.

.4 Coordinate use of existing ventilation system with Owner and ensure its operation during and after application of paint as required.

.5 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.

.6 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted. Adequate lighting facilities shall be provided by Contractor.

.2 Temperature, Humidity and Substrate Moisture Content Levels:

.1 Unless specifically pre-approved by the specifying body, Paint Inspection Agency and the applied product manufacturer, perform no painting work when:

.1 Ambient air and substrate temperatures are below 10°C.

.2 Substrate temperature is over 32°C unless paint is specifically formulated for application at high temperatures.

.3 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.

.4 The relative humidity is above 85% or when the dew point is less than 3°C variance between the air/surface temperature.

.5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.

1.11 SITE REQUIREMENTS (Cont'd)

.2 (Cont'd)
.2 Perform no painting work when the maximum moisture content of the substrate exceeds:
.1 12% for concrete and masonry (clay and concrete brick/block).
.2 15% for wood.
.3 12% for plaster and gypsum board.
.3 Conduct moisture tests using a properly calibrated electronic Moisture Meter, except test concrete floors for moisture using a simple "cover patch test".
.4 Test concrete, masonry and plaster surfaces for alkalinity as required.

.3 Surface and Environmental Conditions:
.1 Apply paint finish only in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
.2 Apply paint only to adequately prepared surfaces and to surfaces within moisture limits noted herein.
.3 Apply paint only when previous coat of paint is dry or adequately cured.

.4 Additional Interior Application Requirements:
.1 Apply paint finishes only when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.
.2 Apply paint in occupied facilities during silent hours only. Schedule operations to approval of Owner such that painted surfaces will have dried and cured sufficiently before occupants are affected.

1.12 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 20.

.2 Paint, stain and wood preservative finishes and related materials (thinners, solvents, etc.,) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.

1.12 WASTE MANAGEMENT AND DISPOSAL (Cont'd)

.3 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.

.4 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.

.5 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground the following procedures shall be strictly adhered to:
.1 Retain cleaning water for water-based materials to allow sediments to be filtered out.
.2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
.3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
.4 Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
.5 Empty paint cans are to be dry prior to disposal or recycling (where available).

.6 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.

.7 Set aside and protect surplus and uncontaminated finish materials: Deliver to or arrange collection by organizations for verifiable re-use or re-manufacturing.

.8 Close and seal tightly partly used sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.

2.1 MATERIALS (Cont'd)

.2 Paint materials for paint systems shall be products of a single manufacturer.

.3 Only qualified products with E2 or E3 "Environmentally Friendly" rating are acceptable for use on this project.

2.2 COLOURS

.1 Departmental Representative will provide Colour Schedule after Contract award.

.2 Selection of colours will be from manufacturers full range of colours.

.3 Where specific products are available in a restricted range of colours, selection will be based on the limited range.

.4 Second coat in a three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.

2.3 MIXING AND TINTING

.1 Perform colour tinting operations prior to delivery of paint to site. On-site tinting of painting materials is allowed only with Departmental Representative's written permission.

.2 Paste, powder or catalyzed paint mixes shall be mixed in strict accordance with manufacturer's written instructions.

.3 Where thinner is used, addition shall not exceed paint manufacturer's recommendations. Do not use kerosene or any such organic solvents to thin water-based paints.

.4 Thin paint for spraying according in strict accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Departmental Representative.

.5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.4 GLOSS/SHEEN RATINGS

.1 Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following values:

.2 Gloss level ratings of painted surfaces shall be selected by the Departmental Representative.

PART 3 - EXECUTION

3.2 EXISTING CONDITIONS

.1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Departmental Representative damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.

.2 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter, except test concrete floors for moisture using a simple "cover patch test" and report findings to Departmental Representative. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

.3 Maximum moisture content as follows:
.1 Plaster and Gypsum Board: 12%.
.2 Concrete Block/Brick: 12%.
.3 Wood: 15%.

3.3 PROTECTION

.1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by Departmental Representative.

.2 Protect items that are permanently attached such as Fire Labels on doors and frames.

.3 Protect factory finished products and equipment.

.4 Protect building occupants in and about the building.

3.3 PROTECTION (Cont'd)

.5 Removal of electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings shall be done prior to undertaking any painting operations by General Contractor. Items shall be securely stored and re-installed after painting is completed by General Contractor.

.6 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.

.7 As painting operations progress, place "WET PAINT" signs in occupied areas to approval of Departmental Representative.

3.4 CLEANING AND PREPARATION

.1 Clean and prepare surfaces in accordance with MPI Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
.1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths.
.2 Wash surfaces with a biodegradable detergent and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
.3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
.4 Allow surfaces to drain completely and allow to dry thoroughly.
.5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
.6 Use trigger operated spray nozzles for water hoses.
.7 Many water-based paints cannot be removed with water once dried. However, minimize the use of kerosene or any such organic solvents to clean up water-based paints.

3.4 CLEANING AND PREPARATION (Cont'd)

.2 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.

.3 Where possible, prime surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
.1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.
.2 Apply wood filler to nail holes and cracks.
.3 Tint filler to match stains for stained woodwork.

.4 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

.5 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes.

.6 Touch up of shop primers with primer as specified in applicable section. Major touch-up including cleaning and painting of field connections, welds, rivets, nuts, washers, bolts, and damaged or defective paint and rusted areas, shall be by supplier of fabricated material.

.7 Do not apply paint until prepared surfaces have been accepted by Departmental Representative.

3.5 APPLICATION

.1 Method of application to be as approved by the Departmental Representative. Apply paint by brush,roller, or spray application. Conform to manufacturer's application instructions unless specified otherwise.

3.5 APPLICATION (Cont'd)

.2 Brush and Roller Application:
.1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.
.2 Work paint into cracks, crevices and corners.
.3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
.4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces shall be free of roller tracking and heavy stipple unless approved by Departmental Representative.
.5 Remove runs, sags and brush marks from finished work and repaint.

.3 Spray application:
.1 Provide and maintain equipment that is suitable for intended purpose, capable of properly atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
.2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
.3 Apply paint in a uniform layer, with overlapping at edges of spray pattern.
.4 Brush out immediately all runs and sags.
.5 Use brushes to work paint into cracks, crevices and places which are not adequately painted by spray.

.4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access and only when specifically authorized by the Departmental Representative.

.5 Apply coats of paint as a continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.

.6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.

3.5 APPLICATION (Cont'd)

.7 Sand and dust between coats to remove visible defects.

.8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.

.9 Finish inside of cupboards and cabinets as specified for outside surfaces.

.10 Finish closets and alcoves as specified for adjoining rooms.

.11 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.6 MECHANICAL/ ELECTRICAL EQUIPMENT

.1 Unless otherwise specified, paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as noted otherwise.

.2 Boiler room, mechanical and electrical rooms: paint exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment.

.3 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.

.4 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.

.5 Do not paint over nameplates.

.6 Keep sprinkler heads free of paint.

.7 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.

.8 Paint fire protection piping red.

3.6 MECHANICAL/ ELECTRICAL EQUIPMENT (Cont'd)

.9 Paint disconnect switches for fire alarm system and exit light systems in red enamel.

.10 Paint natural gas piping yellow.

.11 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

.12 Do not paint interior transformers and substation equipment.

3.7 FIELD QUALITY CONTROL

.1 Field inspection of painting operations to be carried out be independent inspection firm as designated by Departmental Representative.

.2 Advise Departmental Representative when surfaces and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.

.3 Co-operate with inspection firm and provide access to areas of work.

3.8 RESTORATION

.1 Clean and re-install all hardware items removed before undertaken painting operations.

.2 Remove protective coverings and warning signs as soon as practical after operations cease.

.3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.

.4 Protect freshly completed surfaces from paint droppings and dust to approval of Departmental Representative. Avoid scuffing newly applied paint.

.5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Departmental Representative.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Aluminum Association Designation System for Aluminum Finishes (AA):
.1 AA DAF 45-2003(R2009), Designation for Aluminum Finishes.

.2 ASTM International (ASTM):
.1 ASTM G21-15, Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

.3 Underwriters' Laboratories of Canada (ULC):
.1 CAN/ULC-S109-03, Flame Tests of Flame-Resistant Fabrics and Films.

1.2 PRODUCT DATA SHEETS AND SAMPLES

.1 Submit product data sheets in accordance with Sections 01 33 00 and 01 78 00.

.2 Indicate, by large scale details, anchorage, assembly, materials, components, finishes, and perimeter construction conditions.

.3 Submit duplicate samples of fabric 900 x 900 mm in accordance with Sections 01 33 00 and 01 78 00.

.4 Submit a report by an independent testing laboratory verifying fabric meets flammability and smoke requirements.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Waste Management and Disposal:
.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Aluminum: extruded aluminum to Aluminum Association Alloy 6063-T5, finish exposed surfaces of aluminum components in accordance with Aluminum Association Designation System for Aluminum Finishes DAF 45, finish to match window shade metal components of the base building. Mill finish for concealed metal.

.2 Drive chain: Stainless steel bead chain formed in a continuous loop, 40 kg test breaking strength tested with a Dillon Tester, complete with adjustable chain stopper.

.3 Fabric: Fabric to meet the following requirements:

.1 Fabric to have no weave distortion, be flat, dimensionally stable, with basket weave design.

.2 Weight: 406 g/sq.m.

.1 Fabric thickness: 0.033 cm.

.2 Warp: 109 kg.

.3 Weft: 436 kg.

.4 Construction: 4 ply consisting of 1-ply fibreglass and 3-ply PVC.

.5 Washable: Both sides with warm water and 5% detergent solution.

.6 Anti-bacterial properties: To conform to ASTM G21.

.7 Flammability tested in accordance with:

.1 CAN/ULC-S109, vertical burn: Pass. Fabric shall be certified by an independent laboratory to pass specified standard.

.8 Colour:

.1 Blackout fabric colour to match 'BO-108D'.

.2 Shade fabric shall be from same dye lot.

.9 Fabric shall be sealed under heat and pressure to retain weave pattern, with additional heat seal at sides, to prevent fraying and to eliminate rough edges.

2.2 FABRICATION

.1 Fabricate window shade unit, with end bracket, interchangeable idle end, fabric tube cassette, fabric, external hem bar, bottom base and fascia as a single fully assembled unit capable of being mounted or de-mounted without disassembly, similar to shade units in the base building.

.2 End brackets: two piece ABS construction with 68 mm dia. nylon sprocket riding on a silicone based lubricant.

.3 Fabric tube: Minimum 1.5 mm aluminum tube with 3 continuous 4.82 mm internal fins set at 120 degree spacing.

.4 Lift mechanism: 3.61 mm extruded hexagonal aluminum core with a coil surround of spring steel, factory set tension with external adjustment to compensate for wear, built in shock absorption system, finger tip control.

.5 Fascia: Minimum 1.7 mm extruded aluminum fascia, profile to accept attachment of end brackets.

.6 Hem bar: extruded aluminum channel, single length for each shade panel complete with plastic end caps, colour to match fabric.

.7 Mounting bracket: extruded aluminum, 2 piece, L-shaped, pre-drilled, integral screw slot for attachment of end cap.

.8 Black out side channel: extruded aluminum, 6063 alloy, 38 x 28 mm with 12 mm pile height blackout seal inserted internally back and front face inside channel, aluminum finish same as window they are attached to.

.9 Provide stops at highest and lowest shade positions to prevent over winding and unrolling.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for window shade installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Install shades in accordance with reviewed shop drawings and manufacturer's written instructions.

.2 Install shades plumb, true, square, straight and level in proper planes, complete with all fascias/soffits, trims, bars and accessories.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work areas clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Protect installed products and components from damage during during construction.

3.4 PROTECTION (Cont'd)

.2 Repair damage to adjacent materials caused by door installation.

END OF SECTION

PART 1 - GENERAL

1.1 General Contract Documents

.1 Comply with General Conditions of Contract, Supplementary Conditions and Division 1 - General Requirements.

1.2 Work Included

.1 Work to be done under Divisions 21, 22, 23 and 25 to include furnishing of labour, materials and equipment required for installation, testing and putting into proper operation complete mechanical systems as shown, as specified, as intended, and as otherwise required. Complete systems to be left ready for continuous and efficient satisfactory operation.

1.3 DEFINITIONS

.1 The words "indicated", "shown", "noted", "listed" or similar words or phrases used in this Specification, mean that material or item referred to is "indicated", "shown", "listed" or "noted" on Drawings or in Specification.

.2 The words "approved", "satisfactory", "as directed", "submit", "permitted", "inspected", or similar words or phrases used in this Specification, mean that material or item referred to is to be "approved by", "satisfactory to", "as directed by", "submitted to", "permitted by", "inspected by", Consultant.

.3 Instructions using any form of word "provide" involves Contractor in furnishing labour, materials and services to supply and install referenced item.

1.4 LANGUAGE

.1 The specification is written as a series of instructions addressed to the Contractor, and by implication to subcontractors and to suppliers. For clarity and brevity, use is made of numbered lists and bulleted lists. Where list follows a semi-colon (;) the punctuation is for clarity. Where a list follows a colon (:) the punctuation is to be

read as a short-hand form of the verb “to be” or “to have” as context requires.

.2 It is not intended to debate with the Contractor the reasons for these instructions, and words associated with justification for an instruction or restatement of anticipated performance have been omitted to avoid possible ambiguities.

1.5 EXAMINATION

.1 Examine any existing buildings, local conditions, building site, Specifications, and Drawings and report any condition, defect or interference that would prevent execution of the work.

.2 No allowance will be made for any expense incurred through failure to make these examinations of the site and the documents prior to Tender or on account of any conditions on site or any growth or item existing there which was visible or known to exist at time of Tender.

.3 Examine work of other Divisions before commencing this work, and report any defect or interference.

1.6 STANDARD OF MATERIAL AND EQUIPMENT

.1 Provide materials and equipment in accordance with Section 01 61 00 - Material and Equipment.

.2 Materials and equipment:

.1 new and of uniform pattern throughout work,

.2 of Canadian manufacture where obtainable,

.3 standard products of approved manufacture.

.4 labeled or listed as required by Code and/or Inspection Authorities,

.5 registered in accordance with the requirements of TSSA Boilers and Pressure Vessels Safety Division Guidelines for the Registration of Non-nuclear Fittings in the Province of Ontario,

.6 in compliance with Standards and Regulations with respect to;

(a) chemical and physical properties of materials,

(b) design,

(c) performance characteristics, and

(d) methods of construction and installation.

.7 identical units of equipment to be of same manufacture.

.8 identical component parts of same manufacture in similar units of equipment, but various component parts of each unit need not be from one manufacturer.

.3 Materials and equipment are described to establish standards of construction and workmanship.

.1 Where manufacturers or manufacturers' products are identified in lists with the phrase "Standard of Acceptance", these are manufacturers and/or products which meet required standards with regard to performance, quality of material and workmanship.

.2 Manufacturers and or products used are to be chosen from these lists.

.4 Select materials and equipment in accordance with manufacturer's recommendations and install in accordance with manufacturer's instructions.

.5 Materials and equipment not satisfying these selection criteria will be condemned.

.6 Remove condemned materials from job site and provide properly selected and approved materials.

PART 2 - SUBMITTALS

2.1 SHOP DRAWINGS AND PRODUCT DATA SHEETS

.1 Submit shop drawings, manufacturers and product data and samples in accordance with Section 01 33 00.

.1 Submit shop drawings in the same unit of measure as are used on the drawings. Both metric and imperial measures may be included.

.2 Submit shop drawings for each item of equipment.

.3 Manufacturer's letter sized printed data sheets, as black and white originals of graphic quality suitable for photocopying, are acceptable in place of shop drawings for standard production items.

.4 Submit with manufacturers data sheets, typed schedules listing manufacturer's and supplier's name and catalogue model number

.5 For plumbing fixtures and lighting fixtures, submit fixture cuts with catalogue numbers for fixtures to be used on job. Identify and arrange fixture cuts in same sequence as specification fixture list.

.6 Shop drawings and product data to show;

(a) dimensioned outlines of equipment

(b) dimensioned details showing service connection points.

(c) elevations illustrating locations of visible equipment such as gauges, pilot lights, breakers and their trip settings, windows, meters, access doors.

(d) description of operation.

(e) single line diagrams.

(f) general routing of bus ducts and connecting services.

(g) mounting and fixing arrangements.

(h) operating and maintenance clearances, and

(i) access door swing spaces.

.7 Shop drawings and product data to be accompanied by;

(a) detailed drawings of bases, supports and anchor bolts,

(b) sound power data, where applicable, and

(c) performance curve for each piece of equipment marked with point of operation.

.8 Shop drawing and data sheet submission is taken as certification;

.1 that units are from Manufacturer's current production and

.2 in compliance with applicable Codes, Standards, and Regulations.

.9 Do not submit drawings showing internal construction details, component assemblies or interior piping and wiring diagrams. These may be necessary to understand correct functioning of equipment and should be submitted with operating and maintenance data.

.10 Check and stamp each shop drawing as being correct before submission. Shop drawings without such stamps will be rejected and returned.

.11 Keep one copy of each reviewed shop drawing and product data sheet on site available for reference purposes.

.12 Where equipment is delivered without reviewed shop drawing available on site, equipment will be condemned and is to be removed from site and replaced with new equipment after shop drawing has been submitted and reviewed.

2.2 FIELD, FABRICATION, OR INSTALLATION DRAWINGS

.1 Contractor field, fabrication, installation, and/or sleeving drawings will not be reviewed as shop drawings. If submitted as a shop drawing, a transmittal only will be returned identifying the submitted drawings have not been reviewed.

.2 Maintain a copy on site of such drawings for reference by the Consultant.

.3 Provide a copy of such drawings to the Consultant for general information purpose only, upon request.

PART 3 - REFERENCE CODES STANDARDS AND REGULATIONS

3.1 CODES, STANDARDS AND REGULATIONS

.1 Latest current versions in force at time of Tender.

.2 Where relevant documents applicable to this work exist, follow these criterion, recommendations, and requirements as minimum standards.

.3 In event of conflict between codes, regulations, or standards, or where work shown is in conflict with these documents, obtain interpretation before proceeding. Failure to clarify any ambiguity will result in an interpretation requiring application of most demanding requirements.

3.2 CONFINED SPACES

.1 Unless otherwise proscribed by the Constructor’s / Owner’s workplace safety program, treat spaces not designed and constructed for continuous human occupancy as “confined spaces”, including but not limited to:

.1 horizontal and vertical service spaces, shafts, and tunnels,

.2 inside of equipment which permits entry of the head and/or whole body, and

.3 ceiling spaces which are identified as containing a hazardous substance.

3.3 PERMITS, TESTS AND CERTIFICATES

.1 Arrange and pay for permits, tests, and Certificates of Inspection required by Authorities having jurisdiction.

.2 Submit applications requiring Owner's signature before commencing work.

.3 Obtain and submit Inspection Certificates.

.4 Certificates to be renewed as to remain in force for guarantee period.

.5 Co-ordinate and perform testing required by Authorities having jurisdiction in accordance with Clause **TESTING** in this Section

PART 4 - EQUIPMENT

4.1 MANUFACTURERS NAMEPLATES

.1 Metal nameplate with raised or recessed lettering, mounted on each piece of equipment.

.2 On insulated equipment, mechanically fasten plates on metal stand-off bracket arranged to clear insulation and mount Underwriters Laboratories and/or CSA registration plates on same stand-off brackets.

.3 Manufacturer's nameplate to indicate equipment size, capacity, model designation, manufacturer's name, serial number, voltage, cycle, phase and power rating of motors, and approval listings.

4.2 FACTORY APPLIED FINISH PAINTING

.1 Apply prime and final paint coats to equipment and materials where specifically detailed in Sections of these Divisions.

.2 Apply prime and final paint coats factory to pumps, air moving units, un-insulated pressure vessels and bare metal equipment items in boiler, mechanical and fan rooms.

.3 Use heat resistant paint where conditions require.

.4 Protect factory finished equipment during construction, and clean at completion of work.

4.3 FACTORY APPLIED PRIME PAINTING

.1 Have prime paint factory applied to other equipment fabricated from iron or steel including access doors, registers, grilles, diffusers, dampers, metal radiation enclosures and fire hose cabinets.

4.4 FIELD PAINTING

.1 After equipment has been installed and piping and insulation is completed, clean rust and oil from exposed iron and steel work provided under this Division, whether or not it has been factory prime painted.

.2 In "occupied" areas of building touch up any damage to prime coat resulting from shipping or installation and leave ready for final painting under Finishes, Division 9.

.3 In "un-occupied" areas of the building such as mechanical equipment rooms, boiler rooms, fan rooms, crawl spaces, pipe tunnels and penthouses:

.1 paint exposed galvanized metal surfaces with one coat of zinc dust galvanized primer and one coat of 100% Alkyd base enamel in an approved colour; and

.2 paint exposed iron or steel work with one coat of chrome oxide phenolic base primer and one coat of 100% Alkyd base enamel in an approved colour.

4.5 MAINTENANCE OF BEARINGS

.1 "Turn over" rotating equipment at least once a month from delivery to site until start-up.

.2 "Run-in" sleeve type bearings in accordance with manufacturer's written recommendation. After "run-in", drain, flush out and refill with new charge of oil or grease.

.3 Protect bearings, shafts and sheaves against damage, corrosion and dust accumulation during building construction.

PART 5 - OFFICE, STORAGE AND TOOLS

5.1 OFFICE AND STORAGE

.1 Provide temporary office and lunchroom facilities, workshop, and tools and material storage space. Facilities may be site trailers or as otherwise approved by the General Contractor/Construction Manager.

.2 Assume responsibility for security of these facilities and provide heat, light and telephone and Internet service

5.2 APPLIANCES AND TOOLS

.1 Provide tools, equipment, scaffolding, extension cords, lamps and miscellaneous consumable materials, required to carry out work.

PART 6 - COORDINATION

6.1 GENERAL

.1 Consultant drawings are diagrammatic and illustrate the general location of equipment, and intended routing of ductwork, piping, etc. and do not show every structural detail. In congested areas drawings at greater scale may be provided to improve interpretation of the Work. Where equipment or systems are shown as “double line”, they are done so either to improve understanding of the Work, or simply as a result of the use of a CAD drawing tool, and in either case such drawings are not represented as fabrication or installation drawings.

.2 Lay out and coordinate Work to avoid conflict with work under other Divisions.

.3 Make good damage to Owner's property or to other trade's work caused by inaccurate layout or careless performance of work of this Division.

.4 When equipment provided under other Sections connects with material or equipment supplied under this Section, confirm capacity and ratings of equipment being provided.

.5 Take information involving accurate measurements from dimensioned Architectural Drawings or at building.

.6 Install services and equipment which are to be concealed, close to building structure so that furring is kept to minimum dimensions.

.7 Location of pipes, ductwork, raceways and equipment may be altered without extra cost provided instruction is given or approval is obtained, in advance of installation of items involved. Changes will be authorized by site instructions and are to be shown on Record Drawings.

.8 Location of floor drains, hub drains, combination drains, plumbing fixtures, convectors, unit heaters, diffuser, registers grilles and other similar items may be altered without extra cost provided instruction is

given prior to roughing in. No claim will be paid for extra labour and materials for relocating items up to 3 m (10 ft) from original location nor will credits be anticipated where relocation up to 3 m (10 ft) reduces material and labour.

.9 Include incidental material and equipment not specifically noted on Drawings or mentioned in Specifications but which is needed to complete the work as an operating installation.

6.2 FIELD FABRICATION AND INSTALLATION DRAWINGS

.1 Prepare field, fabrication, and/or installation drawings to show location of equipment and relative position of services, and to demonstrate coordination with works of other trades.

.1 Drawing scale: minimum 1:50 (1/4"=1'-0")

.2 Use information from manufacturer's shop drawings for each trade and figured dimensions from latest Architectural and Structural Drawings.

.3 Layout equipment and services to provide access for repair and maintenance.

.4 Submit drawings to other trades involved in each area and include note in drawing title block as follows;

.1 “This drawing was prepared and circulated for review and mark-up to related subcontractors as noted and initialed in the table below. Corrections and concerns identified through this coordination process have been addressed on this drawing. Areas that incorporate significant changes from layouts shown on Contract Drawings have been circled for Consultants’ review”.

6.3 CUTTING AND REMEDIAL WORK

.1 For details of cutting and patching and Division of Work refer to Division 1.

.2 Assume responsibility for prompt installation of work in advance of concrete pouring, masonry, roofing, finishing trades and similar work. Should any cutting or repairing of either unfinished or finished work be required

because such installation was not done, employ the particular trade whose work is involved to do such cutting and patching. Pay for any resulting costs. Layout such work for approval by the Structural Engineer before undertaking same.

.3 Neatly cut or frill holes required in existing construction to accommodate cable, raceways, bus duct or cabletray.

.4 Division 21, 22, 23 contractor to be responsible for arranging and paying for all cutting and patching as required for own work. Before cutting, drilling, or sleeving structural load bearing elements, obtain the Consultant's approval of location and methods in writing. Employ original installer or expert in the finishing of material required to perform cutting or patching for weather exposed or moisture resistant elements or sight exposed surfaces.

.1 Layout cutting of structural elements, such as floors slabs, walls, columns or beams and obtain approval before starting work. Conduct an electromagnetic scan of reinforcing rods, and review with Structural Engineer. Based on these results, arrange and pay for supplemental x-ray examination to locate concrete reinforcement and embedments where required. Submit x-rays and obtain approval before starting work Relocate core drilling location if steel or conduit is found in the proposed location and repeat procedure. Reroute any circuits damaged by core drilling.

6.4 ANCHORS AND INSERTS

.1 Supply anchor bolts and locating templates for installation in advance of concrete pouring.

PART 7 - PROTECTION OF WORK AND PROPERTY

7.1 General

.1 Protect this work and work of other trades from damage.

.2 Cover floors with tarpaulins and provide plywood and other temporary protection.

.3 Assume responsibility for repairing damage to floor and wall surfaces resulting from failure

to provide adequate protection.

.4 Protect equipment, pipe and duct openings from dirt, dust and other foreign materials.

PART 8 - WORK IN EXISTING BUILDINGS

8.1 GENERAL

.1 During the tender period, the Contractor shall perform a site inspection of the place of work and surroundings including the accessible ceiling spaces and other areas where access could be considered reasonable. Make a thorough investigation of As Built conditions to determine scope of renovation or demolition work required prior to submitting tender.

.2 Work includes changes to existing building. Route pipes, ducts, conduits and other services to avoid interference with existing installation.

.3 Relocate existing pipes, ducts, conduits, bus ducts and any other equipment or services required for proper installation of new work, including as required for temporary removal and re-installation to suit new installation work.

.4 Remove existing plumbing fixtures, lighting fixtures, piping, ductwork, wiring, and equipment to suit new construction. Cut back and cap drain, vent and water outlets, conduits and electrical outlets, not being used.

.5 Plumbing fixtures, piping, ductwork, conduit and wiring shown to be removed and not shown relocated, to become property of Contractor and to be taken from site.

.6 On completion of relocations, confirm relocated equipment are in proper working order.

.7 Where Owner wishes to take over renovated areas ahead of project completion date and these areas are to be fed from new distribution systems, make temporary connections to existing services in these areas. Reconnect to permanent services, at later date, when new distribution systems are available.

8.2 CONTINUITY OF SERVICES

.1 Make connections to existing systems at approved times. Obtain written approval recording times when connections can be made. Arrange work so that physical access to existing buildings is not unduly interrupted.

.2 Be responsible for and make good any damages caused to existing systems when making connections.

.3 Keep existing buildings in operation with minimum length of shutdown periods. Include overtime work to tie-in piping or wiring at night or on weekends.

PART 9 - FINAL CLEANING AND ADJUSTMENTS

9.1 GENERAL

.1 Conduct final cleaning in accordance with Section 01 74 11 and as specified herein.

.2 Thoroughly clean exterior surface of exposed piping, and vacuum external surfaces of exposed ducts and interior surfaces of air handling units. Clean strainers in piping systems and install clean filters in air handling systems.

.3 Remove tools and waste materials on completion of work and leave work in clean and perfect condition.

.4 Calibrate components and controls and check function and sequencing of systems under operating conditions.

.5 Supply lubricating oils and packing for proper operation of equipment and systems until work has been accepted.

PART 10 - RECORD DRAWINGS

10.1 RECORD DRAWINGS

.1 Provide record drawings in accordance with Section 01 78 00 and as specified herein.

.2 A set of design drawings in AutoCad on CD or DVD ROM will be provided by the Consultant. Make sets of white prints for each phase of Work, and as Work progresses and changes occur mark white prints in coloured inks to show

revisions. Dimension locations of drains, pipes, ductwork, conduit, manholes, foundations and similar buried items within the building, with respect to building column centres. Mark level with respect to an elevation which will be provided.

.3 Survey information from excavation and backfill of site services to be held on site, after approval, and to be similarly transferred to white prints.

.4 Retain these drawings and make available to Consultant for periodic review.

.5 At 50%, 75% and 90% project completion, scan marked-up drawings to Adobe .pdf format and submit copy to the Consultant, or to the project on-line document service if one is used.

10.2 AS-BUILT DRAWINGS

.1 Prior to testing, balancing and adjusting, transfer site record drawing information to AutoCad (CAD) files, to record final as-built condition. Obtain a current set of CAD files from the Consultant.

.1 Drawings are to remain set to and follow Consultants AutoCad Standards. Do not alter drawing scales, X-refs, colours, layers or text styles.

.2 The Consultant's CAD files may not reflect all or any construction changes.

.2 Where items have been deleted, moved, renumbered or otherwise changed from contract drawings, revise the CAD files to record these changes. “Bubble” these revisions, and place these annotations on a separate and easily identified drawing layer.

.3 Show on mechanical as-built drawings final location of piping, ductwork, switches, starters, Motor Control Centres, thermostats, and equipment.

.4 Show on site services as-built drawings survey information provided by Ontario Land Surveyor (OLS) monitoring services installation.

.5 Identify each drawing in lower right hand

corner in letters at least 12 mm (½ in) high as follows "AS-BUILT DRAWINGS. This drawing has been revised to show systems as installed" (Signature of Contractor) (Date). The site services drawings are to include signature and stamp of OLS surveyor attached to note.

.6 Submit one (1) set of white prints of the draft as-built Cad files for Consultant’s review.

.7 Once “AS BUILT DRAWINGS” white prints are reviewed, transfer Consultant's comments to the CAD files. Return AutoCad drawings modified to “As Built” condition to Consultants on CD or DVD Rom.

.8 Submit three (3) sets of white prints and three (3) copies of CAD files with Operating and Maintenance Manuals.

PART 11 - OPERATING AND MAINTENANCE INSTRUCTIONS

11.1 OPERATING AND MAINTENANCE MANUALS

.1 Provide operation and maintenance data bound in 210 mm x 300 mm x 50mm thick (8½ in x 11 in x 2 in thick) size, vinyl covered, hard back, three-ring covers.

.1 Organize material in volumes generally grouped by Trade Section; Site services, Plumbing, Fire Protection, Heating and Cooling Plant and Distribution, Air Handling, and Controls and Instrumentation.

.2 Title sheet in each volume to be labeled "Operating and Maintenance Manual" and to bear Project Name, Project Number, Date, Trade Section, and List of Contents.

.2 In addition, provide Adobe PDF files for each document, produced from original direct-to-digital file creations.

.1 Organize documents into separate PDF files for each Trade Section identified above, and apply Adobe Bookmarks to create Table of Contents.

.3 Operating data to include;

.1 control schematics for each system,

.2 description of each system and associated control elements,

.3 control operating sequences at various load conditions, reset schedules and anticipated seasonal variances,

.4 operating instructions for each system and each component,

.5 description of actions to be taken in event of equipment failure,

.6 valves schedule and flow diagram,

.7 service piping identification charts.

.4 Maintenance data to include;

.1 manufacturer's literature covering, servicing, maintenance, operating and trouble-shooting instructions for each item of equipment,

.2 fault locating guide,

.3 manufacturer's parts list,

.4 reviewed shop drawings,

.5 equipment manufacturer's performance sheets,

.6 equipment performance verification test results,

.7 voltage and ampere rating for each item of electrical equipment,

.8 spare parts list and an itemized cost,

.9 name and telephone numbers of service organization and technical staff that will provide warranty service on the various items of equipment.

.5 Approval procedure

.1 Submit one set of first draft of Operating and Maintenance Manuals for approval.

.2 Make corrections and resubmit as directed.

.3 Review contents of Operating and Maintenance Manuals with Owner's operating staff or representative to ensure thorough understanding of each item of equipment and its operation.

.4 Hand-over two copies of Operating and Maintenance Manuals to Owner's operating staff and obtain written confirmation of delivery.

11.2 OPERATING AND MAINTENANCE INSTRUCTIONS

.1 Provide instructions to Owners operations staff to thoroughly explain operation and maintenance of each system, incorporating specialized instruction by manufacturers as described under other Sections in these Divisions. Include classroom instruction and hands-on instruction, delivered by competent instructors.

.2 Submit an outline of the training program for review, adjustment and approval by the Owner.

.3 Structure each session to start with the classroom instruction for the overall system, followed by hands-on instruction for each equipment, utilizing the services of the manufacturers' representative as required.

.4 Organize and schedule each training session to deliver the required instruction in an efficient and effective manner on a schedule agreed upon with the Owner. Allow for two (2) training sessions for each training session, separated by approximately one week each. Develop the proposed training plan and obtain approval from the Owner before commencing training.

.5 Complete the training as close to Substantial Performance as possible, so that the operations staff are prepared to operate the systems after Substantial Performance is certified.

.6 Organize each training sessions as follows:

.1 Fire Protection - Division 21

.2 Plumbing - Division 22

.3 HVAC - Division 23

.4 Building Management System - Division 25

.7 Keep record of date and duration of each instruction period together with names of persons attending. Submit signed records at completion of instruction.

.8 For each training session, include the following topics:

.1 General purpose of system (design

intent),

.2 Use of O&M manuals,

.3 Review of control drawings and schematics,

.4 Start-up, normal operation, shutdown, unoccupied operation, seasonal changeover, manual operation, control set-up and programming troubleshooting, and alarms,

.5 Interaction with other systems,

.6 Adjustments and optimizing methods for energy conservation,

.7 Health and safety issues,

.8 Special maintenance and replacement sources,

.9 Occupancy interaction issues, and

.10 System response to different operating conditions.

.9 Develop and provide training material, including printed documents and electronic presentation aids (e.g. MS PowerPoint) for each session. Submit three (3) copies of materials in both hardcopy and electronic format, in accordance with article on Operating and Maintenance Manuals.

.10 Sessions may be videotaped by the Owner as an aid to ongoing training of Owners staff.

PART 12 - START-UP AND TESTING

12.1 CARE, OPERATION AND START-UP

.1 Arrange and pay for services of manufacturer's factory service technician to supervise start-up of installation, check, adjust, balance and calibrate components.

.2 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with every aspect of the operation, care and maintenance thereof.

12.2 TESTING - GENERAL

.1 Methods to comply with following references:

(a) The Ontario Building Code

(b) Ontario Installation Code for Oil-burning Equipment

(c) CSA B149.1 Natural Gas and Propane Installation Code

.2 Conduct tests, during progress of Work and at its completion to show equipment and systems meet contract. Submit details of test methods in writing and obtain approval before commencing work.

.3 Supply test equipment, apparatus, gauges, meters and data recorders, together with skilled personnel to perform tests and log results.

.4 Submit written notice 24 hours in advance of each test series, setting out the time, place and nature of the tests, the Inspection Authority and personnel witnessing tests.

.5 Conduct tests before application of external insulation and before any portion of pipes, ducts or equipment is concealed.

.6 Do not subject expansion joints, flexible pipe connections, meters, control valves, convertors, and fixtures, to test pressures, greater than stated working pressure of equipment. Isolate or remove equipment or devices during tests when prescribed test pressure is greater than working pressure of any piece of equipment or device.

.7 Should section of pipe or duct fail under test, replace faulty fittings or duct with new fittings, pipe or duct, repair and retest. Do not repair screwed joints by caulking nor welded joints by peening. Repeat tests until results are satisfactory.

.8 Where it is necessary to test portions of duct or piping system before system is complete, overlap successive tests so that no joint or section of duct or pipe is missed in testing.

.9 Upon completion of work and testing of same, submit logs to demonstrate that tests have been carried out satisfactorily. Repeat any tests if requested.

12.3 POTABLE WATER PIPING

.1 Test potable water systems with water or air as required by The Ontario Building Code, Part 7.

.2 For water service pipes 100 mm (4") and larger, disinfect the pipe with chlorine from the street valve to the first shut-off valve inside the building. Provide testing laboratory certificate confirming water contaminates are below the threshold values in O.Reg. 248/06.

12.4 TESTING - OTHER PIPING

.1 Hydraulically test other water piping systems at 1½ times system design pressure (relief valve setting) or 1000 kPa (150 psi), whichever is greater, for 24 hours. Pressure must remain essentially constant throughout test period without pumping. Make allowance for correction of pressure readings for variations in ambient temperature between start and finish of test. Hammer test welded joints during hydrostatic test.

.2 Test natural gas system to CSA B149.1

.3 Test fuel oil systems to CSA B139

.4 Test drainage, waste and vent piping for tightness and grade as required by The Ontario Building Code, Part 7.

.5 Test special service piping as detailed.

.6 Test high pressure steam piping and compressed air piping in accordance with requirements of local and Provincial Authorities.

12.5 TESTING - VENTILATION

.1 Test ductwork in accordance with procedures detailed.

12.6 TESTING - ELECTRICAL

.1 Make tests of equipment and wiring.

.2 Tests to include meggered insulation values, voltage and current readings to determine balance of panels and feeders under full load and examination of each piece of equipment for correct operation.

.3 Test electrical work to standards and function

of Specification and applicable Codes.

.4 Replace defective equipment and wiring with new material.

.5 Connect single phase loads to minimize unbalance of supply phases.

PART 13 - TEMPORARY AND TRIAL USAGE

13.1 GENERAL

.1 Temporary and trial usage by Owner of any mechanical or electrical device, machinery, apparatus, equipment or any other work or materials before final completion and written acceptance is not to be construed as evidence of acceptance by Owner.

.2 Owner to have privilege of such temporary and trial usage, as soon as that said work is claimed to be completed and in accordance with Contract Documents, for such reasonable length of time as is sufficient for making complete and thorough test of same.

.3 No claims will be considered for damage to or failure of any parts of such work so used which may be discovered during temporary and trial usage, whether caused by weakness or inaccuracy of structural parts or by defective materials or workmanship of any kind whatsoever.

.4 Defects in workmanship and materials identified during temporary and trial usage are to be rectified under guarantee.

PART 14 - SPECIAL TOOLS AND SPARE PARTS

14.1 GENERAL

.1 Furnish spare parts as follows

.1 One set of packing for each pump gland.

.2 One casing joint gasket for each size pump.

.3 One head gasket for each heat exchanger.

.4 One glass for each gauge glass.

.5 One set of V-belts for each drive.

.6 One filter cartridge or set of filter media for each filter or filter bank installed.

PART 15 - CONSULTANT REVIEWS

15.1 GENERAL

.1 Consultant's attendance at site including but not limited to site meetings, demonstrations, site reviews and any resulting reports are for the sole benefit of the Owner and the local authority have jurisdiction.

15.2 SITE REVIEWS

.1 General reviews and progress reviews do not record deficiencies during the course of the Work until such time as a portion or all of the work is declared complete. In some instances before the work is completed, deficiencies may be recorded where the item is indicative of issues such as poor workmanship, incorrect materials or installation methods, or may be difficult to correct at a later date. Any such reported items, or lack thereof, shall not be relied on in any way as part of the Contractors quality assurance program nor relieve the Contractor in the performance of the Work.

.2 Deficiency reviews conducted by the Consultant are performed on a sampling basis, and any deficiency item is to be interpreted as being indicative of similar locations elsewhere in the Work, unless otherwise shown.

15.3 MILESTONE REVIEWS

.1 Specific milestone reviews may be conducted at key stages by the Consultant, including;

.1 before backfilling of buried drainage,

.2 before closing of shafts,

.3 before closing of ceilings,

.4 before closing of walls,

.5 equipment demonstration,

.6 Substantial Performance deficiency review,

.7 Total Performance deficiency review.

.2 Coordinate with the Consultant the type and quantity of milestone reviews required and incorporate these requirements in the construction schedule.

.3 Notify the Consultant in writing seven (7) calendar days in advance of work to be concealed to arrange a site review prior to the Work being concealed where required by the Consultant. Any noted deficiencies are to be corrected before being concealed. Failure to provide notification can result in the Work being exposed for review at the Contractor's cost.

15.4 SUBSTANTIAL PERFORMANCE REVIEW

.1 At the time of applying for project Substantial Performance, submit to Consultant a comprehensive list of items to be completed or corrected.

15.5 FINAL REVIEW

.1 At project completion submit written request for final review of mechanical and electrical systems.

.1 Refer to section 20 08 19 Project Close-Out.

.2 Include with the request a written certification that:

.1 reported deficiencies have been completed,

.2 systems have been balanced and tested and are ready for operation,

.3 completed maintenance and operating data have been submitted and approved,

.4 tags are in place and equipment identification is completed,

.5 cleaning is finished in every respect,

.6 all mechanical equipment surfaces have been touched up with matching paint, or re-finished as required,

.7 spare parts and replacement parts specified have been provided and receipt acknowledged,

.8 As-built and Record drawings are completed and approved,

.9 Owner's operating personnel have been instructed in operation and maintenance of systems,

.10 fire protection verification is 100%

completed and Verification Certificates have been submitted and accepted.

PART 16 - CORRECTION AFTER COMPLETION

16.1 GENERAL

.1 At completion, submit written guarantee undertaking to remedy defects in work for a period of one year from date of substantial completion. This guarantee is not to supplant other guarantees of longer period called for on certain equipment or materials.

.2 Guarantee to encompass replacement of defective parts, materials or equipment, and to include incidental fluids, gaskets, lubricants, supplies, and labour for removal and reinstallation work.

.3 Submit similar guarantee for one year from date of acceptance for any part of work accepted by Owner, before completion of whole work.

PART 17 - ACCESS DOORS

17.1 GENERAL

.1 Provide access doors to be installed at locations where equipment requiring inspection, service, maintenance or adjustment is "built-in" to work of other trades.

.2 Access is required at;

.1 expansion joints,

.2 dampers,

.3 fire dampers,

.4 air valves,

.5 air terminal units,

.6 isolation and control valves ,

.7 pressure reducing valves,

.8 heating or cooling coils,

.9 control wiring junction boxes.

.3 Submit shop drawings showing access door size, type and location.

.4 Construction:

.1 constructed of steel, prime coated,.

.2 flush mounted with 180° opening door, round safety corners, concealed hinges, plaster lock and anchor straps

.3 600 mm x 600 mm (24 in x 24 in) for personnel entry,

.4 300 mm x 450 mm (12 in x 18 in) for hand entry, and

.5 constructed of stainless steel in areas finished with tile or marble surfaces

.6 constructed of stainless steel with neoprene gasketed door in damp and high humidity areas

.7 generally fitted with screwdriver operated latches, except in areas subject to security risks (Public Corridors, Psychiatric Patient Areas, Public Washrooms). In these areas doors to be fitted with keyed cylinder locks with similar keys.

.5 Installation:

.1 Supply access doors and make arrangements and pay for installation by Division in whose work they occur.

.2 Size and locate access doors in applied tile, block or in glazed or unglazed structural tile to suit joint patterns.

.3 Access doors in ceilings, where acoustic tile is applied to plaster or gypsum board, to be dish type designed to receive tile insert.

.4 Access doors are not required in removable ceilings. Provide coloured marking devices after completion of ceilings, at four corners of each panel below point requiring access. Colour code markers to show service or device above.

.5 At time of instruction of owners operating staff, hand-over and obtain signed receipt for 4 sets of each type of key used to lock access doors in secure areas.

PART 18 - DIELECTRIC COUPLINGS

18.1 GENERAL

.1 Provide dielectric isolation between pipes of dissimilar metals with suitable couplings, insulating dielectric unions, insulating flanges, or insulating gaskets between flanges.

.1 Place dielectric isolation between steel piping and bronze or brass valves.

.2 Do not use bronze or brass valves as dielectric fittings.

.2 Insulating unions for pipe sizes NPS 2 and under

.3 Insulating flanges for pipe or tube from NPS 2 to NPS 4

.4 Insulating gaskets for flanges NPS 5 and over:

.1 compatible with pressure and temperature service,

.2 flange bolts run in insulating sleeves with insulating washers under nuts.

PART 19 - DRAIN VALVES

19.1 GENERAL

.1 Provide drain points for piping systems with drain valves at low points and at section isolating valves.

.2 Drain valves: minimum NPS 1/2 straight pattern bronze with hose end male thread, cap and chain.

PART 20 - V-BELT DRIVES

20.1 GENERAL

.1 Provide V-belt drive for each motor driven device which is not direct connected. Keep overhung loads on prime mover shafts within manufacturer's design guidelines.

.2 Sheaves for motors to 7.5 kW (10 hp) with not more than two belts:

.1 cast iron or steel secured to shafts with removable keys.

.2 adjustable pitch on motor, fixed pitch on driven device, giving plus or minus 10% speed range,

.3 selected to meet specified operating condition at mid position in pitch adjustment.

.3 Sheaves for motors over 7.5 kW (10 hp) or drives with three or more belts

.1 cast iron or steel with split tapered bushing and keyway.

.2 fixed pitch.

.4 Belts:

.1 matched sets of 'b' section, selected for service factor of 2.0 based on installed motor horsepower.

.2 capable of carrying load with one belt broken.

.5 Motor slide rails:

.1 adjustment plates for centre line alignment

.2 belt tension adjusting screws.

.6 Installation

.1 Tension belts to manufacturer's recommendations before start-up and after first 100 hr of operation using calibrated belt tensioning gauge.

.2 Provide replacement pulleys and belts during start-up and balancing to suit field operating conditions.

PART 21 - DRIVE AND COUPLING GUARDS

21.1 GENERAL

.1 Provide guards to protect belt drives, flywheels, rotating couplings on equipment and fan inlet and outlets.

.2 Guards:

.1 removable for servicing,

.2 arranged to permit lubrication with guards in place.

.3 Guards for belt drives:

.1 expanded metal screen welded to steel bar stock or angle frame,

.2 minimum 1.2 mm (18 ga) thick galvanized

sheet metal tops and bottoms,

.3 40 mm (1½") diameter holes at both shaft centres for insertion of tachometer.

.4 Flexible coupling and flywheel guards:

.1 Removable "U" shaped, minimum 1.6 mm (16 ga) thick galvanized mild steel or expanded metal mesh on substantial welded angle iron or round barstock frame.

.5 Guards on unprotected fan inlets and outlets:

.1 Minimum 20 mm (¾ in) galvanized wire mesh or expanded metal screen with net free area of guard not less than 80% of fan opening.

.6 Installation

.1 Belt guards to accommodate movement of motors for belt tension adjustment.

.2 Where equipment is installed on resiliently mounted base frame or pad, attach belt guard to this base

.3 Belt guards and fan inlet guards may be omitted where fan and motor is installed in plenum less than 1.4 m (4 ft) high and disconnect for fan motor is mounted adjacent to and outside access door to plenum.

.4 Fan inlet guards may be omitted where fan is fitted with inlet guide vanes.

PART 22 - SLEEVES

22.1 GENERAL

.1 Sleeve pipes, ducts and conduits passing through masonry walls, concrete floors, and fire rated gypsum board ceilings and partitions.

.2 Maintain fire rating integrity where pipes and ducts pass through fire rated walls, floors and partitions.

22.2 FLOOR AND WALL SLEEVES

.1 Sleeves in fire separations:

.1 sized to suit fire stopping methods employed for bare pipes, conduits, insulated pipes, and bare and insulated ducts without fire dampers, and

.2 sized to suit conditions of approval given in manufacturers installation instructions for fire and smoke dampers.

.2 Sleeves in other construction:

.1 sized to clear insulated pipes and ducts by 13 mm (½ in) all round, and

.2 sized to clear conduits, bare pipes, and bare ducts by 6 mm (¼ in) all round.

.3 Sleeves for pipes, conduits and ducts smaller than 0.4 m^2 (4 sq ft) through solid walls and floors:

.1 Schedule 40 steel pipe or 1 mm (20 ga) (minimum) sheet metal, lapped and spot welded.

.2 Sleeves for pipes, conduits and ducts smaller than 0.4 m^2 (4 sq ft) through gypsum board partitions:

(a) 1 mm (20 ga) minimum sheet metal, lapped and spot welded with 20 mm (¾ in) lip flange at one and.

.4 Sleeves for ducts 0.4 m^2 (4 sq ft) and larger through walls and floors:

.1 1.6 mm (16 ga) minimum sheet metal, lapped and spot welded with 20 mm (¾ in) lip flange at one end.

22.3 WATERPROOF SLEEVES

.1 Applications:

.1 where pipes and ducts pass through floors in areas subject to water, in mechanical rooms, in kitchens, in washing areas and in slabs over electric and telephone rooms.

.2 Waterproof sleeves for pipes and conduits:

.1 Schedule 40 pipe, with 75 mm (3 in) wide annular fin continuously welded at midpoint, hot dip galvanized after fabrication.

.3 Waterproof sleeves for ducts less than 0.4 m^2 (4 sq ft):

.1 1 mm (20 ga) galvanized steel, with 40 mm (1½ in) flange at midpoint.

.4 Waterproof sleeves for ducts 0.4 m^2 (4 sq ft) and larger and openings with multiple ducts:

.1 1.6 mm (16 ga) galvanized steel, with 40 mm (1½ in) flange at midpoint, or,

.2 form opening with wood (removed after

concrete is set) and trim opening with welded steel angle frame 75 mm (3 in) high , bolted to slab and caulked, or,

.3 trim opening with 75 mm x 75 mm (3 in x 3 in) continuous concrete curb doweled to slab.

.5 Modifications for existing construction:

.1 annular fins and flanges attached to sleeve at point equivalent to surrounding floor level or curb.

22.4 INSTALLATION

.1 Place and secure sleeves in concrete form work.

.2 Supply sleeves to be set in concrete and masonry walls with installation detail drawings.

.3 Regular sleeves;

.1 terminate flush with surfaces of concrete and masonry walls.

.4 Waterproof sleeves in new construction;

.1 extend 75 mm (3 in) above finished floor.

.2 with flange embedded within concrete floor.

.5 Sleeves in existing concrete and masonry walls and floors;

.1 installed in neatly cut or drilled holes in existing construction,

.2 cutting and drilling of structural elements, such as floors, slabs, walls, columns, or beams to be carried out in accordance with procedure set out in Article "Cutting and Patching" below.

.3 terminate sleeves flush with surfaces of concrete and masonry walls,

.4 extend waterproof sleeves 75 mm (3 in) above finished floor with flange, countersunk, and bolted down flush into floor surface,

.5 fill opening between sleeve and wall or floor with 2 hour fire rated fire-stopping sealant with water barrier.

.6 Fill future-use sleeves with weak concrete, gypsum plaster or similar material.

.7 Coat exposed exterior surfaces of un-galvanized ferrous sleeves with heavy application of zinc rich paint

.8 At fire separations and smoke separations, pack and seal void between sleeve and pipe, duct without fire damper, conduit, or insulation in accordance with Article "Fire Stopping and Smoke Seals" in this Section.

.9 At other locations, pack void between sleeve and pipe, conduit, duct or insulation for full depth of sleeve, with mineral wool and seal with silicone-free caulking compound.

.10 Install fire dampers in accordance with conditions of approval given in manufacturer's instructions.

PART 23 - FIRE STOPPING AND SMOKE SEALS

23.1 GENERAL

.1 Provide fire stopping and smoke seals where ducts, pipes or conduits penetrate fire separations. Materials to be supplied, worker training to be arranged, and installation to be supervised, by a specialist firm with an established reputation in this field.

.2 Fire stop materials to be impervious to water when installed in a horizontal separation, including waterproof service sleeves.

23.2 PRODUCTS

.1 Materials to form ULC listed or cUL listed/classified assemblies.

.2 Other manufacturers having products with explicitly similar characteristics, listings or classifications and approvals are acceptable.

23.3 INSTALLATION

.1 Seal space between penetrating service and sleeve or opening in slab with firestop and smoke sealing system in strict accordance with terms and conditions of original ULC or cUL listing and manufacturers recommended procedures.

.2 Select thickness and arrangement of back-up materials to suit size of service, length of sleeve and anticipated movement.

.3 Select firestopping system to allow insulation and vapour barrier to pass un-broken through assembly.

.4 Surfaces to be clean, dry and free from dust, oil, grease, loose or flaking paint and foreign materials at time of application of materials

.5 Do not apply fire stopping materials to fire or smoke dampers.

PART 24 - WALL AND FLOOR PLATES

24.1 GENERAL

.1 Fit pipes passing through walls, floors and ceilings in finished areas with escutcheon, wall or floor plates.

.2 Plates:

.1 at floor; chrome plated two piece split type with hinge.

.2 at walls and ceilings; similar to floor plate but with set screw to fasten plate to pipe.

24.1 INSTALLATION

.1 Plates:

.1 sized to cover sleeves

.2 secured tight against finished surfaces, and

.3 fitted to cover sleeve extensions where sleeves extend above finished floor.

PART 25 - LINK SEALS

25.1 GENERAL

.1 Fit each pipe passing through floor slab in contact with ground or basement walls below grade with link seal between sleeve and bare pipe.

.2 Submit manufacturer’s literature and schedule showing location, service, inside diameter of wall opening, sleeve length and pipe outside diameter.

.3 Link seal:

.1 Manufactured from modular synthetic rubber links with stainless steel hardware.

.2 Loosely assembled with bolts to form continuous rubber belt around pipe, with pressure plate under each bolt head and nut.

.3 Constructed to provide electrical insulation between pipe and sleeve.

.4 Installation

.1 Determine inside diameter of each wall opening or sleeve before ordering seal.

.2 Position seal in sleeve around pipe and tighten bolts to expand rubber links until watertight seal is obtained.

PART 26 - PLATFORMS, LADDERS, COVERS, PIPE SUPPORTS, EQUIPMENT SUPPORTS AND BASES

26.1 SUPPORTS FOR MECHANICAL AND ELECTRICAL WORK

.1 Fabricate platforms, gratings, ladders, piping and equipment supplementary supporting steel, and trench and pit covers, from steel and provided by this Division.

.2 Concrete housekeeping bases for mechanical and electrical equipment which are in direct contact with floor slab, to be provided by this Division.

.3 Concrete bases for equipment supported on vibration isolation materials (inertia pads), to be provided by this Division.

.4 Work to be done by firms specializing in these fields.

.5 Submit shop drawings for steel and concrete work, prepared by licensed Professional Engineers.

26.2 APPLICABLE CODES AND STANDARDS

.1 Ministry of Labour

.1 Engineering Data Sheets

.2 Health and Safety Guidelines

.3 Industrial Alert Bulletins

.2 Regulations made under the Occupational Health and Safety Act;

.1 Regulations for Industrial Establishments

.2 Regulations for Health Care and Residential Facilities

.3 The Ontario Building Code

.4 American Society for Testing and Materials (ASTM)

.1 ASTM A 53/A53M, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.2 ASTM A 269, Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

.3 ASTM A 307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.5 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.40, Anti-corrosive Structural Steel Alkyd Primer.

.2 CAN/CGSB-1.108, Bituminous Solvent Type Paint.

.3 CAN/CGSB-1.181, Ready-Mixed, Organic Zinc-Rich Coating.

.6 Canadian Standards Association (CSA)

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

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

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

.4 CSA W59, Welded Steel Construction (Metal Arc Welding).

26.3 SUPPLEMENTARY SUPPORTS AND SUPPORT BRACKETS

.1 Fabricated from structural grade steel with anchor bolts and fastenings.

.2 Designed in consultation with building

structural consultant to transfer live loads and dead loads to building structural elements,

.3 Constructed as frames bracketed from walls, and/or supported from building structure above, and/or floor below.

26.4 PLATFORMS, LADDERS, AND GRATINGS

.1 Vertical ladders:

.1 fabricated with steel sides, 50 mm x 10 mm (2 in x ⅜ in) and 350 mm (14 in) apart with 20 mm (¾ in) round bars 300 mm (12 in) on centres secured to sides.

.2 designed to carry live load of 7.5 kPa (150 lb/sq ft) uniformly distributed.

.2 Platforms:

.1 supported from building structure.

.2 fitted with toe angle carried around outside of platform and extending at least 100 mm (4 in) above top of platform.

.3 covered with open steel floorway grating with pressed diagonal spacing bars. Bars to be 30 mm x 3 mm (1¼ in x ⅛ in).

.3 Gratings:

.1 made up in convenient lengths and arranged so that sections may be removed.

.2 full width shown on drawings

.3 fitted with toe angle carried around outside of grating, and extending at least 100 mm (4 in) above top of grating

.4 hot dipped galvanized after fabrication.

.4 Steel pipe railing:

.1 1070 mm (42 in) high, with intermediate rail 535 mm (21 in) high, around platforms on both sides, except where platform is within 150 mm (6 in) of building wall.

.2 made of 40 mm (1½ in) standard steel pipe with pipe rail fittings and vertical pipe supports secured to platform structure not over 2 m (6 ft 6 in) apart.

.5 Sleeves through grating:

.1 mild steel pipe sleeves of sufficient size

for pipe and insulation.

.2 welded to adjacent bars of platform so that platform strength is maintained.

.3 extend up at least 75 mm (3 in) above top of grating.

.6 Equipment openings through gratings:

.1 fitted with toe angles around equipment, framed to support grating and extending up at least 75 mm (3 in) above top of grating.

.7 Stairs:

.1 bolted to floor construction and masonry walls or steel framing of landing.

.2 treads of same grating as platforms.

.3 maximum rise 190 mm (7⅞ in), minimum run 230 mm (9 in)

.4 supported on steel carrier angles at stringers with reinforcing and carrier angles not less than 30 mm x 30 mm x 6 mm (1¼ in x 1¼ in x ¼ in).

.5 steel channel stringers continuous around landing and secured to masonry.

.8 Finish - Outdoor:

.1 Hot-dipped galvanized after fabrication for outdoor installations.

.9 Finish - Indoor:

.1 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.

.2 Use primer unadulterated, as prepared by manufacturer.

.3 Paint on dry surfaces, free from rust, scale, grease.

.4 Do not paint when temperature is lower than 7°C.

.5 Clean surfaces to be field welded; do not paint.

26.5 TRENCH COVERS, AND PIT COVERS

.1 Fabricated with:

.1 75 mm x 75 mm x 9.5 mm (3 in x 3 in x ⅜ in) welded angle frame with anchor bars,

.2 25 mm x 9.5 mm (1 in x ⅜ in) trim bar to fit concrete pit, and with matching chequer plate cover,

.3 hot dip galvanized after fabrication

26.6 CONCRETE BASES FOR HOUSEKEEPING PADS

.1 Constructed using plywood form work and 20 Mpa (3000 lb) concrete,

.2 Doweled to concrete floor slab with not less than 13 mm (½ in) diameter steel rods.

.3 Plan dimensions:

.1 75 mm (3 in) larger all around than base of apparatus for non-seismic applications,

.2 200 mm (8 in) larger all around than base of apparatus for seismically restrained equipment, and

.3 finished to make smooth, neat surfaces with corners chamfered 25 mm (1 in).

.4 Height conforming to following table;

Equipment	Floor Type	Vibration Isolation	Thickness of Housekeeping Pad mm (in)
Stationary, not motorized	All	All	100 (4)
Motorized, up to 7.5kW (10 HP)	All	---	150 (6) (max. for fans)
Motorized, 11 to 19kW (15 to 25 HP)	Slab on Grade	No	250 (10)
	Slab on Grade	Yes	150 (6)
	Suspended Slab	Yes	150 (6)
Motorized, 22kW (30 HP) and over	Slab on Grade	No	300 (12)
	Slab on Grade	Yes	150 (6)
	Suspended Slab	Yes	150 (6)

26.7 INSTALLATION - GENERAL

.1 Locate supporting steel to permit removal of parts for service or repair, and to allow clear access to valves, fittings, and equipment,

.2 Set equipment on supporting frames and brackets and install hangers, anchor bolts, vibration mountings and snubbers.

.3 Set equipment base plates on housekeeping pads on minimum 13 mm (½ in) epoxy grout and fill hollow portion of base with concrete.

.4 Install anchor bolts, vibration mountings and snubbers between equipment and housekeeping pad, or inertia pad and housekeeping pad.

.5 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.

.6 Provide anchorage, dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.

.7 Make field connections with bolts to CAN/CSA-S16.1, or weld.

.8 Supply items for casting into concrete or building into masonry to appropriate trades together with setting templates.

.9 Touch-up field welds, bolts and burnt or scratched surfaces after completion of erection with primer.

.10 Where gratings or trench covers are cut in field or damaged, touch up with zinc rich paint.

.11 Provide 3mm (1/8") thick PTFE (teflon) glide pads beneath each support leg.

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE

.1 Provide labour, materials and equipment for installation, testing and putting into operation plumbing and drainage systems.

1.2 QUALIFIED TRADESMEN

.1 Work to be done by qualified and recognized firm with an established reputation in this field using tradesmen holding certificates of competency.

1.3 APPLICABLE CODES AND STANDARDS

.1 Ontario Building Code

.2 Regulations of Province, City, or local authority having jurisdiction.

.3 CSA B272 Pre-Fabricated Self Sealing Roof Vent Flashings

.4 AWWA C651, Disinfecting Water Mains.

.5 O.Reg. 212/01 Gaseous Fuels, and related code adoption document.

.6 O.Reg. 215/01 Fuel Industry Certificates

.7 CSA B149.1 Natural Gas and Propane Installation Code

1.4 QUALIFICAITONS

.1 Contractors performing work on natural gas or propane systems to be licensed as a gas and propane installer under O.Reg. 215/01, by the Technical Standards and Safety Authority.

PART 2 - PRODUCTS

2.1 FLASHING

.1 Through-roof penetration flashing, and other waterproofed areas:

.1 manufactured from composite material,

.2 minimum dimensions of 500 mm x 500 mm (20 in x 20 in),

.3 with sleeve extending at least 150 mm (6 in) above roof.

PART 3 - INSTALLATION

3.1 PIPING

.1 Piping system routing is shown diagrammatically. Locate mains, risers and runouts concealed behind furrings or above ceilings except in mechanical equipment rooms and access spaces where piping is to be exposed.

.2 Determine areas without ceilings from Architectural Drawings and Room Finish Schedules, and in these areas keep piping as high as possible.

.3 Anchor, guide and support vertical and horizontal runs of piping to resist dead load and absorb thrust.

3.2 DOMESTIC COLD WATER SYSTEM DISTRIBUTION

.1 Extend existing domestic cold water system with

.1 distribution pipe and fittings,

.2 valves,

.3 premises backflow isolation,

.4 zone or equipment backflow protection.

.2 Provide valved connections from supply system, to fixtures and other equipment requiring cold water.

3.3 DOMESTIC HOT WATER SYSTEM DISTRIBUTION

.1 Extend existing domestic hot water system with

.1 distribution pipe and fittings

.2 valves

.3 zone or equipment backflow protection.

.2 Provide valved connections from hot water supply system to fixtures and other equipment requiring hot water.

3.4 DOMESTIC HOT WATER RECIRCULATION SYSTEM

.1 Extend existing domestic hot water recirculation system with

.1 distribution pipe and fittings

.2 valves

.2 Install recirculation piping as shown.

3.5 NATURAL GAS PIPING

.1 Extend service and provide distribution piping, valves and connections to equipment as shown.

3.6 DRAINAGE

.1 Provide roof drains and storm drainage piping system.

.2 Provide waste and vent connections to plumbing fixtures and equipment.

.3 Fittings;

.1 Do not use double hubs, straight crosses, double T's, or double TY's in soil or waste pipe below any fixture.

.2 Do not use branch fittings other than full "Y" or "Y" and an eighth bend, on soil or waste pipe running in horizontal direction.

.3 Do not use quarter bend placed on its side.

.4 Do not use inverted joints below fixtures.

.5 Do not install cleanouts above food preparation or patient treatment areas. In these areas carry rodding connection up to floor cleanout fitted with adjustable gasketted access cover and plug, with cleanout body cast in floor slab above.

.6 Drainage fittings to match connected piping for quality and wall thickness.

3.7 FLASHING

.1 Provide flashing for piping penetrations through roofs and other waterproofed areas. Leave flashing ready for Roofing or Waterproofing Trades to make watertight connections.

3.8 VENT TERMINATION (VRT)

.1 Fit vents passing through roof with vent stack sleeve terminating not less than 150 mm (6 in) above roof, above flood level of roof, and 900 mm (3 ft) above or 3500 mm (11.5 ft) horizontally from any air intake, door, or operable window.

3.9 FLUSHING AND CLEANING - BUILDING WATER DISTRIBUTION PIPING

.1 Conduct first fill and pressure testing of building distribution piping only after

completion of flushing and disinfection of water service pipe.

.2 Complete piping pressure tests prior to flushing and cleaning operations.

.3 Flush water distribution piping through available outlets with sufficient flow to produce velocity of 1.5 m/s, within pipe for 10 minutes, or until foreign materials have been removed and flushed water is clear.

.4 Minimum flushing flowrates:

Pipe size	Minimum Flow	
NPS	L/s	usgpm
2	3.3	52
2 1/2	4.7	75
3	7.3	115
4	12.6	200

.5 Open and close valves, hydrants and service connections to ensure thorough flushing.

END OF SECTION

PART 1 - GENERAL

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME).
.1 ANSI/ASME B16.24-2001(2006), Cast Copper Alloy Pipe Flanges and Flanged Fittings.

.2 American Society of Mechanical Engineers International (ASME)
.1 ASME B16.15-2013, Cast Copper Alloy Threaded Fittings: Classes 125 and 250.
.2 ASME B16.18-2012, Cast Copper Alloy Solder Joint Pressure Fittings.
.3 ASME B16.22-2001(R2005), Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

.3 ASTM International Inc. (ASTM)
.1 ASTM A307-12, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.
.2 ASTM B88M-13, Standard Specification for Seamless Copper Water Tube (Metric).

.4 American Water Works Association (AWWA)
.1 AWWA C111-12, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

.5 Canadian Standards Association (CSA International)
.1 CSA B242-05(R2011), Groove and Shoulder Type Mechanical Pipe Couplings.

.6 Department of Justice Canada (Jus)
.1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).

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

.8 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
.1 MSS-SP-67-2011, Butterfly Valves.
.2 MSS-SP-70-2011, Gray Iron Gate Valves, Flanged and Threaded Ends.
.3 MSS-SP-71-2011, Gray Iron Swing Check Valves, Flanged and Threaded Ends.

.4 MSS-SP-80-2013, Bronze Gate, Globe, Angle and Check Valves.

.9 National Research Council (NRC)/Institute for Research in Construction
.1 NRCC 47668, National Plumbing Code of Canada (NPC) - 2010.

.10 Transport Canada (TC)
.1 Transportation of Dangerous Goods Act, 1992, c. 34 (TDGA).

PART 2 - PRODUCTS

2.1 PIPING

.1 Domestic hot, cold and recirculation systems, within building.
.1 Above ground: copper tube, hard drawn, type L: to ASTM B88M.
.2 Buried or embedded: copper tube, soft annealed, type K: to ASTM B88M, in long lengths and with no buried joints.

.2 Tube to have certification markings made by testing agency accredited by Standards Council of Canada.

2.2 FITTINGS

.1 Bronze pipe flanges and flanged fittings: to ANSI/ASME B16.24.

.2 Cast bronze threaded fittings: to ASME B16.15.

.3 Cast copper, solder type: to ASME B16.18.

.4 Wrought copper and copper alloy, solder type: to ASME B16.22.

.5 NPS 2 and larger: roll grooved to CSA B242.

2.3 JOINTS

.1 Rubber gaskets, 1.6 mm (1/16 in) thick to AWWA C111.

.2 Bolts, nuts, hex head and washers: heavy series bolts, hexagonal head pattern to ASTM A307, nuts to ASTM 563, and washers.

.3 Solder: tin antimony solder, 95:5 to ASTM B-32.

.4 Teflon tape: for threaded joints.

.5 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.

2.4 GATE VALVES

.1 NPS 2 and under, soldered:
.1 1000 kPa (150 psi),to MSS SP-80, Class 150,bronze body, solid wedge bronze disc, rising stem, screw in, or union bonnet.

.2 NPS 2 and under, screwed:
.1 1000 kPa (150 psi), to MSS SP-80, Class 150, bronze body, solid wedge disc, rising stem, screw in, or union bonnet.

2.5 GLOBE VALVES

.1 NPS2 and under, soldered:
.1 850 kPa (125 psi),to MSS SP-80, 300 CWP, bronze body, renewable composition PTFE disc, threaded over bonnet., lock shield handles as indicated.

.2 NPS 2 and under, screwed:
.1 1000 kPa (150 psi),to MSS SP-80, Class 150, bronze body, renewable composition PTFE disc, union bonnet, lock shield handles as indicated.

2.6 SWING CHECK VALVES

.1 NPS 2 and under, soldered:
.1 850 kPa (125 psi), to MSS SP-80, Class 125, bronze body, bronze swing disc, regrindable seat, screw-in cap.

.2 NPS 2 and under, screwed:
.1 850 kPa (125 psi), to MSS SP-80, Class 125, bronze body, bronze swing disc, regrindable seat, screw-in cap..

2.7 BALL VALVES

.1 NPS 2 and under, screwed:
.1 1000 kPa (150 psi) Copper alloy body, plug type stem with flow measurement ports and tamper-proof setting.

.2 NPS 2 and under, soldered:
.1 1000 kPa (150 psi), two piece bronze body

and chrome plated bronze ball, PTFE seat rings, solder joint or NPT to copper adapters, full port.
.2 handle extensions suitable to clear 50 mm (2 in) pipe insulation thickness.

PART 3 - EXECUTION

3.1 APPLICATIONS

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 Install in accordance with NPC, Ontario Plumbing Code and local authority having jurisdiction.

.2 Install pipe work in accordance with Section 23 05 01, supplemented as specified herein.

.3 Assemble piping using fittings manufactured to ANSI standards.

.4 Install CWS piping below and away from HWS and HWC and other hot piping so as to maintain temperature of cold water as low as possible.

.5 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

.6 Buried tubing:
.1 Lay in well compacted washed sand in accordance with AWWA Class B bedding.
.2 Bend tubing without crimping or constriction. Minimize use of fittings.

.7 Insulate all domestic hot and cold water piping.

3.3 VALVES

.1 Isolate equipment, fixtures and branches with ball valves.

.2 Balance recirculation system using lockshield globe valves. Mark settings and record on

as-built drawings on completion.

3.4 PRESSURE TESTS

.1 Conform to requirements of Section 21 05 01.

.2 Test pressure: greater of 1 times maximum system operating pressure or 860 kPa.

3.5 FLUSHING TEST

.1 Flush entire system for 8 h. Ensure outlets flushed for 2 h. Let stand for 24 h, then draw one sample off longest run. Submit to testing laboratory to verify that system is clean copper to Federal potable water guidelines. Let system flush for additional 2 h, then draw off another sample for testing.

3.6 PRE-START-UP INSPECTIONS

.1 Systems to be complete, prior to flushing, testing and start-up.

.2 Verify that system can be completely drained.

.3 Ensure that pressure booster systems are operating properly.

.4 Ensure that air chambers, expansion compensators are installed properly.

3.7 DISINFECTION

.1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction.

.2 Upon completion, provide laboratory test reports on water quality for Departmental Representative approval.

3.8 START-UP

.1 Timing: Start up after:
.1 Pressure tests have been completed.
.2 Disinfection procedures have been completed.
.3 Certificate of static completion has been issued.
.4 Water treatment systems operational.

.2 Provide continuous supervision during start-up.

.3 Start-up procedures:
.1 Establish circulation and ensure that air is eliminated.
.2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.
.3 Bring HWS storage tank up to design temperature slowly.
.4 Monitor piping HWS and HWC piping systems for freedom of movement, pipe expansion as designed.
.5 Check control, limit, safety devices for normal and safe operation.

.4 Rectify start-up deficiencies.

3.9 PERFORMANCE VERIFICATION

.1 Scheduling:
.1 Verify system performance after pressure and leakage tests and disinfection are completed, and Certificate of Completion has been issued by authority having jurisdiction.

.2 Procedures:
.1 Verify that flow rate and pressure meet Design Criteria.
.2 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.
.3 Sterilize HWS and HWC systems for Legionella control.
.4 Verify performance of temperature controls.
.5 Verify compliance with safety and health requirements.
.7 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers. Repeat for outlets and flush valves.
.8 Confirm water quality consistent with supply standards, and ensure no residuals remain as result of flushing or cleaning.

END OF SECTION

PART 1 - GENERAL

1.2 REFERENCES

.1 ASTM International Inc.
.1 ASTM B32-08(2014), Standard Specification for Solder Metal.
.2 ASTM B306-13, Standard Specification for Copper Drainage Tube (DWV).
.3 ASTM C564-14, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

.2 Canadian Standards Association (CSA International).
.1 CSA B67-1972(R1996), Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories. NOT ON CSA WEB SITE use another reference standard.
.2 CAN/CSA-B70-12, Cast Iron Soil Pipe, Fittings and Means of Joining.
.3 CSA B125.3-12, Plumbing Fittings.

.3 Green Seal Environmental Standards (GSES)
.1 Standard GS-36-00, Commercial Adhesives.

.4 South Coast Air Quality Management District (SCAQMD), California State
.1 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

.1 Above ground sanitary Type DWV to: ASTM B306.
.1 Fittings.
.1 Cast brass: to CSA B125.3.
.2 Wrought copper: to CSA B125.3.
.2 Solder: tin-95:5, type K, to ASTM B32.

2.2 CAST IRON PIPING AND FITTINGS

.1 Buried sanitary and vent minimum NPS 3, to: CAN/CSA-B70, with one layer of protective bituminous coating.
.1 Joints:
.1 Mechanical joints:
.1 Neoprene or butyl rubber compression gaskets: to CAN/CSA-B70. ASTM C564 or
.2 Stainless steel clamps.
.2 Hub and spigot:

.1 Caulking lead: to CSA B67.
.2 Cold caulking compounds.

.2 Above ground sanitary storm and vent: to CAN/CSA-B70.
.1 Joints:
.1 Hub and spigot:
.1 Caulking lead: to CSA B67.
.2 Mechanical joints:
.1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.

PART 3 - EXECUTION

3.1 APPLICATIONS

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 Install in accordance with National Plumbing Code, Provincial Plumbing Code, local authority having jurisdiction.

.2 Slope pipe in accordance with applicable codes.

3.3 FLASHING

.1 Provide flashing for piping penetrations through roofs and other waterproofed areas. Leave flashing ready for Roofing or Waterproofing Trades to make watertight connections.

3.4 Vent termination (VTR)

.1 Fit plumbing vents passing through roof with vent stack sleeve terminating not less than 150 mm (6 in) above roof, above flood level of roof, and 900 mm (3 ft) above or 3500 mm (11.5 ft) horizontally from any air intake, door, or operable window.

3.5 TESTING

.1 Pressure test buried systems before backfilling.

.2 Hydraulically test to verify grades and freedom from obstructions.

3.6 PERFORMANCE

.1 Cleanouts:

VERIFICATION

.1 Ensure accessible and that access doors are correctly located.
.2 Open, cover with linseed oil and re-seal.
.3 Verify that cleanout rods can probe as far as the next cleanout, at least.

.2 Test to ensure traps are fully and permanently primed.

.3 Ensure that fixtures are properly anchored, connected to system and effectively vented.

.4 Affix applicable label (storm, sanitary, vent, pump discharge etc.) c/w directional arrows every floor or 4.5 m (whichever is less).

END OF SECTION

PART 1 - GENERAL

1.2 REFERENCES

.1 ASTM International Inc.
.1 ASTM D2235-04(2011), Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
.2 ASTM D2564-12, Standard Specification for Solvent Cements for Poly(Vinyl-Chloride) (PVC) Plastic Piping Systems.

.2 Canadian Standards Association (CSA International)
.1 CSA B1800-15, Thermoplastic Nonpressure Piping Compendium.

.3 Green Seal Environmental Standards (GSES)
.1 Standard GS-36-00, Commercial Adhesives.

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

.5 South Coast Air Quality Management District (SCAQMD), California State
.1 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

PART 2 - PRODUCTS

2.1 PIPING AND FITTINGS

.1 For buried and/or above ground DWV piping to:
.1 CSA B1800.

2.2 JOINTS

.1 Solvent weld for PVC: to ASTM D2564.

.2 Solvent weld for ABS: to ASTM D2235.

PART 3 - EXECUTION

3.1 APPLICATIONS

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 Install in accordance with National Plumbing Code, Provincial Plumbing Code, local authority having jurisdiction.

3.3 FLASHING

.1 Provide flashing for piping penetrations through roofs and other waterproofed areas. Leave flashing ready for Roofing or Waterproofing Trades to make watertight connections.

3.5 Vent termination (VTR)

.1 Fit plumbing vents passing through roof with vent stack sleeve terminating not less than 150 mm (6 in) above roof, above flood level of roof, and 900 mm (3 ft) above or 3500 mm (11.5 ft) horizontally from any air intake, door, or operable window.

3.6 TESTING

.1 Pressure test buried systems before backfilling.

.2 Hydraulically test to verify grades and freedom from obstructions.

.3 Slope pipe in accordance with applicable codes.

3.7 PERFORMANCE VERIFICATION

.1 Cleanouts:
.1 Ensure accessible and that access doors are correctly located.
.2 Open, cover with linseed oil and re-seal.
.3 Verify cleanout rods can probe as far as the next cleanout, at least.

.2 Test to ensure traps are fully and permanently primed.

.3 Storm water drainage:
.1 Verify domes are secure.
.2 Ensure weirs are correctly sized and installed correctly.
.3 Verify provisions for movement of roof system.

.4 Ensure fixtures are properly anchored, connected to system and effectively vented.

.5 Affix applicable label (storm, sanitary, vent, pump discharge) c/w directional arrows every

floor or 4.5 m (whichever is less).

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Section Includes:
.1 The supply and installation of Plumbing Fixtures and Trim.

.3 Products Installed but not Supplied Under this Section:
.1 Install rough-in for equipment supplied by others, complete with valves on hot and cold water supplies, waste and vent.
.2 Equipment installed by others.
.1 Connect with unions.
.3 Equipment not installed.
.1 Capped for future connection by others.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).
.1 CAN/CSA-B45 Series-02(R2013), Plumbing Fixtures.
.2 CSA B125.3-12, Plumbing Fittings.
.3 CSA B651-12, Accessible Design for the Built Environment.

.2 American Society for Mechanical Engineers (ASME)/Canadian Standards Association(CSA International).
.1 ASME A112.18.1-2012/CSA B125.1-12, Plumbing Supply Fittings.
.2 ASME A112.18.2-2011/CSA B125.2-11, Plumbing Waste Fittings.

1.3 SUBMITTALS

.1 Submit shop drawings and product data
.1 Indicate, for all fixtures and trim:
.1 Dimensions, construction details, roughing-in dimensions.

.3 Closeout Submittals:
.2 Include:
.1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.
.2 Details of operation, servicing, maintenance.
.3 List of recommended spare parts.

1.4 QUALITY ASSURANCE

.1 Health and Safety:
.1 Do construction occupational health and safety in accordance with Section 01 35 29.

PART 2 - PRODUCTS

2.2 MANUFACTURED UNITS

.1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.

.2 Trim, fittings: manufacture in accordance with CSA B125.

.3 Exposed plumbing brass to be chrome plated.

.4 Number, locations: architectural drawings to govern.

.5 Fixtures in any one location to be product of one manufacturer and of same type.

.6 Trim in any one location to be product of one manufacturer and of same type.

.7 Stainless steel counter-top sinkS

.1 S-1: single compartment, ledge back

.1 Single Bowl Countertop Mount Sink, 2 holes 4" (102 mm) center, 384 mm (15-1/8") wide x 392 mm (15-7/16") long x 152 mm (6") high deep, counter mounted, backledge, grade 18-10 20 GA. (0.9 mm) type 302 stainless steel, self-rimming, satin finish rim and bowls, mounting kit provided, fully undercoated to reduce condensation and resonance, factory applied rim seal, 3-1/2" (89 mm) crumb cup waste assembly with 1-1/2" (38 mm) tailpiece.

.2 Two handle Faucet, chrome plated, 4" (102 mm) centerset, lead free (equal or less than 0.25%) cast brass body, 1/4 turn ceramic disc valve cartridges, 5.7 LPM (1.5 GPM) laminar flow control insert in spout inlet, plain end outlet, 136 mm (5-3/8") projection flow control rigid/swing gooseneck spout, 102 mm (4") metal vandal proof wristblade handles with blue and red index buttons.

.3 Below Deck Mechanical Water Mixing Valve, bronze body, temperature adjusting dial, 10 mm (3/8") inlets and outlet compression fittings, high temperature thermostatic limit stop, shut-off with automatic reset when temperature exceeds

120 °F (48.8 °C), integral checks, offer temperature range from full cold through 46 °C (114.8 °F). Provide tee, adaptors and flex. copper tubing to suit installation. Provide tempered water to hot side of faucet.

.4 Faucet Supplies, chrome plated finish polished brass, commercial duty 1/4 turn ball valve angle stops, 13 mm (1/2") I.D. Inlet x 127 mm (5") horizontal extension tubes, combination V.P. Loose key handles, escutcheon and flexible copper risers.

.5 Trap, heavy cast brass adjustable body, with slip nut, 38 mm (1-1/2") size, box flange and seamless tubular wall bend

.6 Sanitary Covering vandal-resistant, flexible seamless moulded closed-cell PVC resin, formulated with anti-microbial additive to limit the growth of fungus and bacteria, to exposed piping (to protect against heat/contusions) as per local codes.

.2 S-2: single compartment, ledge back.

.1 Single Bowl Countertop Mount Sink, 2 holes 4" (102 mm) center, 651 mm (25-5/8") wide x 560 mm (22-1/16") long x 305 mm (12") high deep, counter mounted, backledge, grade 18-10 18 GA. (1.2 mm) type 304 stainless steel, self-rimming, satin finish rim and bowls, mounting kit provided, fully undercoated to reduce condensation and resonance, factory applied rim seal, 3-1/2" (89 mm) vandal resistant grid with 1-1/2" (38 mm) tailpiece.

.2 Two handle Faucet, chrome plated, 4" (102 mm) centerset, lead free (equal or less than 0.25%) cast brass body, 1/4 turn ceramic disc valve cartridges, 5.7 LPM (1.5 GPM) laminar flow control insert in spout inlet, plain end outlet, 136 mm (5-3/8") projection flow control rigid/swing gooseneck spout, 102 mm (4") metal vandal proof wristblade handles with

blue and red index buttons.

.3 Below Deck Mechanical Water Mixing Valve, bronze body, temperature adjusting dial, 10 mm (3/8") inlets and outlet compression fittings, high temperature thermostatic limit stop, shut-off with automatic reset when temperature exceeds 120 °F (48.8 °C), integral checks, offer temperature range from full cold through 46 °C (114.8 °F). Provide tee, adaptors and flex. copper tubing to suit installation. Provide tempered water to hot side of faucet.

.4 Faucet Supplies, chrome plated finish polished brass, commercial duty 1/4 turn ball valve angle stops, 13 mm (1/2") I.D. Inlet x 127 mm (5") horizontal extension tubes, combination V.P. Loose key handles, escutcheon and flexible copper risers.

.5 Trap, heavy cast brass adjustable body, with slip nut, 38 mm (1-1/2") size, box flange and seamless tubular wall bend

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Mounting heights:

.1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.

.2 Wall-hung fixtures: measured from finished floor.

.3 Physically handicapped: to comply with most stringent of either NBCC and CSA B651.

3.2 ADJUSTING

.1 Conform to water conservation requirements specified this section.

.2 Adjustments:

.1 Adjust water flow rate to design flow rates.

.2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.

.3 Checks:

.1 Aerators: operation, cleanliness.

.2 Vacuum breakers, backflow preventers: operation under all conditions.

.3 Wash fountains: operation of flow-actuating devices.

.4 Thermostatic controls:
.1 Verify temperature settings, operation of control, limit and safety controls.

3.3 VERIFICATION

.1 Verification requirements in accordance with Section 01 47 17, include:
.1 Materials and resources.
.2 Storage and collection of recyclables.
.3 Construction waste management.
.4 Resource reuse.
.5 Local/regional materials.
.6 Low-emitting materials.

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE

.1 Provide labour, materials and equipment for installation, testing and putting into operation ventilating and air conditioning systems

1.2 QUALIFIED TRADESMEN

.1 Work to be done by qualified tradesmen holding certificates of competency.

1.3 APPLICABLE STANDARDS

.1 The Ontario Building Code

.2 Regulations of Province, City, or local authority having jurisdiction.

PART 2 - PRODUCTS

2.1 NOT USED

PART 3 - EXECUTION

3.1 DUCTWORK

.1 Ductwork system routing is shown diagrammatically. Drawings are not considered to be fabrication or installation drawings.

.2 Locate mains, risers and runouts to be concealed behind furrings or above ceilings except in mechanical equipment rooms and access spaces where ductwork is to be exposed.

.3 Determine areas without ceilings from Architectural Drawings and Room Finish Schedules, and in these areas keep ductwork as high as possible.

.4 Anchor, guide and support vertical and horizontal runs of ductwork to resist dead load and absorb thrust.

3.2 AIR SUPPLY EQUIPMENT

.1 Install and connect air handling units, and air conditioning units, and build casing and plenums.

3.3 AIR EXHAUST EQUIPMENT

.1 Install and connect exhaust fans, roof and wall exhausters and dust and fume collectors.

3.4 TERMINAL DEVICES

.1 Locate and install terminal boxes, registers, diffusers, and grilles

3.5 LIFE SAFETY

.1 Install fire dampers, smoke dampers, and combination smoke and fire dampers to protect openings in fire separations.

.2 Provide smoke stopping around unprotected ducts passing through smoke separations.

3.6 AIR BALANCING

.1 Co-operate with air balancing agency; install supplementary dampers, access openings and access doors to facilitate testing and adjustment.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)
.1 ANSI/ASHRAE 90.1-2010, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings (ANSI/ASHRAE/IES).

.2 Electrical Equipment Manufacturers' Advisory Council (EEMAC)

.3 Ontario Electrical Safety Code

.4 CSA C22.1 Canadian Electrical Code

.5 National Electrical Manufacturers Association (NEMA)

.6 IEEE Standard 519-1992 IEEE Guide for Harmonic Content and Control

.7 UL 508C Power Conversion Equipment

.8 NEMA ICS 7.0 AC Adjustable Speed Drives

.9 IEC 16800 Parts 1 and 2.

1.3 SHOP DRWAWINGS

.1 Submit shop drawings.

1.4 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for motors, drives and guards for incorporation into manual.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Motors to be high efficiency, in accordance with local Hydro company standards and the requirements of ASHRAE 90.1.
.2 Motors to be designed, manufactured, and tested in accordance with standards of NEMA, ANSI, IEEE, and ASTM.
.3 Motor nameplate rating shall be not less than input brake horsepower of driven equipment at specified operating condition and not less than the minimum horsepower shown.

2.2 MOTORS

.1 Provide motors for mechanical equipment as specified.

.2 If delivery of specified motor will delay delivery or installation of equipment, install motor approved by Departmental Representative for temporary use. Final acceptance of equipment will not occur until specified motor is installed.

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

.4 Motors 373 W (1/2 HP) and larger: EEMAC Class B, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise 40°C, 3 phase, 208V, unless otherwise specified or indicated.

.5 Vibration velocity to be not more than 1.27 mm/s (0.05 inches/second) measured at bearing housing.

.6 Sound Pressure level shall be not more than 85 dBA, measured at 3 meters (10 feet) in accordance with IEEE publication No. 85

.7 Motor manufacturer to ensure that motor is compatible with type of adjustable frequency generation to be supplied, and that system will be capable of providing rated torque over frequency range from 15 to 60 hz while operating within motor temperature rise specification.

.8 Motor to be capable of operating between 60 Hz and 90 Hz with torque reducing at drive frequency above 60 Hz.

.9 Test motor in accordance with IEEE 112 "Polyphase Induction Motors and Generators" to conform with NEMA MG-1.

2.3 TEMPORARY MOTORS

.1 If delivery of specified motor will delay completion or commissioning work, install motor approved by Departmental Representative for temporary use. Work will only be accepted when specified motor is installed.

2.4 BELT DRIVES

.1 Fit reinforced belts in sheave matched to drive. Multiple belts to be matched sets.

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

.3 For motors under 7.5 kW (10 HP): standard adjustable pitch drive sheaves, having plus or minus 10% range.

Use mid-position of range for specified r/min.

.4 For motors 7.5 kW (10 HP) and over: sheave with split tapered bushing and keyway having fixed pitch unless specifically required for item concerned. Provide sheave of correct size to suit balancing.

.5 Correct size of sheave to be determined during commissioning.

.6 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.

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

.8 Supply one set of spare belts for each set installed.

2.5 DRIVE GUARDS

.1 Provide guards for unprotected drives.

.2 Guards for belt drives;
.1 Expanded metal screen welded to steel frame.
.2 Minimum 1.2 mm thick sheet metal tops and bottoms.
.3 38 mm dia holes on both shaft centres for insertion of tachometer.
.4 Removable for servicing.

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

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

.5 Guard for flexible coupling:
.1 "U" shaped, minimum 1.6 mm thick galvanized mild steel.
.2 Securely fasten in place.
.3 Removable for servicing.

.6 Unprotected fan inlets or outlets:
.1 Wire or expanded metal screen, galvanized, 19 mm mesh.
.2 Net free area of guard: not less than 80% of fan openings.
.3 Securely fasten in place.
.4 Removable for servicing.

2.6 MOTOR STARTERS

.1 Magnetic and Manual Motor Starters:
.1 General
.1 Rating: NEMA
.2 Size starters for rated motor load plus additional 25 VA at 120 VAC for damper operator

power supply
.3 Provide wiring diagram for controls circuit where control wiring extends beyond starter enclosure
.2 Starters for single phase motors:
.1 2 pole manual type, or modified 3 pole magnetic type,
.2 where control elements for single phase motors are not rated for motor starting duty, provide separate 120 VAC control circuit and magnetic contactor rated for motor starting duty,
.3 combination switch with:
(a) overload relay
(b) pilot light
(c) control device terminations
(d) NEMA 1 enclosure

.2 Provide wiring, conduit, and devices for mechanical services from disconnect switch (provided by division 26) to motor starter and from motor starter to motor
.1 Wiring
(a) RW-90 copper X-link type installed in conduit, sized to carry 125% of full load running current in accordance with Electrical Code
(b) Minimum no. 12 gauge for power.
(c) Colour coded no. 14 gauge for control
.2 Conduit
(a) EMT and Rigid
(b) Liquid-tight flexible metallic conduit
.3 Grounding
(a) Provide insulated green bonding conductor in each power and control conduit sized per Table 16 of the Electrical Safety Code. Minimum bonding conductor size #12AWG copper
.4 Mineral Insulated Copper Cable (MICC):
(a) ULC listed 2 hour fire rating
(b) Shipped with ends temporarily sealed and stored under dry conditions
(c) Capacities and types noted on drawings and terminated using suitable termination hardware
(d) PVC jackets for embedded cables

2.7 ADJUSTABLE FREQUENCY DRIVES

.1 General:
.1 electronic pulse width modulating design for speed control of NEMA Design B induction

motors,
.2 CSA listed,
.3 mounted in CSA Standard C22.1 Type 1 enclosure,
.4 door or frame mounted interlocked disconnect switch, padlockable, to disconnect all input power from the drive and all internally mounted options,
.5 operating voltage:
(a) +30%, -35% of nominal supply voltage range to drive,
(b) protection circuitry to lock-in drive or bypass over this voltage tolerance,
(c) as per associated equipment, and
.6 Environmental operating conditions:
(a) Temperature: 0 - 40°C (32 - 104 F) continuous,
(b) Altitude: 0 - 1000 m (0 - 3300 ft) above sea level,
(c) Humidity: up to 95% relative humidity non-condensing.
.7 Cooling fans:
(a) designed for easy replacement, and without requiring removing the AFD from the wall or removal of circuit boards,
(b) operate only when required; AFD cycles the cooling fans on and off as required.

.2 Performance requirements:
.1 capable of starting into a coasting load (forward or reverse) up to full speed and accelerate or decelerate to set point without tripping or component damage (flying start),
.2 ability to automatically restart after an over-current, over-voltage, under-voltage, or loss of input signal protective trip.
.3 programmable number of restart attempts, trial time, and time between attempts,
.4 drive overload rating:
(a) 110% of its normal duty current rating for 1 minute every 10 minutes,
(b) 130% overload for 2 seconds
.5 maximum input current rating of the AFD: not more than 3% greater than the output current rating,
.6 input and output current ratings must be shown on the AFD nameplate.
.7 include a coordinated AC transient surge protection system consisting of 4-120 joule

rated MOV's (phase to phase and phase to ground), a capacitor clamp, and 5% impedance reactors.

.8 power mis-wiring detection and alarm on drives up to 75 HP.

.3 Power conditioning:

.1 built-in as part of drive,

.2 input impedance reactors to reduce the total harmonic current demand (TDD) to a maximum of 45% TDD measured at the drive line terminals composed of either:

(a) Dual (positive and negative DC bus) Link, or

(b) 5% AC link, or

(c) Single DC Link and an AC link.

.3 input transient protection,

.4 RFI filter,

.5 Output LC load reactor for drives with motor feeders exceeding 10 meter (30 ft) developed length between drive and motor, matched to motor.

.4 Equipment and motor protection:

.1 under and over voltage protection, phase loss protection and phase unbalance protection,

.2 current limiting device adjustable from 70% to 100% of rated motor current,

.3 ground fault protection,

.4 inherent short circuit protection for line to line and line to ground faults giving safe shut down without damage to power circuit devices,

.5 instantaneous electronic over current-protection,

.6 internal over-temperature protection,

.7 motor stall protection.

.5 Operator Interface Keypad and Display:

.1 same interface across motor rating range,

.2 digital display with keypad,

.3 keypad includes “Hand-Off-Auto” selections and manual speed control,

.4 fault reset and "Help" buttons on the keypad,

.5 loss-of-load alarm,

.6 Keypad:

(a) backlit LCD display,

(b) complete English words for programming and fault diagnostics (alpha-numeric codes are not acceptable),

(c) faults displayed in English words,

.7 Help button access to "on-line"

assistance for programming and troubleshooting, including a minimum of 14 programming assistants:

(a) Start-up
(b) Parameter
(c) PID
(d) Reference
(e) I/O
(f) Serial communications
(g) Option module
(h) Panel display
(i) Low noise set-up
(j) Maintenance
(k) Troubleshooting
(l) Drive optimizer

.8 Operating values displayed in engineering (user) units, with a minimum of three values displayed at one time from the following:

(a) Output Frequency
(b) Motor Speed (RPM, %, or Engineering units)
(c) Motor Current
(d) Motor Torque
(e) Motor Power (kW)
(f) DC Bus Voltage
(g) Output Voltage

.6 Control Functions:

.1 three (3) programmable critical frequency lockout ranges to prevent AFD from operating the load continuously at an unstable speed, fully adjustable, from 0 to full speed.

.2 two (2) PID Set point controllers allowing pressure or flow signals to be connected directly to the AFD;

(a) AFD microprocessor for the closed-loop control,
(b) 250 ma of 24 VDC auxiliary power and be capable of loop powering a transmitter supplied by others,
(c) PID set point adjustable from the AFD keypad, analog inputs, or over the communications bus,
(d) two (2) independent parameter sets for the PID controller and the capability to switch between the parameter sets via a discrete input, serial communications or from the keypad.

.3 the independent second PID loop able to utilize the second analog input and modulate one of the analog outputs to maintain the set point of an independent process (ie. valves,

dampers, etc.),

.4 all set points, process variables, etc. to be accessible from the serial communication network,

.5 programmable "Sleep" and "Wake up" functions to allow the drive to be started and stopped from the level of a process feedback signal.,

.6 "bumpless transfer" of speed reference when switching between "Hand" and "Auto" modes.

.7 programmable loss-of-load (broken belt / broken coupling) Form-C relay output and over the serial communications bus, with programmable time delay for motor start-up,

.8 programmable underload and overload curve functions to allow user defined indications of broken belt or mechanical failure / jam condition causing motor overload,

.9 loss of input reference (4-20mA or 2-10V); user the option of either (1) stopping and displaying a fault, (2) running at a programmable preset speed, (3) hold the AFD speed based on the last good reference received, or (4) cause a warning to be issued, as selected by the user with alarm output to a Form-C relay output and over the serial communication bus,

.10 password protection against parameter changes.

.7 Input Connections:

.1 Analog; two (2) programmable inputs for current or voltage signals,

.2 Discrete; six (6) programmable inputs for interfacing with external devices;

(a) programmable to initiate upon an application or removal of 24VDC or 24VAC.

.3 Run permissive circuit for damper or valve control:

(a) when the damper or valve is fully open, a damper normally open dry contact (end-switch) closes, and the closed end-switch is wired to a discrete input and allows AFD motor operation,

.4 Safety interlock circuits:

(a) two (2) separate safety interlock inputs,

(b) when either safety is opened, the motor coasts to stop and associated damper/valve commanded to close,

(c) keypad displays "start enable 1 (or

2) missing" and the safety input status transmitted over the serial communications bus.

.8 Output Connections:

.1 Analog; two (2) programmable outputs for 0-20ma, 4-20 ma, or 0-10VDC;

(a) each programmable as a minimum to output proportional to Frequency, Motor Speed, Output Voltage, Output Current, Motor Torque, Motor Power (kW), DC Bus voltage, Active Reference, Active Feedback.

.2 Discrete: three (3) programmable, digital Form-C relay outputs;

(a) programmable on and off delay times and adjustable hysteresis,

(b) rated for maximum switching current 8 amps at 24 VDC and 0.4 A at 250 VAC,

(c) maximum voltage 300 VDC and 250 VAC with continuous current rating of 2 amps RMS,

(d) true Form-C type contacts; open collector outputs are not acceptable.

.3 Run command circuit for damper or valve control:

(a) functions regardless of the source of a run command (keypad, input contact closure, time-clock control, or serial communications),

(b) Form-C relay closure that will signal the damper to open (AFD motor does not operate),

.9 Programmable Time Delay functions:

.1 AFD start delay and a keypad indication that this time delay is active,

.2 a Form C relay output provides a contact closure to signal the VAV boxes open; this will allow VAV boxes to be driven open before the motor operates,

.3 field programmable from 0 - 120 seconds,

.4 Start delay active regardless of the start command source (keypad command, input contact closure, time-clock control, or serial communications), and when switching from drive to bypass.

.10 Speed Control functions:

.1 Seven (7) programmable preset speeds,

.2 Two (2) independently adjustable accel and decel ramps with 1 - 1800 seconds adjustable time ramps.

.3 minimum speed setting adjustable from 0

to 70%,

.4 maximum speed setting adjustable from 50 to 110%,

.5 rotating motor restart routine to match frequency and actual speed before accelerating to set speed.

.6 acceleration/deceleration ramp adjustable from 10 to 100 seconds for 0 to 100% speed,

.7 motor flux optimization circuit to automatically reduce applied motor voltage to the motor to optimize energy consumption and reduce audible motor noise;

(a) selectable software for optimization of motor noise, energy consumption, and motor speed control.

.8 carrier frequency control circuit to reduce the carrier frequency based on actual AFD temperature that allows higher carrier frequency settings without derating the AFD.

.11 Programming:

.1 built-in time clock in the AFD keypad with battery back up of 10 years minimum life span,

.2 time clock date and time stamp faults and records operating parameters at the time of fault. On battery failure, the AFD automatically reverts to hours of operation since initial power up,

.3 time clock programmable to control start/stop functions, constant speeds, PID parameter sets and output Form-C relays,

.4 discrete input that allows an override to the time clock (when in the off mode) for a programmable time frame,

.5 four (4) separate, independent timer functions that have both weekday and weekend settings,

.6 utilize pre-programmed application macro's specifically designed to facilitate start-up,

.7 application macros provide one command to reprogram all parameters and customer interfaces for a particular application to reduce programming time, and

.8 two user macros to allow the end-user to create and save custom settings.

.12 Fireman’s Override Input:

.1 On receipt of a contact closure from the fire / smoke control station, the AFD operates in one of two selectable modes:

(a) Operate at a programmed

predetermined fixed speed ranging from -500Hz (reverse) to 500Hz (forward), or

(b) Operate in a specific fireman's override PID algorithm that automatically adjusts motor speed based on override set point and feedback; setpoint adjusted over the serial communications bus.

.2 Operating mode overrides all other inputs (analog/digital, serial communication, and all keypad commands), except safety run interlocks, and force the motor to run in one of the two modes above.

.3 "Override Mode" displayed on the keypad.

.4 Upon removal of the override signal, the AFD resumes normal operation, without the need to cycle the normal discrete input run command.

.13 Provide wiring, conduit, and devices for mechanical services from disconnect switch (provided by division 26) to AFD and from motor starter to motor

.1 Wiring from AFD to motor:

(a) liquid tight, flexible metal conduit and cable to be specifically manufactured for this duty,

(b) voltage rating: nominal 1000 V, and voltage spikes to 2000V,

(c) 3 phase and 3 ground conductors.

.2 Conduit

(a) EMT and Rigid

(b) Liquid-tight flexible metallic conduit

.3 Grounding

(a) Provide insulated green bonding conductor in each power and control conduit sized per Table 16 of the Electrical Safety Code. Minimum bonding conductor size #12AWG copper

.4 Mineral Insulated Copper Cable (MICC):

(a) ULC listed 2 hour fire rating

(b) Shipped with ends temporarily sealed and stored under dry conditions

(c) Capacities and types noted on drawings and terminated using suitable termination hardware

(d) PVC jackets for embedded cables

PART 3 - EXECUTION

3.1 MOTOR INSTALLATION

.1 Fasten securely in place.

.2 Make removable for servicing, easily returned into,

and positively

3.2 WIRING FOR MECHANICAL - GENERAL

.1 Electrical materials, equipment and installation procedures under Mechanical Division to conform to Canadian Electrical Code as amended to date.

2 Wiring methods and standards to conform with those specified in Electrical Division 26 for area of building in which installation is to be made.

.3 Use MICC cable for power and control wiring to motors and dampers, including local control devices such as limit switches, etc., comprising the following systems:

.1 stair pressurization systems,

.2 smoke venting, smoke evacuation, and aid to firefighting ventilation systems, and

.3 smoke dampers, combination smoke dampers.

.4 Use AFD Inverter Duty wiring between adjustable frequency drives (AFD) and associated motor.

.5 Conduit:

.1 EMT: Use thin wall conduit up to and including 32 mm (1 ¼ in) size for wiring in ceilings, furred spaces, in hollow walls and partitions and where not exposed to mechanical injury.

.2 Rigid : Use rigid galvanized steel conduit for wiring in poured concrete, where exposed, and for conduit 40 mm (1½ in) size and larger. All wiring to be installed in conduit or approved raceway.

.3 Liquid-tight flexible: use only for last 1000 mm (3 ft) of motor feeder at connection to motor.

.6 Provide separate conduit for power wiring for each motor or starter. Do not install control wiring in the same conduit as power wiring.

3.3 GROUNDING

.1 Ground electrical equipment and wiring in accordance with Canadian Electrical Code and Local Authority's Rules and Regulations.

.2 Install grounding conductors, outside electrical rooms and electrical closets, in conduit and concealed.

.3 Make connections to neutral and equipment with brass, copper or bronze bolts and connectors.

.4 Ground all motors with separate green insulated copper ground conductor installed in power feeder conduit, wired from ground terminal in starter to a ground lug bolted directly to motor frame inside terminal box of motor. Size

ground conductor per Table 16 of the Canadian Electrical Code. Minimum conductor size to be #12 AWG.

3.4 DISCONNECT SWITCHES

.1 Motors:

.1 Provide disconnect switches for motor driven equipment provided under Mechanical Division;

(a) unfused: where line feeder is provided directly by Division 26,

(b) fused: where line feeder is provided by Division 20 from a splitter box, motor starter rack, or MCC.

.2 Location:

(a) Within 9 meters and line-of-site of motors serving non-refrigeration equipment.

(b) Within 3 meters and line-of-site of equipment containing refrigeration compressors, and equipment serving refrigeration compressors such as air-cooled condensers.

.2 Non-Motor Equipment:

.1 Provide disconnect switch for the following type of equipment provided under Division 20;

(a) VAV terminal boxes

.2 Location:

(a) Immediately adjacent to equipment served.

.3 Disconnects for the above equipment may be provided by the equipment manufacturer.

3.5 MOTOR WINDING TEMPERATURE PROTECTION

.1 Coordinate with motor suppliers that the motor winding temperature sensors provided by the motor supplier is compatible with the thermal protection control units, as applicable.

.2 Provide control wiring between PTC sensors in three phase motors and control units in starters.

3.6 VARIABLE SPEED DRIVES

.1 Install variable speed drives in accordance with manufacturer’s requirements.

.2 Where a separate disconnect is installed between the drive and the controlled equipment, provide interlock wiring between disconnect status contact switch, and AFD, to prevent drive from operating if disconnect switch is open.

.3 Conduct impact vibration test to determine first natural harmonic of driven equipment, and program AFD skip speed function to prevent operation at this speed.
.1 nominal skip speed range equal to ± 5% of measured harmonic frequency, or as determined on site.

.4 Provide power wiring, conduit and branch circuit protection to line side of AFD, selected for drive input current.

3.7 CLEANING

.1 Do not start-up drives until local area has been brought to final clean, floors are sealed, and any drywall in the same space is sanded and painted.

3.8 START-UP AND TESTING

.1 Drives are not to be used for equipment which are used for temporary construction heat prior to final construction cleaning of the space in which the drives are located.
.1 If such heating equipment is to be used prior to final construction clean, provide temporary magnetic starters, or, provide enclosures around the drives and pressurized the enclosures with a source of clean air.

.2 Provide the services of a certified factory authorized representative for the start-up of each drive. Complete and submit a certified start-up form filled out for each drive.

3.9 DEMONSTRATION AND TRAINING

.1 Provide the services of a factory trained manufacturer’s representative to provide training to Owners staff. Include in training:
.1 installation instructions,
.2 programming of AFD,
.3 operation of AFD,
.4 at-site servicing of AFD
.5 replacement of AFD keypad controller
.6 manual and automatic operation of bypass, if applicable.
.7 serial communications
.8 fireman’s smoke control override.

.2 Provide a computer based training CD or 8-hour professionally generated video (VCR format) to the Owner at the time of project closeout for the above topics.

3.10 HAND-OVER

.1 Provide to the Owner service and maintenance manuals, wiring and interconnection diagrams and the start-up reports prepared by a qualified manufacturer’s service technician.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA)
.1 CAN/CSA-B149.1-10, Natural Gas and Propane Installation Code.

.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-1.60-97, Interior Alkyd Gloss Enamel.
.2 CAN/CGSB-24.3-92, Identification of Piping Systems.

.3 National Fire Protection Association (NFPA)
.1 NFPA 13-2010, Standard for the Installation of Sprinkler Systems.
.2 NFPA 14-2010, Standard for the Installation of Standpipe and Hose Systems.

PART 2 - PRODUCTS

2.1 MANUFACTURER'S EQUIPMTENT NAMEPLATES

.1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.

.2 Lettering and numbers raised or recessed.

.3 Information to include, as appropriate:
.1 Equipment: manufacturer's name, model, size, serial number, capacity.
.2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 SYSTEM NAMEPLATES

.1 Colours:
.1 Hazardous: red letters, white background.
.2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

.2 Construction:
.1 3 mm thick laminated plastic or white anodized aluminum, matte finish, with square corners, letters accurately aligned and machine engraved into core.

.3 Sizes:
.1 Conform to following table:

Size # mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3

4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

.2 Use maximum of 25 letters/numbers per line.

.4 Identification for PWGSC Preventive Maintenance Support System (PMSS):
.1 Use arrangement of Main identifier, Source identifier, Destination identifier.
.2 Equipment in Mechanical Room:
.1 Main identifier: size #9.
.2 Source and Destination identifiers: size #6.
.3 Terminal cabinets, control panels: size #5.
.3 Equipment elsewhere: sizes as appropriate.

2.4 EXISTING IDENTIFICATION SYSTEMS

.1 Apply existing identification system to new work.

.2 Where existing identification system does not cover for new work, use identification system specified this section.

.3 Before starting work, obtain written approval of identification system from Departmental Representative.

2.5 IDENTIFICATION DUCTWORK SYSTEMS

.1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.

.2 Colours: back, or co-ordinated with base colour to ensure strong contrast.

2.6 CONTROLS COMPONENTS IDENTIFICATION

.1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.

.2 Inscriptions to include function and (where appropriate) fail-safe position.

2.7 LANGUAGE

.1 Identification in English.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written

recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 TIMING

.1 Provide identification only after painting specified Section 09 91 23 has been completed.

3.3 INSTALLATION

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Provide ULC or CSA registration plates as required by respective agency.

.3 Identify systems, equipment to conform to PWGSC PMSS.

3.4 NAMEPLATES

.1 Locations:
.1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs:
.1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection:
.1 Do not paint, insulate or cover.

3.5 IDENTIFICATION ON DUCTWORK SYSTEMS

.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.

.2 Adjacent to each change in direction.

.3 At least once in each small room through which ductwork passes.

.4 On both sides of visual obstruction or where run is difficult to follow.

.5 On both sides of separations such as walls, floors, partitions.

.6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.

.7 At beginning and end points of each run and at each piece of equipment in run.

.8 At point immediately upstream of major manually

operated or automatically controlled dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.

.9 Identification easily and accurately readable from usual operating areas and from access points.

.1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 23 05 93 - Testing, Adjusting and Balancing of HVAC.

1.2 REFERENCES

.1 National Fire Protection Association (NFPA)
.1 NFPA 13-2009, Installation of Sprinkler Systems.

.2 National Building Code of Canada (NBC) 2010.

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00.

.2 Provide separate shop drawings for each isolated system complete with performance and product data.

PART 2 - PRODUCTS

2.1 GENERAL

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

2.2 ELASTOMERIC PADS

.1 Type EP1 - neoprene waffle or ribbed; 9mm minimum thick; 50 durometer; maximum loading 350 kPa.

.2 Type EP2 - rubber waffle or ribbed; 9 mm minimum thick; 30 durometer natural rubber; maximum loading 415 kPa.

.3 Type EP3 - neoprene-steel-neoprene; 9 mm minimum thick neoprene bonded to 1.71 mm steel plate; 50 durometer neoprene, waffle or ribbed; holes sleeved with isolation washers; maximum loading 350 kPa.

.4 Type EP4 - rubber-steel-rubber; 9 mm minimum thick rubber bonded to 1.71 mm steel plate; 30 durometer natural rubber, waffle or ribbed; holes sleeved with isolation washers; maximum loading 415 kPa.

2.3 ELASTOMERIC MOUNTS

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

2.4 SPRINGS

.1 Design stable springs so that ratio of lateral to axial stiffness is equal to or greater than 1.2 times the ratio of static deflection to working height. Select for 50% travel beyond rated load. Units to

be complete with levelling devices.

.2 Ratio of height when loaded to diameter of spring to be between 0.8 to 1.0.

.3 Cadmium plate for outdoor installations.

.4 Colour code springs.

2.5 SPRING MOUNT

.1 Zinc or cadmium plated hardware; housings coated with rust resistant paint.

.2 Type M2 - stable open spring: support on bonded 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad.

.3 Type M3 - stable open spring: 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad, bonded under isolator and on isolator top plate; levelling bolt for rigidly mounting to equipment.

.4 Type M4 - restrained stable open spring: supported on bonded 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad; built-in resilient limit stops, removable spacer plates.

.5 Type M5 - enclosed spring mounts with snubbers for isolation up to 950 kg maximum.

2.6 HANGERS

.1 Colour coded springs, rust resistant, painted box type hangers. Arrange to permit hanger box or rod to move through a 30° arc without metal to metal contact.

.2 Type H1 - neoprene - in-shear, moulded with rod isolation bushing which passes through hanger box.

.3 Type H2 - stable spring, elastomeric washer, cup with moulded isolation bushing which passes through hanger box.

.4 Type H3 - stable spring, elastomeric element, cup with moulded isolation bushing which passes through hanger box.

.5 Type H4 - stable spring, elastomeric element with precompression washer and nut with deflection indicator.

2.7 ACOUSTIC BARRIERS FOR ANCHORS AND GUIDES

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

2.8 HORIZONTAL THRUST RESTRAINT

.1 Spring and elastomeric element housed in box frame; assembly complete with rods and angle brackets for equipment and ductwork attachment; provision for adjustment to limit maximum start and stop movement to 9 mm.

.2 Arrange restraints symmetrically on either side of unit and attach at centerline of thrust.

2.9 STRUCTURAL BASES

.1 Spring and elastomeric element housed in box frame; assembly complete with rods and angle brackets for equipment and ductwork attachment; provision for adjustment to limit maximum start and stop movement to 9 mm.

.2 Arrange restraints symmetrically on either side of unit and attach at centerline of thrust.

2.10 INERTIA BASE

.1 Type B3 - Full depth perimeter structural or formed channels, frames: welded in place reinforcing rods running in both directions; spring mounted, carried by gussetted height-saving brackets welded to frame; and clear housekeeping pads by 50 mm minimum.

.2 Pump bases: "T" shaped, where applicable, to provide support for elbows.

.3 Concrete: to Section 03 30 00.

2.11 ROOF CURB ISOLATION RAILS

.1 General: complete factory assembled without need for sub-base.

.2 Lower member: continuous rectangular steel tube or extruded aluminum channel.

.3 Upper member: continuous rectangular steel tube or extruded aluminum channel to provide continuous support for equipment, complete with all-directional neoprene snubber bushings 6 mm thick to resist wind forces.

.4 Springs: steel, adjustable, removable, selected for 25 mm maximum static deflection plus 50% additional travel to solid, cadmium plated, sized and positioned to ensure uniform deflection.

.5 High frequency isolation: 6mm minimum thick continuous gasket on top and bottom of complete assembly or pads on top and bottom of each spring. Material: closed cell neoprene.

.6 Weatherproofing: continuous flexible

counterflashing to curb and providing access to springs. Material: aluminum.

.7 Hardware: cadmium plated or galvanized.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install vibration isolation equipment in accordance with manufacturers instructions and adjust mountings to level equipment.

.2 Ensure piping, ducting and electrical connections to isolated equipment do not reduce system flexibility and that piping, conduit and ducting passage through walls and floors do not transmit vibrations.

.3 Where isolation is bolted to floor use vibration isolation rubber washers.

.4 Block and shim level bases so that ductwork and piping connections can be made to a rigid system at the operating level, before isolator adjustment is made. Ensure that there is no physical contact between isolated equipment and building structure.

3.2 SITE VISIT

.1 Manufacturer to visit site and provide written certification that installation is in accordance with manufacturer's instructions and submit report to Departmental Representative.

.2 Provide Departmental Representative with notice 24 h in advance of visit.

.3 Make adjustments and corrections in accordance with written report.

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE

.1 Test, adjust, and balance (TAB) air handling systems and hydronic systems installed, modified or extended as part of this work.

1.2 QUALITY ASSURANCE

.1 Balancing to be performed under supervision of recognized expert in this field.

.2 Perform testing and balancing in accordance with:

.1 SMACNA Testing, Adjusting and Balancing guidelines,

.2 Associated Air Balancing Council standards for Total System Balance.

1.3 PREPATORY WORK

.1 Review design drawings and specifications, shop drawings, interference drawings and other related documentation to become familiar with their intended performance.

.2 Carry out site visits during later stages of construction to ensure that arrangements for TAB are incorporated.

.3 Confirm proper placement of thermometer wells, test ports, pressure gauge cocks, balancing valves, balancing dampers and splitter dampers, and access doors.

.4 Submit TAB schedule, with descriptive data outlining procedures and sample forms showing method of data presentation, three months before start of TAB work on site.

.5 Provide details of specific procedures to be used for determining test parameters from test measurements and criteria proposed to establish compliance with specification requirements.

.6 List instruments to be used, method of instrument application (by sketch) and

correction factors.

.7 Calibrate instruments in accordance with recognized standards, and submit calibration curves not more than three months before commencement of TAB.

.8 TAB measurements to commence when building is “closed in” and work is sufficiently advanced to include;

.1 Installation of ceilings, doors and windows.

.2 Application of sealing, caulking, and weather stripping.

.3 Normal operation of mechanical systems.

1.4 SYSTEMS, EQUIPMENT AND RELATED CONTROLS REQUIRING TAB

.1 Air moving systems.

PART 2 - AIR MOVING SYSTEMS

2.1 PARAMETERS

.1 Listed below is an outline of the information to be established in the TAB process:

.1 Air flow related;

(a) Air velocity

(b) Flow cross sectional area.

(c) Static pressure.

(d) Velocity pressure.

.2 Temperature related;

(a) Wet bulb.

(b) Dry bulb.

.3 Equipment related;

(a) rotational speed (rpm)

(b) Electrical power,

(c) Voltage.

(d) Current draw.

.2 Measurement are required at and around equipment to establish air side performance of;

.1 Fans.

.2 Filters.

.3 Dampers.(fresh, return and relief)

.4 Humidifiers.

.5 Terminal units

.3 Measurement are required to characterize system performance;

.1 at main ducts.

.2 at branch ducts.

.3 at sub-branch ducts.

.4 at each supply, exhaust and return air inlet and outlet.

.5 in each thermostatically controlled zone.

2.2 GENERAL CRITERIA

.1 Balance systems so that fans operate at lowest possible speed and static pressure consistent with delivery of specified air quantity at most remote terminal point.

.2 Set-up supply fans with sufficient speed to deliver required air quantity when filters are loaded to manufacturers recommended maximum pressure drop. Temporarily block filters to achieve maximum pressure drop at design air flow.

.3 Air quantities at each exhaust system inlet and supply system outlet are to be measured and throw and pattern is to be adjusted at each supply outlet.

2.3 FAN PERFORMANCE ASSESSMENT

.1 Measure air quantity by taking anemometer traverses across a coil or at a filter bank or by pitot tube traverse in a straight section of duct at fan suction or discharge.

.2 Measure static pressure difference between fan inlet and discharge, motor amperage and fan speed in rpm. Determine motor input power from a curve showing power output as a function of motor amperage for the particular motor.

.3 Plot results of measurements on fan characteristic curve supplied by fan manufacturer and the air volume, static pressure and fan speed lines should form a triangle enclosed by a rectangle with a

dimension of not more than 15% of the rated static pressure by a dimension of not more than 10% of the specified air quantity. Input power taken from the fan characteristic should be within 10% of the power determined from the motor amperage readings.

.4 If required precision is not obtained, readings to be repeated. If subsequent testing shows that the required precision is unobtainable then fan manufacturer is to submit written report explaining actual fan performance and provide new characteristic curve showing actual performance for fan “as installed”.

.5 Measure static pressure loss across cooling coils, heating coils and individual filter banks and tabulate readings with manufacturers published pressure loss figures for the actual measured air volume.

2.4 VARIABLE VOLUME SYSTEM BALANCING PROCEDURE

.1 Obtain from Consultant the expected diversity value. Open sufficient boxes to 100%, and close a random selection of boxes, equally distributed throughout the system, to obtain the design fan flow rates.

.2 Set system to operate with 100% return air, set room thermostats at design indoor temperature, set fan discharge temperature at design point.

.3 Set thermostat in most remote zone to full cooling and adjust fan inlet guide vane, or AFD speed, static pressure control to supply specified air quantity at most remote zone volume damper, pneumavalve or terminal box.

.4 Reset most remote zone thermostat to design room temperature and set next most remote zone thermostat to full cooling and adjust branch splitter damper ahead of zone volume damper, pneumavalve or terminal box, to provide design air quantity at outlets.

.5 If zone air quantity is less than design, increase fan inlet guide vane, or AFD speed, static pressure control setting to achieve design air quantity and rebalance previously checked zones.

.6 Repeat as required for each zone.

2.5 TERMINAL BOX SUPPLY SYSTEM BALANCING PROCEDURE

.1 Set system to operate with 100% return air, set room thermostats at indoor design temperature and set fan discharge temperature at design value.

.2 Set thermostat in most remote zone to full cooling and adjust fan inlet guide vane static pressure controller to maintain manufacturer's specified minimum static pressure at box inlet.

.3 Check air quantity delivered by box and adjust volume regulators to obtain design value.

.4 Reset room thermostat to full heating and check performance of regulator.

.5 Reset thermostat to design temperature and repeat procedure for remaining terminal boxes.

.6 If inlet static pressure at a subsequent box is less than manufacturer's specified minimum, reset inlet guide vane static pressure controller to suit.

.7 Open balancing dampers and adjust fan inlet static pressure controllers, or fan speed to obtain design air quantity at most remote outlet.

.8 Balance remaining outlets by adjusting dampers.

.9 If air quantity at some outlet other than the most remote outlet is less than design, re-adjust fan and rebalance previously adjusted outlets.

.10 Measure fan performance and adjust fan speeds and inlet guide vane controllers so that return air quantity is equal to supply air quantity less fixed exhaust air quantities, with a 10 percent allowance for pressurization.

2.6 FRESH AIR ADJUSTMENT PROCEDURE

.1 After adjustment of supply, return and related

exhaust fans, adjust minimum fresh air damper position to obtain design fresh air quantity.

.2 Damper position to be determined by measurement of outside return and mixed air temperatures and confirming calculations to be included in balance report.

.3 Where duct space permits, include airflow measurement of supply, and recirculation or outdoor air, to verify results.

2.7 BRANCH AIR QUANTITY MEASUREMENT PROCEDURE

.1 Branch air quantities to be determined using pitot tube traverses in accordance with the procedures outlined in "Testing, Balancing and Adjusting of Environmental Systems" by William G. Eads, P.E., issued by SMACNA.

.2 Measurements to be taken at each riser as it is connected to fan discharge or suction header and at each floor where branches are taken from the riser. Measurement to be repeated until sum of branch air quantities is within 10% of fan delivery.

PART 3 - EQUIPMENT TESTING

3.1 PERFORMANCE DATA

.1 Submit the following data as a minimum. If contractor's standard forms provide for additional data, also submit such additional data.

.1 Some equipment tests may need to be performed during the alternate season testing.

.2 Include nameplate data and as-tested results.

.2 Motors:

.1 manufacturer,

.2 model or Serial number,

.3 amperage and voltage,

.4 horsepower,

.5 RPM,

.6 corrected full load amperage,

.7 measured amperage and voltage,

.8 calculated BHP (kW).

.3 Fans:

.1 manufacturer,

.2 model or Serial number,

.3 flow rate

.4 RPM,

.5 static pressures (suction and discharge),

.6 pulley size, type and manufacturer,

.7 belt size and quantity.

PART 4 - REPORT PRESENTATION AND VERIFICATION

4.1 REQUIRED REPORTS

.1 Provide the following reports:

.1 Air balancing report,

4.2 REPORT FORMAT

.1 Reports to incorporate approved standard forms, with values expressed in SI and (Imperial) units.

.2 Include "as-built" system schematics showing flow quantities and measurement points. Use as-built drawings and ventilating line diagrams for references.

.3 Submit four hard copies of TAB reports, with index tabs, in "D" ring binders, for verification.

.4 Submit two soft copies of TAB reports in Adobe Acrobat V7 PDF format.

4.3 ACCURACY

.1 Adjust systems until operating values within plus or minus 5% of design values are achieved.

.2 Measurements to be accurate to within plus or minus 2% of actual values.

4.4 SPOT CHECKS

.1 After review of the Draft Report by the Consultant and at the Consultants direction, retest up to 30% of all measurements in locations as directed by the Consultant, at no cost extra to the contract.

.2 If results indicate unusual testing inaccuracy, omissions, or incomplete balancing/adjustment, in the opinion of the Consultant, re-balance entire affected system(s) at no increase in Contract Price.

4.5 BALANCE POSITION MARKING

.1 Mark the balance position of dampers and valves at the completion of the final testing:

.1 Ductwork: indicate with arrow using paint or permanent marker,

.2 Exposed ductwork in public areas: self adhesive label, placed adjacent to balancing damper, neatly filled in with % open or degree open value.

.3 Valves: self-adhesive label, placed on piping (insulated or not) adjacent to valve, neatly filled in with either % valve open, or number of valve turns to open.

.2 Additional requirements for Double Regulating Valves:

.1 Remove valve handle or other protective device, and set memory stop to limit valve open travel. Replace valve handle or protective cover.

4.6 RECORD KEEPING

.1 Keep records of trial and final balance and submit preliminary report as each system is completed.

.2 Make spot checks as requested and repeat balancing of system if actual spot check quantities do not agree with preliminary report figures.

4.7 VERIFICATION

.1 Reported measurements will be verified.

.2 Provide instrumentation and manpower to verify results of up to 30% of reported measurements.

.3 Number and location of verification measurements to be at discretion of Engineer.

.4 Where discrepancies are encountered repeat TAB, and resubmit reports.

4.8 COMPLETION

.1 Continue TAB until reports are approved.

.2 The Substantial Performance of the Mechanical Work will be considered reached when the initial Start-Up and Performance Testing report is accepted by the Consultant and in the opinion of the Consultant all systems have been satisfactorily installed, operated tested, balanced, and adjusted to meet the specified and intended performance.

.3 The substantial performance is not dependent upon alternate season testing.

.4 The total performance of the Mechanical Subcontract (Contract) will not be considered reached until the alternate season testing and balancing is completed and the final report submitted and accepted by the Consultant.

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE

.1 Insulate and finish ducts, casing, and plenums;

.1 provide insulation, sealer coatings, finishes, and mechanical protection.

.2 insulation is not required on factory insulated and/or and acoustically lined ductwork except as otherwise shown.

1.2 QUALITY

.1 Manufacturers and products are listed in this Section to establish quality and manufacturing standards. Products from other manufacturers with explicitly similar characteristics may be acceptable but must be submitted as an alternative product submission.

1.3 SAMPLE BOARDS

.1 Submit sample assembly of each type of insulation and covering. Mount samples on PVC coroplast board with typewritten label beneath each sample indicating service and material specification.

.2 Include samples of vapor barrier installation including coatings (indoors), mastics (outdoors), reinforcing membranes, on a square surface sample minimum 300 mm x 300 mm (12 in x 12 in).

1.4 MATERIAL TEST CRITERIA

.1 Insulation, adhesives, coatings, finishes, sealers, and tapes:

.1 maximum flame spread rating of 25 to CAN/ULC-S102,

.2 maximum smoke developed rating of 50 to CAN/ULC-S102.

.3 Exception: vapor barrier mastics installed outside of building.

1.5 APPLICABLE CODES AND STANDARDS

.1 Material and method of application to comply with or be tested in accordance with following Standards;

.1 Thermal Insulation Association of Canada

(TIAC) National Insulation Standard, excluding section 12

.2 NFPA 90-A Installation of Air-Conditioning and Ventilating Systems

.3 ASHRAE/IES 90.1 Energy Standard for Buildings Except Low-Rise Residential Buildings

.4 NFPA 255 Test of Surface Burning Characteristics of Building Materials

.5 CAN/ULC-S102 Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies

.6 ASTM C411 Standard Test Method for Hot Surface Performance of High Temperature Thermal Insulation

.7 ASTM C518 Standard Test Method for Steady State Thermal Transmission Properties by Means of Heat Flo Meter Apparatus

.8 ASTM C533 Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation

.9 ASTM C534 Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form

.10 ASTM C552 Standard Specification for Cellular Glass Thermal Insulation

.11 ASTM C553 Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications

.12 ASTM C612 Standard Specification for Mineral Fiber Block and Board Thermal Insulation

.13 ASTM C1126 (Gr.1) Standard Specification for Faced and Unfaced Rigid Cellular Phenolic Thermal Insulation

.14 CGSB 51-GP-52MA Vapour Barrier, Jacket and Facing Material for Pipe, Duct, and Equipment Thermal Insulation.

.15 CGSB 51.53-95 Poly(Vinyl Chloride) Jacket Sheeting, for Insulated Pipes Vessels and Round Ducts.

1.6 DEFINITIONS

.1 In this Section;

.1 “Ambient”: as applied to temperatures means outdoor design temperature.

.2 "Concealed": as applied to mechanical services and equipment located in space above opaque suspended ceilings, and within trenches not in boiler rooms, pipe and/or duct shafts, and non-accessible chases and furred spaces.

.3 “Ductwork”: as applied to this section includes ducts, fans, supply unit casings, and plenums.

.4 "Exposed": as applied to remainder of mechanical services and equipment which are not "concealed" as defined above. For greater certainty, the following locations are Exposed:

(a) Services in tunnels,

(b) Services in space beneath raised floors,

(c) Trenches located in boiler rooms,

(d) Outdoors.

.5 “Conditioned air”: air supplied from air handling units which heats, cools, dehumidifies, or humidifies the air.

.6 “Unconditioned space”: rooms or spaces that are not supplied with conditioned air, including ceiling spaces which are not part of a ceiling return plenum system

.7 “Outdoor”: mechanical services and equipment located outside of the building envelope including services located beneath overhangs and soffits, and exposed to any outdoor condition including temperature, sun exposure, or precipitation.

.8 “Mastic”: heavy-consistency waterproof compound for outdoor applications used in conjunction with reinforcing fabric that remains adhesive and generally pliable with age, to provide either a breathable or vapour barrier finish to insulation.

.9 “Coating”: light-consistency compound for indoor applications used in conjunction with reinforcing fabric, to provide either a breathable or vapour barrier finish to insulation.

.10 “Finish Jacket”: final finish protective layer for insulation, including lagging

fabric, PVC, metal, and adhesive films; that provides weather-protective finish depending on application.

.11 "Service temperature": for purpose of ductwork temperature, is equal to the design operating temperature.

1.7 ADHESIVES, FASTENERS AND TAPE

.1 Contact bond cement:

.1 for quick setting for metal surfaces.

.2 Volatile Organic Content: maximum 80 g/L.

.2 Adhesive for flexible closed cell foam insulation:

.1 Volatile Organic Content: maximum 80 g/L.

.3 Lap seal adhesive:

.1 for joints and lap sealing of vapour barriers.

.2 Volatile Organic Content: maximum 250 g/L.

.4 Fibrous insulation adhesive:

.1 Volatile Organic Content: maximum 250 g/L.

.5 Vapour barrier tape:

.1 colour matched and foil faced

.2 UL 181A listed.

.6 Weld Pins, Studs and Clips

.7 Staples

.1 Monel, flare type, minimum size 12 mm (½ in).

.8 Tie Wire

.1 1.6 mm (16 ga) stainless steel with twisted ends.

.9 Caulking for sheetmetal jackets (outdoor use only)

.1 fast-drying, aluminum colour finish, flexible butyl elastomer based vapour barrier sealant.

1.8 COATINGS AND MEMBRANES

.1 Reinforcing Membrane:

.1 synthetic fibre:

(a) Leno weave,

(b) indoor and outdoor use.

.2 glass-fibre fabric:

(a) indoor use.

.3 glass-fibre fabric for use with elastomeric closed cell foam:

(a) indoor use.

.2 Breather Coating - Indoors:

.1 for breather coatings and lagging adhesive,

.2 Volatile Organic Content: maximum 50 g/L.

.3 white in colour,

.3 Breather Mastic - Outdoors:

.1 for breather coatings and lagging adhesive,

.2 abrasion resistive, flexible,

.3 UV stabile,

.4 grey in colour.

.4 Vapor Barrier Coatings - Indoors:

.1 Volatile Organic Content: maximum 50 g/L.

.2 for vapor barrier coatings and lagging adhesive except for elastomeric closed cell foam,

(a) permeance rating 0.02 perms maximum,

(b) white in colour

.3 for use with elastomeric closed cell foam.

.5 Vapor Barrier Mastic - Outdoors:

.1 for vapor barrier coatings and lagging adhesive,

.2 asphalt cutback,

.3 permeance rating 0.02 perms maximum,

.4 grey in colour.

.5 for outdoor use only; not rated to meet fire/smoke rating of 25/50.

1.9 INSULATION CEMENT

.1 Hydraulic-setting finishing type.

1.10 FIELD APPLIED FINISHES

.1 PVC (Polyvinyl Chloride) finish jacket:

.1 minimum 20 mil thickness with permeability not more than 0.09 perms,

.2 flexible flat-sheet,

.3 pressure sensitive, colour matching vinyl tape.

.2 Fabric finish jacket:

.1 ULC listed plain weave cotton fabric at 220 g/m2 (6 oz/sq yd), treated with fire retardant lagging adhesive, or

.2 re-wettable fiberglass lagging fabric with water activated self-adhesive.

.3 suitable for field painting.

.3 Metal finish jacket:

.1 equipment:

(a) stucco embossed aluminum not less than 0.45 mm (0.016 in) thick sheet or,

(b) corrugated stainless steel not less than 0.25 mm (0.010 in) thick sheet.

.2 fittings:

(a) Custom made swaged ring or lobster back covers on bends and die shaped fitting covers over fitting, valves, strainers, flanges, and grooved couplings.

.3 bands:

(a) 12 mm (½ in) wide stainless steel with mechanical fasteners.

.4 Protective finish for elastomeric cellular foam insulation

.1 indoors and outdoors:

1.11 DUCTWORK INSULATION

.1 Type D-1 glass fibre blanket:

.1 to ASTM C1290

.2 service temperature: up to 121°C (250°F)

.3 flexible blanket,

.4 FSK jacket of kraft bonded to aluminum

foil reinforced with glass fibre yarn, maximum 0.02 perms to ASTM E96 Procedure A.

.5 noncombustible,

.6 thermal performance: R = 0.74 m^2 °C/W @ 24°C (4.2 btu ft^2 °F /Btu @ 75°F)

.7 density: 12 kg/m^3 (0.75 pcf)

.8 vapor transmission : maximum 0.02 perms

.2 Type D-2 glass fibre board:

.1 to ASTM C612,

.2 service temperature: up to jacket surface temperature (air contact) up to 66°C (150°F) and un-jacketed surface temperature (equipment contact) up to 232°C (450°F).

.3 rigid for flat surfaces or,

.4 scored board for curved surfaces 250 mm (10 in) dia and over,

.5 jacket of kraft bonded to aluminum foil reinforced with glass fibre yarn,

.6 thermal performance: 0.033 W/m/C @ 24°C (0.23 btu/hr/in/sq ft/F @ 75°F),

.7 vapor transmission: maximum 0.02 perms

.8 density: 48 kg/m3 (3.0 lb/cu ft),

.9 suitable for jacket surface temperature (air contact) up to 66°C (150°F) and un-jacketed surface temperature (equipment contact) up to 232°C (450°F).

.3 Type D-3 flexible elastomeric closed cell foam:

.1 to ASTM C534,

.2 service temperature: up to 82°C (180°F).

.3 sheet self-adhering, roll type,

.4 thermal performance: 0.04 W/m/C @ 24°C (0.28 btu/hr/in/sq ft/F @ 75°F),

.5 manufacturer specific sealer/adhesive.

.4 Type D-4 low temperature phenolic board:

.1 to ASTM C1126 (Gr.1),

.2 service temperature: -73°C to+121°C (-100°F to 250°F).

.3 rigid for flat surfaces,

.4 meeting 25/50 flame spread/smoke development when tested to ASTM E84,

.5 thermal performance: 0.021 W/m/C°@ 10°C (0.145 btu/hr/in/sq ft/F° @ 50°F),

.6 density: 37 kg/m3 (2.3 Ib/cuft),

PART 2 - EXECUTION

2.1 INSULATION LIMITS

.1 Externally insulate air handling system components:

.1 Conditioned air with cooling coils: supply unit casings and plenums, and free standing supply fans for both recirculating and non-recirculating type systems,

.2 Conditioned air supply ducts,

.3 un-conditioned supply air ducts and plenums that pass through unheated rooms or spaces,

.4 the first 300 mm (12 in) length of acoustically lined ductwork,

.5 return air ducts and plenums in unheated spaces,

.6 exhaust air ducts and plenums in unheated spaces,

.7 exhaust air ducts between exhaust air damper and point of discharge to outside of building,

.8 outside air intake ducts and plenums;

(a) for non-recirculating type ventilation systems without cooling coils, terminate plenum or casing insulation 300 mm (12 in) downstream of final heating coil,

.9 mixed air plenums and ducts;

(a) for recirculating type ventilation systems without cooling coils, terminate outside air intake insulation 300 mm (12 in) downstream of mixing plenum,

.10 sheet metal blank-off plates behind unused sections of air intake louvres.

.2 Externally insulate ductwork located outdoors:

.1 supply ducts.

.2 conditioned supply ducts.

.3 return ducts,

.4 exhaust ducts,

(a) excluding fan discharge duct,

.5 kitchen exhaust ducts with more than 3 m (10 ft) length of duct on roof.

(a) excluding fan discharge duct.

.3 External insulation is not required on:

.1 casings, ducts or plenums which have been lined with acoustic insulation, except as described above,

.2 free standing unconditioned supply fans, supply ducts and plenums,

.3 portions of intake ducts or plenums, unit casings and conditioned air plenums which are of double wall insulated construction,

.4 pre-insulated flexible ducts.

.5 factory insulated air handling units.

2.2 GENERAL REQUIREMENTS

.1 Insulate ductwork in accordance with Table 1 at the end of this section.

.2 Store and use adhesives, mastics, and insulation cements at ambient temperatures and conditions recommended by product manufacturers.

.3 Surfaces to be clean and dry before application of insulation. Apply insulation after pressure and leakage testing is completed and accepted.

.4 Place insulation with joints staggered and tightly butted, with no visible gaps.

.5 Neatly finish insulation at supports, protrusions, and interruptions.

.6 Seal exposed insulation with reinforced vapor barrier or breather coating/mastic as shown.

.7 Finish ductwork with field installed finish jackets as shown.

2.3 APPLICATION

.1 Rigid insulation - fans, ducts, and casing:

.1 overlap horizontal boards over vertical boards, and butt edges tightly together.

.2 impale insulation on weld pins, studs, and clips at 300 mm (12 in) centres in both directions, with not less than 2 rows per side and bottom.

.3 secure insulation laps with mechanical fasteners (staples).

.2 Rigid insulation - outside air duct and plenums - glass fibre:

.1 as above for fans, ducts, and casings, and;

(a) apply first layer of insulation without integral vapour barrier,

(b) apply second layer of insulation with integral vapour barrier with staggered joints.

.3 Rigid insulation - outside air duct and plenum - phenolic board:

.1 as above for fans, ducts, and casings, but with only one layer of insulation board.

.4 Rigid insulation - exhaust air plenums:

.1 as above for fans, ducts, and casings.

.5 Flexible insulation:

.1 overlap insulation 50 mm (2 in) on each lap joint, and butt end edges tightly together,

.2 on rectangular ducts 600 mm (24 in) and wider, and round ducts 450 mm (18 in) and wider;

(a) secure insulation to the underside of duct with weld pins, studs, and clips at 300 mm (12 in) centres in both directions, with not less than 2 rows per side and bottom,

(b) secure insulation laps with mechanical fasteners (staples),

(c) for round ductwork, the underside of duct is measured as being half the circumference of the duct.

.6 Flexible elastomeric:

.1 wrap tightly onto ductwork and drain pans, and secure with 100% adhesive coverage.

.2 on round ducts, overlap insulation 50 mm (2 in) on each lap joint, and butt end edges tightly together,

.7 Cover angles or standing seams on the outside of plenums, casings and ducts which extend beyond face of applied rigid insulation;

.1 with same material and thickness as adjacent ductwork,

.2 extend this insulation 75 mm (3 in) on each side of the angle and place tight around the projecting leg of the angle.

.3 apply rigid insulation overlapping edge of flexible insulation on angle so that outstanding part of insulated angle projects through work.

.8 Cut and mitre rigid insulation at elbows and fittings and attach to ductwork with 50% coverage of adhesive, and mechanical fasteners with weld pins, speed clips and washers.

.9 Attach speed washers when insulation has been placed on metal pins and cut off excess pin length flush with speed washer. Cover washers with vapour barrier tape.

.10 At junctions between external insulation and acoustic insulation, overlap external insulation 300 mm (12 in) over acoustic lining.

.11 Outdoor rectangular and flat-oval ductwork:

.1 build-up and slope insulation on top of ductwork to provide a 1:100 drainage slope,

.2 where width of ductwork exceeds 600 mm (24 in), slope insulation in both directions.

2.4 SEALING INSULATION

.1 Hot ducts, casings, and plenums - Indoors:

.1 service temperature: 20°C to 65°C (70°F - 150°F)

.2 apply vapour barrier tape to butt joints, overlapping my minimum 50 mm (2 in) each side,

.3 do not tape lap joints.

.2 Cold or dual temperature ducts, casings, and plenums - Indoors:

.1 service temperature: Ambient to 20°C (Ambient to 70°F)

.2 apply reinforced vapor barrier coating to all corners, lap edges and butt edges, overlapping joint by minimum 50 mm (2 in) each side,

.3 cover mechanical fastener (staple) penetrations with reinforced vapour barrier coating,

.4 insulate flanges and standing seams with overlapping strips of flexible insulation, and cover with reinforced vapour barrier coating.

.3 Ducts - Hot ducts - Outdoors:

.1 service temperature: 20°C to 65°C (70°F - 150°F)

.2 apply reinforced breather mastic to all corners, lap edges and butt edges, overlapping joint by minimum 50 mm (2 in) each side.

.3 cover mechanical fastener (staple) penetrations with reinforced breather mastic,

.4 insulate flanges and standing seams with overlapping strips of flexible insulation, and cover with reinforced breather mastic.

.5 for greater clarity, do not use vapor barrier tape on outdoor applications.

.4 Ducts - Cold or Dual Temperature - Outdoors:

.1 service temperature: Ambient to 20°C (Ambient to 70°F)

.2 apply reinforced vapor barrier mastic to all corners, lap edges and butt edges, overlapping joint by minimum 50 mm (2 in) each side,

.3 cover mechanical fastener (staple) penetrations with reinforced vapour barrier mastic,

.4 insulate flanges and standing seams with overlapping strips of flexible insulation, and cover with reinforced vapour barrier mastic,

.5 for greater clarity, do not use vapor barrier tape on outdoor applications.

.5 Apply mastics and coatings when ambient temperature is above 4°C (40°F), unless manufacturer’s instructions permit colder

ambient installation conditions.

2.5 INSULATION FINISH

.1 Install protective finish on insulation in accordance with Table 2 at the end of this Section, after breather and vapor barrier sealing is completed.

.2 Install finish jacket materials used for covering to allow 50 mm to 100 mm (2 in to 4 in) overlap on longitudinal and circumferential edges.

.3 Fabric:

.1 Cotton lagging:

(a) apply cotton lagging with minimum two coatings of breather or vapor barrier coating adhesive as applicable to the duct system, and finish to provide a smooth surface free of wrinkles and sags.

(b) where cotton lagging with appropriate coating is used this satisfies the requirements of a sealer coating for Hot or Cold/Dual temperature ducting systems.

.2 Fibreglass lagging:

(a) apply re-wettable fibreglass lagging in accordance with manufacturer instructions. Finish to provide a smooth surface free of wrinkles and sags.

(b) where re-wettable fiberglass lagging is used this satisfies the requirements of a breather sealer coating for Hot piping systems.

.4 Metal:

.1 use lock-on systems or secure sheeting with bands 450 mm (18 in) apart.

.2 joint sealing, indoor:

(a) Hot ducts and plenums: do <u>not</u> seal joints.

(b) Cold or Dual Temperature ducts and plenums: seal joints with caulking.

.3 curved surfaces: custom made swaged ring or lobster back covers,

.4 on outdoor hot and cold/dual temperature ductwork, caulk overlapping metal joints to permit expansion of metal jacket.

.5 Flexible elastomeric closed cell foam insulation:

.1 apply thin coat of lagging adhesive, and apply glass mesh,

.2 when dry apply indoor or outdoor finish at 400 square feet per gallon,

.3 apply second coat of same material, at same rate of application, after four hours.

2.6 MECHANICAL DAMAGE PROTECTION - INDOORS

.1 Protect exposed insulated ductwork from floor level up to 1200 mm (4 ft) above floor with 1.2 mm (18 ga) stainless steel jacket, secured to floor slab.

.2 Do not overlap fire damper slip joint with protective sheeting.

2.7 FIELD QUALITY CONTROL

.1 The Consultant reserves the right to have protective finish coverings removed on up to 5% of all fittings and flanges to review the sealing of the insulation, at no change in cost.

.2 If insulation sealing is found to be incorrect at any one location, remove the protective finish on all fittings and flanges for review.

.3 Repair defective sealing and replace protective coverings at no change in cost.

2.8 INSULATING AND FINISHES TABLES

.1 Tables 1, and 2 follows.

Table 1 : Ductwork and Plenum Insulation Type and Thickness
mm (in)

Nominal Surface Temperature	Equipment Description	Insulation Type	Insulation Thickness
5°C to 65°C (40˚F to 150˚F)	Supply unit casings and plenums Free standing supply fans Rectangular, exposed Rectangular, concealed	D-2	25 (1)

Table 1 : Ductwork and Plenum Insulation Type and Thickness mm (in)			
Nominal Surface Temperature	Equipment Description	Insulation Type	Insulation Thickness
	Rectangular, concealed Round and Oval, exposed Round and Oval, concealed	D-1	38 (1-1/2) *note (1)*
Ambient to 65°C (Ambient to 150˚F)	Plenums and Casings - Air Intake	D2	Two layers each 50 (2)
		D4	75 (3)
	Plenums and Casings - Exhaust	D2	50 (2)
		D4	38 (1-1/2)
	Rectangular - Outdoor - Supply	D2	50 (2)
	Rectangular - Outdoor - Return Rectangular - Outdoor - Exhaust	D2	38 (1-1/2)
	Round - Outdoor	D3	Two layers each 25 (1)
	Drain pans	D3	20 (3/4)

Note (1): thickness is “out of box” before installation.

Table 2 : Ductwork Insulation Protective Finishes			
Location	Weather Exposure	System/Space	Finish
Concealed	Indoors	All	None
Exposed	Indoors	Service Rooms	Fabric
	Indoors	Public Spaces	Fabric
	Outdoors	All	Metal

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)

.2 ASTM International
.1 ASTM A480/A480M-13b, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
.2 ASTM A635/A635M-13, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Alloy, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, General Requirements for.
.3 ASTM A653/A653M-13, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

.3 National Fire Protection Association (NFPA)
.1 NFPA 90A-12, Standard for the Installation of Air-Conditioning and Ventilating Systems.
.2 NFPA 90B-12, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
.3 NFPA 96-11, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

.4 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
.1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2005.
.2 SMACNA HVAC Air Duct Leakage Test Manual, 2012.

.3 IAQ Guideline for Occupied Buildings Under Construction 2007.

PART 2 - PRODUCTS

2.1 SEAL CLASSIFICATION

SPEC NOTE: Select appropriate class from the following and indicate location for each pressure and seal class.

.1 Classification as follows:

Maximum Pressure [Pa]	SMACNA Seal Class
500	[C]
250	[C]
125	[C]
125	[Unsealed]

.2 Seal classification:
.1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape.
.2 Class B: longitudinal seams, transverse joints and connections made airtight with sealant, tape or combination thereof.
.3 Class C: transverse joints and connections made air tight with gaskets, sealant, tape, or combination thereof. Longitudinal seams unsealed.
.4 Unsealed seams and joints.

2.2 SEALANT

.1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.1 Sealant: oil resistant, polymer type flame resistant duct sealant. Temperature range of minus 30 degrees C to plus 93 degrees C.

2.3 TAPE

.1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide

2.4 DUCT LEAKAGE

.1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

2.5 FITTINGS

.1 Fabrication: to SMACNA.

.2 Radiused elbows:
.1 Rectangular: standard radius, short radius with single thickness turning vanes, or centreline radius: 1.5 times width of duct.
.2 Round: smooth radius or five piece, centreline radius: 1.5 times diameter.

.3 Mitred elbows, rectangular:
.1 To 400 mm: with single thickness turning vanes.
.2 Over 400 mm: with double thickness turning vanes.

.4 Branches:
.1 Rectangular main and branch: with radius on branch 1.5 times width of duct or 45 degrees entry on branch.
.2 Round main and branch: enter main duct at 45 degrees with conical connection.
.3 Provide volume control damper in branch duct near connection to main duct.
.4 Main duct branches: with splitter damper.

.5 Transitions:
.1 Diverging: 20 degrees maximum included angle.
.2 Converging: 30 degrees maximum included angle.

.6 Offsets:
.1 Full or Short radiused elbows as indicated.

.7 Obstruction deflectors: maintain full cross-sectional area.
.1 Maximum included angles: as for transitions.

2.6 FIRE STOPPING

.1 Retaining angles around duct, on both sides of fire separation in accordance with Section 07 84 00.

.2 Fire stopping material and installation must not distort duct

2.7 GALVANIZED STEEL

.1 Lock forming quality: to ASTM A653/A653M, Z90 zinc coating.

.2 Thickness, fabrication and reinforcement: to ASHRAE and SMACNA.

.3 Joints: to ASHRAE amd SMACNA

2.8 STAINLESS STEEL

.1 To ASTM A480/A480M, Type 304.

.2 Finish: number 4.

.3 Thickness, fabrication and reinforcement: to ASHRAE, and SMACNA.

.4 Joints: to ASHRAE and SMACNA be continuous inert gas welded.

2.9 HANGERS AND SUPPORTS

.1 Hangers and Supports:
.1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.
.1 Maximum size duct supported by strap hanger: 500.
.2 Hanger configuration: to ASHRAE and SMACNA.
.3 Hangers: black steel angle with galvanized steel rods to ASHRAE, SMACNA, and following table:

Duct Size (mm)	Angle Size (mm)	ROD SIZE (mm)
up to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	6
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10
2101 to 2400	50 x 50 x 5	10
2401 and over	50 x 50 x 6	10

.4 Upper hanger attachments:
.1 For concrete: manufactured concrete

inserts.
.2 For steel joist: manufactured joist clamp.
.3 For steel beams: manufactured beam clamps:

PART 3 - EXECUTION

3.1 GENERAL

.1 Do work in accordance with NFPA 90A, NFPA 90B, ASHRAE, and SMACNA.

.2 Do not break continuity of insulation vapour barrier with hangers or rods.
.1 Insulate strap hangers 100 mm beyond insulated duct and ensure diffuser is fully seated.

.3 Support risers in accordance with ASHRAE, and SMACNA.

.4 Install breakaway joints in ductwork on sides of fire separation.

.5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.

.6 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining where indicated.

3.2 HANGERS

.1 Strap hangers: install in accordance with SMACNA.

.2 Angle hangers: complete with locking nuts and washers.

.3 Hanger spacing: in accordance with ASHRAE, SMACNA, and as follows:

Duct Size (mm)	Spacing (mm)
to 1500	3000
1501 and over	2500

3.3 WATERTIGHT DUCT

.1 Provide watertight duct for:
.1 Minimum 3000 mm from duct mounted humidifier in all directions.

.2 Form bottom of horizontal duct without longitudinal seams.
.1 Solder or Weld joints of bottom and side sheets.
.2 Seal other joints with duct sealer.

.3 Fit low points of duct with drain sump and 32 mm drain connected indirectly to open funnel drain.

.4 Watertight duct for duct mounted humidifier shall be stainless steel.

3.4 SEALING AND TAPING

.1 Apply sealant in accordance with SMACNA and to manufacturer's recommendations.

.2 Bed tape in sealant and recoat with minimum of 1 coat of sealant to manufacturers recommendations.

3.5 LEAKAGE TESTS

.1 In accordance with SMACNA HVAC Duct Leakage Test Manual.

.3 Do leakage tests in sections.

.4 Make trial leakage tests as instructed to demonstrate workmanship.

.5 Do not install additional ductwork until trial test has been passed.

.6 Test section minimum of 30 m long with not less than three branch takeoffs and two 90 degrees elbows.

.7 Complete test before performance insulation or concealment Work.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
.1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible, [2005].

PART 2 - PRODUCTS

2.1 GENERAL

.1 Manufacture in accordance with SMACNA - HVAC Duct Construction Standards.

2.2 FLEXIBLE CONNECTIONS

.1 Frame: galvanized sheet metal frame 0.66 mm thick with fabric clenched by means of double locked seams.

.2 Material:
.1 Fire resistant, self extinguishing, neoprene coated glass fabric, temperature rated at minus 40 degrees C to plus 90 degrees C, density of 1.3 kg/m3.

2.3 ACCESS DOORS IN DUCTS

.1 Non-Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame.

.2 Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame and 25 mm thick rigid glass fibre insulation.

.3 Gaskets: neoprene.

.4 Hardware:
.1 Up to 300 x 300 mm: two sash locks.
.2 301 to 450 mm: four sash locks complete with safety chain.
.3 451 to 1000 mm: piano hinge and minimum two sash locks.
.4 Doors over 1000 mm: piano hinge and two handles operable from both sides.
.5 Hold open devices.
.6 300 x 300 mm glass viewing panels.

2.4 TURNING VANES

.1 Factory or shop fabricated single thickness, double thickness, with or without trailing edge, to recommendations of SMACNA.

2.5 INSTRUMENT TEST

.1 1.6 mm thick steel zinc plated after manufacture.

.2 Cam lock handles with neoprene expansion plug and handle chain.

.3 28 mm minimum inside diameter. Length to suit insulation thickness.

.4 Neoprene mounting gasket.

2.6 SPIN- ON COLLARS

.1 Conical galvanized sheet metal spin-in collars with lockable butterfly damper.

.2 Sheet metal thickness to co-responding round duct standards.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Flexible Connections:
- .1 Install in following locations:
  - .1 Inlets and outlets to supply air units and fans.
  - .2 Inlets and outlets of exhaust and return air fans.
  - .3 As indicated.
- .2 Length of connection: 100 mm.
- .3 Minimum distance between metal parts when system in operation: 75 mm.
- .4 Install in accordance with recommendations of SMACNA.
- .5 When fan is running:
  - .1 Ducting on sides of flexible connection to be in alignment.
  - .2 Ensure slack material in flexible connection.

.2 Access Doors and Viewing Panels:
- .1 Size:
  - .1 900 x 2100 mm for person size entry.
  - .2 450 x 450 mm for servicing entry.
  - .3 300 x 300 mm for viewing.
  - .4 As indicated.
- .2 Locations:
  - .1 Fire and smoke dampers.
  - .2 Control dampers.
  - .3 Devices requiring maintenance.
  - .4 Required by code.
  - .5 Reheat coils.
  - .6 Elsewhere as indicated.

.3 Instrument Test Ports:
- .1 General:
  - .1 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
- .2 Locate to permit easy manipulation of instruments.

.3 Install insulation port extensions as required.
.4 Locations:
.1 For traverse readings:
.1 Ducted inlets to roof and wall exhausters.
.2 Inlets and outlets of other fan systems.
.3 Main and sub-main ducts.
.4 And as indicated.
.2 For temperature readings:
.1 At outside air intakes.
.2 In mixed air applications in locations as approved by Departmental Representative.
.3 At inlet and outlet of coils.
.4 Downstream of junctions of two converging air streams of different temperatures.
.5 And as indicated.

.4 Turning Vanes:
.1 Install in accordance with recommendations of SMACNA and as indicated.

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE

.1 Provide balancing dampers as shown.

PART 2 - PRODUCTS

2.1 SPLITTER DAMPERS

.1 Construction:

.1 single thickness construction, of same material as duct but one sheet metal thickness heavier where both dimensions of damper blade are less than 300 mm (12 in),

.2 double thickness construction, one metal thickness lighter than duct, where either dimension of damper blade is 300 mm (12 in) or larger,

.3 of height equal to full depth of branch duct and length 1½ times branch duct width.

.4 fitted with piano hinge pivot, control rod, and locking device accessible from outside fitting.

2.2 SINGLE BLADE DAMPERS IN RECTANGULAR DUCTWORK

.1 Construction:

.1 shop fabricated of same material and sheet metal thickness as duct, stiffened with longitudinal V-grooves.

.2 maximum aspect ratio: 3:1,

.3 maximum blade height: 250 mm (10 in).

.4 fitted with locking quadrant and inside and outside bearings.

2.3 MULTI-BLADE DAMPERS IN RECTANGULAR DUCTWORK

.1 Construction:

.1 shop fabricated of same material and sheet metal thickness as duct, stiffened with longitudinal V-grooves.

.2 opposed blade configuration

.3 channel frame with angle blade stop,

.4 maximum blade height: 100 mm (4 in),

.5 maximum blade length: 1200 mm (48 in).

.6 bearings with bronze bushings.

.7 shaft extension with locking quadrant.

2.4 SINGLE BLADE DAMPERS IN ROUND DUCTWORK

.1 Construction:

.1 shop fabricated butterfly type with round edged 3.5 mm (10 ga) disk set in round sheet metal housing, fitting snugly when closed, 10 degrees from vertical,

.2 fitted with rubber packing glands, shaft extension, wing nuts, and indexing device to indicate disk position.

PART 3 - EXECUTION

3.1 MANUAL DAMPERS

.1 Install dampers:

.1 where branch serving more than two outlets is taken from main supply duct, use splitter damper in take-off fitting, or single or multiple blade damper in branch.

.2 where branch joins main return or exhaust duct use single or multiple blade damper in branch .

.2 Install splitter dampers and single or multiple blade dampers where branches are taken from or feed into main ducts as specified above.

.3 Provide other manual dampers as shown.

3.2 ACCESS FOR ADJUSTMENT

.1 Locate dampers to allow adjustment of blade position and locking of quadrant and for servicing damper actuators on motorized dampers.

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE

.1 Provide motorized dampers as shown.

1.2 RELATED SECTIONS

.1 Dampers complying with this section:

.1 25 35 01: B.A.S. Instrumentation and Actuators

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit manufacturer's catalogue literature with:

.1 performance charts, pressure drop vs approach velocity for range of blade angles from 0 to 90°

.2 torque requirements.

.3 construction details.

PART 2 - PRODUCTS

2.1 MULTI-LEAF DAMPERS

.1 Parallel blade type:

.1 for two position, OPEN/CLOSED, service

.2 for modulating fresh and return service in air handling units.

.2 Opposed blade type

.1 for other modulating service.

.3 Performance:

.1 leakage in closed position: maximum 2% of rated air flow at 500Pa (2 in wg) differential across assembly,

.2 pressure drop in open position: maximum 50 Pa (0.2 in wg) differential at 5 m/s (1000 fpm).

.4 Construction:

.1 blades, non-insulated: extruded aluminum interlocking blades,

.2 frame, non-insulated: extruded aluminum,

.3 blades, insulated: extruded aluminum interlocking double thickness insulated blades,

.4 frame, insulated: extruded aluminum, thermally broken,

.5 seals: extruded vinyl seals, and spring stainless steel side seals,

.6 maximum blade width: 125 mm (5 in),

.7 maximum blade length: 1200 mm (4 ft).

.8 self-lubricated bronze bearings.

.9 blade linkage with steel tie rods, brass pivots and steel brackets.

.5 Actuator:

.1 24 Volt electric actuator with spring return, stroking damper from closed to open with 4 -20 mA] signal.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Secure dampers within ductwork, air handling units and at air inlets an exhaust outlets, and as shown.

.2 Caulk around frames and between multiple damper modules with UL listed silicone-free sealant.

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE

.1 Provide fire and smoke dampers as shown.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit manufacturers' product sheets with installation data for:

.1 Fire dampers.

.2 Smoke dampers.

.3 Combination smoke and fire dampers.

1.3 APPLICABLE CODES AND STANDARDS

.1 General:

.1 AMCA 500 Laboratory Methods of Testing Dampers for Ratings.

.2 AMCA 503 Fire Ceiling (Radiation), Smoke, and Fire/Smoke Dampers Application Manual.

.2 Listings:

.1 ULC, UL or Warnock Hersey listed to:

(a) CAN/ULC - S112 Standard Method of Fire Test of Fire Damper Assemblies

(b) CAN/ULC - S112.1 Standard for Leakage Rated Dampers for Use in Smoke Control Systems

(c) CAN/ULC - S112.2 Standard Method of Fire Test of Ceiling Firestop Flap Assemblies

.3 Field Testing:

.1 NFPA 90A Standard for the Installation of Air-Conditioning and Ventilating Systems

.2 NFPA 80 Standard for Fire Doors and Other Opening Protectives

.3 NFPA 105 Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives

1.4 DEFINITIONS

.1 ***Static damper***: means a damper rated only to close with essentially no airflow through damper.

.2 ***Dynamic damper***: means a damper rated to close

with air flow through damper at specified air velocities and operating pressure.

PART 2 - PRODUCTS

2.1 FIRE DAMPERS

.1 Curtain damper styles:

.1 Type A: blade pack and frames in airstream,

.2 Type B: blade pack out of airstream,

.3 Type C: blade pack and frame out of airstream; for rectangular, round and flat oval ductwork; and sleeve joints and damper/sleeve joints sealed.

.2 Fire damper fire-resistance rating:

.1 Fire separation ratings 2 hr and less: 1-1/2 hrs

.2 Fire separation rating 3 hr or more: 3 hr.

.3 Ratings, dynamic dampers:

.1 standard performance

(a) air velocity, maximum 10 m/s (2000 fpm)

(b) operating static pressure, maximum 1000 Pa (4 in wc.)

.2 extended performance (“EPxx”)

(a) air velocity, maximum 15 m/s (3000 fpm)

(b) operating static pressure, maximum 1000 Pa (4 in wc.)

.3 high velocity performance (“HVxx”)

(a) air velocity, maximum 20 m/s (4000 fpm)

(b) operating static pressure, maximum 1000 Pa (4 in wc.)

2.2 FIRE DAMPERS - CURTAIN TYPE

.1 Construction:

.1 frame: G60 roll formed galvanized steel frame,

.2 blades: curtain type, interlocking blades, G60 galvanized steel,

.3 sleeve:

(a) same material as damper frame, length to suit application with steel enclosure and transition collars, and retaining angles.

(b) for type B damper sleeves, top of sleeve is formed closely around top of damper; sleeve construction that leaves the blade pack in the airstream is not permitted.

.4 sleeve type: type A, B, and C as shown.

.5 fusible link: 71°C (160°F) unless otherwise shown.

.6 notwithstanding the above, frame, sleeve, and blades to be stainless steel where damper is installed in a duct system which is stainless steel.

.7 dynamic dampers: fitted with stainless steel closure spring, and rated for velocity and operating pressure based on type.

.8 static dampers: fitted with stainless steel closure spring.

PART 3 - EXECUTION

3.1 FIRE DAMPERS

.1 Install fire dampers and fire stop flaps throughout supply, return and exhaust air systems.

.2 Install fire dampers in accordance with manufacturer's instructions, with sleeve, duct connections and angle supports to comply with terms and conditions of listing or classification and maintain integrity of fire wall and/or fire separation.

3.2 FIRE DAMPER SELECTION

.1 Select fire damper types as follows:

.1 “Dynamic” - all locations unless otherwise shown,

.2 “Static” - restricted to un-ducted transfer air openings only where shown.

.2 Select curtain fire damper styles as follows:

.1 For dynamic and static dampers:

(a) duct height is duct dimension perpendicular to blade length orientation.

Damper Velocity Class	Duct Height mm	Curtain Damper Style
Standard Performance (≤ 10 m/s)	> 300	A
	≤ 300	B
Extended Performance (≤ 15 m/s)	> 200	B
	≤ 200	C
High Velocity Performance (≤ 20 m/s)	Any	C

Damper Velocity Class	Duct Height In.	Curtain Damper Style
Standard Performance (≤ 2000 fpm)	> 12	A
	≤ 12	B
Extended Performance (≤ 3000 fpm)	> 8	B
	≤ 8	C
High Velocity Performance (≤ 4000 fpm)	Any	C

3.3 FIRE DAMPER INSTALLATION

.1 Install individual fire dampers and/or assemblies of individual fire dampers within limitations of listing or classification.

.2 Where size of duct exceeds the maximum listing size of a multiple curtain damper assembly, provide multiblade dampers.

.3 Where fire dampers are shown to be motorized, provide multiblade fire damper with electric operator.

.4 Install stainless steel dampers in stainless steel duct systems and/or wherever ductwork is specified to be watertight construction.

.5 Position duct access door at each fire damper, to permit visual inspection and replacement of fusible link.

.6 Install fire stop flaps in accordance with manufacturers' instructions to comply with terms and conditions of listing or classification. Position supplied thermal blankets to cover ceiling diffusers.

3.4 DAMPER SLEEVES

.1 Provide factory damper sleeves in accordance with damper listing requirements, and as described herein.

.1 For type “B” curtain fire dampers, fabricate the sleeve to keep the folded-blade stack out of the air stream, by forming that portion of the sleeve to wrap-around the blade stack to eliminate air pockets on the entering and leaving side of the damper.

.2 For multiblade dampers, smoke dampers, and combination smoke/fire dampers fabricate sleeve style based on damper size listing requirements.

.2 Install damper sleeves with retaining angles in accordance with the damper listing instructions.

3.5 DAMPER ACCESS

.1 Position duct access door at each fire damper, to permit visual inspection and replacement of fusible link.

.1 for horizontal dampers, preferred access location is from the floor above the damper.

.2 Position duct access door at each combination fire and smoke damper, to permit visual inspection and service of detection/actuation mechanism.

.3 Provide similar access door upstream or downstream of each smoke damper for visual inspection.

3.6 TESTING

.1 Field test all fire dampers, smoke dampers, combination smoke/fire dampers and fire stop flaps as follows:

.1 operate dampers to demonstrate unobstructed operation of the damper from open-to-close-to open state. These tests are to be performed while the fan systems are not in operation (static test).

.2 for dynamic dampers, confirm air velocity through the open dampers under normal HVAC system operation, once air balancing is completed. Dampers may be selected as appropriate to confirm operation for ducts

operating within 80% of the maximum air velocity of the damper listing.

.3 confirm accessibility to components of fire damper to permit maintenance and testing.

.4 where a damper is provided with an indicating device, confirm device functions and annunciates to the supervised location or system when the damper is in both the open and closed state, as applicable.

.5 Upon completion of testing, provide labour and resources necessary to re- test up to 10% of dampers on each floor as selected and witnessed by Engineer

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE

.1 Provide package roof and wall exhausters as shown.

1.2 SHOP DRAWINGS AND PRODUCT DATA SHEETS

.1 Submit manufacturer's data sheets for:

.1 roof and wall exhausters,

.2 air intake cowls.

.2 Provide equipment model numbers, performance and design data, outline dimensions, power requirements, prefabricated curb details, support and connection details and unit weights.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Roof and wall exhausters, sound curbs and air intake cowls to be products from current catalogue of one manufacturer.

2.2 ROOF AND WALL EXHAUSTERS

.1 Construction:

.1 centrifugal belt driven type with spun aluminum housing, insulated aluminum curb or wall cap, continuous curb gasket and stainless steel fastenings,

.2 non overloading, statically and dynamically balanced aluminum fan wheels,

.3 lubricated ball bearing shaft and motor mounted in compartment isolated from air stream,

.4 motor disconnect switch mounted in motor compartment,

.5 adjustable pitch drive with automatic spring loaded belt tensioner,

.6 vibration isolation between static and rotating components,

.7 bird screen and and motorized inlet dampers with electric actuators.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install fans, and curbs.

.2 Supply curbs to roofer with location details and counter flash before installation of fans and inlet cowls.

.3 Interlock motorized dampers with fan operation, open with fan ON, closed with fan OFF.]

3.2 COMMISSIONING

.1 Check direction of fan rotation and adjust variable pitch drives during balancing.

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE

.1 Provide terminal boxes as shown.

1.2 SHOP DRAWINGS

.1 Submit manufacturer's data sheets with equipment model numbers, performance and design data, outline dimensions, enclosure details, support and connection arrangements and electrical power requirements where applicable.

1.3 APPLICABLE CODES AND STANDARDS

.1 ARI Standard 880 Standard for Air Terminals

.2 ARI Standard 885 Standard for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets.

.3 ASHRAE Standard 180 Methods of Testing for Rating Ducted Air Terminal Units

PART 2 - PRODUCTS

2.1 GENERAL

.1 Selection of units to meet air quantities shown to be based on;

.1 maximum Inlet Air Pressure; 750 Pa (3 in wg),

.2 minimum Inlet Air Pressure; 75 Pa (0.3 in wg),

.3 maximum room NC sound pressure level (2 x 10^{-4} microbar reference) at maximum inlet pressure to be less than 40 at discharge and 42 radiated for box with attenuator mounted exposed (without ceiling).

.2 Where sizes, model numbers and unit types are indicated, selections are taken from E.H. Price catalogue.

2.2 TERMINAL BOX

.1 Construction:

.1 pressure independent type with pneumatic velocity sensor, damper assembly, factory calibrated controller and actuator with adjustable minimum stop

.2 damper arranged "normally open" for

morning warm-up.

.3 controller capable of maintaining air quantity within ±5% of set value, between zero and stipulated rated air flow,

.4 sound level below specified values when operating from minimum to maximum inlet static pressure.

.2 Silencer/attenuator:

.1 on box discharge, acoustically treated open end or multiple outlet attenuator 900mm (30 in) long on boxes up to Size 10 and 1.5 m (5 ft) long on boxes Size 12 and larger

.2 acoustic lining - fibreglass:[

(a) 20 mm (13/16 in) thick, 64kg/m^3 (4 lb/sq ft) density, rigid fibreglass with fire resistive reinforced aluminum foil-scrim-kraft (FSK) facing,

(b) flame spread rating not to exceed 25, smoke development rating not to exceed 50,

(c) fastened to interior sheet metal surface with 100% coverage of adhesive, and fasteners at 1 pin per 0.2m^2 (2 sq ft) but not less than 1 row on each duct side.

(d) edges concealed by metal nosings at inlet and discharge, with notch and tuck fabrication and seams protected by Z strips

.3 acoustic lining - elastomeric:

(a) spray coated, flexible, closed cell elastomeric insulation in sheet form, with self-adhering backing]

(b) flame spread rating not to exceed 25, smoke development rating not to exceed 50,

(c) fastened to interior sheet metal surface with 100% coverage of adhesive, and fasteners at 1 pin per 0.2m^2 (2 sq ft) but not less than 1 row on each duct side.

.4 duct liner fasteners:

(a) 2.0 mm (1/16 in) diameter pins,

(b) length selected to suit thickness of insulation,

(c) 32 mm (1¼ in) square Nylon retaining clips.

2.3 CONTROLLERS

.1 Direct Digital Controllers (DDC) including actuators to be supplied and factory mounted by Terminal Box Manufacturer.

.2 Air flow sensor to be provided by Terminal Box Manufacturer.

.3 120 VAC to 24 VAC transformer for DDC controller to be supplied by and factory installed by the Terminal Box Manufacturer.

PART 3 - EXECUTION

3.1 BOX INSTALLATION

.1 Support terminal boxes from building structure with angles, hangers and supplementary steel before installation of piping and connecting ductwork.

.2 Provide access door in ductwork downstream of reheat coil.

3.2 DUCTWORK CONNECTIONS

.1 Connect inlet ductwork with spiral flat seam round duct of same diameter as terminal box inlet

.2 Support outlet ductwork independent from box.

.3 Seal openings in box and attenuator for [][reheat coil and connections,]control, and power wiring.

3.3 ELECTRICAL CONNECTIONS

.1 Electrical Division 26 will provided 120 Volt, single phase power supply with a junction box for each group of terminal boxes with maximum of 12 terminal box controls fed from one junction box.

.2 Extend power supply from these junction boxes and connect to terminal units.

3.4 LEAKAGE TESTING

.1 Terminal boxes and attenuators to be included in ductwork leakage testing.

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE

.1 Provide grilles, registers, and diffusers as shown.

1.2 SHOP DRAWINGS

.1 Submit manufacturer's data sheets with equipment model numbers, performance and design data, outline dimensions, support recommendations and connection details.

1.3 SAMPLES

.1 Submit examples of each type and style of register, diffuser and grille with sample finishes when requested.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Grilles, registers and diffusers:

.1 product of one manufacturer where same model or type identification is used.

.2 standard catalogue products selected to meet capacity, throw, and noise level.

.3 prime coated, stamped or cold rolled steel material with mitred corners and exposed joints welded and ground smooth.

.4 extruded satin finish, clear anodized aluminum material with mitred corners and mechanical fasteners.

.5 Frames with full perimeter gaskets, plaster stops where set into plaster or gypsum board, and concealed fasteners.

2.2 TYPE DESIGNATIONS

.1 Diffuser, register and grille schedule identifies model or type identifiers used on floor plans with model numbers taken from listed manufacturer's catalogue.

.2 Where several manufacturer's model numbers are given, these are acceptable alternatives.

.3 Where only one manufacturer's model number is given, provide designated item.

2.3 SUPPLY REGISTERS

.1 double deflection style with face bars vertical and rear bars horizontal,

.2 perimeter border with gasket,

.3 opposed blade dampers (OPD) with concealed manual operator,

.4 of steel or aluminum material.

2.4 RETURN OR EXHAUST GRILLES

.1 single deflection type, with horizontal face bars, 20 maximum turn up,

.2 perimeter border with gasket,

.3 opposed blade damper with concealed operator,

.4 of steel or aluminum material.

2.5 DIFFUSERS

.1 circular or square multiple cone or perforated face type, with adjustable pattern control,

.2 of steel or aluminum material.

PART 3 - EXECUTION

3.1 LAYOUT

.1 Drawings showing position of air distribution outlets are essentially diagrammatic. Coordinate exact location of diffusers with other elements in ceiling and shown on reflected ceiling drawings and select trim to suit ceiling materials listed in Finish Schedules.

3.1 SPECIAL INSTRUCTIONS

.1 Grilles, registers and diffusers penetrating fire walls and fire partitions, to have steel sleeves secured to structure in accordance with NFPA 90A-1985.

.2 In gymnasium provide safety chain on each diffuser face and core and bolt diffuser in place.

.3 For laminar flow diffusers, with or without HEPA filters, support diffuser from the building structure with steel cable, independent of ceiling system and ductwork.

.4 For security grilles and diffusers, and other grilles and diffusers exceeding 5 kg (12 lbs) weight, mechanically fasten grille/diffuser

to ceiling or wall structure, independent of ductwork connection or support.

3.3 INSTALLATION OF GRILLES AND REGISTERS

.1 Install supply registers with face bars vertical and exhaust and return registers with face bars horizontal.

.2 Install registers and grilles with oval head cadmium plated screws in countersunk holes where fastenings are visible.

3.4 INSTALLATION OF DIFFUSERS

.1 Diffusers to be installed with concealed fastenings.

.2 Round, square and rectangular diffusers to be provided with equalizing deflectors, mounted in neck, accessible from diffuser face, with blades oriented at right angles to direction from which air is flowing.

.3 Except for last diffuser on branch, each diffuser installed in underside of supply duct to have extract volume control damper.

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE

.1 Provide roof top package units as shown.

1.2 SHOP DRAWINGS

.1 Submit shop drawings for each roof top package unit with;

.1 equipment model number,

.2 outline dimensions,

.3 enclosure details,

.4 space requirements for service and maintenance,

.5 support arrangements.

.2 Provide rating information showing capacity and power input requirements for heating and cooling at full load.

.3 Provide diagrams showing;

.1 requirements for field assembly with air flows, connection pipe sizes and external pressure drop at rated air flow,

.2 unit internal and external electrical power and control wiring with motors, starters, relays and interlocks identified, and with terminal and wire numbers marked.

.4 Submit sound power data for supply, relief, or return fans rated at more than 2.0 m^3/s (4000 cfm) and for condenser section where unit capacity exceeds 40 kW (11.4 tons).

1.3 REFERENCE STANDARDS

.1 Sound ratings to AMCA (Air Moving and Air Conditioning Association) 301 when tested to AMCA 300 and soundproofing to ARI 270.

.2 Fans to AMCA 99

.3 Fan ratings to AMCA 210, and ASHRAE 51.

.4 Weatherproofing to AGA rain test standards.

.5 Salt spray test to ASTM B117.

.6 Units larger than 40 KW (11.4 tons) to ARI 210 Standard for Unitary Air Conditioning Equipment.

1.4 WARRANTY

.1 Compressors to be warranted against failure for five (5) years parts only.

.2 Gas heat exchangers to be warranted against failure for ten (10) years parts only.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Performance as shown.

.2 Hermetic reciprocating or scroll compressor, evaporator, air cooled condenser, condenser fans, evaporator fan, heater section, filter box, economizer section, power exhaust fans, motor starters, and controls,

.3 Roof curb mounting frame for down discharge supply and up-flow return,

.4 Factory assembled and tested with refrigeration piping, refrigerant and oil charge.

.5 Ready for connection to ductwork, gas and electric power source.

2.2 CABINET

.1 Construction:

.1 assembled on galvanized steel base with lifting lugs and curb flashings,

.2 constructed with angle or folded plate frame of galvanized steel, minimum 22 mm (14 ga), and panels of [0.8 mm (22 ga)][1.2 mm (18 ga)][1.0 mm (20 ga)],

.3 configured for bottom or side air supply and return connections

.4 weathertight casing with removable gasketed panels for access to motorized equipment, electrical control panel and filter changing,

.5 primed and enameled to withstand 1000 hr salt spray test.

.2 Insulation:

.1 insulation on panel surfaces in contact with conditioned air: 13 mm (½ in), 24 kg/m³ (1.5 lb/ft³) density foil faced or neoprene coated glass fibre.

2.3 EVAPORATOR

.1 Direct expansion type, arranged with counter flow between air and refrigerant,

.1 minimum of two circuits for units with capacities of 6 tons or larger,

.2 aluminum fins on copper tubes mounted in zinc coated steel casing,

.3 maximum face velocity of 2.6 m/s (500 fpm), minimum 3 rows,

.2 Condensate pan:

.1 galvanized steel welded condensate pan draining to 20 mm (¾ in) side outlet connection.

2.4 EVAPORATOR FAN

.1 Double width, double inlet centrifugal type;

.1 statically and dynamically balanced,

.2 arrangement 3 belt driven, with adjustable pitch sheave and belt tensioning arrangement, sized for 150% of fan motor horsepower for units with capacities of 6 tons or larger.

.3 fan complete with AFD for VAV control,

.4 mounted with motor on isolation base separated from unit casing with flexible connections and rubber in shear isolators.

2.5 AIR FILTERS

.1 50 mm (2 in) thick throwaway filters.

.2 Mounted ahead of evaporator coil, in filter box with access panel.

2.6 REFRIGERATION COMPRESSORS

.1 Variable speed compressors operating with to allow modulating cooling capacity.

.2 Each compressor with;

.1 thermal overloads,

.2 oil pump for forced feed lubrication,

.3 solid state motor protection including phase failure and under/over voltage.

.3 Mounted on pad type vibration isolators.

.4 Located in separate compartment isolated from air stream.

2.7 REFRIGERANT CIRCUIT

.1 Piping, valves, fittings and related parts to CSA B52 with;

.1 thermal expansion valve or capillary refrigerant metering device

.2 combination filter/dryer,

.3 high side pressure relief device, and

.4 charging valve.

.2 Insulation:

.1 19 mm (¾ in) thick flexible elastomeric insulation on suction line.

2.8 CONDENSER SECTION

.1 Fans:

.1 direct drive, slow speed, multiple propeller fans.

.2 Condenser coil:

.1 aluminum fins on copper tube, integral subcooling circuits,

.2 separate refrigeration circuits for each compressor,

.3 sized for outdoor air entering temperature of 38 C (100 F).

2.9 REFRIGERANT CONTROLS

.1 Microprocessor based DDC control system with;

.1 external unit stop switch,

.2 high and low refrigerant pressure switches,

2.10 GAS FIRED HEATING SECTION

.1 CGA certified heating section suitable for natural gas supplied at 7 in wg.

.2 Electronic spark ignition, electronic flame failure sensor, limit controls and gas train,

.3 Single stage heating with modulating heating capacity.

.4 Control system located in sheet metal weatherproof enclosure.

2.11 ECONOMIZER SECTION

.1 Motorized fresh air and recirculation dampers,

.2 Gravity relief dampers with direct drive propeller type power exhaust fans

2.12 TEMPERATURE CONTROL SYSTEM

.1 DDC control module to operate heating, economizer dampers and power exhaust fans, and cooling in sequence in response to Building Automation System or thermostat.

2.13 ELECTRICAL PANEL

.1 Single point power supply with;

.1 power connection,

.2 control interlock terminals,

.3 unit control system located in sheet metal weatherproof enclosure.

.2 Circuit protection for;

.1 compressors and starters,

.2 fans and control circuit,

.3 solid state sequence timer,

.4 compressor motor overload protection with current sensing in three passes,

.5 control transformer.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install roof curb and place unit on curb with adequate clearance for service and maintenance.

.2 Connect ductwork, and gas piping.

.3 Provide un-fused weatherproof disconnect on or adjacent unit and run electric power and control wiring.

3.2 START-UP SERVICE

.1 Arrange for manufacturers' field representative to supervise installation, start-up unit and instruct Owners operations and maintenance personnel.

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE

.1 Provide ductless split air conditioning units and heat pump units as shown.

1.2 SHOP DRAWINGS

.1 Submit shop drawings for each condensing unit and evaporator with;

.1 equipment model number,

.2 outline dimensions,

.3 enclosure details,

.4 space requirements for service and maintenance,

.5 support arrangements.

.2 Provide rating information showing capacity and power input requirements for heating and cooling at full load.

.3 Provide diagrams showing;

.1 requirements for field assembly with air flows, connection pipe sizes and rated air flow,

.2 unit internal and external electrical power and control wiring with motors, starters, relays and interlocks identified, and with terminal and wire numbers marked.

1.3 WARRANTY

.1 Compressors to be warranted against failure for five (5) years parts only.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Package system, factory assembled and tested with pre-charged refrigeration piping, refrigerant and oil charge.

.2 Ready for connection of electric power at evaporator unit and condensing unit and control wiring between units.

2.2 EVAPORATOR UNIT

.1 Exposed indoor evaporator unit;

.1 pre-charged direct expansion type cooling coil, arranged with counter flow between air and refrigerant,

.2 three speed fans statically and dynamically balanced,

.3 disposable filters for particulate and odour control,

.4 condensate pan draining to 20 mm (¾ in) side outlet connection.

.5 exposed: plastic enclosure with removable panels for servicing,

.6 conceaned: enamel sheet metal enclosure with access doors and concealed fasteners,

.7 concealed suspension brackets

.8 operating sound level less than 45dB(A)

2.3 CONDENSING UNIT

.1 Outdoor, air cooled, hermetic compressor;

.1 mounted on vibration isolators,

.2 air cooled condensing coil,

.3 condenser fans, motor starters, and controls,

.4 sheet metal enclosure with mounting lugs and fan safety grille primed and enameled to withstand 1000 hr salt spray test.

.5 low ambient operation to -22°C (-7°F)

.6 operating sound level less than 55dB(A)

2.4 REFRIGERANT CIRCUIT

.1 Piping, valves, fittings and related parts to CSA B52.

.2 Pipe insulation: 19 mm (¾ in) thick flexible elastomeric insulation on suction line.

2.5 TEMPERATURE CONTROL SYSTEM

.1 Hard wired electronic thermostat and control module to operate heating, and cooling in sequence in response to thermostat sensed temperature, with indication for;

.1 operating mode (heat/cool)

.2 compressor operation,

.3 no heat,

.4 touch sensitive key pad to allow hour/day operating program and adjustment of thermostat set point.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install evaporator unit in space, route drain piping as shown.

.2 Install condensing unit with adequate clearance for service and maintenance.

.3 Run refrigeration suction and liquid piping as shown in accordance with manufacturer’s instructions with respect to horizontal and vertical length limitations

.4 Charge systems and leak test in accordance with manufacturer’s instructions

.5 Provide un-fused weatherproof disconnect on or adjacent condenser and evaporator units and run electric power and control wiring.

.6 As required, depending on manufacturer, sub-feed electrical power for evaporator unit from condenser unit.

.7 Provide sheet-metal wind-baffle shield on condenser as required by manufacturer's instructions for low ambient operation.

3.2 START-UP SERVICE

.1 Arrange for manufacturers’ field representative to supervise installation, start-up system and instruct Owners operations and maintenance personnel.

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE

.1 Provide humidifiers as shown.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit manufacturer's piping and wiring diagrams, and data sheets showing:

.1 capacities,

.2 absorption distances,

.3 recommended installation methods.

.2 Submit manufacturers data substantiating absorption distances with air leaving humidifier at 13°C (55°F) and 65%RH.

PART 2 - PRODUCTS

2.1 RAPID ABSORPTION STEAM HUMIDIFIERS

.1 Distribution panels with closely spaced steam dispersion tubes spanning between headers and mounted in galvanized steel casing;

.1 normally closed modulating steam control valve,

.2 centrifugal type steam/water separator,

.3 factory installed electric valve actuator,

PART 3 - INSTALLATION

3.1 INSTALLATION

.1 Mount and fit units in accordance with manufacturer's instructions.

.2 Provide cold water supply, minimum 6 mm (¼ in) size type K soft temper copper tubing with shut-off valve.

.3 Provide air gap or backflow preventer in inlet water line and air gap in drain line to each humidifier

.4 Connect overflow with drain line sloped 1 in 25, terminating over open drain.

.5 Install steam trap assembly, strainers, isolating valves, and connect up steam supply and condensate return.

.6 Locate steam generator close to and below distributors.

3.2 SUPERVISION AND START-UP	.1 Arrange and pay for services of trained representative of equipment manufacturer to supervise installation, wiring, set up, and testing of humidifier systems. .2 At completion, manufacturers' representative is to instruct Owners operating personnel in operation and maintenance of humidifier systems

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

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

.2 Reference Standards:
.1 CSA Group
.1 CSA C22.1-15, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations.
.2 CSA C22.2.
.3 CAN3-C235-83(R2015), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
.1 IEEE SP1122-[2000], The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
.2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.
.3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between

each item of equipment.
.4 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
.5 If changes are required, notify Departmental Representative of these changes before they are made.

.5 Certificates:
.1 Provide CSA certified equipment and material.
.2 Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction and inspection authorities for special approval before delivery to site.
.3 Submit test results of installed electrical systems and instrumentation.
.4 Permits and fees: in accordance with General Conditions of contract.
.5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
.6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.

.6 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

.2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.
.1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
.2 Operating instructions to include following:
.1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
.2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
.3 Safety precautions.

.4 Procedures to be followed in event of equipment failure.
.5 Other items of instruction as recommended by manufacturer of each system or item of equipment.

.3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
.4 Post instructions where directed.
.5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
.6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

1.4 DELIVERY STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:
.1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect equipment from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

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

.3 Language operating requirements: provide identification nameplates and labels for

control items in English.

2.2 MATERIALS AND EQUIPMENT

.1 Provide material and equipment in accordance with Section 01 61 00.

.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 and inspection authorities before delivery to site and submit such approval as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.3 Factory assemble control panels and component assemblies.

2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

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

.2 Control wiring and conduit: in accordance with Section 26 05 34 except for conduit, wiring and connections below 50 V which are related to control systems specified in mechanical sections and as indicated on mechanical drawings.

2.4 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of authority having jurisdiction and inspection authorities Departmental Representative.

.2 decal signs, minimum size 175 x 250 mm.

2.5 WIRING TERMINATIONS

.1 Ensure lugs, terminals, screws used for termination of wiring are suitable for copper conductors.

2.6 EQUIPMENT INDENTIFICATION

.1 Identify electrical equipment with nameplates and labels as follows

.1 Nameplates: lamicoid 3mm melamine, black face, white core, lettering accurately aligned and engraved into core and mechanically attached with self tapping screws.

.2 Sizes as follows:

NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high Letters
Size 2	12 x 70 mm	1 line	5 mm high Letters
Size 3	12 x 70 mm	2 lines	3 mm high Letters
Size 4	20 x 90 mm	1 line	8 mm high Letters
Size 5	20 x 90 mm	2 lines	5 mm high Letters
Size 6	25 x 100 mm	1 line	12 mm high Letters
Size 7	25 x 100 mm	2 lines	6 mm high Letters

.2 Labels: embossed plastic labels with [6] mm high letters unless specified otherwise.

.3 Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture.

.4 Allow for minimum of twenty-five (25) letters per nameplate and label.

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

.6 Identify equipment with Size 3 labels engraved "ASSET INVENTORY NO." as directed by Departmental Representative.

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

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

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

2.7 WIRING INDENTIFICATION

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

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

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

2.8 CONDUIT AND CABLE INDENTIFICATION

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

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

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security System	Red	Yellow

2.3 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.1 Paint indoor switchgear and distribution enclosures light gray.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

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

.2 Do overhead and underground systems in accordance with CAN/CSA-C22.3 No.1 except where specified otherwise.

3.3 NAMEPLATES AND LABELS

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

3.4 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete.

.1 Sleeves through concrete: plastic, sized for free passage of conduit, and protruding 50 mm.

.2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.5 LOCATION OF OUTLETS

.1 Locate outlets in accordance with Section 26 05 32.

.2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

.3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

.4 Locate light switches on latch side of doors.
.1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

3.6 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

.3 Install electrical equipment at following heights unless indicated otherwise (General/Barrier Free).
.1 Local switches: 1200/900-1100 mm.
.2 Wall receptacles:
.1 General: 300/450 mm.
.2 Above top of continuous baseboard heater: 200/200 mm.
.3 Above top of counters or counter splash backs: 175/175 mm.
.4 In mechanical rooms: 1200/1200 mm.
.3 Panelboards: as required by Code or as indicated.
.4 Telephone and interphone outlets: 300/450 mm.
.5 Wall mounted telephone and interphone outlets: 1500/1200 mm.
.6 Fire alarm stations: 1500/1200 mm (centre line).
.7 Fire alarm bells: 2100/2100 mm.
.8 Television outlets: 300/450 mm.
.9 Wall mounted speakers: 2100/2100 mm.
.10 Clocks: 2100/2100 mm.
.11 Door bell pushbuttons: 1200/900-1100 mm

3.7 CO-ORDINATION OF PROTECTIVE DEVICES

.1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.8 FIELD QUALITY CONTROL

.1 Load Balance:

.1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

.2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

.3 Provide upon completion of work, load balance report as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS, phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.

.2 Conduct following tests in accordance with Section 01 45 00.

.1 Power distribution system including phasing, voltage, grounding and load balancing.

.2 Circuits originating from branch distribution panels.

.3 Lighting and its control.

.4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.

.5 Systems: fire alarm and communications.

.6 Insulation resistance testing:

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

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

.3 Check resistance to ground before energizing.

.3 Carry out tests in presence of Departmental Representative.

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

.5 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.6 SYSTEM STARTUP

.1 Instruct Departmental Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.

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

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

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 34 - Conduits, Fastenings and Fittings.

1.2 REFERENCES

.1 CSA International
- .1 CSA C22.2 No.18.1-13, Metallic outlet boxes (Tri-national standard, with UL 514A and ANCE NMX- J-023/1).
- .2 CAN/CSA-C22.2 No.18.2-06(R2011), Nonmetallic Outlet Boxes.
- .3 CSA C22.2 No.18.3-12, Conduit, tubing, and cable fittings (Tri-national standard, with ANCE NMX-J-017 and UL 514B).
- .4 CAN/CSA-C22.2 No.18.4-04(R2013), Hardware for the Support of Conduit, Tubing, and Cable (Bi-National standard, with UL 2239).
- .5 CSA C22.2 No. 18.5-13, Positioning devices (Bi-national standard, with UL 1565).
- .6 CSA C22.2 NO. 65-13, Wire connectors (Tri-national standard, with UL 486A-486B and NMX-J-543-ANCE).
- .7 CSA C22.2 No. 188, Splicing Wire Conneectors.

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
- .1 EEMAC 1Y-2-1961, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

.2 National Electrical Manufacturers Association (NEMA)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

.2 Operation and Maintenance Data: submit operation and maintenance data for wire and box connectors for incorporation into manual.

1.5 DELIVERY STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:
.1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect equipment from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.

.2 Fixture type splicing connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

.3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:
.1 Connector body and stud clamp for copper conductors or bars.
.2 Clamp for copper conductors or bars.
.3 Stud clamp bolts.
.4 Bolts for copper conductors or bars.
.5 Sized for conductors or bars as indicated or required.

.4 Clamps or connectors for armoured cable, mineral insulated cable, as required to: CAN/CSA-C22.2 No.18.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

.1 Provide connectors in accordance with the manufacturer’s recommendation for the size, quantity and type of wires.

.2 Install connectors in accordance with the manufacturer’s recommendations.

.3 Remove insulation carefully from ends of conductors:
.1 where the conductor is damaged, remove the damaged portion and strip the insulation back further as necessary,
.2 where the conductor is too short, replace the conductor.

.4 Tighten screws of mechanical pressure type connectors in accordance with the manufacturer’s recommendations. Installation to meet secureness tests in accordance with CSA C22.2 No.65.

.5 Install compression type connectors using the appropriate compression tool and die as recommended by the manufacturer. Make two crimps on each wire. Installation to meet secureness tests in accordance with CSA C22.2 No.65.

.6 Remove insulation carefully from ends of conductors:

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

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

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 PRODUCT DATA

.1 Provide product data in accordance with Section 01 33 00.

1.2 DELIVERY, STORAGE AND HANDLING

.1 Packaging Waste Management: remove for reuse and return of pallets and packaging materials in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12AWG.

.2 Copper conductors: size as indicated, with 600V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE, RWU90 XLPE Jacketed.

2.2 TECK 90 CABLE

.1 Cable: in accordance with Section 26 05 00.

.2 Conductors:
.1 Grounding conductor: copper.
.2 Circuit conductors: copper, size as indicated.

.3 Insulation:
.1 Cross-linked polyethylene XLPE.
.2 Rating: 600V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: interlocking.

2.3 MINERAL-INSULATED CABLES

.1 Conductors: solid bare soft-annealed copper, size as indicated.

.2 Insulation: compressed powdered magnesium oxide or silicon dioxide to form compact homogeneous mass throughout entire length of cable.

.3 Outer covering: annealed seamless copper sheath, Type M1 rated 600 V, 250 degrees C.

.4 Overall jacket: PVC applied over the sheath and compliant to applicable Building Code classification for this project, wet locations.

.5 Two hour fire rating.

.6 Connectors: factory installed and tested approved for MI cable.

.7 Termination kits: factory installed approved for MI cable

2.4 ARMOURED CABLES

.1 Conductors: insulated, copper, size as indicated.

.2 Type: AC90.

.3 Armour: interlocking type fabricated from galvanized steel strip.

2.5 ALUMINUM SHEATHED CABLE

.1 Conductors: copper], size as indicated.

.2 Insulation: cross linked polyethylene type RW90 rated 600 V.

.3 Sheath: aluminum applied to form continuous corrugated sheath.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00.

.2 Perform tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

.1 Cable Colour Coding: to Section 26 05 00.

.2 Conductor length for parallel feeders to be identical.

.3 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

.4 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.

3.3 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:
.1 In conduit systems in accordance with Section 26 05 34.

3.4 INSTALLATION OF TECK 90 CABLE (0-1000 V)

.1 Group cables wherever possible on channels.

.2 Install cable exposed or concealed, depending on room finish, securely supported by straps.

3.5 INSTALLATION OF MINERAL-INSULATED CABLES

.1 Install cable exposed or concealed, depending on room finish, securely supported by straps.

.2 Support 2 hour fire rated cables at 1 m intervals.

.3 Make cable terminations by using factory-made kits.

.4 Cable terminations: use thermoplastic sleeving over bare conductors.

.5 Do not splice cables unless indicated.

3.6 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible on channels.

3.7 INSTALLATION OF ALUMINUM SHEATHED CABLE

.1 Group cables wherever possible on channels.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for connectors and terminations.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CSA C22.2
- .2 CSA C22.2 No.41-13, Grounding and Bonding Equipment.

1.3 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 20.

.2 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Departmental Representative.

PART 2 - PRODUCTS

2.1 CONNECTORS AND TERMINATIONS

.1 Copper long barrel compression connectors to CSA C22.2 as required sized for conductors.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install stress cones, terminations, and splices in accordance with manufacturer's instructions.

.2 Bond and ground as required to CSA C22.2 No.41.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00.

1.2 REFERENCES

.1 American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE)
.1 ANSI/IEEE 837, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.

.2 CSA International
.1 CSA C22.1 Electrical Safety Code.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit product data in accordance with Section 01 33 00.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

.2 Operation and Maintenance Data: submit operation and maintenance data for grounding equipment for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:
.1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect grounding equipment from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 EQUIPMENT

.1 Clamps for grounding of conductor: size as required to electrically conductive underground water pipe.

.2 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, tinned, soft annealed, size #4/0 AWG or as indicated.

.3 Rod electrodes: copper clad steel 19 mm diameter by minimum 3m long.

.4 Plate electrodes: steel, surface area 0.2m^2, minimum 1.6mm thick.

.5 Grounding conductors: bare stranded copper, tinned], soft annealed, size #4/0 AWG or as indicated.

.6 Insulated grounding conductors: green, copper conductors, size as indicated.

.7 Ground bus: copper, size 6mm x 50mm copper, mounted 150mm above floor on insulated spacers 600m on centre.

.8 Ground bus mounting spacers
.1 standoff insulators to UL891
.2 25 to 32mm high waterproof glass fibre reinforced polyamide
.3 750V insulated
.4 UL 94VO self extinguishing
.5 Bichromated zinc plated threaded steel inserts.

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

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for grounding equipment installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Make buried connections, and connections to conductive water main, electrodes, using copper welding by thermit process.

.5 Use mechanical connectors for grounding connections to equipment provided with lugs.

.6 Soldered joints not permitted.

.7 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

.9 Install separate ground conductor to outdoor lighting standards.

.10 Install grounding resistance bank where required.

3.3 ELECTRODES

.1 Make ground connections to continuously conductive underground water pipe on street side of water meter.

.2 Install concrete encased electrodes in building foundation footings, with terminal connected to grounding network.

.4 Install rod electrodes and make grounding connections as indicated.

.5 Bond separate, multiple electrodes together.

.6 Use size #4/0 AWG copper conductors for connections to electrodes.

3.4 EQUIPMENT GROUNDINGS

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

3.5 GROUNDING BUS

.1 Install copper grounding bus mounted on insulated supports on wall of electrical room.

.2 Ground items of electrical equipment in electrical room and IT equipment in communication equipment room to ground bus with individual bare stranded copper connections size 2/0AWG.

3.6 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

.4 Disconnect ground fault indicator during tests.

3.7 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 61 00 - Common Product Requirements.

.2 Concrete bases and housekeeping pads for electrical equipment shall be arranged and paid for by Division 26 and installed by trade specialists under respective Carpentry, Concrete and Painting Divisions.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:
.1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect grounding equipment from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted, suspended or set in poured concrete walls and ceilings.

2.2 INSERTS

.1 Inserts for conduits and raceway hangers, for single, double and multiple runs shall be galvanized.

2.3 HANGERS

.1 Hangers for electrical conduit shall be hot dipped galvanized after fabrication.

2.4 TRAPEZE HANGERS

.1 Performance:
- .1 Manufactured:
  - (a) to product load listings.
- .2 Custom fabricated:
  - (a) maximum deflection between supports: 1/250 (0.4%) of span
  - (b) minimum factor of safety : 5 times load to ultimate tensile or compressive strength.

.2 Construction:
- .1 Carbon steel shapes, to suit load application:
  - (a) hollow steel section,
  - (b) equal leg El section, or
  - (c) double C channel “strong-back”, with welded clips.
- .2 Hanger rods:
  - (a) as specified above, and
  - (b) minimum two support rods,
  - (c) rods selected for minimum factor of safety of 5 times load to ultimate tensile or compressive strength of rod.

.3 Finish:
- .1 hot dipped galvanized finish in mechanical rooms and outdoors.
- .2 black steel finish in other areas.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for grounding equipment installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

.1 Supply and deliver inserts to site in ample time to be built into work of other trades. Provide necessary templates and adequate instructions to locate and install inserts.

.2 Secure equipment to masonry, tile and plaster surfaces with lead anchors.

.3 Secure equipment to poured concrete with expandable inserts.

.4 Secure surface mounted equipment with T-bar support hanger fastened to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

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

.6 Fasten exposed conduit or cables to building construction or support system using straps.
.1 One-hole steel straps to secure surface conduits and cables 50 mm (2") and smaller.
.2 Two-hole steel straps for conduits and cables larger than 50 mm (2").
.3 Beam clamps to secure conduit to exposed steel work.

.7 Suspended support systems.
.1 Support individual cable or conduit runs with 6 mm (¼") dia threaded rods and spring clips.
.2 Support 2 or more cables or conduits on channels supported by 6 mm (¼") dia threaded rod hangers where direct fastening to building construction is impractical.

.8 For surface mounting of two or more conduits use channels.

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

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

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

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

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

.14 Supply and erect special structural work required for the installation of electrical equipment. Provide anchor bolts and fastenings unless noted otherwise. Mount equipment required to be suspended above floor level, where details are not shown, on a frame or platform bracketed from the wall or suspended from the ceiling. Carry supports to either the ceiling or the floor, or both as required, at locations where, because wall thickness is inadequate, it is not permitted to use such brackets.

.15 Electrical panels, switches or other electrical equipment shall be complete with suitable bases or mounting brackets. Install angle or channel iron supports to bear the equipment where it is shown in or on structural tile walls, or walls that are inadequate to bear the equipment.

.16 Provide channel iron or other metal supports where necessary to adequately support lighting fixtures. Do not use wood. Lighting fixtures shall be supported totally independent of ceiling and supported from structure above.

.17 Support hangers, in general, from inserts in concrete construction or from building structural steel beams, using beam clamps. Provide additional angle or channel steel members required between beams for supporting conduits.

.18 Do not use explosive drive pins in any section of work without obtaining prior written approval.

.19 Provide re-enforced concrete pads under switchboards, generators, and all other floor mounted electrical equipment. Pads are to formed with chamfered edges to prevent chipping. Pads are to be sealed and painted to prevent dust from entering and interfering with electrical equipment.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International).
- .1 CSA C22.1-09, Canadian Electrical Code, Part 1, 21st Edition.
- .2 CSA C22.2 No. 76 Splitters
- .3 CSA C22.2 No. 40 Junction and Pull Boxes.

1.2 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:
- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 SPLITTERS

.1 Construction: sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.

.2 Terminations: main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.

.3 Spare Terminals: minimum three spare terminals on each connection or lug block sized less than 400 A.

2.2 JUNCTION AND PULL BOXES

.1 Construction: welded steel enclosure.

.2 Covers Flush Mounted: 25 mm minimum extension all around.

.3 Covers Surface Mounted: screw-on flat covers.

2.3 CABINETS

.1 Construction: welded sheet steel hinged door, handle, lock 2 keys and catch

.2 Type E Empty: flush overlapping sides mounting as indicated.

PART 3 - EXECUTION

3.1 SPLITTER INSTALLATION

.1 Mount plumb, true and square to building lines.

.2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.

.3 Install terminal block as indicated in Type T cabinets.

.4 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.3 IDENTIFICATION

.1 Equipment Identification: to Section 26 05 00.

.2 Identification Labels: size 2 indicating system name, voltage and phase.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International).
  .1 CSA C22.1, Canadian Electrical Code, Part 1, 21st Edition.
  .2 CSA C22.2 NO. 18.

1.2 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00.

.2 Waste Management and Disposal:
  .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 OUTLETS AND CONDUIT BOXES GENERAL

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

.2 102mm square or larger outlet boxes as required.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices

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

2.2 GALVANIZED STEEL OUTLET BOXES

.1 One-piece electro-galvanized construction.

.2 Single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38mm or as indicated. 102mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.

.3 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48mm.

.4 102mm square or octagonal outlet boxes for lighting fixture outlets.

.5 Extension and plaster rings for flush mounting devices in finished plaster or tile walls.

2.3 MASONRY BOXES

.1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

2.4 CONCRETE BOXES

.1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.5 CONDUIT BOXES

.1 Cast FS boxes with factory-threaded hubs and mounting feet for surface wiring of devices.

2.6 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

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

.3 Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.

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

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

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

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

.4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.

.5 Vacuum clean interior of outlet boxes before installation of wiring devices.

.6 Identify systems for outlet boxes as required.

.7 Provide a suitable outlet box for each light, switch, receptacle or other outlet, approved for the particular area in which it is to be installed.

.8 Locate outlet boxes, mounted in hung ceiling space, so they do not obstruct or interfere with the removal of lay-in ceiling tiles.

.9 Offset outlet boxes, shown back to back in partitions, horizontally to minimize noise transmission between adjacent rooms.

.10 Use gang boxes at locations where more than one device is to be mounted. Use combination boxes with suitable barriers where outlets for more than one system are shown.

.11 Where 100 mm (4") square boxes are installed in exposed concrete or cinder block in finished areas, blocks will be cut under masonry division as instructed under this section. Openings shall be cut to provide a close fit to boxes and covers so that edges of openings are not visible after installation of plates. Mortar shall not be used to patch up openings that are cut too large or to patch ragged edges.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International).

- .1 CSA C22.2 NO. 18.1-13, Metallic Outlet Boxes.
- .2 CAN/CSA-C22.2 NO. 18.2-06(R2011), Nonmetallic Outlet Boxes.
- .3 CSA C22.2 No. 18.3-12, Conduit, Tubing, and Cable Fittings (Tri-National standard, with ANCE NMX-J-017 and UL 514B).
- .4 CAN/CSA-C22.2 No. 18.4-04(R2013), Hardware for the Support of Conduit, Tubing, and Cable.
- .5 CSA C22.2 No. 45.1-07(R2012), Electrical Rigid Metal Conduit - Steel (Tri-National standard, with UL 6 and NMX-J-534-ANCE-2007).
- .6 CSA C22.2 No. 56-13, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit
- .7 CSA C22.2 No. 83-M1985(R2013), Electrical Metallic Tubing.
- .8 CSA C22.2 No. 211.2-06(R2011), Rigid PVC (Unplasticized) Conduit.
- .9 CAN/CSA-C22.2 No. 227.3-05(R2010), Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

1.2 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

PART 2 - PRODUCTS

2.1 CABLES AND REELS

.1 Provide cables on reels or coils.
.1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.

.2 Each coil or reel of cable to contain only one continuous cable without splices.

.3 Identify cables for exclusively dc applications.

.4 Reel and mark shielded cables rated 2,001 volts and above.

2.2 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No. 45, Hot dipped galvanized steel threaded.

.2 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.

.3 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

.4 Rigid pvc conduit: to CSA C22.2 No. 211.2.

.5 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.

.6 Flexible pvc conduit: to CAN/CSA-C22.2 No. 227.3.

.7 Conduits shall be of sufficient size to allow easy removal of conductors at any time. Conduits sizes, where shown, are minimum and shall not be reduced.

2.3 CONDUIT FASTENINGS

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

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

.3 Channel type supports for two or more conduits.

.4 Threaded rods, 6mm diameter, to support suspended channels.

2.4 CONDUIT FITTINGS

.1 Fittings: to CSA C22.2 No. 18.3 and CAN/CSA-C22.2 No. 18.4, manufactured for use with conduit specified. Coating: same as conduit.

.2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.

.3 Watertight connectors and couplings for EMT.
.1 Set-screws are not acceptable.

2.5 EXPANSION FITTING FOR RIGID CONDUIT

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

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

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

2.6 FISH CORD

.1 Polypropylene.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

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

.2 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.

.3 Surface mount conduits except for in finished areas.

.4 Use EMT threaded conduit for all areas of this project except for underground installation.

.5 Use rigid PVC conduit underground

.7 Install conduit sealing fittings in hazardous areas.
.1 Fill with compound.

.8 Minimum conduit size for lighting and power circuits: 21 mm.

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

.10 Mechanically bend steel conduit over 21 mm diameter.

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

.12 Install fish cord in empty conduits.

.13 Remove and replace blocked conduit sections.
.1 Do not use liquids to clean out conduits.

.14 Dry conduits out before installing wire.

.15 Runs of conduit and cables, where shown, are indicated only by general location and routing. Install conduits and cables so to provide maximum head room and to interfere as little as possible with free use of space through which they pass. They shall be installed as close to building structure as possible such that, where concealed, necessary furring can be kept to a minimum.

3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on suspended

or surface channels.

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

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

3.4 CONCEALED CONDUIT

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not install conduits in terrazzo or concrete toppings.

3.5 CLEANING

.1 Proceed in accordance with Section 01 74 11.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)
  .1 CAN/CSA-C22.2 No.126-[M91(R1997)], Cable Tray Systems.

.2 National Electrical Manufacturers Association (NEMA) standards
  .1 NEMA VE 1-[2002], Metal Cable Tray Systems.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with section [01 33 00].

.2 Identify types of cabletroughs used.

.3 Show actual cabletrough installation details and suspension system.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 20.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Departmental Representative .

.5 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 - PRODUCTS

2.1 ELECTRICAL CABLETROUGH

.1 Cabletroughs and fittings: to NEMA [FG 1] [VE 1].

.2 Ventilated type, Class[A] to CAN/CSA C22.2 No.126.

.3 Trays: galvanized steel, 600 mm wide with depth of 100 mm.

.4 Fittings: horizontal elbows, end plates, drop outs, vertical risers and drops, tees, wyes, expansion joints and reducers where required, manufactured accessories for cabletrough supplied.

.1 Radii on fittings: [300] [600] [900] mm minimum.

.5 Barriers where different voltage systems are in same cabletrough.

2.2 SUPPORTS

.1 Provide supports as required.

2.3 COMMUNICATION CABLE TRAY

.1 Cable tray and fittings: to EEMAC F5-1-1977 and CSA C22.2 No. 126-M91.

.2 Communication Cable Tray - Wire basket cable runway type, minimum inside depth 50 mm, minimum inside width 300 mm, minimum 4.4 mm (.173”) wire diameter, 5.08 (2”) x 101.6 (4”) mesh pattern, tested load capacity of 43 lbs./ft. (with supports @ 1524 mm on centre).

.3 Cable tray shall be constructed of ASTM A510 high strength steel wires with electro-plated zinc galvanized finish.

.4 Horizontal elbows, end plates, drop outs, vertical risers, drops, tees, wyes, expansion joints, and reducers as required to be manufactured on site according to manufacturer’s instructions.

.5 Suspend tray on 3/8” (9.5 mm) threaded rods at 1524 mm (5’-0”) on centre with centre hanger assembly. Attach to beams and joists with beam clamps.

.6 Two steel barrier strips shall be provided to divide the communication tray into three sections (voice, data and BSCS/comm. systems).

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install complete cabletrough system.

.2 Support cabletrough on [one] [both] side[s].

.3 Remove sharp burrs or projections to prevent damage to cables or injury to personnel.

3.2 CABLES IN CABLETROUGH

.1 Install cables individually.

.2 Lay cables into cabletrough. Use rollers when necessary to pull cables.

.3 Secure cables in cabletrough at 6 m centres, with nylon ties.

.4 Identify cables every 30 m with size 2 nameplates.

.5 Locate cable trays a minimum of 200 mm clear above suspended ceiling tile grid to accommodate installation / removal of luminaires and ceiling tiles. Coordinate with depth of luminaires to allow a minimum of 75 mm clearance between top of recessed luminaires and bottom of cable tray.

.6 Electrical Contractor (Division 26) will be responsible for installation of all control cabling, low voltage wires (cabling and wires supplied by Section 27 51 23, 28 13 27, 28 13 29 and 28 23 00 Contractor) and pneumatic tubing (supplied by Section 11 19 20 DEC Contractor) in conduit and wire trays provided by Electrical Contractor (Division 26). Splices or tees in pneumatic tubing shall NOT be permitted.

.10 Coordinate control cabling, low voltage wires and pneumatic tubing in conduit, raceways and cable trays with Section 11 19 20 DEC Contractor Section 27 51 23, 28 13 27, 28 13 29 and 28 23 00 Contractor.

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA)
- .1 CSA C22.2 No. 100-[95], Motors and Generators.
- .2 CSA C22.2 No. 145-[M1986(R1992)], Motors and Generators for use in Hazardous Locations.

.2 Electrical and Electronic Manufacturers' Association of Canada
- .1 EEMAC M1-6.
- .2 EEMAC M1-1.

1.2 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00.

.2 Submit WHMIS MSDS - Material Safety Data Sheets. WHMIS acceptable to Labour Canada, and Health and Welfare Canada.

.3 Submit product data sheets for motors. Include product characteristics, performance criteria, physical size, horsepower, watt rating, limitations and finish.

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00.

.2 Indicate dimensions, recommended installation procedure, wiring diagrams, sizes and location of mounting bolt holes and recommended support method.

1.4 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for fractional horsepower motors for incorporation into manual specified in Section 01 78 00.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 20.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

.4 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with the Waste Management Plan.

.5 Fold up metal banding, flatten and place in designated area for recycling.

.6 Collect, package and store expired motors for either recycling or rebuilding and return to recycler or rebuilder.

PART 2 - PRODUCTS

2.1 FRACTIONAL HORSEPOWER MOTOR

.1 Non-hazardous locations: to CSA C22.2 No. 100 and EEMAC M1-6.

.2 Motor with inherent overheating protectors.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install wiring, flexible connections and grounding.

.2 Check rotation before coupling to driven equipment.

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CSA C22.2 No. 100-[04], Motors and Generators.
- .2 CSA C22.2 No. 145-[M1986(R2004)], Motors and Generators for Use in Hazardous Locations.

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
- .1 EEMAC M1-7-[1992], Standard for Motors and Generators.
- .2 EEMAC M2-1-[1966], Standard for Lead Marking and Connections for Single-Phase and Polyphase Induction Motors.

1.2 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00.

.2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 47 15 and Section 02 61 33 and include: product characteristics, performance criteria, physical size, horsepower, watt rating, limitations and finish.

.3 Shop drawings:
- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
- .2 Indicate:
  - .1 Overall dimensions of motor.
  - .2 Shaft centreline to base dimension.
  - .3 Shaft extension diameter and keyway, coupling dimensions and details.
  - .4 Fixing support dimensions.
  - .5 Dimensioned position of ventilation openings. Details of ventilation duct attachments.
  - .6 Terminal box location and size of terminals.
  - .7 Arrangement and dimensions of accessories.
  - .8 Diagram of connections.
  - .9 Starting current and relative data necessary for use in design of motor starting equipment.
  - .10 Speed/torque characteristic.
  - .11 Weight.
  - .12 Installation data.

.4 Closeout Submittals:
- .1 Provide maintenance data for motors for

incorporation into manual specified in Section 01 78 00.
.2 Data necessary for maintenance of motors.
.3 Manufacturer's recommended list of spare parts.

.5 Quality Assurance:
.1 Departmental Representative reserves the right to witness standard factory testing of motors [50 hp] [37.3 kW] and above.
.2 Submit site tests results of installed electrical systems and instrumentation.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store, handle and protect materials in accordance with Section 01 61 00.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.3 Handle motors with suitable lifting equipment.

.4 Store motors in heated, dry, weather-protected enclosure.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

.2 Collect, package and store expired motors for either recycling or rebuilding and return to recycler or rebuilder.

1.5 EXTRA MATERIALS

.1 Provide maintenance materials and spare parts in accordance with Section 01 78 00.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Motors:
.1 Non-hazardous locations: to CSA C22.2 No. 100 and EEMAC M1-7.

.2 Lead markings: to EEMAC M2-1.

2.2 CORROSION PREVENTION AND FINISH PAINTING

.1 Provide equipment resistant to corrosion from severe moisture conditions.

2.3 MOTOR TYPE

.1 Squirrel cage.

2.4 DESIGN LETTERS

.1 Polyphase squirrel cage induction motors design [A] [B] [C] [D].

.2 Single phase integral induction motors design [L] [M].

2.5 ENCLOSURE

.1 Open drip proof fully guarded.

2.6 APPLICATION

.1 Motor suitable for driving pumps, fans, blower, compressor.

2.7 INSULATION

.1 Class: B.

.2 Ambient temperature: 40 degrees C.

2.8 LOCKED ROTOR KVA PER [HP] [KW]

.1 Locked rotor kVA per [hp] [kW], code letter.

2.9 DIRECTION OF ROTATION

.1 Direction of rotation, [counter] [clock wise] when facing end of machine opposite drive.

2.10 BEARINGS

.1 Antifriction type bearings, fitted with readily accessible facilities for lubrication while motor running or stationary.

2.11 MOTOR MOUNTING AND TERMINAL HOUSING

.1 [Horizontal floor mounting, assembly [F-1] [F-2]] [horizontal wall mounting, assembly W- [1] [_____]] [horizontal ceiling mounting, assembly [C-1] [C-2]].

.2 Vertical [flange] [_____] mounting with thrust bearing.

.3 Slide rails for motor mounting.

2.12 SHAFT

.1 [Standard] [_____] shaft extension.

2.13 THERMAL PROTECTION

.1 Factory installed [thermistors] [[copper] [nickel] [platinum] RTD], [one] [_____] in each phase, wired to identified terminals in motor terminal box.

2.14 STARTING METHOD

.1 Terminate winding connection necessary for appropriate starting method and identify in motor terminal box.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Dry out motor if dampness present in accordance with manufacturer's instructions.

.2 Install motor on [driven machinery] [baseplate] [structure] [slide rails] [concrete base, ensuring it has fully cured before installation] rigid plumb and square, using only lifting facilities provided.

.3 Make wiring connections.
.1 Use liquid tight pvc jacketed flexible conduit between rigid conduit and motor.

.4 Make flexible conduit long enough to permit movement of motor over entire length of slide rails.

.5 Check for correct direction of rotation, with motor uncoupled from driven equipment.

.6 Align and couple motor to driven machinery to manufacturer's instructions, using only correct parts such as couplings, belts, sheaves, as provided by manufacturer.

3.3 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00.

3.4 CLEANING

.1 Proceed in accordance with Section 01 74 11.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 06 10 12 - Rough Carpentry.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).
.1 CSA C22.2 No.29-M1989, Panelboards and Enclosed Panelboards

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for [panelboards] and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
.2 Include on drawings:
.1 Electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

.2 Operation and Maintenance Data: submit operation and maintenance data for panelboards for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:
.1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect dry type transformers from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 PANELBOARDS

.1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.
.1 Install circuit breakers in panelboards before shipment.
.2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

.2 250V panelboards: bus and breakers rated for 10,000A (symmetrical) interrupting capacity or as indicated.

.3 600V panelboards: bus and breakers rated for 18,000A (symmetrical) interrupting capacity or as indicated.

.4 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

.5 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

.6 Minimum of 2 flush locks for each panel board.

.7 Two keys for each panelboard and key panelboards alike.

.8 Copper bus with neutral of same ampere rating of mains.

.9 Mains: suitable for bolt-on breakers.

.10 Trim with concealed front bolts and hinges.

.11 Trim and door finish: baked enamel ASA #61, Grey.

.12 Ground bus to be Copper.

.13 Panels shall be surface or flush mounted, as shown.

.14 Where indicated breakers shall have a ground fault interrupter.

2.2 BREAKER

.1 Breakers: to Section 26 28 16.02.

.2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

.3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

.4 Lock-on devices for fire alarm, emergency, exit light circuits.

.5 Bolt-on moulded case circuit breaker: quick-make, quick-break type, for manual and automatic operation.

.6 Common-trip breakers: with single handle for multi-pole applications.

.7 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting. Trip settings on breakers with adjustable trips to range from 5 - 10 times current rating.

.8 Circuit breakers with interchangeable trips over 150 A.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00.

.2 Nameplate for each panelboard size 4 engraved as indicated.

.3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.

.4 Complete circuit directory with typewritten legend showing location and load of each circuit, mounted in plastic envelope at inside of panel door.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for panelboards installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Install surface mounted panelboards on plywood backboards in accordance with Section 06 10 12. Where practical, group panelboards on common backboard.

.3 Mount panelboards to height specified in Section 26 05 00 or as indicated.

.4 Connect loads to circuits.

.5 Connect neutral conductors to common neutral bus with respective neutral identified.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by panelboards installation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International).
- .1 CSA C22.2 No.42-10, General Use Receptacles, Attachment Plugs and Similar Devices.
- .2 CAN/CSA-C22.2 No.42.1-00(R2009), Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
- .3 CSA C22.2 No.55-M1986(R2008), Special Use Switches.
- .4 CSA C22.2 No.111-10, General-Use Snap Switches (Bi-national standard, with UL 20).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

.2 Operation and Maintenance Data: submit operation and maintenance data for wiring devices for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:
- .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect dry type transformers from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 SWITCHES

.1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.
- .1 Install circuit breakers in panelboards before shipment.
- .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

.1 20 A, 120 V, single pole, three-way, four-way switches to: CSA C22.2 No.55 and CSA C22.2 No.111.

.2 Manually-operated general purpose AC switches with following features:
- .1 Terminal holes approved for No. 10 AWG wire.
- .2 Silver alloy contacts.
- .3 Urea or melamine moulding for parts subject to carbon tracking.
- .4 Suitable for back and side wiring.
- .5 Ivory toggle.

.3 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads and heating loads.

.4 Switches of one manufacturer throughout project.

2.2 RECEPTACLES

.1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA C22.2 No.42 with following features:
- .1 Ivory urea moulded housing.
- .2 Suitable for No. 10 AWG for back and side wiring.
- .3 Break-off links for use as split receptacles.
- .4 Eight back wired entrances, four side wiring screws.
- .5 Triple wipe contacts and rivetted grounding contacts.

.2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:
.1 Ivory urea moulded housing.
.2 Suitable for No. 10 AWG for back and side wiring.
.3 Four back wired entrances, 2 side wiring screws

.3 Other receptacles with ampacity and voltage as indicated.

.4 Receptacles of one manufacturer throughout project.

2.3 COVER PLATES

.1 Cover plates for wiring devices to: CSA C22.2 No.42.1.

.2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

.3 Stainless steel, 1 mm thick cover plates cover plates, thickness 2.5 mm for wiring devices mounted in flush-mounted outlet box.

.4 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

.5 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.

.6 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

.7 Stainless steel 18-8 chrome metal alloy, Type 302, vertically brushed, 1 mm thick cover plates for wiring devices mounted in flush-mounted outlet box.

2.4 SOURCE QUALITY CONTROL

.1 Cover plates from one manufacturer throughout project.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wiring devices installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

.1 Switches:
.1 Install single throw switches with handle in "UP" position when switch closed.
.2 Install switches in gang type outlet box when more than one switch is required in one location.
.3 Mount toggle switches at height in accordance with Section 26 05 00.

.2 Receptacles:
.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
.2 Mount receptacles at height in accordance with Section 26 05 00.
.3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
.4 Install GFI type receptacles.

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

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.

.3 Repair damage to adjacent materials caused by wiring device installation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International).
- .1 CSA C22.1-15, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations.
- .2 CSA C22.2 No. 106 HRC - Miscellaneous Fuses.

1.2 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Product Data:
- .1 Provide fuse performance data characteristics for each fuse type and size above 200A. Performance data to include: average melting time-current characteristics.

.3 Shop Drawings:
- .1 Provide shop drawings in accordance with Section 01 33 00.
- .2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Ship fuses in original containers.

.2 Do not ship fuses installed in switchboard.

.3 Store fuses in original containers in storage cabinet, moisture free location.

.4 Waste Management and Disposal:
- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

1.4 MAINTENANCE MATERIALS

.1 Provide maintenance materials in accordance with Section 01 78 00.

.2 Three spare fuses of each type and size installed above 600A.

.3 Six spare fuses of each type and size installed up to and including 600A.

PART 2 - PRODUCTS

2.1 FUSES - GENERAL

.1 Fuse type references L1, L2, J1, R1, etc. have been adopted for use in this specification.

.2 Fuses: product of one manufacturer.

2.2 FUSE TYPE

.1 Class L fuses.
 .1 Type L1, time delay, capable of carrying 500% of its rated current for 10 s minimum.
 .2 Type L2, fast acting.

.2 Class J fuses.
 .1 Type J1, time delay, capable of carrying 500% of its rated current for 10 s minimum.
 .2 Type J2, fast acting.

.3 Class R -R fuses.
 .1 Type R1, (UL Class RK1), time delay, capable of carrying 500% of its rated current for 10 s minimum, to meet UL Class RK1 maximum let-through limits.
 .2 Type R2, time delay, capable of carrying 500% of its rated current for 10 s minimum.
 .3 Type R3, (UL Class RK1), fast acting Class R, to meet UL Class RK1 maximum let-through limits.

.4 Class C fuses.

2.3 FUSE STORAGE CABINET

.1 Fuse storage cabinet, manufactured from 2.0mm thick aluminum, 750mm high, 600mm wide, 300mm deep, hinged, lockable front access door finished in accordance with Section 26 05 00.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install fuses in mounting devices immediately before energizing circuit.

.2 Ensure correct fuses fitted to physically matched mounting devices.

.1 Install rejection clips for Class R fuses.

.3 Ensure correct fuses fitted to assigned electrical circuit.

.4 Where UL Class RK1 fuses are specified, install warning label "Use only UL Class RK1 fuses for replacement" on equipment.

.5 Install spare fuses in fuse storage cabinet.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International).
- .1 CSA C22.2 No. 5-09, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2010).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:
- .1 Store circuit breakers in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect circuit breakers from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 BREAKERS - GENERAL

.1 Moulded-case circuit breakers, Circuit breakers, and ground-fault circuit-interrupters: to CSA C22.2 No. 5

.2 Bolt-on moulded case circuit breaker: quick-make, quick-break type, for manual and automatic operation.

.4 Common-trip breakers: with single handle for multi-pole applications.

.5 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.
.2 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.

.6 Circuit breakers with interchangeable trips over 150A.

.7 Circuit breakers to have minimum 18000 symmetrical rms interrupting capacity rating at 600V.

2.2 THERMAL MAGNETIC BREAKERS DESIGN A

.1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

2.3 MAGNETIC BREAKERS DESIGN B

.1 Moulded case circuit breaker to operate automatically by means of magnetic tripping devices to provide instantaneous tripping for short circuit protection.

2.4 OPTIONAL FEATURES

.1 Include:
.1 On-off locking device.
.2 Handle mechanism.

2.5 ENCLOSURE

.1 Mount Individually mounted breakers in CEMA 3 enclosure or as noted on drawing.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for dry type transformers installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

.1 Install circuit breakers as indicated.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International).
- .1 CAN/CSA-C22.2 No.144-M91(R2011), Ground Fault Circuit Interrupters.

.2 National Electrical Manufacturers Association (NEMA)
- .1 NEMA PG 2.2-1999(R2009), Application Guide for Ground Fault Protection Devices for Equipment.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

.2 Operation and Maintenance Data: submit operation and maintenance data for ground fault circuit interrupters for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:
- .1 Store circuit breakers in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect circuit breakers from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Equipment and components for ground fault circuit interrupters (GFCI): to CAN/CSA-C22.2 No.144.

.2 Components comprising ground fault protective system to be of same manufacturer.

2.2 BREAKER TYPE GROUND FAULT INTERRUPTER

.1 Single or Two pole ground fault circuit interrupter for 15A, 120 or 208V, 1 phase circuit c/w test and reset facilities.

2.3 GROUND FAULT PROTECTOR UNIT

.1 Unit shall include a 15A grounded duplex receptacle, a button to test operation of unit and current transformer and sensing mechanism. Unit to be complete with suitable outlet box.

.2 Unless noted otherwise, unit shall trip at 6 mA.

.3 Where shown in outdoor locations, units shall be enclosed in weatherproof surface-mounted enclosures. In other locations units shall be furnished with stainless steel coverplates.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for dry type transformers installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

.1 Do not ground neutral on load side of ground fault relay.

.2 Provide dedicated branch wiring neutral conductor for each individual breaker type ground fault interrupter.

.3 Connect supply and load wiring to equipment in accordance with manufacturer's recommendations.

3.3 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00.

.2 Demonstrate simulated ground fault tests.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 PRODUCT

.1 Submit product data in accordance with Section 01 33 00.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 20.

1.3 RELATED SECTION

.1 Section 26 28 13-01 Fuses - Low Voltage

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

.1 Design 1
.1 Fusible disconnect switch in CSA Enclosure CSA Type 1, size as indicated.
.2 Provision for padlocking in off switch position.
.3 Mechanically interlocked door to prevent opening when handle in ON position.
.4 Fuses: size as indicated, to Section 26 28 13-01.
.5 Fuseholders: suitable without adaptors, for type and size of fuse indicated.
.6 Heavy Duty, Quick-make, quick-break action, rated for load breaking operation.
.7 ON-OFF switch position indication on switch enclosure cover.
.8 Rust inhibiting process to enclosure prior to finishing.

.2 Design 2
.1 Non-Fusible disconnect switch in CSA Enclosure CSA Type 1, size as indicated.
.2 Provision for padlocking in off switch position.
.3 Mechanically interlocked door to prevent opening when handle in ON position.
.4 Fuses: size as indicated, to Section 26 28 13-01.
.5 Fuseholders: suitable without adaptors, for type and size of fuse indicated.
.6 Heavy Duty, Quick-make, quick-break action, rated for load breaking operation.
.7 ON-OFF switch position indication on switch enclosure cover.

.8 Rust inhibiting process to enclosure prior to finishing.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00.

.2 Indicate name of load controlled on size 4 nameplate.

PART 3 - EXECUTION

3.2 INSTALLATION

.1 Install disconnect switches complete with fuses if applicable.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 International Electrotechnical Commission (IEC)
.1 IEC 60947-4-1-[2002], Part 4: Electromechanical contactors and motor-starters.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 11 33 00.

.2 Product Data:
.1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
.1 Provide shop drawings: in accordance with Section 01 33 00.
.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
.2 Provide shop drawings for each type of starter to indicate:
.1 Mounting method and dimensions.
.2 Starter size and type.
.3 Layout and components.
.4 Enclosure types.
.5 Wiring diagram.
.6 Interconnection diagrams.

1.3 CLOSEOUT SUBMITTALS

.1 Provide maintenance materials in accordance with Section 01 78 00.

.2 Submit operation and maintenance data for each type and style of motor starter for incorporation into maintenance manual.

.3 Extra Materials:
.1 Provide listed spare parts for each different size and type of starter.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Section 01 61 00.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Packaging Waste Management: remove for reuse [and return] [by manufacturer] of [pallets] [crates] [paddling] [and] [packaging materials] in accordance with Section [01 74 20].

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Starters to CSA C22.2 No. 14-M91, EEMAC E14-1.
- .1 Half size starters not acceptable.
- .2 Control transformers - to CSA C22.2 No. 66-1988.
- .3 Resistors - to EEMAC 13E-1-1965.
- .4 Auto transformers - to CSA C22.2 No. 47-M90.

2.2 MANUAL MOTOR STARTERS

.1 Single phase manual motor starters of size, type, rating, and enclosure type as indicated, with components as follows:
- .1 Switching mechanism, quick make and break.
- .2 One overload heater, manual reset, trip indicating handle.

.2 Accessories:
- .1 Toggle switch heavy duty labelled as indicated.
- .2 Indicating light: heavy duty type and colour as indicated.
- .3 Locking tab to permit padlocking in "ON" or "OFF" position.

2.3 FULL VOLTAGE MAGNETIC STARTERS

.1 Magnetic and combination magnetic starters of size, type, rating and enclosure type as indicated with components as follows:
- .1 Contactor solenoid operated, rapid action type.
- .2 Motor overload protective device in each phase, manually reset from outside enclosure.
- .3 Wiring and schematic diagram inside starter enclosure in visible location.
- .4 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.
- .5 Power and control terminals.

.2 Combination type starters to be circuit breaker with operating lever on outside of enclosure to control circuit breaker, and provision for:

.1 Locking in "OFF" position with up to 3 padlocks.
.2 Independent locking of enclosure door.
.3 Provision for preventing switching to "ON" position while enclosure door open.
.4 Locking in “ON” position.

.3 Accessories:
.1 Selector switches: heavy duty labelled as indicated.
.2 Indicating lights: heavy duty type and color as indicated.
.3 1-N/O and 1-N/C spare auxiliary contacts unless otherwise indicated.

2.13 CONTROL TRANSFORMER

.1 Single phase, dry type, control transformer with primary voltage as indicated and 120 V secondary, complete with secondary fuse, installed in with starter as indicated.

.2 Size control transformer for control circuit load plus 20% spare capacity.

2.14 ACCESSORIES

.1 Pushbutton: heavy duty, oil tight as required.

.2 Selector switches: heavy duty, oil tight as required.

.3 Indicating lights: heavy duty, oil tight, type and colour as indicated.

2.15 FINISHES

.1 Apply finishes to enclosure in accordance with Section 26 05 00.

2.16 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00.

.2 Manual starter designation label, white plate, black letters, size 1, engraved as indicated.

.3 Magnetic starter designation label, white plate, black letters, size 1 engraved as indicated.

2.17 MANUFACTURERS

.1 Acceptable Manufacturers are: Allen-Bradely Canada Company, Siemens Canada Ltd., Cutler-Hammer Canada Ltd., Schneider Canada, General Electric, or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install starters and control devices in accordance with manufacturer's instructions.

.2 Install and wire starters and controls as indicated.

.3 Ensure correct fuses installed.

.4 Confirm motor nameplate and adjust overload device to suit.

.5 Provide the necessary conduit for mechanical heating and ventilation control to the starters as required under the mechanical contract. Confirm with the Mechanical Contractor the conduit requirements prior to installation.

.6 The Electrical Contractor shall complete all control wiring required which is not specifically related to the controls systems as outlined in the mechanical specifications. All control wiring outlined in the mechanical specifications as part of the controls systems shall be completed by the Controls Contractor. The Electrical Contractor shall supply all control equipment specifically noted on plans or specifications. All other equipment required shall be supplied by Mechanical or other trades. The electrical Contractor shall co-operate with the Mechanical trades to ensure that all control sequences and equipment are correct. The Electrical Contractor shall be supplied with all electrical equipment from other trades and shall verify that its characteristics are correct. It will be the responsibility of the Electrical Contractor to obtain from the Mechanical Contractor, and all other trades, complete detailed wiring diagrams for all equipment supplied by these trades requiring electrical wiring by the Electrical Contractor's work and the work of other trades. It is the Electrical Contractor's responsibility to point out immediately any discrepancies in these diagrams or any reason they cannot be adhered to. All control equipment such as immersion type thermostats, coil

freeze protection, pneumatic control devices, etc. shall be installed by the trade responsible for its supply and operation.

.7 It is the responsibility of the electrical contractor to provide a dedicated line voltage power source where required for control systems.

.8 It is the responsibility of the electrical contractor to provide all control devices such as pushbutton stations, when they do not form part of a control panel.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 and manufacturer's instructions.

.2 Operate switches and contactors to verify correct functioning.

.3 Perform starting and stopping sequences of contactors and relays.

.4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

3.3 CLEANING

.1 Clean in accordance with Section 01 74 11.
  .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

PART 1 - GENERAL

1.1 REFERENCES

.1 American National Standards Institute (ANSI)
- .1 ANSI C82.1-2004, American National Standard for Lamp Ballasts - Line Frequency Fluorescent Lamp Ballasts.
- .2 ANSI C82.4-2002, American National Standard for Ballasts for High-Intensity Discharge and Low-Pressure Sodium (LPS) Lamps (Multiple-Supply Type).

.2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
- .1 ANSI/IEEE C62.41-1991, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.

.3 ASTM International Inc.
- .1 ASTM F1137-00(2006), Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.

.4 Canadian Standards Association (CSA International)

.5 ICES-005-07, Radio Frequency Lighting Devices.

.6 Underwriters' Laboratories of Canada (ULC)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Quality assurance submittals: provide following in accordance with Section 01 45 00.
- .1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence and cleaning procedures.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Packaging Waste Management: remove for reuse and return of pallets and packaging materials in accordance with Section 01 74 20.

.4 Divert unused metal materials from landfill to metal recycling facility.

.5 Disposal and recycling of fluorescent lamps as per local regulations.

PART 2 - PRODUCTS

2.1 LAMPS

.1 Fluorescent lamps to be - T8, 32 Watt, medium bi-pin, rapid-start, 4100 K, 30,000 hour lamp life, 2950 initial lumens, CRI 80; or as indicated.

.2 Metal halide lamps to be - clear, BT37, Watt as indicated, mogul base, horizontal burn, 4100 K, 15,000 hour lamp life, 36,000 initial lumens, CRI65, open or enclosed type to suit the luminaire; or as indicated.

2.2 BALLASTS

.1 Fluorescent ballast: CBM and CSA certified, energy efficient type, IC electronic.
.1 Rating: voltage as indicated, 60 Hz, for use with 2-32W, rapid start lamps.
.2 Totally encased and designed for 40 degrees Celsius ambient temperature.
.3 Power factor: minimum 95 % with 95% of rated lamp lumens.
.4 Current crest factor: 1.7 maximum.
.5 Harmonics: 10 % maximum THD.
.6 Operating frequency of electronic ballast: 20 kHz minimum.
.7 Total circuit power: 62 Watts.
.8 Ballast factor: greater than 0.90.
.9 Sound rated: Class A.
.10 Mounting: integral with luminaire.

.2 Metal halide ballast:
.1 Rating: voltage as indicated, 60 Hz, for use with metal halide lamp. Provide circuitry for quartz re-strike standby light where indicated.
.2 Totally encased and designed for 40 degrees Celsius ambient temperature.
.3 Power factor: minimum 95 % with 95% of rated lamp lumens.
.4 Type: constant wattage autotransformer.
.5 Input voltage range: plus or minus 10% of nominal.
.6 Minimum starting temperature: minus 31 degrees Celsius at 90% line voltage.
.7 Mounting: integral with luminaire.
.8 Current crest factor: 1.8 maximum current.

2.3 FINISHES

.1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

2.4 OPTICAL CONTROL DEVICES

.1 As indicated in luminaire schedule.

2.5 LUMINAIRES

.1 As indicated in luminaire schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Locate and install luminaires as indicated.

.2 Provide adequate support to suit ceiling system.

3.2 WIRING

.1 Connect luminaires to lighting circuits:

.2 Demonstrate simulated ground fault tests.
.1 Install flexible or rigid conduit for luminaires as indicated.

3.3 LUMINAIRE SUPPORTS

.1 For suspended ceiling installations support luminaires independently of ceiling.

.2 Demonstrate simulated ground fault tests.

3.4 LUMINAIRE ALIGNMENT

.1 Align luminaires mounted in continuous rows to form straight uninterrupted line.

.2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

3.5 CLEANING

.1 Clean in accordance with Section 01 74 11.
.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 CSA International
  .1 CSA C22.2 No.141, Emergency Lighting Equipment.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

.2 Operation and Maintenance Data: submit operation and maintenance data for emergency lighting for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00.

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

.3 Storage and Handling Requirements:
  .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  .2 Store and protect emergency lighting from nicks, scratches, and blemishes.
  .3 Replace defective or damaged materials with new.

1.5 WARRANTY

.1 For batteries in this Section 26 52 00 - Emergency Lighting, there is 12 months warranty period.

PART 2 - PRODUCTS

2.1 EQUIPMENT

.1 Emergency lighting equipment: to CSA C22.2 No.141.

.2 Supply voltage: 120 V, AC.

.3 Output voltage: 24 V DC.

.4 Operating time: 60 minutes.

.5 Battery: sealed, maintenance free.

.6 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01 V for plus or minus 10% input variations.

.7 Solid state transfer circuit.

.8 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.

.9 Signal lights: solid state, life expectancy 100,000 h minimum for 'AC Power ON' and 'High Charge'.

.10 Lamp heads: integral on unit 360 degrees horizontal and 180 degrees vertical adjustment. Lamp type: LED, 12W, minimum.

.11 Cabinet: suitable for direct or shelf mounting to wall and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.

.12 Finish: Type 1.

.13 Auxiliary equipment for central battery units:
.1 Ammeter.
.2 Voltmeter.
.3 Test switch.
.4 Time delay relay.
.5 Battery disconnect device.
.6 AC input and DC output terminal blocks inside cabinet.
.7 Shelf.
.8 Cord and plug connection for AC.
.9 RFI suppressors.

2.2 WIRING OF REMOTE HEADS

.1 Conduit: type EMT, in accordance with Section 26 05 34.

.2 Conductors: RW90 type in accordance with Section 26 05 21, sized as indicated and in accordance with manufacturer's recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for emergency lighting installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

.1 Install unit equipment and remote mounted fixtures.

.2 Direct heads. Direction is shown on the drawings. Allow for re-aiming as many times as required for the satisfaction of the AHJ and engineer.

.3 Connect exit lights to unit equipment.

.4 Where heads are shown remote from unit, provide suitable outlet box at 2440 mm and install head. Connect with conduit to battery and charger unit. Wire size to suit manufacturer's recommendations, but not less than #10 gauge, and for a minimum of 3% voltage drop at remote heads. Ensure remote head wiring lengths are reviewed with manufacturer prior to installation. Voltage drops will be tested by Engineer and Building Inspector. Replace any wiring not passing the 3% voltage drop test with new size and retest.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by emergency lighting installation.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:
.1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect communication raceway systems from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

.1 Empty telecommunications raceways system consists of outlet boxes, cover plates, terminal distribution cabinets, conduits, cable trays, pull boxes, sleeves and caps, fish wires, service poles, service fittings, concrete encased ducts.

.2 Provide complete conduit system for Data System.

2.2 MATERIAL

.1 Conduits: EMT type, in accordance with Section 26 05 34.

.2 Junction boxes: in accordance with Section 26

05 31.

.3 Outlet boxes, conduit boxes, and fittings: in accordance with Section 26 05 31.

.4 Fish wire: polypropylene type.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for communication raceway systems installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

.1 Install empty raceway system, including distribution system, fish wire, terminal cabinets, outlet boxes, floor boxes, pull boxes, cover plates, conduit, sleeves and caps, cable tray, service poles, miscellaneous and positioning material to constitute complete system.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 11.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by pathways for communications systems installation.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Related Sections:
.1 Section 26 05 21 Wire & Cables 0-1000 Volts.
.2 Section 26 05 34 Conduits, Fastenings and Fittings

1.2 REFERENCES

.1 Government of Canada
.1 TB OSH Chapter 3-03, 1997-01-28, Treasury Board of Canada, Occupational Safety and Health, Chapter 3-03, Standard for Fire protection Electronic Data Processing Equipment.
.2 TB OSH Chapter 3-04, 1994-12-22, Treasury Board of Canada, Occupational Safety and Health, Chapter 3-04, Standard for Fire Alarm Systems.

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

.3 Underwriter's Laboratories of Canada (ULC)
.1 CAN/ULC-S524-14, Standard for the Installation of Fire Alarm Systems.
.2 CAN/ULC-S525-07, Audible Signal Device for Fire Alarm Systems.
.3 CAN/ULC-S526-07, Visual Signal Devices for Fire Alarm Systems.
.4 CAN/ULC-S527-11, Control Units.
.5 CAN/ULC-S528-05, Manual Pull Stations for Fire Alarm Systems.
.6 CAN/ULC-S529-09, Smoke Detectors for Fire Alarm Systems.
.7 CAN/ULC-S530-M91, Heat Actuated Fire Detectors for Fire Alarm Systems.
.8 CAN/ULC-S531-02, Standard for Smoke Alarms.
.9 CAN/ULC-S536-S537-04, Burglar and Fire Alarm Systems and Components.
.10 CAN/ULC-S1001-11, Standard for Integrated Systems Testing of Fire Protection and Life Safety Systems.

.4 CSA Group
.1 CSA C22.1-15, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations.

1.3 SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00.
.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00.

.2 Shop Drawings:
.1 Submit shop drawings in accordance with Section 01 33 00.
.1 Shop drawings: stamped and signed by professional engineer registered or licensed in Province s of Ontario, Canada.
.2 Include:
.1 Layout of equipment.
.2 Zoning.
.3 Complete wiring diagram, including schematics of modules.

.3 Quality assurance submittals: submit following in accordance with Section 01 33 00.
.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
.2 Instructions: submit manufacturer's installation instructions.
.3 Manufacturer's Field Reports: manufacturer's field reports specified.

.4 Closeout Submittals:
.1 Submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00.
.2 Authority of Jurisdiction will delegate authority for review and approval of submittals required by this Section.
.3 Submit to Authority of Jurisdiction 2 sets of approved submittals and drawings immediately after approval but no later than 15 working days to prior to final inspection.
.4 Submit following:

.1 Manufacturer's Data for:
- .1 Control panel and modules.
- .2 Manual pull stations.
- .3 Heat detectors.
- .4 Open-area smoke detectors.
- .5 Alarm horns.
- .6 Wiring.
- .7 Conduit.
- .8 Outlet boxes.
- .9 Fittings for conduit and outlet boxes.
- .10 Submit 1 original for each item and clear, legible, first-generation photocopies for remainder of specified copies.

.2 System wiring diagrams:
- .1 Submit complete wiring diagrams of system showing points of connection and terminals used for electrical connections in the system.
- .2 Show modules, relays, switches and lamps in control panel.

.3 Design data: Power Calculations:
- .1 Submit design calculations for existing system and new work specified to substantiate that battery capacity exceeds supervisory and alarm power requirements.
- .2 Show comparison of detector power requirements per zone versus control panel smoke detector power output per zone in both standby and alarm modes.
- .3 Show comparison of notification appliance circuit alarm power requirements with rated circuit power output.
- .4 Schedules:
- .5 Conductor wire marker schedule.

.6 Test Reports:
- .1 Open-area 2-wire smoke detectors.

.2 Preliminary testing:
.1 Final acceptance testing.
.2 Submit for inspections and tests specified under

1.4 QUALITY ASSURANCE

.1 Qualifications:
.1 Installer: company or person specializing in fire alarm system installations approved by manufacturer.

.2 Provide services of representative or technician from manufacturer of system, to supervise installation, adjustment, preliminary testing, and final testing of system and to provide instruction to project personnel.

.3 Extra Materials:
.1 Provide maintenance materials in accordance with Section 01 78 00.
.2 Include:
.1 five spare glass rods for manual pull box stations if applicable.

.4 Maintenance Service:
.1 Provide one year's free maintenance with two inspections by manufacturer during warranty period. Inspection tests to conform to CAN/ULC-S536. Submit inspection report to Departmental Representative.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:
.1 Deliver, store and handle in accordance with Section 01 61 00.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:
.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MATERIAL

.1 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.

.2 Power supply: to CAN/ULC-S524.

.3 Audible signal devices: to CAN/ULC-S525.

.4 Visual signal devices: to CAN/ULC-S526.

.5 Control unit: to CAN/ULC-S527.

.6 Manual pull stations: to CAN/ULC-S528.

.7 Thermal detectors: to CAN/ULC-S530.

.8 Smoke detectors: to CAN/ULC-S529.

.9 Smoke alarms: to CAN/ULC-S531.

2.2 SYSTEM OPERATION

.1 The existing Notifier fire alarm system will be used. The existing fire alarm system is addressable. The existing fire alarm zone for the corridor serving the mini Greenhouses 1, 2 & 3 will be extended and serve the link as well. A new fire alarm zone will be provided for the Headerhouse and Greenhouse. All new devices provided shall be either weatherproof or be complete with a weatherproof cover and enclosure.

2.3 CONTROL PANEL

.1 The Existing Control Panel is a Notifier Fire Alarm system.

.2 Existing System is Addressible.

2.4 POWER SUPPLY

.1 120 V, ac, 60 Hz input, 24 V dc output from rectifier to operate alarm and signal circuits, with standby power of gell cell batteries minimum expected life of 4 years, sized in accordance with NBC.

2.5 MANUAL ALARM STATIONS

.1 To match existing devices in facility.

.2 Station colour: red.

.3 Provide station with visible indication of operation.

.4 Where weatherproof stations are required, provide stations with cast metal, weatherproof housings with hinged access doors.
.1 Finish housings with red enamel paint and provide permanently affixed bilingual signage indicating "FIRE ALARM" with white letters of 19 mm high.

2.6 AUTOMATIC ALARM INITIATING DEVICES

.1 Heat detectors: provide heat detectors designed for detection of fire by combination fixed temperature rate-of-rise principle.

.2 Combination Fixed Temperature Rate-Of-Rise Detectors (Spot Type): designed for surface or semi-flush outlet box mounting and supported independently of conduit, tubing or wiring connections.
.1 Contacts: self-resetting after response to rate-of-rise actuation
.2 Operation under fixed temperature actuation to result in external indication.
.3 Detector units located in boiler rooms, showers, or other areas subject to abnormal temperature changes to operate on fixed temperature principle only.

.3 Rate Compensating Detector (Spot Type): designed for surface or flush outlet box mounting and supported independently of conduit, tubing or wiring connections.
.1 Detectors: hermetically sealed and automatically resetting type which will operate when ambient air temperature reaches detector setting regardless of rate of temperature rise.
.2 Detector operation: not be subject to thermal time lag.

.4 Open-Area Smoke Detectors: provide detectors designed for detection of abnormal smoke densities by ionization and photoelectric principle.
.1 Detectors, to match existing in the facility.

.5 Locate detectors in accordance with their listing by ULC, except provide at least 2 detectors in rooms of 54 square meters or larger in area.

.6 Mount detectors at underside of ceiling or deck above unless otherwise indicated.
.1 For mounting heights greater than 3 m above floor level, reduce actual detector linear spacing from listed spacing as required by ULC.
.2 For heights greater than 9m space detectors no farther apart than 34% of their listed spacing.

.7 Temperature rating of detectors: in accordance with ULC.

.8 Locate detectors minimum 300mm to lighting fixtures and not closer than 600 mm to air supply or return diffuser.

.9 Ensure detectors, located in areas subject to moisture or exterior atmospheric conditions or hazardous locations as defined by ULC, are approved for such locations.

.10 Provide detectors with terminal screw type connections.

.11 Removal of detector head from its base to cause activation of system trouble signals if detectors are provided with separable heads and bases.

2.7 ALARM INTIATING DEVICES SPACING AND LOCATION

.1 Detector spacing and location: in accordance with manufacturer's recommendations and requirements of ULC.

.2 Provide at least 2 detectors in rooms of 54 square meters or larger.

.3 Spacing: not to exceed 9 m by 9 m per detector, and 9 linear m per detector along corridors.

.4 Locate detectors minimum 600mm from air discharge or return grille, and not closer than 300 mm to lighting fixtures.

.5 In areas without finished ceilings, mount detectors at underside of deck above unless otherwise indicated.

2.8 AUDIBLE SIGNAL DEVICES

.1 Provide Notifier Mini-Horns, to match existing in the facility.

2.9 END-OF-LINE DEVICES

.1 End-of-line devices to control supervisory current in alarm circuits and signalling circuits, sized to ensure correct supervisory current for each circuit. Open, short or ground fault in any circuit will alter supervisory current in that circuit, producing audible and visible alarm at main control panel.

2.10 GRAPHIC ANNUNCIATOR PANEL

.1 Update existing graphic with new, extended and altered zones and devices.

2.11 CONDUIT

.1 Electrical Metallic Tubing (EMT).

2.12 WIRING

.1 Wire for 120 V circuits: No. 12 AWG minimum solid copper conductor.

.2 Wire for low voltage DC circuits: No. 14 AWG minimum solid copper conductor

.3 Wire to remote annunciators: No. 18 AWG minimum solid copper conductor.

.4 Wire for connection to base telegraphic alarm loop: No. 10 AWG minimum solid copper conductor.

.5 Insulation 75 degrees C minimum with nylon jacket.

.6 Colour code wiring.

2.13 AS-BUILT RISER DIAGRAM

.1 Update existing riser diagram with new, extended and altered zones and devices.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install systems in accordance with CAN/ULC-S524.

.2 Locate and install manual alarm stations and connect to alarm circuit wiring.

.3 Locate and install detectors and connect to alarm circuit wiring. Do not mount detectors within 600 m of air outlets. Maintain at least 600 mm radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts.

.5 Connect alarm circuits to main control panel.

.6 Locate and install horns and connect to signalling circuits.

.7 Connect signalling circuits to main control panel.

.8 Install end-of-line devices at end of alarm and signalling circuits.

3.3 FIELD QUALITY CONTROL

.1 Site Tests:

.1 Perform tests in accordance with Section 26 05 00 and CAN/ULC-S537.

.2 Fire alarm system:

.1 Test each device and alarm circuit to ensure manual stations, detectors transmit alarm to control panel and actuate general alarm.

.2 Check annunciator panels to ensure zones are shown correctly.

.3 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of system.

.4 Class A circuits.

.1 Test each conductor on circuits for capability of providing alarm signal on each side of single open-circuit fault condition imposed near midmost point of circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.

.2 Test each conductor on circuits for capability of providing alarm signal during ground-fault condition imposed near midmost point of circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.

.5 Class B circuits.

.1 Test each conductor on circuits for capability of providing alarm signal on line side of single open-circuit fault condition imposed at electrically most remote device on circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.

.2 Test each conductor on circuits for capability of providing alarm signal during ground-fault condition imposed at electrically most remote device on circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.

.2 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

.3 Verification requirements in accordance with Section 01 47 20, include:
.1 Materials and resources.
.2 Storage and collection of recyclables.
.3 Construction waste management.
.4 Resource reuse.
.5 Recycled content.
.6 Local/regional materials.
.7 Low-emitting materials.

3.4 TRAINING

.1 Arrange and pay for on-site lectures and demonstrations by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system.

3.5 CLEANING

.1 Proceed in accordance with Section 01 74 11.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

APPENDICES

PART 1 - GENERAL

1.1 REPORTS

.1 A copy of the following report(s) are appended to this Document:

Installation Specifications
Intrusion Detection, Access Control and Video Systems
Sarnia Detachment Relocation
Version 2
Protective Technical Services Section, “O” Division
Dated: 2016-03-11
10 pages

Project Specific Designated Substance Survey
Demo and Fit-Up for a Public Safety Client
Government of Canada Building
105 Christina Street South, Sarnia, Ontario
Prepared by: Golder Associates Ltd.
Report Number: 1663615-R01
Dated: September 19, 2016
49 pages

Asbestos Materials Report
105 Christina Street South, Sarnia, Ontario
5 Year Asbestos Reassessment
Prepared by: Pinchin Environmental Ltd.
Report Number: S62931
Dated: March 11, 2011
22 pages

Designated Substances Assessment
Government of Canada Building
105 Christina Street South, Sarnia, Ontario, Building #5520068
Prepared by: OH Solutions
Report Number: 12-030
Dated: November 9, 2012
36 pages

.2 The reports, by their nature, cannot reveal all conditions that exist or can occur on the site. Should subsurface conditions be found to vary substantially from the report, immediately notify Departmental Representative in writing and await instructions.

.3 Contractor shall not be entitled to extra payment or extension of Contract Time for work which is required and which is reasonably inferable in the report(s) as being necessary.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

Installation Specifications

INSTALLATION SPECIFICATIONS
Intrusion Detection, Access Control and Video Systems
SARNIA DETACHMENT RELOCATION

2016-03-11
Version 2.0

Prepared by:

[redacted]
Protective Technical Services Section
“O” Division

General

This document defines the requirement for the supply and installation of infrastructure associated with the installation of Intrusion Detection, Access Control and Video Systems related to the relocation of [redacted] Detachment Sarnia, Ontario. For additional information on any point, please contact;

[redacted]

Notes about this document

A. Sections 1 to 7 (inclusive) of this document is the specification package released to the General Contractor. It defines the areas of responsibility expected of them in order to properly prepare for the installations of the afore noted systems. These sections serve as reference for the General Contractor, and compliment the appropriate security floor plan.

General Notes

A. In this document;
[redacted] will refer to the contact above.
"General Contractor" will refer to the primary building contractor installing the infrastructure and security wiring.

B. The General contractor shall obtain any municipal and/or provincial permit(s) required for the installation of the access control systems herein specified, and forward a copy of this (these) permit(s) to the [redacted] contact person upon request.

C. All schematics, drawings, software, manuals and specifications required for the system shall remain the property of the [redacted] and are subject to recall at the completion of the project.

D. Any damage to existing utilities, equipment or finished surfaces resulting from the performance of this contract shall be repaired to the [redacted]s satisfaction at the general contractor expense.

E. All system components supplied by the Site General contractor shall be new.

F. This contract shall be modified only with the approval of the [redacted] No alteration or variation of the terms and conditions of the contract shall be valid unless made in writing and signed by the parties. Every amendment shall specify the date on which its provisions shall be effective.

General Notes ***(continued)***

G. All installation work shall, as a minimum, satisfy the requirement of all local, applicable Codes and Bylaws, both provincial and municipal. This shall include the running of all low and high voltage AC circuits complete with the installation of electrical components, control lines and all required conduit runs as put forward in this document.

H. All installation work shall be subject to inspection and approval by the [redacted] The final inspection shall require the presence of a representative from the installation company, and any deemed deficiencies shall be corrected.

1. Areas of Responsibility - Site General Contractor

The site general contractor will provide and install the following;

1.1 All conduit or cable tray infrastructure and all related fixtures.

1.2 All 120vac outlets as described herein.

1.3 All low voltage security wiring.

1.4 All Access control and video cable.

1.5 A complete and accurate wire list provided to the [redacted]

1.6 Wiring labeled as per section 4 in this document

1.6 An electrician to connect 120vac to control panels as indicated in these specifications.

1.7 Equipment Room preparation as described in section 19 of this document

2. Areas of Responsibility -[redacted]

[redacted] will supply and install the following;

2.1 All Intrusion detection, access Control and video hardware, and related control electronics and equipment racks.

3. Conduit Requirements - General Indoor

3.1 To the extent possible, all conduits will be hidden and all single duplex electrical boxes flush with the wall surface. ** Exception; 4 x 4 Junction boxes above ceiling tiles.

3.2 The contractor may use hand or machine to complete the required conduit system. Care should be taken by the contractor to ensure minimal damage is done to the surroundings. The contractor shall return the surroundings and any disturbed area to the condition they were in, previous to the installation.

3.3 The contractor shall supply and install cover plates on all junction boxes.

3.4 Pull strings must be supplied in all new and reworked conduits, and secured on both ends.

3.5 Under no circumstances shall any conduit contain more than two 90 degree bends nor exceed 180 degree total bending angle without the installation of pull box(s) to accomplish the above.

3.6 All main conduit is to be 25 mm in diameter at all times unless extreme circumstances dictate.

3.7 All main junction boxes shall be 200 mm x 200 mm with a depth of 100 mm. All junction boxes shall be easily accessible.

3.8 All wall and floor penetrations shall be packed or sealed with an approved fire retardant sealing compound around the conduit.

3.9 All surface mount cable must be enclosed in conduit or raceway.

4. Wire and Cable Runs

4.1 Unless indicated in this document, all wiring shall terminate in equipment room 209, on a plywood wall indicated in the plan. Wires pulled into this room shall be pulled long enough to run from the ceiling to the floor, and back to the ceiling again.

4.2 Cables shall be run in a uniform fashion and shall not be woven among other utilities.

4.3 If used, cable ties must be trimmed off cleanly.

4.4 Each wire shall be uniquely labeled at both ends using proper wire labelers or markers. These numbers shall appear two feet from each end of the cables.

4.5 [redacted] will supply a wire label list which follows [redacted] labelling standards. The Contractor shall label as per this list.

4.6 All wires destined for door locations will be pulled into the appropriate door frame cutout and a 2 foot length left in place or wire pull in place. Care must be taken to guard this length against being cut or damaged once it is in place.

Wire and Cable Runs (continued)

4.7 The various wires to each door shall be bundled at the equipment room end in order to aid in routing that door's group of wires into the proper control panel.

4.8 All wire runs shall be completed without wire splices.

4.9 Any wire entering or transiting a public area must be contained in conduit while in the public area.

5. Wire and Cable Types

5.1 Low voltage security wiring will be;

5.1.1 **4 conductor** - solid, individual conductor colors (Rd, Bk, Yl, Gn) 22awg, no shield or drain wire, grey outer jacket, FT6 (Cerco Cable 1651 or equivalent).

5.1.2 **2 conductor** - stranded, individual conductor colors (Bk, Red), 18awg, no shield or drain wire, grey outer jacket, FT6 (Cerco Cable 7560 or equivalent).

5.1.3 **Video Cable (CAM)** - RG 59/BU, copper conductor, 95% overall shielding, black outer jacket, FT6 (Provo Cable 995911 or equivalent).

6. RESERVED

7. Card Reader door (CR) – REFER TO DRAWING "Door Type C"

7.1 The following doors will be fitted with access control equipment;

Door 200B
Door 215A

7.2 Each door and frame will be prepared as per drawing "Door Type C".

7.3 Each door will require the following wires supplied to the door frame;

7.3.1 1 x 4 conductor wire to the "**Door Contact**". Route the wire into the 1" hole prepared in the door frame for this contact. Leave a 2 foot coil of wire.

7.3.2 1 x 4 conductor wire supplied to **JB1**- Leave a 2 foot coil of wire.

7.3.3 1 x 4 conductor wire to **JB3** – Leave a 2 foot coil of wire.

7.3.4 Reserved

7.3.5 1 x 2 conductor to **JB1**. Leave a 2 foot coil of wire

7.3.6 1 x Transfer Cable (Electrolynx QC –C1500P – supplied by [redacted]. Connect this cable to the electrified mortise lock in the door. Route the other end of the cable (Pins end) through the transfer loop in the door frame, and on to JB1.

.

8. Alarmed Doors – REFER TO DRAWING "Door Type D"

8.1 The following Doors will be fitted intrusion detection equipment;

Door 200
Door 204
Door 209B
Door 211
Door 215B

8.2 Each door and frame will be prepared as per drawing "Door Type D".

8.3 Each door will require the following wires supplied to the door frame;

8.3.1 1 x 4 conductor wire to the "**Door Contact**". Route the wire into the 1" hole prepared in the door frame for this contact. Leave a 2 foot coil of wire.

8.3.2 1 x 4 conductor wire supplied to **JB4**- Leave a 2 foot coil of wire.

9. Alarmed Card Reader Doors – REFER TO DRAWINGS "Door Type E"

9.1 The following Door will be fitted with both access control and intrusion detection equipment;

Door 210

9.2 Each door and frame will be prepared as per drawing "Door Type E".

9.3 Each door will require the following wires supplied to the door frame;

9.3.1 1 x 4 conductor wire to the "**Door Contact**". Route the wire into the 1" hole prepared in the door frame for this contact. Leave a 2 foot coil of wire.

9.3.2 Reserved

9.3.3 1 x 4 conductor wire to **JB4** – Leave a 2 foot coil of wire.

9.3.4 1 x 4 conductor wire supplied to **JB3**- Leave a 2 foot coil of wire.

9.3.5 1 x 4 conductor wire to **JB1** – Leave a 2 foot coil of wire.

9.3.6 1 x 2 conductor to **JB1**. Leave a 2 foot coil of wire.

9.3.7. 1 x Transfer Cable (Electrolynx QC –C1500P – supplied by [redacted]. Connect this cable to the electrified mortise lock in the door. Route the other end of the cable (Pins end) through the transfer loop in the door frame, and on to JB1.

10. Alarmed Doors – REFER TO DRAWING "Door Type B"

10.1 The following Door will be fitted with a door contact only;

Door 201A

10.2 1 x 4 conductor wire to the "**Door Contact**". Route the wire into the 1" hole prepared in the door frame for this contact. Leave a 2 foot coil of wire at the door contact location.

11. RESERVED

12. INTRUSION DETECTION

Area 200
Hallway 202 x 2
Room 204
Room 209B
Room 210
Room 211
Area 215

12.1 1 x 4 conductor wire - To Each location marked **MD**. Leave a 5 foot coil of wire in the ceiling at the indicated position.

13. Panic Signaling

Hallway 202 x 2 locations

13.1 1 x 4 conductor wire- To each location marked **SIREN**. Leave a 5 foot coil of wire in the ceiling at the indicated position.

.

14. Actuating

14.1 4 x 4 conductors - To the reception desk. Leave a 5 foot coil of wire on the floor under the reception desk.

14.2 4 x 4 conductors - To the workstation in Area 202. Leave a 5 foot coil of wire on the floor of the workstation.

15. **Spare**

15.1 4 x 4 conductors – To the hallway area outside door 212. Leave a 5 foot coil of wire in the ceiling at the indicated location.

16. Wiring - Room 201 to 203

16.1 2 x 4 conductors - From Junction box JB201 in room 201 to Junction box JB203 in room 203. Leave a 5 foot coil of wire at each junction box.

16.3 1 x RG59 video cable
1 x 2 conductor cable
- From Junction box JB203 in room 203 to each ceiling location in room 201 marked **CAM**. Leave 15 foot coils of wire at all locations.

17. Junction Box 203

17.1 Junction Box 203 shall be a 6 x 6 electrical junction box mounted flush to the wall surface in room 203, as indicated in the floor plan.

17.2 3 single gang electrical boxes shall be mounted above the 6x6, and connected to JB 203 by ½" conduit. The conduit and electrical boxes shall be mounted flush to the wall surface.

18. Junction Box 201

18.1 Junction box 201 in room 201, shall be a single gang electrical box mounted flush to the wall at a height of 39 inches on center above the floor.

18.2 Conduit shall be run from the single gang box and stub out above ceiling tile level.

19. Cameras

19.1 1 x RG59 video cable
1 x 2 conductor cable
- From two ceiling locations in area 200 marked **CAM** to equipment room 209. Leave 15 foot coils of wire at all locations.

19.2 1 x RG-59 - From equipment room 209 to the workstation in area 202. Leave 15 foot coils of wire at all locations.

20. Lan Room / Equipment Room 209 Preparation

20.1 Prepare one wall in this room as per the diagram "Typical Equipment Room Wall Preparation…."

20.2 One 120vac circuit (not shown in the diagram) is to be reserved for installation to the main control panel to be installed on this wall. This circuit should be on UPS/Generator if it is available.

20.3 Ensure sufficiently bright lighting is provided in this area.

21. Lan Requirements

21.1 4 LAN drops are required on the Equipment Room wall in room 209

22. Telephone Requirements

22.1 A telephone is required and shall be mounted in equipment room 209.

23. RESERVED

Project Specific Designated Substance Survey

September 19, 2016

PROJECT SPECIFIC DESIGNATED SUBSTANCE SURVEY

Demo and Fit Up for a Public Safety Client
Government of Canada Building
105 Christina Street South, Sarnia, Ontario
PWGSC Project No. R.073089.040

Submitted to:
Mr. Mohammad Salam, B.Eng., MBA
Real Property Branch
Public Works & Government Services Canada
4900 Yonge Street, 11th Floor
North York, ON M2N 6A6

REPORT

Report Number: 1663615-R01

Distribution:

Electronic Copy - Public Works & Government Services Canada
1 Copy - Golder Associates Ltd.

Golder Associates

Table of Contents

TABLES

APPENDICES

1.0 INTRODUCTION

Golder Associates Ltd. ("Golder") was retained by Public Works & Government Services Canada ("PWGSC") to conduct a project specific designated substance survey (DSS) associated with the interior demolition and fit up for a Public Safety client at the Government of Canada building located at 105 Christina Street South in Sarnia, Ontario (the "Site"). The project will occur in the northeast corner of the second floor and is referenced as PWGSC Project No. R.073089.040.

The survey was performed by Golder to identify the potential presence of designated substances associated with demolition and fit-up of a portion of the second floor (the "project") and anticipated to be disturbed during these activities, as required under the *Ontario Occupational Health and Safety Act, R.S.O.*, as amended (the Act) and Public Works and Government Services Canada (PWGSC) *Departmental Policy 057: Asbestos Management*. While all designated substances associated with demolition and fit-up were considered in the survey, inspections and/or sampling focused on materials that were considered likely to be present, including asbestos-containing materials (ACMs), lead and silica. Authorization to proceed with the survey was provided by Purchase Order No. 700362417, issued on September 9, 2016.

1.1 Scope of Work and Date of Inspection

The scope of work included a visual assessment of building materials, architectural finishes and accessible equipment associated with the intended tenant space in the northeast corner of the second floor for the purpose of identifying potential designated substances likely to be disturbed during upcoming project related construction activities. Our assessment included representative sampling of materials suspected of containing asbestos and/or lead, laboratory analysis of samples for asbestos and/or lead content, and the preparation of a factual report summarizing the results of the project specific designated substance investigation. In order to accomplish the required scope of work, some limited intrusive investigation and/or sampling was conducted. The survey was conducted by Mr. C. Rahm of Golder on September 12, 2016.

1.2 Designated Substance Inventory

The Act, as amended, defines 11 designated substances and sets forth two regulations covering the requirements pertaining to the 11 designated substances in Ontario. Section 30 of the Act requires that, prior to beginning a construction project, including building renovations or demolition, a document detailing the presence of designated substances must be made available to contractors and subcontractors requesting tenders and/or performing the work where tenders are not utilized. Ontario Regulation 278/05 *Designated Substance - Asbestos on Construction Projects and in Buildings and Repair Operations*, as amended (O. Reg. 278/05) requires that a similar document be prepared, and provided to all bidders (including sub-contractors) at the time of tendering, outlining the presence, content and types of asbestos present.

Below are the designated substances included in this assessment and their corresponding regulations:

- Asbestos – O. Reg. 278/05; and
- Lead, Mercury, and Silica – Ontario Regulation 490/09 *Designated Substances*, as amended (O. Reg. 490/09).

Only the asbestos regulation, O. Reg. 278/05, sets forth specific work procedures for handling materials. The remaining regulation does not set forth methods and procedures to be implemented when disturbances are expected to occur. In addition to the provincial regulations described above, the Ontario Ministry of Labour (MOL) has published guidelines designed for the disturbance of both lead and silica on construction projects, as noted in Sections 2.2 and 2.3, respectively, of this report.

In addition to provincial regulatory and guideline requirements, PWGSC *Department Policy 057: Asbestos Management* outlines requirements for the management of asbestos-containing materials (ACMs) in federal facilities including notification requirements prior to abatement activities.

The presence of the following additional hazardous materials was also visually assessed by Golder, where appropriate, within the project specific area:

- Polychlorinated Biphenyls – Ontario Regulation 362 *Waste Management - PCBs*, as amended (O. Reg. 362), promulgated under the Ontario Environmental Protection Act, R.S.O. 1990, c. E.19 (EPA); and
- Ozone-Depleting Substances – Ontario Regulation 463/10 *Ozone Depleting Substances and Other Halocarbons*, (O. Reg. 463/10), promulgated under the EPA.

1.3 Site and Project Information

The crown-owned Site (Building Number 010816) consists of a flat-roofed two-story structure, reportedly constructed between 1956 and 1960, with a floor area of approximately 7,100 square metres. Tenants include a variety of federal departments and crown agencies. The Site is a recognized federal heritage building.

For the purposes of this project specific DSS, the following site information was reviewed prior to attending the site:

- Drawing No S200 *Part Existing Roof Plan*, prepared by Taylor Hazell Architects Ltd. and dated December 17, 2015;
- Drawing No A200 *Demolition Plan / RCP*, prepared by Taylor Hazell Architects Ltd. and dated December 17, 2015;
- Drawing No E200 *Demolition Floor and Reflected Ceiling Plan*, prepared by Taylor Hazell Architects Ltd. and dated December 17, 2015;
- Drawing No M-02 *HVAC Demolition and New Layout Mechanical*, prepared by Taylor Hazell Architects Ltd. and dated December 17, 2015;
- Drawing No. M-1 *Mechanical Layout, Details and Notes*, prepared by Callidus Engineering, Project No. GOC325578, dated January 2016;
- Drawing No. E-1 *Schedules*, prepared by Callidus Engineering, Project No. GOC325578, dated January 2016;
- Drawing No. E-2 *Part Second Floor and Basement Plans*, prepared by Callidus Engineering, Project No. GOC325578, dated January 2016;

- Drawing No. E-3 *Roof Plan and Basement Boiler Room Plan*, prepared by Callidus Engineering, Project No. GOC325578, dated January 2016;
- Drawing No. E-4 *Single Line Diagram and Riser - Demo*, prepared by Callidus Engineering, Project No. GOC325578, dated January 2016;
- Drawing No. E-5 *Single Line Diagram and Riser - New*, prepared by Callidus Engineering, Project No. GOC325578, dated January 2016;
- Drawing No. S-1 *Key Plan, RTU Location Plan & General Notes*, prepared by D.C. Buck Engineering, Project No. 14416, dated February 9, 2016;
- Drawing No. S-2 *Key Plan, RTU Location Plans*, prepared by D.C. Buck Engineering, Project No. 14416, dated February 9, 2016;
- Drawing No. S-3 *Key Plan, Chiller Sections & Details*, prepared by D.C. Buck Engineering, Project No. 14416, dated February 9, 2016;
- Drawing No. S-4 *Generator Sections and Details*, prepared by D.C. Buck Engineering, Project No. 14416, dated February 9, 2016;
- *Asbestos Materials Report, 105 Christina St. South, Sarnia, Ontario, 5 Year Asbestos Reassessment*, prepared by Pinchin Environmental Ltd., Project No. S62931, dated March 31, 2011; and
- *Designated Substances Assessment, Government of Canada Building, 105 Christina Street, Sarnia, Ontario, Building #5520068*, prepared by OH Solutions, Project No. 12-030, dated November 9, 2012.

The drawings and referenced documents form the basis on the project specific DSS completed by Golder; only items described as being disturbed (i.e., decommissioned, removed or otherwise impacted during construction) were assessed. Assessment was limited to the locations in the northeast corner of the second floor described in the drawings prepared by Taylor Hazell Architects Ltd and dated December 17, 2015.

Mr. Robert Slater of Brookfield Global Integrated Solutions provided site access.

2.0 METHODOLOGY

This report provides our observations of the areas accessed and the analytical results of materials sampled during the survey. The analytical results provided reflect the sampled materials at the specific sample locations. Visually similar materials (colour and texture) have been referenced to specific analyzed samples and were considered to be 'homogeneous' (of like composition) in nature.

2.1 Asbestos-Containing Materials (ACMs)

Golder conducted a site reconnaissance that included a limited intrusive investigation to determine the presence and extent of asbestos, if any, associated with the project specific area and planned work activities. Systems, building materials and architectural finishes anticipated to be disturbed as described on the drawings and figures pertaining to the project were visually inspected on a systematic basis in order to identify the locations of suspect ACMs. Materials suspected of containing asbestos were sampled following the requirements of O. Reg. 278/05.

Bulk samples of each "homogeneous material" or "component" suspected to contain asbestos were collected and submitted for laboratory analysis. Homogeneous materials are defined by O. Reg. 278/05 as materials that are uniform in colour and texture. The number of samples collected and submitted for analysis of each homogeneous material was in accordance with Table 1 *Bulk Material Samples* of O. Reg. 278/05. Sample analysis of each homogeneous material was stopped at the first positive result in accordance with O. Reg. 278/05. Some samples may have been identified by the laboratory to contain multiple phases which required separation and individual analysis of each separate phase by the laboratory.

The sample collection consisted of obtaining a small volume of material from either a damaged section of suspect ACMs or cut out of intact material. The collected samples were placed in individual plastic bags, labelled and submitted to an independent asbestos laboratory, Crisp Analytical Laboratories, L.L.C. (CAL) in Carrollton, Texas for analysis of asbestos type and percentage content using Polarized Light Microscopy (PLM) with dispersion staining techniques. CAL is accredited under the National Voluntary Laboratory Accreditation Program (NVLAP), Laboratory Code 200349-0, and by the American Industrial Hygiene Association (AIHA), Laboratory ID 102929, for asbestos bulk sample analysis and adheres to a written QA/QC program which governs their analysis process.

Samples were analyzed by CAL for asbestos type and percentage asbestos content using Polarized Light Microscopy (PLM) in accordance with U.S. Environmental Protection Agency (US EPA) methodology and dispersion staining technique EPA 600/R-93/116, as is required by O. Reg. 278/05. Materials reported to contain less than 0.5 percent (%) asbestos, including those referred to as less than the method detection limit (<MDL) or trace, are not considered to be asbestos-containing under current regulations in Ontario.

2.2 Lead

Lead is a naturally occurring metal. It was used primarily in paint prior to the 1980's in order to expedite the drying process. Lead in paint becomes a potential danger when it becomes old or damaged as it may result in lead emissions and dust. Lead can also be found in soldered joints installed on piping up to the mid-1990s and in older cast iron bell and spigot joints.

Visual identification and systematic sampling of suspected lead-containing paints associated with the project specific area were completed as part of the site survey. Samples of suspected lead-containing paint were collected

and submitted to EMSL Canada Inc. (EMSL) in Mississauga, Ontario under chain of custody procedures. Analysis for lead-containing paints was performed by EMSL following US EPA Test Method *SW-846-7000B: Flame Atomic Absorption Spectrophotometry* (AAS). As part of the method, each sample is digested, diluted and analyzed via US EPA Test Method *3050B Acid Digestion of Sediments, Sludges, and Soils* prior to analysis by AAS. EMSL is accredited under the Environmental Lead Proficiency Analytical Testing (ELPAT) Program, Laboratory Code 196142, administered by the AIHA, for lead analysis in dust, paint and soil and adheres to a written QA/QC program which governs their analysis process.

The MOL has not prescribed specific criteria for classification of lead-containing paints. In the past, the abatement industry has generally used regulations set by the federal Hazardous Products Act (HPA) and the U.S. Department of Housing and Urban Development (HUD) to determine whether a material is considered lead-containing. Until July 2005, the HPA classified all lead-containing paints and coatings as 0.5% lead by weight (or 5,000 parts per million) as determined by bulk chemical analysis. In July 2005, the HPA was amended to harmonize with US legislation that prescribes an acceptable lead level of 0.06% lead by weight or less, as determined by bulk chemical analysis, for paints and coatings on children's furniture, toys, learning materials and surface coatings on artists' brushes and pencils. Under the amended HPA, other items containing lead, such as residential paints, remain at the 0.5% level. The HUD classifies lead-containing paint as any paint application containing at least 0.5% by weight [5,000 milligrams per kilogram (mg/kg)] or 1.0 milligram of lead per square centimetre of surface area (mg/cm^2).

While lead in workplaces is regulated under O. Reg. 490/09, this regulation does not specifically apply to construction projects. O. Reg. 490/09 sets forth occupational exposure limits (OELs) and prescriptive requirements surrounding engineering controls, work practices, hygiene practices and facilities for workers who may become exposed to lead. Since O. Reg. 490/09 is not applicable to construction projects, the Occupational Health and Safety Branch of the MOL published their *Guideline, Lead on Construction Projects* in September 2004 (revised 2011), the stated purpose of which was to raise the awareness of employers and workers in the construction industry of the hazards posed by lead in construction, and the measures and procedures that should be taken to control those hazards. Currently, this document is enforced by the MOL through the general due diligence clause of the Act. As such, it is referenced herein, where appropriate, to provide guidance on appropriate handling and exposure control procedures when dealing with lead during anticipated demolition and/or construction related activities.

Based on discussion between the MOL and the Environmental Abatement Council of Ontario (EACO), an industry group representing consultants and contractors in the abatement industry, it is noted that the MOL has adopted a position where they consider that <u>any</u> detectable amount of lead in paint and similar materials has the potential to produce an airborne hazard to workers and building occupants when these materials are disturbed. As such, for the purpose of this survey, and in light of our current understanding of the MOL position, Golder has classified any material containing detectable amounts of lead as "lead-containing" materials and recommends that all disturbances to these materials be conducted in accordance with the MOL document *Guideline, Lead on Construction Projects*.

2.3 Silica

Silica is a naturally occurring mineral and may be found in common aggregates such as plaster, concrete, mortar, ceiling tiles and brick. The health risk from silica is related to the inhalation of free respirable silica particulate. Silica is likely present in concrete, concrete block and mortar used to construct the building, and in hard plaster finishes and acoustic tiles used as architectural finishes.

In September 2004 (revised 2011), the Occupational Health and Safety Branch of the MOL published their *Guideline, Silica on Construction Projects*, the stated purpose of which was to raise the awareness of employers and workers in the construction industry of the hazards posed by silica in construction and the measures and procedures that should be taken to control those hazards. Similar to the MOL Lead Guideline, this document is also enforced by the MOL through the general due diligence clause of the Act. As such, it is referenced herein, where appropriate, to provide guidance on appropriate handling and exposure control procedures when dealing with silica.

No sampling for the presence of silica in construction materials was performed as part of this survey as silica is presumed to be present in building materials and architectural finishes constructed from raw aggregates, such as ceiling tiles, plaster, concrete, and concrete blocks present at the Site. In the event of disturbance to silica-containing materials, appropriate dust control measures, combined with personal protective equipment, must be employed to prevent occupational exposure to respirable silica dust.

2.4 Mercury

Elemental mercury may be present in, among other items, thermostats, switch gears, barometers, and sump pump float switches. If elemental mercury is spilled, the beads and droplets can accumulate and emit colourless and odourless vapours. These vapours may present a health risk to occupants. Trace amounts of mercury may also be present as a vapour within fluorescent light tubes. These light tubes may pose an occupational hazard to unprotected workers if broken.

Our survey included a visual assessment for the potential presence of mercury-containing equipment in the northeast corner of the second floor only. No sampling of suspect mercury-containing equipment or lighting was completed as part of the survey. Controls associated with mechanical systems at the Site may be present which contain mercury gauges, controls and/or switches.

2.5 Other Designated Substances

Other designated substances, as defined by the Act, include: acrylonitrile, arsenic, benzene, coke oven emissions, ethylene oxide, isocyanates and vinyl chloride. Brief discussions of the potential for these materials to be encountered and/or disturbed during construction related activities at the Site are outlined in the following subsections. None of these substances were expected to be present as significant constituents of the building materials and architectural finishes within the project specific area. As such, no specific observations or sampling of materials potentially containing these substances was included as part of this survey and, with the exception of the general descriptions below, will not be discussed further in this document.

2.5.1 Acrylonitrile

Acrylonitrile is a semi-transparent liquid used in the manufacturing of acrylic and modacrylic fibres and as a raw material in the manufacture of plastics, some forms of rubber, coatings, paints, resins and adhesives. Worker exposure may be possible via vapour inhalation and/or ingestion, and primarily occurs during usage and manufacturing processes. While acrylonitrile may be present in paints and adhesives in a stable form, acrylonitrile is not expected to release emissions in its hardened form that would exceed allowable limits. As such, our survey included acrylonitrile in its raw form only.

2.5.2 Arsenic

Arsenic is a metal that may be used in elemental form or as a chemical compound, such as an alloying additive for metals such as lead and copper. The primary occupational exposure to arsenic is during refinery processing. It may be found in battery grids, cable sheaths and boiler tubes. It may also be present in paints and adhesives in a stable form.

2.5.3 Benzene

Benzene is typically used in the chemical manufacturing of products such as rubbers, adhesives, paints and plastics. It is also a by-product in the production of hydrocarbons and can be found in gasoline and other products. It is anticipated that trace amounts of benzene may be present within roofing materials, paints and adhesives; however, the benzene constituent would most likely have volatized out of these materials and, therefore, is highly unlikely to present an occupational exposure hazard.

2.5.4 Coke Oven Emissions

Coke oven emissions are a mixture of coal tar, coal tar pitch and creosote, and are a by-product of coking and steel manufacturing. Coke oven emissions can create gases as the result of bituminous coal combustion or can be found in a condensed state as a viscous brownish liquid.

2.5.5 Ethylene Oxide

Ethylene oxide is a chemical intermediary and is used as a fumigant and sterilant. It is also used in glycol and detergents.

2.5.6 Isocyanates

Isocyanates are a group of chemicals used as hardening agents in paints and epoxies. Numerous processes also use isocyanates in the manufacture of products such as foams, rubbers, adhesives, sealants, coatings and inks. In their hardened form, isocyanates are not expected to be released at concentrations that would exceed allowable limits.

2.5.7 Vinyl Chloride

Vinyl chloride is a manufactured substance that is used in the manufacturing of polyvinyl chloride plastics, including pipes, fittings, automotive parts, wire and cable insulations, and roofing membranes. In its hardened form, polyvinyl chloride is not expected to release vinyl chloride at concentrations that would exceed allowable limits.

2.6 Additional Potential Hazardous Materials

2.6.1 Polychlorinated Biphenyls (PCBs)

The use of PCBs in electrical equipment such as transformers, fluorescent lamp ballasts and capacitors was common up to approximately 1980. The former Federal Chlorobiphenyls Regulation, SOR/91-152, prohibited the use of PCBs in the above-noted types of electrical equipment installed after July 1, 1980. Equipment which pre-dates this federal 1980 ban may contain PCBs.

By definition, PCB liquid, solid and equipment containing PCBs means materials containing more than 50 parts per million (ppm) PCBs. Materials containing less than 50 ppm PCB concentration are not regulated under current provincial or federal regulations, unless designated as a “PCB related waste", which is waste containing low levels of PCBs or waste arising from a spill or clean-up of PCB liquid or PCB waste.

Federal PCB Regulation SOR/2008-273, which was published in the Canada Gazette on September 17, 2008, revoked and replaced several PCB regulations that were previously in place, outlined the phase-out of all in-service PCB equipment, and placed restrictions on the disposal of that equipment. It also required the labelling and reporting of in-use and stored equipment. The use of all equipment containing greater than 500 milligrams per kilogram (mg/kg) PCBs or 50 mg/kg for equipment at or within sensitive locations (e.g., schools, hospitals, water treatment plants, etc.) was to have been discontinued by December 31, 2009. The deadline for this equipment may have been extended to December 31, 2014 on a case-by-case basis. At all other locations, the use of all equipment containing greater than 50 mg/kg PCBs, including lighting ballasts and pole-mounted transformers, must be discontinued no later than December 31, 2025. Finally, all existing PCB storage sites were to have been eliminated by December 31, 2009.

Golder’s survey included a visual assessment for the presence of PCB-containing light ballasts and transformers within the project specific area. No sampling of any equipment or electrical fluids was completed as part of the survey.

2.6.2 Ozone Depleting Substances (ODSs)

ODSs may be present in air conditioners, water coolers/fountains and refrigerators/freezers. Our survey included a visual assessment for cooling units that may contain ODSs within the project specific area, specifically refrigeration and cooling equipment. No sampling of suspect ODS-containing equipment was completed as part of the survey.

3.0 SURVEY LIMITATIONS

The site reconnaissance included limited intrusive investigations only where it was safe to do so and deemed necessary, based on professional experience, in order to attempt to characterise hidden designated substances associated with materials anticipated to be disturbed during upcoming construction activities related to the demolition and fit-up. Golder did not sample materials where the sample collection would have affected the operation of equipment (e.g., wiring) or present an unmanageable health and safety hazard for our staff (e.g., live electricity, working at heights). These materials were deemed to be inaccessible at the time of the assessment.

Only materials outlined on the drawings and figures described in Section 1.3 *Site and Project Information* were assessed. If project activities must occur in other areas outside the northeast corner of the second floor (i.e., in areas other than those outlined in the referenced drawings and figures), those areas and/or work activities must be assessed for the potential presence of designated substances and/or the potential for disturbance prior to work activities occurring.

Wiring, high voltage cables and conduits were not specifically assessed as electricity was live at the time of our assessment. The existing *Asbestos Materials Report, 105 Christina St. South, Sarnia, Ontario, 5 Year Asbestos Reassessment*, prepared by Pinchin Environmental Ltd., Project No. S62931 and dated March 31, 2011, defines all high voltage wiring and “Rockbestos” firewall III cabling present as presumed ACMs at the Site.

Doors into the proposed project work area were noted to be metal with assumed hollow cores as they were not listed as fire-rated. Should a core be present, the core material should be assumed to be ACM.

Gaskets may be present within closed piping and equipment associated with the perimeter heating system. Gaskets were not observed during the assessment but may be determined to be present during decommissioning. If observed, they should be treated as presumed ACMs.

Roofing materials were not assessed as disturbances to the roof are not anticipated during the project.

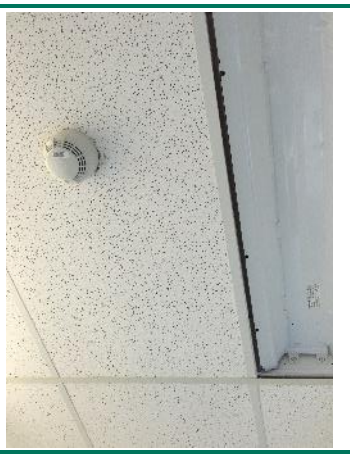
4.0 RESULTS AND FINDINGS

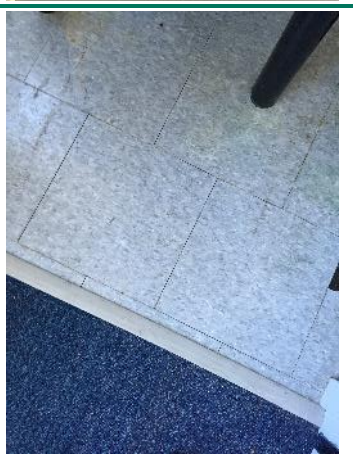
The following section provides a summary of the findings of the preconstruction DSS. Copies of the asbestos certificate of analysis from CAL and the lead certificate of analysis from EMSL are provided in Appendix A.

4.1 Asbestos-Containing Materials

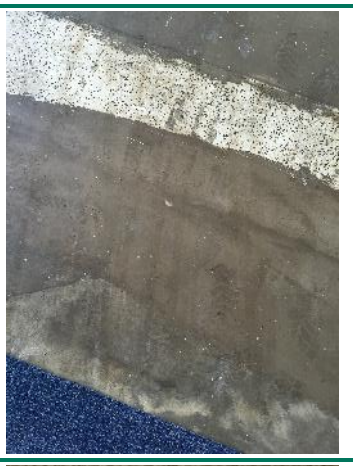
A total of 15 homogeneous sample groups (HSGs) were visually identified at the Site and associated with the project specific area. A total of 45 samples were collected and submitted for asbestos analysis in order to comply with the Table 1 requirements of O. Reg. 278/05. A total of 68 individual sample analyses were performed, including those identified to contain multiple phases as determined by the laboratory. The results of the analyses are summarized in Table 1, below.

Table 1: Summary of Asbestos Analytical Laboratory Results

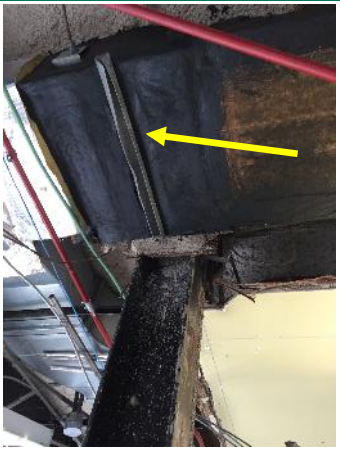
Sample ID	Description	Quantity / Location ACMs	Asbestos Result	Representative Photo
A-1	Ceiling Tiles, 2x4-Foot, Small Fissures, Red Back	---	Non-Detect (all layers) (White surface layer, tan tile layer)	
A-2			Non-Detect (all layers) (White surface layer, tan tile layer)	
A-3			Non-Detect (all layers) (White surface layer, tan tile layer)	
B-1	Ceiling Tiles, 2x4-Foot, Large Fissures, Red Back	---	Non-Detect (all layers) (White surface layer, tan tile layer)	
B-2			Non-Detect (all layers) (White surface layer, tan tile layer)	
B-3			Non-Detect (all layers) (White surface layer, tan tile layer)	

Sample ID	Description	Quantity / Location ACMs	Asbestos Result	Representative Photo
C-1	Ceiling Tile, 12x12-inches	---	Non-Detect (all layers) (White surface layer, tan tile layer)	
C-2			Non-Detect (all layers) (White surface layer, tan tile layer)	
C-3			Non-Detect (all layers) (White surface layer, tan tile layer)	
D-1	Ceiling Tile Mastic (associated with 12x12-inch ceiling tiles)	30 square metres	2% Chrysotile	
D-2			Positive Stop	
D-3			Positive Stop	
E-1	Vinyl Floor Tile and associated Black Mastic, 12x12-inch, Grey Mottled	75 square metres	2% Chrysotile (Black Mastic below top tile) Non-Detect (Tile, tan carpet mastic, layered tile remnants and remnant mastic)	
E-2			Positive Stop (Black Mastic) Non-Detect (Tile, tan mastic, tile remnants and remnant mastic)	
E-3			Positive Stop (Black Mastic) Non-Detect (Tile, tan mastic, tile remnants and remnant mastic)	

Sample ID	Description	Quantity / Location ACMs	Asbestos Result	Representative Photo
F-1	Window Caulking, Interior Side of Windows	---	Non-Detect	
F-2			Non-Detect	
F-3			Non-Detect	
G-1	Window Glazing, Interior Side of Windows, Black	---	Non-Detect	
G-2			Non-Detect	
G-3			Non-Detect	
H-1	Ceiling Tiles, 2x4-Foot, Pinholes & Fissures, Red Back	---	Non-Detect (all layers) (White surface layer, tan tile layer)	
H-2			Non-Detect (all layers) (White surface layer, tan tile layer)	
H-3			Non-Detect (all layers) (White surface layer, tan tile layer)	

Sample ID	Description	Quantity / Location ACMs	Asbestos Result	Representative Photo
I-1	Window Caulking, Exterior	---	Non-Detect	
I-2			Non-Detect	
I-3			Non-Detect	
J-1	Floor Levelling Compound, Grey	---	Non-Detect	
J-2			Non-Detect	
J-3			Non-Detect	
K-1	Fireproofing, Cementitious	---	Non-Detect	
K-2			Non-Detect	
K-3			Non-Detect	

Sample ID	Description	Quantity / Location ACMs	Asbestos Result	Representative Photo
L-1	Plaster, Walls and Ceiling	---	Non-Detect (all layers) (White outer layer, tan inner layer)	
L-2			Non-Detect (all layers) (White outer layer, tan inner layer)	
L-3			Non-Detect (all layers) (White outer layer, tan inner layer)	
M-1	Drywall Joint Compound, Walls	---	Non-Detect (all layers) (Grey outer layer, white inner layer)	
M-2			Non-Detect (all layers) (Grey outer layer, white inner layer)	
M-3			Non-Detect	
N-1	Linoleum Flooring with Burlap Backing, Brown	---	Non-Detect	
N-2			Non-Detect	
N-3			Non-Detect	

Sample ID	Description	Quantity / Location ACMs	Asbestos Result	Representative Photo
O-1	Tar, HVAC Ducts	See Drawing No M-02 titled *HVAC Demolition and New Layout Mechanical*, PWGSC Project No. R.073089.040 for quantities.	3% Chrysotile (tar) Non-Detect (fibreglass)	
O-2			Positive Stop (tar) Non-Detect (fibreglass)	
O-3			Positive Stop (tar) Non-Detect (fibreglass)	

Notes:
1. Laboratory descriptions may be inconsistent with Golder's descriptions; however, the laboratory descriptions are considered subjective and the materials analysed are considered to be consistent with the materials sampled.
2. Non-Detect = Less than the limit of detection.
3. Positive Stop. As per O. Reg. 278/05, analysis was stopped at the first positive result in each HSG.
4. All quantities and/or locations provided are approximate only and should be confirmed on-site as needed.

As indicated in Table 1, the laboratory results identified three materials within the project specific area which are anticipated to be disturbed and contain asbestos at concentrations greater than, or equal to, 0.5% asbestos by dry weight. These three materials are considered to be an ACM as per O. Reg. 278/05:

- Mastic pucks (2% chrysotile asbestos) on the backside of 1x1-foot ceiling tiles in portions of the project specific area;
- Black mastic vinyl floor tile adhesive (2% chrysotile asbestos), located immediately below the uppermost vinyl floor tile (grey mottled 12x12-inch tiles) in portions of the project specific area; and
- Black tar (3% chrysotile asbestos) located over yellow fibreglass insulation on deck-mounted HVAC equipment and ducts in the current / former ceiling plenums within the project specific area.

The remaining materials sampled and analysed for asbestos were all determined to be non-detect and, as such, are not considered to be ACMs. Please note that the exterior wall cavities contain black "pumice" blocks for assumed insulation purposed. This materials is uncommon but not suspect for asbestos fibres within the material.

In addition to the three positively identified ACMs above, all high voltage wiring and "Rockbestos" firewall III cabling present at the Site is considered to be a presumed ACM. While none was observed within the project specific area, should they be encountered during demolition work, they are to be handled as ACMs.

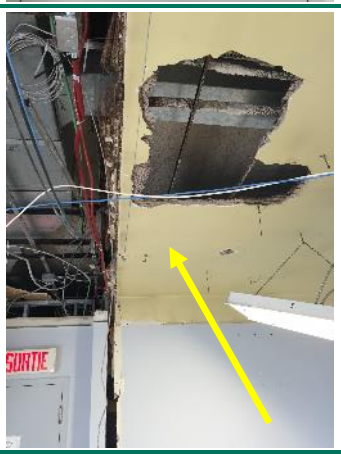
Doors into the proposed project work area were noted to be metal with assumed hollow cores as they were not listed as fire-rated. After removal, should a core be present, the core material should be assumed to be ACM.

Insulating materials were not observed with perimeter HVAC cabinets but gaskets may be present within closed piping and equipment associated with the perimeter heating/cooling system. If observed during demolition activities, they should be treated as presumed ACMs.

4.2 Lead

A total of two samples of visually distinct painted surface coatings anticipated to be disturbed during demolition and fit-up were collected and analyzed by EMSL for lead content. The results of the lead analysis are summarized in Table 2.

Table 2: Summary of Lead Analytical Laboratory Results

Sample ID	Paint Description	Lead Sample Concentration	Representative Photo
P-1	Light grey paint on walls.	340 ppm lead (340 µg/g or 0.0034% lead)	
P-2	Yellow paint on exposed plaster ceiling.	1,700 ppm lead (1,700 µg/g or 0.017% lead)	

Note: µg/g = micrograms per gram of lead. PPM = parts per million lead. 1 µg/g lead = 1 ppm lead, 0.5% lead = 5,000 ppm lead.

As indicated in Table 2 and the attached laboratory certificate of analysis, the laboratory analyses identified both paints to contain detectable concentrations of lead. The light grey paint on the walls within the project area contains 340 parts per million (ppm) of lead while the yellow paint on exposed plaster ceilings contains 1,700 ppm of lead. Residual paints on bulkheads in the project specific area were previously identified as lead containing in the project specific area in the 2012 *Designated Substances Assessment* report prepared by OH Solutions.

All disturbances to lead-containing materials must be conducted in accordance with the MOL document *Guideline, Lead on Construction Projects*.

Three exit signs and two emergency lights were observed, all of which are assumed to contain lead-acid batteries.

4.3 Mercury

No mercury-containing equipment was positively identified that is anticipated to be disturbed by planned construction activities in the project specific area. Observed thermostats on wall surfaces did not contain glass switches containing elemental mercury.

A total of 68 fluorescent light fixtures were observed within the project area. Fixtures included a variety of different sizes, ranging from single light tube units up to four light tube units. Not all fluorescent light fixtures present contained fluorescent light tubes within. Observed fluorescent light tubes were primarily 2-foot tubes although a handful of 4-foot tubes were noted to be present. A total of approximately 120 light tubes were present in the project areas within the light fixtures or stacked on the floor surface.

Trace amounts of mercury is assumed to be present as a vapour within each fluorescent light tube present.

4.4 Silica

Silica is a naturally occurring mineral and may be found in common aggregates such as plaster, concrete, mortar and brick. The health risk from silica is related to the inhalation of free respirable silica particulate. Silica is likely present in the concrete, concrete block, brick, mortar, speed tile, terrazzo and pumice block used to construct the building in the project area and in the ceiling tiles, plaster, drywall and cementitious fireproofing present at the Site.

In the event that any of the materials are disturbed, appropriate precautions must be taken to protect workers from silica emissions produced during the dust generating processes.

4.5 Additional Hazardous Materials

4.5.1 PCBs

Ballasts present within the project specific area were observed to be T8's, first introduced in 1981. The introduction of T8's commenced approximately one year following the July 1, 1980 federal prohibition on the use of PCBs in electrical equipment (former Federal Chlorobiphenyls Regulation, SOR/91-152). For confirmation purposes, one random ballast was observed and noted to be manufactured by Electronic Ballast Technology, Inc., labelled SSB2-120-4/32IS LH, and clearly identified on the label as "No PCB's".

No additional electrical equipment was observed that is considered suspect for PCBs within the project specific area.

4.5.2 ODSs

No air conditioners, water coolers/fountains and/or refrigerators/freezers were observed within the project specific area. These types of equipment, when present, may contain ozone-depleting substances as part of the refrigerant gas(es).

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on our visual assessment of the Site and subsequent laboratory analyses for asbestos and lead, the following designated substances, as outlined in Table 3 below, are considered to be present at the Site in the project specific area and likely to be disturbed during the demolition and fit-up project as detailed on the previously referenced figures and drawings:

Table 3: Summary of Designated Substances

Material	Description
ACMs	■ Mastic pucks (2% chrysotile asbestos) on the backside of 1x1-foot ceiling tiles in portions of the project specific area; ■ Black mastic vinyl floor tile adhesive (2% chrysotile asbestos), located immediately below the uppermost vinyl floor tile (grey mottled 12x12-inch tiles) in portions of the project specific area; and ■ Black tar (3% chrysotile asbestos) located over yellow fibreglass insulation on deck-mounted HVAC equipment and ducts in the current / former ceiling plenums within the project specific area. Presumed asbestos-containing materials not observed at the time of the assessment but which may be present: ■ Gaskets associated with heating piping; ■ High voltage wiring and "Rockbestos" firewall III cabling; and ■ Cores within metal doors within the project work area.
Lead	■ Grey paint on wall and metal trim; ■ Yellow paint on plaster ceilings; and ■ Lead acid batteries in exit signs and emergency lighting.
Mercury	■ Approximately 120 light tubes present within light fixtures or stacked on the floor surface, all of which are assumed to contain trace quantities of mercury vapour.
Silica	■ Silica is likely present in concrete, concrete block, brick, mortar, plaster, terrazzo, pumice block, cementitious fireproofing, drywall, and ceiling tiles present at the Site.
PCBs	■ None observed.
ODSs	■ None observed.

The following is a summary of the asbestos abatement work procedures, in accordance with O. Reg. 278/05, that may be used to remove or disturb the identified asbestos-containing materials within the project specific area:

- Asbestos-containing mastic pucks, located on the backside of the 1x1-foot ceiling tiles, may be hand scraped under Type 1 asbestos work procedures, provided that only hand-powered tools are used and the materials

are adequately wetted prior to and during disturbance. Removed 1x1-foot ceiling tiles and/or gypsum panels with any residual mastic are to be treated as asbestos waste;

- Black mastic vinyl floor tile adhesive (2% chrysotile asbestos), located immediately below the uppermost vinyl floor tile, may be hand scraped together with the vinyl floor tile under Type 1 asbestos work procedures, provided that only hand-powered tools are used and the materials are adequately wetted prior to and during disturbance. Removed vinyl floor tiles are to be treated as asbestos waste. Chemical removal of any residual black mastic adhered to the floor slab may also be removed under Type 1 asbestos work procedures using only hand-powered tools;
- Black tar (3% chrysotile asbestos) located over yellow fibreglass insulation on deck-mounted HVAC equipment and ducts in the current / former ceiling plenums, may be hand removed under Type 1 asbestos work procedures, provided that only hand-powered tools are used and the materials are adequately wetted prior to and during disturbance;
- Should gaskets be determined to be present associated with the perimeter heating system, they should be removed by hand tools only in accordance with Type 1 asbestos work procedures;
- Should any high voltage wiring and "Rockbestos" firewall III cabling be discovered and require removal or disturbance, it may be removed under Type 1 asbestos work procedures following verification of de-energization; and
- Should it be determined that metal doors present within the project work area do contain asbestos cores, the doors may be removed in their entirety, double wrapped and disposed of as asbestos waste under Type 1 asbestos work procedures.

Lead acid batteries are present in the project area. Should the lead-acid batteries be removed from Site, the Site must be registered as a Hazardous Waste Generator with the Ministry of Environment and Climate Change (MOE) prior to transport and disposal. Lead acid batteries may be sent to an MOE-approved recycling facility provided that transport is done by an MOE-approved waste carrier.

All paints present contain concentrations of lead. The MOL Guideline, *Lead on Construction Projects*, establishes work procedures to be followed in the event of a disturbance to lead-containing materials. Classification of lead-based work is based on assumed levels of airborne emissions of lead dust likely to be generated as a result of the work. As such, disturbances with less potential to generate airborne dust require fewer precautionary measures.

Prior to disposal of any lead-containing coatings or paints, it is recommended that the material and the underlying substrate be sampled and analysed to determine leachability of the lead, in accordance with Ontario Regulation 347/90 *General – Waste Management*, as amended (O. Reg. 347/90), for environmental waste classification purposes. While there is not a direct correlation between lead concentration, material type and potential leaching of lead from the material and substrate, materials with substantial concentrations of lead are considered more likely to exceed the threshold quantity for being considered a hazardous waste product than materials with low concentrations. Painted metal components may be sent for metal recycling rather than disposal regardless of lead content in the surface paint or coating.

Silica is likely present in concrete, brick, block, pumice block and mortar used to construct the building, and in hard plaster finishes, cementitious fireproofing, terrazzo, drywall and ceiling tiles observed to be present in the project work area. Should it be necessary to core or otherwise disturb these materials, disturbances must be performed in accordance with the MOL Guideline*, Silica on Construction Projects*. Drilling, milling, grinding, hammering, cutting, polishing, sanding or sandblasting of silica-based materials should be minimised to reduce the potential creation of airborne emissions of silica. In the event that such work is required to be conducted, the contractor is to ensure that respirable silica dust does not exceed the allowable Ontario occupational exposure limit (OEL) of 0.05 milligrams per cubic metre (mg/m^3) for cristobalite silica and 0.10 mg/m^3 for quartz and tripoli forms of silica.

Mercury vapour is assumed to be present in the approximately 120 fluorescent light tubes present within light fixtures or stacked on the floor surface in the project area. Similar to lead-containing materials, the Site would require registration as a Hazardous Waste Generator with the MOE prior to the transport and disposal of the mercury at an approved disposal or recycling facility provided that transport is done by an MOE-approved waste carrier. Fluorescent light tubes may be sent to a recycling facility for mercury vapour extraction rather than landfilling.

It is possible that additional undiscovered designated substances may be present within inaccessible locations within the project area. If encountered during the demolition and fit-up project, suspect materials should be treated as potential designated substances until proven otherwise.

6.0 LIMITATIONS AND USE OF REPORT

This report is prepared for the sole use of Public Works & Government Services Canada. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third party. The conclusions and recommendations contained in this assessment report are based upon professional opinions with regard to the subject matter. These opinions are in accordance with currently accepted industry practices for designated substance surveys and regulatory requirements for sampling and identifying designated substances and are subject to the following inherent limitations:

1) The data and findings presented in this report are valid as of the dates of the investigation only. The passage of time, manifestation of latent conditions or occurrence of future events may warrant further exploration of the Site, analysis of the data, and re-evaluation of the findings, observations, and conclusions expressed in this report.

2) The data reported and the findings, observations, conclusions and recommendations expressed in this report are limited by the Scope of Work. The Scope of Work was defined by the request of the client, the time and budgetary constraints imposed by the client and availability of access to the Site.

3) Because of the limitations stated above, the findings, observations, conclusions, and recommendations expressed by Golder Associates Ltd. in this report are not, and should not be, considered an opinion concerning compliance of any past or present owner or operator of the Site with any federal, provincial or local laws or regulations.

4) No warranty or guarantee, whether expressed or implied, is made with respect to the data or the reported findings, observations and conclusions, which are based solely upon site conditions in existence at the time of investigation.

5) Golder Associates Ltd. will not be responsible for any real or perceived decrease in the property value, its saleability or ability to gain financing through the reporting of information in this report.

6) Golder Associates Ltd.'s assessment presents professional opinions and findings of a scientific and technical nature. While attempts were made to relate the data and findings to applicable environmental and occupational health & safety laws and regulations, the report shall not be construed to offer legal opinion or representations as to the requirements of, nor compliance with, environmental and occupational health and safety laws, rules, regulations or policies of federal, provincial, or local governmental agencies. Any use of the assessment report constitutes acceptance of the limits of Golder Associates Ltd.'s liability. Golder Associates Ltd.'s liability extends only to its client and not to other parties who may obtain this assessment report. Issues raised by the report should be reviewed by appropriate legal counsel.

7.0 CLOSURE

We trust that this report meets your requirements. If you have any questions regarding the content of this report, please do not hesitate to contact the undersigned.

Sincerely,

GOLDER ASSOCIATES LTD.

Jesse Clay
EHS Technician

Christopher Rahm, B.E.S.
Associate; Senior EHS Consultant

JC/CJR/ly

n:\active\2016\3 proj\1663615 pwgsc_dss 105 christina_sarnia\7-correspondence\5-rpts\1663615-r01 sept2016 2nd floor dss.docx

APPENDIX A

Asbestos and Lead Laboratory Certificates of Analysis

CA Labs
Dedicated to Quality

Crisp Analytical, L.L.C.
1929 Old Denton Road
Carrollton, TX 75006
Phone 972-242-2754
Fax 972-242-2798

CA Labs, L.L.C.
12232 Industriplex, Suite 32
Baton Rouge, LA 70809
Phone 225-751-5632
Fax 225-751-5634

Materials Characterization - Bulk Asbestos Analysis

Laboratory Analysis Report - Polarized Light

Golder Associates, Ltd.
309 Exeter Road, Unit #1
London, ON N6L 1C1

Attn: Patrick Chesney
Customer Project: 1663615, PWGSC Christina Street
Reference #: CAL16096247JE Date: 9/14/2016

Analysis and Method

Summary of polarizing light microscopy (PLM / Stereomicroscopy bulk asbestos analysis) using the methods described in 40CFR Part 763 Appendix E to Subpart E (Interim and EPA 600 / R-93 / 116 (Improved). The sample is first viewed with the aid of stereomicroscopy. Numerous liquid slide preparations are created for analysis under the polarized microscope where identifications and quantifications are preformed. Calibrated liquid refractive oils are used as liquid mouting medium. These oils are used for identification (dispersion staining). A calibrated visual estimation is reported, should any asbestiform mineral be present. Other techniques such as acid washing are used in conjugation with refractive oils for detection of smaller quantities of asbestos. All asbestos percentages are based on calibrated visual estimation traceable to NIST standards for regulated of asbestos. Traceability to measurement and calibration is achieved by using known amounts and types of asbestos from standards where analyst and laboratory accuracy are measured.

Discussion

Vermiculite containing samples may have trace amounts of actinolite-tremolite, where not found be PLM should be analyzed using TEM methods and / or water separation techniques. Suspected actinolite/vermiculite presence will be indicated through the sample comment section of this report.

Fibrous talc containing samples may even contain a related asbestos fiber known as anthophyllite. Under certain conditions the same fiber may actually contain both talc and anthophyllite (a phenomenon called intergrowth). Again, TEM detection methods are recommended. CA Labs PLM report comments will denote suspected amounts of asbestiform anthophyllite with talc, where further analysis is recommended.

Some samples (floor tiles, surfacings, etc.) may contain fibers too small to be delectable by PLM analysis and should be analyzed by TEM bulk protocols.

A "trace asbestos" will be reported if the analyst observes far less than 0.5% asbestos. CA Labs defines "trace asbestos" as a few fibers detected by the analyst in several preparations and will indicate as such under these circumstances. These samples are analyzed according to the Ontario Regulation 278/05.

Qualifications

CA Labs is accredited by the National Voluntary Accreditation Program (NVLAP) for selected test methods for airborne fiber analysis (TEM), and for bulk asbestos fiber analysis (PLM). CA Labs is also accredited by AIHA LAP, LLC. in the PLM asbestos field of testing for Industrial Hygiene. All analysts have a college degree in a natural science (geology, biology, or environmental science) or are recognized by a state professional board in one these disciplines .Extensive in-house training programs are used to augment education background of the analyst. The group leader of polarized light has received supplemental McCrone Research training for asbestos identification. Analysis performed at Crisp Analytical Labs, LLC 1929 Old Denton Road Carrollton, TX 75006

Dallas NVLAP Lab Code 200349-0 TEM/PLM TCEQ# T104704513-15-3 TDH 30-0235
AIHA LAP, LLC Laboratory #102929

CA Labs
Dedicated to Quality

Crisp Analytical, L.L.C.
1929 Old Denton Road
Carrollton, TX 75006
Phone 972-242-2754
Fax 972-242-2798

CA Labs, L.L.C.
12232 Industriplex, Suite 32
Baton Rouge, LA 70809
Phone 225-751-5632
Fax 225-751-5634

Overview of Project Sample Material Containing Asbestos

Customer Project: 1663615, PWGSC Christina Street **CA Labs Project #:** CAL16096247JE

Sample #	Layer #	Analysts Physical Description of Subsample	Asbestos type / calibrated visual estimate percent	List of Affected Building Material Types
D-1	*D-1-1*	***Ceiling Tile Mastic**/ brown mastic*	***2% Chrysotile***	***brown mastic*** ***black mastic*** ***black tar and black felt***
E-1	*E-1-2*	*black mastic*	***2% Chrysotile***	
O-1	*O-1-1*	***Duct Tar, HVAC Ducts**/ black tar and black felt*	***3% Chrysotile***	

Dallas NVLAP Lab Code 200349-0 TEM/PLM TCEQ# T104704513-15-3 TDH 30-0235

AIHA LAP, LLC Laboratory #102929

Glossary of abbreviations (non-asbestos fibers and non-fibrous minerals):

ca - carbonate
gypsum - gypsum
bi - binder
or - organic
ma - matrix
mi - mica
ve - vermiculite
ot - other
pe - perlite
qu - quartz
fg - fiberglass
mw - mineral wool
wo - wollastinite
ta - talc
sy - synthetic
ce - cellulose
br - brucite
ka - kaolin (clay)
pa - palygorskite (clay)

CA Labs
Dedicated to Quality

Crisp Analytical, L.L.C.
1929 Old Denton Road
Carrollton, TX 75006
Phone 972-242-2754
Fax 972-242-2798

CA Labs, L.L.C.
12232 Industriplex, Suite 32
Baton Rouge, LA 70809
Phone 225-751-5632
Fax 225-751-5634

Polarized Light Asbestiform Materials Characterization

Customer Info: **Attn:** Patrick Chesney
Golder Associates, Ltd.
309 Exeter Road, Unit #1
London, ON N6L 1C1

Phone # 519-652-0099
Fax # 519-652-6299

Customer Project:
1663615, PWGSC Christina Street
Turnaround Time:
2 Days

CA Labs Project #:
CAL16096247JE

Date: 9/14/2016
Samples Received: 9/13/16 10:30am
Date Of Sampling: 9/12/2016
Purchase Order #: 1663615

Sample #	Comment	Layer #	Analysts Physical Description of Subsample	Homogeneous (Y/N)	Asbestos type / calibrated visual estimate percent	Non-asbestos fiber type / percent	Non-fibrous type / percent
A-1		*A-1-1*	***Ceiling Tile, 2x4-Feet, Small Fissures, Red-Back**/ white surfacing*	*y*	***None Detected***		100% qu,bi
		A-1-2	*tan ceiling tile*	*y*	***None Detected***	66% ce 34% fg	
A-2		*A-2-1*	***Ceiling Tile, 2x4-Feet, Small Fissures, Red-Back**/ white surfacing*	*y*	***None Detected***		100% qu,bi
		A-2-2	*tan ceiling tile*	*y*	***None Detected***	62% ce 38% fg	
A-3		*A-3-1*	***Ceiling Tile, 2x4-Feet, Small Fissures, Red-Back**/ white surfacing*	*y*	***None Detected***		100% qu,bi
		A-3-2	*tan ceiling tile*	*y*	***None Detected***	65% ce 35% fg	
B-1		*B-1-1*	***Ceiling Tile, 2x4-Feet, Large Fissures, Red Back**/ white surfacing*	*y*	***None Detected***		100% qu,bi

Dallas NVLAP Lab Code 200349-0 TEM/PLM TCEQ# T104704513-15-3 TDH 30-0235

AIHA LAP, LLC Laboratory #102929

Analysis Method: Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116). *All samples received in good condition unless noted.*
Preparation Method: HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for identification of asbestos types by dispersion attaining / becke line method.

ca - carbonate	mi - mica	fg - fiberglass	ce - cellulose
gypsum - gypsum	ve - vermiculite	mw - mineral wool	br - brucite
bi - binder	ot -other	wo - wollastinite	ka - kaolin (clay)
or - organic	pe - perlite	ta - talc	pa - palygorskite (clay)
ma - matrix	qu - quartz	sy - synthetic	

Approved Signatories:

Julio Robles
Analyst

QAC
Leslie Crisp, P.G.

Technical Manager
Chad Lytle

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages effecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze
6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested

CA Labs
Dedicated to Quality

Crisp Analytical, L.L.C.
1929 Old Denton Road
Carrollton, TX 75006
Phone 972-242-2754
Fax 972-242-2798

CA Labs, L.L.C.
12232 Industriplex, Suite 32
Baton Rouge, LA 70809
Phone 225-751-5632
Fax 225-751-5634

Polarized Light Asbestiform Materials Characterization

Customer Info: **Attn:** Patrick Chesney
Golder Associates, Ltd.
309 Exeter Road, Unit #1
London, ON N6L 1C1

Phone # 519-652-0099
Fax # 519-652-6299

Customer Project:
1663615, PWGSC Christina Street
Turnaround Time:
2 Days

CA Labs Project #:
CAL16096247JE

Date: 9/14/2016
Samples Received: 9/13/16 10:30am
Date Of Sampling: 9/12/2016
Purchase Order #: 1663615

Sample #	Comment	Layer #	Analysts Physical Description of Subsample	Homogeneous (Y/N)	Asbestos type / calibrated visual estimate percent	Non-asbestos fiber type / percent	Non-fibrous type / percent
		B-1-2	*tan ceiling tile*	*y*	***None Detected***	62% ce 34% fg 4% wo	
B-2		*B-2-1*	***Ceiling Tile, 2x4-Feet, Large Fissures, Red Back**/ white surfacing*	*y*	***None Detected***		100% qu,bi
		B-2-2	*tan ceiling tile*	*y*	***None Detected***	61% ce 36% fg 3% wo	
B-3		*B-3-1*	***Ceiling Tile, 2x4-Feet, Large Fissures, Red Back**/ white surfacing*	*y*	***None Detected***		100% qu,bi
		B-3-2	*tan ceiling tile*	*y*	***None Detected***	65% ce 31% fg 4% wo	
C-1		*C-1-1*	***Ceiling Tile, 1x1-Foot**/ white surfacing*	*y*	***None Detected***		100% qu,bi
		C-1-2	*tan ceiling tile*	*y*	***None Detected***	63% ce 37% fg	

Dallas NVLAP Lab Code 200349-0 TEM/PLM TCEQ# T104704513-15-3 TDH 30-0235

AIHA LAP, LLC Laboratory #102929

Analysis Method: Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116). *All samples received in good condition unless noted.*
Preparation Method: HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for identification of asbestos types by dispersion attaining / becke line method.

ca - carbonate	mi - mica	fg - fiberglass	ce - cellulose
gypsum - gypsum	ve - vermiculite	mw - mineral wool	br - brucite
bi - binder	ot -other	wo - wollastinite	ka - kaolin (clay)
or - organic	pe - perlite	ta - talc	pa - palygorskite (clay)
ma - matrix	qu - quartz	sy - synthetic	

Approved Signatories:

Julio Robles
Analyst

QAC
Leslie Crisp, P.G.

Technical Manager
Chad Lytle

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages effecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze
6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested

CA Labs
Dedicated to Quality

Crisp Analytical, L.L.C.
1929 Old Denton Road
Carrollton, TX 75006
Phone 972-242-2754
Fax 972-242-2798

CA Labs, L.L.C.
12232 Industriplex, Suite 32
Baton Rouge, LA 70809
Phone 225-751-5632
Fax 225-751-5634

Polarized Light Asbestiform Materials Characterization

Customer Info: **Attn:** Patrick Chesney
Golder Associates, Ltd.
309 Exeter Road, Unit #1
London, ON N6L 1C1

Phone # 519-652-0099
Fax # 519-652-6299

Customer Project:
1663615, PWGSC Christina Street
Turnaround Time:
2 Days

CA Labs Project #:
CAL16096247JE

Date: 9/14/2016
Samples Received: 9/13/16 10:30am
Date Of Sampling: 9/12/2016
Purchase Order #: 1663615

Sample #	Comment	Layer #	Analysts Physical Description of Subsample	Homogeneous (Y/N)	Asbestos type / calibrated visual estimate percent	Non-asbestos fiber type / percent	Non-fibrous type / percent
C-2		*C-2-1*	***Ceiling Tile, 1x1-Foot**/ white surfacing*	*y*	***None Detected***		100% qu,bi
		C-2-2	*tan ceiling tile*	*y*	***None Detected***	68% ce 32% fg	
C-3		*C-3-1*	***Ceiling Tile, 1x1-Foot**/ white surfacing*	*y*	***None Detected***		100% qu,bi
		C-3-2	*tan ceiling tile*	*y*	***None Detected***	65% ce 35% fg	
D-1		*D-1-1*	***Ceiling Tile Mastic**/ brown mastic*	*y*	***2% Chrysotile***		98% gy,bi
D-2		*D-2-1*	***Ceiling Tile Mastic**/ brown mastic*		*Positive Stop*		
D-3		*D-3-1*	***Ceiling Tile Mastic**/ brown mastic*		*Positive Stop*		

Dallas NVLAP Lab Code 200349-0 TEM/PLM TCEQ# T104704513-15-3 TDH 30-0235

AIHA LAP, LLC Laboratory #102929

Analysis Method: Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116). *All samples received in good condition unless noted.*
Preparation Method: HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for identification of asbestos types by dispersion attaining / becke line method.

ca - carbonate	mi - mica	fg - fiberglass	ce - cellulose
gypsum - gypsum	ve - vermiculite	mw - mineral wool	br - brucite
bi - binder	ot -other	wo - wollastinite	ka - kaolin (clay)
or - organic	pe - perlite	ta - talc	pa - palygorskite (clay)
ma - matrix	qu - quartz	sy - synthetic	

Approved Signatories:

Julio Robles
Analyst

QAC
Leslie Crisp, P.G.

Technical Manager
Chad Lytle

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages effecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze
6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested

CA Labs
Dedicated to Quality

Crisp Analytical, L.L.C.
1929 Old Denton Road
Carrollton, TX 75006
Phone 972-242-2754
Fax 972-242-2798

CA Labs, L.L.C.
12232 Industriplex, Suite 32
Baton Rouge, LA 70809
Phone 225-751-5632
Fax 225-751-5634

Polarized Light Asbestiform Materials Characterization

Customer Info: **Attn:** Patrick Chesney
Golder Associates, Ltd.
309 Exeter Road, Unit #1
London, ON N6L 1C1

Phone # 519-652-0099
Fax # 519-652-6299

Customer Project:
1663615, PWGSC Christina Street

Turnaround Time:
2 Days

CA Labs Project #:
CAL16096247JE

Date: 9/14/2016
Samples Received: 9/13/16 10:30am
Date Of Sampling: 9/12/2016
Purchase Order #: 1663615

Sample #	Comment	Layer #	Analysts Physical Description of Subsample	Homogeneous (Y/N)	Asbestos type / calibrated visual estimate percent	Non-asbestos fiber type / percent	Non-fibrous type / percent
E-1		*E-1-1*	***Vinyl Floor Tile And Black Mastic, 12x12-Inch, Gray Mottled**/ gray floor tile*	*y*	***None Detected***		100% qu,ca
		E-1-2	*black mastic*	*y*	***2% Chrysotile***		98% gy,bi
		E-1-3	*tan mastic*	*y*	***None Detected***		100% gy,bi
		E-1-4	*gray floor tile*	*y*	***None Detected***		100% qu,ca
		E-1-5	*black mastic*	*y*	***None Detected***		100% gy,bi
E-2		*E-2-1*	***Vinyl Floor Tile And Black Mastic, 12x12-Inch, Gray Mottled**/ tan mastic*	*y*	***None Detected***		100% gy,bi
		E-2-2	*gray floor tile*	*y*	***None Detected***		100% qu,ca

Dallas NVLAP Lab Code 200349-0 TEM/PLM TCEQ# T104704513-15-3 TDH 30-0235

AIHA LAP, LLC Laboratory #102929

Analysis Method: Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116). *All samples received in good condition unless noted.*
Preparation Method: HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for identification of asbestos types by dispersion attaining / becke line method.

ca - carbonate	mi - mica	fg - fiberglass	ce - cellulose
gypsum - gypsum	ve - vermiculite	mw - mineral wool	br - brucite
bi - binder	ot -other	wo - wollastinite	ka - kaolin (clay)
or - organic	pe - perlite	ta - talc	pa - palygorskite (clay)
ma - matrix	qu - quartz	sy - synthetic	

Approved Signatories:

Julio Robles
Analyst

QAC
Leslie Crisp, P.G.

Technical Manager
Chad Lytle

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages effecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze
6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested

CA Labs
Dedicated to Quality

Crisp Analytical, L.L.C.
1929 Old Denton Road
Carrollton, TX 75006
Phone 972-242-2754
Fax 972-242-2798

CA Labs, L.L.C.
12232 Industriplex, Suite 32
Baton Rouge, LA 70809
Phone 225-751-5632
Fax 225-751-5634

Polarized Light Asbestiform Materials Characterization

Customer Info: **Attn:** Patrick Chesney
Golder Associates, Ltd.
309 Exeter Road, Unit #1
London, ON N6L 1C1

Phone # 519-652-0099
Fax # 519-652-6299

Customer Project:
1663615, PWGSC Christina Street

Turnaround Time:
2 Days

CA Labs Project #:
CAL16096247JE

Date: 9/14/2016
Samples Received: 9/13/16 10:30am
Date Of Sampling: 9/12/2016
Purchase Order #: 1663615

Sample #	Comment	Layer #	Analysts Physical Description of Subsample	Homogeneous (Y/N)	Asbestos type / calibrated visual estimate percent	Non-asbestos fiber type / percent	Non-fibrous type / percent
		E-2-3	*black mastic*	*y*	***None Detected***		100% gy,bi
E-3		*E-3-1*	***Vinyl Floor Tile And Black Mastic, 12x12-Inch, Gray Mottled**/ tan mastic*	*y*	***None Detected***		100% gy,bi
		E-3-2	*gray floor tile*	*y*	***None Detected***		100% qu,ca
		E-3-3	*black mastic*	*y*	***None Detected***		100% gy,bi
F-1		*F-1-1*	***Caulking, Interior Side Of Windows**/ gray sealant*	*y*	***None Detected***		100% qu,gy,bi
F-2		*F-2-1*	***Caulking, Interior Side Of Windows**/ gray sealant*	*y*	***None Detected***		100% qu,gy,bi
F-3		*F-3-1*	***Caulking, Interior Side Of Windows**/ gray sealant*	*y*	***None Detected***		100% qu,gy,bi

Dallas NVLAP Lab Code 200349-0 TEM/PLM TCEQ# T104704513-15-3 TDH 30-0235

AIHA LAP, LLC Laboratory #102929

Analysis Method: Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116). *All samples received in good condition unless noted.*
Preparation Method: HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for identification of asbestos types by dispersion attaining / becke line method.

ca - carbonate	mi - mica	fg - fiberglass	ce - cellulose
gypsum - gypsum	ve - vermiculite	mw - mineral wool	br - brucite
bi - binder	ot -other	wo - wollastinite	ka - kaolin (clay)
or - organic	pe - perlite	ta - talc	pa - palygorskite (clay)
ma - matrix	qu - quartz	sy - synthetic	

Approved Signatories:

Julio Robles
Analyst

QAC
Leslie Crisp, P.G.

Technical Manager
Chad Lytle

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages effecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze
6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested

CA Labs
Dedicated to Quality

Crisp Analytical, L.L.C.
1929 Old Denton Road
Carrollton, TX 75006
Phone 972-242-2754
Fax 972-242-2798

CA Labs, L.L.C.
12232 Industriplex, Suite 32
Baton Rouge, LA 70809
Phone 225-751-5632
Fax 225-751-5634

Polarized Light Asbestiform Materials Characterization

Customer Info: **Attn:** Patrick Chesney
Golder Associates, Ltd.
309 Exeter Road, Unit #1
London, ON N6L 1C1

Phone # 519-652-0099
Fax # 519-652-6299

Customer Project:
1663615, PWGSC Christina Street

Turnaround Time:
2 Days

CA Labs Project #:
CAL16096247JE

Date: 9/14/2016
Samples Received: 9/13/16 10:30am
Date Of Sampling: 9/12/2016
Purchase Order #: 1663615

Sample #	Comment	Layer #	Analysts Physical Description of Subsample	Homogeneous (Y/N)	Asbestos type / calibrated visual estimate percent	Non-asbestos fiber type / percent	Non-fibrous type / percent
G-1		*G-1-1*	***Glazing, Black, Interior Side Of Windows**/ black sealant*	*y*	***None Detected***		100% qu,gy,bi
G-2		*G-2-1*	***Glazing, Black, Interior Side Of Windows**/ black sealant*	*y*	***None Detected***		100% qu,gy,bi
G-3		*G-3-1*	***Glazing, Black, Interior Side Of Windows**/ black sealant*	*y*	***None Detected***		100% qu,gy,bi
H-1		*H-1-1*	***Ceiling Tile, 2x4-Feet, Pinholes And Fissures, Red-Back**/ white surfacing*	*y*	***None Detected***		100% qu,bi
		H-1-2	*tan ceiling tile*	*y*	***None Detected***	62% ce 38% fg	
H-2		*H-2-1*	***Ceiling Tile, 2x4-Feet, Pinholes And Fissures, Red-Back**/ white surfacing*	*y*	***None Detected***		100% qu,bi
		H-2-2	*tan ceiling tile*	*y*	***None Detected***	66% ce 34% fg	

Dallas NVLAP Lab Code 200349-0 TEM/PLM TCEQ# T104704513-15-3 TDH 30-0235

AIHA LAP, LLC Laboratory #102929

Analysis Method: Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116). *All samples received in good condition unless noted.*
Preparation Method: HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for identification of asbestos types by dispersion attaining / becke line method.

ca - carbonate	mi - mica	fg - fiberglass	ce - cellulose
gypsum - gypsum	ve - vermiculite	mw - mineral wool	br - brucite
bi - binder	ot -other	wo - wollastinite	ka - kaolin (clay)
or - organic	pe - perlite	ta - talc	pa - palygorskite (clay)
ma - matrix	qu - quartz	sy - synthetic	

Approved Signatories:

Julio Robles
Analyst

QAC
Leslie Crisp, P.G.

Technical Manager
Chad Lytle

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages effecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze
6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested

CA Labs
Dedicated to Quality

Crisp Analytical, L.L.C.
1929 Old Denton Road
Carrollton, TX 75006
Phone 972-242-2754
Fax 972-242-2798

CA Labs, L.L.C.
12232 Industriplex, Suite 32
Baton Rouge, LA 70809
Phone 225-751-5632
Fax 225-751-5634

Polarized Light Asbestiform Materials Characterization

Customer Info: **Attn:** Patrick Chesney
Golder Associates, Ltd.
309 Exeter Road, Unit #1
London, ON N6L 1C1

Phone # 519-652-0099
Fax # 519-652-6299

Customer Project:
1663615, PWGSC Christina Street
Turnaround Time:
2 Days

CA Labs Project #:
CAL16096247JE

Date: 9/14/2016
Samples Received: 9/13/16 10:30am
Date Of Sampling: 9/12/2016
Purchase Order #: 1663615

Sample #	Comment	Layer #	Analysts Physical Description of Subsample	Homogeneous (Y/N)	Asbestos type / calibrated visual estimate percent	Non-asbestos fiber type / percent	Non-fibrous type / percent
H-3		*H-3-1*	***Ceiling Tile, 2x4-Feet, Pinholes And Fissures, Red-Back**/ white surfacing*	*y*	***None Detected***		100% qu,bi
		H-3-2	*tan ceiling tile*	*y*	***None Detected***	69% ce 31% fg	
I-1		*I-1-1*	***Caulking, Exterior Side Of Windows**/ white sealant*	*y*	***None Detected***		100% qu,gy,bi
I-2		*I-2-1*	***Caulking, Exterior Side Of Windows**/ white sealant*	*y*	***None Detected***		100% qu,gy,bi
I-3		*I-3-1*	***Caulking, Exterior Side Of Windows**/ white sealant*	*y*	***None Detected***		100% qu,gy,bi
J-1		*J-1-1*	***Floor Leveling Compound, Gray**/ gray leveling compound*	*y*	***None Detected***		100% qu,ca
J-2		*J-2-1*	***Floor Leveling Compound, Gray**/ gray leveling compound*	*y*	***None Detected***		100% qu,ca

Dallas NVLAP Lab Code 200349-0 TEM/PLM TCEQ# T104704513-15-3 TDH 30-0235

AIHA LAP, LLC Laboratory #102929

Analysis Method: Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116). *All samples received in good condition unless noted.*
Preparation Method: HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for identification of asbestos types by dispersion attaining / becke line method.

ca - carbonate	mi - mica	fg - fiberglass	ce - cellulose
gypsum - gypsum	ve - vermiculite	mw - mineral wool	br - brucite
bi - binder	ot -other	wo - wollastinite	ka - kaolin (clay)
or - organic	pe - perlite	ta - talc	pa - palygorskite (clay)
ma - matrix	qu - quartz	sy - synthetic	

Approved Signatories:

Julio Robles
Analyst

QAC
Leslie Crisp, P.G.

Technical Manager
Chad Lytle

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages effecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze
6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested

CA Labs
Dedicated to Quality

Crisp Analytical, L.L.C.
1929 Old Denton Road
Carrollton, TX 75006
Phone 972-242-2754
Fax 972-242-2798

CA Labs, L.L.C.
12232 Industriplex, Suite 32
Baton Rouge, LA 70809
Phone 225-751-5632
Fax 225-751-5634

Polarized Light Asbestiform Materials Characterization

Customer Info: **Attn:** Patrick Chesney
Golder Associates, Ltd.
309 Exeter Road, Unit #1
London, ON N6L 1C1

Phone # 519-652-0099
Fax # 519-652-6299

Customer Project:
1663615, PWGSC Christina Street
Turnaround Time:
2 Days

CA Labs Project #:
CAL16096247JE

Date: 9/14/2016
Samples Received: 9/13/16 10:30am
Date Of Sampling: 9/12/2016
Purchase Order #: 1663615

Sample #	Comment	Layer #	Analysts Physical Description of Subsample	Homogeneous (Y/N)	Asbestos type / calibrated visual estimate percent	Non-asbestos fiber type / percent	Non-fibrous type / percent
J-3		*J-3-1*	***Floor Leveling Compound, Gray****/ gray leveling compound*	*y*	***None Detected***		100% qu,ca
K-1		*K-1-1*	***Fireproofing, Cementitious****/ gray fireproofing*	*y*	***None Detected***		100% qu,ve,ca
K-2		*K-2-1*	***Fireproofing, Cementitious****/ gray fireproofing*	*y*	***None Detected***		100% qu,ve,ca
K-3		*K-3-1*	***Fireproofing, Cementitious****/ gray fireproofing*	*y*	***None Detected***		100% qu,ve,ca
L-1		*L-1-1*	***Plaster, Walls And Ceilings****/ tan surfaced white finishing plaster*	*n*	***None Detected***		100% qu,bi,ca
		L-1-2	*tan plaster*	*y*	***None Detected***		100% qu,ca
L-2		*L-2-1*	***Plaster, Walls And Ceilings****/ tan surfaced white finishing plaster*	*n*	***None Detected***		100% qu,bi,ca

Dallas NVLAP Lab Code 200349-0 TEM/PLM TCEQ# T104704513-15-3 TDH 30-0235

AIHA LAP, LLC Laboratory #102929

Analysis Method: Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116). *All samples received in good condition unless noted.*
Preparation Method: HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for identification of asbestos types by dispersion attaining / becke line method.

ca - carbonate	mi - mica	fg - fiberglass	ce - cellulose
gypsum - gypsum	ve - vermiculite	mw - mineral wool	br - brucite
bi - binder	ot -other	wo - wollastinite	ka - kaolin (clay)
or - organic	pe - perlite	ta - talc	pa - palygorskite (clay)
ma - matrix	qu - quartz	sy - synthetic	

Approved Signatories:

Julio Robles
Analyst

QAC
Leslie Crisp, P.G.

Technical Manager
Chad Lytle

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages effecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze
6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested

CA Labs
Dedicated to Quality

Crisp Analytical, L.L.C.
1929 Old Denton Road
Carrollton, TX 75006
Phone 972-242-2754
Fax 972-242-2798

CA Labs, L.L.C.
12232 Industriplex, Suite 32
Baton Rouge, LA 70809
Phone 225-751-5632
Fax 225-751-5634

Polarized Light Asbestiform Materials Characterization

Customer Info: **Attn:** Patrick Chesney
Golder Associates, Ltd.
309 Exeter Road, Unit #1
London, ON N6L 1C1

Phone # 519-652-0099
Fax # 519-652-6299

Customer Project:
1663615, PWGSC Christina Street
Turnaround Time:
2 Days

CA Labs Project #:
CAL16096247JE

Date: 9/14/2016
Samples Received: 9/13/16 10:30am
Date Of Sampling: 9/12/2016
Purchase Order #: 1663615

Sample #	Comment	Layer #	Analysts Physical Description of Subsample	Homogeneous (Y/N)	Asbestos type / calibrated visual estimate percent	Non-asbestos fiber type / percent	Non-fibrous type / percent
		L-2-2	*tan plaster*	*y*	***None Detected***		100% qu,ca
L-3		*L-3-1*	***Plaster, Walls And Ceilings****/ tan surfaced white finishing plaster*	*n*	***None Detected***		100% qu,bi,ca
		L-3-2	*tan plaster*	*y*	***None Detected***		100% qu,ca
M-1		*M-1-1*	***Drywall Joint Compound, Walls****/ gray surfaced white compound*	*n*	***None Detected***		100% mi,bi,ca
		M-1-2	*white compound (beneath tape)*	*y*	***None Detected***		100% mi,ca
M-2		*M-2-1*	***Drywall Joint Compound, Walls****/ gray surfaced white compound*	*n*	***None Detected***		100% mi,bi,ca
M-3		*M-3-1*	***Drywall Joint Compound, Walls****/ gray surfaced white compound*	*n*	***None Detected***		100% mi,bi,ca

Dallas NVLAP Lab Code 200349-0 TEM/PLM TCEQ# T104704513-15-3 TDH 30-0235

AIHA LAP, LLC Laboratory #102929

Analysis Method: Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116). *All samples received in good condition unless noted.*
Preparation Method: HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for identification of asbestos types by dispersion attaining / becke line method.

ca - carbonate	mi - mica	fg - fiberglass	ce - cellulose
gypsum - gypsum	ve - vermiculite	mw - mineral wool	br - brucite
bi - binder	ot -other	wo - wollastinite	ka - kaolin (clay)
or - organic	pe - perlite	ta - talc	pa - palygorskite (clay)
ma - matrix	qu - quartz	sy - synthetic	

Approved Signatories:

Julio Robles
Analyst

QAC
Leslie Crisp, P.G.

Technical Manager
Chad Lytle

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages effecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze
6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested

CA Labs
Dedicated to Quality

Crisp Analytical, L.L.C.
1929 Old Denton Road
Carrollton, TX 75006
Phone 972-242-2754
Fax 972-242-2798

CA Labs, L.L.C.
12232 Industriplex, Suite 32
Baton Rouge, LA 70809
Phone 225-751-5632
Fax 225-751-5634

Polarized Light Asbestiform Materials Characterization

Customer Info: **Attn:** Patrick Chesney
Golder Associates, Ltd.
309 Exeter Road, Unit #1
London, ON N6L 1C1

Phone # 519-652-0099
Fax # 519-652-6299

Customer Project:
1663615, PWGSC Christina Street

Turnaround Time:
2 Days

CA Labs Project #:
CAL16096247JE

Date: 9/14/2016
Samples Received: 9/13/16 10:30am
Date Of Sampling: 9/12/2016
Purchase Order #: 1663615

Sample #	Comment	Layer #	Analysts Physical Description of Subsample	Homogeneous (Y/N)	Asbestos type / calibrated visual estimate percent	Non-asbestos fiber type / percent	Non-fibrous type / percent
N-1		*N-1-1*	***Linoleum, Brown With Burlap**/ brown flooring with woven backing*	*y*	***None Detected***	26% ce	74% gy,ma
N-2		*N-2-1*	***Linoleum, Brown With Burlap**/ brown flooring with woven backing*	*y*	***None Detected***	24% ce	76% gy,ma
N-3		*N-3-1*	***Linoleum, Brown With Burlap**/ brown flooring with woven backing*	*y*	***None Detected***	25% ce	75% gy,ma
O-1		*O-1-1*	***Duct Tar, HVAC Ducts**/ black tar and black felt*	*n*	***3% Chrysotile***		97% qu,bi
		O-1-2	*yellow insulation*	*y*	***None Detected***	100% fg	
O-2		*O-2-1*	***Duct Tar, HVAC Ducts**/ black tar and black felt*		*Positive Stop*		
		O-2-2	*yellow insulation*	*y*	***None Detected***	100% fg	

Dallas NVLAP Lab Code 200349-0 TEM/PLM TCEQ# T104704513-15-3 TDH 30-0235

AIHA LAP, LLC Laboratory #102929

Analysis Method: Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116). *All samples received in good condition unless noted.*
Preparation Method: HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for identification of asbestos types by dispersion attaining / becke line method.

ca - carbonate	mi - mica	fg - fiberglass	ce - cellulose
gypsum - gypsum	ve - vermiculite	mw - mineral wool	br - brucite
bi - binder	ot -other	wo - wollastinite	ka - kaolin (clay)
or - organic	pe - perlite	ta - talc	pa - palygorskite (clay)
ma - matrix	qu - quartz	sy - synthetic	

Approved Signatories:

Julio Robles
Analyst

QAC
Leslie Crisp, P.G.

Technical Manager
Chad Lytle

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages effecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze
6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested

CA Labs
Dedicated to Quality

Crisp Analytical, L.L.C.
1929 Old Denton Road
Carrollton, TX 75006
Phone 972-242-2754
Fax 972-242-2798

CA Labs, L.L.C.
12232 Industriplex, Suite 32
Baton Rouge, LA 70809
Phone 225-751-5632
Fax 225-751-5634

Polarized Light Asbestiform Materials Characterization

Customer Info: **Attn:** Patrick Chesney
Golder Associates, Ltd.
309 Exeter Road, Unit #1
London, ON N6L 1C1

Phone # 519-652-0099
Fax # 519-652-6299

Customer Project:
1663615, PWGSC Christina Street

Turnaround Time:
2 Days

CA Labs Project #:
CAL16096247JE

Date: 9/14/2016
Samples Received: 9/13/16 10:30am
Date Of Sampling: 9/12/2016
Purchase Order #: 1663615

Sample #	Comment	Layer #	Analysts Physical Description of Subsample	Homogeneous (Y/N)	Asbestos type / calibrated visual estimate percent	Non-asbestos fiber type / percent	Non-fibrous type / percent
O-3		*O-3-1*	***Duct Tar, HVAC Ducts**/ black tar and black felt*		*Positive Stop*		
		O-3-2	*yellow insulation*	*y*	***None Detected***		100% fg

Dallas NVLAP Lab Code 200349-0 TEM/PLM TCEQ# T104704513-15-3 TDH 30-0235

AIHA LAP, LLC Laboratory #102929

Analysis Method: Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116). *All samples received in good condition unless noted.*
Preparation Method: HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for identification of asbestos types by dispersion attaining / becke line method.

ca - carbonate	mi - mica	fg - fiberglass	ce - cellulose
gypsum - gypsum	ve - vermiculite	mw - mineral wool	br - brucite
bi - binder	ot -other	wo - wollastinite	ka - kaolin (clay)
or - organic	pe - perlite	ta - talc	pa - palygorskite (clay)
ma - matrix	qu - quartz	sy - synthetic	

Approved Signatories:

Julio Robles
Analyst

QAC
Leslie Crisp, P.G.

Technical Manager
Chad Lytle

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages effecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze
6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L9T 5N4
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551609777
CustomerID:	55GOAS62
CustomerPO:	1663615
ProjectID:	

Attn: **CHRIS RAHM**
Golder Associates, Ltd.
1-309 Exeter Road
London, ON N6L 1C1

Phone:	(519) 652-0099
Fax:	(519) 652-6299
Received:	09/13/16 10:25 AM
Collected:	

Project: **1663615**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
P-1	*551609777-0001*		9/14/2016	340 ppm
	Site: LIGHT GREY WALL PAINT			
P-2	*551609777-0002*		9/14/2016	1700 ppm
	Site: YELLOW PAINT ON PLASTER CEILING			

Jeff Siria / Shiraz Saloojee
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements unless specifically indicated otherwise. Definitions of modifications are available upon request.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 09/15/2016 08:20:13

APPENDIX B

Type 1 Abatement Specification

Part 1 General

1.1 SUMMARY

.1 Comply with requirements of this Section when performing following work:

.1 Installing or removing ceiling tiles that are asbestos-containing material, if the tiles cover an area less than 7.5 square metres and are installed or removed without being broken, cut, drilled, abraded, ground, sanded or vibrated.

.2 Installing or removing non-friable asbestos-containing material, other than ceiling tiles, if the material is installed or removed without being broken, cut, drilled, abraded, ground, sanded or vibrated.

.3 Breaking, cutting, drilling, abrading, grinding, sanding or vibrating non-friable asbestos-containing material if:

.1 The material is wetted to control the spread of dust or fibres, and

.2 The work is done only by means of non-powered hand-held tools.

.4 Removing less than one square metre of drywall in which joint-filling compounds that are asbestos-containing material have been used.

1.2 SECTION INCLUDES

.1 Requirements and procedures for asbestos abatement on non-friable asbestos-containing materials without the use of power tools.

1.3 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 35 29.06 - Health and Safety Requirements.

.3 Section 01 74 20 - Construction/Demolition Waste Management and Disposal.

1.4 REGULATORY REQUIREMENTS

.1 Comply with Federal, Provincial and local requirements pertaining to asbestos, provided that in case of conflict among those requirements or with these specifications the more stringent requirement applies. Comply with regulations and guidelines in effect at the time the work is performed, including but not limited to the following:

.1 Canada Labour Code, Part II Occupational Health and Safety.

.2 Ontario Occupational Health and Safety Act (OSHA).

.1 O.Reg. 490/09, as amended: Designated Substances.

.2 O.Reg. 278/05, as amended: Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations.

.3 Ontario Environmental Protection Act (OEPA).

.1 O.Reg. 347/90, as amended: General – Waste Management.

.4 Canadian Environmental Protection Act, 1999 (CEPA).

.5 Transportation of Dangerous Goods Act, 1992 (TDGA).

.6 Public Works & Government Services Canada (PWGSC) Department Policy 057: Asbestos Management.

.7 CSA Standard Z94.4-11: Selection Care and Use of Respirators.

.8 National Building Code Part 8 (as applicable).

.9 Ontario Building Code (as applicable).

.10 CSA Standard S350-M1980 (R2003): Code of Practice of Safety in Demolition of Structures.

.11 CAN/CGSB 1.205-2003 Sealer for Application to Asbestos-Fibre-Releasing Materials

1.5 DEFINITIONS

.1 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with a filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.

.2 HEPA Filter: High Efficiency Particulate Air filter at least 99.97% efficient in collecting and retaining fibres greater than 0.3 microns.

.3 Amended Water: Water with a non-ionic surfactant wetting agent added to reduce water tension to allow wetting of fibres.

.4 Asbestos-Containing Materials (ACMs): Materials containing 0.5% or greater asbestos by dry weight, including settled dust and fallen material.

.5 Asbestos Work Area: Area where actual removal of asbestos-containing materials takes place.

.6 Occupied Area: Any area of the building or work site that is outside Asbestos Work Area.

.7 Authorized Visitors: Consultant and Building Owner, or designated representatives, and representatives of regulatory agencies.

.8 Non-Friable Material: Material that when dry cannot be crumbled, pulverized or powdered by hand pressure and generally includes manufactured materials that contain asbestos as a binding agent.

.9 DOP Test: A testing method used to determine the integrity of the Negative Pressure unit using dispersed oil particle (DOP) HEPA-filter leak test.

.10 Sprayer: Garden reservoir type sprayer or airless spray equipment capable of producing a mist or fine spray. Must be appropriate capacity for scope of work.

1.6 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Before commencing work:

.1 Obtain from the appropriate agency and submit to Engineer/Consultant all necessary permits for transportation and disposal of asbestos waste. Ensure that dump operator is fully aware of hazardous nature of material being dumped, and of proper methods of disposal. Submit proof satisfactory to Owner that suitable arrangements have been made to receive and properly dispose of asbestos waste.

.2 Submit proof satisfactory to Owner that all employees have had instruction on the hazards of asbestos exposure, respirator use, dress, hygiene, and washing facilities, entry and exit from work areas, and all aspects of work procedures and protective measures for Type 1 Operations. Supervisory personnel shall have attended an asbestos abatement course, of not less than two days duration, approved by the Owner. Submit proof of attendance in the form of a certificate.

.3 Submit Provincial requirements for Notice of Project Form, if required.

.4 Submit proof of Contractor's Asbestos Liability and Commercial General Liability and Automobile Insurances in the minimum amounts specified by the Owner.

.5 Submit DOP test results for all negative air units and/or HEPA vacuums to be utilized within asbestos work areas.

.6 Submit proof satisfactory to the Owner that all employees have had respirator fitting and testing. Workers must be fit-tested with the respirator that is personally issued in accordance with the requirements of CSA Z94.4-11 Selection, Use, and Care of Respirators.

.7 Inform and submit proof that all sub-trades have been informed of the presence of asbestos-containing materials identified in the Designated Substance Survey.

.8 Submit Worker's Safety and Insurance Board status and transcription of insurance.

.9 Submit documentation including test results, fire and flammability data, and Safety Data Sheets for chemicals or materials to be brought on-site, including but not limited to the following:

.1 Amended water.

.2 Slow-drying sealer.

1.7 QUALITY ASSURANCE

.1 Regulatory Requirements: comply with Federal, Provincial, and local requirements pertaining to asbestos, provided that in case of conflict among these requirements or with these specifications, more stringent requirement applies. Comply with regulations in effect at time Work is performed.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.2 Safety Requirements: worker protection.

.1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area include:

.1 Non-powered reusable or replaceable filter-type NIOSH-approved respirator equipped with HEPA filter cartridges, personally issued

to the worker and marked as to efficiency and purpose, suitable for protection against asbestos and acceptable to the Provincial Authority having jurisdiction (Must meet the requirements and usage as outlined in Table 2 – Respirators of O.Reg. 278/05).

.2 Disposable-type protective clothing that does not readily retain or permit penetration of asbestos fibres, consisting of full-body covering including head covering with snug-fitting cuffs at wrists, ankles, and neck.

.2 Eating, drinking, chewing, and smoking are not permitted in Asbestos Work Area or anywhere within the building.

.3 Before leaving Asbestos Work Area, dispose of protective clothing as contaminated waste as specified.

.4 Ensure workers wash hands, neck and face when leaving Asbestos Work Area.

.5 Ensure that no person required to enter an Asbestos Work Area has facial hair that affects seal between respirator and face.

1.8 INSTRUCTION AND TRAINING

.1 Before commencing work, provide to Owner satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene and work practices, and in use, cleaning, and disposal of respirators and protective clothing.

.2 Instruction and training related to respirators includes, at a minimum:

.1 Proper fitting of equipment.

.2 Inspection and maintenance of equipment.

.3 Disinfecting of equipment.

.4 Limitations of equipment.

.3 Instruction and training must be provided by a competent, qualified person, as defined by O.Reg 278/05.

1.9 EXISTING CONDITIONS

.1 Notify Engineer/Consultant of friable and non-friable suspect asbestos-containing material discovered during work and not apparent from drawings, specifications, or report pertaining to work. Do not disturb such material pending written instructions from Engineer and/or Consultant.

1.10 SUPERVISION

.1 An approved Asbestos Supervisor must remain on-site at all times during the disturbance, removal, or other handling of asbestos-containing materials. Minimum of one Asbestos Supervisor for every fifteen workers.

1.11 WASTE MANAGEMENT AND DISPOSAL

.1 The contractor is responsible for contacting the Owner to ensure that the site has a valid Ontario Waste Generator Number, available through the Ontario Hazardous Waste Network (www.hwin.ca).

.2 Asbestos Containing Materials are regulated waste products. All asbestos waste removed must be shipped to a landfill approved to accept asbestos waste. Only a licensed waste carrier with a valid Ministry of Environment and Climate Change (MOE) Environmental Compliance Approval for transporting asbestos waste can transport the asbestos waste to a landfill that has an Environmental Compliance Approval from the MOE to accept this form of hazardous material. The contractor will provide proof to the Engineer/Consultant, in the form of landfill weigh scale receipts, that all asbestos waste was properly disposed at a licensed landfill.

.3 Any waste bins stored on-site must be sealed and locked at all times when not being loaded with waste.

Part 2 Products

2.1 MATERIALS

.1 Drop Sheets: 0.15 mm (6 mil) thick polyethylene.

.2 Polyethylene: 0.15 mm (6 mil) thick.

.3 FR polyethylene: 0.25 mm (10 mil) thick woven fibre reinforced fabric bonded both sides with polyethylene.

.4 Wetting Agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with water in a concentration to provide thorough wetting of asbestos-containing material.

.5 Waste Containers: Contain waste in two separate containers. Inner container: 0.15 mm thick sealable polyethylene waste bag. Outer container: sealable metal or fibre type where there are sharp objects included in the waste material; otherwise outer container may be a sealable metal or fibre type or a second 0.15 mm thick sealable polyethylene bag. Labelling requirements: Affix a pre-printed cautionary asbestos warning that is clearly visible when ready for removal to disposal site.

Part 3 Execution

3.1 PROCEDURES

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.2 Before beginning Work, isolate Asbestos Work Area using, minimum, preprinted cautionary asbestos warning signs in both official languages that are visible at access routes to Asbestos Work Area.

.3 Remove visible dust from surfaces in the work area where dust is likely to be disturbed during course of work. Use HEPA vacuum or damp cloths where damp cleaning does not create a hazard and is otherwise appropriate. Do not use compressed air to clean up or remove dust from any surface.

.4 Prevent the spread of dust from Asbestos Work Area using measures appropriate to the work to be done.

.1 Use FR polyethylene drop sheets over flooring such as carpeting that absorbs dust and over flooring in Asbestos Work Area where dust and contamination cannot otherwise be safely contained.

.2 Seal all diffusers and ducts with FR polyethylene.

.3 Seal all doorways with FR polyethylene.

.4 Seal all non-firestopped wall and ceiling penetrations with stuffed fibreglass insulation covered by FR polyethylene.

.5 Wet materials containing asbestos to be disturbed (including cut, ground, abraded, scraped, drilled, or otherwise disturbed) with an appropriate wetting agent.

.1 Use garden reservoir type low - velocity fine - mist sprayer.

.2 Perform Work to reduce dust creation to lowest levels practicable.

.3 Work will be subject to visual inspection and air monitoring.

.4 Contamination of surrounding areas indicated by visual inspection or air monitoring will require complete enclosure and clean-up of affected areas at no additional cost to Owner.

.6 Clean-Up:

.1 Frequently during the work and immediately after completion of work, clean up dust and asbestos-containing waste using a HEPA vacuum or by damp mopping.

.2 Place dust and asbestos-containing waste in sealed dust-tight waste bags. Treat drop sheets and disposable protective clothing as an asbestos waste; wet and fold these items to contain dust, and then place in plastic bags.

.3 Clean the exterior of each waste-filled bag using damp cloths or a HEPA vacuum and place in second clean waste bag immediately prior to removal from Asbestos Work Area.

.4 Seal waste bags and remove from site. Dispose of in accordance with requirements of Provincial and Federal Authority having jurisdiction. Supervise dumping and ensure that dump operator is fully aware of hazardous nature of material to be dumped and that guidelines and regulations for asbestos disposal are followed.

.5 Perform final thorough clean-up of work areas and adjacent areas affected by the work using HEPA vacuum.

END OF SECTION

As a global, employee-owned organisation with over 50 years of experience, Golder Associates is driven by our purpose to engineer earth's development while preserving earth's integrity. We deliver solutions that help our clients achieve their sustainable development goals by providing a wide range of independent consulting, design and construction services in our specialist areas of earth, environment and energy.

For more information, visit golder.com

Africa	+ 27 11 254 4800
Asia	+ 86 21 6258 5522
Australasia	+ 61 3 8862 3500
Europe	+ 44 1628 851851
North America	+ 1 800 275 3281
South America	+ 56 2 2616 2000

solutions@golder.com
www.golder.com

Golder Associates Ltd.
309 Exeter Road, Unit #1
London, Ontario, N6L 1C1
Canada
T: +1 (519) 652 0099

Golder Associates

Asbestos Materials Report

Asbestos Materials Report
105 Christina St South Sarnia, Ontario
5 Year Asbestos Reassessment

Prepared for:

SNC-Lavalin O&M
Suite G34
Toronto, Ontario
M5J 2X5

PINCHIN PROJECT # S62931

MARCH 31, 2011

30 QUEEN STREET SOUTH, TILBURY, ONTARIO N0P 2L0 TEL: (519) 682-4492 FAX: (519) 682-4493
SERVICES IN ENVIRONMENTAL HEALTH & SAFETY MANAGEMENT FROM 21 OFFICES ACROSS CANADA
www.pinchin.com • 1-888-767-3330

EXECUTIVE SUMMARY

Pinchin Environmental Ltd. was retained by SNC-Lavalin O&M to conduct a reassessment of asbestos-containing materials (ACM) in various buildings in Ontario. The objective of the re-assessment survey was to establish changes in the condition of asbestos-containing materials previously reported in previous assessment reports issued by other consultant companies. In addition, all areas containing ACM or suspect ACM were investigated for materials in fair and poor condition.

The Assessment Report for the buildings provides a detailed description of the Introduction and Scope, Assessment Criteria, Findings for the Buildings, and Recommendations and Limitations of the Reassessment. The Report also includes Appendices common to the surveyed Building, Friability and Regulations (Appendix I) and the Asbestos Assessment Matrix (Appendix II).

This re-assessment report provides a description of the current findings for the building and any remedial recommendations for the building, and must be read in conjunction with the original building reports.

Friable Asbestos was confirmed to be present in the following materials in this building:

Asbestos-containing parging cement pipe fittings are present in the building

Asbestos-containing pipe wrap pipe insulations are present in the building

Non-Friable Asbestos was confirmed, or presumed, to be present in the following materials in this building:

Asbestos-containing transite cement board is present in the building

Asbestos-containing black mastic insulations on ducting is present in the building

Asbestos-containing cloth weave is present as expansion joints in ducting in the building

Presumed asbestos-containing vinyl sheet flooring is present in the building

Presumed asbestos-containing vinyl floor tiles is present in the building

Remedial Action required for this building:

No remedial asbestos work is required to comply with current Regulations (O.Reg. 278/05) and/or MOL field practice.

Remedial Action update for this building:

Presumed asbestos-containing vinyl floor tiles that were previously recorded as being present in the Kitchen (Location 126), Workshop (Location 129), were reported as being abated.

.

TABLE OF CONTENTS

1.0 INTRODUCTION AND SCOPE

1.1 Introduction

Pinchin Environmental Ltd. was retained by SNC-Lavalin O&M to conduct a reassessment of asbestos-containing materials (ACM) in various buildings in Ontario. The objective of the re-assessment survey was to establish changes in the condition of asbestos-containing materials previously reported in previous assessment reports issued by other consultants. In addition, all areas containing ACM or suspect ACM were investigated for material in fair and poor condition.

The assessment Report for the buildings provides a detailed description of the Introduction and Scope, Assessment Criteria, Findings for the Buildings, and Recommendations and Limitations of the Reassessment. The Report also includes Appendices common to the surveyed Building, Friability and Regulations (Appendix I), and the Asbestos Assessment Matrix (Appendix II).

This re-assessment report provides a description of the current findings for the building and any remedial recommendations for the building, and must be read in conjunction with the original building reports.

1.2 Scope of Assessment

The assessed area consisted of all parts of the building previously reported as containing asbestos materials.

Owner or occupant processes, articles within the building(s) such as stored items, furniture, etc., subsurface materials or equipment (vessels, drums, underground storage tanks, pipes, etc.), possible contaminants in the soil and groundwater on the site, and sampling of materials that could result in a hazard to the surveyor or damage to the building were not included in the assessment.

2.0 ASSESSMENT METHODOLOGIES AND CRITERIA

2.1 Methodology

The surveyor entered each room, corridor, service area, etc. where access was possible within the extent of the assessed area and inspected for the presence of damaged asbestos-containing materials (ACM). The relevant information of the observed damage was recorded where the damage was observed, including approximate quantities, locations, condition.

The re-assessment for the Government of Canada building located at 105 Christina St. South, Sarnia, Ontario was completed by Ralph Verbeek of Pinchin Environmental Ltd. on February 9, 2011.

2.2 Basis of Evaluation and Recommendations regarding ACM

The condition and the potential for disturbance of any ACM observed were evaluated. The

evaluation criteria were based on the conclusions of published studies, particularly the "Royal Commission on Matters of Health and Safety Arising from the Use of Asbestos in Ontario", existing Ontario regulation, and our experience involving buildings that contain ACM.

An ACM was considered damaged if it is sprayed material that is delaminating, mechanical insulation with damaged/missing insulation or jacketing, or non-friable materials that have been pulverized or damaged so that they have become friable.

The priority for remedial action is based not only on the evaluation of condition but is also based on several other factors which include:

- Accessibility or potential for direct contact and disturbance.
- Practicality of repair (for example, will damage to the ACM continue even if it is repaired).
- Visibility of the material.
- Efficiency of the work (for example, if damaged ACM is being removed in an area, it may be most practical to remove all ACM in the area even if it is in good condition).

Recommendations also include removal of ACM that may be disturbed by any planned renovation or demolition activity known to Pinchin.

3.0 REASSESSMENT FINDINGS

The following bays, rooms, or areas of the building or areas of assessment were not accessible to the surveyor and their contents could not be assessed, and are therefore not included in the report:

Location Number of Inaccessible Room or Area	Roof

3.1 Asbestos

3.1.1 Pipe Insulation

Asbestos-containing parging cement pipe fittings are present in the following locations:

Mezzanine Level locations: Observation Area ("Corridor"), Observation Area – Top of Landing and Ceiling Space, Southwest Corner Asbestos-containing parging cement pipe fittings in poor condition are present in the following locations:

Approximately seven asbestos-containing parging cement pipe fittings were observed in the Loading Dock Area

All observed pipe parging cement was in good condition

Asbestos-containing pipe wrap is present in the following locations

Washroom B15 (Location 53) and in the Loading Dock Area (Location 108, all observed pipe wrap was observed in good condition

3.1.2 Ducting

Asbestos black mastic duct insulation was observed in the following locations:

Reception (Location 116), Coast Guard (Location 119), Office (Location 120), Meeting Room (Location 122), Coast Guard (Location 123), LAN Room (Location 125), and Workshop (Location 129). All asbestos-containing black mastic insulation covering ducting was observed in good condition

3.1.3 Asbestos Cement Products (Transite)

Asbestos cement sheeting (also known as transite sheeting) is present is present above the ceiling in the Galley and the Mail Drop Box (Location101). All observed transite cement sheeting was considered to be in good condition.

3.1.4 ACM Weave

Asbestos-containing cloth weave is present in the “flex joints” present on the air handling unit (AHU #1) located in the Fan Room B10 (Location 14). All were observed during the reassessment to be in good condition.

3.1.5 Vinyl Sheet Flooring

Presumed asbestos-containing vinyl sheet flooring was previously recorded as being present in Entrance to Observation Room and Observation Deck (Location 80) and in the Washrooms (Locations142 and 152). All vinyl sheet flooring observed during the reassessment was considered to be in good condition.

3.1.6 Vinyl Floor Tile and Mastic

Presumed asbestos-containing vinyl floor tiles were previously recorded as being present in the Lunch Room (Location 71), Storage Room (Location 92), Women’s Washroom (Location 94), Women’s Change Room (Location 95), Office Areas (Locations 96, 97 and 112), Mail Drop Room (Location 103), Mail Sorting Area (Location 105) and Men’s Change Room (Location109). All vinyl floor tiles observed during the reassessment was considered to be in good condition.

The presumed asbestos-containing vinyl floor tiles that were previously recorded as being present in the Kitchen (Location 126), Workshop (Location 129) were reported as being abated.

3.1.7 Presumed Mechanical ACM

Pinchin did not reassess the following suspect mechanical materials during the survey. The following materials are presumed to be asbestos-containing materials and are in good condition.

Fire-door cores (friable)

Demountable fire resistant metal clad wall cores (friable)

Pipe gaskets, valve packing, equipment gaskets (non-friable)

3.1.8 Presumed Electrical ACM

Pinchin did not reassess the following suspect electrical materials during the survey. The following materials are presumed to be asbestos-containing materials until confirmed by bulk sample analysis

Equipment electrical seals and internals (non-friable)

Components or wiring within motor control centers, breakers, motors or lights (non-friable)

High voltage wiring (non-friable)

Breaker panels of motor control and building isolation centers, spark chutes, spark deflectors and textile gaskets (non-friable)

"Rockbestos" a registered trade name for 600V Firewall III cabling contains internal textile asbestos-containing material (non-friable)

Paper heat shield protection inside incandescent light fixtures (non-friable)

4.0 RECOMMENDATIONS

4.1 Asbestos

This report must be given to the constructor. In turn the constructor must provide this report to contractors and sub-contractors.

Constructors/Contractors must use the information in this report when filing a Notice of Project Form with the Ontario Ministry of Labour. In Section 6 of the form, check all Designated Substances listed in this report that will be disturbed. In Section 5 of the form check the Type 3 – Asbestos Removal box, if the following recommendations include Type 3 removal or Glove Bag removal over approximately 10 linear feet (1 square metre).

Dispose of waste containing hazardous materials as per the requirements of applicable waste handling regulations[1].

[1] Transportation and disposal of Hazardous Building Materials are under the jurisdiction of Federal, Provincial and local government agencies. Primarily, Ministry of the Environment Regulation 347 as amended dictates disposal requirements. However, regional dumpsites have the ability to impose more stringent requirements. Disposal of some Hazardous Building Materials may require testing prior to disposal so as to classify the waste.

4.1.1 Remedial Work

Regardless of proposed construction work, damaged ACM must be repaired or removed in order to comply with current Regulations (O.Reg. 278/05) and/or MOL field practice. The following materials require repair or removal:

No remedial asbestos work is required to comply with current Regulations (O.Reg. 278/05) and/or MOL field practice.

4.1.2 Building Demolition

Prior to building demolition, all ACM must be removed.

Sample all materials excluded from sampling or presumed to contain asbestos immediately prior to removal where required.

4.1.3 Pipe Insulations

If pipe insulation is to be removed, remove minor amounts (less than 1 square metre) of asbestos-containing pipe insulations using Type 2 procedures as outlined within Ontario Regulation 278/05. If larger amounts of pipe insulation (greater than 1 square metre) are to be removed, use Type 3 procedures as outlined within Ontario Regulation 278/05. Alternately use Glove Bag Procedures as outlined within Ontario Regulation 278/05.

If jacketing over asbestos insulation is to be repaired (e.g. canvas and lagging), use Type 2 procedures as outlined within Ontario Regulation 278/05.

4.1.4 Black Mastic Materials

If asbestos black mastic materials must be removed as a result of planned demolition, renovation, etc. use Type 1 procedures as outlined within Ontario Regulation 278/05 if the work is done using wet methods and using hand-held non-powered tools.

4.1.5 Ducting Expansion Weave Materials

If asbestos expansion weave materials must be removed as a result of planned demolition, renovation, etc. use Type 1 procedures as outlined within Ontario Regulation 278/05 if the work is done using wet methods and using hand-held non-powered tools.

4.1.6 Asbestos-Cement (Transite) Materials

If asbestos cement (Transite) materials must be removed as a result of planned demolition, renovation, etc. use Type 1 procedures as outlined within Ontario Regulation 278/05 if the work is done using wet methods and using hand-held non-powered tools.

4.1.7 Vinyl Sheet Flooring

Vinyl sheet flooring is a non-friable material that can become friable, and can generate significant dust, upon removal. Therefore, if vinyl sheet flooring is to be abated as a result of planned demolition, renovation, etc., use Type 2 abatement procedures as outlined within Ontario Regulation 278/05 if the work is done using wet methods and using hand-held non-powered tools.

4.1.8 Vinyl Floor Tiles

If vinyl floor tiles must be removed as a result of planned demolition, renovation, etc, use Type 1 procedures as outlined within Ontario Regulation 278/05 if the work is done using wet methods and using hand-held non-powered tools.

5.0 LIMITATIONS

This report details the hazardous building materials found within or forming part of the building envelope. The assessment only included inspections of the structure and finishes, including mechanical equipment. The assessment did not include inspection of current or past owner or occupant articles within the building (i.e. process materials or equipment, portable equipment, curriculum items, etc.) and does not report on possible contaminants in the soil and groundwater of the site, underground storage tanks, buried piping, inside drums, vessels, production equipment, or in areas not accessed by the surveyor.

The work performed by Pinchin was conducted in accordance with generally accepted engineering or scientific practices current in this geographical area at the time the work was performed. The Client acknowledges that subsurface and concealed conditions may vary from those encountered or inspected. Pinchin can only comment on the environmental conditions observed on the date(s) the assessment is performed. The work is limited to those materials or areas of concern identified by the Client or outlined in our proposal. Other areas of concern may exist but were not investigated within the scope of this assignment.

Pinchin makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issue, regulatory statutes are subject to interpretation and these interpretations may change over time. Pinchin accepts no responsibility for consequential financial effects on transactions or property values, or requirements for follow-

No warranty is either expressed or implied, or intended by this agreement or by furnishing oral or written reports or findings. The liability of Pinchin or its staff will be limited to the lesser of the fees paid or actual damages incurred by the Client. Pinchin will not be responsible for any

consequential or indirect damages. Pinchin will only be liable for damages resulting from negligence of Pinchin. Pinchin will not be liable for any losses or damage if client has failed, within a period of (2) years following the date upon which the claim is discovered within the meaning of the Limitations Act, 2002 (Ontario), to commence legal proceedings against Consultant to recover such losses or damage.

Information provided by Pinchin is intended for Client use only. Pinchin will not provide results or information to any party other than the Client, unless the Client, in writing, requests information to be provided to a third party or unless disclosure by Pinchin is required by law. Any use by a third party, of reports or documents authored by Pinchin, or any reliance by a third party on or decisions made by a third party based on the findings described in said documents, is the sole responsibility of such third parties. Pinchin accepts no responsibility for damages suffered by any third party as a result of decisions made or actions conducted.

6.0 CLOSURE

I trust you will find the above in order. Should you have any questions or concerns, please call Tina Manning at (519) 682 4492.

Yours truly,

Pinchin Environmental Limited

Prepared by:

Original signed by...

per: Ron Downs
Project Technologist
Hazardous Materials Group
rdowns@pinchinsw.com

Prepared by:

Original signed by...

per: Graham Manning, CET
Senior Technical Consultant
Hazardous Materials Group
gmanning@pinchinsw.com

Reviewed by:

Original signed by...

per: Per…Tina Manning, PMP, LEED AP
Operations Manager
Hazardous Materials Group
tmanning@pinchinsw.com

APPENDIX I

FRIABILITY AND REGULATIONS

1.0 FRIABILITY

As per regulation 278/05, "friable material" means material that, (a) when dry, can be crumbled, pulverized or powdered by hand pressure, or (b) is crumbled, pulverized or powdered. Asbestos-containing material (ACM) that is friable has a much greater potential than non-friable ACM to release airborne asbestos fibres when disturbed. The most common friable ACM used in the past are surfacing materials (usually sprayed fireproofing, texture, decorative or acoustic sprayed finishes) and thermal insulations on mechanical systems. Asbestos-containing non-friable materials include vinyl floor tiles, drywall joint compound, gasket materials, asbestos cement pipe or board, asbestos textiles, etc. Note that though a product may be considered non-friable when new, if the product releases fine dust due to deterioration or during removal, the free dust is considered friable. Potentially friable materials (or sometimes called miscellaneous friable materials) include materials such as ceiling tiles and plaster. These materials are non-friable in place, but can generate dust upon removal.

2.0 TABLE 1 REGULATION 278/05 – ASBESTOS SAMPLING FREQUENCY

Type of Material	Size of Area of Homogeneous Material	Minimum Number of Samples
Surfacing material, including without limitation material that is applied to surfaces by spraying, by troweling or otherwise, such as acoustical plaster on ceilings, fireproofing materials on structural members and plaster	Less than 90 square metres	3
	90 or more square metres, but less than 450 square metres	5
	450 or more square metres	7
Thermal insulation, except as described below	Any size	3
Thermal insulation patch	Less than 2 linear metres or 0.5 square metres	1
Other material	Any size	3

3.0 REGULATIONS - ONTARIO

Section 30 of the Occupational Health and Safety Act requires building owners or their agents (architects, general contractors, construction managers, etc.) to prepare or have prepared, a list of designated substances present in the area of construction or facility undergoing construction

work. There are eleven designated substances subject to special regulation under the Occupational Health and Safety Act. Of these eleven, asbestos, lead, mercury, and silica are commonly found in buildings and can impact construction, demolition, and renovation projects. The owner must ensure that a prospective constructor has received a designated substance report before entering into a binding contract with the constructor/contractor.

The disturbance of asbestos-containing materials (ACM) on construction projects is controlled by Ontario Ministry of Labour Regulation 278/05 made under the Occupational Health and Safety Act (Designated Substance - Asbestos on Construction Projects and in Buildings and Repair Operations). The Regulation classifies all disturbances as Type 1, Type 2, or Type 3, each of which has defined work practices. All ACM are subject to special handling and disposal, and must be removed before partial or full demolition. The Ministry of Labour must be notified prior to any project involving removal of more than a minor amount of friable ACM (Type 3 or Glove Bag abatement).

The Ministry of Labour released two documents in December 2004, Ministry of Labour Guideline - Lead on Construction Projects, and Ministry of Labour Guideline - Silica on Construction Projects. Although these documents were not released as Regulations, to quote the Ministry of Labour *"These guidelines will raise awareness of the potential hazards associated with Lead and Silica for common construction activities and tasks, and will provide assistance to employers, constructors and workers in how to take reasonable precautions to protect workers from exposure to Lead and Silica. These Guidelines include specific measures and procedures for typical construction activities and operations and can be used as best practices by the industry."* These guidelines are expected to be widely enforced by the Ministry of Labour, via the general duty clause 25 (2) (h) of the Occupational Health and Safety Act, since there is no other construction regulation regarding lead and silica available for them to draw upon as a resource. The Ministry of Labour has also issued guidelines or proposed regulations for coal tar products and handling of mercury on construction sites.

Management, handling and transfer of PCBs are controlled by R.R.O. 1990, Reg. 362, Waste Management-PCB's Regulation, made under the Ontario Environmental Protection Act, and the PCB Regulation (SOR/2008-273) made under the federal Environmental Protection Act.

The Ontario Ministry of Labour published the hazard alert "Mould in Workplace Buildings", in December 2000. To quote from the alert, "The sustained and/or extensive growth of any visible mould on the interior surfaces of a building is unacceptable. Mould growth on the interior surfaces of buildings is a risk factor for health problems." The Ministry of Labour has enforced work stoppages as a result of indoor mould growth and has enforced removal using work practices similar to those required for asbestos abatement.

Waste disposal is controlled by Ministry of the Environment Regulation, R.R.O. 1990 Reg. 347 as amended.

APPENDIX II

HMIS ASBESTOS ASSESSMENT MATRIX

EVALUATION CRITERIA AND BASIS OF RECOMMENDATIONS

The detailed asbestos assessment provides information regarding the location, condition friability and accessibility of the Asbestos-Containing Materials (ACM) used in the construction of the building. In order to make recommendations for compliance with current regulations, Pinchin developed the following ACM evaluation criteria based on the conclusions of published studies, particularly the "Royal Commission on Matters of Health and Safety Arising from the Use of Asbestos in Ontario" and our experience involving buildings that contain friable ACM.

EVALUATION OF CONDITION

Friable Spray Applied Fireproofing, Insulation and Texture Finishes

To evaluate the condition of ACM sprayed or trowelled fireproofing, sprayed or trowelled thermal insulation (non-mechanical), or texture, decorative or acoustic finishes, the following criteria are applied:

Good	Surface of material shows no significant signs of damage, deterioration or delamination. Good condition includes unencapsulated or unpainted fireproofing or texture finishes, where no delamination or damage is observed, or encapsulated fireproofing or texture finishes where the encapsulant or paint has been applied after the damage or fallout occurred.
Poor	A sprayed material that shows signs of significant damage or is significantly delaminating or deteriorating. This may be limited to surface delamination or some portion of the substrate may be exposed.

In observation areas where damage exists in isolated locations, both good and poor condition may be applicable. The extent or percentage of each condition will be recorded. Fair condition is not utilized in the evaluation of ACM sprayed or trowelled fireproofing, sprayed or trowelled thermal insulation (non-mechanical), or texture, decorative or acoustic finishes.

The evaluation of sprayed or trowelled fireproofing, sprayed or trowelled thermal insulation (non-mechanical insulation), or texture, decorative or acoustic finishes which are present above ceilings, may be limited by the number of observations made, and by building components such as ducts or full height walls that obstruct the above ceiling observations.

Friable Mechanical Insulation

To evaluate the condition of ACM mechanical insulation (on vessels, boilers, breeching, ducts, pipes, fan units, equipment etc.) the following criteria are applied:

Good	Insulation is completely covered in jacketing and exhibits no evidence of damage or deterioration. No insulation is exposed. Includes conditions where the jacketing has minor damage (i.e. scuffs or stains), but the jacketing is not penetrated.
Fair	Minor penetrating damage to jacketed insulation (cuts, tears, nicks, deterioration or delamination) or undamaged insulation that had never been jacketed. Insulation is exposed but not showing surface disintegration. The extent of missing insulation ranges from minor to none. Damage can be repaired.
Poor	Original insulation jacket is missing, damaged, deteriorated or delaminated. Insulation is exposed and significant areas have been dislodged. Damage cannot be readily repaired. Includes components where mechanical insulation may have been removed incompletely.

The evaluation of mechanical insulation may be limited by the number of observations made and building components such as ducts or full height walls that obstruct observations. It is often not possible to observe each foot of mechanical insulation from all angles.

Potentially Friable Materials (Miscellaneous Friable Materials)

Potentially friable ACM are products that are basically non-friable while in place, but have the potential to generate friable dust upon removal or if significantly disturbed without appropriate procedures. These products may become friable, but are not used as Spray Applied Fireproofing, Insulation or Texture Finishes or Mechanical Insulation. Potentially Friable Materials include materials such as acoustic ceiling tiles and plaster. The use of the description Fair with regard to a potentially friable ACM may reflect their physical condition and not their tendency to release fibres to the air under normal use. To evaluate the condition of Potentially Friable Materials, the following criteria are applied:

Good	No significant damage or deterioration. Condition is at or near to the condition when it was installed. Still serving its intended use as a building material or finish.
Fair	Showing signs of some cracking or breakage, but is not deteriorating (e.g. cracked plaster, broken but in place ceiling tile, etc). The condition is such that it is still serving its intended use as a building material or finish but may require repair for mainly cosmetic purposes.
Poor	Significant deterioration or breaking apart of the material. Material has deteriorated to the point it is not serving its intended use as building material or finish. Material has deteriorated to a point it has become friable. Normally potentially friable ACM in Poor condition is not repairable and requires at least localized removal and replacement.

Non-friable Materials

Non-friable ACM cover a wide range of products with a wide variation in their tendency to release dust or asbestos fibres to the air. Many of these materials, (particularly where the matrix is an unweathered bitumen, asphalt or tar material) do not release fibres except in very unusual circumstances or during significant disturbance (e.g. use of power tools). Others with a cementitious matrix (asbestos-cement products) can more readily release dust due to abrasion, demolition, weathering, etc. The potential for asbestos release from non-friable ACM is always lower than from friable ACM. Therefore the use of the descriptions Fair or Poor in regard to a non-friable ACM reflects only their physical condition and not their tendency to release fibres to the air under normal use or when disturbed. To evaluate the condition of Non- Friable Materials, the following criteria are applied:

Good	No significant damage or deterioration. Condition is at or near to the condition when it was installed. Still serving its intended use as a building material or finish.
Fair	Showing signs of some cracking or damage but has not deteriorated. Such change in condition may be repairable. The condition is such that it is still serving its intended use as a building material or finish and does not require repair or removal from an asbestos hazard perspective.
Poor	Significant deterioration or breaking apart of the material to the point at which it cannot be repaired and it will require at least local removal. Material has deteriorated to the point it is not serving its intended use as building material or finish. Material may have deteriorated to a point where traffic or disturbance may cause it to become friable. Non-friable ACM in poor condition may, but does not necessarily, indicate the material is friable, or pose a risk of fibre release if disturbed.

Evaluation of ACM DEBRIS

The identification of the exact location or presence of debris on the top of ceiling tiles is limited by the number of observations made and the presence of building components such as ducts or full height walls that obstruct observations.

The presence of fallen or dislodged ACM is noted separately from the ACM source and is referred to as Debris. Debris may be friable if from a friable ACM source or a badly deteriorated non-friable ACM source. Debris may also be non-friable (such as fallen pieces of transite sheet or mastic fittings, or broken, dislodged floor tiles).

Debris	Debris may be friable or non-friable, but is always identified as debris.

Evaluation of Presumed Asbestos-Containing Material (PACM)

Presumed Asbestos-Containing Materials (PACM), are building materials that may contain asbestos but were not sampled or analyzed due to a hazard to the surveyor, in damage to the building, or live equipment, inaccessibility or the need to perform destructive testing to obtain a reasonable sample set. Evaluation of these materials is based on the assumption that these PACM are asbestos-containing. A list of PACM is provided in the Building Report. If PACM are evaluated, Pinchin used the criteria that correspond with the type (and friability) of the material listed.

EVALUATION OF ACCESSIBILITY

The accessibility of building materials known or presumed of being ACM is rated according to the following criteria:

Access (A)	Common areas of the building within reach of all building users (approximately 8 ’- 9’ from floor or standard ceiling height). Includes other areas where occupant activities may result in disturbance of material that is not normally within reach from floor level, but may be disturbed by common activities (e.g. gymnasiums, workshops, warehouses)
Access (B)	Areas of the building accessed primarily by Maintenance/Caretaking/Janitorial Staff and within reach without use of a ladder. Includes areas within reach in Boiler Rooms, Electrical Rooms, Janitors Closets, Elevator Rooms, Mechanical Rooms, etc. Includes materials within reach from fixed ladders or catwalks, mezzanines, and accessible pipe chases.
Access(C) and Visible	Areas of the building above 8'-9’ where use of a ladder or scaffold is required to reach the ACM. Only includes ACM that are visible to view without the removal or opening of other building components such as ceiling tiles or service access panels. Visible column on HMIS-ONLINE sheets will say YES.
Access (C) and not Visible	Areas of the building above 8'-9’ where use of a ladder or scaffold is required to reach the ACM. Includes ACM that are not visible to view and require the removal of a building component, such as ceilings tiles or access panels to view and access. Includes rarely entered crawl spaces, attic spaces, etc. Observations will be limited to the extent visible from the access points. Visible column on HMIS-Online sheets will say NO.
Access (D)	Areas of the building behind inaccessible solid ceiling systems, walls or equipment etc. where demolition of the ceiling, wall or equipment etc. is required to reach the ACM. Material inaccessible due to height or location or is only reached under unusual situations. Evaluation of condition and extent of ACM is limited or impossible, depending on the surveyor's ability to visually examine materials in access D.

ACTION MATRIX AND DEFINITIONS

Pinchin's evaluation of the viability of a specific asbestos control option is based on the consideration of the friability, condition, accessibility and visibility of a material. The logic used is that damaged ACM located in an area frequently accessed by all building occupants is of a higher priority than damaged ACM located in an infrequently accessed service area. The action matrix considers the potential for fibre release (primarily from friable ACM) and the possible concerns from regulatory bodies and many building occupants to all damaged ACM (including non-friable).

In any building with asbestos, many current regulations require an Asbestos Management Program be implemented. Depending on the condition and the accessibility, more active measures such as repair or removal may be recommended. The following matrix provides guidance for recommended Actions in the absence of renovation or demolition. In the event of construction or maintenance activity which will disturb ACM more aggressive control or removal will be required.

Action Matrix

The following tables outline the **action** decisions based on the relationship of **access** and **condition**. Table I applies to friable ACM. Table II applies to non-friable ACM.

Table I Decision Matrix for Friable ACM

Access	**Condition**			**Debris**
	Good	**Fair**	**Poor**	
(A)	Action 5[2]	Action 5[3]	Action 3	Action 1
(B)	Action 7	Action 6[4]	Action 3	Action 1
(C) Visible	Action 7	Action 6	Action 3	Action 2
(C) Not Visible	Action 7	Action 7	Action 4	Action 2
(D)	Action 7	Action 7	Action 7	Action 7

Table II Decision Matrix for Non-Friable ACM

Access	Condition			Debris
	Good	Fair	Poor	
(A)	Action 7	Action 7[5]	Action 3	Action 1

[2] If friable ACM in access (A)/Good condition is not proactively removed Action 7 (Manage) is recommended.
[3] If friable ACM in access (A)/Fair condition is not proactively removed repair is recommended.
[4] If friable ACM in access (B)/Fair condition is likely to be disturbed after repair proactive removal is recommended.
[5] Action 7 is recommended for all non-friable ACM in Fair condition however some clients may wish to repair or take some action primarily for cosmetic reasons

(B)	Action 7	Action 7	Action 3	Action 1
(C) Visible	Action 7	Action 7	Action 4	Action 2
(C) Not Visible	Action 7	Action 7	Action 4	Action 2
(D)	Action 7	Action 7	Action 7	Action 7

Action Definitions

The following are the definitions in the Action Matrix Table presented above:

ACTION DEFINITIONS	
Action 1	**Clean-Up of ACM Debris** Restrict access that is likely to cause a disturbance of the ACM Debris and clean up ACM Debris as soon as possible. Utilize appropriate asbestos precautions.
Action 2	**Precautions for Access Which may Disturb ACM Debris** Use appropriate means to isolate the debris or to limit entry to the area which may disturb the material. At locations where ACM Debris can remain in place in lieu of removal or clean-up (e.g. Debris on top of ceiling tiles or behind lockable door), Utilize appropriate asbestos precautions to enter the area if this will disturb debris. The precautions will be required until the ACM Debris has been cleaned up.
Action 3	**ACM Removal** Remove ACM. Utilize asbestos procedures appropriate to the scope of the removal work. Until it is removed, restrict access to the material so it is not disturbed.
Action 4	**Precautions for Work Which may Disturb ACM in Poor Condition** Utilize appropriate asbestos precautions if ACM may be disturbed by work on or near ACM. This does not require restricting access to the area, only control of work which may contact or disturb the ACM. Removal is the only viable option if work will disturb ACM.
Action 5	**Proactive ACM Removal / ACM (Fair) Repair** Remove friable ACM where the presence of friable asbestos in Good and Fair condition is not desirable. If friable ACM in Fair condition is not removed then Repair the friable ACM
Action 6	**ACM Repair** Repair friable ACM in Fair condition which is not likely to be damaged again or disturbed by normal use of the area or room. Pinchin recommends proactive removal if friable ACM is likely to be damaged or disturbed during normal use of the area or room

ACTION DEFINITIONS	
Action 7	**Asbestos Management Program with Routine Surveillance** Implement an Asbestos Management Program, including routine surveillance of ACM. Reassess materials regularly (typically once per year).

Designated Substances Assessment

DESIGNATED SUBSTANCES ASSESSMENT

GOVERNMENT OF CANADA BUILDING

105 Christina Street
Sarnia, Ontario
Building #5520068

Prepared for:

SNC Lavalin O&M
441 University Avenue West, Suite 212
Windsor, Ontario
N9A 5P9

November 9th, 2012

OHS Project No.: 12-030

233 Mitchell Ave, Dorchester, ON, Canada, N0L 1G3
T: +1.519.268.2200 F: 866.700.4975 www.ohsolutions.ca

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

OH Solutions Inc (OHS) was retained by SNC Lavalin O&M to conduct a Designated Substances Assessment within 105 Christina Street in Sarnia, Ontario (the Site).

This report was prepared to fulfil an Owner's requirements under Section 30 of the Ontario Occupational Health and Safety Act (as amended). Prior to tendering project work in buildings, the building owner or owner's agent must provide this report to constructors. The successful constructor must then provide this document to all future subcontractors prior to accepting bids.

"Designated Substance" as defined by the Ontario *Occupational Health & Safety Act* (OHSA) means "a biological, chemical or physical agent or combination thereof prescribed as a Designated Substance to which the exposure of a worker is prohibited, regulated, restricted, limited or controlled." Designated Substances include the following; asbestos, acrylonitrile, arsenic, benzene, coke oven emissions, ethylene oxide, isocyanates, lead, mercury, silica and vinyl chloride.

The sections below explain our survey methodology and summarize the Designated Substances found at the Site.

2.0 SURVEY METHODOLOGY

A thorough room by room inspection/walkthrough of all areas of the facility suspected of containing designated substances was conducted. Materials suspected of containing designated substances were visually identified, based on the surveyor's knowledge of the historic composition of building products. While on site OHS personnel conducted the following:

- Characterization the existing building data;
- Determined the approximate quantities, location and condition of accessible Designated Substances and;
- Conducted sampling of representative building materials and finishes

For the purposes of this assessment, OHS targeted the following Designated Substances:

- Lead
- Mercury
- Silica (free crystalline)

Sampling for both friable and non-friable suspected asbestos-containing materials has been previously conducted at this facility and therefore has not been included as part of this assessment. Please refer to the Asbestos Building Product Surveys for information regarding building products containing asbestos at this facility.

Concealed locations within the building such as areas above plaster or drywall ceilings, chases and bulkheads were not included as part of the assessment.

OHS collected visually distinct paint samples suspected of containing lead. Where possible, OHS removed all layers of paint down to the buildings components unpainted surface.

Several samples of suspected lead-containing paint samples were collected and subsequently submitted for analysis. The suspected lead-containing paints were analyzed using flame atomic absorption spectroscopy (F.A.A.S.). OHS has included samples collected during previous assessments.

OHS submitted samples of suspected asbestos-containing lead paint to International Asbestos Testing Laboratories (IATL) of Mt. Laurel, New Jersey, USA.

All other designated substances were identified based on visual assessment and historical usage.

In addition to Designated Substances, OHS scope of work included the identification of PCBs in florescent light fixtures. OHS visually inspected random fixtures/ballasts and compared model numbers, serial numbers and date codes to Environment Canada Report EPS 2/CC/2 (revised) August 1991 - Identification of Lamp Ballasts Containing PCB's.

3.0 REGULATORY REQUIREMENTS

As outlined above, under Section 30 of the Occupational Health and Safety Act, the intent of this assessment is to fulfil the owner requirements to determine whether any Designated Substances are present at a project site during tendering and/or before beginning construction.

Designated Substances are regulated under Ontario Regulation 490/09. This regulation outlines the occupational exposure limits (OELs) for each Designated Substance. While construction projects are generally exempt, the OELs establish an Ontario standard for worker protection.

In addition to Ontario Regulation 490/09, Asbestos is regulated under O. Reg. 278/05, Asbestos on Construction Projects and in Buildings and Repair Operation, as

amended. Disposal of asbestos waste is subject to waste management regulations under Ontario Regulation 347/90 as amended.

The MOL does not have a standard to state what percentage of lead or silica a material must have to be considered lead or silica-containing. Procedures that provide an equivalent level of protection should, therefore, be implemented on construction projects where exposure to lead and silica is possible.

The Ministry of Labour has issued drafted guidelines for control of lead and silica exposures on construction projects. The Guideline for Lead on Construction Projects and the Guideline for Silica on Construction Projects should be adhered to during construction projects in order to protect the health and safety of workers.

The Federal Chlorobiphenyls Regulation, SOR/91-152 prohibits the use of PCBs in electrical transformers, capacitors and associated electrical equipment manufactured in or imported into Canada after July 1, 1980. The Federal Chlorobiphenyls Regulation SOR/92-507 and Ontario Regulation 362/90 outline the handling, storage and disposal of PCBs and PCB-containing equipment.

4.0 RESULTS

The Site is a two-story building with mezzanine and full basement. The building has a total footprint of approximately 7,000 square metres and appears to have been constructed in 1957.

4.1 Asbestos-Containing Materials

Please refer to the asbestos survey(s) for information regarding products suspected to contain asbestos within the building.

4.2 Lead

Paint samples were collected and subsequently submitted for laboratory analysis. Lead paint concentrations range from none detected to 1.9%. Previously collected lead bulk samples have been included within Appendix A. A summary of the current sampling is outlined below:

Sample #	Location	% Lead
P1	Transport Canada Grey 2nd Floor	<0.0065
P2	Blue Pink Bulkhead 232	0.24
P3	Taupe Wall 256	<0.012
P4	White/Blue/Pink 219	0.057
P5	Peach Above Lay-In 202	0.0076
P6	2nd Floor LAN White Bulkhead	0.18
P7	224 Pink And Green Above Lay-In	0.29
P8	DFO Control Centre Yellow At Exterior Bulkhead	0.53
P9	Chiller Exterior Paint	0.011
P10	Grey Floor Paint –Mezzanine	0.23
P11	Yellow Wall – Mezzanine	0.045
P12	Baby Blue Wall – Mezzanine	0.13
P13	Transport Canada 1st Floor Column Grey	0.062
P14	OBS 1st Floor Yellow Pain (Transport Canada)	<0.0075
P15	Exterior Wall Purple Paint Transport Canada 1st Floor	0.0073
P16	Transport Canada White @Photocopier 1st Floor	<0.0095
P17	CPC White Column Paint 1st Floor	0.088
P18	Grey/White Office Paint CPC @135	<0.012
P19	Sea Cadets White	0.0074
P20	Taupe Sea Cadets	<0.0098
P21	Baby Blue Yellow Under Sea Cadets	0.062
P22	B5 Salmon	1.9
P23	B11 Green	0.0053
P24	B7 Yellow	<0.0063
P25	Boiler Room White Wall	0.66
P26	Stairwell Beige @B9	0.066
P27	Telephone Room @ B6-15 Grey Floor	0.59

Lead is also suspected to be a component of the following:

- Solder on copper plumbing fixtures
- Mortar at brick veneer
- Lead wool or caulking in bell/spigot fittings on cast iron piping systems
- Lead-acid batteries

Sampling of the above was not conducted.

4.3 Mercury

Mercury is present in fluorescent light tubes. OHS did not observe any thermostats containing mercury however may be present within boiler and air handling unit control equipment and within laboratory drain pipes.

4.4 Silica

Common construction sand contains free crystalline silica will be present in concrete products, mortar, brick, etc found throughout building structures.

4.5 Acrylonitrile, Benzene, Isocyanates, Arsenic, Ethylene Oxide, Vinyl Chloride and Coke Oven Emissions

The presence of acrylonitrile, benzene, isocyanates, arsenic, ethylene oxide, vinyl chloride monomer or coke oven emissions are not expected at the Site.

4.6 Polychlorinated Biphenyls (PCB)

Florescent light ballasts are present in various locations within the facility. The building has undergone a lighting retrofit within the last few years. Of the ballasts inspected, none were suspected to contain PCB's.

5.0 RECOMMENDATIONS

Asbestos-containing materials have been previously identified within the facility and therefore the building is subject to the requirement for an Asbestos Management Program, as specified under Ontario Regulation 278/05. Please refer to the existing on-site Asbestos Management Program and Survey(s) for recommendations regarding asbestos at this facility.

5.1 Lead

Lead is present in some painted surfaces and is suspected to be a component of solder on copper plumbing fixtures, mortar at brick veneer, wool or caulking in bell/spigot fittings on cast iron piping systems and within lead-acid batteries.

Elevated airborne lead levels can result when uncontrolled work procedures such as drilling, cutting, removing, grinding, etc. are used on lead-based materials. The control of dust levels during the demolition of the buildings can be accomplished through proper work practices to reduce overall dust levels and providing workers with proper personal protective equipment.

OHS recommends the work procedures and personal protective equipment outlined within the MOL document 'Guideline – Lead on Construction Projects' (2004) be utilized during the disturbance or handling of the material.

5.2 Mercury

Mercury is present in florescent light tubes and may be present in may be present within boiler and air handling unit control equipment and within laboratory drain pipes.

Exposure to airborne mercury is regulated under the Designated Substances regulation titled, *Ontario Regulation 490/09, Designated Substances*. Mercury waste must be handled and disposed of according to Ontario Regulation 347, as amended, and may be subject to Leachate Criteria (Schedule 4) of this regulation.

5.3 Silica

Disturbance of materials containing silica will occur during demolition activities. Elevated airborne silica levels can result when uncontrolled work procedures such as drilling, cutting, removing, grinding, etc. are used on silica-containing materials.

OHS recommends the work procedures and personal protective equipment outlined within the MOL document 'Guideline – Silica on Construction Projects' (2004) be utilized during the disturbance or handling of the material.

6.0 LIMITATIONS AND WARRANTY

OHS has prepared this report for the exclusive use of the Client in evaluating the Site at the time of OHS's assessment. OHS will not be responsible for the use of this report by any third party, or reliance on or any decision to be made based on it without the prior written consent of OHS. OHS accepts no responsibility for damages, if any, by any third party because of decisions or actions based on this report.

The findings contained in this report are based upon conditions as they were observed at the time of investigation. No assurance is made regarding changes in conditions subsequent to the time of investigation.

If new information is developed in future work, OHS should be contacted to re-evaluate the conclusions of this report and to provide amendments as required.

Respectfully submitted,

OH Solutions Inc.

Jeff Doherty, BSc
Senior Occupational Hygienist

APPENDIX I

LEAD SAMPLING RESULTS

IATL International Asbestos Testing Laboratories

9000 Commerce Parkway Suite B Mt. Laurel, NJ 08054
Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: O H Solutions
233 Mitchell Ave
Dorchester ON N0L 1G3

Report Date: 8/9/2012
Report Number: 281854
Project: 105 Christina
Project No.: 12-030

LEAD PAINT SAMPLE ANALYSIS SUMMARY

Lab No.	Client No.	Location / Description	Concentration Lead By Weight (%)
4742773	1	Grey Paint 2nd Floor Transport Canada	<0.0065
4742774	2	Blue/Pink Paint Bulkhead 232	0.24 ***
4742775	3	Taupe Wall Paint 256	<0.012 *
4742776	4	White/Blue/Pink Paint 219	0.057
4742777	5	Peach Paint Above Lay-In 202	0.0076
4742778	6	White Paint 2nd Floor LAN Bulkhead	0.18
4742779	7	Pink And Green Paint Above Lay-In 224	0.29
4742780	8	Yellow Paint DFO Control Centre At Exterior Bulkhead	0.53
4742781	9	Exterior Paint Chiller	0.011
4742782	10	Grey Floor Paint Mezz.	0.23

Accreditations: **NATIONAL LEAD LABORATORY ACCREDITATION PROGRAM (NLLAP)**
AIHA-LAP, LLC No. 100188 NYSDOH-ELAP No. 11021

Analytical Methods: ASTM D3335-85A "Standard Method To Test For Low Concentrations Of Lead In Paint By Atomic Absorption Spectrophotometry"
EPA SW846-(3050B:7000B) "Standard Method To Test For Low Concentrations Of Lead In Soils, Sludges and Sediments By AAS"

Comments: Regulatory limit is 0.5% lead by weight (EPA/HUD guidelines). Recommend multiple sampling for all samples less than regulatory limit for confirmation. All results are based on the samples as received at the lab. IATL assumes that appropriate sampling methods have been used and the data upon which these results are based have been accurately supplied by the client. Method Detection Limit (MDL) per EPA Method 40CFR Part 136 Apendix B. Reporting Limit (RL) based upon Lowest Standard Determined (LSD) in accordance with AIHA-ELLAP policies. LSD=0.2 ppm MDL=0.0044% by weight. RL= 0.010% by weight (based upon 100 mg sampled). * Insufficient sample provided to perform QC reanalysis (<200 mg) ** Not enough sample provided to analyze (<50 mg) *** Matrix / substrate interference possible. Sample results are not corrected for contamination by field or analytical blanks. This confidential report relates only to those item(s) tested and does not represent an endorsement by NIST-NVLAP, AIHA or any government agency. This report shall not be reproduced except in full, without written approval of the laboratory.

Date Received: 8/2/2012
Date Analyzed: 8/9/2012
Analyst: C. Shaffer

Approved By: _____
Frank E. Ehrenfeld, III
Laboratory Director

IATL International Asbestos Testing Laboratories

9000 Commerce Parkway Suite B Mt. Laurel, NJ 08054
Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: O H Solutions
233 Mitchell Ave
Dorchester ON N0L 1G3

Report Date: 8/9/2012
Report Number: 281854
Project: 105 Christina
Project No.: 12-030

LEAD PAINT SAMPLE ANALYSIS SUMMARY

Lab No.	Client No.	Location / Description	Concentration Lead By Weight (%)
4742783	11	Yellow Wall Paint Mezz.	0.045
4742784	12	Baby Blue Wall Paint Mezz.	0.13
4742785	13	Grey Paint 1st Floor Transport Canada Column	0.062
4742786	14	Yellow Paint OBS 1st Floor Transport Canada Column	<0.0075 ***
4742787	15	Purple Wall Paint 1st Floor Transport Canada Exterior	0.0073 ***
4742788	16	White Paint 1st Floor Transport Canada @ Photocopier	<0.0095 ***
4742789	17	White Paint 1st Floor CPC Column	0.088
4742790	18	Grey White Paint CPC Office @ 135	<0.012 *
4742791	19	White Paint Sea Cadets	0.0074 ***
4742792	20	Taupe Paint Sea Cadets	<0.0098

Accreditations: **NATIONAL LEAD LABORATORY ACCREDITATION PROGRAM (NLLAP)**
AIHA-LAP, LLC No. 100188 NYSDOH-ELAP No. 11021

Analytical Methods: ASTM D3335-85A "Standard Method To Test For Low Concentrations Of Lead In Paint By Atomic Absorption Spectrophotometry"
EPA SW846-(3050B:7000B) "Standard Method To Test For Low Concentrations Of Lead In Soils, Sludges and Sediments By AAS"

Comments: Regulatory limit is 0.5% lead by weight (EPA/HUD guidelines). Recommend multiple sampling for all samples less than regulatory limit for confirmation. All results are based on the samples as received at the lab. IATL assumes that appropriate sampling methods have been used and the data upon which these results are based have been accurately supplied by the client. Method Detection Limit (MDL) per EPA Method 40CFR Part 136 Apendix B. Reporting Limit (RL) based upon Lowest Standard Determined (LSD) in accordance with AIHA-ELLAP policies. LSD=0.2 ppm MDL=0.0044% by weight. RL= 0.010% by weight (based upon 100 mg sampled). * Insufficient sample provided to perform QC reanalysis (<200 mg) ** Not enough sample provided to analyze (<50 mg) *** Matrix / substrate interference possible. Sample results are not corrected for contamination by field or analytical blanks. This confidential report relates only to those item(s) tested and does not represent an endorsement by NIST-NVLAP, AIHA or any government agency. This report shall not be reproduced except in full, without written approval of the laboratory.

Date Received: 8/2/2012

Date Analyzed: 8/9/2012

Analyst: C. Shaffer

IATL International Asbestos Testing Laboratories

9000 Commerce Parkway Suite B Mt. Laurel, NJ 08054
Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: O H Solutions
233 Mitchell Ave
Dorchester ON N0L 1G3

Report Date: 8/9/2012
Report Number: 281854
Project: 105 Christina
Project No.: 12-030

LEAD PAINT SAMPLE ANALYSIS SUMMARY

Lab No.	Client No.	Location / Description	Concentration Lead By Weight (%)
4742793	21	Baby Blue/Yellow Paint Under Sea Cadets	0.062
4742794	22	Salmon Paint B5	1.9 *
4742795	23	Green Paint B11	0.0053
4742796	24	Yellow Paint B7	<0.0063
4742797	25	White Wall Paint Boiler Room	0.66
4742798	26	Beige Paint Stairwell @ B9	0.066
4742799	27	Grey Floor Paint Telephone Room @ B6-15	0.59

Accreditations: **NATIONAL LEAD LABORATORY ACCREDITATION PROGRAM (NLLAP)**
AIHA-LAP, LLC No. 100188 NYSDOH-ELAP No. 11021

Analytical Methods: ASTM D3335-85A "Standard Method To Test For Low Concentrations Of Lead In Paint By Atomic Absorption Spectrophotometry"
EPA SW846-(3050B:7000B) "Standard Method To Test For Low Concentrations Of Lead In Soils, Sludges and Sediments By AAS"

Comments: Regulatory limit is 0.5% lead by weight (EPA/HUD guidelines). Recommend multiple sampling for all samples less than regulatory limit for confirmation. All results are based on the samples as received at the lab. IATL assumes that appropriate sampling methods have been used and the data upon which these results are based have been accurately supplied by the client. Method Detection Limit (MDL) per EPA Method 40CFR Part 136 Apendix B. Reporting Limit (RL) based upon Lowest Standard Determined (LSD) in accordance with AIHA-ELLAP policies. LSD=0.2 ppm MDL=0.0044% by weight. RL= 0.010% by weight (based upon 100 mg sampled). * Insufficient sample provided to perform QC reanalysis (<200 mg) ** Not enough sample provided to analyze (<50 mg) *** Matrix / substrate interference possible. Sample results are not corrected for contamination by field or analytical blanks. This confidential report relates only to those item(s) tested and does not represent an endorsement by NIST-NVLAP, AIHA or any government agency. This report shall not be reproduced except in full, without written approval of the laboratory.

Date Received: 8/2/2012

Date Analyzed: 8/9/2012

Analyst: C. Shaffer

Atomic Absorption Lead Report

Analysis Method: Lead in Paint analyzed by Atomic Absorption (AA)/SW-846-7420;
This analysis is not covered by the scope of accreditation by NVLAP or AIHA.

Sample Prep Method: Samples are dissolved in nitric acid, extracted, and analyzed on a properly calibrated AA; Absorbency curve was calculated, bandwidth corrected, and wavelength at the time of the analysis was measured and recorded.

Client Information:
Advanced Environmental Corp
4093 Meadowbrook Drive, Unit 114
London, Ontario N6L1G2

Client Project:
105 Christina St. Sarnia
08-4220-02

CA Labs Project #:
CAL08075459

Date: 07/30/08 SR

Phone: 519-652-6105

Fax: 519-652-1709

Turnaround Time: 5 Days

Attn:

Samples Received:
07/29/08 10:00 am

Purchase Order #:

Sample#		Sample Concentration: parts per million (ppm)	Weight Percent:
L-01-Roof top Mechanical Room, Grey		785.52	0.0786
L-02-2nd Floor Corridor, Green Wall Paint		2622.43	0.2622
L-03-121 Meeting Room, White Wall Paint		1969.23	0.1969
L-04-2nd Floor Corridor, Light Grey Wall Paint		3112.87	0.3113
L-05-Spy Room, Yellow Wall Paint		5089.29	0.5089
L-06-Lunch Room Loc. 71, Beige Paint		792.05	0.0792
L-07-Cust. Storage Rm., Loc. 109 Light Beige Paint		2052.42	0.2052
L-08-Loading Dock Loc. 106, Black Door/Trim Paint		< 156.37	< 0.0156
L-09- Loading Dock Loc. 106, Blue Door Paint		< 459.77	< 0.0460
L-10- Staircase at Boiler Room Loc. 07, Light Beige Paint		1895.93	0.1896
L-11-Basement Corridor Loc 57, White Wall Paint		< 549.45	< 0.0549
L-12-Loc 44 Storage, Peach/Orange Paint		35645.76	3.5646

NVLAP # 200349-0

TDH # 30-0235

Approved Signatories:

Henry Heiser
Analyst

Leslie Crisp
Laboratory Director

Chad Lytle
Senior Analyst

Notes:
The current guidelines for lead in paint from the Consumer Products Safety Council (CPSC) is 0.06% by weight; the Housing and Urban Development (HUD) guideline is 0.5% by weight.

Analysis performed at Crisp Analytical Labs, LLC 2081 Hutton Dr. Suite 301 Carrollton, TX 75006; phone (972) 488-1414, fax (fax) 488-8006, mobile (214) 564-8366.

Atomic Absorption Lead Report

Analysis Method: Lead in Paint analyzed by Atomic Absorption (AA)/SW-846-7420;
This analysis is not covered by the scope of accreditation by NVLAP or AIHA.

Sample Prep Method: Samples are dissolved in nitric acid, extracted, and analyzed on a properly calibrated AA; Absorbency curve was calculated, bandwidth corrected, and wavelength at the time of the analysis was measured and recorded.

Client Information:
Advanced Environmental Corp
4093 Meadowbrook Drive, Unit 114
London, Ontario N6L1G2

Client Project:
105 Christina St. Sarnia
08-4220-02

CA Labs Project #:
CAL08075459

Date: 07/30/08 SR

Phone: 519-652-6105

Fax: 519-652-1709

Turnaround Time: 5 Days

Attn:

Samples Received:
07/29/08 10:00 am

Purchase Order #:

Sample#		Sample Concentration: parts per million (ppm)	Weight Percent:
L-13-Loc 46 Storage , Blue Wall Paint		1414.90	0.1415
L-14-Loc 63 RCMP Storage, Light Colored Paint		3350.54	0.3351
Lab Blank	< 1.00	----	----

Quality Control:
Duplicate: **2.7 RPD**
Spike: **97.8% Recovery**

NVLAP # 200349-0

Approved Signatories:

TDH # 30-0235

Henry Heiser
Analyst

Leslie Crisp
Laboratory Director

Chad Lytle
Senior Analyst

Notes:
The current guidelines for lead in paint from the Consumer Products Safety Council (CPSC) is 0.06% by weight; the Housing and Urban Development (HUD) guideline is 0.5% by weight.

Analysis performed at Crisp Analytical Labs, LLC 2081 Hutton Dr. Suite 301 Carrollton, TX 75006; phone (972) 488-1414, fax (fax) 488-8006, mobile (214) 564-8366.

ATOMIC ABSORPTION
LEAD ANALYSIS
LABORATORY ANALYSIS REPORT

Advanced Environmental Corp
4093 Meadowbrook Drive, Unit 114
London, Ontario N6L1G2
reference number: CAL08075459

LABORATORY ANALYSIS:

Summary of lead analysis by atomic absorption in all relevant media using the method described in SW-846-7420. All analysts have received the necessary in-house and extramural training to perform analysis of samples for the presence of lead. A duplicate analysis is performed on greater than ten percent of all samples. A spiked concentration sample is analyzed with each sample group for instrument calibration. All analysts are required to participate in quality control analysis rounds. Instrument calibrations are performed on a daily, weekly, and monthly basis.

This report must not be used to claim product endorsement by AIHA or any agency of the U.S. Government. This test relates only to the items described and tested herein. This report may not be reproduced except in full, without written permission by CA Labs.

METHOD:

The procedure for paint chip analysis follows AOAC5.009(974.02) and SW-846-7420. The analysis of soil, wipes, and wastewater for the presence of lead is also referenced by SW-846-7420. Methodology for the analysis of lead in air samples follows NIOSH Method 7082.

Analysis performed at Crisp Analytical Labs, L.L.C. 2081 Hutton Dr. Suite 301 Carrollton, TX 75006: phone (972) 488-1414; fax (972) 488-8006, after hours mobile (214) 564-8366.

APPENDIX II

ROOM BY ROOM SUMMARY

Client: SNC-LAVALIN O&M
Project: Designated Substances Survey
Building: 105 Christina Street – Sarnia, Ontario (Building ##5520068)

Location / Room Description		Lead in Paint Description	Reference Sample No. (Lead Weight %)	Mercury Thermostats	PCB Suspected in Light Ballasts
1	Office (2nd Floor)	Taupe Wall Paint	V- 3 (<0.012%)	No	No
2	Locker Room (2nd Floor)	Taupe Wall Paint	V- 3 (<0.012%)	Yes	No
3	Office Space (2nd Floor)	Taupe Wall Paint	V- 3 (<0.012%)	Yes	No
4	Lunch Room (2nd Floor)	Taupe Wall Paint	Actual 3 (<0.012%)	No	No
5	Interview Room (2nd Floor)	Taupe Wall Paint	V- 3 (<0.012%)	No	No
6	Reception Area (2nd Floor)	Taupe Wall Paint	V- 3 (<0.012%)	No	No
7	Boiler Room	Grey Floor Paint White Wall Paint Light Beige @Stairs	VL-01 (0.0786%) Actual 25 (0.66%) Actual 26 (0.066%)	No	No
8	Generator Room	Light Beige on All Surfaces	VL-10 (0.1896%)	No	No
9	Sump Room	Light Beige on All Surfaces	VL-10 (0.1896%)	No	No
10	Vacant Room	Light Beige on All Surfaces Grey Floor/ Grey Wall Paint	VL-10 (0.1896%) NA	No	No
11	Storage Room	Light Beige on All Surfaces	VL-10 (0.1896%)	No	No
12	Office	White Ceiling Paint/Grey Floor Paint	NA	No	No

Location / Room Description		Lead in Paint Description	Reference Sample No. (Lead Weight %)	Mercury Thermostats	PCB Suspected in Light Ballasts
13	Washroom	Light Beige on All Surfaces	VL-10 (0.1896%)	No	No
14	Fan Room	Light Beige on All Surfaces	VL-10 (0.1896%)	No	No
15	Meeting Room	Light Beige on All Surfaces	VL-10 (0.1896%) Actual 20 (<0.0098%)	No	No
16	Storage Room	White Wall Paint	VL-11 (<0.0549%)	No	No
17	Classroom	Taupe Paint	Visual 20 (<0.0098%)	No	No
18	Office	NA	N/A	No	No
19	Office	NA	N/A	No	No
20	Office	NA	N/A	No	No
21	Classroom	Grey Floor Paint Baby Blue Wall Paint	VL-01 (0.0786%) Actual 20 (0.062%)	No	No
22	Classroom	Grey Floor Paint	VL-01 (0.0786%)	No	No
		Blue Door Paint White Ceiling Paint	VL-09 (<0.0460%) NA	No	No

Location / Room Description		Lead in Paint Description	Reference Sample No. (Lead Weight %)	Mercury Thermostats	PCB Suspected in Light Ballasts
		White Wall Paint Yellow Wall Paint	VL-11 (<0.0549%) NA	No	No
23	Office	White Wall Paint Baby Blue Wall Paint	VL-11 (<0.0549%) Visual 20 (0.062%)	No	No
24	Office	White Wall Paint Baby Blue Wall Paint	VL-11 (<0.0549%) Visual 20 (0.062%)	No	No
25	Classroom	Grey Floor Paint White Ceiling Paint Grey Wall Paint	VL-01 (0.0786%) NA NA	No	No
		Blue Door Paint	VL-09 (<0.0460%)	No	No
26	Classroom	White Wall Paint Grey Floor Paint	VL-11 (<0.0549%) NA	No	No
27	Office	White Wall Paint	VL-11 (<0.0549%)	No	No
28	Sea Cadets	White Wall Paint	VL-11 (<0.0549%) Actual 19 (0.0074%)	No	No
		Grey Floor Paint	VL-01 (0.0786%)	No	No

Location / Room Description		Lead in Paint Description	Reference Sample No. (Lead Weight %)	Mercury Thermostats	PCB Suspected in Light Ballasts
		Blue Door Paint	VL-09 (<0.0460%)	No	No
		White Wall Paint	VL-11 (<0.0549%)	No	No
29	Classroom	Grey Floor Paint	VL-01 (0.0786%)	No	No
		Blue Door Paint	VL-09 (<0.0460%)	No	No
		White Wall Paint	VL-11 (<0.0549%)	No	No
30	Storage Room	Grey Floor Paint	VL-01 (0.0786%)	No	No
		Blue Door Paint	VL-09 (<0.0460%)	No	No
		White Wall Paint	VL-11 (<0.0549%)	No	No
31	Storage Room	Grey Floor Paint	VL-01 (0.0786%)	No	No
		Blue Door Paint	VL-09 (<0.0460%)	No	No
		White Wall Paint	VL-11 (<0.0549%)	No	No
32	Storage Room	Yellow Wall Paint	VL-05 (0.5089%)	No	No
33	Custodial Office	White Wall Paint	VL-11 (<0.0549%)	No	No
34	Storage Room	White Wall Paint	VL-11 (<0.0549%)	No	No

Location / Room Description		Lead in Paint Description	Reference Sample No. (Lead Weight %)	Mercury Thermostats	PCB Suspected in Light Ballasts
34	DFO (002)	White Ceiling Paint Green Wall Paint	NA Actual 23 (0.0053%)	No	No
35	Corridor	White Wall Paint Grey Wall Paint (2010)	VL-11 (<0.0549%) NA	No	No
36	Storage Room	NA	N/A	No	No
37	Storage Room	NA	N/A	No	No
38	Corridor	White Wall Paint	VL-11 (<0.0549%)	No	No
39	Boardroom	NA	N/A	No	No
40	Shower Room	No Access	N/A	No	No
41	Shower Room	No Access	N/A	No	No
42	Telephone Room	White Ceiling Paint Grey Floor Paint	NA Actual 27 (0.59%)	No	No
43	Stairwell	Light Beige on All Surfaces	Actual L-10 (0.1896%)	No	No
44	Storage Room	Peach/Orange Paint	Actual L-12 (3.5646%) Actual 22 (1.9%)	No	No

Location / Room Description		Lead in Paint Description	Reference Sample No. (Lead Weight %)	Mercury Thermostats	PCB Suspected in Light Ballasts
45	Electrical Room	Grey Ceiling/Wall Paint	N/A	No	No
46	Lunch Room	Blue Wall Paint	Actual L-13 (0.1415%)	No	No
47	Elevator Room	Green Wall Paint on Original Plaster	VL-02 (0.2622%)	No	No
48	Men's Washroom	NA	N/A	No	No
49	Corridor	NA	N/A	No	No
50	Vacant Room	Yellow Paint	N/A	No	No
51	Stairwell	NA	N/A	No	No
52	Custodial Closet	Yellow Ceiling/Floor Paint	Actual (<0.0063%)	No	No
53	Women's Washroom	White Ceiling/Wall Paint	N/A	No	No
54	Corridor	White Ceiling/Wall Paint	N/A	No	No
55	Storage Room	Grey Floor Paint	VL-01 (0.0786%)	No	No
		Light Grey Wall Paint White Ceiling/Wall Paint	VL-04 (0.3113%) NA	No	No
56	Corridor	White Wall Paint	VL-11 (<0.0549%)	No	No

Location / Room Description		Lead in Paint Description	Reference Sample No. (Lead Weight %)	Mercury Thermostats	PCB Suspected in Light Ballasts
57	Corridor	White Wall Paint	Actual L-11 (<0.0549%)	No	No
58	Storage Room	White Ceiling Paint Yellow Wall Paint	NA NA	No	No
59	Storage Room	White Ceiling Paint Green Wall Paint Grey Floor Paint	N/A	No	No
60	Storage Room	Taupe Ceiling and Wall Paint	N/A	No	No
61	Storage Room	White Wall Paint	VL-11 (<0.0549%)	No	No
62	Storage Room	NA	N/A	No	No
63	Storage Room	Light Coloured Wall Paint	Actual L-14 (0.3351%)	No	No
64	Transport Canada	Grey Column Paint Yellow Wall Paint Purple Wall Paint White @Photocopier	Actual 13 (0.062%) Actual 14 (<0.0075%) Actual 15 (0.0073%) Actual 16 (<0.0095%)	No	No
65	Office	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
66	Office	Light Grey Wall Paint	VL-04 (0.3113%)	No	No

Location / Room Description		Lead in Paint Description	Reference Sample No. (Lead Weight %)	Mercury Thermostats	PCB Suspected in Light Ballasts
67	Office	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
68	Meeting Room	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
69	Office	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
70	Office	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
71	Lunch Room	Beige Paint on Wall	Actual L-06 (0.0792%)	No	No
72	Office	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
73	Library	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
74	File Room	No Access	N/A	No	No
75	Men's Washroom	No Access	N/A	No	No
76	Women's Washroom	No Access	N/A	No	No
77	Custodial Closet	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
78	File Area	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
79	Office Space	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
80	Entrance to Observation Room and Observation Deck	Yellow Wall Paint	VL-05 (0.5089%)	No	No

Location / Room Description		Lead in Paint Description	Reference Sample No. (Lead Weight %)	Mercury Thermostats	PCB Suspected in Light Ballasts
81	Elevator Lobby	New Renovation	N/A	No	No
82	Handicap Washroom	No access	N/A	No	No
83	Pipe Chase	NA	N/A	No	No
84	Office	NA	N/A	No	No
85	Office	NA	N/A	No	No
86	Corridor	New Renovation	N/A	No	No
87	Lobby	NA	N/A	No	No
88	Stairs Spy Room	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
		Yellow Wall Paint	Actual L-05 (0.5089%)	No	No
89	Training Room	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
90	Lunch Room	Light Grey Wall Paint Grey/White Wall Paint	VL-04 (0.3113%) Actual 18 (<0.012%)	No	No
91	Supply Room	No Suspect Lead Paints	N/A	No	No
92	Storage Room	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
93	Handicap Washroom	Light Grey Wall Paint	VL-04 (0.3113%)	No	No

Location / Room Description		Lead in Paint Description	Reference Sample No. (Lead Weight %)	Mercury Thermostats	PCB Suspected in Light Ballasts
94	Women's Washroom	No access	N/A	No	No
95	Women's Change Room	No Access	N/A	No	No
96	Office Area		N/A	No	No
97	Office		N/A	No	No
98	Storage Room		N/A	No	No
99	Retail Area	New Renovation	N/A	No	No
100	Lobby	New Renovation	N/A	No	No
101	Galley/Mail Drop Box	No Access	N/A	No	No
102	Mail Drop	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
103	Mail Drop Room	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
104	Mezzanine	Grey Floor Paint Yellow Wall Paint Light Blue Wall Paint	Actual 10 (0.23%) Actual 11 (0.045%) Actual 12 (0.13%)	No	No
105	Mail Sorting Area	Light Grey Wall Paint White Column Paint	VL-04 (0.3113%) Actual 17 (0.088%)	No	No

Location / Room Description		Lead in Paint Description	Reference Sample No. (Lead Weight %)	Mercury Thermostats	PCB Suspected in Light Ballasts
106	Loading Dock	Black Door/Trim Paint	Actual L-08 (<0.0156%)	No	No
		Blue Door Paint	Actual L-09 (<0.0460%)	No	No
107	Exhaust Room	Blue Door Paint	VL-09 (<0.0460%)	No	No
108	Loading Dock	Blue Door Paint	VL-09 (<0.0460%)	No	No
109	Men's Change Room Custodial Closet	Light Beige Paint	Actual L-07 (0.2052%)	No	No
		Light Grey Wall Paint	VL-04 (0.3113%)	No	No
110	Men's Washroom	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
111	Freight Elevator	No Access	N/A	No	No
112	Office	White Wall Paint - General	VL-03 (0.1969%)	No	No
113	Stairwell	White Wall Paint - General	VL-03 (0.1969%)	No	No
114	Meeting Room	White Wall Paint - General	VL-03 (0.1969%)	No	No
115	Meeting Room	White Wall Paint – General Peach Paint (above tile)	VL-03 (0.1969%) Actual 5 (0.0076%)	No	No

Location / Room Description		Lead in Paint Description	Reference Sample No. (Lead Weight %)	Mercury Thermostats	PCB Suspected in Light Ballasts
116	Reception	White Wall Paint – General Yellow (2009)	VL-03 (0.1969%) NA	No	No
117	Office	White Wall Paint - General	VL-03 (0.1969%)	No	No
118	Storage Room	White Wall Paint - General	VL-03 (0.1969%)	No	No
119	Coast Guard/DFO	White Wall Paint - General White/Blue/Pink Wall Paint	VL-03 (0.1969%) Actual 4 (<0.057%)	No	No
120	Office	White Wall Paint - General	VL-03 (0.1969%)	No	No
121	Meeting Room	White Wall Paint - General	Actual L-03 (0.1969%)	No	No
122	Meeting Room	White Wall Paint - General	VL-03 (0.1969%)	No	No
123	Coast Guard	Light Grey Wall Paint Yellow Bulkhead Taupe (2012)	VL-04 (0.3113%) Actual 8 (0.53%) NA	No	No
124	Locker Room	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
125	LAN Room	White Wall Paint – General Pink and Green (above tile)	VL-03 (0.1969%) Actual 6 (0.18%) Actual 7 (0.29%)	No	No

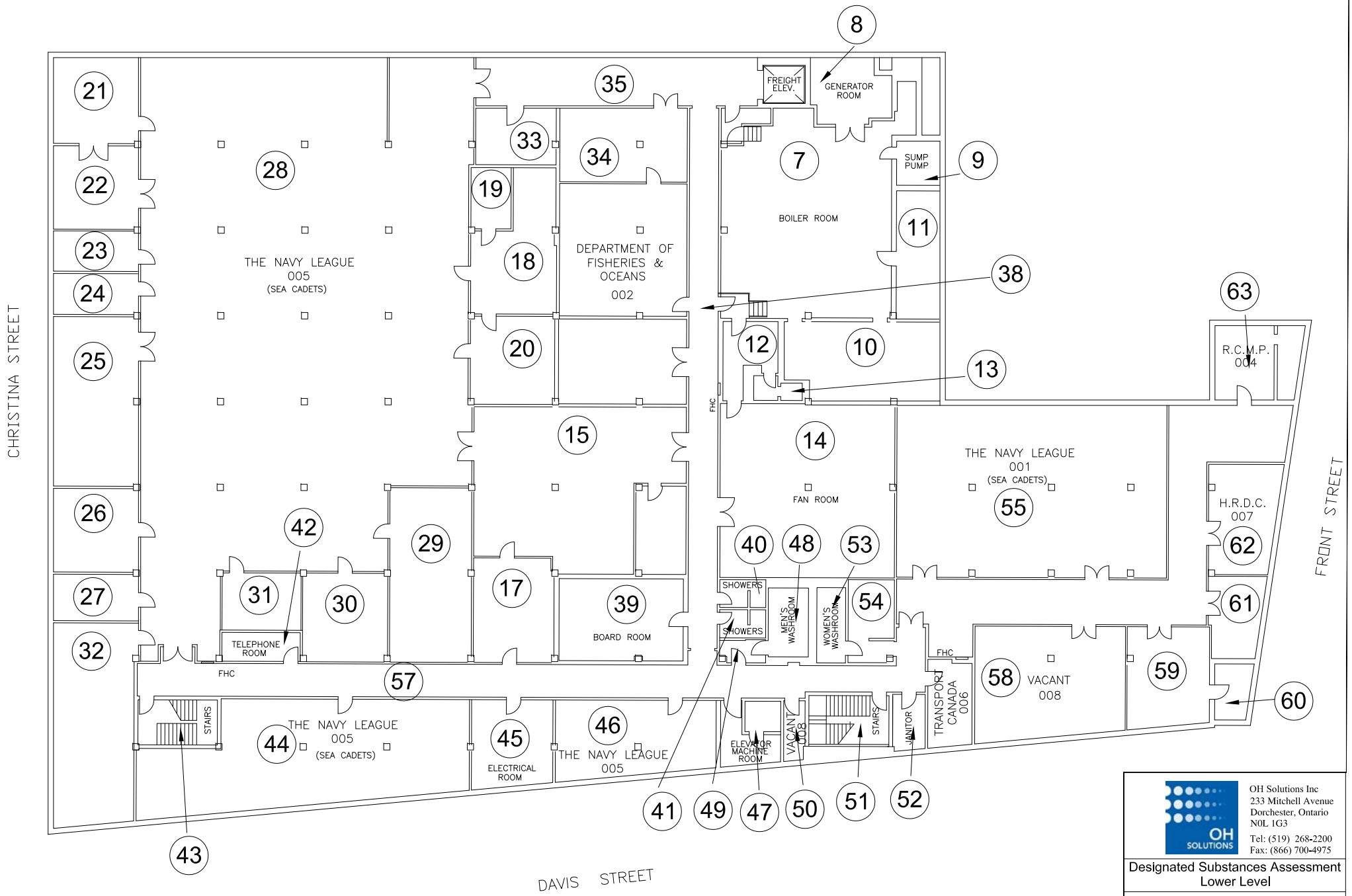
Location / Room Description		Lead in Paint Description	Reference Sample No. (Lead Weight %)	Mercury Thermostats	PCB Suspected in Light Ballasts
126	Kitchen	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
127	Office	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
128	DFO	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
129	DFO	Light Grey Wall Paint Light Blue (2010)	VL-04 (0.3113%) NA	No	No
130	Custodial Closet		N/A	No	No
131	Men's Washroom		N/A	No	No
132	Handicap Washroom	No Access	N/A	No	No
133	Women's Washroom	No Access	N/A	No	No
134	Electrical Room	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
135	Vacant Room	Blue/Pink Bulkhead Grey wall paint (2010)	Actual 2 (0.24%) NA	No	No
136	Vacant Room	Grey/White Wall Paint	N/A	No	No
137	Reception	Grey/White Wall Paint	N/A	No	No
138	Corridor	Grey/White Wall Paint	N/A	No	No

Location / Room Description		Lead in Paint Description	Reference Sample No. (Lead Weight %)	Mercury Thermostats	PCB Suspected in Light Ballasts
139	Office	Grey/White Wall Paint	N/A	No	No
140	Office	Grey/White Wall Paint	N/A	No	No
141	Office	Grey/White Wall Paint	N/A	No	No
142	Washroom	Grey/White Wall Paint	N/A	No	No
143	Telephone Room	Grey/White Wall Paint	N/A	No	No
144	Vacant Room	Grey/White Wall Paint	N/A	No	No
145	Stairwell	Grey/White Wall Paint	N/A	No	No
146	Office	Grey/White Wall Paint	N/A	No	No
147	Office	Light Grey Wall Paint	VL-04 (0.3113%) Actual 1 (<0.0065%)	No	No
148	Office	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
149	Boardroom	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
150	Office	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
151	Office	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
152	Washroom	Light Grey Wall Paint	VL-04 (0.3113%)	No	No

Location / Room Description		Lead in Paint Description	Reference Sample No. (Lead Weight %)	Mercury Thermostats	PCB Suspected in Light Ballasts
153	Office	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
154	Photocopy Room	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
155	Corridor	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
156	Corridor	Light Grey Wall Paint	Actual L-04 (0.3113%)	No	No
157	Corridor	Light Grey Wall Paint	VL-04 (0.3113%)	No	No
158	Corridor	Grey/blue Wall Paint on Original Plaster	Actual L02 (0.2622%)	No	No
159	Roof Top Mechanical Room	Grey Floor Paint Exterior Chiller Paint	Actual L-01 (0.0786%) Actual 9 (0.011%)	No	No

APPENDIX III

BUILDING DRAWINGS

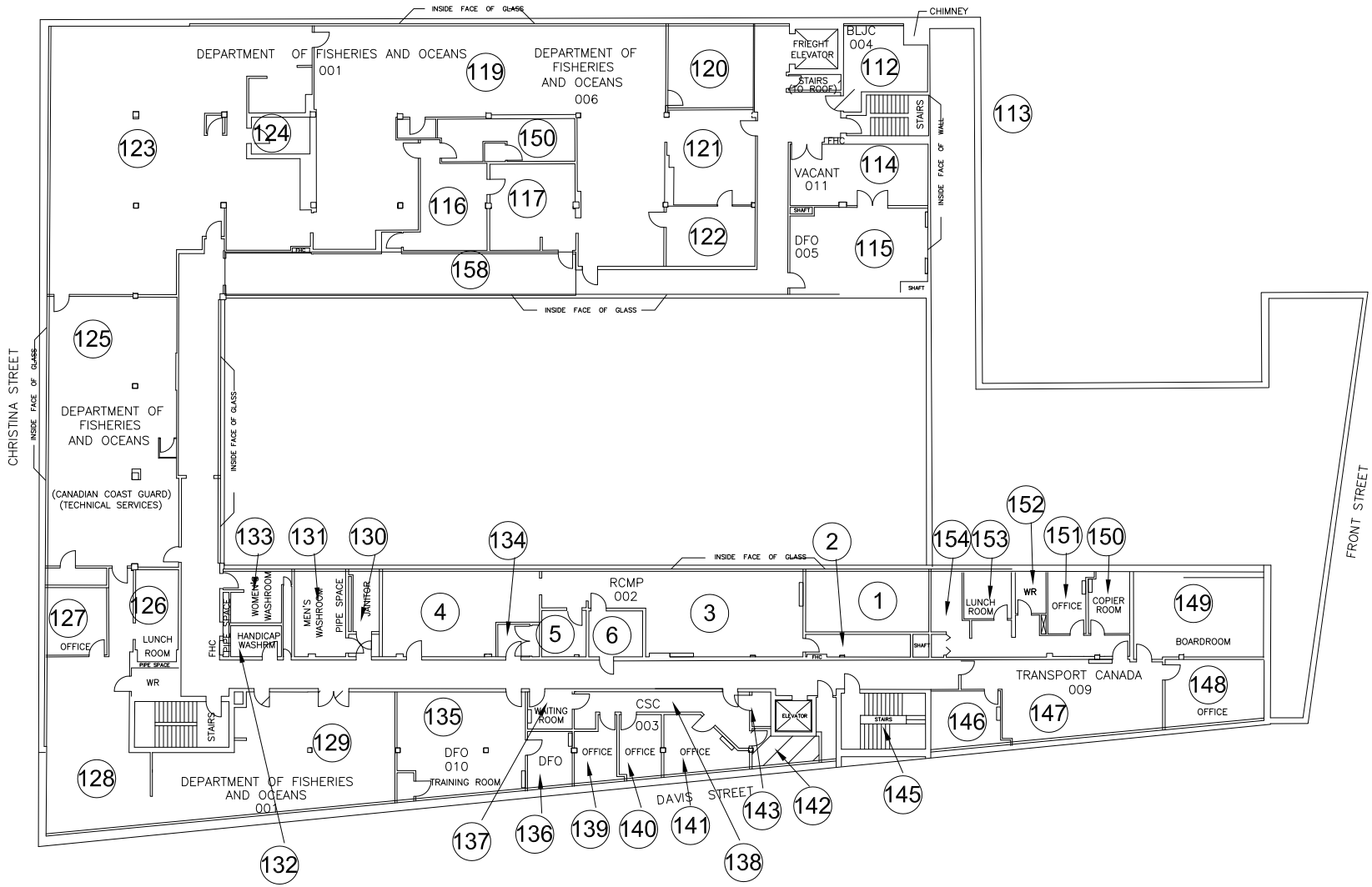


OH Solutions Inc
233 Mitchell Avenue
Dorchester, Ontario
N0L 1G3
Tel: (519) 268-2200
Fax: (866) 700-4975

Designated Substances Assessment
Lower Level

Government of Canada Building
105 Christina Street - Sarnia, Ontario
Building #5520068

SCALE:	DATE:
NTS	10/10/12
DRAWING #: 001	OHS PROJECT: 12-030

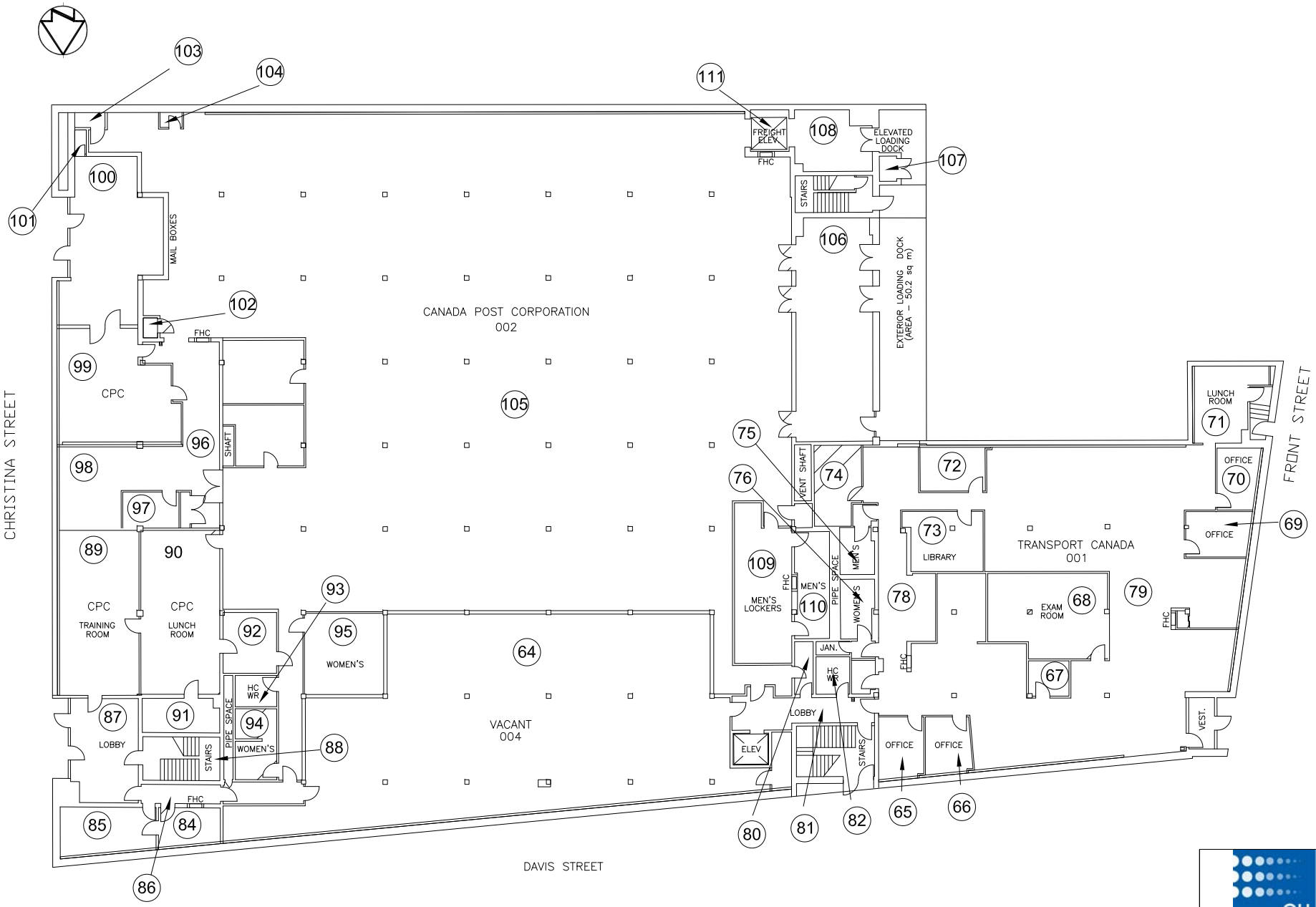


OH Solutions Inc
233 Mitchell Avenue
Dorchester, Ontario
N0L 1G3
Tel: (519) 268-2200
Fax: (866) 700-4975

Designated Substances Assessment
Second Level

Government of Canada Building
105 Christina Street - Sarnia, Ontario
Building #5520068

SCALE:	DATE:
NTS	10/10/12
DRAWING #: 003	OHS PROJECT: 12-030



OH Solutions Inc
233 Mitchell Avenue
Dorchester, Ontario
N0L 1G3
Tel: (519) 268-2200
Fax: (866) 700-4975

Designated Substances Assessment
Main Floor

Government of Canada Building
105 Christina Street - Sarnia, Ontario
Building #5520068

SCALE:	DATE:
NTS	10/10/12
DRAWING #: 002	OHS PROJECT: 12-030