Halifax Regional School Board

Purchasing Division

TENDER # 3926
Skilled Trades Building-Sir John A. Macdonald High School
Addendum #5

January 3rd, 2018
12:15 P.M.

To: Bidders

From: Don Walpola, Buyer

Pages: 2 including cover

Phone: 464-2000(ext. 2223)

The bid documents shall be amended and new drawings and clauses added, and shall become part of the contract documents as follows:

QUESTIONS FROM CONTRACTORS

1. *The specifications as well as the drawings make mention of a Geotechnical Report prepared by Conquest Engineering. This report does not seem to be included with the tender documents.*

   Answer:

   Reference specification section 31 00 00 Earthwork,
   Add: Geotechnical Investigation Report Prepared by Conquest Engineering, dated December 11, 2017.

2. *Drawing A101 indicates a "Smart Board" located along GL 4, however no specifications are provided. Please confirm Smart Board is supplied & installed by others. If Smart Board is to be supplied & installed by the General Contractor, please provide specification.*

   Answer:

   Reference Drawing A101 and EP101,
   Clarification: Power and data to be provided for the Smart Board as indicated on EP101. Smartboard supply and install by others.

   The HRSB will be supplying and installing the Smart Board indicated in the drawings and Specs. The constructor is only responsible to install the power and network infrastructure related to the smart board as per the drawings and specs.

3. *The plans show a 75mm one lift of asphalt with no overlap, but the specs are reflecting a minimum of 300mm overlap from new to existing. With that being said, how thick would the overlap be on the existing when you are placing a 75mm one lift of asphalt*

Answer:

Reference C101 Site Service and Grading Plan and Specification section 32 12 16 Asphalt Paving; Clarification: Provide minimum 32mm thickness overlap where the new meets the existing asphalt.

End of Addendum #5

PLEASE SIGN BELOW AND RETURN WITH BID DOCUMENTS:

_____ _____

Signature Company Name

CC: Nova Scotia Construction Association Fax # 468-2470

Conquest Engineering
Experience commitment.
Geotechnical and Materials Engineers

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December 11, 2017

Mr. Gary Mannette
Halifax Regional School Board
33 Spectacle Lake Drive
Dartmouth, NS B3B 1X7

Dear Mr. Mannette,

Re: Geotechnical Investigation – Skilled Trades Building
Scholars Road, Upper Tantallon, NS

This is our geotechnical investigation report for the proposed skilled trades building on Scholars Road in Upper Tantallon, Nova Scotia. The subsurface conditions are generally good for spread footing foundations. Excavations into bedrock will be required and will require the use of hydraulic breakers.

The subsurface conditions encountered throughout the site generally consist of rootmat/topsoil overlying glacial till and then bedrock, except for an area of existing fill on the northeastern portion of the site. Glacial till was encountered at depths between 0.1 m and 0.2 m. Fill was encountered in Test Pits 7 to 9, overlying the bedrock and ranged in thickness from 0.7 m to 2.2 m. Bedrock was encountered at depths between 0.1 m and 1.1 m on the southwestern portion of the site and between 0.1 m and 2.3 m on the northeastern portion of the site. Groundwater was not encountered in the test pits. The test pits were excavated to depths of up to 2.3 m.

The main findings/recommendations from our investigation are as follows:

- Bedrock was encountered at shallow depths throughout the site. Bedrock elevations are generally above the road elevation on the southwestern portion of the site and near or below the road elevation on the northeastern portion. Due to the amount of bedrock excavation that would be required on the southwestern portion of the site, the northeastern portion would likely be the more cost effective location for the building.

- A foundation system with footings founded on undisturbed glacial till, approved structural fill or bedrock would be practical for this site following site work.

- The existing fill should be removed from within the building area and reinstated with structural fill. Structural fill should be placed and compacted in lifts to design grades, as required.

- In the proposed paved areas, the rootmat/topsoil should be removed and the areas should be cut to the design subgrade elevation and proof-rolled. Any weak or soft zones should be replaced with approved fill.

- Excavations will encounter bedrock at shallow depths. The use of hydraulic breakers should be anticipated by the contractor to achieve design grades. Blasting could be considered but it might not be practical.

- Geotechnical inspection of earthworks is recommended (and is required for building permits).

Please contact us if you have any questions.

Thank you,

Devan McKenney, P.Eng.
Geotechnical Engineer
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R. Bruce MacNeil, P.Eng.
Senior Geotechnical Engineer
bmacneil@conquest-eng.com

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APPENDICES

1.0 INTRODUCTION

We have conducted a geotechnical investigation for the proposed skilled trades building on Scholars Road in Upper Tantallon, Nova Scotia, at the request of the Halifax Regional School Board. The purpose of this investigation was to evaluate the subsurface conditions at the site and to provide recommendations.

This report presents all of our findings and our recommendations for foundation design and general site work. This report includes recommendations for geotechnical works only.

2.0 SITE DESCRIPTION AND GEOLOGY

The proposed development is located on Scholars Road in Upper Tantallon, NS. The site is generally grass covered. A garbage disposal area for the high school is located on the northeastern side of the site and consists of a concrete slab and chain link fence.

The site generally slopes down to the southeast; however, there is a mound on the south side of the site.

Photograph A shows a view of the site from the south.

Photograph A: View of the site from the south.

Based on geologic mapping, the principal soil type in the area is stony till plains. Bedrock in the area is mapped as granite of the South Mountain Batholith.

3.0 SUMMARIZED SUBSURFACE CONDITIONS

The field program consisted of nine (9) test pits (TP1 to TP9) completed on November 27, 2017. The test pit locations are shown in Figure A (Drawing 1, appended, is a complete location plan).

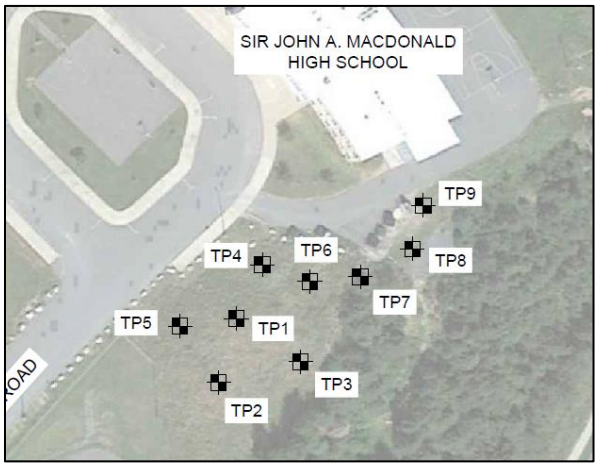

Figure A: Test Pit Locations

The test pits were conducted using an excavator. Representative samples were taken during the field work and the conditions at the test pits were logged in detail. The soil conditions encountered at the site are described in detail on the appended Test Pit Records and summarized below in the following paragraphs and Table A.

The subsurface conditions encountered throughout the site generally consist of rootmat/topsoil overlying glacial till and then bedrock, except for an area of existing fill on the northeastern portion of the site. Glacial till was encountered at depths between 0.1 m and 0.2 m. Fill was encountered in Test Pits 7 to 9, overlying the bedrock and ranged in thickness from 0.7 m to 2.2 m. Bedrock was encountered at depths between 0.1 m and 1.1 m on the southwestern portion of the site and between 0.1 m and 2.3 m on the northeastern portion of the site. Groundwater was not encountered in the test pits. The test pits were excavated to depths of up to 2.3 m.

Table A: Summary of Findings – Test Pits

Location	Elevation[1] (m)	Thickness of Rootmat / Topsoil (mm)	Depth to Glacial Till (m)	Depth to Bedrock (m)	Depth of Test Pit (m)
TP1	93.6	130	--	0.1	0.5
TP2	90.5	130	0.1	0.8	0.8
TP3	90.7	130	0.1	1.1	1.1
TP4	92.6	230	0.2	0.3	0.3
TP5	92.0	180	0.2	0.5	1.1
TP6	92.2	100	0.1	0.3	0.3
TP7	92.7	100	--	0.1/1.2[2]	1.2
TP8	93.3	100	--	0.3/2.3[2]	2.3
TP9	93.0	180	--	0.9	0.9

Notes: [1]Geodetic Datum. Ground surface elevation taken with GPS mapping unit.
[2]Bedrock was encountered at different depths on opposite sides of the test pit.

4.0 DISCUSSION AND RECOMMENDATIONS

4.1 Main Findings

It is understood that the site is intended to be developed for a new skilled trades building for the high school. The subsurface conditions are generally good for spread footing foundations. Excavations into bedrock will be required and will require the use of hydraulic breakers.

The main findings/recommendations from our investigation are as follows:

- Bedrock was encountered at shallow depths throughout the site. Bedrock elevations are generally above the road elevation on the southwestern portion of the site and near or below the road elevation on the northeastern portion. Due to the amount of bedrock excavation that would be required on the southwestern portion of the site, the northeastern portion would likely be the more cost effective location for the building.

- A foundation system with footings founded on undisturbed glacial till, approved structural fill or bedrock would be practical for this site following site work.

- The existing fill should be removed from within the building area and reinstated with structural fill. Structural fill should be placed and compacted in lifts to design grades, as required.

- In the proposed paved areas, the rootmat/topsoil should be removed and the areas should be cut to the design subgrade elevation and proof-rolled. Any weak or soft zones should be replaced with approved fill.

- Excavations will encounter bedrock at shallow depths. The use of hydraulic breakers should be anticipated by the contractor to achieve design grades. Blasting could be considered but it might not be practical.

- Geotechnical inspection of earthworks is recommended (and is required for building permits).

The following sections outline our geotechnical recommendations for site preparation and design.

4.2 Earthworks

Earthworks for this project will likely involve excavations into the fill, glacial till, and bedrock, and placement of fill to achieve design grade elevations if required.

Bedrock was encountered very close to the ground surface. It is anticipated that excavations into bedrock will require the use of hydraulic breakers.

4.2.1 Surface Water Control and Erosion Control

Prior to excavations, surface water drainage controls should be provided on the up-gradient side of the site to minimize run-off onto exposed soils. Suitable erosion and sedimentation control measures should be employed. These may include silt fences, check dams in ditches, and granular working pads.

4.2.2 Excavation

Excavation into the site soils will be practical with conventional earth-moving equipment. Excavations into bedrock will be required and will require the use of hydraulic breakers. The bedrock surface appears to be very irregular on the northeastern side of the site.

The existing fill should be removed from within the building area and reinstated with approved fill. Approved fill should be placed and compacted in lifts to design grades, as required.

In the proposed paved areas, the rootmat/topsoil should be removed and the areas should be cut to the design subgrade elevation and proof-rolled with a 10-tonne steel drum vibratory roller. Any weak or soft zones should be replaced with approved fill.

Temporary excavated side slopes in soil should be stable at one horizontal to one vertical (1H:1V). Material that is planned for re-use should be placed directly in the intended areas or compacted in stockpiles for later use. Unsuitable materials should be used in landscaped areas or wasted in an approved area. Excavated material containing organics will not be suitable for reuse in development areas.

4.2.3 Dewatering of Excavations

With proper surface water controls, dewatering of excavations through the use of ditches and swales draining to sumps would be practical. Construction dewatering should be planned for excavations for footings, services, and other underground structures.

4.2.4 Fill Placement and Compaction

Fill required for the building and pavement areas should consist of the following:

- approved on-site soils, or;
- imported, quarried rockfill and gravel or sand and gravel pit run.

The onsite soil considered for re-use should be at or near optimum moisture content (ASTM D698). Excavated organic material will not be suitable for re-use.

The lift thickness used during placement of fills must be compatible with the compaction equipment and the material type to ensure the specified density throughout. The lift thickness should not exceed approximately 450 mm for mass filling and 200 mm for backfilling of foundations and services. The maximum particle size should be no larger than ⅔ of the lift thickness.

Fill materials should be compacted to the following percentage of maximum Standard Proctor dry density:

- Fill in building areas 100%
- Fill within 0.3 m of paved area subgrade 98%
- Fill below 0.3 m of paved area subgrade 95%
- Landscaped areas 93%

Where fill is needed below footings, the fill must be extended laterally beyond the edges of the footings to include a 0.3 m bench and the conventional 1H:1V splay.

4.2.5 Slopes and Toe Drainage

Permanent fill slopes should be 2H:1V, or lower. Permanent cut slopes should be stable at 3H:1V for slope heights of less than 2 m. Cut slopes of greater heights will require a 300 mm thick granular blanket or deep rooting vegetation to reinforce the slope. A toe drain or swale should be provided for drainage at the base of cut slopes.

4.2.6 Building and Parking Area Subgrade

The contractor must take precautions to avoid disturbance of the site soils, or reinstate the material to the required condition. The condition of the subgrade should be reviewed prior to placement of base gravel.

4.2.7 Inspection and Testing

It is recommended that inspection of all footing bearing surfaces be conducted by experienced geotechnical personnel prior to placement of concrete. Inspection and testing is also recommended during site grading and backfilling operations.

4.3 Foundations

A foundation system consisting of spread footings and a grade slab founded on structural fill, undisturbed glacial till, or bedrock is favorable for the proposed building.

4.3.1 Shallow Foundations

For analysis using Limit States Design for footings on soil, we calculated bearing capacities for square and strip footings up to 3.0 m for a settlement tolerance of 25 mm. Other bearing capacities for other footing sizes (or settlement tolerances) can be provided at your request. Bearing resistance values for square and strip footings founded on structural fill or undisturbed glacial till are plotted on Figures 1 and 2 in the appendix.

For comparison using the old Working Stress design approach, an allowable bearing pressure of 200 kPa for a tolerable settlement of 25 mm and footing size up to 2.0 m would have been used for a footing founded on structural fill or undisturbed glacial till. This includes a global factor of safety of 3.

For footings founded directly on undisturbed bedrock we estimated factored bearing resistance for square and strip footings of 1500 kPa. This includes a geotechnical resistance factor of 0.5. The settlement for footings bearing on bedrock is negligible and therefore SLS bearing resistance do not apply.

For foundations founded on bedrock, the use of lean concrete should be anticipated to provide a level surface for footing construction.

Differential settlement up to 25 mm may be expected across the site for footings bearing on structural fill or undisturbed till and footings bearing on bedrock. However, this will depend on the footing size and design loads. This can be reviewed once more details are known.
Exterior footings should be founded a minimum of 1.2 m below grade for frost protection, or equivalent insulation provided.

4.3.2 Slab on Grade and Exterior Slabs

A conventional grade slab founded on approved structural fill, undisturbed glacial till, or bedrock is practical for this site. A 150 mm thick layer of DTIR Type 1 Gravel is recommended below the floor slab for levelling and support purposes. The gravel should be compacted to 100% Standard Proctor.

We typically recommend a 50 mm thickness of approved insulation for frost protection of exterior slabs but this may vary depending on subgrade type and slab thickness and should be reviewed once more details are known. The insulation should extend 1.0 m beyond the slab edge.

For a slab on grade, a perimeter foundation system is recommended, unless the surrounding finished exterior grades are below the floor elevation.

4.4 Pavement Structure

With the subgrade prepared as outlined in Section 4.2, the following pavement structure is recommended. However, it will be critical to evaluate the subgrade prior to placement of gravel.

Table B: Pavement Structure Thicknesses

Material	Standard Duty Pavement[1]	Heavy Duty Pavement
Asphalt Concrete:		
Top Course (C Mix)	75 mm	40 mm
Base Course (B Mix)	-	50 mm
Type 1 Gravel	150 mm	150 mm
Type 2 Gravel	150 mm	200 mm

Notes: [1]Cars and light trucks.

All aggregate and asphalt concrete materials should meet the DTIR Standard Specifications. The gravels should be compacted to 100% of Standard Proctor maximum dry density. Asphalt concrete should be compacted to 92.5% of Maximum Theoretical Relative Density.

4.5 Seismic Classification

The site classification for seismic site response was based on our local experience in the area and our geotechnical investigation.

The recommended site classification for seismic site response, as per Table 4.1.8.4.A of NBCC 2015 is Site Class B.

4.6 Additional Geotechnical Services

It is recommended that inspection of the footing bearing surfaces be conducted by Conquest Engineering prior to placement of concrete. Inspection and testing is recommended during site grading and backfilling operations.

5.0 CLOSURE

This report has been prepared for the sole benefit of the Halifax Regional School Board, its designates, nominees and partners. Any use or reliance on this report under any of the following conditions would render this report inapplicable:

- where there have been any change in site conditions; or
- where used for purposes not intended or delineated in this report; or
- where used by third parties without express written agreement of Conquest Engineering.

Any use of, or reliance upon, this report under such circumstances or by such parties is strictly prohibited and without risk or liability to Conquest.

Conquest Engineering used reasonable care, skill, competence and judgment in the preparation of this report. The information and conclusions contained in this report are based upon work undertaken by trained professional and technical staff in accordance with generally accepted engineering and scientific practices current at the time the work was performed. The information and conclusions contained in this report are generally consistent with professional standards for individuals providing similar services at the same time, in the same locale and under like circumstances.

A field investigation is a limited sampling of a site. Some variation between sampling locations should be expected. The conclusions presented in this report represent the best technical judgment of Conquest Engineering based on the data obtained from the work. The conclusions are based on the site conditions observed by Conquest Engineering at the time the work was performed at the specific testing and/or sampling locations, and can only be extrapolated to an undefined limited area around these locations. The extent of the limited area depends on the soil and groundwater conditions, as well as the history of the site reflecting natural, construction and other activities. Due to the nature of the investigation and the limited data available, Conquest Engineering cannot warrant against undiscovered environmental liabilities.

If any conditions become apparent that differ significantly from our understanding of conditions as presented in this report, we request that we be notified immediately to reassess the conclusions provided herein. Further, if there are changes to the proposed work, such as adjustments in founding elevation or building loads, etc., we require that we be notified to allow for review of our recommendations.

Devan McKenney, P.Eng.
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R. Bruce MacNeil, P.Eng.
Senior Geotechnical Engineer
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APPENDIX A

CONQUEST ENGINEERING LTD.

SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT RECORDS
(NS and NL Offices)

SOIL DESCRIPTION

Terminology describing common soil genesis:

Topsoil	-	mixture of soil and humus capable of supporting good vegetative growth
Peat	-	fibrous aggregate of visible and invisible fragments of decayed organic matter
Till	-	unstratified glacial deposit which may range from clay to boulders
Fill	-	any materials below the surface identified as placed by humans (excluding buried services)

Terminology describing soil structure:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure
Varved	-	composed of regular alternating layers of silt and clay
Stratified	-	composed of alternating successions of different soil types, e.g. silt and sand
Layer	-	>75 mm
Seam	-	2 mm to 75 mm
Parting	-	< 2 mm
Well Graded	-	having wide range in grain sizes and substantial amounts of all intermediate particle sizes
Uniformly Graded	-	predominantly of one grain size

Terminology describing soils on the basis of grain size and plasticity is based on the Unified Soil Classification System (USCS) (ASTM D-2488). The classification excludes particles larger than 76 mm (3 inches). This system provides a group symbol (e.g. SM) and group name (e.g. silty sand) for identification.

Terminology describing materials outside the USCS, (e.g. particles larger than 76 mm, visible organic matter, construction debris) is based upon the proportion of these materials present:

Trace or occasional	Less than 10%
Some	10-20%
Numerous or Frequent	20% - 50%

The standard terminology to describe cohesionless soils includes the compactness (formerly “relative density”), as determined by laboratory test or by the Standard Penetration Test ‘N’ – value.

Relative Density	‘N’ Value	Compactness %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by insitu vane tests, penetrometer tests, unconfined compression tests, or occasionally by standard penetration tests.

Consistency	Undrained Shear Strength		'N' Value (approx.)
	kips/sq.ft.	kPa	
Very Soft	< 0.25	< 12.5	< 2
Soft	0.25 – 0.5	12.5 – 25	2 – 4
Firm	0.5 – 1.0	25 – 50	4 – 8
Stiff	1.0 – 2.0	50 – 100	8 – 15
Very Stiff	2.0 – 4.0	100 – 200	15 – 30
Hard	> 4.0	> 200	> 30

ROCK DESCRIPTION

Rock Quality Designation (RQD)

The classification is based on a modified core recovery percentage in which all pieces of intact core over 100 mm long are totalled and divided by the cone drilled length. The smaller pieces are considered to be due to close shearing, jointing, faulting, or weathering in the rock mass and are not counted. RQD was originally intended to be done on N-size (45 mm) core; however, it can be used on different core sizes if the bulk of the fractures caused by drilling stresses are easily distinguishable from in situ fractures.

RQD	ROCK QUALITY
90 – 100	very sound
75 – 90	sound
50 – 75	fractured
25 – 50	severely fractured
0 – 25	very severely fractured

Terminology describing rock mass:

Spacing (mm)	Bedding, Laminations, Bands	Discontinuities
2000 – 6000	*Very Thick*	*Very Wide*
600 – 2000	*Thick*	*Wide*
200 – 600	*Medium*	*Moderate*
60 – 200	*Thin*	*Close*
20 – 60	*Very Thin*	*Very Close*
< 20	*Laminated*	*Extremely Close*
< 6	*Thinly Laminated*	

Strength Classification	Uniaxial Compressive Strength (MPa)
Very Weak	1 – 5
Weak	5 – 25
Medium Strong	25 – 50
Strong	50 – 100
Very Strong	100 – 250
Extremely Strong	> 250

Terminology describing weathering:

Slight - Weathering limited to the surface of major discontinuities. Typically iron stained.
Moderate - Weathering extends throughout rock mass. Rock is not friable.
High - Weathering extends throughout rock mass. Rock is friable.

STRATA PLOT

Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols:

Boulders Cobbles Gravel | Sand | Silt | Clay | Organics | Asphalt | Concrete | Fill | Igneous Bedrock | Metamorphic Bedrock | Sedimentary

WATER LEVEL MEASUREMENT

Borehole or Standpipe

Piezometer

SAMPLE TYPE

SS	Split spoon sample (obtained by performing the standard Penetration Test)	AS	Auger Sample
		BS	Bulk Sample
		WS	Wash Sample
ST	Shelby tube or thin wall tube	HQ, NQ, BQ, etc. Rock core samples obtained with the use of standard size diamond drilling bits	
PS	Piston sample		
DC	Dynamic Cone Penetration		
SV	Field Shear Vane		

N- VALUE

Numbers in this column are the results of the Standard Penetration Test: the number of blows of a 140 pound (64kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (305 mm) into the soil. For split spoon samples where insufficient penetration was achieved and 'N' values cannot be presented, the blow count and penetration are shown.

OTHER TESTS

Symbols in this column indicate that the following laboratory tests have been carried out and the results are presented separately.

S	Sieve analysis	H	Hydrometer analysis
G_s	Specific gravity of soil particles	γ	Unit weight
k	Permeability	C	Consolidation
	Single packer permeability test; test interval from depth shown to bottom of borehole	CD	Consolidation drained triaxial
		CU	Consolidated undrained triaxial with pore pressure measurements
	Double packer permeability test; Test interval as indicated	UU	Unconsolidated undrained triaxial
		DS	Direct shear
	Falling head permeability test using casing	Q_u	Unconfined compression
		I_p	Point Load Index (I_p on Borehole Records equals I_p (50); the index corrected to a reference diameter of 50 mm)
	Falling head permeability test using well point or piezometer		

Conquest Engineering Ltd.

TEST PIT RECORD

Project Name: Skilled Trades Building

Location: Scholars Road, Upper Tantallon, NS

Project No.: 420-002

Client: Halifax Regional School Board

Water Level Date: Nov 27, 2017

Test Pit: 1

Sheet: 1 of 1

Date: Nov 27, 2017

Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			
Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	93.6				
		ROOTMAT	93.5				
		WEATHERED BEDROCK: Grey granite	93.1				
		End of Test Pit at 0.5 m - REFUSAL ON BEDROCK - groundwater not encountered					
1							
2							
3							
4							
5							

Conquest Engineering Ltd.

TEST PIT RECORD

Project Name: Skilled Trades Building

Location: Scholars Road, Upper Tantallon, NS

Project No.: 420-002

Client: Halifax Regional School Board

Water Level Date: Nov 27, 2017

Test Pit: 2

Sheet: 1 of 1

Date: Nov 27, 2017

Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			
Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	90.5				
		ROOTMAT	90.3				
		TILL: Dense light grey silty sand with gravel - trace cobbles - subangular to angular clasts - moist to wet			BS	1	
			89.7				
1		End of Test Pit at 0.8 m - REFUSAL ON INFERRED BEDROCK - groundwater not encountered					
2							
3							
4							
5							

Conquest Engineering Ltd.

TEST PIT RECORD

Project Name: Skilled Trades Building

Location: Scholars Road, Upper Tantallon, NS

Project No.: 420-002

Client: Halifax Regional School Board

Water Level Date: Nov 27, 2017

Test Pit: 3

Sheet: 1 of 1

Date: Nov 27, 2017

Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			
Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	90.7				
		ROOTMAT	90.6				
		TILL: Dense light grey silty sand with gravel - trace cobbles - subangular to angular clasts - moist to wet					
1			89.6				
		End of Test Pit at 1.1 m - REFUSAL ON INFERRED BEDROCK - groundwater not encountered					
2							
3							
4							
5							

TEST PIT RECORD

Conquest Engineering Ltd.

Project Name: Skilled Trades Building

Location: Scholars Road, Upper Tantallon, NS

Project No.: 420-002

Client: Halifax Regional School Board

Water Level Date: Nov 27, 2017

Test Pit: 4

Sheet: 1 of 1

Date: Nov 27, 2017

Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			
Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	92.6				
		ROOTMAT/TOPSOIL	92.4				
		TILL: Dense light grey silty sand with gravel - trace cobbles - subangular to angular clasts - moist to wet	92.3				
1		End of Test Pit at 0.3 m - REFUSAL ON INFERRED BEDROCK - groundwater not encountered					
2							
3							
4							
5							

Conquest Engineering Ltd.

TEST PIT RECORD

Project Name: Skilled Trades Building

Location: Scholars Road, Upper Tantallon, NS

Project No.: 420-002

Client: Halifax Regional School Board

Water Level Date: Nov 27, 2017

Test Pit: 5

Sheet: 1 of 1

Date: Nov 27, 2017

Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			
Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	92.0				
		ROOTMAT/TOPSOIL	91.8				
		TILL: Dense light grey silty sand with gravel - trace cobbles and boulders (up to 0.3 m in diameter) - subangular to angular clasts - moist to wet	91.5				
1		WEATHERED BEDROCK: Grey granite	90.9				
		End of Test Pit at 1.1 m - REFUSAL ON BEDROCK - groundwater not encountered					
2							
3							
4							
5							

Conquest Engineering Ltd.

TEST PIT RECORD

Project Name: Skilled Trades Building

Location: Scholars Road, Upper Tantallon, NS

Project No.: 420-002

Client: Halifax Regional School Board

Water Level Date: Nov 27, 2017

Test Pit: 6

Sheet: 1 of 1

Date: Nov 27, 2017

Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			
Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	92.2				
		ROOTMAT	92.1				
		TILL: Dense light grey silty sand with gravel - trace cobbles - subangular to angular clasts - moist to wet	91.9				
		End of Test Pit at 0.3 m - REFUSAL ON INFERRED BEDROCK - groundwater not encountered					
1							
2							
3							
4							
5							

TEST PIT RECORD

Conquest Engineering Ltd.

Project Name: Skilled Trades Building
Location: Scholars Road, Upper Tantallon, NS
Project No.: 420-002
Client: Halifax Regional School Board
Water Level Date: Nov 27, 2017

Test Pit: 7
Sheet: 1 of 1
Date: Nov 27, 2017
Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			
Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	92.7				
		ROOTMAT	92.6				
		FILL: Loose to compact brown silty sand with gravel - trace to some cobbles and boulders (up to 0.5 m in diameter) - trace roots/rootlets - subangular to angular clasts - moist to wet					
1			91.5				
		End of Test Pit at 1.2 m - REFUSAL ON BEDROCK - weathered bedrock encountered at 0.1 m on the south side of the test pit - groundwater not encountered					
2							
3							
4							
5							

TEST PIT RECORD

Conquest Engineering Ltd.

Project Name: Skilled Trades Building
Location: Scholars Road, Upper Tantallon, NS
Project No.: 420-002
Client: Halifax Regional School Board
Water Level Date: Nov 27, 2017

Test Pit: 8
Sheet: 1 of 1
Date: Nov 27, 2017
Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			
Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	93.3				
		ROOTMAT	93.2				
		FILL: Loose to compact brown silty sand with gravel - trace cobbles - subrounded to angular clasts - moist					
1							
2			91.0				
		End of Test Pit at 2.3 m - REFUSAL ON BEDROCK - bedrock encountered at 0.3 m on the east side of the test pit - groundwater not encountered					
3							
4							
5							

Conquest Engineering Ltd.

TEST PIT RECORD

Project Name: Skilled Trades Building

Location: Scholars Road, Upper Tantallon, NS

Project No.: 420-002

Client: Halifax Regional School Board

Water Level Date: Nov 27, 2017

Test Pit: 9

Sheet: 1 of 1

Date: Nov 27, 2017

Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			
Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	93.0				
		ROOTMAT	92.8				
		FILL: Compact brown silty sand with gravel - trace Type 1 Gravel layer at bottom - trace boulders (up to 0.3 m in diameter) - some cobbles - subangular to angular clasts - moist to wet	92.1				
1		End of Test Pit at 0.9 m - REFUSAL ON INFERRED BEDROCK - groundwater not encountered					
2							
3							
4							
5							

FACTORED ULS BEARING RESISTANCE (UNDISTURBED GLACIAL TILL OR STRUCTURAL FILL)

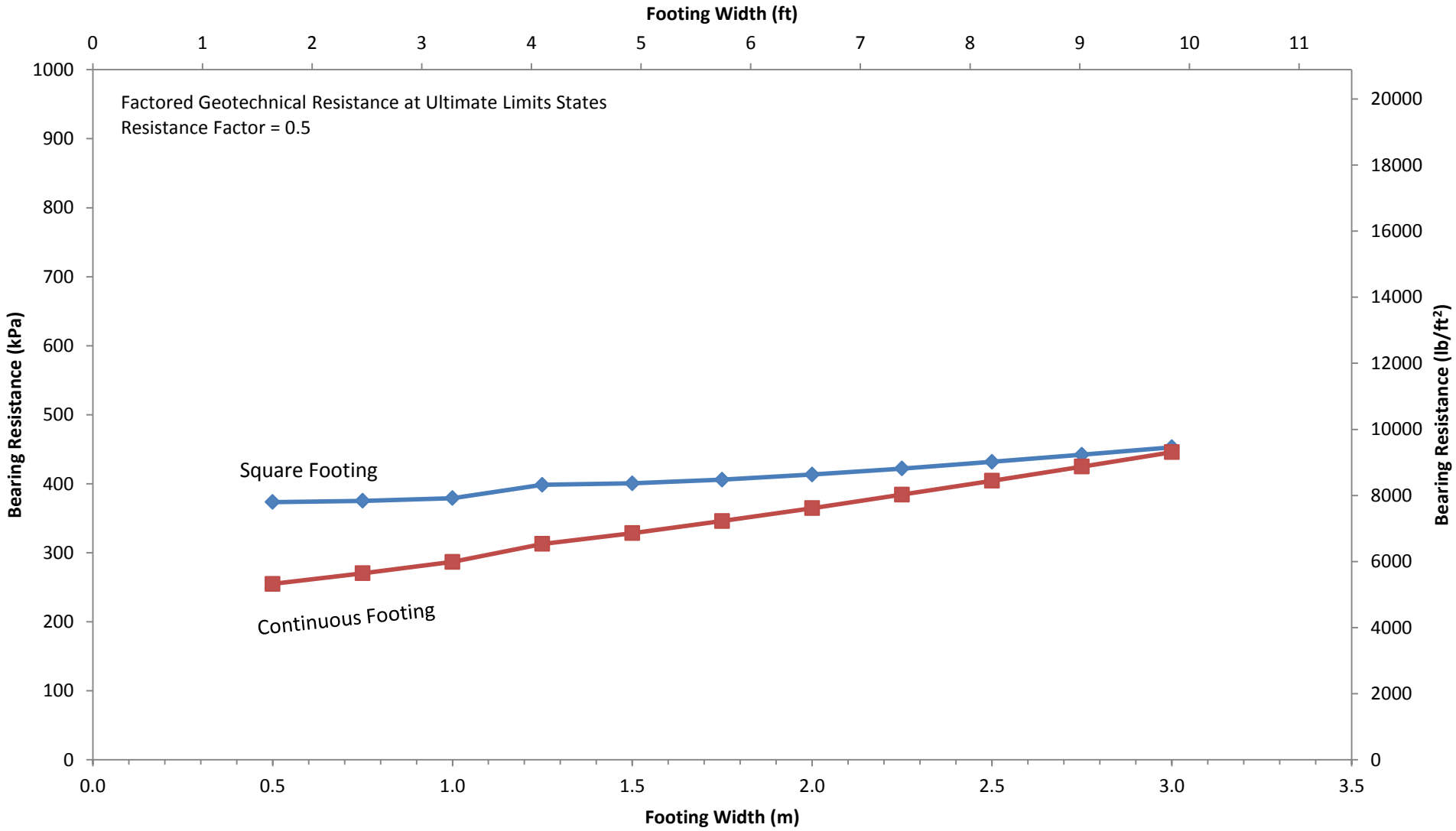


Figure 1

Project # 420-002

SLS BEARING RESISTANCE (UNDISTURBED GLACIAL TILL OR STRUCTURAL FILL)

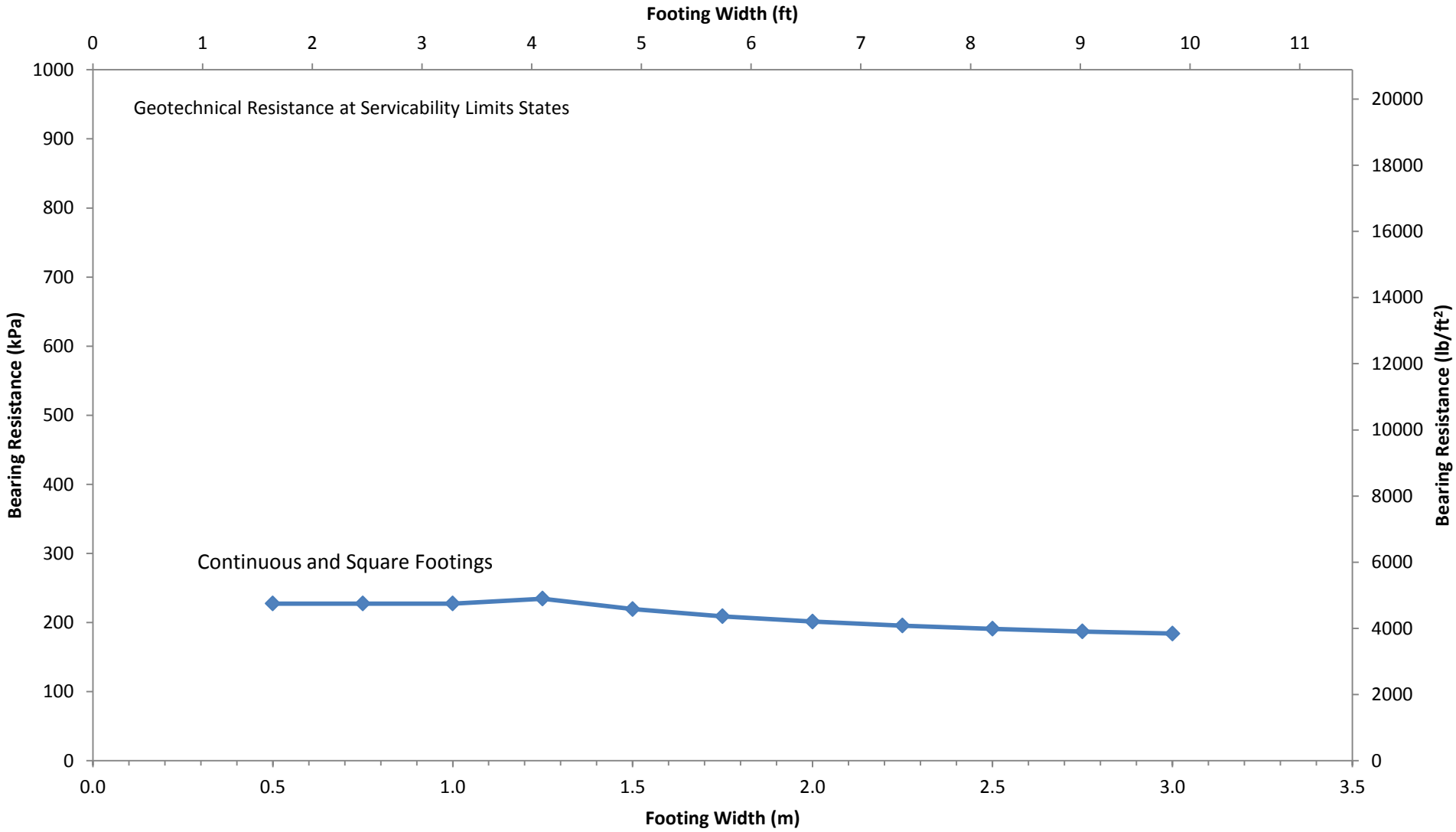


Figure 2

Project # 420-002

Photograph 1: Test Pit 1. November 27, 2017.

Photograph 2: Test Pit 2. November 27, 2017.

Photograph 3: Test Pit 3. November 27, 2017.

Photograph 4: Test Pit 4. November 27, 2017.

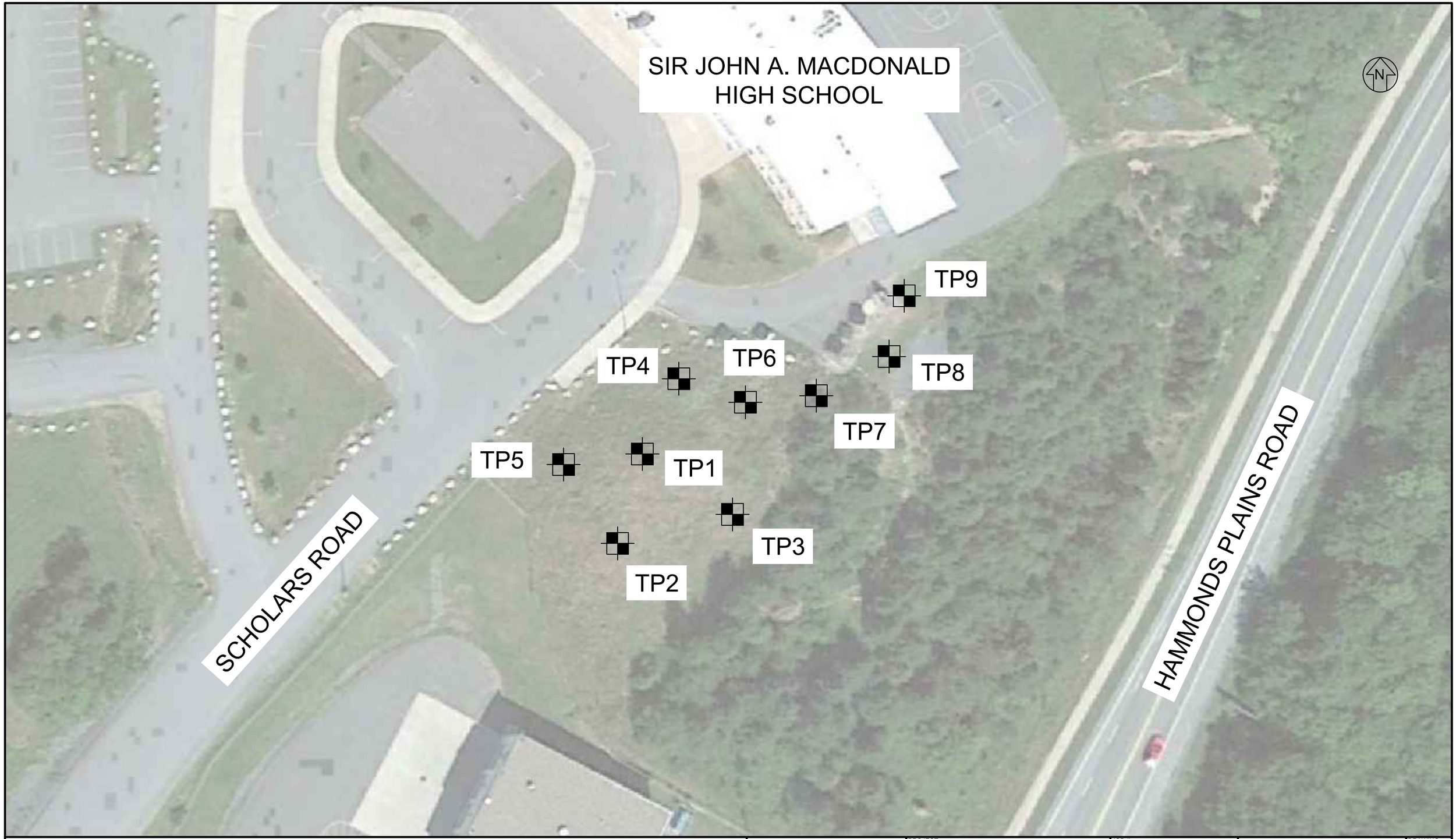
Photograph 5: Test Pit 5. November 27, 2017.

Photograph 6: Test Pit 6. November 27, 2017.

Photograph 7: Test Pit 7. November 27, 2017.

Photograph 8: Test Pit 8. November 27, 2017.

Photograph 9: Test Pit 9. November 27, 2017.



LEGEND

APPRO□IMATE CONQUEST TEST PITS □NOV 2017□

CONQUEST ENGINEERING LTD.
348 B□ie□□ter Ro□d
Bed□ord□No□□ Scot□□
B4B 1J6

PROJECT

TEST PIT LOCATION PLAN

SKILLED TRADES BUILDING
SCHOLARS ROAD
UPPER TANTALLON□NS

JOB #:	420-002
SCALE:	NTS
DATE:	06-DEC-2017
DRAWN BY:	DM
CHECKED BY:	RBM

DRAWING: 1

REV: 1

Halifax Regional School Board

Purchasing Division

TENDER # 3926
Skilled Trades Building-Sir John A. Macdonald High School
Addendum #4

January 2nd, 2018
10:30 A.M.

To: Bidders

From: Don Walpola, Buyer

Pages: 1 including cover

Phone: 464-2000(ext. 2223)

The bid documents shall be amended and new drawings and clauses added, and shall become part of the contract documents as follows:

QUESTIONS FROM CONTRACTORS

1.) In the Contractor's checklist, it indicates to provide "Applicable Warranty Information". Please advise what the expectations of this deliverable are at the time of tender.

Answer: 2 year warranty

2.) In section 01 45 00 – Quality Control, item 4.1 indicates the contractor is to provide inspection services and item 5.1 indicates it is by the owner. Section 31 23 10 , item 1.2.2 indicates costs off testing is by the owner. Please identify intent as it pertains to inspection and testing costs and if performed by the contractor, is this limited to concrete testing?

Answer: Concrete testing is to be covered by the contractor.

APPROVED ALTERNATE MANUFACTURES

Reference specification section 07 04 00 Preformed Metal Siding:

Add 'Ideal Roofing' and 'Agway' to list of approved alternate manufactures to steel corrugated siding. Gauge, profile and finish to be equivalent to VIcWest.

Reference specification section 07 41 10 Standing Seam Metal Roofing:

Add 'Agways' to list of approved alternate manufactures. Standing seam to roofing to be equivalent in gauge, profile and finish to product specified.

End of Addendum #4

PLEASE SIGN BELOW AND RETURN WITH BID DOCUMENTS:

_____ _____

Signature Company Name

CC: Nova Scotia Construction Association Fax # 468-2470

Halifax Regional School Board

Purchasing Division

TENDER # 3926
Skilled Trades Building-Sir John A. Macdonald High School
Addendum #3

December 29th, 2017
1:15 P.M.

To: Bidders From: Don Walpola, Buyer

Pages: 2 including cover Phone: 464-2000(ext. 2223)

The bid documents shall be amended and new drawings and clauses added, and shall become part of the contract documents as follows:

INSURANCE REQUIREMENTS TO BE INCLUDED IN TENDER #3926

Professional Liability for a combined single limit of no less than $5,000,000 per occurrence.

Wrap-Up Liability for a combined single limit of no less than $5,000,000 per occurrence.

QUESTIONS FROM CONTRACTORS

1. *There are differences between insurance requirements between section 00 73 00, GC 11.1 – Insurance and the Contractor's Checklist on page 129 of 129. Please clarify insurance requirements.*
    a. *General Liability – GC11.1 indicates a limit of $2M and Contractor's Checklist indicates $5M.*
    b. *Professional Liability – Indicated in Contractor's Checklist however not applicable for a lump sum tender.*

    Answer:
    a.) The Commercial General Liability should be $ 5,000,000
    b.) The pricing term does not impact the insurance requirements

2. *On the tender form and in the Contractor's Checklist, there is reference to a schedule being provided 5 days following award. Please advise what the intended deliverable is at time of tender closing for this item.*

    Answer: This refers to the timelines that will be followed by the successful contractor to complete all aspects of work in relation to this tender.

3. *In section 00 73 00 – Supplementary General Conditions, item 6.5.6 refers to costs incurred by the owner as a result of delay. Please identify the amount of these costs.*

    Answer: This would depend on what the costs were if the delay occurred and could only be determined at that time

4. *On drawing A-100, the height of the chain link fence and gates varies between details 3 and 4. Please clarify.*

   Answer: Gate and fence to be 6'-0" tall.

5. *There is no flooring specification provided however on drawing A105, it shows VCT with rubber base in room 104 – Washroom. Please provide specification.*

   Answer: Tarkett Expressions VCT flooring with 4" Johnsonite Rubber Base.

6. *Section 2 on drawing A104 shows non-slip sheet flooring with flash cove for Mezzanine 106 however in the finish schedule on drawing A105, this room is shown to have exposed hardened concrete. Please clarify intent.*

   Answer: Please delete non slip sheet flooring. Intent to be exposed concrete hardener.

7. *There is a section 10 80 00 - Washroom Accessories and a section 10 80 00 – Bath Accessories provided with the specification. Please indicate which of the two should be used as there is contradictory information between the two specifications.*

   Answer: Use 10 80 00 Bath Accessories. Delete section 10 80 00 Washroom Accessories.

8. *There is a section 31 23 10 – Earthwork and a section 31 00 00 – Earthwork provided with the specification. Are both of these sections applicable?*

   Answer: Use Section 31 00 00 Earthwork. Delete section 31 23 10 Earthwork.

9. *When we remove the existing slab inside the existing building for the new services, will we have full access to this space during regular working hours?*

   Answer: All work inside the classroom ,corridors or any other areas inside the school is to take place after school hours.

End of Addendum #3

PLEASE SIGN BELOW AND RETURN WITH BID DOCUMENTS:

_____ _____

Signature Company Name

CC: Nova Scotia Construction Association Fax # 468-2470

Halifax Regional School Board

Purchasing Division

TENDER # 3926
Skilled Trades Building-Sir John A. Macdonald High School
Addendum #2

December 29th, 2017
11:15 A.M.

To: Bidders From: Don Walpola, Buyer

Pages: 2 including cover Phone: 464-2000(ext. 2223)

The bid documents shall be amended and new drawings and clauses added, and shall become part of the contract documents as follows:

MECHANICAL

DRAWINGS

1. Reference Drawing MV601
    1. Heat Pump Schedules: Refer to 1/MC601 for room sensor and BACnet Adapter supplied with Heat pump.

2. Reference Drawing MC601
    1. Detail 3/MC601 revise title to "EF-1 Wiring & Control"
    2. Detail 3/MC601 Delete control damper and damper motor.
    3. Detail 2/MC601: EF-4, EF-W1 and EF-W2 are future.
    4. Refer to electrical drawing for control of Unit heater and baseboard by electrical.
    5. Ethernet for BAS to run back to existing Building BAS. Refer to electrical drawing for underground BAS conduit

SPECIFICATIONS

3. Section 20 05 03 Mechanical Contract Closeout
    .1 Paragraph 1.3.3 delete and add "Instruction duration time requirements at Substantial Performance as follows: Plumbing 4 hours, Air Distribution 4 hours and Controls 4 hours

4. Section24 72 00 Energy Recovery Equipment
    1. Paragraph 2.1 Add ".10 Acceptable Manufacturer Greenheck to the requirements listed"

5. Section 24 81 35 Variable Refrigerant Flow Multi Split Systems
    1. Paragraph 2.8 Add ".2 Samsung to the requirements listed"
    2. Paragraph 2.8 Add ".3 Daikin to the requirements listed"

6. Section 25 05 01 BAS Controls
    1. Paragraph 1.10.1 Add "include Service contact in tender piece."

ELECTRICAL

DRAWINGS:

1.0 Drawing E101

Reference Systems Legend

1. Revise Card Reader symbol to read "Card Reader supplied, installed and wired by Electrical Contractor".

2. Revise Access Control Panel symbol to read "Access Control Panel supplied, installed and wired by Electrical Contractor".

2.0 Drawing ES501

Reference Detail 4 Partial Intrusion Detection System Riser

1. All wiring to be unshielded.

End of Addendum #2

PLEASE SIGN BELOW AND RETURN WITH BID DOCUMENTS:

_____ _____

Signature Company Name

CC: Nova Scotia Construction Association Fax # 468-2470

Halifax Regional School Board

Purchasing Division

TENDER # 3926
Skilled Trades Building-Sir John A. Macdonald High School
Addendum #1

December 20th, 2017
11:45 A.M.

To: Bidders

From: Don Walpola, Buyer

Pages: 1 including cover

Phone: 464-2000(ext. 2223)

The bid documents shall be amended and new drawings and clauses added, and shall become part of the contract documents as follows:

Paragraph 1.1 of Section 00 00 15 should read as:

The work of this contract includes the provision of all materials, labour and equipment necessary to **construct the skilled trades building** at Sir John A.Macdonald High School as per the drawings and specifications prepared by SP Dumaresq Architect Ltd.

End of Addendum #1

PLEASE SIGN BELOW AND RETURN WITH BID DOCUMENTS:

_____ _____

Signature Company Name

CC: Nova Scotia Construction Association **Fax # 468-2470**

TENDER #3926

SKILLED TRADES BUILDING
SIR JOHN A.MACDONALD HIGH SCHOOL

Closing Date: **FRIDAY JANUARY 5th 2018**
Closing/Opening Time: ***2:00:00 P.M.***

Closing Location:
Halifax Regional School Board
33 Spectacle Lake Drive
Dartmouth, N.S. B3B 1X7

Substantial Completion Date:
March 25th, 2018

HRSB Contacts:
Don Walpola, Buyer
Tel: (902) 464-2000 #2223
Fax: (902) 464-0161
Email: dwalpola@hrsb.ca

School Location:
Sir John A. Macdonald High
31 Scholars Rd,
Upper Tantallon NS, B3Z 0C3

Operations Contact:
Gary Mannette, TCA Project Coordinator
Tel: (902) 464-2000 #5124
Email: gmannette@hrsb.ca

A mandatory tenderers' site meeting is scheduled for *WEDNESDAY DECEMBER 20TH 2017 at 1.00 p.m., SIR JOHN A.MACDONALD HIGH SCHOOL – Please meet at the front entrance of the school.*

To obtain documents:
Download tender documents in .pdf format from the School Board's Website:

http://www.hrsb.ca/about-hrsb/financial-services/purchasing/tenders/tender-listing

SECTION 00 00 01 - TABLE OF CONTENTS

TECHNICAL SPECIFICATIONS **No. of Pages#**

#3926 SIR JOHN A.MACDONALD HIGH SCHOOL

TECHNICAL SPECIFICATIONS **No. of Pages#**

TECHNICAL SPECIFICATIONS **No. of Pages#**

Division 24 AIR DISTRIBUTION

Division 25 INTEGRATED AUTOMATION

ELECTRICAL NO. DIVISIONS 26, 27, 28

TECHNICAL SPECIFICATIONS **No. of Pages#**

SECTION 00 00 15 - DESCRIPTION OF WORK & LIST OF DRAWINGS

1. General

1.1. The work of this contract includes the provision of all materials, labour and equipment necessary to complete the roofing upgrades at ***Sir John A.Macdonald High School*** to remove the existing roof and materials in areas as noted on the drawings and specifications prepared by ***SP Dumaresq Architect Ltd.***

1.2. It is the School Board's intent to have all work completed, to point of Substantial Performance, prior to ***March 25th, 2018***. The Building will be occupied during this time period. It is expected that an early award of this contract will enable the Contractor to facilitate shop drawing review and ordering of materials to allow commencement of work immediately following award of tender.

1.2. The whole of the work shall agree in all particulars with the levels, measurements and details contained in the drawings accompanying this specification and with such other drawings or information as may from time to time be supplied by the School Board, or may be supplied by the Contractor and reviewed by the School Board.

2. List Of Drawings

DRAWING NO.	DRAWING TITLE
A000	COVER SHEET
C101	SITE SERVICES & GRADING PLAN
S100	FOUNDATION PLAN AND NOTES
S101	ROOF FRAMING PLAN
S102	SECTIONS
A100	SITE PLAN
A101	FLOOR PLANS
A102	ELEVATIONS
A103	SECTIONS
A104	WALL SECTIONS
A106	DETAILS
A108	PARTAIL FLOOR PLAN MAIN BUILDING
A107	MILLWORK

DRAWING NO.	DRAWING TITLE
A109	ROOF PLAN
A110	REFLECTED CEILING PLAN
A106.1	DETAILS
M-100	MECHANICAL LEGEND
PS101	MECHANICAL FLOOR PLAN-SANITARY AND VENT
PW101	MECHANICAL FLOOR PLAN-DOMESTIC WATER
P-501	SCHEDULES AND DETAILS-PLUMBING
MV101	MECHANICAL FLOOR PLAN - AIR DISTRIBUTION
MV501	AIR DISTRIBUTION
MV601	AIR DISTRIBUTION SCHEDULES
MC601	CONTROLS
E-101	ELECTRICAL LEGEND AND SCHEDULES
E-102	ELECTRICAL SITE PLAN AND DETAILS
E-103	ELECTRICAL DETAILS
EL101	FLOOR PLANS LIGHTING
EM101	FLOOR PLANS HEATING AND MECHANICAL EQUIPMENT CONNECTIONS
EM601	MOTOR STARTER AND CONTROL LIST
EP101	FLOOR PLANS POWER AND SYSTEMS
EP601	PANEL SCHEDULES AND POWER RISER DIAGRAM
ES501	SYSTEMS DETAILS

END OF SECTION 00 00 15

SECTION 00 05 00 - LIST OF CONSULTANTS

Owner:

HALIFAX REGIONAL SCHOOL BOARD
33 SPECTACLE LAKE DRIVE, DARTMOUTH NS

Architect:

Jon Carmichael
SP Dumaresq Architect Ltd.
Phone: 902-719-4682
Email: jon@spda.ca

END OF SECTION 00 05 00

SECTION 00 21 13 – INFORMATION FOR TENDERERS

Invitation:

1. Bid Call

1.1. The HALIFAX REGIONAL SCHOOL BOARD (The Board/HRSB) will receive offers in the form of a bid from Contractors which is signed and received on or before the date and time specified on the cover sheet of this document. HRSB deems the correct time to be the time indicated on the phone clock on the Receptionist's desk at at 33 Spectacle Lake Drive.

1.2. Offers submitted after the closing time/date shall be returned to the tenderer unopened.

1.3. Submit completed tender documents for above project in sealed envelope marked as follows: ***TENDER #3926, SKILLED TRADES BUILDING-SIR JOHN A.MACDONALD HIGH SCHOOL***

1.4. Bids will be opened at the time indicated on the cover sheet of this document. As of April 1, 2014 Public tender openings are no longer held for any tenders relating to goods, services or construction for HRSB. A list of tenderers and bid amounts will be posted on the Procurement Services website (http://novascotia.ca/tenders/tenders/ns-tenders.aspx) shortly following the closing of the tender. All bid submissions are subject to evaluation after opening and before award of contract. The winning tenderer and award amount will be posted on the Procurement Services website (http://novascotia.ca/tenders/tenders/ns-tenders.aspx) after award.

1.5. In the event that the HALIFAX REGIONAL SCHOOL BOARD office is closed due to inclement weather or any other reason on the date and at the time of closing, the Closing Date and Time will be extended one (1) business day. Proponents should note that closure of Schools does not necessarily mean closure of the Board's Regional Office.

1.6. Amendments to the submitted offer will be permitted if received in writing prior to bid closing and if endorsed by the same party or parties who signed and executed the offer.

1.7. Emailed/Faxed Bid Submissions **will not** be accepted.

2. Intent

2.1. The intent of this bid call is to obtain an offer to perform all work associated with ***TENDER #3926, SKILLED TRADES BUILDING,*** at ***SIR JOHN A.MACDONALD HIGH SCHOOL*** for a Stipulated Price Contract in accordance with the Contract Documents.

3. Scope of work

3.1. Refer to Section 00 00 15 – Description of Work and List of Drawings.

4. Availability

4.1. Bid Documents can be obtained as per the directions on the cover sheet of this document.

4.2. Bid Documents are made available only for the purpose of obtaining offers for this project. Their use does not confer a license or grant for other purposes.

4.3. The HALIFAX REGIONAL SCHOOL BOARD is not responsible for accuracy of documents and project postings obtained from any other source.

5. Examination

5.1. Bid Documents are on display at the offices of the Nova Scotia Construction Association (CANS), Halifax, NS.

5.2. Upon receipt of Bid Documents verify that documents are complete; notify the Board's Buyer by email to dwalpola@hrsb.ca, should the documents be incomplete, or upon finding discrepancies or omissions in the Bid Documents.

5.3. Tenderers shall become fully aware of the content of all tender documents for the preparation of the Tenderer's offer.

5.4. Tenderers will be deemed to have familiarized themselves with the existing site and working conditions and all other conditions which may affect the performance of the work. No plea of ignorance of such conditions as a result of failure to make all necessary examinations will be accepted as a basis for any claims for extra compensation or an extension of time.

6. Clarification and Addenda

6.1. Notify Don Walpola, Buyer, by email to dwalpola@hrsb.ca no less than **five (5)** working days before Tender Closing regarding any questions, omissions, errors or ambiguities found in Contract Documents. If HRSB considers that correction, explanation or interpretation is necessary, a reply will be in the form of an addendum, a copy of which will be posted on the

novascotia.ca/tenders and/or HRSB website as applicable, and it is the responsibility of the Tenderer to ensure all addenda are received and acknowledged.

6.2. Addenda will be issued no less than three (3) business days before tender closing date and time, and will form part of the Contract Documents.

6.3. Verbal answers to queries are not binding. Information must be confirmed by written addenda. The Board and its representatives shall not be bound by or be liable for any representation or information provided verbally. Information obtained by any other source is not official and will not bind the HALIFAX REGIONAL SCHOOL BOARD.

6.4. Complete tender form (section 00 41 13) acknowledging that addenda have been received.

7. Product/System Options

7.1. Alternatives to specified products and systems will only be considered during the bidding period in the manner prescribed below.

7.1.1. Where the Bid Documents stipulate a particular product, alternatives may be considered by the Consultant up to five (5) working days before tender closing date and time. Tenderers must forward their written requests by email to: dwalpola@hrsb.ca. The Buyer will relay the requests to the appropriate person(s) for review.

7.2. The submission must provide sufficient information to enable the Consultant to determine acceptability of such products. Request for an alternate must be accompanied with:

7.2.1. information about how the request affects other work in order to accommodate each alternate;

7.2.2. the dollar amount of additions to or reductions from the Bid Price, including revisions to other Work.

A later claim by the tenderer for an addition to the contract price because of changes in work necessitated by use of alternates shall not be considered.

7.3. When a request to substitute a product is made and pursuant to consultation with the Consultant, HRSB may approve or disapprove the substitution. The tenderer making the request will be notified of the Board's decision and if the alternate is approved HRSB will issue an Addendum.

7.4. Alternates must be submitted in above manner; otherwise, they will not be accepted.

8. Mandatory Tenderers' Site Meeting (Site Assessment)

8.1. Tenderers will be deemed to have familiarized themselves with existing project site and working conditions and all other conditions, which may affect performance of the Contract. No plea of ignorance of such conditions as a result of failure to make all necessary examinations will be accepted as a basis for any claims for extra compensation or an extension of time.

8.1.1. A Mandatory Tenderers' Site Meeting has been scheduled as per the information on the cover sheet of this document. All Tenderers are required to attend. Representatives of HRSB and the Consultant will be in attendance;

9. Tenderers Registration

9.1. The successful Contractor and Sub-contractors must comply with the Nova Scotia Corporations Registration Act or Partnerships and Business Name Registration Act, or equivalent, before a contract is awarded.

10. Qualifications

10.1. Sub-Contractors

10.1.1. HRSB reserves the right to reject a proposed sub-contractor for a reasonable cause.

10.1.2. Refer to Article GC 3.7.3 of CCDC-2 2008.

11. Bid Submission

11.1. Submissions

11.1.1. Tenderers shall be solely responsible for the delivery of their bids in the manner and time prescribed.

11.1.2. Bids must be submitted on the **Bid Form** provided by HRSB (Section 00 41 13 – Bid Form). These forms are to be completely filled out in ink, with the signature in longhand, and corporate sealed as applicable, and the completed form shall be without interlineations, alterations or erasures. Electronic bid submissions sent by facsimile transmission or email will not be accepted.

11.1.3. Fully complete the Tender Bid Form and enter the contract price in both written words and numerals. Where this bid is requested in both words and numbers, and if the two (2) do not represent the identical amount, words shall prevail.

11.1.4. Submit the executed offer on the Bid Forms together with the required bid security in a closed opaque envelope, clearly identified with tenderer's name, project name and tender number on the outside.

11.1.5. Improperly completed information, irregularities in the bid security, may be cause to declare the bid informal.

12. Accuracy of Referencing

12.1. Indexing and cross-referencing are for convenience only.

13. Conditions of Tendering

13.1. Take full cognizance of content of all Contract Documents in preparation of Tender. Refer to Section 00 41 13 – Tender Form, Subsection 5.0 for a complete list of Contract Documents.

14. Preparation of Tender

14.1. Complete Tender Bid Form (section 00 41 13) provided with Contract Documents in ink. Tender all items and fill in all blanks. Have corrections initialed by person signing Tender. Tenderers' are required to provide all information as detailed.

15. Amendment or Withdrawal of Tender

15.1. Bids may be amended or withdrawn by post, hand or facsimile prior to date and time of closing.

15.2. A Tender Price Amendment Form is provided immediately following the Bid Form (section 00 41 73).

15.2.1.1. The Tender Price Amendment Form provided is the standard Master form for submission of all tender price amendments for this project.

15.2.1.2. Copy and complete form, as directed, for all tender price amendments submitted.

15.3. Amendments shall not disclose either original or revised total price.

15.4. Sign, execute and submit to HRSB Board Office or by facsimile to (902) 464-0161 prior to time of Tender Closing.

16. Bid Ineligibility (reason for rejection)

16.1. HRSB may reject a bid which has been received prior to the closing time where:

16.1.1. The bid is not submitted on the required bid form (Section 00 41 13) included herein.

16.1.2. The bid is submitted by electronic transmission.

16.1.3. There are omissions of information that HRSB in its sole discretion deems to be significant.

16.1.4. The bid is not signed as required.

16.1.5. The bid has conditions attached which are not authorized by the invitation to bid**.**

16.1.6. The bid fails to meet one or more standards specified in the invitation to bid.

16.1.7. All addenda have not been acknowledged.

16.1.8. Any other defect which, in the opinion of the HRSB brings the meaning of the bid into question.

16.1.9. A major irregularity is a deviation from the bid request which affects the price, quality, quantity, or delivery of the project and is material to the award, and is a reason for rejection.

16.1.10. A minor irregularity is a deviation from the bid request which affects form, rather than substance. The effect on price, quality, quantity or delivery is not material to the award, and may be waived by the HRSB.

16.1.11. The required bid security in the required form is not provided.

16.1.12. Tenderer failed to attend Tenderers' Mandatory Site Meeting.

17. Communications Affecting Bids

17.1. Electronic Transmissions, including, but not limited to facsimile transmission:

17.1.1. Bid forms submitted by facsimile and/or e-mail etc. transmission are not acceptable and will be rejected.

17.1.2. Electronic transmissions (facsimile only) modifying tenderer supplied information are acceptable when signed by an authorized signatory of the original bid. Submission and receipt of such electronic transmissions is at the risk of the tenderer. HRSB assumes no liability for the receipt of the electronic transmission or for their proper inclusion with original bid. There is no requirement for HRSB to follow up upon receipt of an electronic transmission. Electronic submissions will be considered binding on both parties. Electronic submissions must be submitted and received prior to closing time and date specified in the bid documents. HRSB Procurement Department Date and Time stamps will prevail. **HRSB Procurement facsimile number is 902-464-0161.**

18. Right to Accept or Reject any Tender

18.1. The Board reserves the right to reject any bid in its sole and absolute discretion for any reason whatsoever.

18.2. The Board specifically reserves the right to reject all bids if none is considered to be satisfactory in the Board's sole and absolute discretion and, in that event, at its option, to call for additional bids.

18.3. Without limiting the generality of any other provision herein, the Board reserves the right to accept or reject any bid in accordance with bullet #16 above. (Bid Ineligibility)

18.4. Notwithstanding the above, the Board shall be entitled, in its sole and absolute discretion, to waive any irregularity, informality or non-conformance with these instructions in any proposal received by the Board. HRSB reserves the right to reject any or all tenders, or to accept any tender, or portion thereof, deemed in its best interest.

18.5. In the event that a number of Tenderers submit bids in substantially the same amount, the Board may, at its discretion, call upon those Tenderers to submit further bids or take into consideration any value added services being provide in determination of award.

18.6. No term or condition shall be implied, based upon any industry or trade practice or custom or in a practice or policy of the Board or otherwise, which is inconsistent or conflicts with the provisions contained in these Instructions.

19. Construction Contract Guidelines

19.1. The printed policies of the Nova Scotia Construction Guidelines, dated May 18, 2006 (or latest revisions) are applicable to these bid documents.

20. Bid and Security Forms – Signatures

20.1. All bid forms, bid security forms and performance assurance forms **must** bear the Tenderer's original signature and name HRSB as insured.

21. Bid Security

21.1. Submit with Bid one of the following: Bid security in the form of a Certified Cheque, Irrevocable Letter of Credit, or Bid Bond on CCDC Form 220, in the amount of ten percent (10%) of the Bid Price made payable to, or naming HRSB (as obligee), must accompany the tender.

21.2. Where bid bond is provided as bid security:

21.2.1. Provide bond on the standard CCDC Bid Bond Form, latest version, in the amount of not less than ten percent (10%) of the Bid Price.

21.2.2. Bid Bonds, submitted by the general contractor tenderer, signed and sealed by the principal (Contractor) and Surety and shall be with an established Surety Company satisfactory to and approved by HRSB.

21.2.3. Where Bid Bond is used as Bid Security, include the cost of providing the Bid Bond in the Bid Price.

21.3. Where certified cheque or bank draft is provided as bid security:

21.3.1. Provide a certified cheque or bank draft, endorsed in the name of HRSB, for a sum not less than ten percent (10%) of the amount of the Bid Price.

21.3.2. Where certified cheque or bank draft is used as Bid Security, include the cost in the Bid Price.

21.4. Where the Irrevocable Standby Letter of Credit is used as bid security:

21.4.1. Provide an Irrevocable Standby Letter, endorsed in the name of HRSB, for a sum not less than ten percent (10%) of the Bid Price

21.4.2. The Irrevocable Standby Letter of Credit shall be issued by a certified financial institution subject to the Uniform Custom and Practices for Documentary Credit (1993 revision or latest revision) International Chamber of Commerce (Publication No. 500).

21.4.3. Where Irrevocable Standby Letter of Credit is used as bid security, include the cost in the Bid Price.

21.5. Return of Bid Security:

21.5.1. The bid security of the unsuccessful tenderers will be returned to them after the contract has been signed, or previous to such time, at the discretion of HRSB.

21.5.2. The above shall apply provided a contract is awarded within ninety (90) days from the closing date of the bid.

21.5.3. If no contract is awarded, all bid security will be returned.

22. Contract Security (Performance Assurance)

22.1. All bid forms, bid security forms and performance assurance forms must bear the tenderer's original signature and name HRSB as insured.

22.2. Tenderer shall maintain performance assurance in force for a period of not less than twelve (12) months after the issue of the substantial performance certificate certified by HRSB and until completion of the contract.

22.3. Endorse Performance Assurance as specified for bid security.

22.4. Should it become apparent that the final cost of the project will exceed the total amount payable by more than 20%, the tenderer shall arrange to have their bonds reissued based on the projected final cost.

22.5. Refer to Section 00 72 13 – General Conditions GC11.2 and Section 00 73 00 – Supplementary General Conditions for form of Contract Security. Refer to project documents for amount of Contract Security and alternate type of Contract Security if applicable.

22.6. Submit as Performance Assurance one of the following:

22.6.1. Where a Bid Bond was used as bid security:

22.6.1.1. Within ten (10) days after notification of award of the Contract, provide a Performance Bond and a Labour & Material Payment Bond, each in an amount equal to fifty percent (50%) of the amount of the Contract, naming HRSB.

22.6.1.2. Performance Bond and Labour and Material Payment Bonds, submitted by the tenderers, shall be provided at the expense of the tenderer and shall be with an established Surety Company satisfactory to and approved by HRSB.

22.6.1.3. Include the cost of providing the Performance Bond and Labour and Material bond in the Contract price.

22.6.2. Where a Certified Cheque or Bank Draft is used as Contract Security:

22.6.2.1. The Certified Cheque or Bank Draft submitted during the bid period will be cashed and the amount retained by HRSB shall serve as Performance Assurance**,** including the payment of all obligations arising under the Contract.

22.6.2.2. The Certified Cheque or Bank Draft will be held in lieu of the Performance Bond and Labour and Material Bonds, providing that, at Contract award, the successful Tenderer shall supplement their Certified Cheque or Bank Draft to maintain an amount of ten (10%) of

the total amount payable (Contract Price plus HST) under the contract.

22.6.2.3. The amount remaining will be returned without interest after a period of not less than twelve (12) months after the issue of the substantial performance certificate certified by HRSB and shall serve as performance assurance and not until completion of the contract.

22.6.2.4. Where certified cheque or bank draft is used as Performance Assurance, include the cost of providing the certified cheque in the Contract price.

22.6.3. Where an Irrevocable Standby Letter or Credit is used as Contract Security:

22.6.3.1. The Irrevocable Standby Letter of Credit submitted during the bid period will be retained by HRSB and shall serve as performance assurance, including the payment of all obligations arising under the contract. The irrevocable standby letter of credit shall be issued by a certified financial intuition subject to the Uniform Customs and Practices for Documentary Credit (1993 revision) International Chamber of Commerce (Publication No. 500).

22.6.3.2. Where irrevocable standby letter of credit is used as Performance Assurance, include the cost of providing and Irrevocable Standby Letter of Credit in the Contract Price. The contractor shall provide to HRSB documentation throughout the duration of the contract that the irrevocable standby letter of credit remains in full effect at all times as specified,

22.6.3.3. Upon expiry of the Irrevocable Standby Letter of Credit, a separate Irrevocable Standby Letter of Credit shall be provided for work requiring extended warranties for such amounts as are required by the contract.

22.6.3.4. The Irrevocable Standby Letter of Credit is to be in effect for a period of not less than twelve (12) months after the issue of the substantial performance certificate certified by HRSB and shall serve as performance assurance and not until completion of the contract.

23. Insurance

23.1. Refer to Section 00 72 13 -General Conditions of Contract, GC 11.1 – Insurance and Section 00 73 00 – Supplementary General Conditions for form of Insurance. Refer to project documents for amount of insurance, duration of coverage and alternate type of Insurance if applicable.

23.2. General Contractor shall secure and maintain at its expense during the term of the Insurance:

23.2.1. Workers' Compensation to meet Statuary requirements and/or Employers Liability.

23.2.2. Wrap Up liability Insurance must insure the general contractor(s) and all sub-contractors on this project:

23.2.2.1. including but not limited to, products liability and completed operations, contractual liability, owners and contractors liability, attached machinery extension endorsement, independent contractor, for a combined single limit of no less than $5,000,000.00 per occurrence.

23.2.3. Commercial Auto Liability insurance covering all owned, non-owned and hired vehicles for a minimum combined single coverage of $2,000,000.00 per occurrence.

23.2.4. Builders Risk – all risks – in the amount of the project contract stipulated bid price.

23.2.5. Deliver a certificate of insurance evidencing the above prior to work being performed. It is also agreed that the above insurance coverage is primary and must be kept in force during the term of this agreement. Furthermore, HRSB must receive, in writing, at least thirty (30) days' notice of cancellation or modification of the above insurances. All insurance policies or certification documents shall specify coverage being applicable to this contract. The Contractor shall not do or omit to do or suffer anything to be done or omitted to be done which will in any way impair or invalidate such policy or policies of insurance.

23.3. Primary Insurance- Supplier agrees that the insurance as required above shall be primary and non-contributory.

23.4. No limitation- Supplier is responsible for determining whether the above minimum insurance coverage's are adequate to protect its interests. The above minimum coverage's do not constitute limitations upon Supplier's Liability.

23.5. Endorsements – For the policies in para 23 above, there shall contain an endorsement naming HRSB and its Affiliates as an Additional Insureds, and eliminating and removing any exclusion of liability for:

23.5.1. injury, including bodily injury and death to an employee of the insured or of HRSB, or

23.5.2. any obligation of the insured to indemnify, hold harmless, defend, or otherwise make contribution to School Board because of damage arising out of injury, including bodily injury and death, to an employee of HRSB.

24. Proof of Competency of Tenderer

24.1. Any tenderer may be required to furnish evidence satisfactory to the owner that he and his proposed sub-contractors have sufficient means and experience in the types of work called for to assure completion of the contract in a satisfactory manner.

24.1.1. The successful tenderer **must** be a member in good standing with CRCA, RCANS; and

24.1.2. Nova Scotia Construction Safety Association or approved recognized association or program.

25. Bid Form Requirements

25.1. Bid Submission

25.1.1.1. Tenderers shall be solely responsible for the delivery of their bids in the manner and time prescribed.

25.1.1.2. Bids must be submitted on forms provided by the Board. These forms are to be completely filled out in ink or by typewriter, with the signature in longhand, and the completed form shall be without interlineations, alterations or erasures.

25.1.1.3. Submit the executed bid on the bid forms provided, signed and corporate sealed as applicable together with the required security in a closed opaque envelope, clearly identified with Tenderers name, project name on the outside.

25.1.1.4. Improperly completed information, irregularities, in required enclosures may be cause to declare the bid informal.

25.2. Bid Signing

25.2.1. The bid form **Must** be signed and under seal (as applicable) by a duly authorized signing officer(s) in their normal signatures.

25.3. Contract Time

25.3.1. The tenderer, in submitting an offer, agrees to achieve Substantial performance of the work by the date indicated in the contract documents. The Substantial Performance date in the agreement shall be as indicated on the cover sheet.

26. Offer Acceptance / Rejection

26.1. Duration of offer

26.1.1. Bids shall remain open to acceptance and shall be irrevocable for a period of ninety (90) days after the bid closing date.

26.2. Award/Selection/Acceptance of Offer

26.2.1. In the evaluation of a bid, HRSB will consider, but not be limited to, the following criteria:

26.2.1.1. Compliance with Bid requirements.

26.2.1.2. Bid price submitted.

26.2.1.3. The qualifications and experience of the tenderer with similar projects in size and scope.

26.2.1.4. References.

26.2.1.5. Gantt chart (schedule of proposed scope of work for various disciplines).

26.2.1.6. Completion date.

26.2.2. The Owner's evaluation of any and all bid submission(s) will be final.

26.3. HRSB reserves the right to accept or reject any or all offers or to accept any offer deemed most satisfactory, HRSB reserves the right to waive any informality in any or all bids.

26.4. After acceptance HRSB will issue to the successful tenderer, a written bid acceptance.

26.5. After acceptance by HRSB, the successful tenderer shall be notified in writing of acceptance of the bid and will be issued an official purchase order.

27. Agreement

27.1. After acceptance by HRSB and the successful tenderer will enter into a CCDC-2 –2008, standard form of contract for the execution of the work.

28. Post Bid Submissions

28.1. Provide after closing of bid period, but before award of Contract, when requested by HRSB, a copy of the following documents:

28.1.1. Current Certificate of Recognition or Letter of Good Standing:

28.1.1.1. Certificate of Recognition issued jointly by the Nova Scotia Department of Labour and an occupational health and safety organization approved by Nova Scotia Department of Labour, or a valid letter of Good Standing from an occupational health and safety organization approved by HRSB indicating the Contractor is in the process of qualifying for the Certificate of Recognition. Contractor shall remain in good standing for the duration of the contract. In the event that any such certification during the term of the contract expires, the obligation remains with the contractor to provide the updated required certificates.

28.1.1.2. Worker's Compensation Coverage

28.1.1.2.1. Evidence of an account with the Workers' Compensation board, coverage under the Workers Compensation Ace, R.S.N.S. and a clearance certificate indicating the tenderer is in good standing and shall remain so for the duration of the contract. In the event that any such certification during the term of the contract expires, the obligation remains with the contractor to provide the updated required certificates.

28.1.1.3. Certificates of good standing with CRCA (Canadian Roofing Contractors Association) and RCANS (Roofing Contractors Association of Nova Scotia),

28.1.2. Submit Post-Bid Submissions requested by HRSB within forty-eight (48) hours of request in order to be eligible to receive award of contract.

28.1.3. Submit the following post award documents within ten (10) working days of notice of award:

28.1.3.1. Provide all required contract security and insurance documentation,

28.1.3.2. Schedule of Values,

28.1.3.3. Copy of safety plan,

28.1.3.4. Copy of Hot Work Permit system and procedures,

28.1.3.5. Shop drawings, as applicable, and

28.1.3.6. Applicable documentation as required by the Tender Documents.

28.1.4. All post bid submissions must be received by HRSB in the manner prescribed above, or prior to commencement of work and delivery of materials on-site, whichever occurs first.

29. Taxes

29.1. The General Conditions of the Contract state that the Contractor as of April 1,1997 and thereafter, the Contractor is to pay all Harmonized Sales Tax.

29.2. HRSB is not exempt for Harmonized Sales Tax (HST) purposes. As a result, the aggregate amount of the bid for contracts is subject to HST, however, **prices submitted shall not include HST.**

29.3. The HST payable by the Board will be added as a separate item during the processing of progress payments and therefore **HST will not appear as a cost in the aggregate amount of the tender.**

29.4. Tenderers are advised that they may be eligible to claim an Input Tax Credit (ITC) for a portion of the HST paid in relation to the Contract requirement of the Government of Canada.

29.5. Tenderers are to note that prices indicated on the Bid Form and the appendices to the Bid Form shall not include Provincial Sales Taxes, the Federal Goods and Services Tax or the Harmonized Sales Tax.

29.6. Exclude Harmonized Sales Tax in Tender Contract Price, unless requested to do otherwise.

29.7. Refer to CCDC-2 - 2008 (Section 00 72 13) and Supplementary General Conditions (Section 00 73 00).

END OF SECTION 00 21 13

SECTION 00 41 13 - TENDER FORM

1. Salutation:

To: **HALIFAX REGIONAL SCHOOL BOARD**
33 SPECTACLE LAKE DRIVE, DARTMOUTH NS
Attn: DON WALPOLA, BUYER

For: ***#3926 SKILLED TRADES BUILDING – SIR JOHN A.MACDONALD HIGH SCHOOL***

From: _____
Address: _____
_____
E-Mail: _____
Phone: _____ **Fax**: _____
Person Signing for Firm: _____
Position: _____

2. Tenderer Declares:

2.1. That this tender was made without collusion or fraud.
2.2. That the proposed work was carefully examined.
2.3. That the Tenderer was familiar with local conditions.
2.4. That Contract Documents and Addenda were carefully examined.
2.5. That all the above were taken into consideration in preparation of this Tender.

3. Tenderer Agrees:

3.1. To provide all necessary equipment, tools, labour, incidentals and other means of construction to do all the Work and furnish all the materials of the specified requirements which are necessary to complete the Work in accordance with the Contract and agrees to accept, therefore, as payment in full the Lump Sum Price stated in Subsection 6 hereunder.
3.2. Carefully examined the site of the work described herein; become familiar with local conditions and the character and the extent of the work; carefully examined every part of the proposed Contract and thoroughly understands its stipulations, requirements and provisions.

3.3. Determined the quality and quantity of materials required; investigated the location and determined the source of supply of the materials required; investigated labour conditions; and has arranged for the continuous prosecution of the work herein described

3.4. To be bound by the award of the contract and if awarded the contract on this bid to execute the required contract within ten (10) days after notice of award.

3.5. Noted that the Harmonized Sales Tax is excluded from his "Contract Price".

3.6. School/Work site access control: Contractor's employees shall always report to the main office of a school, indicate who they are and state their purpose on site prior to starting any work in the school. Contractor is not permitted to work on the school site without School Board's assigned representative on site unless authorized by School Board Operations representative. Typical hours of work are daylight hours. Working in occupied schools will be determined by the Operations representative. No work shall be conducted on weekends or holidays without specific approval of the Operations Representative. Work in an occupied school will be limited to work that is not disruptive to the school. IE: No mechanical removals, no drilling, screwing or torch work during occupied hours without approval from HRSB.

3.7. Hours of work – All work shall be carried out during regular business hours unless otherwise indicated below or in writing by the Manager of Operations or designate. Hours of work shall comply with local ordinances and bylaws for each site.

4. Owner Agrees

4.1. To examine this bid and in consideration, therefore, the tenderer hereby agrees not to revoke this bid:

4.1.1. until some other tenderer has entered into the contract with The School Board for the performance of the work and the supply of the materials specified in the notice inviting bids; or in the Information to Tenderers, or

4.1.2. until ninety (90) days after the time fixed in the Information to Tenderers for receiving bids has expired,

4.1.3. Whichever first occurs; provided, however, that the tenderer may revoke this bid at any time before the time fixed in the Information to Tenderers for receiving bids has expired upon receipt by the Board from the tenderer of written notice of such revocation before said time has expired.

4.1.4. The Tenderer declares that he has obtained from the Subcontractors all Bid Security required to be provided by Subcontractors pursuant to the "Instructions to Tenderers".

5. Contract Documents include:

5.1.1. Cover Page
5.1.2. Table of Contents – Section 00 00 01
5.1.3. Description of Work & List of Drawings – Section 00 00 15
5.1.4. List of Consultants – Section 00 05 00
5.1.5. Information for Tenderers – Section 00 21 13
5.1.6. Tender Form – Section 00 41 13
5.1.7. Tender Price Amendment Form (if applicable) – Section 00 41 73
5.1.8. Agreement Between Owner and Contractor (CCDC 2 – 2008) – Section 00 52 00
5.1.9. Definitions (CCDC 2 – 2008) – Section 00 52 13
5.1.10. General Conditions of the Stipulated Contract Price (CCDC 2 -2008) – Section 00 72 13
5.1.11. Supplementary General Conditions – Section 00 73 00
5.1.12. HRSB General Terms & Conditions – Section 00 73 10
5.1.13. Specifications of Work (all applicable sections)
5.1.14. Drawing(s) – as applicable
5.1.15. Addendum/Addenda issued by HRSB.
5.1.16. Contract Sets (2)

6. Fee Submission - Contract Price:

6.1. The undersigned Tenderer, having carefully read and examined the aforementioned Contract Documents prepared by the Consultant, for Halifax Regional School Board hereby accepts the same as part and parcel of the Contract herein referred to, and having carefully examined the locality and Site of Works and having full knowledge of the work required and of the materials to be furnished and used, does hereby Tender and offer to enter into a contract to perform and complete, the whole of the said works and provide all necessary labour, plant, tools, materials and equipment and pay all applicable taxes, as set forth and in strict accordance with the Specifications, Drawings and other Contract Documents and to do all therein called for on the terms and conditions and under the provisions therein set forth for the following:

6.2. LUMP SUM BID PRICE

_____ /100 Dollars ($_____) (HST Excluded)

Contract Price to be completed in written form on the lines provided above, with cents expressed as numerical fraction of a dollar. Contract price to be completed in numerical form on the line bounded by parenthesis above, with cents expressed as a decimal of a dollar. WHERE THERE IS A CONFLICT, WRITTEN WORD WILL GOVERN.

6.3. Breakout Prices: Breakout prices requested in the Tender Document, as detailed below, **SHALL BE INCLUDED IN THE LUMP SUM TENDER PRICE** above (6.1 - Contract Price) and deleted only on the instruction at the sole discretion of the Owner, for which a credit will be offered by the Contractor, equal to the breakout pricing detailed below (price excludes HST):

Item No.	Description	Unit of Measurement	Credit Amount
1.	_____n/a_____	_____	$_____
2.	_____	_____	$_____
3.	_____	_____	$_____
4.	_____	_____	$_____
5.	_____	_____	$_____

Total Credit Amount for ALL Breakout Items:

_____ /100 Dollars ($_____) (HST Excluded)

Separate Prices: Separate prices requested in the Tender Document, as detailed below **SHALL NOT BE INCLUDED IN THE LUMP SUM TENDER PRICE** above (6.1 - Contract Price) and added only on the instruction and at the sole discretion of the Owner, for which the contract will be adjusted, equal to the separate pricing detailed below (price excludes HST):

Listing of Separate Price Details Requested by Board:

Item No.	Description	Unit of Measurement	Unit Price
6.	n/a		$
7.			$
8.			$
9.			$
10.			$

7. Completion Time:

7.1. Tenderer agrees to be substantially complete as follows:

7.1.1.1. ***March 25th, 2018***

7.1.1.2. The undersigned Tenderer agrees if awarded the Contract on this Bid to achieve the Substantial Completion Date providing the contract is awarded within ten (10) business days of tender closing time.

7.2. Detailed breakdown of overall project specific phases (schedule of proposed scope of work for various disciplines) written and/or Gant Chart to be provided with bid documents or within five (5) business days of tender award.

8. Addenda Acknowledgement

I/We have received and noted the following addenda ***for Tender #3926, Sir John A.Macdonald High School***

Addendum #	Dated	# Of Pages

9. Supporting Information

9.1. References: (Minimum of three)

Tenderer to furnish particulars of at least three (3) similar contracts successfully completed or currently being carried to completion. The projects quoted should preferably be approximate in nature to the work now tendered for and be of comparable or greater size. References are to be submitted with the bid prior to closing date and time.

Contact Name & Phone #	Date	Contract Value
_____	From _____ to _____	$ _____
_____	From _____ to _____	$ _____
_____	From _____ to _____	$ _____
_____	From _____ to _____	$ _____

9.2. Bid submission to include a minimum of two letters of endorsement from clients commenting upon the contractor's ability to deliver quality projects, similar in scope and size, which met schedule and budget.

10. Proof Of Competency Of Tenderer

10.1. Any tenderer may be required to furnish evidence satisfactory to the Owner that he and his proposed sub-contractors have sufficient means and experience in the types of work called for to assure completion of the Contract in a satisfactory manner.

10.1.1. The Tenderer acknowledges, as part of their bid submission, their responsibility and contract obligations to ensure that the proposed sub-contractors will fully perform the project requirements and meet the timings as detailed in this tender call.

10.2. Sub-Contractors: The Tenderer to provide the name and address of each major sub-contractor used in making up this tender. This list of sub-contractors is to be submitted with the bid prior to closing date and time. Only one sub-contractor shall be named for each part of the work to be sublet.

Subcontractor/Suppliers/Manufacturers	**Service/Material**
Site Works	
Electrical	
Mechanical	
Roof	

10.2.1. Project Personnel: The Tenderer to include below, the names, qualifications and previous experience of those people who will be directly involved with the project. The names shall, for example, include foremen, superintendent, project engineer and/or project manager, labourers and trade staff. This list of personnel is to be submitted with the bid prior to closing date and time.

Name	**Position**	**Qualifications/Experience**

Signature * The undersigned Tenderer declares that this bid is made without connection with any other person(s) submitting bids for the same work and is in all respects fair and without collusion or fraud.

SIGNATURE:

SIGNED AND DELIVERED
in the presence of:

_____
Witness

CONTRACTOR

_____
Company name

_____
Signature of Signing Officer

_____
Name and Title (printed)

_____
Date

HRSB is directly responsible for the safety of its students and staff. Should contractors be required to work in or on school property while children are present, it is a MANDATORY SCHOOL BOARD REQUIREMENT that contractors assign the work to employees and/or sub-contractors who DO NOT have a CRIMINAL RECORD and who ARE NOT LISTED ON THE CHILD ABUSE REGISTRY. Failure to comply with this requirement may result in immediate contract termination.

By checking the "Agreed" box you are confirming that you understand and will abide by this mandatory School Board requirement.

Agreed □

Note: *Bids submitted **Must** be signed by a duly authorized officer or agent.*

END OF SECTION 00 41 13

SECTION 00 41 73 - TENDER AMENDMENT FORM

#3926 SKILLED TRADES BUILDING
SIR JOHN A.MACDONALD HIGH SCHOOL

Note: to be completed and forwarded for each Bid Price adjustment prior to bid closing time and date as detailed on the Cover Sheet of the tender document and related Addendum.

Lump Sum Price Adjustment – Section 00 41 13 Tender form, Article 6.1.1 Contract Price

Increase Bid by		**Decrease Bid By**	
Amount (excluding HST)	**$**	**Amount** (excluding HST)	**$**
HST	**$**	**HST**	**$**
Total Amount (including HST)	**$**	**Total Amount** (including HST)	**$**

It is the Tenderer's responsibility to ensure the table above is legible

Attachments included: **no** ☐ **yes** ☐ (✓ one)

If yes above, check ✓ and complete information regarding attachments

☐ **Revised Bid Form**: Dated _____ # of pages _____

☐ **Other, Specify** _____

Dated _____ # of pages _____

Total number of pages (including this form) _____

Submitted by:

_____

Company Name (please print as it appears on original tender envelope)

_____

Authorized Tenderer's Name (please print as it appears on Bid Form)

_____

Authorized Tenderer's Signature

END OF SECTION 00 41 73

SECTION 00 52 00 - AGREEMENT BETWEEN OWNER AND CONTRACTOR

CCDC 2 – 2008

(a copy of Section 00 52 00, Standard Construction Contract CCDC 2 – 2008 (5 pages) is available upon request, otherwise, will form part of the contract sets to the successful tenderer)

END OF SECTION 00 52 00

SECTION 00 52 13 - DEFINITIONS

CCDC 2 - 2008

(A copy of section 00 52 13, Standard Construction Contract CCDC 2 – 2008 (2 pages) is available upon request, otherwise, will form part of the contract sets to the successful tenderer)

END OF SECTION 00 52 13

SECTION 00 72 13 - GENERAL CONDITIONS
OF THE STIPULATED PRICE CONTRACT
CCDC 2 - 2008

(A copy of section 00 72 13, Standard Construction Contract CCDC 2 – 2008 (23 pages) is available upon request, otherwise, will form part of the contract sets to the successful tenderer)

END OF SECTION 00 72 13

SECTION 00 73 00 - SUPPLEMENTARY GENERAL CONDITIONS CCDC2 – 2008

The Canadian Standard Construction Document for Stipulated Price Contract (CCDC 2, 2008 version), Definitions and General Conditions governing same, shall be used by the project. The following Supplementary General Conditions are intended to supplement or amend the General Conditions, and where conflicts occur, the Supplementary Conditions shall take precedence.

Where a General Condition or paragraph of the General Conditions of the Stipulated Price Contract is deleted by these Supplementary Conditions, the numbering of the remaining General Conditions or paragraphs shall remain unchanged, and the numbering of the deleted item will be retained, unused.

ARTICLE A-5 PAYMENT

Delete paragraph 5.1 in its entirety and insert:

5.1 "Subject to applicable legislation and the provisions of the Contract Documents, and in accordance with legislation and statutory regulations respecting holdback percentages and, where such legislation or regulations do not exist or apply, subject to a holdback of ten percent (10%) including the HST (Harmonized Sales Tax), the Owner shall:"

.1 Make progress payments to the Contractor on account of the Contract Price (work performed) when due in the amount certified by the Consultant together with Value Added Taxes as may be applicable to such payments, and
.2 Upon Substantial Performance of the Work as certified by the Consultant, pay to the Contractor the unpaid balance of monies then due, excepting that amounts as certified by the Consultant to rectify deficiency items, or incomplete portions of individual work items may be retained by the Owner pending Total Performance of the work or other authorization for the release by the Consultant, and
.3 Upon Total performance of the Work as certified by the Consultant pay to the contractor the unpaid balance of monies due together with such Value Added Taxes as may be applicable to such payment.

Change 5.3.1 (1) to read: "1% per annum above the prime rate."

Delete 5.3.2 (2) in its entirety.

DEFINITIONS

Add subparagraph 19a to definitions:

19a. Submittals

Submittals are documents or items required by the Contract Documents to be provided by the Contractor, such as:

1 Shop Drawings, samples, models, mock-ups to include details or characteristics, before the portion of the Work that they represent can be incorporated into the Work; and
2 As-built drawings and manuals to provide instructions to the operation and maintenance of the Work.

GC 1.1 CONTRACT DOCUMENTS

Add to the end of subparagraph 1.1.2.2:

1.1.2.2 Except where the Consultant shall be indemnified as a third party beneficiary as provided in subparagraphs 9.2.7.4, 9.5.3.4 and in 12.1.3.

Add subparagraph 1.1.7.5:

1.1.7.5 Should conflicts occur between Contract Documents and any work is done without consulting the Consultant for his decision, the Contractor shall assume full responsibility.

Add subparagraph to 1.1.7.6:

1.1.7.6 In case of discrepancies, noted materials and annotations shall take precedence over graphic indications in the Contract Documents.

Delete paragraph 1.18 in its entirety and insert:

1.18 "The Contractor will be provided with up to a maximum of ten (10) copies, without charge, of the Contract Documents or parts thereof for the performance of the work. Extra copies may be obtained for cost of printing and mailing."

GC 2.4 DEFECTIVE WORK

Add new subparagraphs 2.4.1.1 and 2.4.1.2:

2.4.1.1 The Contractor shall rectify, in a manner acceptable to the Owner and the Consultant, all defective work and deficiencies throughout the Work, whether or not they are specifically identified by the Consultant.

2.4.1.2 The Contractor shall prioritize the correction of any defective work which, in the sole discretion of the Owner, adversely affects the day to day operation of the Owner.

GC 3.1 CONTROL OF THE WORK

Add new paragraph 3.1.3:

3.1.3 Prior to commencing individual procurement, fabrication, and construction activities, the Contractor shall verify, at the Place of work, all relevant measurements and levels necessary for proper and complete fabrication, assembly and installation of the Work and shall further carefully compare such field measurements and conditions with the requirements of the Contract Documents. Where dimensions are not included or contradictions exist, or exact locations are not apparent, the Contractor shall immediately notify the Consultant before proceeding with any part of the affected work.

GC 3.4 DOCUMENT REVIEW

Delete paragraph 3.4.1 in its entirety and substitute new paragraph:

3.4.1 The Contractor shall review the Contract Documents and shall report promptly to the Consultant and error, inconsistency or omission the Contractor may discover. Except for its obligation to make such review and report the result, the Contractor does not assume any responsibility to the Owner or to the Consultant for the accuracy of the Contract Documents. The Contractor shall not be liable for damage or costs resulting from such errors, inconsistencies, or omissions in the Contract Documents, which the Contractor could not have reasonably have discovered. If the Contractor does discover any error, inconsistency, or omission in the Contract Documents the Contractor shall not proceed with the work affected until the Contractor has received corrected or missing information from the Consultant.

GC 3.7 SUBCONTRACTORS AND SUPPLIERS

Add the following paragraph 3.7.7:

3.7.7 A copy of the agreement between Contractor and any subcontractor(s) shall be provided to the Consultant if so requested.

GC 3.8 LABOUR AND PRODUCTS

Add the following paragraph 3.8.4:

3.8.4 The Contractor is responsible for the safe on-site storage of Products and their protection (including Products supplied by the Owner and other contractors to be installed under the Contract) in such ways as to avoid dangerous conditions or contamination to the Products or other persons or property and in locations at the Place of the Work to the satisfaction of the Owner and the Consultant. The Owner shall provide all relevant information on the Products to be supplied by the Owner.

GC 3.10 SHOP DRAWINGS

Add the words "AND OTHER SUBMITTALS" to the Title after SHOP DRAWINGS in GC 3.10.

Add "and submittals" after the words "Shop Drawings" in paragraphs 3.10.1, 3.10.2, 3.10.4, 3.10.7, 3.10.8, 3.10.8.2, 3.10.9, 3.10.10, 3.10.11 and 3.10.12.

Delete 3.10.3 in its entirety and substitute new paragraph:

3.10.3 Prior to the first application for payment, the Contractor and the Consultant shall jointly prepare a schedule of the dates for submission and return of Shop Drawings and any Submittals.

Add the following subparagraph 3.10.6.1:

3.10.6.1 The following paragraph shall apply to each shop drawing and submittals reviewed in connection with the project. This review shall not mean that the Consultant approved the detailed design inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same. The Contractor is responsible for information that pertains solely to fabricated processes or to techniques of construction and installation, and for coordination of the work of all sub trades.

Delete and insert the words in paragraph 3.10.12

3.10.12 "with reasonable promptness so as to cause no delay in the performance of the Work" and replace with "within ten (10) working days or such longer period as may be reasonably required"

PART 3 EXECUTION OF THE WORK

Add new GC 3.14 as follows:

GC 3.14 CONTRACTOR RESPONSIBILITY FOR WATER TIGHTNESS

GC 3.14.1 The drawings and specifications are not intended to depict each and every condition or detail of construction. As the knowledgeable party in the field, the contractor is in the best position to verify that all construction is completed in a manner which will provide a watertight structure. The contractor has the sole responsibility for ensuring the watertight integrity of the structure.

Add new GC 3.15 as follows:

GC 3.15 PERFORMANCE BY CONTRACTOR

GC 3.15.1 In performing its services and obligations under the Contract, the Contractor shall exercise a standard of care, skill and diligence that would normally be provided by an experienced and prudent contractor supplying similar services for similar projects. The Contractor acknowledges and agrees that throughout the Contract, the Contractor's obligations, duties and responsibilities shall be interpreted in accordance with this standard. The Contractor shall exercise the same standard of due care and diligence in respect of any products, personnel, or procedures which it may recommend to the Owner.

The Contractor further represents, covenants and warrants to the Owner that:

1. The personnel it assigns to the Project are appropriately experienced;
2. It has sufficient staff of qualified and competent personnel to replace its designated supervisor and project manager, subject to the Owner's approval, in the event of death, incapacity, removal or resignation.

GC 4.1 CASH ALLOWANCES

Delete paragraph 4.1.4 in its entirety and substitute:

4.1.4 Where cost under a cash allowance exceed the amount of the allowances, unexpended amounts from other cash allowances shall be reallocated at the *Consultant's* direction to cover the shortfall.

Delete paragraph 4.1.5 in its entirety and substitute:

4.1.5 The net amount of any unexpended cash allowances, after providing for any reallocations as contemplated in paragraph 4.1.4, shall be deducted from the Contract Price by Change Order.

Delete paragraph 4.1.7 in its entirety and substitute:

4.1.7 At the commencement of the work, the Contractor shall prepare for the review and acceptance of the Owner and the Consultant, a schedule indicating the times, within the construction schedule referred to in GC 3.5, that items call for under cash allowances and items that are specified to be Owner purchased and Contractor installed or hooked up are required at the site to avoid delaying the progress of the Work.

Add new paragraph 4.1.8:

4.1.8 The *Owner* reserves the right to call, or to have the Contractor call, for competitive bids for portions of the Work, to be paid for from cash allowances.

GC 5.1 FINANCING INFORMATION REQUIRED OF THE OWNER

Delete section GC 5.1 in its entirety.

GC 5.2 APPLICATION FOR PROGRESS PAYMENT

Add the following at the end of paragraph 5.2.2:

5.2.2 Such applications shall be accompanied by one or more of the following documents: a Statutory Declaration Waiver of Lien or receipt stating that the holdback monies claimed have been paid to the particular party or parties so named or referred to in the Declaration. Form of Statutory Declaration shall meet the approval of the Consultant.

Add the following paragraph 5.2.8:

5.2.8 The reference to payment for products delivered to the place of work in Article 5.2.7 shall not be construed as covering day-to-day financing of the project. Products delivered to the place of work shall be construed to mean major items of equipment or quantities of items that are essential for the expedient conduct of the work.

GC 5.3 PROGRESS PAYMENT

Supplement paragraph 5.3.1 by adding the following:

5.3.1 A holdback percentage of ten (10) percent (%) shall apply to progress payments. The sworn statement by the Contractor for release of holdback monies shall be in the form of a Statutory Declaration meeting the approval of the Consultant. Amounts as certified by the Consultant to rectify deficiency items, or incomplete portions of individual work items, may be retained by the Owner after Substantial Performance has been obtained, pending Total Performance of the work or other authorization for release by the Consultant.

Amend subparagraph 5.3.1.3 as follows:

5.3.1.3 Delete "20" and replace with "30."

GC 5.4 SUBSTANTIAL PERFORMANCE OF THE WORK

Add the following paragraph 5.4.4:

5.4.4 Before the Contractor submits his application for Substantial Performance of the Work, all Operations and Maintenance Manual materials shall be submitted in accordance with the Contract Documents. The Certificate of Substantial Performance will not be issued until this requirement is met.

GC 5.5 PAYMENT OF HOLDBACK UPON SUBSTANTIAL PERFORMANCE OF WORK

Add the following subparagraphs 5.5.1.3 and 5.5.1.4:

5.5.1.3 Submit a certificate from barrister stating that there are no Builders' Liens filed relating to the Contract Works.
5.5.1.4 Submit a clearance letter from the Workers' Compensation Board.

GC 5.7 FINAL PAYMENT

Add the following subparagraphs 5.7.1.1, 5.7.1.2, 5.7.1.3, 5.7.1.4 and 5.7.1.5:

5.7.1.1 Contractor's application for final payment is considered to be valid when the following have been performed:

1. Work has been completed and inspected for compliance with Contract Documents, and the Consultant is satisfied that all the requirements of the Contract have been fulfilled by the Contractor.
2. Defects have been corrected and deficiencies have been completed.
3. Equipment and systems have been tested, adjusted and balanced and are fully operational, and written reports as outlined in the Contract Documents have been provided to the Consultant.
4. Certificates required by Utility companies, manufacturer's representative and inspectors have been submitted.
5. Spare parts, maintenance materials, warranties and bonds have been provided.

5.7.1.2 If Work is deemed incomplete by Consultant, complete outstanding items and request re-inspection.

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

5.7.1.4 If, within sixty (60) days after the issue by the Consultant of the Certificate of the Substantial Performance, the Contractor has not corrected all the deficiencies, the Owner will retain sufficient money to cover the cost of completing said deficiencies, as determined by the Consultant, in addition to holding monies retained in accordance with the Contract and subject to the provisions of the Builders' lien legislation of Nova Scotia.

5.7.1.5 Neither the final certificate nor the payment thereunder, nor any provision in the Contract Documents shall relieve the Contractor from responsibility for faulty material or workmanship which shall appear within a period of one (1) year from the date of Substantial Performance of the Work and he shall remedy any defects due thereto and pay for any damage to other Work resulting therefrom which shall appear within such period of one year. The Owner shall give notice of observed defects promptly. This article shall not be deemed to restrict any liability of the Contractor arising out of any law in force in the Province of Nova Scotia.

GC 6.2 CHANGE ORDER

Add the following paragraphs 6.2.3, 6.2.4, 6.2.5, 6.2.5, 6.2.6 and 6.2.7:

6.2.3 All contemplated changes in the work shall be issued by the Consultant on a "Contemplated Change Order" form.

6.2.4 For lump sum pricing, the Contractor shall, upon receipt of the Contemplated Change Order, submit to the Consultant for approval within seven (7) days, a quotation for changes in the work.

6.2.5 Quotation for changes shall be priced in sufficient detail (GC6.6 applies).

6.2.6 Consultant shall, within five (5) working days, notify the Contractor whether estimates are accepted by Owner or further information required. Acceptance of Owner shall be indicated by writing, and a signed copy of form (Change Order) returned to Contractor.

6.2.7 Contractor shall take reasonable measures to stop work or minimize the work in areas affected by or related to the contemplated changes.

GC 6.4 CONCEALED OR UNKNOWN CONDITIONS

Add new paragraph 6.4.5:

6.4.5 The *Contractor* confirms that, prior to bidding the *Project,* it carefully investigated the Place of the Work and applied to that investigation the degree of care and skill described in paragraph 3.15.1, given the amount of time provided between the issue of the bid documents and the actual closing of bids, the degree of access provided to the Contractor prior to submission of bid, and the sufficiency and completeness of the information provided by the Owner. The Contractor s not entitled to compensation or to an extension of the Contract Time for which could reasonably have been ascertained by the Contractor by such careful investigation undertaken prior to the submission of the bid.

GC 6.5 DELAYS

Delete the period at the end of paragraph 6.5.1 and substitute the following words:

6.5.1 ", but excluding any consequential, indirect or special damages."

Add new paragraph 6.5.6:

6.5.6 If the Contractor is delayed in the performance of the Work by any act or omission of the Contractor or anyone employed or engaged by the Contractor directly or indirectly, or by any cause within the Contractor's control, then the Contract Time shall be extended for such reasonable time as the Consultant may decide in consultation with the Contractor. The Owner shall be reimbursed by the Contractor for all reasonable costs incurred by the Owner as the result of such delay, including all services required by the Owner from the Consultant as a result of such delay by the Contractor and, in particular, the cost of the Consultant's services during the period between the date of Substantial Performance of the Work stated in Article A-1 herein as the same may be extended through the provisions of these General Conditions and any later, actual date of Substantial Performance of the Work achieved by the Contractor.

Add new paragraph 6.5.7:

6.5.7 If the Contractor is delayed in the completion of the Work by any act or neglect of: The School Board, any employee or either any other Contractor employed by The School Board, changes ordered in the Work, strikes, lockouts, fire, unusual delay by common carriers, unavoidable casualties, any other cause of any kind whatsoever beyond the Contractor's control or by any cause within the Contractor's control which the Consultant shall decide as justifying the delay,

then the time of completion shall be extended for such reasonable time as the Consultant may decide.

Add new paragraph 6.5.8:

6.5.8 No such extension shall be made for delay occurring more than seven (7) days before claim therefore is made in writing to the Consultant, provided however that in the case of a continuing cause of delay, only one (1) claim shall be necessary.

Add new paragraph 6.5.9:

6.5.9 If no schedule is made, no claim for delay shall be allowed on account of failure to furnish such schedule until two (2) weeks after demand for such schedule and not then unless such claim be reasonable.

Add new paragraph 6.5.10:

6.5.10 The Consultant shall not, except by written notice to the Contractor, stop or delay any part of the main Contract Work pending decisions or proposed changes.

GC6.6 CLAIMS FOR A CHANGE IN CONTRACT PRICE

Amend paragraph 6.6.5 as follows:

6.6.5 Add the words “as noted in paragraph 6.6.3” after the words “of the claim” and add the words “and the consultant”, at the end.

GC 6.7 VALUATION OF CHANGES

Add the following Header and paragraphs 6.7.1, 6.7.2, 6.7.3 and 6.7.4 in their entirety:

GC 6.7 VALUATION OF CHANGES

6.7.1 The value of any change shall be determined in one or more of the following way as determined by the Consultant:

(a) By estimate and acceptance in a lump sum, submitted with sub-contractors' and suppliers' signed quotations and breakdown estimates including itemized material and labour lists.
For changes where the individual trade cost is anticipated to be less than $1000, the requirement for the detailed cost breakdown may be waived, but individual trade quotation must be supplied.

(b) By unit prices agreed upon or as listed in the contract.

(c) Cost of work and percentage or by cost and fixed fee.

6.7.2 In cases of additional work to be paid for under method "c", the Contractor shall keep and present in such form as the Consultant may direct, a correct account of the net cost of labour and materials, together with vouchers. In any case, the Consultant shall certify to the amount due to the Contractor including the profit and overhead. Pending final determination of value, payments on account of changes shall be made on the Consultant's certificate.

6.7.3 In determination of method ".1(a) or ".1(c) above, the labour costs to be calculated by the actual estimated hours at an hourly rate determined as follows:

The hourly labour rate to be total payroll costs including hourly wage, statutory contributions to UIC, WCB, CPP, Training Funds, Health Benefits and other applicable labour burdens paid directly by the employer such as vacation pay, holiday pay, pension plan etc.

The School Board reserves the right to verify the payroll cost by independent audit.

To the total payroll cost the following percentage factors will be recognized.

- small tools/expenditures 5% (on payroll costs)
- site supervision 5% (on payroll costs)

(d) In determination of methods ".1(a)" and ".1(c)" above, the material costs to be calculated as follows:

Contractors net costs, including contractor discounts from suppliers, FOB the project site plus applicable taxes.

(e) In determination of methods ".1(a)" and ".1(c)" above, equipment rental costs for major pieces of equipment required will be at local industry rates.

(f) In determination of methods ".1(a)" and ".1(c)" above, overhead and fees shall be calculated as follows:

The cost of any authorized change shall be determined by the net total of labour and material or equipment as outlined in ".3(a)", ".3(b)" and ".3(c)" above on which the percentage markup shall be determined as follows:

For Extras Up to $5,000:

Sub- Contractors Own Work	- Overhead & Fee – 15% total
General Contractors Own Work	- Overhead & Fee – 15% total
General Contractors on Sub Contractors work	- 10% total

(no percentage markup shall be applied to deductions)

For Extras Above $5,000:

Sub Contractors Own Work	- Overhead & Fee – 10% total
General Contractors Own Work	- Overhead & Fee – 10% total
General Contractors on sub contractor's work	– 8% total

(no percentage markup shall be applied to deductions)

6.7.4 Submit to the Consultant and The School Boards representative detailed breakdown of the hourly labour rate as defined in paragraph ".3(a)".

GC 8.2 NEGOTIATION, MEDIATION, AND ARBITRATION

Add the following paragraphs 8.2.9, 8.2.10, 8.2.11, 8.2.12, 8.2.13, 8.2.14, and 8.3:

8.2.9 Within five days of receipt of the notice of arbitration by the responding party under paragraph 8.2.6, the Owner and the Contractor shall give the Consultant a written notice containing:

a) a copy of the notice of arbitration;
b) a copy of supplementary conditions 8.2.9 to 8.2.14 of this contract, and;
c) any claims or issues which the Contractor or the Owner, as the case may be, wishes to raise in relation to the Consultant arising out of the issues in dispute in the arbitration.

8.2.10 The Owner and the Contractor agree that the Consultant may elect, within ten days of receipt of the notice under paragraph 8.2.9, to become a full party to the arbitration under paragraph 8.2.6 if the Consultant:

a) has a vested or contingent financial interest in the outcome of the arbitration;

b) gives the notice of election to the Owner and the Contractor before the arbitrator is appointed;

c) agrees to be a party to the arbitration within the meaning of the rules referred to in paragraph 8.2.6, and;

d) agrees to be bound by the arbitral award made in the arbitration.

8.2.11 If an election is made under paragraph 8.2.10, the Consultant may participate in the appointment of the arbitrator and, notwithstanding the rules referred to in paragraph 8.2.6, the time period for reaching agreement on the appointment of the arbitrator shall begin to run from the date the respondent receives a copy of the notice of arbitration.

8.2.12 The arbitrator in the arbitration in which the Consultant has elected under paragraph 8.2.10 to become a full party may:

a) on application of the Owner or the Contractor, determine whether the Consultant has satisfies the requirements of paragraph 8.2.10, and;

b) make any procedural order considered necessary to facilitate the addition of the Consultant as a party to the arbitration.

8.2.13 The provisions of paragraph 8.2.9 shall apply mutatis mutandis to written notice to be given by the Consultant to any sub-consultant.

8.2.14 In the event of notice of arbitration given by the Consultant to a sub-consultant, the sub-consultant is not entitled to any election with respect to the proceeding as outlined in 8.2.10, and is deemed to be bound by the arbitration proceeding.

8.3 An application for arbitration shall be accompanied by security in the amount of $1000 to apply to the cost of arbitration. Any claims of excess costs must be submitted in writing to the Consultant within two weeks of completion or alleged completion of the work. No claims shall be accepted after this date and, also, no claims shall be accepted for disputed work unless the Consultant has been notified as specified.

GC 9.1 PROTECTION OF WORK AND PROPERTY

Delete subparagraph 9.1.1.1 in its entirety and substitute the following new paragraph 9.1.1.1:

9.1.1.1 errors in the Contract Documents which the Contractor could not have discovered applying the standard of care described in paragraph 3.15.1.

Delete paragraph 9.1.2 in its entirety and substitute the following new paragraph 9.1.2:

9.12 Before commencing any Work, the Contractor shall determine the locations of all underground utilities and structures indicated in the Contract Documents, or that are discoverable by applying to an Inspection of the Place of Work exercising the degree of care and skill described in paragraph 3.15.1.

GC 9.2 TOXIC AND HAXARDOUS SUBSTANCES

Add in paragraph 9.2.6 after the word “responsible”, the following new words:

9.2.6 Or whether any toxic or hazardous substances or materials already at the Place of Work (and which were then harmless or stored, contained or otherwise dealt with in accordance with legal and regulatory requirements) were dealt with by the Contractor or anyone for whom the Contractor is responsible in a manner which does not comply with legal and regulatory requirements, or which threatens human health and safety or the environment, or material damage to the property of the Owner and others,

Add in subparagraph 9.2.7.4:

9.2.7.4 “and the Consultant” after “Contractor”:

Add in paragraph 9.2.8 after the word “responsible”, the following new words:

9.2.8 or that any toxic or hazardous substances or materials already at the Place of the Work (and which were then harmless or stored, contained or otherwise dealt with in accordance with legal and regulatory requirements) were dealt with by the Contractor or anyone for whom the Contractor is responsible in a manner which does not comply with legal and regulatory requirement, or which threatens, humane health and safety or the environment, or material damage to the property of the Owner or others.

GC 9.5 MOULD

Add in subparagraph 9.5.3.4:

9.5.3.4 "and the Consultant" after "Contractor"

GC 10.1 TAXES AND DUTIES

Add the following paragraph 10.1.3:

10.1.3 The Contractor shall indicate on each application for payment as a separate amount, the appropriate Harmonized Sales Tax the Owner is legally obliged to pay. This amount will be paid to the Contractor in addition to the amount certified for payment under the Contract.

GC 10.2 LAWS, NOTICES, PERMITS AND FEES

Delete from the first line of paragraph 10.2.5 the word, "The" and substitute the words:

10.2.5 "Subject to paragraph 3.15.1, the"

GC 10.4 WORKERS' COMPENSATION

Add the following paragraphs 10.4.3, 10.4.4,and 10.4.5:

10.4.3 The contractor is referred to regulations, as applicable, under the Worker's Compensation Act of Nova Scotia.

10.4.4 Registration with Worker's Compensation Board shall be continuous during the contract. Should registrations be scheduled to expire during the contract period, the Contractor shall submit a copy of registration renewal one month prior to the expiration of the current certificate.

10.4.5 The Contractor shall furnish evidence of coverage under the Worker's Compensation Act, R.S.N.S. and a clearance Certificate providing proof of registration with Worker's Compensation Board prior to commencement of work. (A photocopy of the Contractors registration certificate is acceptable proof). On-going proof of good standing with the Worker's Compensation Board during the term of the contract is required.

GC 11.1 INSURANCE

Delete sentences and replace with the following in subparagraph 11.1.1.1:

11.1.1.1 "General liability insurance shall be maintained from the commencement of the work until one year from the date of Substantial Performance of the Work. Liability coverage shall be provided for completed operations hazards from the date of Substantial Performance of the Work, as set out in the certificate of Substantial Performance of the Work, on an ongoing basis for a period of 6 years following the Substantial Performance of the Work**" and replace with:** " General Liability Insurance or Wrap- Up Liability Insurance, (as detailed in the Information to Tenders section under "Insurance Requirements"), shall be maintained from the commencement of the work until final completion and acceptance of the work including the making good of faulty work or materials, except that coverage of completed operations liability shall in any event be maintained for twelve (12) months from date of Substantial Performance of the work as certified from the Consultant, and approved by the Owner".

Add the following subparagraphs 11.1.1.1.1, 11.1.1.1.2, and 11.1.1.2.1:

11.1.1.1.1 The general liability insurance to be maintained by the Contractor shall include Commercial General Liability Insurance covering Premises and Operations Liability, elevators, board form property damage, board from automobile, owners and contractors protective, blanket contractual, personal injury, completed operations liability contingent employers liability, cross liability clause, non-owned automobile liability, and a 30 day notice of cancellation clause.

11.1.1.1.2 All liability insurance policies shall be written in such terms as will fully protect the Contractor and
The School Board as an additional named insured.

11.1.1.2.1 Liability coverage of not less than two million dollars ($2,000,000) is required with regard to operations of owned automobiles.

Delete subparagraph 11.1.1.4 in its entirety and insert the following subparagraphs:

11.1.1.4 Broad Form (All Risks) Builders Risk Coverage - Prior to the commencement of any Work the Contractor shall maintain and pay for Broad Form (All Risks) Builders Risk Coverage in the joint names of The School Board and the Contractor totalling not less than one hundred percent (100%) of the total value of the Work done and materials delivered on the site (contract value), so that any loss under such policies of insurance will be payable to The School Board and the Contractor as their respective interests appear. The Builders

Risk Insurance shall include all materials related to the work while in transit or at other locations.

11.1.1.4.1 Should a loss be sustained under the Builders Risk Coverage, the Contractor shall act on behalf of The School Board and Contractor for the purpose of adjusting the amount of such loss with the insurance companies. As soon as such adjustment has been satisfactorily completed, the Contractor shall proceed to repair the damage and complete the Work and shall be entitled to receive from The School Board in addition to any sum due under the Contract, the amount at which The School Board interest has been appraised in the adjustment made with the insurance companies as referred to above, said amount to be paid to the Contractor as the Work of restoration proceeds. Any loss or damage which may occur shall not affect the rights and obligations of either party under the Contract except as aforesaid and except that the Contractor shall be entitled to a reasonable extension of time for the performance of the Work, as The School Board may decide.

11.1.1.4.2 Upon approval by The School Board of the Substantial Performance certificate issued by the Consultant, the Contractor's obligation to maintain Builder Risk Insurance shall cease and The School Board shall assume full responsibility for insuring the whole of the Work against loss or damage.

11.1.1.4.3 "Broad form" property insurance in the joint names of the *Contractor,* the *Owner* and the *Consultant*. The policy shall include as insureds all *Subcontractors* The Broad form" property insurance shall be provided from the date of commencement of the *Work* until the earliest of:

11.1.4.3.1 Ten (10) Calendar days after the date of *Substantial Performance of the Work;*

11.1.4.3.2 on the commencement of use or occupancy of any part or section of the *Work* unless such use or occupancy is for construction purposes, habitational, office, banking, convenience store under 465 square meter in area, or parking purposes, or for the installation, testing and commissioning or equipment forming part of the *Work*; and

11.1.4.3.3 when left unattended for more than thirty (30) consecutive calendar days or when construction activity has ceased for more than thirty (30) consecutive calendar days.

Paragraph 11.1.2 is clarified as follows:

11.1.2 Submit Certified true copies of each insurance policy to the Owner's Contract Authority within seven (7) working days after notification of award or in any event prior to payment of the first progress claim. Such copies shall be exclusive of information pertaining to premium or premium bases used by the insurer to determine the cost of the insurance. Prior to the commencement of any work, the Contractor shall file with the Owner a certified copy of each insurance policy and certificate required.

Delete 11.1.5 in its entirety and replace with the following:

11.1.5 Insurance contracts shall be procured from and the premiums paid to a resident agent of an insurance Company licensed to underwrite insurance in the Province of Nova Scotia.

Add the following paragraph 11.1.9:

11.1.9 All of the insurance policies shall contain a clause stating that no change in terms and conditions or cancellation may at any time be made without the full knowledge and consent of the owner.

GC 11.2 CONTRACT SECURITY

Add the following subparagraph 11.2.2.1:

11.2.2.1 "Bonds shall be procured from a Nova Scotia resident agent of an insurance company licensed to do business in Nova Scotia and shall be maintained in good standing and held by the Owner until one (1) year after Substantial Performance of the Work.

Add the following paragraph 11.2.3:

11.2.3 If a Certified Cheque is held as contract security it shall be in an amount equal to ten (10) percent (%) of the Contract Price. Supplement the Certified Cheque as necessary to maintain the amount equal to ten (10) percent (%) of the total amount payable (Contract Price plus HST).

.1 The Certified Cheque will be deposited at the chartered bank holding The School Board deposits.
.2 The School Board will return the cheque amount to the Contractor upon satisfactory completion of the contract and duration as specified in the Tender documents.
.3 Should Contractor default, total amount payable under the Certified Cheque will be the face value of the cheque plus all accrued interest.

.4 Payment for completion of work, due to failure of performance of the Contractor, shall include all reasonable obligations under the Contract, including architectural and engineering costs arising because of the default of the Contractor.

.5 Payment for labour and materials shall be limited to those who have a direct contract with the Contractor for the provision of labour and/or material (which includes equipment rental).

GC 12.3 INDEMNIFICATION

Add the following paragraph 12.1.1.3:

12.1.1.3 The Contractor shall indemnify and hold harmless the Consultant, its agents and employees from and against claims, demands, losses, costs, damages, actions, suits, or proceeding by third parties that arise out of, or are attributable to, the Contractor's performance of the Contract, provided such claims are attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property, and caused by negligent acts or omissions of the Contractor or anyone for whose acts the Contractor may be liable, and made in writing within a period of six (6) years from the date of Substantial Performance of the Work, or within such shorter such period as may be prescribed by any limitation statute or the province or territory of the Place of Work.

GC 12.3 WARRANTY

Delete from the first line the word, "The" and substitute the words in paragraph 12.3.2:

12.3.2 "Subject to paragraph 3.15.1, the…"

Add the following paragraph 12.3.7:

12.3.7 Warranty repairs or replacements which arise during warranty period which affect the operation of the system shall be attended to immediately upon notification from the Consultant.

END OF SECTION 00 73 00

SECTION 00 73 10 - HRSB GENERAL TERMS & CONDITIONS

1. General

1.1. These Terms and Conditions, shall apply only to those documents (Quotations, Request for Proposals and Tenders, herein referred to as Public RFX or RFX) that reference them specifically. In the event of any conflict or disagreement between these Terms and Conditions and the RFX documents, the RFX documents have precedence and will be assumed to be correct.

1.2. These Terms and Conditions are intended to cover a wide range of procurements, including goods and services. As such, not all clauses will be applicable in all situations. If Suppliers have questions regarding any of these Terms and Conditions, they should contact the Halifax Regional School Board (HRSB) Procurement Division. To satisfy special requirements, supplementary Terms and Conditions may also apply to some acquisitions. If this is the case, the RFX documents will reference any such documents, in addition to these Terms and Conditions.

1.3. For the purpose of these Terms and Conditions HRSB intends to only contract with responsible Suppliers who are in the business of providing the goods and/or services submitted upon, and can provide proof that they can furnish satisfactory performance based on past work experience with HRSB, other companies, or government agencies and have the financial managerial, and resource capabilities for the size of project bid upon. Satisfactory performance includes meeting all of the requirements of the various federal and provincial regulations and agencies for the completion of work and making payment to sub-contractors in a timely basis.

1.4. All of the terms, conditions and/or specifications stated or referenced in the Solicitation are assumed to be accepted by the Tenderer and incorporated in the Bid.

2. RFX Documents

2.1. RFX Documents should be obtained as indicated on the Cover Sheet of the tender document.

2.2. While HRSB has tried to ensure accuracy in the RFX documents, it is not guaranteed or warranted by HRSB to be accurate, nor is it necessarily comprehensive or exhaustive.

2.3. HRSB cannot ensure the accuracy of RFX documents obtained from any other source. (i.e. Construction Association of Nova Scotia (CANS), Nova Scotia Electronic Tendering Bulletin Board, Project Consultants, etc.).

2.4. All inquiries to this RFX are to be directed, in writing, to HRSB Procurement Division representative indicated in the RFX documents. Information obtained from any other source is not official and will not bind HRSB.

2.5. HRSB will assume that all Suppliers have resolved any questions they might have about the RFX and have informed themselves as to existing conditions and limitations, site restrictions, etc. before providing a RFX submission.

2.6. Nothing in the RFX is intended to relieve Suppliers from forming their own opinions and conclusions with respect to the matters addressed in the RFX or its associated documents.

2.7. In the event that HRSB Regional Office (33 Spectacle Lake Drive, Dartmouth) is closed (this includes partial day closures) due to inclement weather on the date and time of the RFX closing, the closing date and time will be extended one (1) business day. Tenderers should note that closure of Schools does not necessarily mean the closure of the Board's Regional Office. Closures are detailed on HRSB website.

3. Verbal instructions: Any changes to RFX call, specifications, terms and conditions shall be stated in writing. Verbal statements made by employees or representatives of HRSB, whether or not they appear to have the proper authority, shall not be binding on HRSB.

4. Addenda: HRSB reserves the right to modify the terms of the RFX documents prior to closing, at its sole discretion by addenda.

4.1. HRSB Procurement Division will make every effort to ensure the information provided on HRSB.ca is complete and accurate, please report any omissions or discrepancies to the Procurement Division immediately. **Any questions or requests for clarification arising from omissions, discrepancies, or ambiguities, must be made in writing no later than five(5) working days prior to the closing date, not including the closing date**. Replies to requests for clarification, if required, will be made in the form of written addenda, copies of which will be posted on www.HRSB.ca/tender no later than three (3) working days prior to the date of closing, not including the closing date.

4.2. By downloading files from the www.hrsb.ca, you will automatically become registered for the applicable RFX. HRSB Procurement Division will make reasonable efforts, strictly as a courtesy, to directly inform registered Suppliers of any addenda, **however it is the sole responsibility of each registered Supplier to ensure that they have all the documents associated with any RFX and, to this end, every registered Supplier should review HRSB Tender Web Site daily**. These documents must be downloaded from the www.hrsb.ca/tender or obtained from HRSB Procurement Division, as applicable. Suppliers must acknowledge receipt of all addenda(s) with their RFX Submission.

5. Suppliers Responsibility: Suppliers are solely responsible for their own expenses in preparing, delivering or presenting a RFX and for subsequent negotiations, if any, with HRSB. It will be the responsibility of the Supplier to acquire at the Suppliers cost, any RFX documents as indicated on the Cover Sheet of the tender document.

6. Existing Conditions: Suppliers will be deemed to have familiarized themselves with the existing conditions which may affect the performance of required goods, services and construction. No plea of ignorance of such conditions as a result of failure to make all necessary examinations will be accepted as a basis for any claims for extra compensation or an extension of time. Suppliers are to ensure that they understand the expected use for the requested goods, service and construction and submit their RFX submission accordingly.

7. RFX Submissions

7.1. RFX will close at the time, date and location specified in the RFX documents (Atlantic Time Zone).

7.2. All RFX submissions must be received in their entirety on or before the closing time specified. Suppliers are responsible for ensuring that their RFX submission, however submitted, is received on time and at the location specified.

7.3. RFX Submissions must be submitted on the forms provided or in such format as directed in the RFX documents. These forms must be legible, complete, filled out in ink, or by typewriter, with the signature in longhand and the completed form shall be without interlineations, alterations or erasures.

7.4. If an electronic transmission (i.e. Facsimile, e-mail or HRSB.ca upload) can be accepted, as detailed in the applicable RFX documents, it is the responsibility of the Supplier:

7.4.1. to ensure that the submissions are delivered on or before the closing time and date shown on the RFX documents;

7.4.2. that the correspondence is legible and properly transmitted; and

7.4.3. that the name and number of the RFX is clearly displayed.

7.5. Electronic transmission of a RFX submission cannot be used where original documents are required, e.g. bid bonds, certified cheques, samples, etc., or as may be otherwise stated in the RFX documents.

7.6. **Sealed RFX submissions** must be delivered to HRSB Receptionist, 1st floor, 33 Spectacle Lake Drive, Dartmouth, Nova Scotia, on or before the closing time and date shown on the RFX documents. The RFX Submission is to be submitted on the provided forms, signed (together with the required RFX security as applicable) in a sealed opaque envelope, clearly identified with Suppliers name, RFX identification number and name, and closing date on the outside of the envelope. RFX Submissions are date and time stamped upon receipt at the Procurement Division (not at any other location) by the Procurement date time stamp. Any submission received after the

closing date and time shown on the RFX documents will not be accepted and will be returned to the Supplier unopened and deemed non-compliant.

7.7. **Facsimile submissions** received are date and time stamped by the Procurement Division Facsimile, no other time stamp will be considered. A facsimile submission received after the closing date and time shown on the RFX documents will not be accepted and shall be deemed non-compliant. **The facsimile number for the Procurement Department of HRSB is (902) 464-0161. Do not send RFX correspondence to any other fax number.**

7.7.1. Where specified, facsimile submissions are accepted for the convenience of the Supplier; HRSB cannot ensure the confidentiality or error-free receipt of facsimile submissions.

7.8. **Amendments/Withdrawn Submissions**

7.8.1. Submissions may be withdrawn or amended by written request (on company letterhead or equivalent), prior to RFX closing date and time, but cannot be altered or changed in any way after the RFX closing.

7.8.2. Facsimile transmissions modifying supplier provided information are acceptable when signed by a duly authorized officer or agent. Submission of such electronic transmissions is at the risk of the Supplier. HRSB assumes no liability for the receipt of the electronic transmissions or their proper inclusion with original RFX submission. An electronic submission must be submitted prior to closing time and date specified in the RFX documents.

7.8.3. An amendment to a RFX submission replaces any other RFX submission amendment previously submitted by the supplier; only the last of any RFX submission amendment received will be accepted.

7.9. All RFX submissions must be signed by an authorized representative of the entity.

7.10. HRSB's time clocks will be assumed to be correct in the event of dispute.

7.11. HRSB reserves the right in its sole discretion to clarify any RFX submission after closing by seeking further information from that Supplier, without becoming obligated to clarify or seek further information from any or all other Supplier. However, Suppliers are cautioned that any clarifications sought will not be an opportunity either to correct errors or change their Bids in any substantive manner.

8. **Brand Name:** Some terminology may be used that would imply or denote a particular supplier. Brand names may be utilized to designate the type and quality of the product requested. Such usage shall not to be construed as restrictive in any way. Suppliers must be prepared to provide samples if required.

9. **Substitute**

9.1. If the Supplier is offering an equivalent (similar) substitute product to those specified, unless a specific product is requested, the supplier must clearly identify this substitution and supply the manufacturer's name, product number and provide any technical information required so that HRSB can determine the acceptability of the substitute.

9.2. HRSB reserves the right to inspect or test any product bid to determine equivalency, and may require demonstrator or sample items in order to be able to evaluate the items proposed.

9.3. HRSB shall be the sole judge of the acceptability of any substitute or proposed equivalent.

9.4. Specifications may, for technical or logistical reasons, require that the items specified be supplied without substitution.

10. Warranty

10.1. The supplier must describe the duration, type (e.g. on-site, depot, ship-in or carry-in) and terms of the manufacturer's warranty on all goods. If the supplier provides any additional/supplementary warranty coverage, describe this as well.

10.2. If warranties can be upgraded or extended, identify the upgrade costs separately. Do not include warranty upgrade or extension costs in the price unless the RFX documents specifically states that the upgrade is a mandatory requirement.

11. Pricing

11.1. All prices must be extended and totaled, where practical to do so. RFX Submission may be rejected as incomplete if total figures are not provided. In the case of an error in the extension of prices, the unit prices shall prevail.

11.2. Prices must be in Canadian funds, and shall include all shipping, handling, freight, offloading, duty, insurance and any other charges, which are applicable at time RFX is awarded (FOB – Destination). HRSB will not assume responsibility for any goods or services until they have been delivered to the destination(s) specified in the Solicitation. It is the responsibility of the Supplier to find out from the appropriate authorities what rates and charges are applicable to this RFX. No extra charges will be paid by HRSB.

11.3. In the event that a number of Suppliers provide submission in substantially the same amount, HRSB may, at its discretion, call upon those Suppliers to submit further bids.

12. Permits and Taxes: It is the responsibility of the Supplier to ensure that quotations include all taxes, permits, and other charges required to supply the goods, services and construction. The successful Supplier is to comply with all codes, regulations, and by-laws and all government and applicable standards pertaining to the work and job-site including, and not limited to, the Nova Scotia Occupational Health and Safety Act and Regulations. HRSB is required to pay a Harmonized Sales Tax (HST) at a rate specified by the Province of Nova Scotia. This tax is to be shown as a separate line item.

13. Standards

13.1. All goods, services and construction supplied to HRSB shall, when standards are available, be certified in accordance with the applicable code(s), but not limited to:

13.1.1. Canadian Standards Association;

13.1.2. Canadian Government Standards HRSB;

13.1.3. Underwriters Laboratories of Canada; and

13.1.4. And all applicable Federal, Provincial and Municipal regulations and acts.

13.2. HRSB reserves the right to discontinue the purchase of any product/service that does not continue to meet the applicable standard(s).

14. Inspection: HRSB reserves the right to inspect any goods, services or construction supplied either during or after manufacture and delivery, and shall be the sole judge as to the acceptability of goods, services and construction to meet the needs of HRSB and fulfills the requirements as specified.

15. Rejection of RFX Submissions/Compliance:

15.1. Failure to comply with any of the mandatory terms or conditions contained or referenced in the RFX documents shall result in the rejection of the RFX submission.

15.2. HRSB specifically reserves the right to accept or reject any or all RFX submission and implies no obligation on HRSB to accept any RFX submission, a portion of any RFX submission or any RFX submission. HRSB reserves the

right to cancel any RFX in its entirety and shall not be responsible, in any manner, for expenses incurred by the Supplier for preparing a RFX submission. HRSB may award all or a portion of the work to one or more Suppliers. Without limiting the generality or any other provision hereof, HRSB reserves the right to reject or accept any RFX submission:

15.2.1. that contains any irregularity or informality;
15.2.2. that is not accompanied by the security documents required;
15.2.3. that contains an alteration in the quoted price that is not initialed by the or on behalf of the Supplier;
15.2.4. that is incomplete or ambiguous;
15.2.5. contains clauses additional to the RFX that are "qualified" or "conditional"; and/or
15.2.6. that does not strictly comply with the requirements contained in these instructions.

15.3. HRSB reserves the right to waive minor non-compliance where such non- compliance is not of a material nature in its sole and absolute discretion, or to accept or reject in whole or in part any or all RFX submissions, with or without giving notice. Such minor non-compliance will be deemed substantial compliance and capable of acceptance. HRSB will be the sole judge of whether a RFX submission is accepted or rejected.

15.4. HRSB reserves the right to accept or reject any or all RFX submission, not necessarily accept the lowest priced RFX submission, or to accept any RFX submission which it may consider to be in its best interest.

16. Evaluation criteria: If applicable, award of the RFX will be based on “Best Value” (which includes, but not limited to; price, discounts, product specifications, warranty, delivery, reference checks, etc.

17. Cancellation/no award

17.1. Issuing a RFX implies no obligation on HRSB to accept any submission, or a portion of any submission. The lowest or any RFX submission will not necessarily be accepted.

17.2. RFX’s may be cancelled in whole or in part by HRSB in its sole discretion when:

17.2.1. the RFX submission price exceeds the funds allocated for the purchase;
17.2.2. there has been a substantial change in the requirements after the RFX has been issued;
17.2.3. information has been received by the RFX after the RFX has been issued that the RFX believes has substantially altered the procurement;
17.2.4. there was insufficient competition in order to provide the level of service, quality of goods or pricing required.

17.3. If no compliant RFX submission is received in response to a RFX, the RFX reserves the right to enter into negotiations with one or more suppliers in order to complete the procurement.

17.4. HRSB will be the sole judge of whether there is sufficient justification to cancel any RFX.

17.5. No action or liability will lie or reside against HRSB in its exercise of its rights under this section.

18. Eligibility and Conflict of Interest

18.1. A RFX Submission may not be eligible for acceptance if current or past corporate or other interests of the Tenderer may, in HRSB's opinion, give rise to a conflict of interest in connection with a project.

18.2. Suppliers are cautioned that acceptance of their RFX submission may preclude them from submitting a response on subsequent phases where a conflict of interest may arise. Suppliers should study the project implementation strategy to determine whether or not they plan to submit response on subsequent phases.

18.3. If the RFX submission covers the first phase of what may prove to be a multi-phased project, the successful Supplier on the initial phase may be permitted to respond on subsequent phases as long as, in HRSB's opinion, no conflict of interest would be created in performance of the work by that Supplier.

18.4. Sub-contracting to any firm or individual whose current or past corporate or other interests may, in HRSB's opinion, give rise to a conflict of interest in connection with this bid will not be permitted. This includes, but is not limited to, any firm or individual involved in the preparation of the RFX documents.

19. **Disputes:** In case of dispute as to whether or not an item or service quoted or delivered meets RFX requirements, the decision of HRSB, or its authorized representative, shall be final and binding on all parties.

20. **Exceptions:** A RFX submission shall be considered an agreement to all terms and conditions provided herein and in various RFX documents, unless specifically noted otherwise in the RFX documents.

21. **Irrevocable Offer:** A RFX submission represents an irrevocable offer, unless otherwise stated in the RFX documents and shall be valid for a period of ninety (90) days following the closing date for RFX submissions.

22. **Patent right and royalties:** The successful Supplier shall pay all royalties and patent license fees required for the performance of the work. The successful Supplier shall hold HRSB harmless from and against claims, demands, losses, costs, damages, action suits or proceedings arising out of the successful Supplier's performance of the Contract which are attributable to an infringement or an alleged infringement of a patent of invention by the successful Supplier or anyone for whose acts the successful Supplier may be liable.

23. **Assignment:** The successful Supplier shall not assign the Contract (or portion thereof) nor sub-contract without the prior written consent of HRSB, consent shall not be unreasonably withheld.

24. **Purchase Order:** Work by the Supplier will begin only with the issuance of HRSB's official purchase order and/or any Contract Documents as applicable. The purchase order number must appear on any/all invoices covering same. No work is authorized until the successful Supplier has received an official HRSB purchase order and/or required Contract Documents. HRSB accepts no responsibility for any work performed prior to the issuance of a purchase order and/or required Contract Documents.

25. **Delivery**
    - **25.1.** Where the RFX Document includes a mandatory delivery schedule, HRSB will assume that the Supplier can meet the requested schedule and is satisfied that the goods or services required will be available for delivery on the requested date(s).
    - **25.2.** If Suppliers wish to specify a delivery schedule different from that requested in the RFX document, they must provide specific delivery dates or a schedule in calendar days from the date a Purchase Order is issued. RFX Submission that do not meet the delivery schedule as requested in the RFX documents may be rejected.
    - **25.3.** Time is of the essence, and supplier's delivery schedule is legally binding. HRSB reserves the right to assess penalties or cancel awards to Suppliers who fail to meet their stated delivery or completion dates.

26. **Invoices**
    - **26.1.** All invoices are to be submitted quoting the Purchase Order number (as applicable). The H.S.T. number must be shown on each invoice. Invoices must include a description of the goods, services and construction provided with HRSB Work Order Numbers (where applicable). Invoices must also clearly indicate list price, discounts offered and net price, if applicable. All invoices are to be forwarded to:

      Halifax Regional School Board
      33 Spectacle Lake Drive
      Dartmouth, NS, B3B 1X7
      Attn: Accounts Payable
    - **26.2.** All Suppliers are required to maintain their tax status in good standing. In this regard, Suppliers are advised that verification of good standing with the Nova Scotia Minister of Finance and Revenue Canada (GST/HST) may be carried out prior to the award of a contract to a successful Supplier.

26.3. In order to maximize efficiencies, as well as to be more environmentally friendly, vendor payments are now being paid via EFT (Electronic Funds Transfer) direct deposit to vendor bank accounts. A vendor direct deposit form must be filled out with banking information for EFT payments.

27. Payment:

27.1. HRSB's normal payment terms are thirty (30) days from acceptance that the goods, services and construction meet the specifications. Alternative payment schedules may be proposed and are to be shown as an option and list any additional discounts to HRSB. Early payment discount terms (minimum period ten (10) days) may be considered in the evaluation of the RFX response. Payment of term discount invoices will be calculated from the date of the invoice or goods have been received, whichever is later. Discount terms must appear on the invoice.

27.2. The Supplier shall make application for payment at least monthly with the application based on progress or services provided during that month. HRSB will hold back ten percent (10%) of any payment until the lien periods have expired and the Supplier has provided HRSB with a complete release of any lien registered as a result of any work carried out by the Supplier, or any sub-contractor or supplier to the Supplier.

28. Right to offset: The successful Supplier agrees that HRSB may apply payments for goods, services and construction to any amount owing to HRSB by the Supplier or supplier including any related administration fees.

29. Confidentiality: The Supplier shall keep private, treat as being confidential, and not make public or divulge during, as well as after, the term on this Agreement, any information or material to which the Supplier or staff becomes privy as a result of acting under this Agreement without having first obtained HRSB's consent in writing.

30. Freedom of Information and Protection of Privacy (FOIPOP) Act and Personal Information International Disclosure Protection Act (PIIDPA)

30.1. As a public body, HRSB is subject to provincial legislation, Freedom of Information and Protection of Privacy (FOIPOP) Act. RFX submissions and associated documents are subject to disclosure and protection under this legislation. In the event an application for disclosure of information is made under FOIPOP, HRSB is subject to the disclosure and protection of information in accordance with that legislation. Suppliers are recommended to visit the following websites for more information on the Act: http://www.gov.ns.ca/just/IAP/default.asp and http://www.foipop.ns.ca/

30.2. The Province of Nova Scotia is required to comply with the Personal Information International Disclosure Protection Act (PIIDPA)(S.N.S 2006, c.3). The act creates obligations for the Province of Nova Scotia and its service providers when personal information is collected, used or disclosed. Requirements include limiting storage, access and disclosure of personal information to Canada, except as necessary or otherwise required by law. Suppliers are recommended to visit the following PIIDPA websites for more information on the Act: http://nslegislature.ca/legc/bills/60th_1st/3rd_read/b019.htm and http://www.gov.ns.ca/just/IAP/PIIDPAquest.asp#p01

30.3. The Supplier acknowledges and confirms that it is a "service provider" as defined in the Personal Information International Disclosure Protection Act, SNS 2006 c. 3 ("PIIDPA"), that the Supplier has read and understands its obligations as a service provider thereunder and that as a service provider It is legally bound by the obligations imposed on it by PIIDPA. It is a condition precedent to HRSB entering into the Agreement with the Supplier that the Supplier irrevocably undertakes covenants and agrees to be bound by and comply with the obligations imposed on it as a service provider under PIIDPA.

30.4. The Supplier further covenants, warranty and represents to HRSB that it will not at any time provide or allow the release of personal information to which it has access in its capacity as a service provider to HRSB in response to any "foreign demand for disclosure" or permit or allow the "unauthorized disclosure of personal information" as each of those terms are defined in PIIDPA.

30.5. The Supplier shall implement and strictly enforce security arrangements that will ensure that all personal information that it collects or uses on behalf of HRSB is protected at all times from unauthorized access or disclosure and shall confirm in writhing to HRSB, upon request, the details of such security arrangement. The Supplier also agrees to implement and enforce any additional security procedures as may be required by HRSB from time to time to protect the personal information that the Supplier collects on behalf of HRSB. HRSB shall be authorized, upon giving prior written notice to the Supplier, to enter the premises of the Supplier during normal business hours for the purpose of conducting an audit of the security arrangement referenced herein.

30.6. All personal information that the Supplier obtains or becomes aware of while providing services to HRSB is not and shall not be or be deemed to be the property of the Supplier. The Supplier acknowledges and agrees that it will not, either directly or indirectly, acquire any rights to use or own any such information other than the right to use it for the sole purpose of fulfilling its obligations to HRSB under the Agreement.

30.7. All RFX submissions become the property of HRSB. By providing a RFX submission, the supplier hereby grants HRSB a license to distribute, copy, print or translate the RFX submission for the purposes of the RFX. Any attempt to limit HRSB's right in this area may result in rejection of the RFX submission.

30.8. Suppliers RFX submission may be subject to disclosure under the Province's "freedom of information" legislation. By submitting a RFX submission, the Supplier agrees to the appropriate disclosure of the information supplied, subject to the provisions of the governing law. HRSB cannot guarantee the confidentiality of the complete content of any RFX submissions after the procurement has been awarded to the successful supplier.

30.9. During the delivery and installation of goods and/or services, the supplier or supplier's staff may have access to confidential information belonging to HRSB. Should this occur, the supplier must ensure that such information is not released to any third parties or unauthorized individuals; failure to comply may result in legal action being taken and/or the supplier's disqualification from any further RFX's issued by HRSB.

31. Indemnification: The Supplier shall indemnify and hold harmless HRSB, their agents, representatives and employees from and against all claims, demands, losses, costs, damages, actions, suits or proceedings arising out of, or resulting from the performance of this work, provided that any such claim is caused in whole or in part by the negligent act or omission of the Supplier, and sub-contractor, supplier, licensee, anyone directly or indirectly employed by any one of them or anyone for whose act any of them is liable, regardless of whether or not it is cause in part by a party indemnified hereunder.

32. Insurance: Unless otherwise stated, Commercial General Liability Insurance with policy limits of not less than two (2) million dollars ($2,000,000.00) must be filed with the Procurement Department of HRSB; such insurance shall be in the name of the Supplier and HRSB. The insurance must include non-owned automobile liability with policy limits of not less than two (2) million dollars ($2,000,000.00). All insurances are to be maintained in good standing for the duration of the Contract.

33. Termination for convenience: HRSB may terminate a contract, in whole or part, whenever HRSB determined that such termination is in the best interest of HRSB, without just cause giving sixty (60) days written notice to the proponent. However, in no event shall the proponent be paid an amount that exceeds the submitted price for the work performed.

34. Termination for default: When the proponent has not performed or has unsatisfactorily performed the contract, HRSB may terminate the contract for default. Upon termination for default, outstanding payment will be withheld at the discretion of HRSB. Failure on the part of the proponent to fulfill the contract obligations shall be considered just cause for termination of the contract. The proponent will be paid for work satisfactorily performed prior to termination, less any excess costs incurred by HRSB in re-procuring and completing the work.

35. Workers Compensation: Prior to commencing the work, the Supplier shall provide a current clearance letter from the Workmen's Compensation HRSB (WCB) and must maintain this coverage during the whole term of the Contract.

36. WHMIS: All controlled products supplies to HRSB must have approved Workplace Hazardous Materials Information System (WHMIS) supplier labels; Material Safety Data Sheets must also be supplied. Failure to comply with this requirement may result in rejection of any shipment, and may result in cancellation of the order and the return of goods to the supplier at the supplier's expense.

37. Health and Safety Act: The Supplier shall take every precaution to ensure that every employee, self-employed person and employer performing work in respect of the project complies with the latest revisions of the Nova Scotia Occupational Health and Safety Act and the Regulations. Halifax Regional School HRSB Occupational Health and Safety Policy BP 303.1, and all other safety measures as required by authorities having jurisdiction.

38. Site Safety Plan: Before being permitted access to the site to commence construction the Supplier may be requested provide HRSB with a written Project Specific Site Safety Plan. The Site Safety Plan provided shall be a written course of action that, through a pre-job evaluation, identifies and sets out specific actions to be taken to eliminate or control hazards associated with the work to be performed and to also deal with concerns or hazards that may develop during the course of the project. This Plan shall include, but not be limited to, identification of safety hazards anticipated during the project, solutions to those hazards, safety procedures, identification of designated safety officers and provision for safe access to the site for HRSB staff and or Consultants. Receipt and acceptance of the safety plan shall be mandatory prior to commencement of work.

39. Extension to the Broader Public Sector

39.1. HRSB may choose to allow the Broader Public Sector to purchase goods or services from some RFX's. The Broader Public Sector are generally permitted to purchase from "Standing Offers", which are contracts resulting from a RFX. Other RFXs may also be available to the Broader Public Sector; if so, the Solicitation documents will state this.

39.2. By submitting a response to a RFX, the Supplier agrees to extend the same pricing to other eligible Broader Public Sector institutions as per the terms and specifications in the Solicitation

40. Governing Laws and Trade Agreements

40.1. Unless the RFX documents specifically state otherwise, the RFX, all submissions, and any subsequent contracts will be construed and interpreted in accordance with the laws of the Province in which the Solicitation was issued.

40.2. RFX's subject to the Atlantic Procurement Agreement, the Agreement on Internal Trade, any other inter-provincial trade agreements, or any international trade agreements, will be specifically identified as such in the public notice and/or the Solicitation documents.

40.3. Information of any applicable trade or procurement agreements and/or legislation can be obtained by contacting HRSB Procurement Department.

40.4. Suppliers agree to comply with all applicable laws, regulations and standards, including all labour, occupational health & safety, and worker compensation requirements of the Province.

40.5. HRSB may consider and evaluate any RFX submission from other jurisdictions on the same basis that the purchasing authorities in those jurisdictions would treat a similar RFX submission from a supplier located in this Province. HRSB will be the sole judge of whether these conditions will be used and the extent to which they will be applied.

40.6. Suppliers registered to do business in any Atlantic Province can bid on RFX issued by any other Atlantic Province without having to satisfy any local registration or residency requirements.

40.7. Under Canadian law (and international agreements), your RFX submission must be arrived at separately and independently, without conspiracy, collusion or fraud; see: http://www.competitionbureau.gc.ca/internet/index.cfm?itemid=1243&lg=e for further information.

41. Other General Conditions

41.1. No RFX submissions shall be accepted from any person or corporation who, or which, has a claim or has instituted a legal proceeding against HRSB or against whom HRSB has a claim or has instituted a legal proceeding with respect to a previous contract, without prior approval of HRSB.

41.2. The Supplier shall perform the obligations of this Contract in a good and workmanlike manner in compliance with all applicable legislation in effect in Nova Scotia, and in accordance with industry standards and practice.

41.3. The Supplier shall be solely responsible for all means, methods, techniques and procedures necessary for performing the work required under this Contract.

41.4. All Suppliers must comply with the Nova Scotia Corporations Registration Act (CRA) or the Partnerships and Business Names Registration Act (PBNRA) as one of the conditions of doing business with the Province of Nova Scotia. In this regard, Suppliers are advised that verification of registration and good standing may be carried out prior to the final award of a contract to a successful Supplier. Suppliers residing outside Nova Scotia (which are not otherwise carrying on business in Nova Scotia) are expected to be registered in an equivalent manner in their respective jurisdictions.

41.5. Unless otherwise specified, all materials installed by the Supplier as part of this Contract shall be new and shall comply with the specifications and any applicable building codes. The Supplier is, at all times, responsible for correcting any defective work or materials at the Supplier's cost, and payment by HRSB to the Supplier does not relieve the Supplier of that responsibility.

41.6. Where applicable, the end user must be provided with complete operation manuals, warranty registration forms, user licenses/ authentications and/or other associated documentation normally provided by the manufacturer, reseller, installer and/or consultant.

41.7. The Supplier shall, at all times, keep HRSB premises free from accumulations of waste and rubbish. Disposal of all waste and rubbish shall be at approved waste disposal sites.

41.8. If the Supplier files for bankruptcy, becomes insolvent or fails to perform the Supplier's obligations under this Contract in a timely and workmanlike manner, HRSB may, by written notice, immediately terminate the employment of the Supplier and the Supplier shall be entitled only to the value of work performed and materials supplied up to the date of the termination.

41.9. The Supplier shall not permit smoking by any of its employees or sub-contractors on HRSB property and will act in accordance to the Halifax Regional School HRSB policy BP101.3 Tobacco-Free Schools and Workplaces.

41.10. The Supplier warrants its work and materials for a minimum of twelve (12) months after the date of substantial completion.

41.11. The Supplier, if performing work on HRSB property may be required to provide a safety program certified with the Nova Scotia Construction Safety Association or with an approved alternate safety association and/or program.

41.12. HRSB reserves the right to split an award amongst Suppliers as deemed in the best interests of HRSB.

END OF SECTION 00 73 10

SECTION 01 11 00 - HRSB SUMMARY OF WORK

1. **Project Location & General Scope**
   - **1.1.** ***SIR JOHN A.MACDONALD HIGH SCHOOL, 31 SCHOLARS RD,UPPER TANTALLON NS,B3Z 0C3***
   - **1.2.** Scope: Refer to Section 00 00 15 for scope and schedule information.

2. **Contract Documents**
   - **2.1.** Work will be performed under CCDC-2, 2008 contract.

3. **General Conditions**
   - **3.1.** Halifax Regional School Board and CCDC-2, 2008, form an integral part of this Project Manual, a copy of which is bound herein.

4. **Project Manual**
   - **4.1.** Sections of the Project Manual are numbered in conformance with the Master List of Section Titles and Numbers, CSC Document 004E, published jointly by Construction Specifications Canada and The Construction Specifications Institute (USA). Sections are arranged in their standard format.
   - **4.2.** Sections are written as units of the Work which have been assigned numbers in conformance with the CSC/CSI system. They are arranged in sequence for this Manual. Gaps in the order of numerical sequence do not indicate that a section has been inadvertently omitted from this Manual, but, rather that a Section is not required for completion of the Work.
   - **4.3.** Wherever the project location building name occurs in the Contract Documents it shall be taken to mean all work included in the Contract.
   - **4.4.** Wherever in the Contract Documents the words "approval", "approved", "direction", "directed", "selection", "selected", "request", "requested", "report", and similar words are used, such approvals, directions, selections, requests and reports shall be given by the HRSB unless specifically stated otherwise.
   - **4.5.** Wherever in the Contract Documents the word "provide" is used in any form, it shall mean that the Work concerned shall include both supply and installation of the products required for completion of that part of the Work.
   - **4.6.** Wherever in this Project Manual it is specified that Work is to proceed or to meet approval, direction, selection or request of jurisdictional authorities or others, such approval, direction, selection or request shall be in writing.

5. Errors & Omissions

5.1. If errors or omissions are observed in the Contract Documents, immediately notify the HRSB Procurement in writing of all such errors or omissions. In the event no such notice is given, the Contractor will be held responsible for the results of any such error or omission and the cost of rectifying the same.

6. Division 1

6.1. The provisions of all Sections of **Division 1** shall apply to each Section of this Specification**.**

7. Wage Rates

7.1. Pay all employees engaged on the Work a wage not less than the minimum wage per hour as set out by the Province of Nova Scotia. For overtime work beyond 48 hours in any one week, pay no employee at a rate of less than one and one-half times the minimum wage per hour noted above. Provide for these wage rates in tendered contract amount.

8. Work Performed Under Separate Contracts

8.1. Work not to be included in the Contract, as noted "NIC" on the Drawings, shall be governed by Article 37, Separate Contracts, of General Conditions of Contract.

8.2. Furniture installation will be carried out by others.

8.3. Computer installation will be carried out by others.

9. Project Schedule

9.1. Refer to Section 00 00 15 Description of Work.

9.2. Existing services (mechanical & electrical) will need to be maintained through the renovations.

9.3. During construction, all life safety systems as well as mechanical and electrical systems must be in active, usable condition to permit the school to operate or alternate methods used to ensure the safe operation of the school as directed by HRSB project representative.

9.4. As construction progresses revise the schedule to compensate for any delays or unforeseen activities so as to maintain the contract completion date. Each schedule submission is to be complete with a statement indicating the changes made, the reason they were changed and confirmation that the project completion date will not change. The above schedule information is to be submitted monthly or more often if necessary.

10. Site Progress Records

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

10.1.1. Commencement and completion dates of the Work of each trade in each area of Project.

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

10.1.3. Visits to site by representatives of the Owner, Engineer, jurisdictional authorities, Contractor, Subcontractors, and suppliers.

10.2. Maintain a progress chart in approved format. Show on chart proposed Work schedule and progress of Work by Contractor and Subcontractor.

11. Examination

11.1. Site:

11.1.1. Examine site, and ensure that site conditions have been examined, that all are fully informed on all particulars which affect Work thereon and at the place of construction, and in order that construction proceeds competently and expeditiously.

11.1.2. Ensure by examination that all physical features, and working restrictions and limitations which exist are known.

11.2. Previously Completed Work:

11.2.1. Verify dimensions of existing Work in place before construction of Work to be incorporated with it.

11.2.2. Verify that previously executed Work and surfaces are satisfactory for construction, and that performance of subsequent Work will not be adversely affected.

11.2.3. Commencement of Work will constitute acceptance of site conditions and previously executed Work as satisfactory.

11.2.4. Report to Engineer defects in prior Work which will affect quality of subsequent Work, or construction schedule.

11.3. Construction Measurements:

11.3.1. Before commencing installation of Work, verify that its layout is accurate in accordance with intent of Drawings, and that locations, elevations, and clearances to adjacent infrastructure are maintained.

11.3.2. If Work is installed in wrong location, rectify it before other Work concerned

proceeds.

12. PROTECTION OF WORK, PROPERTY & PERSONS

12.1. Include in Work necessary methods, materials, and construction to ensure that no damage or harm to Work, materials, property and persons results from the Work of this Contract. Temporary facilities relating to protection are specified in Section 01 52 00.

12.2. Protect, and if damaged make good, adjacent private and public property.

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

12.4. Protect finished surfaces of completed Work from damage by restriction of access or by use of physical means suitable to the material and surface location. Establish with each Subcontractor the suitability of such protection in each case.

12.5. Protect existing underground infrastructure, mechanical, electrical, telephone and similar services from damage. If necessary, relocate active services to ensure that they function continuously in safety and without risk of damage.

12.6. Cap off and remove unused utility services encountered during Work after approval is given by the utilities concerned or jurisdictional authorities, whichever may apply. Relocation, removal, protection and capping of existing utility services shall be performed only by the applicable utility and of other services by licensed mechanics.

12.7. To prevent soiling or damage to finish flooring where pedestrian traffic occurs after the flooring has been installed, install and maintain 6 mil. polyethylene membrane or reinforced kraft paper temporary protection, secured in place and with joints sealed by reinforced pressure sensitive tape.

12.8. Install plywood panels of minimum ¼" thickness over completed finish flooring materials, on which further construction Work is performed by other trades or delivery of products is made, or both. Seal joints between panels with reinforced pressure sensitive tape.

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

12.10. The outside work area shall be appropriately demarked and/or surrounded by rigid chain link panels or fencing to prevent unauthorized entry to the work area. Any area of roof having work completed is to be covered below with this fencing approximately 10' from the edge of the building. It is to be maintained at all times throughout the project. All waste disposal bins are to be fenced in using the same type of fencing as indicated above during working hours. After working hours, all waste disposal bins shall be located a minimum of 25 feet from any structure.

Any windows where the debris chute is located are to be covered. All entrances below the roof area are to have covered scaffolding erected to ensure a safe travel path to a distance of ten feet from edge of building. All workers shall contain their activity to the work site area. Access to the school shall only be allowed as planned in coordination with HRSB Operations and the school administration.

12.11. The contractor is responsible for security of all project materials and access to the project site and/or the school through the project site at all times until completion of work and acceptance of the finished project by HRSB. Such additional security costs for security personnel or other means of security as deemed necessary by the contractor will be the sole responsibility of the contractor. The HRSB will provide security personnel up to and including the Substantial Completion date as noted on the bid submission documents.

12.12. The contractor shall keep the work site free from accumulated debris caused by the employees or work and shall remove all debris at the end of each work shift. Debris shall not be deposited in HRSB controlled garbage and/or recycling containers.

12.13. All waste materials and debris created during demolition and/or construction shall be disposed of in a dumpster provided by the contractor, to be removed at the end of the construction project, using a methodology that is in compliance with the applicable HRM solid waste by laws. Otherwise, the material must be removed and disposed of off site at the end of each working day. The waste materials may not be stored on site unless they are held in an approved project dumpster no closer than twenty five (25) feet from any structure.

12.14. All temporary structures such as portable washroom facilities, materials storage trailer, work trailer, debris dumpster, vehicles, etc., shall be located a minimum of (25) twenty-five feet from the school building.

12.15. Where applicable, a hot work permit will be required to be completed prior to commencement of work and all conditions of the permit must be maintained until completion of hot work. A copy of the hot work permit signed by the contractor representative shall be provided to HRSB upon completion of each hot work session. Contractor must assign a designated fire watch as noted on the permit document who shall remain on site for three hours after completion of each hot work session.

12.16. A school washroom will be designated for use where appropriate. However, protection of the surfaces as indicated above must be maintained. It should also be noted that access to the building during summer months will be limited for security reasons. Contractor is responsible to provide temporary portable washroom facilities for general use of contractor staff.

12.17. Access to Interior of School - All interior access is to be scheduled with the PM. This will allow

for notice to the school admin., custodial and possible scheduling of a security guard for after hour access.

12.18. Adhesives / Torch Work - All adhesive use and torch work must be completed after school hours.

13. Cleaning

13.1. Ensure that during and after construction the public streets and existing asphalt parking lot are cleaned as required.

14. Salvage

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

15. Site Limitations

15.1. Since the existing building will be occupied during the Work (in accordance with the Phasing Schedule) the Architect will designate the precise areas on the site which may be utilized for work and storage, and where personnel will be permitted to be present. Refer also to Drawings. Allow for hoarding to secure construction areas from occupied portions of the Building and Site.

15.2. All access to the construction site is to be coordinated with the Project Manager for HRSB and communicated at the pre-construction meeting.

15.3. Any Work carried out in the building is to be carried out during hours approved by the School Administration.

15.4. Any disruption to services within the building must occur during hours approved by School Administration.

15.5. Any Work which may have an adverse affect on the occupancy functions, must have prior approval of the School Administration and **may** require scheduling during off-hours.

16. Security Regulations

16.1. Perform Work in conformance to the security regulations of the building as directed by the Project Manager for HRSB.

17. Project Identification

17.1. No project sign is required on this Project.

18. Owner's Occupancy

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

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

END OF SECTION 01 11 00

SECTION 01 11 25 - PRICES

1. General

1.1. Prices included in the Contract shall be complete for the applicable Work, and shall include for each price:

1.1.1. Expenditures for wages and for salaries of workmen, engineers, superintendents, draftsmen, foremen, timekeepers, accountants, expeditors, clerks, watchmen and such other personnel as may be approved, employed directly under the Contractor and while engaged on the applicable Work at the site and expenditures for travelling and board allowances of such employees when required by location of the applicable Work or when covered by trade agreements and when approved; provided, however, that nothing shall be included for wages or salary of the Contractor if an individual, or of any member of the Contractor's firm if the Contractor is a firm or the salary of any officer of the Corporation if the Contractor is a corporation, unless otherwise agreed to in writing.

1.1.2. Expenditures for material used in or required in connection with the construction of the applicable Work including material tests and required by the laws or ordinances of any authority having jurisdiction and not included under Subparagraph .9.

1.1.3. Expenditures for preparation, inspection, delivery, installation and removal of materials, equipment, tools and supplies.

1.1.4. Temporary facilities as required for the applicable Work.

1.1.5. Travelling expenses properly incurred by the Contractor in connection with the inspection and supervision of the applicable Work or in connection with the inspection of materials prepared or in course of preparation for the applicable Work and in expediting their delivery.

1.1.6. Rentals of all equipment whether rented from the Contractor or others, in accordance with approved rental agreements including any approved applicable insurance premiums thereon and expenditures for transportation to and from the site of such equipment, costs of loading and unloading, cost of installation, dismantling and removal thereof and repairs or replacements during its use on the applicable Work, exclusive of any repairs which may be necessary because of defects in the equipment when brought to the Work or appearing within thirty (30) days thereafter.

1.1.7. The cost of all expendable materials, supplies, light, power, heat, water and tools (other than tools customarily provided by tradesmen) less the salvage value thereof at the completion of the applicable Work.

1.1.8. Assessments under the Workmen's Compensation Act, the Unemployment Insurance Act, Canada Pension Act, statutes providing for government hospitalization, vacations with pay or any similar statutes; or payments on account of usual vacations made by the Contractor to his employees engaged on the applicable Work at the site, to the extent to which such assessments or payments for vacations with pay relate to the Work covered by the specified price; and all sales taxes or other taxes where applicable.

1.1.9. The amounts of all Subcontracts related to the specified price.

1.1.10. Premiums on all insurance policies and bonds called for under this Contract as related to the specified price.

1.1.11. Royalties for the use of any patented invention on the applicable Work.

1.1.12. Fees for licences and permits in connection with the applicable Work. No Building Permit is required for the project.

1.1.13. Duties and taxes imposed on the applicable Work.

1.1.14. Such other expenditures in connection with the applicable Work as may be approved.

1.1.15. Provided always that except with the consent of the Owner, the above items of cost shall be at rates comparable with those prevailing in the locality of the Work.

END OF SECTION 01 11 25

SECTION 01 11 41 - PROJECT COORDINATION

1. Requirements Included

1.1. Each Trade Contractor's responsibilities include the coordination of Work within his own Contract and with the Work of other Contracts.

2. Related Requirements

2.1. Project Meetings: Section 01 31 19

2.2. Submittals: Section 01 33 00

3. Description

3.1. Coordinate Work on which subsequent Work depends to facilitate mutual progress, and to prevent conflict between parts of the work.

3.2. Ensure that each Section makes known for the information of the Construction Manager and other Sections, the environmental and surface conditions required for the execution of its Work, and the sequence of others Work required installation of its Work.

3.3. Ensure that each Section, commencing Work, and that each Section is assisted in the execution of its preparatory Work by Sections depending upon its preparation.

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

3.5. Sections giving installation information in error, or too late to incorporate in the Work, shall be responsible for having Work done which was thereby additionally made necessary.

3.6. Coordinate warranty conditions of interconnected Work to ensure that full coverage is obtained.

3.7. Remove work installed in error which is unsatisfactory for subsequent Work.

4. Cutting And Patching

4.1. Include under Work of this Section all cutting and patching of asphalt required by the Work.

4.2. Finish new surfaces flush with existing surfaces.

4.3. Cut and patch as required making work fit.

4.4. Make cuts with clean, true, smooth edges.

4.5. Patching of existing or new asphalt shall be performed only by workmen with expertise in that particular trade and who normally perform that Trade.

4.6. Replace, and otherwise make good, damaged or defective Work. If required by the Construction Manager.

4.7. Do not endanger Work or property by cutting, digging, or similar activities. No Section shall cut or alter the Work of another Section unless approved by the Section which has installed it.

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

4.9. If required, before cutting, drilling, or sleeving structural load bearing elements, obtain approval of location and methods.

4.10. Cutting, drilling and sleeving of Work shall be done only by the Section which has installed it. The Section requiring drilling and sleeving shall inform the Section performing the Work of the location and other requirements for drilling and sleeving. The Contractor shall directly supervise performance of cutting and patching.

4.11. Cutting and Patching for Holes Required by Mechanical & Electrical Work:

4.11.1. Include under Work of Mechanical Divisions cutting or provision of holes up to 8" in diameter and related patching.

4.11.2. Include under Work of this Section holes and other openings required by the work of Mechanical Divisions which are larger than 8" in diameter or least dimension, and chases, bulkheads, furring and required patching. This Section shall be responsible for determination of Work required for holes in excess of 8" diameter or least dimension.

4.11.3. Include under the Work of Electrical Divisions all cutting or provision of holes and related patching for the Work of that Division.

4.12. Include under Work of this Section all other cutting and patching required by the Work except as described in Clause .11 above.

4.13. Patching or replacement of damaged Work shall be done by the Subcontractor under whose Work it was originally executed, and at the expense of the Subcontractor who caused the damage.

4.14. Make patches invisible in final assembly.

5. Quality Assurance

5.1. Requirements of Regulatory Agencies:

5.1.1. Make known and coordinate the requirements of jurisdictional authorities, as made explicit by the Contract Documents, and by representatives of such authorities

5.2. Source Quality Control:

5.2.1. Ensure that Work meets specified requirements

5.2.2. Schedule, supervise and administer inspection and testing as specified in Section 01 45 00.

5.3. Job Records:

5.3.1. Maintain job records and ensure that such records are maintained by subcontractors.

Submittals

5.4. Prepare a Project schedule in accordance with Section 01 33 00, and ensure that all subcontractors and suppliers are aware of the details of this schedule, and progressively of their general compliance with the schedule.

5.5. Become aware of the required submittals specified in each Section, and expedite submission of such submittals so as not to hinder the Project Schedule.

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

6. Job Conditions

6.1. Ensure that Work proceeds under conditions meeting specified environment and job safety requirements

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

7. Product Delivery, Storage And Handling

7.1. Site has limited spaces for storage, only delivery of materials agreed upon by the Construction Manager will be allowed. Comply with Construction Manager's allocations. Any requirement for modifications to the building in order to allow delivery and storage of the materials to complete this work is the responsibility of the contractor.

7.2. Schedule delivery of products & removal of material with Construction Manager.

7.3. Make available areas for storage of products and construction equipment to meet specified requirements, and to ensure a minimum of interference with progress of the Work and relocations.

7.4. Trade Contractor to provide flag persons, traffic signals, barricades and Flares/lights/lanterns as required to perform the Work and to protect the public.

7.5. Material and Waste - Deliveries and Removals - Must be coordinated to be completed 30 minutes after school dismissal where applicable.

END OF SECTION 01 11 41

SECTION 01 31 19 – PROJECT MEETINGS

1. Pre-Award Meeting

1.1. A Pre-award meeting will be held at which time the following will be addressed:

1.1.1. Owner and HRSB's functions.
1.1.2. The Consultant and the Consultant's functions.
1.1.3. The General Contractor and the General Contractor's functions.
1.1.4. Documentation requirements from the General Contractor.
1.1.5. Obligee for Performance and Payment Bonds from Sub-contractors.
1.1.6. Progress Claims.
1.1.7. CO's & CCO's.
1.1.8. Construction Schedule.
1.1.9. Project Start-up.
1.1.10. Job Meetings.
1.1.11. Superintendent – General Contractor's Representative.
1.1.12. Design / Administration authority.
1.1.13. Owner's Representative.
1.1.14. Special Consultants.
1.1.15. Quality of Workmanship.
1.1.16. Accountability.
1.1.17. Harmonized Sales Tax.
1.1.18. Contract Close-out Documentation.

2. Preconstruction Meeting

2.1. Within fifteen (15) days after award of Contract, arrange a meeting between the, Consultant, Subcontractors, Project Superintendents, Inspection and Testing Company Representatives, and representatives of others whose coordination is required during construction.

2.2. Discuss at the meeting the means by which full cooperation and coordination of the participants during construction can be achieved.

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

2.4. Establish procedures for maintenance and completion of Project record drawings specified in Section 01 77 00.

2.5. Review and establish methods of maintaining life safety and egress for the school occupants. Communicate these methods thoroughly with the School Principal.

3. Progress Meeting

3.1. Invite representatives of HRSB, to attend twice monthly site meetings called by the Contractor during the progress of the Work.

3.2. Inform HRSB of each meeting and of proposed agenda a minimum of five (5) days before meeting.
3.3. Submit proposed schedule of site meetings to Engineer and Owner.
3.4. Record, prepare and distribute minutes of each meeting to HRSB and to each other participant within 72 hours of meeting.
3.5. Ensure that all representatives who attend meetings have the authority to conduct business on behalf of firms they represent.
3.6. Details of Progress Meetings to be discussed at the project start-up meeting.

4. Suggested Agendum (Preconstruction Meeting)

4.1. Distribution and discussion of:
4.1.1. List of major subcontractors and suppliers.
4.1.2. Projected Construction Schedules.
4.2. Critical work sequencing.
4.3. Major equipment deliveries and priorities.
4.4. Project Coordination:
4.4.1. Designation of responsible personnel.
4.5. Procedures and Processing of:
4.5.1. Field decisions
4.5.2. Proposal requests
4.5.3. Submittals
4.5.4. Change orders
4.5.5. Applications for Payment.
4.6. Adequacy of distribution of Contract Documents.
4.7. Procedures for maintaining Record Documents.
4.8. Use of premises:
4.8.1. Office, work and storage areas.
4.8.2. Owners requirements.
4.9. Construction facilities, controls and construction aids.
4.10. Safety/Tool Box Meetings.
4.11. Security procedures.
4.12. Housekeeping procedures.
4.13. Egress/life safety procedures

5. Suggested Agendum (Progress Meetings)

5.1. Review and approval of minutes of previous meeting.
5.2. Safety meeting minutes.
5.3. Review of work progress since previous meeting.

5.4. Field observations, problems, conflicts.
5.5. Problems which impede Construction Schedule.
5.6. Review of off-site fabrication, delivery Schedules.
5.7. Corrective measures and procedures to regain projected schedules.
5.8. Revisions to Construction Schedules.
5.9. Maintenance of quality standards.
5.10. Pending changes and substitutions and effect on Construction Schedule.
5.11. Other Business.

6. Attend, with representatives of HRSB weekly meetings with the School Administration to review construction activities and concerns of Building Occupants.
7. Quarterly meetings with Contractor and School Board / User during Warranty Period including major sub-trade contractors.
8. Dates for meetings will be set at time of completion.

END OF SECTION 01 31 19

SECTION 01 33 00 – SUBMITTAL PROCEDURES

1. General Requirements

1.1. Make submittals specified in this Section to Consultant unless otherwise specified, with additional submissions made, in manner he directs, to other parties involved with construction of the Project as their interests are concerned. These parties are, but shall not be restricted to, consultants, jurisdictional authorities, and Subcontractors whose Work must be coordinated with Work related to Submittals.

1.2. Ensure that submissions are made to allow sufficient time for review without the construction schedule being delayed.

2. Document Submissions Required

2.1. At Commencement of Contract:

2.1.1. Performance and Payment Bonds.

2.1.2. Public Liability and Property Damage Insurance Certificates.

2.1.3. List of Subcontractors by firm name.

2.1.4. Construction Schedule and other required schedules and estimates.

2.1.5. Site Specific Safety Plan/Safety Policy.

2.1.6. Workers' Compensation Board status.

2.2. During Construction:

2.2.1. Weekly progress reports.

2.2.2. Job meeting reports and minutes.

2.2.3. Updated construction schedules.

2.2.4. Shop drawings as required.

2.2.5. Inspection and test reports.

2.2.6. Daily communication of Hot Work Permits as needed.

2.3. Submissions at completion of Work are specified in Section 01 77 00, Contract Closeout.

3. Administrative

3.1. Submit to Consultant 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 no claim for extension by reason of such default will be allowed.

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

3.3. Present shop drawings, product data, samples and in Imperial units.

3.4. Review submittals prior to submission to Consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has

been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.

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

3.6. Verify field measurements and affirm that affected adjacent work is co-ordinated.

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

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

3.9. Keep one review copy of each submission on site.

4. Construction Schedules

4.1. Submit proposed construction schedule at beginning of Project, as specified in Project Documents.

4.2. As construction progresses, submit up-dated construction schedules as specified in Project documents.

5. Shop Drawings And Product Data

5.1. 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.

5.2. Submit drawings stamped and signed by professional consultant registered or licensed in Province of Nova Scotia of Canada.

5.3. 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 coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

5.4. Allow seven (7) days for Consultant's review of each submission. Do not proceed with work involving relevant products until completion of shop drawing review.

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

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

Accompany submission with transmittal letter, in duplicate, containing:

5.6.1. Date

5.6.2. Project title and number

5.6.3. Contractor's name and address

5.6.4. Identification and quantity of each shop drawing, product data and sample.

5.6.5. Other pertinent data.

5.7. Submission to include:

5.7.1. Date and revision dates.

5.7.2. Project title and number.

5.7.3. Name and address of:

5.7.3.1. Subcontractor.

5.7.3.2. Supplier.

5.7.3.3. Manufacturer.

5.7.4. Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.

5.7.5. Details of appropriate portions of Work as applicable:

5.7.5.1. Fabrication.

5.7.5.2. Layout, showing dimensions, including identified field dimensions, and clearances.

5.7.5.3. Setting or erection details.

5.7.5.4. Capacities.

5.7.5.5. Performance characteristics.

5.7.5.6. Standards.

5.7.5.7. Relationship to adjacent work.

5.8. After Consultant's review, distribute copies.

5.9. Submit for review one electronic copy in PDF file format of shop drawings for each requirement requested in specification Sections and as Consultant may reasonably request.

5.10. Submit electronic copies of product data sheets for brochures for requirements requested in specification Sections and as requested by Consultant where shop drawings will not be prepared due to standardized manufacture of product.

5.11. Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Consultant.

5.11.1. 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.

5.11.2. Testing must have been within three (3) years of date of contract award for project.

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

5.13. Delete information not applicable to project.

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

5.14.1. If upon review by Consultant, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of work may proceed.

5.14.2. 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 coordination of work of sub-trades.

5.15. Shop Drawings are specified for submission under the following:

Section 03 20 00 Concrete Reinforcement
Section 05 12 23 Structural Steel
Section 05 31 00 Steel Deck
Section 05 50 00 Metal Fabrications
Section 06 10 11 Rough Carpentry
Section 06 40 00 Architectural Woodwork
Section 07 41 43 Aluminum Composite Panels
Section 07 46 13 Preformed Metal Siding
Section 07 55 00 Modified Bitumen Roofing System & Flashing
Section 07 84 00 Fire Stopping and Smoke Seals
Section 08 11 14 Steel Doors & Frames
Section 08 11 16 Aluminum Doors & Frames
Section 08 14 10 Wood Doors
Section 08 50 50 Aluminum Windows
Section 08 62 11 Vinyl Windows
Section 08 71 10 Door Hardware

Section 09 22 16 Non-Load Bearing Wall Framing
Section 09 30 13 Ceramic Tile
Section 10 11 13 Communication Boards
Section 10 11 23 Tackboards
Section 10 14 53 Traffic Signs
Section 10 28 10 Toilet & Bath Accessories
Section 10 50 00 Miscellaneous Specialties
Section 11 40 11 Food Services Catalogued & Custom Equipment
Section 12 21 13 Horizontal Blinds
Section 12 21 16 Roller Shades
Section 14 42 13 Wheelchair Platform Lift

All pre-manufactured Mechanical & Electrical items as noted in Mechanical & Electrical Divisions.

6. SAMPLES

6.1. Submit for review samples in duplicate as requested in respective specification Sections, as requested by the Consultant. Label samples with origin and intended use.

6.2. Deliver samples prepaid to Consultant's business address.

6.3. Notify Consultant in writing, at time of submission of deviations in samples from requirements of Contract Documents.

6.4. Adjustments made on samples by Consultant are not intended to change.

6.5. Make changes in samples which Consultant may require, consistent with Contract Documents.

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

6.7. Samples are specified for submission under the following Sections:

Section 07 41 43 Aluminum Composite Panels
Section 07 46 13 Preformed Metal Siding
Section 08 14 10 Wood Doors
Section 08 50 50 Aluminum Windows
Section 09 30 13 Ceramic Tile
Section 09 51 13 Acoustical Ceiling Units
Section 09 65 19 Resilient Tile Flooring
Section 12 21 13 Horizontal Blinds
Section 12 21 16 Roller Shades
Refer to Mechanical & Electrical Divisions for sample requirements in those Trades.

7. Record Drawings

7.1. Record, as the Work progresses, changes and deviations in the location of Work concealed by the finished Work, and such other approved changes that occur during progress of Work, to ensure that an accurate record is provided for future maintenance and alterations.

7.2. White prints will be provided by the School Board for use in preparing record drawings. Record changes in the Work on these prints in red ink.

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

7.4. Record work constructed differently than shown on Contract Documents, changes in the work caused by site conditions, by Owner, Consultant, Contractor and Subcontractor originated changes, and by site instructions, supplementary instructions, field orders, change orders, addenda, correspondence and directions of jurisdictional authorities.

7.5. Record location of mechanical and electrical services, piping, valves, conduits, pull boxes, junction boxes and similar work not clearly in view, and position of which is required for maintenance, alteration work and future additions. Do not conceal critical work until its location has been recorded.

7.6. Identify record drawings as a "Project Record Copy". Maintain in good condition, do not use for construction purposes and make available to Consultant at all times.

7.7. Submit record drawings at completion of Work. Final acceptance of the Work will be predicated on receipt and approval of record drawings.

8. Extra Stock

8.1. Supply extra stock at completion of Project as specified in other Sections of the Project Manual.

8.2. Deliver extra stock as directed by the Architect to location he designates.

8.3. Extra stock is specified to be supplied in the following Sections:

Section 09 30 13 Ceramic Tile
Section 09 51 13 Acoustical Ceiling Units
Section 09 65 19 Resilient Tile Flooring
Section 09 91 23 Painting
Refer to Mechanical & Electrical Divisions for Extra Stock requirements in those Trades.

9. Maintenance Manual & Operating Instructions

9.1. Submit three (3) copies of Maintenance Manual with application for completion certificate.

9.2. Include in Maintenance Manual one (1) copy of each final approved shop drawing issued for Project on which have been recorded changes made during fabrication and installation caused by unforeseen conditions.

9.3. Submit extended guarantees together in one (1) report binder.

9.4. The Manuals shall:

9.4.1. Consist of a hard-cover, black, vinyl-covered, loose-leaf, letter-size binder.

9.4.2. Have a title sheet, or sheets preceding data on which shall be recorded Project name, Project number, date, list of contents, and Contractor's and Subcontractors' names.

9.4.3. Be organized into applicable Sections of Work with each Section separated by hard paper dividers with plastic covered tabs marked by Section.

9.4.4. Contain only typed or printed information and notes, and neatly drafted drawings.

9.4.5. Contain maintenance and operating instructions on all building, and mechanical and electrical equipment.

9.4.6. Contain maintenance instructions as specified in various Sections.

9.4.7. Contain brochures and parts lists on all equipment.

9.4.8. Contain sources of supply for all proprietary products used in the Work.

9.4.9. Contain lists of supply sources for maintenance of all equipment in Project of which more detailed information is not included above.

9.4.10. Contain finished hardware schedule.

9.4.11. Contain charts, diagrams and reports specified in Mechanical & Electrical Divisions.

10. Extended Warranties

10.1. Submit the extended warranties listed in this Article and as specified in each applicable Section of this Project Manual.

10.2. Extended warranties shall commence on termination of the standard one-year warranty granted in this Contract.

10.3. Submit each extended warranty on a standard Form of Warranty, a sample of which is included in this Section.

10.4. Secure each extended Warranty by a Maintenance Bond in an amount indicated.

10.5. Submit extended warranties for:

Section 06 40 00 Architectural Woodwork – extended 4 years
Section 07 41 43 Aluminum Composite Panels – extended 10 years (panel finish)

Section 07 55 00 Modified Bitumen Roofing System & Flashing:

- 2 year CRCA materials and workmanship against leaks and blow off
- 10 year material warranty the membrane will perform as a roofing material
- 1 year CRCA warranty against defects of materials and workmanship for the sheet metal work.

Section 07 92 10 Joint Sealants – extended 5 years
Section 08 11 16 Aluminum Doors & Frames – extended 4 years
Section 08 14 10 Wood Doors – extended 4 years
Section 08 50 50 Aluminum Windows – extended 4 years
Section 08 62 11 Vinyl Windows – extended 5 years
Section 08 71 10 Door Hardware – various, refer to that Section
Section 09 30 13 Ceramic Tile – extended 4 years
Section 09 51 13 Acoustical Ceiling Units – extended 4 years
Section 09 65 19 Resilient Tile Flooring – extended 4 years
Section 10 11 13 Communication Boards – extended 24 years
Section 10 11 23 Tackboards – extended 9 years
Section 12 21 13 Horizontal Blinds – extended 5 years
Section 12 21 16 Rollers Shades – extended 5 years
Section 14 42 13 Platform Lift – extended 5 years

Refer to Mechanical & Electrical Divisions for extended Warranty requirements in those trades.

11. Inspection Laboratory Reports

11.1. Submit copies of inspection and test reports obtained by the Contractor and Subcontractors for their Work or for Jurisdictional Authorities, if requested by Consultant.

11.2. Submit reports in accordance with requirements specified in Section 01 41 00.

12. Documentation On Suppliers & Manufacturers

12.1. Provide information under headings identifying the following: Associated Technical Section, Manufacturer, Supplier, Contact Name, Phone Numbers.

SAMPLE FORM OF WARRANTY FOLLOWS THIS PAGE

Sample Form for Warranty

Date .....

Client .....

Project .....

.....

Warranty .....

(title of work)

We hereby undertake to warrant all materials supplied and installed under our Contracts and include the providing of necessary materials and labour to cover the result of faulty materials or workmanship. Upon written notification from Client or the Architect that the above work is defective any repair or replacement work required shall be to the Architect's satisfaction at no cost to the Client. This Warranty shall not apply to defects caused by the work of others, maltreatment of materials, negligence or Acts of God. This Warranty shall remain in effect for the total period from the acceptance of the Work to (....date....), irrespective of the date of completion or the beneficial use by the Owner.

Signature .....

Authorized Signing Officer .....

Name of Firm .....

Address .....

END OF SECTION 01 33 00

SECTION 01 35 13 – APPENDIX A - SPECIAL PROJECT PROCEDURES

1. Introduction

1.1. School construction, renovation and maintenance projects are scheduled every year as a normal and necessary course of business by operations departments in each Nova Scotia School Board. Building modifications, repairs and additions/demolitions to buildings may impact the school environment without appropriate controls. With increased controls based primarily on the CSA standards implementation, proper scheduling and clear communication on adequate controls can be put into place to eliminate/minimize the impact to all occupants.

1.2. Projects of this nature may generate varying levels of dusts, noises and odors. It is possible, unknown/unforeseeable environmental contaminants, such as spills, mould, fumes, lead or asbestos exposure maybe identified.

1.3. To successfully complete work within the school environment, it is necessary to plan and implement appropriate containment and control strategies. This document is developed to provide a minimum standard for contaminant controls for various types of projects in schools. These standards are in addition to and should complement all legislated protocols for working with regulated materials such as asbestos, lead paints, PCB's etc.

1.4. Executing a successful project will depend primarily on clear, concise communication. This may involve a number of parties (Project Manager, Operations staff, School Administration and Health & Safety staff and Joint Occupational Health & Safety Committee).

2. Communication Plan

2.1. The most critical element of any project management plan is effective communication between all stakeholders. Communication between the Operations project manager/supervisor, the contractor and school administrators before the start of a project is very important. This meeting is meant to explain the scope, schedule and risk assessment for the project. The meeting will also help establish clear expectations when managing planned and unplanned exposure risks associated with contaminant controls.

2.2. The communication plan shall include:

2.2.1. A description of potential contaminants, which may include but is not limited to:

2.2.1.1. Particulates (dirt, concrete/silica, steel, fiberglass, wood dust, ash, cellulose, etc.)

2.2.1.2. Moisture: external water infiltration, internal system leaks (domestic water, sanitary, storm, sprinkler)

2.2.1.3. Noise from equipment/tool operation,

2.2.1.4. Fumes/odors from equipment exhaust, boiler exhaust, septic waste, chemical/adhesives, etc.

2.2.1.5. Hazardous materials including, asbestos, PCB, mercury, lead, fuel oil, fungi/mould, etc.

2.2.1.6. Excessive heat/cold

2.2.2. A description of the control measure which may include but not be limited to:

2.2.2.1. Isolation within an enclosure (water, noise, hazardous materials)

2.2.2.2. Ventilation and filtration

2.2.2.3. Dehumidifiers/blowers (moisture)

2.2.2.4. Personal protective equipment

2.2.2.5. Schedule outside or inside school hours

2.2.2.6. Sound dampeners

2.2.2.7. Monitoring

2.2.2.8. Security

2.2.3. Other Hazards created by the work, including but not limited to fire safety and the need to alter fire safety plans.

2.3. For small routine work orders the communication plan may only involve one tradesperson and the school principal or designate. This communication is equally as important for management of contaminant controls.

3. Contaminant Control Management

3.1. Regardless of the contaminant or control measure used, the following procedures shall apply for every project:

3.1.1. Every project, including all routine work requests, shall be assessed, as per this document, by appropriate personnel for potential contaminant risk.

3.1.2. Clear lines of communication must be established between project personnel, site supervisor or project manager and the school administration.

3.1.3. Control strategies as per this document, shall be, communicated to workers as well as the site JOHSC and implemented prior to starting the work.

3.1.4. Where isolation is used as a control, all entry points must be clearly posted to describe the purpose of the enclosure and limitations of access.

3.1.5. During the execution of the project, the control measures must be regularly inspected and maintained before the start of each work shift, and throughout the shift as required.

3.1.6. A process for stop work and remediation orders must be established to ensure the project manager; site supervisor and school administrator have a means to cease project operations when a contaminant control breach may impact the school environment. Breached control measures must be reported immediately to the board project manager upon discovery. He/she will be responsible to communicate to the school principal or designate. Work shall be stopped immediately until the control measures are re-established.

3.1.7. Access to the controlled work site is only permitted by authorized personnel. The project supervisor or designate shall determine appropriate personal protective equipment (PPE) and necessary worker orientation.

4. Particulate Control

4.1. Exposure to minimal levels of dust is a normal condition in most outdoor and indoor environments and is typically controlled inside a building through building ventilation, filtration and routine housekeeping measures. However, as noted, construction projects generally create elevated dust levels in work areas, whether inside or outside of a building.

4.2. Operational Services Managers must ensure maintenance staff and contracted service providers implement dust control measures appropriate for the type and scope of work being performed. This will include assessing the type and amount of dust being created as well as the location of the work being conducted.

4.2.1. Interior Construction Projects:

4.2.2. Construction projects may be described as projects that may include window replacement, wall creation/demolition, etc.

4.3. As a minimum for these types of construction projects, all interior entry points into a construction zone must be effectively sealed. The barrier must prevent contaminants from the work area to be distributed to other areas of the school. Appropriate signage must be posted to indicate only authorized persons are permitted access.

4.4. Entrance design could range from a two flap plastic tarp door to a fully constructed sealed entry door with negative hepa-filtered ventilation on the construction side of the barrier.

4.5. Exterior Construction Projects:

4.5.1. Exterior work shall be performed so as not to affect the safety of building occupants. It will also provide controls to avoid impact to adjacent properties. Depending up on the results identified in the risk assessment, at a minimum consideration must be given to prevent dust from entering into the school environment. This may be controlled through isolation, dampening application, closing building AHU and window/door openings.

5. Noise Control

5.1. Hearing plays an essential role in communication, speech and language development and learning within a school environment. During construction the contractor is responsible for ensuring acceptable noise levels will be adhered to for school board staff and students within the building. Noise related to a project may prove to be very distracting for staff and students. To minimize distractions and interruptions in student learning the following are important to consider:

5.1.1. Contractors are responsible to ensure appropriate noise control measures are taken

5.1.2. "No work" periods may need to be incorporated into construction schedules

5.1.3. Work causing a noise disruption may need to take place during unoccupied times and/or during pre-determined acceptable times of the day (i.e. before and after class times)

5.1.4. It may be necessary for the School Administrator to make a request to the Board Project Manager or the Contractor to exclude undertaking certain noisy activities during particular periods and/or activities.

6. Moisture Control

6.1. Moisture levels are to be controlled during construction and maintenance activities. Moisture levels above normal may impact the air in the room and/or building and may also penetrate building materials giving the potential to lead to mould growth.

6.2. Certain activities (i.e. tape and mud of drywall, painting, pressure washing, concrete cutting with water or other water based dust-suppression) introduce high amounts of moisture into the room environment and ventilation and or drying is required to control local moisture.

6.3. An enclosure properly set-up to contain other contaminants will similarly contain/control high levels of airborne moisture. A wet-vac should be available on-site for activities which have a risk of water spillage of more than 5 gallons at any instance.

6.4. Standing and or stagnate water must be avoided on construction sites, for a number of reasons, including, but not limited to; insects breed in these bodies of water, the water may give off odours, it is a nuisance to walk through, and it may be an ice hazard in cold weather.

6.5. It is important that all water leaks and flooding are reported immediately to the board's project manager and building supervisor. Where works to existing "plumbing" is to occur the water lines (potable, heating, fire suppression) must be isolated and drained (de-energized/de-pressurized) following Lock Out - Tag Out procedure. Adequate supplies such as buckets and absorbents should be present when drains are not available to drain a line.

6.6. When an interruption to the water supply, potable or service, is to occur then the "owner's representative" and building supervisor should be notified 24 hours in advance. Bottled water provision may be required.

6.7. Materials used in the construction and or maintenance activities are to be stored in dry areas. The introduction of materials to the activities with moisture levels above the acceptable (XXX%)CNBC states for wood, on dry weight basis, a max of 19%, I can't find info on drywall but assume it is much lower range is prohibited as these materials are highly susceptible to colonization by mould spores.

7. Fumes

7.1. Fumes may be produced on a project site for a variety of reasons such as use of motorized equipment, off gassing of sealants, adhesives and finish products, cutting/torching processes, exposure of sanitary systems, process ignition gases such as propane and acetylene, proximity of project temporary washrooms, radon, etc.

7.2. The impact of fumes on occupants may range from discomfort to health risk, to life safety risk.

7.3. The project manager or supervisor must ensure that all potential fume sources are identified and remedial or control measures included in the scope of work by the contractor.

7.4. Monitoring equipment may be required to determine for example radon exposure or safety of confined space access.

8. Activity Assessment

8.1. Activities that may produce contaminants which require control may be considered as low, medium and high impact.

8.2. Low impact activities include routine maintenance and repairs that may create localized dust or odors or brief periods of noise which are not considered harmful to occupants but may be a nuisance which requires minimal control. These may include activities such as opening ceiling tiles or gyproc walls, replacing a plumbing fixture, paint touch ups, drilling through a wall, etc.

8.3. Medium impact activities include larger repair jobs or longer duration projects that will create more wide spread levels of contaminant which must be controlled to prevent exposure to building occupants. Boiler cleaning, ceiling replacement, long periods of hammer drilling, etc.

8.4. High impact activities include large demolition and construction projects, or jobs with exposure to contaminants that are a risk to health or life safety such as asbestos remediation, mould abatement, lead paint clean up, etc.

9. Hazard Assessment

9.1. A hazardous assessment is required to be completed for each job to ensure hazards are identified and corresponding controls are implemented. Depending upon the circumstances at the site it may be necessary to upgrade and/or add other precautions.

9.2. Determine the most appropriate hazard classification and apply the corresponding protocols. The attached hazard assessment identifies the minimum controls that must be in place during the corresponding activities. Depending on the specific circumstances at a site further controls may be required. When the hazards are deemed to be in the C or F category the form including specific controls must be submitted to the board for review, prior to commencing work. The contractor may still be required to complete their own hazard assessment of the job/work.

10. Contaminant Controls Procedure for initiating work for all Contaminant Controls:

10.1. Contaminant Control I

10.1.1. The tradesperson or project manager for the board will discuss the details, including the scope and any impacts of the job/project with the principal.

10.1.2. Ensure fire exiting requirements and life safety systems are addressed or adequate mitigating plans are implemented for the building, construction staff and building occupants.

10.1.3. Presence of lead paint or ACM's (Asbestos Containing Materials) must be determined prior to the start of any job. Specific protocols or Codes of Practice may apply.

10.1.4. Consideration will be given for work that is anticipated to generate significant noise, odours or VOC's (Volatile Organic Compounds) and this will be scheduled outside of school hours or during times when the noise will not disrupt occupant activities. This will require coordination with the Principal.

10.1.5. The work area shall be isolated where possible. This may be achieved at varying levels, by closing doors and opening outside windows for ventilation or by installing appropriate hoarding and negative pressure units to ensure contaminants are not circulated throughout the school causing further health and safety concerns.

10.1.6. Dust shall be minimized during the activity. When drilling, sanding or cutting is taking place, wetting the area may be necessary to reduce dust.

10.1.7. Good housekeeping practices shall be maintained at all times on the work site. Bag and remove dust and debris from the building as soon as possible.

10.1.8. Possible environmental impacts shall be managed and minimized. If work uncovers environmental contaminants or suspected contaminants such as oil spills (current or historic) or potentially friable asbestos materials (check the school asbestos audit) that may be disturbed, this information shall be brought to the attention of the

Board's employee responsible for the project so that appropriate actions can be taken.

10.1.9. When the activity is completed the work area shall be inspected and cleaned. Dust and debris shall be removed from the area and all efforts will be made to return items to their pre-maintenance activity location.

10.1.10. The Principal shall be notified that the work is completed.

10.2. Contaminant Control II - All Contaminant Control I measures shall apply, as well as;

10.2.1. Cover furniture, bookshelves and teaching materials with plastic sheets.

10.2.2. Water misting while performing dust generating activities may be required.

10.2.3. Seal un-used doors. Seal wall penetrations, electrical outlets, or any other source of air leaks in the construction area.

10.2.4. Seal exhaust air vents in construction area and open the windows. If possible shut down air handling system in the area for duration of project.

10.2.5. A walk out mat at exterior of exit door to trap dust may be required.

10.3. Contaminant Control III - All Contaminant Control I and II measures shall apply, as well as;

10.3.1. Install an impermeable dust barrier from the true ceiling to the floor consisting of two layers of 6 mil fire retardant polyethylene or solid wall and sealed door. The wall shall remain in place until the job is finished and the clean-up is completed.

10.3.2. Seal all wall penetrations

10.3.3. Seal off all return and supply air handling ducts and close all windows.

10.3.4. Turn off the air handling system in the area of construction.

10.3.5. Maintain negative air pressure in the construction area using HEPA filter equipped exhaust ventilation. The pressure differential between the project area of contamination and the building's occupied areas shall be demonstrable by a means approved by the Board employee responsible for the project.

10.3.6. Ensure that the air is exhausted directly outside and away from intake vents.

10.3.7. Vacuum all horizontal surfaces including drop cloths with a hepa vacuum.

10.3.8. Remove drop clothes

10.3.9. Vacuum again all horizontal surfaces with HEPA Vacuum.

10.3.10. Restore ventilation.

10.3.11. Remove enclosure and equipment.

10.4. Control IV: (External Work)

10.4.1. External work may impact building interior or occupants.

10.4.2. To reduce the impact to building interior or occupants, it may be necessary to contain the work area from impacting building interior. This may include closing or

opening windows, tarping ceilings to capture debris or water, temporary relocation of occupants or ventilation controls.

10.4.3. The job supervisor shall consider weather conditions and forecast to reduce the effect of any weather impacts to the building materials or building occupants.

10.4.4. It may be necessary to use protective tarps and ground cover sheets below equipment and work areas to contain building debris such as paint chips, materials, dust or oil from equipment.

10.4.5. When the job is completed and the tarps have been lifted, inspect the ground around the job for debris and clean as necessary.

Fire Protection

10.5. Type V: General Fire Protection

10.5.1. Ensure fire exiting requirements and life safety systems are addressed or adequate mitigating plans are implemented for the building, construction staff and building occupants. Staff must be aware of temporary modifications to fire safety plans.

10.5.2. MSDSs for all materials to be used must be reviewed and available on site.

10.5.3. Construction materials stored outside must be a minimum distance of ten feet from the building and be in a secured area.

10.5.4. Flammable or Combustible liquids must be stored as per Fire Code requirements. All flammable and combustible liquids or materials must be kept in a secure area at all times.

10.6. Control VI: Fire Protection (minor hot work) - All Contaminant Control V shall apply as well as;

10.6.1. Notify the Principal that a risk of fire has increased and the area in which the hot work will occur.

10.6.2. Refer and implement the board's hot work permit process. At a minimum the following should be considered;

10.6.2.1. Sweep the work area and remove all unnecessary materials in the vicinity; particularly all combustible and flammable materials and liquids shall be removed from the area (35 feet).

10.6.2.2. Have an appropriate size fire extinguisher available.

10.6.2.3. Inspect the work location for areas (such as a hole in the wall) where hot material or sparks could fall and smolder and close them off so that any hot debris can only fall within your field of view.

10.6.2.4. If it is possible that the flame will go past the object being welded or soldered and excessively heat a flammable or combustible material then either protect that material with a non-flammable material or wet the material and keep it wetted during the use of heat or grinding.

10.6.2.5. Remain in the area while the joint and/or heated materials cool to room temperature (ambient) while checking for the smell or appearance of smoke in the area.

10.6.2.6. Stay in the area for at least Y2 hour and then re-inspect for any smell or appearance of smoke.

10.6.2.7. Ask another staff person to inspect the area for the smell or appearance of smoke. Record who you asked to do the final inspection.

10.6.3. Type VII: Fire Protection (hot work w fire watch) - All Contaminant Control V and VI shall apply as well as;

10.6.4. Notify the Principal that a risk of fire has increased and the area in which the hot work will occur. If any life safety system components (sprinkler, detectors, fire alarms) are not function, hot work should not proceed until these systems are functioning unless fire watch procedures for life systems are followed. See Activation of Fire Watch for Life Safety Systems checklist. Appendix…XX

10.6.5. Refer and implement the board's hot work permit process. At a minimum the following should be considered;

10.6.5.1. Cover all floor openings with fire stop material. Seal duct work openings with metal covers or blankets and close all doors.

10.6.5.2. Ensure that there are no potentially explosive atmospheres in the area.

10.6.5.3. Hot work on vessels, pressure tanks or boilers, use only contractors who are qualified by nationally or internationally recognized boiler and pressure vessel code.

10.6.5.4. Notify the local fire department of the type of work and the work schedule.

10.6.5.5. Before hot work is started, designate one employee responsible to complete the f ire watch: while work is in progress, during lunch breaks and other breaks and for one hour after all fames are extinguished for the day and monitor the area for an additional two hours. After three hours after the last flame has been extinguished, have a second employee do a final survey of the area for smells or evidence of smoldering or fire and record the inspection.

APPENDIX
Fire Watch Activation Checklist

1. Documentation (identify locations to be checked on an hourly basis, provide contact information for relevant board staff and outside agencies} Board provided template to be used for documentation.
2. Procedure reviewed with Custodian or individual responsible for fire watch. Any high risk areas shall be identified to be highlighted on the documentation page and checked during the rounds.
3. Staff working in the building have been notified of the Fire Watch and that they are responsible to monitor areas for signs of fire or smoke and have been reminded of required actions to take according to the school fire safety plan.
4. Staff responsible for fire watch have been trained in how to use a fire extinguisher. (PASS)
5. Staff responsible for the fire watch have a means of communication (cell phone or walkie-talkies)
6. Staff responsible for the fire watch are aware of the procedure for initiating fire alarm and what systems are functioning. i.e. systems (sprinklers, alarm panel or if school has monitoring company or if calling 911 is required)
7. The School Insurance Program (SIP) Emergency Information Line has been notified 1-902-448-2840
8. All relevant information has been documented in the school's fire books. Including date, time and reason for fire watch.

Fire Watch De-Activation Checklist

1. Document the date, time and actions taken to remedy the deficiency requiring the fire watch.
2. School Insurance Program (SIP) has been notified
3. Copy of the Fire Watch documentation is kept in the fire book and the original is sent to the HRSB Project Representative.

END OF SECTION 01 35 13

SECTION 01 35 29 - OCCUPATIONAL HEALTH & SAFETY REQUIREMENTS

1. References

1.1. CSA S269.1-1975 Falsework for Construction Purposes.

2. CONSTRUCTION SAFETY MEASURES

2.1. Observe construction safety measures of:

2.1.1. National Building Code 2010, Part 8

2.1.2. National Fire Code of Canada

2.1.3. Provincial Government, including but not limited to the:

2.1.3.1. Occupational Health & Safety Act revised Statutes of Nova Scotia 1996, Chapter 7 and regulations.

2.1.3.2. Workers' Compensation Act

2.1.3.3. Fire Protection Act

2.1.3.4. Dangerous Goods Transportation Act

2.2. In case of conflict or discrepancy the more stringent requirement shall apply.

2.3. Ensure that employees working on this specific project have met training requirements as legislated by the Nova Scotia Occupational Health & Safety Act and its regulations.

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

3. Equipment & Tools

3.1. Each user of equipment or tools shall be responsible to examine for sufficiency before use. Make equipment and tools safe if necessary.

4. WHMIS

4.1. 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.

4.2. Have a copy of WHMIS data sheets available at the workplace on delivery of materials.

5. Hazardous Material

5.1. Should material resembling hazardous materials other than those identified with the Contract Documents, including but not limited to spray or trowel applied asbestos, be encountered in course of work; stop work immediately. Do not proceed until written instructions have been received from Consultant.

5.2. Where work entails use, storage, or disposal of toxic or hazardous materials, chemicals and or explosives, or otherwise creates a hazard to life, safety, health, or the environment; work shall be in accordance with the Jurisdictional Authority.

6. Site Cleaning

6.1. Except where special permission is obtained, maintain clear access on public sidewalks and roads.

6.2. Maintain walks and roads clear of construction materials and debris, including excavated material. Clean walks and roads as frequently as required to ensure that they are cleared of materials, debris and excavated material.

7. Fire Safety Requirements

7.1. Enforce fire protection methods, good housekeeping and adherence to local and Underwriter's fire regulations including, but not limited to, Fire Protection Act and the Provincial Building Code Act. Provide UL approved fire extinguishers, and other fire- fighting services and equipment, except where more explicit requirements are specified as the responsibility of individual Sections.

7.2. Smoking is not permitted on school property.

7.3. Advise Fire Chief in the area of Work of any work that would impede fire apparatus response, including but not limited to violation of minimum overhead clearance prescribed by the fire chief, erecting of barricades and digging of trenches and in areas where work is being done.

7.4. Ensure nothing subverts the integrity of fire protection provided for the building structure.

8. Reporting Fires

8.1. Know the location of the nearest fire alarm box and telephone, including the emergency phone number.

8.2. Report immediately all fire incidents to the fire department as follows:

8.2.1. Activate nearest fire alarm box, or

8.2.2. Telephone local fire department

8.2.3. Where fire alarm box is exterior to building, the person activating the fire alarm box shall remain at the box to direct Fire Department to scene of the fire.

8.2.4. When reporting a fire by telephone, give location of fire, name or number of building and be prepared to verify the location.

9. Safety Document Submission

9.1. Ensure Safety Document Submission applies to Work of this specific project and site.

9.2. Submit two (2) copies of Project Safety Document at the Pre-Construction Meeting. Do not commence Work nor deliver material on-site prior to submission.

9.3. Include in Safety Document submission specific information detailing the methods and procedures to be implemented ensuring adherence to the acts, regulations, codes and policies specified in this section and to:

9.3.1. Ensure the Health & Safety of persons at or near the Work; including, but not limited to, the Public.

9.3.2. Ensure the measures and procedures of the regulatory agencies specified are carried out.

9.3.3. Ensure every employee, self-employed person and employer performing Work under this contract complies with the regulatory agencies specified.

9.3.4. Where changes to the methods and procedures in the execution of work change submitted safety methods and procedures, modify submitted Safety Documentation and submit modifications, in writing to the Consultant and Owner prior to implementation.

10. Safety Document Organization

10.1. Organize information in the form of an instructional manual as follows:

10.1.1. Place in binders of commercial quality, accommodating 8½" x 11" paper size.

10.1.2. Cover: Identify binder with typed or printed title ‘Project Safety Document’ and list the title of project.

10.1.3. Provide tabbed fly leaf for each separate heading, with typed heading on tab.

10.1.4. Where drawings are within the safety document, provide with reinforced punched binder tab. Bind in with text; fold in larger drawings to size of text pages.

10.1.5. Arrange content under Safety Document headings specified herein.

11. Safety Document Headings

11.1. Employee Safety Training

11.1.1. Place, under this heading, a statement indicating employees working on this specific project have met specified training requirements, if required.

11.2. Company Safety Policy

11.2.1. Place, under this heading, information pertaining to the company's policy and commitment to Occupational Health & Safety, including the responsibilities of management, supervisors and workers.

11.3. Company Safety Rules in General Terms

11.3.1. Place, under this heading, information of a general, global nature, applying to every work environment where the company has staff and pertaining to rules directing compliance to policy. For example state company safety rules with respect to use of hard hats, safety glasses, safety foot ware, CSA approval on such items, use of alcohol or non-prescription drugs.

11.4. Hazard Assessment

11.4.1. Place, under this heading, information identifying possible hazards specific to this project and identify safe methods and procedures for the execution of work to ensure safety in the work place.

11.4.2. Arrange contents of this heading by technical section number of the project manual.

11.5. Emergency Action Plan

11.5.1. Place, under this heading, information detailing action to be taken in the event of various emergencies.

11.5.2. Arrange content under the following sub-headings:

11.5.2.1. First Aid

11.5.2.1.1. Include information concerning establishment of a First Aid Station, related supplies, staff awareness of location and staff training in First Aid Care of Casualties.

11.5.2.2. Contact of Emergency Support Groups:

11.5.2.2.1. Include relative information including phone location for emergency use, the emergency telephone numbers and their location for the various organizations which must be contacted in case of an emergency, and staff training in procedures.

Cessation of Work:

11.5.2.2.2. Include relative information how work cessation during emergencies is handled and communicated to persons present on site.

11.6. Joint Occupational Health & Safety Committee/Representative:

11.6.1. Place under this heading information detailing membership and terms of reference.

OCCUPATIONAL HEALTH & SAFETY SUMMARY FOLLOWS THIS PAGE

Occupational Health & Safety Summary (to be submitted with each monthly Progress estimate)

The following information summarizes Occupational Health & Safety activities on the project conducted by the Contractor during the month and includes activities of Subcontractors. Activities include all matters prescribed by the Occupational Health & Safety Act and Regulations and the submitted Occupational Health & Safety Document for the Project.

Indicate the applicable # number below:

#_____new contractors on site,
#_____orientations
#_____toolbox talks
#_____safety meetings
#_____Joint Occupational Health and Safety Committee meetings
#_____hazard assessments
#_____formal written inspections
#_____warnings issued to employees or subcontractors
#_____other, explain_____

List new Contractors on Site below:

_____
_____
_____
_____
_____
_____

The Contractor certifies that the above noted activity list is accurate and that during the month:

Check

☐ All activities on the Project were found to be in compliance with the Occupational Health & Safety Act and Regulations

☐ Some activities on the Project were not found to be in compliance with the Occupational Health & Safety Act and Regulations but were adequately corrected in an appropriate time frame. Explain _____
_____

Prepared by

_____
(Contractor Project Manager)

Certified by

_____
(Contractor Senior Management)

END OF SECTION 01 35 29

SECTION 01 37 00 - SCHEDULE OF VALUES

1. Related Documents

1.1. General Conditions of Contract.

2. General

2.1. Submit to the Architect, and Owner, Schedule of Values, within twenty (20) days after signing Agreement.

2.2. Use Schedule of Values as basis for Contractor's Progress Claim.

3. Form Of Submittal

3.1. Form included at end of this Section.

3.2. **The form included below is a suggested guide but might not be appropriate for all projects. Contractors may submit their own template to the Owner for review/approval.**

4. Preparing Schedule Of Values

4.1. Itemize separate line item cost for work required.

4.2. Round off figures to nearest ten (10) dollars.

4.3. The sum of all values listed in the schedule shall equal the total contract sum.

5. Review And Submittal

5.1. After review by Architect and Owner, revise and resubmit Schedule as directed.

5.2. The form shall be completed and supported by such evidence as to its correctness as the Architect may reasonably direct.

Schedule Of Values

Project Name ***#3926 Skilled Trades Building, Sir John A.Macdonald High School***

Contract Number .....

Architect .....

Contractor .....

Date .....

Item	Description	Item Amount

1. **General Requirements**
   - **1.1.** Mobilization & Initial Expenses
   - **1.2.** Site Overhead & Fee
   - **1.3.** Bonds
   - **1.4.** Certificates
   - **1.5.** Testing
   - **1.6.** Construction Facilities & Temporary Controls
   - **1.7.** Other (Specify)

Total (Items 1.1 to 1.7) _____

2. **Excavation, Backfill, Sitework**

Total (Item 2.) _____

3. **Concrete**

Total (Item 3.) _____

4. **Masonry**

Total (Item 4.) _____

5. **Metals**

Total (Item 5.) _____

6. **Wood & Plastics**
   - **6.1.** Rough Carpentry
   - **6.2.** Finish Carpentry
   - **6.3.** Architectural Woodwork

Total (Items 6.1 to 6.3) _____

7. **Thermal & Moisture Protection**
   - **7.1.** Insulation
   - **7.2.** Air Vapour Barrier
   - **7.3.** Aluminum Composite Panels
   - **7.4.** Preformed Metal Siding
   - **7.5.** Fire Stopping
   - **7.6.** Roofing

Total (Item 7.1 to 7.6) _____

8. Doors And Windows

8.1. Metal Doors & Frames
8.2. Wood Doors
8.3. Hardware
8.4. Windows

Total (Items 8.1 to 8.4) _____

9. Finishes

9.1. Acoustic Ceiling Systems
9.2. Gypsum Board and Support Systems
9.3. Hard Tile
9.4. Resilient Tile
9.5. Painting

Total (Items 9.1 to 9.5) _____

10. Specialties

10.1. Tackboards, Communication Boards
10.2. Toilet & Bath Accessories
10.3. Manufactured Specialties
10.4. Food Service Equipment

Total (Items 10.1 to 10.4) _____

11. Mechanical

11.1. As per Sections — Total (Item 11.) _____

12. Electrical

12.1. As per Sections — Total (Item 12.) _____

TOTAL (Items 1 - 12) _____

END OF SECTION 01 37 00

SECTION 01 41 00 - REGULATORY AGENCIES

1. Jurisdictional Authorities

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

2. Definitions

2.1. The "Constructor" named in the Construction Safety Act, Chapter 52, Revised Statutes of Nova Scotia, as amended by 1972, Chapter 25; and Construction Safety Regulations, pursuant to Chapter 52 R.S.N.S., including any amendments, shall mean the "Contractor" for the Work performed under this Specification.

3. Fire Prevention, Safety & Protection

3.1. General Construction Safety Measures:

3.1.1. Observe safety measures of the

3.1.1.1. National Building Code 2010, Part 8.

3.1.1.2. National Fire Code of Canada.

3.1.1.3. Provincial Government, including but not limited to the Occupational Health & Safety Act Revised Statutes of Nova Scotia 1996, Chapter 320, and the Construction Safety & Industrial Safety Regulations made pursuant to the Occupational Health and Safety Act, 1996.

3.1.1.4. Workers'/Workmen's Compensation Board.

3.1.2. In case of conflict or discrepancy the more stringent requirement shall apply.

3.1.3. Maintain clear emergency exit paths for personnel.

3.2. Except where special permission is obtained, maintain clear access on public sidewalks and roads.

3.3. Maintain walks and roads clear of construction materials and debris, including excavated materials. Clean walks and roads as frequently as required to ensure that they are cleared of materials, debris and excavated materials.

3.4. WHMIS:

3.4.1. 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 Labour Canada and Health & Welfare Canada.

3.4.2. Have a copy of WHMIS data sheets available at the workplace on delivery of materials.

Blockage Of Roadways

3.5. Advise Fire Chief of any work that would impede fire apparatus response. This includes violation of minimum overhead clearance, as prescribed by fire chief, erecting of barricades and the digging of trenches.

4. Smoking Precautions

4.1. Observe, at all times, smoking regulations.

5. Rubbish And Waste Materials

5.1. Rubbish and waste materials are to be kept to a minimum.

5.2. The burning of rubbish is prohibited.

6. Flammable And Combustible Liquids

6.1. The handling, storage and use of flammable and combustible liquids are to be governed by the current National Fire Code of Canada.

6.2. Flammable and combustible liquids such as gasoline, kerosene and naphtha will be kept for ready use in quantities not exceeding 45 litres provided they are stored in approved safety cans bearing the Underwriter's Laboratory of Canada or Factory Mutual seal of approval. Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes, requires the permission of the Fire Chief.

6.3. Transfer of flammable and combustible liquids is prohibited within buildings or jetties.

6.4. Transfer of flammable and combustible liquids will not be carried out in the vicinity of open flames or any type of heat-producing devices.

6.5. Flammable liquids having a flash point below 38°C such as naphtha or gasoline will not be used as solvents or cleaning agents.

6.6. Flammable and combustible waste liquids, for disposal, will be stored in approved containers located in a safe ventilated area. Quantities are to be kept to a minimum and the Fire Department is to be notified when disposal is required.

7. Hazardous Substances

7.1. Work entailing the use of toxic or hazardous materials, chemicals and/or explosives, otherwise creates a hazard to life, safety or health, will be in accordance with the National Fire Code of Canada.

7.2. Where flammable liquids, such as lacquers or urethanes are to be used, proper ventilation will be assured and all sources of ignition are to be eliminated. The Fire Chief is to be informed prior to and at the cessation of such work.

8. Questions and/or Clarification

8.1. Direct any questions or clarification on Fire Safety in addition to above requirements to Fire Chief.

9. Fire Inspection

9.1. Site inspections by Fire Chief will be coordinated through HRSB Project Manager.

9.2. Allow Fire Chief unrestricted access to the work site.

9.3. Co-operate with the Fire Chief during routine fire safety inspection of the Work site.

9.4. Immediately remedy all unsafe fire situations observed by the Fire Chief.

10. Reference Standards

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

10.2. Reference standards and specifications are quoted in this Specification to establish minimum standards. Work which in quality exceeds these minimum standards shall be considered to conform.

10.3. Should the Contract Documents conflict with specified reference standards or specifications the General Conditions of the Contract shall govern.

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

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

10.6. Standards, specifications, associations, and regulatory bodies are generally referred to throughout the specifications by their abbreviated designations:

AA	The Aluminum Association
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
ARI	Air Conditioning & Refrigeration Institute
ASTM	American Society for Testing & Materials
CCA	Canadian Construction Association
CGSB	Canadian General Standards Board
CSA	Canadian Standards Association
NSDTIR	Department of Transportation & Infrastructure Renewal, Province of Nova Scotia
IAO	Insurers Advisory Organization
NBC	National Building Code
NFPA	National Fire Protection Association
CANS	Construction Association of Nova Scotia
ULC	Underwriters Laboratories of Canada
WHMIS	Workplace Hazardous Materials Information System

END OF SECTION 01 41 00

SECTION 01 45 00 - QUALITY CONTROL

1. Section Includes

1.1. Inspection and testing, administrative and enforcement requirements

1.2. Tests and mix designs.

1.3. Mock-ups.

1.4. Mill tests.

1.5. Equipment and system adjust and balance.

1.6. Verification by affidavits and certificates that specified products meet requirements of reference standards: In applicable Sections of the Specification.

1.7. Testing, balancing and adjusting of equipment: In applicable Mechanical and Electrical Sections of the Specification.

1.8. Cutting & Patching: Section 01 11 41.

2. Related Sections

2.1. Section 01 33 00 Submittal Procedures: Submission of samples to confirm product quality.

2.2. Section 01 61 00 Material & Equipment: Material and workmanship quality – reference standards.

2.3. Section 01 77 00 Contract Closeout.

3. REVIEW OF WORK

3.1. The Owner shall have access to the Work. If part of the Work is in preparation at locations other than the Place of the Work, access shall be given to such work whenever it is in progress.

3.2. Give timely notice to the Owner's Representative, requesting review of the Work as indicated in the Contract Documents.

3.3. If the Contractor covers or permits to be covered Work that has been designated for review by the Owner before such is made, uncover such Work, have the review satisfactorily completed and make good such Work at no extra cost to Owner.

4. Inspection, Special Tests, Approvals

4.1. Engage the services of appropriate inspection testing agencies ensuring the Work meets codes, acts and regulations, and lows in force at the place of Work. Include such costs in the Contract Price.

4.2. Give timely notice requesting inspection to those required to provide inspections, special tests, or approvals, where Work is designated, by the Owner's instructions or the law of the place of Work, for special tests.

4.3. If the 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 the inspections or tests satisfactorily completed and make good such Work at no extra cost to the Owner.

4.4. The Owner may order any part of the Work to be examined if the Work is suspected to be not in accordance with the Contract Documents. If, upon examination such Work is found not in accordance with the Contract Documents, correct such Work and pay the cost of examination and correction. If such Work is found in accordance with the Contractor Documents, the Owner shall pay the cost of examination and replacement.

5. Independent Inspection Agencies

5.1. Independent Inspection/Testing Agencies may be engaged by the Owner for the purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by the Owner.

5.2. Provide access to the Work, and equipment required for executing inspection and testing by the appointed agencies.

5.3. Employment of inspection/testing agencies does not relax the Contractor's responsibility to perform Work, or carry out his own inspections and testing in accordance with the Contract Documents.

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

6. Access To Work

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

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

7. Procedures

7.1. Notify the appropriate agency and Owner in advance of the requirement for tests, in order that attendance arrangements can be made.

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

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

8. Rejected Work

8.1. Remove defective Work, whether the result of poor workmanship, use of defective products or damage and whether incorporated in the Work or not, which has been rejected, including (but not limited to) defective Work rejected by the Owner as failing to conform to the Contract Documents. Replace or re-execute in accordance with the Contract Documents.

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

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

9. Reports

9.1. Submit four (4) copies of inspection and test reports to the Owner.

9.2. Provide copies to Contractor's Consultant and Subcontractor of Work being inspected or tested.

10. Tests and Mix Designs

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

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

11. Mock-Up

11.1. Prepare mock-up for Work for each finish in the Work and other work specifically requested in the specifications. Include for Work of all Sections required to provide mock-ups.

11.2. Construct in all locations as specified in specific Section.

11.3. Prepare mock-up for Owner's review with reasonable promptness and in an orderly sequence, so as not to cause any delay in the Work.

11.4. Failure to prepare mock-up 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.

11.5. If requested the Owner will assist in preparing a schedule fixing the dates for preparation.

11.6. Mock-ups may remain as part of the Work, unless specified otherwise in the Contract Documents.

12. Mill Tests

12.1. Submit mill test certificates as may be requested.

13. Equipment And Systems

13.1. Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.

13.2. Refer to Contract Documents for definitive requirements.

END OF SECTION 01 45 00

SECTION 01 52 00 – CONSTRUCTION & TEMPORARY FACILITIES

1. General

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

1.2. Include in the Work construction and temporary facilities to provide for construction safety such as: fences, barricades, bracing, supports, storage, sanitation and first aid facilities, fire protection, stand pipes, electrical supply, construction equipment with its supports and guards, stairs, ramps, platforms, runways, ladders, scaffolds, guardrails, temporary flooring, rubbish chutes, and walkway, morality and guard lights, and as otherwise required of the Constructor by the Construction Safety Act, of the Province of Nova Scotia, as well as all other applicable regulations or jurisdictional authorities.

1.3. Construct temporary Work of new materials unless use of second-hand materials is approved.

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

1.5. Locate temporary facilities as directed and coordinated with School Administration and HRSB.

1.6. Relocate construction and temporary facilities as required by the Progress of the Work, and remove at completion of Work.

1.7. Do not permit construction personnel to use new washroom and toilet facilities.

1.8. Interior work zones to be complete with temporary negative air ventilation units to be functioning at all times to control dust migration to occupied areas.

1.9. Refer also to HRSB Policies & Guidelines contained in Appendix A of Section 01 35 13.

2. Services

2.1. Temporary Electric Power:

2.1.1. The Contractor will provide a source of electric power for all construction purposes.

2.1.2. Coordinate with the Building Operator locations of power sources and arrange to connect under his direction.

2.1.3. Install electric service distribution conductors and necessary components. Determine anticipated demand which will be placed on service during normal peak

periods and obtain approval on this basis before making installation. Supply power of characteristics required by the Work. Install a power centre for miscellaneous tools and equipment for each major building floor area with distribution box, a minimum of four 20 amp grounded outlets, and circuit breaker protection for each outlet. Make connections available to any part of the Work within distance of a 100'-0" extension.

2.2. Temporary Lighting:

2.2.1. Install lighting for

2.2.1.1. emergency evacuation, safety and security throughout the Project at intensity levels required by jurisdictional authorities.

2.2.1.2. performance of Work throughout Work areas as required, evenly distributed, and at intensities to ensure that proper installations and applications are achieved.

2.2.1.3. performance of finishing Work in areas as required, evenly distributed and of an intensity of at least 15 foot candles.

2.2.2. Permanent fluorescent lighting may be used during construction, provided that fixtures, lamps and lenses are completely cleaned. Incandescent sources may be used during construction to the extent of 20% of the total. Electrical Division Contractor to provide 20% spare lamps to the Owner for replacement purposes.

2.3. Temporary Sanitary Facilities:

2.3.1. Provide sanitary facilities for persons on the Work site. Facilities in areas of the building are only to be used under extraordinary circumstances and with prior approval.

2.4. Maintain fire protection as required by jurisdictional authorities. The Contractor is responsible for de-activating and re-activating Fire Alarm zones as required by the Work of the Contract and to maintain protection in the existing building.

3. Construction Aids

3.1. Hoists & Cranes:

3.1.1. Select, operate and maintain hoisting equipment and cranes as may be required. Operate such equipment only by qualified hoist or crane operators. Make hoist available for Work of each Section.

3.2. Building Enclosure:

3.2.1. Include in Work temporary enclosure for building as required to protect it, in its entirety or in its parts, against the elements, to maintain environmental conditions required for Work. Design enclosures to withstand wind pressures required for the building by jurisdictional authorities. Erect enclosures to allow complete accessibility for installation of materials during the time enclosures remain in place.

3.3. Scaffolding:

3.3.1. Each user of scaffolding shall be responsible for its examination and testing for sufficiency before using it. He shall make it secure if necessary, or shall notify the Contractor in writing that he will not commence work until it is made secure; otherwise he will be held responsible for accidents due to its insufficiency.

4. Barriers

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

4.2. Construct hoardings and walkways as required by HRSB or jurisdictional authorities.

5. Protection

5.1. Protect roofs and podiums by substantial temporary construction to ensure that no damage occurs. Provide protection by materials of sufficient thickness to prevent all damage to structure and finish, and to waterproofing qualities of membranes, whenever each of these individual components are exposed. Damage shall include harm resulting from all construction work, such as falling objects, wheel and foot traffic, failure to remove debris, operation of machinery and equipment, and scaffolding and hoisting operations. Positively secure protection to prevent displacement from any cause.

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

END OF SECTION 01 52 00

SECTION 01 61 00 - MATERIAL & EQUIPMENT

1. General

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

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

1.3. Products for use in the Project and on which the Tender was based shall be in production at that time, with a precise model and shop drawings available for viewing.

1.4. Where equivalent products are specified, or where alternatives are proposed under "substitution of products", these products claimed by the Contractor as equivalent shall be comparable in construction, type, function, quality, performance, and, where applicable, in appearance, as approved. Where specified equivalents are used in the tendered bulk sum price for the Work, they shall be subject to final approval.

1.5. Incorporate products in the Work in strict accordance with manufacturers' directions unless specified otherwise.

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

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

2. Specified Products

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

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

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

3. Substitution Of Products During Progress Of Work

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

3.2. Obtain approval for substitutions. Application for approval of substitutions shall be made only by Contractor. Process proposals for substituted Work in accordance with procedures established for changes in the Work.

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

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

4. Product Handling

4.1. Manufacture, pack, ship, deliver and store products so that no damage occurs to structural qualities and finish appearance, nor in any other way detrimental to their function or appearance, or both.

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

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

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

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

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

5. Storage & Protection

5.1. Coordinate material delivery to ensure that areas within or on building are available to receive them.

5.2. Store manufactured products in accordance with manufacturer's instructions, when such instructions are attached to products or submitted by him.

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

5.4. Store and handle flammable liquids and other hazardous materials in approved safety containers and as otherwise prescribed by safety authorities. Store no flammable liquids or other hazardous materials in bulk within the Project.

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

6. Defective Products & Work

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

6.2. Remove rejected products and Work from the premises immediately.

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

7. Workers, Suppliers & Subcontractors

7.1. Assign Work only to workers, suppliers, and Subcontractors who have complete knowledge, not only of the conditions of this Project Manual, but of jurisdictional requirements, and reference standards and specifications.

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

8. Workmanship

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

END OF SECTION 01 61 00

SECTION 01 77 00 – CONTRACT CLOSEOUT

1. Section Includes

1.1. Final cleaning.

1.2. Spare parts and maintenance materials.

1.3. Take over procedures.

2. Related Sections

2.1. Individual Specifications Sections: Specific requirements for operation and maintenance data.

3. Final Cleaning

3.1. Refer to the General Conditions of Contract.

3.2. Before final inspection, replace glass and mirrors broken, damaged and etched during construction, or which are otherwise defective.

3.3. In addition to requirements for cleaning-up specified in General Conditions of the Contract, include in Work final cleaning by skilled cleaning specialists on completion of construction.

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

3.5. Remove waste products and debris other than that caused by the Owner, other contractors or their employees, and leave the Work clean and suitable for occupancy by Owner.

3.6. Remove surplus products, tools, construction machinery and equipment. Remove waste products and debris other than that caused by the Owner or other Contractors.

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

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

3.9. Vacuum clean and dust building interiors, behind grilles, louvres and screens as affected by Work.

3.10. Wax, seal, shampoo, buff or prepare floor finishes, as recommended by the manufacturer. Use products compatible with products used by building maintenance staff.

3.11. Broom clean and wash all horizontal and vertical surfaces as affected by Work.

3.12. Clean up and make good exterior grades, lawns, planting and surfaces after removal of temporary access and facilities.

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

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

4. Spare Parts And Maintenance Materials

4.1. Spare parts and maintenance materials provided shall be new, not damaged or defective, and of the same quality and manufacture as Products provided in the Work. If requested, furnish evidence as to type, source and quality of Products provided.

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

4.3. Store spare parts and maintenance materials in a manner to prevent damage, or deterioration.

4.4. Provide spare parts, special tools, maintenance and extra materials in quantities specified in individual specification Sections.

4.5. Provide items of same manufacture and quality as items in the Work.

5. Demonstration Of Systems & Equipment

5.1. Give a complete demonstration of all systems and equipment in the presence of the Consultant at the following times:

5.2. When each is 100% completed at the request of the Contractor.

5.3. At time of inspection to validate final completion.

5.4. At final completion for the benefit of the maintenance staff for the Project.

5.5. Responsible personnel representing the Subcontractor responsible for the Work being demonstrated shall be present at each demonstration.

6. Submittals

6.1. Submit with application for substantial performance certificate.

6.1.1. Certificate of substantial completion inspection report from electrical utility or inspection.

6.1.2. Certificate of verification of fire alarm system.

6.1.3. Certificate from the Fire Marshal's Office and I.A.O. of final inspection of sprinkler system.

6.1.4. Air balance reports.

6.1.5. Other reports required or specified.

6.1.6. Maintenance Manuals and Operating Instructions.

6.2. Submit with application for release of final payment:

6.2.1. Final project record drawings.

6.2.2. Extra stock.

6.2.3. Performance bonds which shall remain in effect for one (1) year after take-over date.

6.2.4. Completed Liability Insurance Policy extended for one (1) year from take-over date.

6.2.5. Written guarantee covering all workmanship and materials used in the Work.
6.2.6. Maintenance bonds as specified.
6.2.7. Extended Warranties as specified
6.2.8. Certificate from Workers' Compensation Board.
6.2.9. Certificate from Health Services Tax Division.

7. Final Inspection Procedures

7.1. Schedule, make arrangements for and administer final inspections and close out in the following stages.

7.2. Contractor's Inspection:

7.2.1. Determination that Project meets requirements for substantial performance and inspection is the responsibility of the Contractor.

7.2.2. The Contractor and all Subcontractors shall conduct an inspection of the work, identify deficiencies and defects; repair as required. Notify the Consultant in writing of satisfactory completion of the contractor's Inspection and that corrections have been made. Request a Consultant's Substantial Performance Inspection.

7.3. Consultant's Inspection: Consultants and the Contractor will perform an inspection of the Work to identify obvious defects or deficiencies. The contractor shall correct Work accordingly.

7.4. Substantial Performance Inspection:

7.4.1. When the items noted above are complete, request a substantial performance inspection of the Work by the Consultant, and the Contractor. If Work is deemed incomplete by the Consultant, complete the outstanding items and request a re-inspection.

7.4.2. Substantial performance inspections shall be scheduled to begin within eight working days of the Contractor's request.

7.4.3. Present at the substantial performance inspection will be:

7.4.3.1. The Consultant and his Sub-consultants that he requires and notifies.
7.4.3.2. The Owner's representatives, upon notification by the Consultant.
7.4.3.3. The Contractor and such Subcontractors that he considers are required.
7.4.3.4. The Contractor will compile a substantial performance deficiency list at this inspection and issue it to the Consultant and Owner.
7.4.3.5. The Contractor shall correct substantial performance deficiencies before a date agreed upon by the Contractor and Consultant.
7.4.3.6. Upon the Consultant's approval of substantial performance, the Contractor shall submit an application for a substantial performance certificate.
7.4.3.7. When the Contractor has satisfied himself that these corrections have been completed in a satisfactory manner by his inspection he shall schedule a

final Contractor's inspection by the Consultant, and the Owner's representatives if required, within five working days of the Contractor's request.

7.4.3.8. Upon the Consultant's approval of completion, the Contractor shall submit an application for a completion certificate.

8. Substantial Performance

8.1. The Consultant will issue a Certificate of Substantial Performance when satisfied outstanding deficiencies noted during inspections prior to the substantial completion inspection have been corrected, the Work is substantially complete and is so certified by the Owner.

8.2. A list of remaining deficiencies to be rectified before final acceptance will be attached to the Certificate of Substantial Performance.

8.3. Make submissions specified in Subparagraph 1.06 of this Section.

9. Certificate For Release Of Amount Due At Substantial performance

9.1. The Consultant will issue to the Owner a certificate for release of money in an amount equal to the amount due the Contractor under the Agreement providing he is satisfied the Work has been substantially completed.

9.2. The certificate shall indicate the date of substantial performance.

9.3. Payment shall be due upon date of substantial performance.

10. Completion Certificate

10.1. The Consultant will issue a Certificate of Completion (DSS Document DC670-92) when he is satisfied that outstanding deficiencies noted during inspections have been corrected and the Work is completed and is so certified by the Owner.

10.2. The date of the completion certificate will commence the required sixty (60) day period before release of final payment.

11. Certificate For Release Of Final Payment

11.1. The Consultant will issue to the Owner a certificate for release of final payment sixty (60) days after date of completion certificate providing he is satisfied the Work has been completed.

11.2. The certificate will be in an amount equal to the remaining money due the Contractor under the Contract, and shall indicate the date of final completion.

11.3. Payment shall be due upon date of final completion.

12. Warranties

12.1. Establishment of Warranties:

12.1.1. Warranties shall commence on date of substantial performance certificate.

12.2. Warranty Period:

12.2.1. The Owner will advise the Consultant of defects observed during warranty periods.

12.2.2. The Consultant will notify the Contractor of defects observed during warranty period and request him to remedy the defects in accordance with the Contractor documents.

12.2.3. Thirty (30) days before expiration of warranties the Owner's representatives, the Consultant and the Contractor will inspect the Work as arranged by the Contractor noting defects of products and workmanship.

12.2.4. The Contractor shall immediately remedy such noted defects.

END OF SECTION 01 77 00

CONTRACTOR'S CHECKLIST

Enclose the following documents with your bid:

□ ***Bid Security as required in section 21.1 (Information for Tenderers)*** - in the amount of 10% of the Contract Price (before HST).

□ ***Contract Security for bids over $100,000 as required in section 22.6.1.1 (Information for Tenderers)*** – required upon award.

□ ***Certificate of Insurance*** indicating a minimum of **$5,000,000** ***Commercial General Liability Insurance*** per occurrence and ***Commercial Auto Liability Insurance*** covering all owned, non-owned and hired vehicles for a minimum combined single limit of **$2,000,000** per occurrence, ***Wrap-up Liability*** for a minimum combined single limit of **$5,000,000** per occurrence, ***Professional Liability*** for a minimum combined single limit of **$5,000,000** per occurrence and ***Builder's Risk Insurance*** in the amount of the contract price. ***Please comply with the insurance requirements as indicated in the sample insurance form (attached)***

□ ***Tentative Work Schedule (Timelines)*** – Subsequently, within five (5) business days of tender award the successful tenderer shall provide a schedule clearly indicating timelines for completion of all aspects of the project.

□ ***Workers' Compensation Board Letter*** of Good Standing

□ ***Certificates of good standing with CRCA*** **(**Canadian Roofing Contractors Association**)** ***and RCANS*** **(**Roofing Contractors Association of Nova Scotia**).**

□ ***Certificate of Recognition from one of the seven safety audit companies that jointly sign with the WCB***:

- East Coast Mobile Medical Inc.
- HSE Integrated
- Nova Scotia Construction Safety Association
- Nova Scotia Trucking Safety Association
- Occupational Health & Educational Services (2002) Inc.
- Safety Services Nova Scotia
- Stantec Inc.

This list can be found on WCB's website: www.wcb.ns.ca.

□ ***Completed HRSB Safety Plan***

□ ***Applicable Warranty Information***

CSIO

CERTIFICATE OF LIABILITY INSURANCE

This certificate is issued as a matter of information only and confers no rights upon the certificate holder and imposes no liability on the insurer. This certificate does not amend, extend or alter the coverage afforded by the policies below.

1. CERTIFICATE HOLDER - NAME AND MAILING ADDRESS	2. INSURED'S FULL NAME AND MAILING ADDRESS
Halifax Regional School Board	Contractors Name and Address
11 Akerley Blvd., Unit 150	
Dartmouth, NS POSTAL CODE B3B 1V7	POSTAL CODE

3. DESCRIPTION OF OPERATIONS/LOCATIONS/AUTOMOBILES/SPECIAL ITEMS TO WHICH THIS CERTIFICATE APPLIES (but only with respect to the operations of the Named Insured)

Insured project details and address: (List specific Project details)

Policy Includes: Contractual Liability, Primary and Non-Contributory, Waiver of Subrogation, Broad Form Property Damage

4. COVERAGES

This is to certify that the policies of insurance listed below have been issued to the insured named above for the policy period indicated notwithstanding any requirements, terms or conditions of any contract or other document with respect to which this certificate may be issued or may pertain. The insurance afforded by the policies described herein is subject to all terms, exclusions and conditions of such policies.

LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS

TYPE OF INSURANCE	INSURANCE COMPANY AND POLICY NUMBER	EFFECTIVE DATE YYYY/MM/DD	EXPIRY DATE YYYY/MM/DD	LIMITS OF LIABILITY (Canadian dollars unless indicated otherwise)		
				COVERAGE	DED.	AMOUNT OF INSURANCE
COMMERCIAL GENERAL LIABILITY ☐ CLAIMS MADE **OR** ☑ OCCURRENCE ☑ PRODUCTS AND / OR COMPLETED OPERATIONS ☑ EMPLOYER'S LIABILITY ☑ CROSS LIABILITY ☑ TENANTS LEGAL LIABILITY ☑ POLLUTION LIABILITY EXTENSION	XX Insuance 123Binder (Wrap - Up Liability)	2017/11/20	2018/11/20	COMMERCIAL GENERAL LIABILITY BODILY INJURY AND PROPERTY DAMAGE LIABILITY - GENERAL AGGREGATE		$5,000,000
				- EACH OCCURRENCE		$5,000,000
				PRODUCTS AND COMPLETED OPERATIONS AGGREGATE		$5,000,000
				☐ PERSONAL INJURY LIABILITY OR ☑ PERSONAL AND ADVERTISING INJURY LIABILITY		$1,000,000
				MEDICAL PAYMENTS		$25,000
				TENANTS LEGAL LIABILITY		$1,000,000
				POLLUTION LIABILITY EXTENSION		$2,000,000
☑ NON-OWNED AUTOMOBILES ☐ HIRED AUTOMOBILES	XX Insurance 123 Binder	2017/11/20	2018/11/20	NON OWNED AUTOMOBILE		$2,000,000
AUTOMOBILE LIABILITY ☑ DESCRIBED AUTOMOBILES ☐ ALL OWNED AUTOMOBILES ☐ LEASED AUTOMOBILES ** ** ALL AUTOMOBILES LEASED IN EXCESS OF 30 DAYS WHERE THE INSURED IS REQUIRED TO PROVIDE INSURANCE	XX Insurance 123 Binder	2017/11/20	2018/11/20	BODILY INJURY AND PROPERTY DAMAGE COMBINED		$2,000,000
				BODILY INJURY (PER PERSON)		
				BODILY INJURY (PER ACCIDENT)		
				PROPERTY DAMAGE		
EXCESS LIABILITY ☐ UMBRELLA FORM ☐				EACH OCCURRENCE		
				AGGREGATE		
OTHER LIABILITY (SPECIFY) ☑ Builders Risk - All Risk	XX Insurance 123 Binder	2017/11/20	2018/11/20	Limit - (Project Limit)		
☐				Extra Expense		$1,000,000
☑ Professional Liability	XX Insurance 123 Binder	2017/11/20	2018/11/20	Limit of Liability - Per Claim		$5,000,000

5. CANCELLATION

Should any of the above described policies be cancelled before the expiration date thereof, the issuing company will endeavor to mail 30 days written notice to the certificate holder named above, but failure to mail such notice shall impose no obligation or liability of any kind upon the company, its agents or representatives.

6. BROKERAGE/AGENCY FULL NAME AND MAILING ADDRESS	7. ADDITIONAL INSURED NAME AND MAILING ADDRESS (but only with respect to the operations of the Named Insured)
	Halifax Regional School Board
POSTAL CODE	11 Akerley Blvd., Unit 150
BROKER CLIENT ID:	Dartmouth, NS POSTAL CODE B3B 1V7

8. CERTIFICATE AUTHORIZATION

ISSUER	CONTACT NUMBER(S)			
	TYPE	NO.	TYPE	NO.
AUTHORIZED REPRESENTATIVE	TYPE	NO.	TYPE	NO.
SIGNATURE OF AUTHORIZED REPRESENTATIVE	DATE 2017/11/20		EMAIL ADDRESS	

Halifax Regional School Board

Project Safety Plan Outline

During the planning of each project, environmental and occupational health and safety issues will be assessed like any other key project component.

Prior to beginning a new project, tendering contractors shall examine the work area to identify potentially hazardous site specific situations.

Once identified, these hazards should be prioritized on this Hazard Assessments/Project Safety Plan Outline and corrective *actions* noted to eliminate or control each hazard. The dates of when and names of the persons who are responsible for completing the *action* should also be assigned.

Copies of the completed Safety Plan Outline shall be submitted as part of the tender document submittal, sent to the HRSB Operations Services Regional Manager, made available on the job site and communicated to the workers.

Project Name: _____

Project Location: _____

Project Start date: _____

Project End date: _____

Company Name: _____

Completed by: _____
(Contractor's project manager)

Date: _____

Copy to: _____

PLANNING:

Does the Contractor's Occupational Health and Safety Program deal with the work activities associated with this project? ☐ Yes ☐ No

Describe tasks to be undertaken:_____

_____

_____

_____

HAZARDS ASSESSMENT:

Identify the hazards that could present themselves on this project (e.g. live electrical wires, over water, confined space, etc) and describe what steps will be taken to prevent an incident (e.g. cover up, de-energize, safe work practices, netting, etc). Prioritize from #1 as needing immediate action.

#	Hazard	Required Action	Completed by	Date
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

ENVIRONMENTAL ASSESSMENT:

Identify the environmental issues that could present themselves on this project (e.g. oil spills, asbestos, etc.) and describe the action that will betaken to eliminate or reduce the risk of occurrence (e.g. mop kits, air sampling, etc.)

#	Hazard	Required Action	Completed by	Date
1				
2				
3				
4				
5				

EMERGENCY RESPONSE:

In the event of an incident, pre-plan the response and write up the procedures. Minimally, the following list should be completed and posted on site:

Contact	Phone #	Contact	Phone #
Fire	911	Poison Control	428-8161
Ambulance	911	Dangerous Goods	1-800-565-1633
Doctor	911	Waste Disposal	
Police	911	Insurance	
HRSB Office	493-5110	Min/Dept of Labour	1-800-952-2687
Min./Dept.of Transport.		Min/Dept of Environment	1-800-565-1633

- Identify and arrange source of first aid, ambulance and rescue.
- Accidents will be reported to: _____
- Accidents will be investigated by: _____
- Back-up call to: _____
- HRSB # emergency/after hours: day 493-5110 after 4:00 pm 442-2476

SAFETY MEETINGS:

On this project, given the nature of the work and the anticipated size of the work force, the following frequency will apply:

Site meetings _____

Site Audits _____

Follow up with HRSB Manager: _____

SITE IMPLEMENTATION:

- Health and Safety Rep & Safety Committee:
  Establish liaison between HRSB, contractor, site administration
  First Aid, PPE, other safety items as required.

- Documentation:
  Applicable MSDS
  Safety program
  Applicable work procedures
  Permits
  First Aid Certification

TRAINING:

The following training/testing will be mandatory on site:

1) _____

_____

2) _____

_____

3) _____

_____

TENTATIVE SCHEDULE OF WORK:

1) Date Project Will Commence: _____

2) Number of Weeks to Complete Project: _____ weeks

NOTE:

Within one week of tender award the successful bidder shall provide a schedule clearly indicating timelines for completion of all aspects of the project.

Division 25 INTEGRATED AUTOMATION

ELECTRICAL NO. DIVISIONS 26, 27, 28 No. of Pages

NUMBER TITLE

1 General

1.1 REFERENCE STANDARDS

.1 Perform work in accordance with the following standards:

.1 Canadian Construction Safety Code, latest edition.

.2 NBCC - Latest Issue, Part 8 - Safety Measures at Construction and Demolition sites.

.3 CSA S350 - Code of Practice for Safety in Demolition of Structures.

.4 NFC Latest Issue - Part 6 governing installation and maintenance of portable fire extinguishers.

.5 CSA C22.1, "Canadian Electrical Code", governing temporary electrical installations.

.6 Transportation of Dangerous Goods Acts.

1.2 WORK INCLUDED

.1 Demolition, removal and disposal of the all work itemized on the drawings.

.2 Coordinate removals in order to maintain services as required for operation.

.3 Obtain all necessary permits required to perform the above noted work.

1.3 EXISTING CONDITIONS

.1 Take over structures to be demolished based on their condition on date that the contract is awarded.

.2 Inspect adjacent existing property to extent possible and ensure that its condition and stability is recorded.

.3 Photograph adjacent existing properties in sufficient detail to record its conditions before Work of this Section commences. These photographs will be used to compare the condition of adjacent construction before and after performance of Work of this Section in the event damage of adjacent construction is claimed as a result of demolition.

.4 Should unlabelled drums or potentially hazardous materials be encountered in the course of demolition, stop work and notify the Architect. Do not proceed until written instructions have been received from the Architect. Comply fully with CSA Z 317.13.

1.4 PROTECTION

.1 For demolition within the existing building provide dust proof partitions, negative air pressure and all other measures required to maintain a clean environment for the building occupants.

.2 Prevent movement, settlement or damage of adjacent properties, structures, services, paving, roadways, and parking areas. Make good damage and be liable for injury caused by demolition.

.3 Prevent debris from blocking existing surface drainage systems, which must remain in operation.

.4 Ensure safe passage of the public and building occupants past area of demolition.

.5 Prevailing weather conditions and weather forecast shall be considered. Demolition work shall not proceed when extreme weather conditions constitute a hazard to the works and site.

.6 Protect existing items designated to remain. In event of damage, immediately replace such items or make repairs to approval of the Architect at no additional cost to the Owner.

.7 Protect the supply of electricity to areas of property to remain in service.

.8 Protect telephone service to areas of property to remain in service.

.9 Protect water and sewer service to areas of the property to remain in service.

.10 Take precautions to support structures and, if safety of building being demolished or adjacent structures or services, etc. appears to be endangered, cease operations and notify the Architect.

.11 Prevent debris from blocking surface drainage system, mechanical and electrical systems which must remain in operation.

.12 Ensure that adjacent properties, and other equipment are protected from damage resulting from Work of this Section. Install protection consisting of fences, barricades, signs, and substantial construction to provide physical protection.

.13 Post danger signs in conspicuous locations to warn persons that demolition is in progress.

.14 Erect protection to provide safe access which must be maintained to existing buildings and support area of the building being demolished.

.15 Protect existing services from damages. Where required, arrange to relocate existing active services to ensure that they function continuously in safety and without risk of damage. Cap off and remove unused services encountered during demolition after approval is given by the Architect and utilities or jurisdictional authorities, whichever may apply.

.16 Maintain security of areas in which demolition is proceeding by control of access through enclosing fences, barricades, and hoardings during times Work is in progress, and by locking hardware otherwise.

.17 Maintain security of areas in which demolition is proceeding while Work is shut down because of a strike or a lockout.

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

.19 Keep sidewalks, streets, and roads free of dust and debris from demolition Work. Clean up accumulations as they occur.

.20 Provide up-to-date proof of certification of all equipment to be used on site.

.21 Temporary shoring and protection shall be designed by a professional engineer registered or licensed to practice in Nova Scotia.

1.5 SALVAGEABLE MATERIALS

.1 Salvage, recycling or reuse of materials or equipment from the buildings to be demolished is encouraged.

.2 Re-grade and label salvageable lumber as required by law.

.3 The Contractor shall protect the owner from any claims, however, rising, from the salvage, recycling or reuse of materials or equipment from the demolished buildings.

3 Execution

3.1 ENVIRONMENTAL PROTECTION

.1 Perform work in an environmentally acceptable manner.

3.2 PREPARATION

.1 Obtain all necessary permits and approvals.

.2 Inspect site and verify with the Architect items designated for removal and items to be preserved.

.3 Locate and protect utility lines to remain. Notify utility companies before starting demolition.

.4 Employ rodent and vermin exterminators to comply with Health and Environmental regulations.

3.3 EXAMINATION

.1 Before commencing Work, ensure in examination of the site and Work to be demolished that all possible factors concerning demolition are investigated, and that the following are know in particular:

.1 Methods and means available for material handling, disposal, storage, and transportation.

.2 Construction details of structures to be demolished.

.3 Construction details of other existing and adjacent properties.

.4 Location of utility and other services.

.2 Review demolition Work to be performed in all its details. Do not proceed without review of the demolition methods that will be used.

3.4 DEMOLITION - GENERAL

.1 Remove any equipment or materials intended for reuse, recycling or salvage.

.2 Sub-Contractor shall provide a detailed description of the proposed methods and procedures for demolition prior to commencing work on the site.

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

.4 At end of each day's work leave site in safe condition so that no part is in danger of toppling or falling.

.5 Carefully remove and lower structural framing and other heavy or large objects.

.6 Demolish to minimize dusting and noise. Spray water on structures during demolition as required and when ever requested by the Architect to control dust.

.7 Remove and dispose of all demolition items and materials from site in accordance with authorities having jurisdiction and as per "3.8 Disposal of Material" of this section.

.8 In removal of pavements, curbs and gutters:

.1 Square up adjacent surfaces to remain in place by saw cutting or other approved method.

.2 Protect adjacent joints and load transfer devices.

.3 Protect underlying granular materials.

.9 Remove existing equipment, services, and obstacles where required for refinishing or making good of existing surfaces, and replace as work progresses.

.10 Demolish concrete walls in small sections. Carefully remove and lower structural framing and other heavy or large objects.

.11 Dispose of materials not designated for salvage or re-use in work, off site.

.12 Do not sell or burn materials on site.

3.5 DISPOSAL OF MATERIAL

.1 Reuse, recycling and salvage of materials and equipment is permitted and encouraged with regulatory requirements. Do not reuse salvaged material in this project unless approved by the Architect.

.2 Sale of materials shall not take place on or from the site.

.3 All debris must be disposed off site at an approved disposal facility.

.4 The contractor will provide a waste disposal plan to the Architect and obtain approval for the disposal plan in writing from the NSDOE, and the Architect prior to commencement of work at the site.

3.6 RESTORATION

.1 Upon completion of work, remove debris, trim surfaces and leave work sites clean to a condition satisfactory to the Architect.

.2 Reinstated areas must be considered safe by the Architect.

.3 Reinstate areas in existing works outside area of demolition to conditions that existed prior to commencement of work.

END OF SECTION

1 General

1.1 RELATED WORK

.1 Section 03 20 00: Concrete Reinforcing

.2 Section 03 30 00: Cast-in-Place Concrete

1.2 REFERENCES

.1 CAN/CSA A23.1, Concrete Materials and Methods of Concrete Construction.

.2 CAN3 O86.1-94, Engineering Design in Wood (Working Stress Design).

.3 CAN/CSA O86.1-M89, Engineering Design in Wood (Limit States Design).

.4 CSA O121-M1978, Douglas Fir Plywood.

.5 CSA O151-M1978, Canadian Softwood Plywood.

.6 CSA O153-M1980, Poplar Plywood.

.7 CAN/CSA S269.3-M92, Concrete Formwork.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Collect, separate and recycle all site generated waste materials.

2 Products

2.1 MATERIALS

.1 Formwork materials:

.1 For concrete without special architectural features, use plywood and wood formwork materials to CSA O121, CAN/CSA O86.1, CSA O153.

.2 Form ties:

.1 Removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.

.3 Form release agent: chemically active release agents containing compounds that react with free lime in concrete resulting in water insoluble soaps.

.4 Form stripping agent: colorless mineral oil, free of kerosene, with viscosity between 70 and 110 s Saybolt Universal at 40☜C, flashpoint minimum 150☜C, open cup.

3 Execution

3.1 FABRICATION AND ERECTION

.1 Verify lines, levels and centres before proceeding with formwork and ensure dimensions agree with drawings.

.2 Do not place shores and mud sills on frozen ground.

.3 Provide site drainage to prevent washout of soil supporting mud sills and shores.

.4 Fabricate and erect formwork in accordance with CAN/CSA S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CAN/CSA A23.1.

.5 Align form joints and make watertight. Keep form joints to minimum.

.6 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners of concrete members, joints, unless specified otherwise.

.7 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

.8 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections. Assure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

.9 Clean formwork in accordance with CAN/CSA A23.1, before placing concrete.

3.2 REMOVAL AND RESHORING

.1 Leave formwork in place for the following minimum periods of time after placing concrete:

.1 Five days for walls and entire sides of beams.

.2 Five days for columns.

.3 Twenty-eight days for beam soffits, slabs and other structural members, or seven days when replaced immediately with adequate shoring to standard specified for falsework.

.2 Re-use formwork subject to requirements of CAN/CSA-A23.1.

END OF SECTION

1 General

1.1 RELATED WORK

.1 .1 Section 03 10 00: Concrete Formwork

.2 .2 Section 03 30 00: Cast-In-Place Concrete

1.2 1.2 REFERENCES

.1 .1 Manual of Standard Practice - Reinforcing Steel Institute of Ontario.

.2 .2 CAN/CSA 23.1-M94, Concrete Materials and Methods of Concrete Construction.

.3 .3 CAN3 A23.3-M84, Design of Concrete Structures for Buildings.

.4 .4 CSA G30.5-M198(R1991), Welded Steel Wire Fabric for Concrete Reinforcement.

.5 .5 CAN/CSA G30.18 –M92, Billet-Steel Bars for Concrete Reinforcement.

1.3 SOURCE QUALITY CONTROL

.1 Upon request, provide Architect with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis.

.2 Upon request, inform Architect of proposed source of material to be supplied.

1.4 SUBSTITUTES

.1 Substitute different size bars only if permitted in writing by Architect.

2 Products

2.1 **MATERIALS**

.1 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA G30.18, unless indicated otherwise.

.2 Cold-drawn, annealed, steel wire ties: to CSA G30.3.

.3 Welded steel wire fabric: to CSA G30.5

.4 Chairs, bolsters, bar supports, spacers: to CAN/CSA A23.1.

2.2 **FABRICATION**

.1 Fabricate reinforcing steel in accordance with CAN/CSA-A23.1 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Ontario unless indicated otherwise.

.2 Obtain Architect's approval for locations of reinforcement splices other than those shown on placing drawings.

.3 Ship bundles of bar reinforcement clearly identified in accordance with bar bending details and lists.

3 Execution

3.1 FIELD BENDING

.1 Do not field bend or field weld reinforcement except where indicated or authorized by Architect.

3.2 PLACING REINFORCEMENT

.1 Remove all coatings on reinforcement which might reduce bond before placing.

.2 Cold bend bars and place accurately in position in strict accordance with the approved shop drawings.

.3 Place reinforcing steel as indicated on drawings and in accordance with CAN/CSA-A23.1.

.4 Secure reinforcing bars in position on chairs and spaces to provide the following minimum concrete coverage:

1. Concrete directly on ground without forms-3" (75mm).
2. Concrete exposed to weather or to ground after removal of forms-2" (50mm).
3. Other concrete – 1 ½" (38mm) (beams and columns), ¾" (19mm) (slabs and walls).
4. Keep splices to a minimum. Lap necessary splices at least 40 bar diameters in length. Lap adjacent sheets of fabricated mats or wire mesh at least 6" (150mm) and securely wire to prevent elastic curl.

.5 Prior to placing concrete, obtain Architect's approval of reinforcing material and placement.

.6 Ensure cover to reinforcement is maintained during concrete pour.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 03 10 00 Concrete Formwork

.2 Section 03 20 00 Concrete Reinforcing

.3 Section 04 05 00 Masonry Procedures

.4 Section 05 50 00 Metal Fabrication

1.2 REFERENCES

.1 CAN/CGSB 37.2-M88, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.

.2 CAN/CGSB 51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

.3 CAN/CSA-A5-93, Portland Cement.

.4 CAN/CSA-A23.1-M94, Concrete Materials and Methods of Concrete Construction.

.5 CAN/CSA-A23.2-M94, Methods of Test for Concrete.

.6 CAN/CSA-A23.5-M86(R1992), Supplementary Cementing Materials.

.7 CAN3-A266.1-M78, Air-Entraining Admixtures for Concrete.

.8 CAN3-A266.2-M78, Chemical Admixtures for Concrete.

.9 CAN3-A266.4-M78, Guidelines for the Use of Admixtures in Concrete.

.10 CAN/CSA A363-M88, Cementitious Hydraulic Slag.

1.3 QUALITY ASSURANCE

.1 Minimum 2 weeks prior to starting concrete work, submit proposed quality control procedures for Architect's approval for following items:
- .1 Hot weather concrete mix.
- .2 Cold weather concrete mix.
- .3 Curing.

.2 Have all concrete produced and delivered by a ready-mix plant that is a member of the Atlantic Provinces Ready Mixed Concrete Association (APRMCA) and holds a current "Certificate of Ready Mixed Concrete Production Facilities" issued by the Association. Submit a copy of this certificate to Architect for approval.

2 Products

2.1 MATERIALS

.1 Portland cement: to CAN/CSA A5.

.2 Supplementary cementing materials: to CAN/CSA A23.5.

.3 Cementitious hydraulic slag: to CAN/CSA A363.

.4 Water: to CAN/CSA A23.1.

.5 Aggregates: to CAN/CSA A23.1. Coarse aggregates to be normal density.

.6 Air entraining admixture: to CAN3-A266.1.

.7 Chemical admixtures: to CAN3-A266.2. Architect to approve accelerating or set retarding admixtures during cold and hot weather placing.

.8 Non, premixed dry pack grout: composition of non metallic aggregate Portland cement with sufficient water for the mixture to retain its shape when made into a ball by hand and capable of developing compressive strength of 35 MPa at 7 days.

.9 Curing compound: to CAN/CSA A23.1 clear and to ASTM C309, Type 1-chlorinated rubber.

.10 Pre-moulded joint fillers:
- .1 Bituminous impregnated fiber board: to ASTM D1751.
- .2 Sponge rubber: to ASTM D1752, Type I, flexible grade.

.11 Weep hole tubes: plastic.

.12 Damp proof membrane:
- .1 Kraft/polyethylene membrane:
  - .1 Reinforced: two 0.75mm thick polyethylene films bonded each side of asphalt treated creped kraft paper, reinforced with 13 x 13 mm fibreglass scrim.
  - .2 Membrane adhesive: as recommended by membrane manufacturer.

.13 Damp proofing:

.1 Emulsified asphalt, mineral colloid type, unfilled: to CAN/CGSB 37.2, and to Section 07160 Bituminous Dampproofing.

.14 Polyethylene film: 6mil thickness to CAN/CGSB 51.34.

2.2 MIXES

.1 Proportion normal density concrete in accordance with CAN/CSA A23.1, Alternative 1 to give following quality for concrete.
- .1 Cement: Type 10 Portland cement.
- .2 Minimum concrete strength:
  - .1 All concrete unless noted – 4000psi
  - .2 Exterior Slab on Grade – 34.4 Mpa
  - .3 Exterior sidewalks and curbs – 31.0 Mpa
  - .4 Columns and structural slabs – 34.4 Mpa
  - .5 Footings – 20.0 Mpa
  - .6 Mud slab – 12.0 Mpa
- .3 Class of exposure: C-2
- .4 Nominal size of coarse aggregate: 20 mm.
- .4 Slump at time and point of discharge: 20 to 40 mm.
- .5 Air content: 5 to 8%.
- .6 Chemical admixtures: following admixtures in accordance with CAN3-A266.4, type, quantity, water reducing strength increasing.

.2 Aggregate to be 25mm maximum throughout.

.3 All concrete exposed to weather shall be air entrained to 6%. Maximum slump to be 75mm.

3.3 ADMIXTURES

.1 Non air entrained concrete, use a water reducing agent in compliance with ASTM C494 Type 1, such as Eucon WR75 by Euclid Canada.

.2 All exterior exposed concrete, such as walks, curbs, steps and landings shall, in addition to the water reducer, have an approved air entraining agent such as Euclid's AirExtra (ASTM C-260) added to the mix to bring the total air content to 6% plus or minus 2%.

.3 Concrete floors with hardener as designated on the finish schedule shall be surfaced hardened using "Surflex coloured by Euclid Canada" coloured non-metallic hardener.

3 Execution

3.1 PREPARATION

.1 Obtain Architect's approval before placing concrete. Provide 24 h notice prior to placing of concrete.

.2 Pumping of concrete is permitted only after approval of equipment and mix.

.3 Ensure reinforcement and inserts are not disturbed during concrete placement.

.4 Prior to placing of concrete obtain approval of proposed method for protection of concrete during placing and curing.

.5 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

.6 Do not place load upon new concrete until authorized by Architect.

3.2 CONSTRUCTION

.1 Do cast-in-place concrete work in accordance with CAN/CSA A23.1.

.2 Sleeves and inserts.

- .1 No sleeves, ducts, pipes or other openings shall pass through columns, except where indicated or approved by Architect.
- .2 Where approved by Architect, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere. Sleeves and openings greater than 100 x 100 mm not indicated must be approved by Architect.
- .3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Architect before placing of concrete.
- .4 Check locations and sizes of sleeves and openings shown on drawings.

.3 Anchor bolts.

- .1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.

.4 Drainage holes and weep holes:

- .1 Form weep holes and drainage holes in accordance with Section 03100 Concrete Formwork. If wood forms are used, remove them after concrete has set.
- .2 Install weep hole tubes and drains as indicated.

.5 Grout under base plates and machinery using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area. Euco NS Grout by Euclid Canada

.6 Finishing.

- .1 Finish concrete in accordance with CAN/CSA-A23.1.
- .2 Use procedures acceptable to Architect or those noted in CAN/CSA A23.1 to remove excess bleed water. Ensure surface is not damaged.

.3 Use curing compounds compatible with applied finish on concrete surfaces. Provide written declaration that compounds used are compatible.
.4 Finish concrete floor to meet requirements of CGSB 81 GP 1M.
.5 Provide swirl trowelled finish where floor tile is to be applied. Provide depressions to accommodate floor file.
.6 Provide swirl trowelled finish unless otherwise indicated.
.7 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.

.7 Joint fillers.
.1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Architect. When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
.2 Locate and form isolation joints as indicated. Install joint filler.
.3 Use 12 mm thick joint filler to separate slabs on grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.

.8 Housekeeping Pads: Provide 4" thick poured in place concrete housekeeping pads for all floor mounted mechanical and electrical equipment. Tops of housekeeping pads to be level.

.9 Reinforcing bars shall have a minimum lap of 30 bar diameters unless noted otherwise. Corner bars shall be provided at all corners.

.10 Concrete cover for reinforcing steel shall conform to A23.1-00.

.11 Concrete for interior walls, footings, and slabs on grade shall be exposure Class N, with a minimum compressive strength at 28 days of 25 Mpa, a maximum water/cement ratio of 0.45, and an air content of 4% to 7%.
Concrete for exterior walls and footings shall be exposure Class F-2, with a minimum compressive strength at 28 days of 25 Mpa, a maximum water/cement ratio of 0.55, and an air content. Concrete for exterior sidewalks and curbs shall be exposure Class C-2, with a minimum compressive strength at 28 days of 4% to 7% content of 5% to 8%.

.12 Provide control joints in slab on grade at 30 times the slab thickness in both directions. Joints are to be saw cut to 1/3 of slab depth.

.13 Provide keyed control joints in foundation walls at 20 meters on centre. Wall reinforcing to be continuous through joint.

.14 Footings are designed to bear on competent undisturbed till or on prepared structural fill.

.15 Depth of exterior footings to be 1200mm below grade for frost protection.

.16 See architectural, mechanical and electrical drawings for locations and sizes of housekeeping of housekeeping pads, sleeves and other concrete inserts.

3.3 SITE TOLERANCE

.1 Concrete tolerance in accordance with CAN/CSA A23.1 straight edge method.

3.4 FIELD QUALITY CONTROL

.1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory in accordance with CAN/CSA A23.1.

.2 Such testing will not augment or replace Contractor quality control nor relieve him of his contractual responsibility.

3.5 CURING MATERIAL

.1 Curing compound for all concrete floor areas, except those which are to receive VCT, chemical hardener, seamless flooring, epoxy or latex coatings, or quarry tile, cure using Super Diamond Clear by Euclid Canada.

3.6 PLACING ACCESSORIES AND COATINGS

.1 Place all water stops and expansion joints to manufacturer's directions, where called for by the drawings. Apply and maintain all form surfaces prior to installation of reinforcing.

.2 Submit name of pre-mix concrete supplier for written approval of Architect prior to pouring. Pre-mix concrete to conform to CAN3-A23.1. Coordinate supplier for inspection and tests.

.3 Use a standard batch mixer and accurately measure all aggregates cement and water, mixing not less than 1 ½ minutes and no larger batch than can be placed in 30 minutes.

.4 Alternatively use “in-transit” pre-mixed concrete. Submit name of pre-mix concrete supplier for written approval of Architect prior to pouring. Pre-mix concrete to conform to CAN3-A23.1-M94. Coordinate supplier for inspection and tests.

3.7 PLACING CONCRETE

.1 Preparation: Clean and wet down all form surfaces. Remove all debris from forms and excess water from bearing surfaces. Clean and prepare adequate vibrators.

.2 Transporting: Transport concrete on site to avoid separation of materials and deposit immediately as close as possible to its final position. Use chutes or spouts for deposit fall exceeding 5' (1500mm) in height. Transport and deposit continuously until complete panel or section is completed.

.3 Vibrating: Furnish and maintain in operation during placing of concrete an adequate number of vibrators equipped with 2" (50mm) diameter heads and adequately long shafts. Vibrate with sufficient intensity to compact the mass and ensure uniform maximum density. Take care not to vibrate or shock partially set earlier pours or to disturb placed reinforcing inserts or accessories. Keep spare vibrators on hand in case of breakdown.

.4 Walls: Pour concrete walls in length less than 60 feet (18 m) for each pour. Allow initial set and shrinkage to occur (at least 24 hrs.) before applying construction joint and pouring adjacent wall section.

.5 Stair Treads and Landings: Pour concrete treads and landings for all stairs as shown and detailed on the drawings.

.6 Slabs on Grade

.1 Co-operation: Install floor slabs on grade only after all underground services have been installed, tested, inspected and backfilled and sub-floor gravel supplied under Division 2 has been installed, levelled, consolidated and approved. Co-operate with the installer of waterproofing membranes on sub-slabs called for under Division 7.

.2 Expansion Joints: Install Flexcell expansion joint material at the perimeter of the floor slabs at walls and columns.

3.8 CONSTRUCTION JOINTS

.1 Location: Locate all construction joints to ensure the continuity of structural capacity of the concrete design. Obtain Architect's approval of joint location before concreting begins.

.2 Interior Joints: Where monolithic panels or sections must be placed in two or more stages, cut and chip hardened surface of earlier pours, remove laitence and brush exposed face with a grout mix, using surfaciete missed therein, to prevent dusting.

3.9 CONCRETE CURING

.1 Structural Concrete: Keep concrete continually moist for 7 days. Provide temporary coverings to maintain moist curing atmosphere and heat to protect from weather. Protect surface against all traffic or loads throughout curing period.

.2 Floor Slabs: Install curing compounds in accordance with manufacturer's directions. Floor slabs which are to receive seamless, epoxy or latex coatings are to be cured with water and polyethylene sheets and shall be kept continually moist for a period of 7 days.

.3 Cold Weather: Provide protection for concrete curing as per specification and CSA A23.1.

3.10 EXPOSED CONCRETE FINISH

.1 Form Surface Finish: Carefully remove forms to avoid damage. Cut back ties, form bolts nails, etc., using a cement brick, rub down all fins and projections, chip all voids, cavities and depressions to a keyed edge margin. Ram-fill all holes, cavities and depressions with approved sample finish mix. Work entire exposed concrete surface smooth to the same colour and texture with cement brick and approved sample finish mix. SBR Latex by Euclid Canada is to be used in all cement sand repair mixes.

3.11 CONCRETE FLOOR FINISH

.1 Qualifications: Use experienced competent floor finishers who have been approved by the Architect.

.2 Accuracy: Finish all surfaces within an elevation tolerance of + or - 1/4" in 10’ in any direction.

.3 Method:

- .1 While concrete is still plastic; rake tamp and draw to proper levels or slopes and steel trowel with an approved machine trowel to a hard, smooth, even surface.
- .2 Apply floor hardeners in accordance with manufacturer's directions and as required by the Finish Schedule.
- .3 Finish floor slabs to receive waterproofing as in .1 above.
- .4 Finish surfaces to receive ceramic tile with no waterproofing membrane with a wood float.
- .5 Slope floors to drains where called for 1/8" per ft. Maintain uniform slab thickness.

.4 Finishing Saw Cuts: Make all saw cuts where shown on the drawings a minimum of 16 hours and a maximum of 24 hours after concrete is poured. After 7 days curing, clean saw cuts using compressed air jet and brushes and fill to within ½” of the top with fine silica sand or other approved filler. Fill top ½” of saw cuts with “Duoflex” 2 part polysulfide self-levelling compound to manufacturer’s directions.

3.12 GROUTING

.1 Grout all construction joints as called for by the drawings; concrete to concrete, concrete to steel.

.2 Materials:

.1 Cement: High early Portland Cement to CAN3-A5-M93.

.2 Fine Aggregate: to CAN3-A23.1-M94.

.3 Coarse Aggregate to CAN3-A23.1-M94.

.4 Water: Drinking quality.

.5 Grouting Aggregates: A non-shrink metallic grouting aggregate equal to Sternsons: "M" bed super flow.

.3 Installation:

.1 Bond Coat: Dry mix 1 part cement to 1 part grouting aggregate by weight. Mix well with sufficient water to produce a heavy, brushable consistency. Clean bearing surfaces removing all dirt, oil, grease, and loose materials. Brush on bond coat, scrubbing well into pores.

.2 Grout Coat: Dry mix 1 part cement to 1 part grouting aggregate to 1 part fine aggregate by weight. If grouting excess 1" (25mm) thickness, add also 1 part coarse aggregate. Mix only with sufficient water to produce a heavy trowelling grout. Trowel grout into space before bond coat has taken initial set. Thoroughly ram grout under plates tightly from one side to ensure all air pockets are removed. While still plastic, cut excess grout and trowel or tool exposed surfaces smooth and hard.

.4 Finish: After a minimum of 14 days curing, apply two coats of heavy-duty concrete oil base paint to all exposed surfaces.

3.13 REMOVAL OF FORMS

.1 Forms shall not be disturbed until the concrete has hardened sufficiently to permit their removal with safety. Shoring shall not be removed until the member has acquired sufficient strength to support safely its own weight and the load upon it. Members subject to additional loads during construction shall be adequately reshored to support both the member and construction loads in such a manner as will protect the member from damage by loads.

.2 Do not remove forms or carry out any stripping prior to approval of the Architect. This approval shall not relieve the Contractor of any responsibility for failure of structure.

3.14 DEFECTIVE CONCRETE

.1 If the average strength of the laboratory control cylinder for any portion of the structure falls below the required compressive strength, the Architect shall order 3" x 6" concrete cores to be taken by the appointed inspection laboratory at random sections of the pour to be paid for by the Contractor. Should these cores show sub-standard concrete, the Architect reserves the right to order a change in the mix proportions and to order the removal and replacement of the defective concrete at the expense of the contractor.

3.15 CUTTING AND PATCHING

.1 The contractor shall perform all cutting and patching in completed concrete work which may be required to accommodate sleeves or openings, etc., which were erroneously omitted from the formwork before the concrete was placed. All cutting shall be done by means of core drills only, sizes and locations of openings to be cut shall be approved by the Architect before any cutting begins.

3.16 NON-METALLIC HARDENED FLOOR FINISH

.1 Finish concrete floors to CSA A23.1, Clause 16 to bring surface true grade and apply hardener aggregate at rate of 60 lbs. per 100 SF (2.99 kg/mxy2) plus the addition of 30 lbs. per 100 SF (1.5 kg/M2) of cement to aggregate to manufacturer's instructions for Class 5 floors (Foot and Wheels: abrasive wear).

.2 Apply first shake of aggregate (one half of amount specified) after floating.

.3 Float first shake and apply second shake.

.4 Cure trowelled surface immediately with a clear Non-Yellowing Cure & Seal such as Super Diamond Clear by Euclid Canada.

3.17 TOLERANCES

.1 Variation from plumb:

.1 In lines and surfaces of columns, piers, walls and in rises and in any 10' - 1/4" max. for a total height of structure -1".

.2 For exposed corner columns, control joint grooves, and other conspicuous lines and in any 20' - 1/4" max. for a total height of structure 1/2".

.2 Variation of linear building lines from basic dimensions in plan; variation in related position of column wall beams and partitions. In any bay + or - 1/2". In any 20' + or - 1/2". Max for the structure + or - 1".

.3 Variation of cross-sectional dimensions of columns, beams, walls, slab thickness. Dimensions up to 12": + 3/4", - 1/4". Dimensions more than 12": + 1/2, - 3/8".

.4 Variation in sleeves, floor openings, and wall openings. Size: + or - 1/4". Location of centre lines: + or - 1/2".

.5 Variation in footings:

.1 Footings for masonry: Alignment in 10' + or - 1/4" . Max for 50" + or - 1/2". Level in 10' + or - 1/4". Max for 50' + or - 1/2".

.2 Other footings: Horiz. dimensions of formed footings + 2", - 1/2" Horiz. dimensions of footings cast against earth + 3". Misplacement of eccentricity 2% of footing width in direction of misplacement, but no more than + or - 2". Cross sectional thickness + no limit, = 5%.

.6 Variation in Stairs:
- .1 For an individual step: riser + or - 1/8” - tread: + or - 1/4".
- .2 For a flight of stairs: Rise + or - 1/8” - Run: + or - 1/4".
- .3 Tolerances for slab finishing:
  - .1 Depth of depressions in floors between high spots, as measured below a 10’ straight edge. Class A - 1/8".

END OF SECTION

1 General

1.1 RELATED WORK

.1 Mortar and grout for masonry: Section 04 10 00

.2 Masonry accessories: Section 04 15 00

.3 Masonry reinforcing and tying: Section 04 16 00

.4 Unit Masonry: Section 04 20 00

1.3 REFERENCE STANDARD

.1 Do masonry work in accordance with CAN3-S304-M78 except where specified otherwise.

1.4 JOB MOCK-UP

.1 Construct mock-up panel of exterior masonry cavity wall 6'-0" high x 6'-0" long showing masonry colours and textures, use of reinforcement ties, air barrier membrane insulation, through wall flashings weep holes, mortar colouring, coursing, jointing and workmanship.

.2 Erect panels where directed, at least 7 days prior to Architect's inspection, and well in advance of starting project work.

.3 Remove sample panels when masonry work is completed.

1.5 PRODUCT STORAGE AND HANDLING

.1 Deliver materials to job site in dry condition.

.2 Keep materials dry until use, except where wetting of bricks is specified.

.3 Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.

1.6 COLD WEATHER REQUIREMENTS

.1 When air temperature is below 5 deg. C, take following precautions in preparing and using mortar:

.1 Heat sand slowly and evenly. Do not use scorched sand, having a reddish cast, in mortar.

.2 Heat water to 70 deg.C maximum; 20 deg.C minimum.

.3 After combining heated ingredients maintain temperature of mortar between 5 deg.C and 50 deg.C. until used.

.4 Protect mortar from rain and snow.

.2 Maintain dry beds for masonry and use dry masonry units only. Do not wet masonry units in cold weather.

.3 When air temperature is below -4 deg. C, protect and heat masonry to maintain air temperature above 0 deg.C. on both sides of walls during operations and for period of 24 h after.

.4 When air temperature is above -4 deg. C, erect windbreaks to prevent differential freezing of walls.

1.7 HOT WEATHER REQUIREMENTS

.1 Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.

1.8 PROTECTION

.1 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until masonry work is permanent construction.

.2 Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.

.3 Provide temporary bracing of masonry work during and after erection until permanent lateral support is in place.

2 Products

2.1 MATERIALS

.1 Masonry materials are specified in related Sections indicated in 1.1.

3 Execution

3.1 WORKMANSHIP

.1 Build masonry plumb, level, and true to line, with vertical joints in alignment.

.2 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

3.2 TOLERANCES

.1 Deviation in joint thickness: +/-1/8".

3.3 EXPOSED MASONRY

.1 Remove chipped, cracked, and otherwise damaged units in exposed masonry and replace with undamaged units.

3.4 JOINTING

.1 Allow joints to set just enough to remove excess water, then tool with round jointer to provide smooth, compressed, uniformly concave joints.

.2 Strike flush all joints concealed in walls and joints in walls to receive insulation air barrier, or other applied material except paint or similar thin finish coating.

3.5 JOINING OF WORK

.1 Where necessary to temporarily stop horizontal runs of masonry, and in building corners.

.1 Step-back masonry diagonally to lowest course previously laid.

.2 Do not "tooth" new masonry.

.3 Fill in adjacent courses before heights of stepped masonry reach

4'-0".

3.6 CUTTING

.1 Cut out neatly for electrical switches, outlet boxes, and other recessed or built-in objects.

.2 Make cuts straight, clean, and free from uneven edges.

3.7 BUILDING-IN

.1 Build in items required to be built into masonry.

.2 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.

.3 Brace door jambs to maintain plumb. Fill spaces between jambs and masonry with mortar.

3.8 WETTING OF BRICKS

.1 Except in cold weather, wet clay bricks having an initial rate of absorption exceeding .025 oz./m^2/min.: wet to uniform degree of saturation, 3 to 24 h before laying, and do not lay until surface dry.

.2 Wet tops of walls built of bricks qualifying for wetting, when recommencing work on such walls.

3.9 PROVISION FOR MOVEMENT

.1 In exterior brickwork cladding, provide horizontal "soft joints" in accordance with CAN3-534-M84, Clause 4.1.5.2.

.2 Leave 1/4" space between top of non-load bearing walls and partitions and structural elements. Do not use wedges. Provide “soft joints”.

3.10 LOOSE STEEL LINTELS

.1 Install loose steel lintels. Centre over opening width.

3.11 CONTROL JOINTS

.1 Provide continuous control joints as indicated.

.2 Caulk to meet requirements of 07 90 00.

3.12 AIR BARRIER & THROUGH WALL FLASHING

1. Install air barrier and through wall flashing to meet specified requirements of Section 07 19 00 and 04 15 00.

3.13 CAVITY WALL INSULATION

.1 Install cavity wall insulation to meet specified requirements of Section 07 21 20.

END OF SECTION

1 General

1.1 RELATED WORK

.1 Masonry Procedures: Section 04 05 00

1.2 REFERENCE STANDARD

.1 Do masonry mortar and grout work in accordance with CSA A179-M1976 except where specified otherwise.

1.3 SAMPLES

.1 Refer to Section 04 05 00, Masonry Procedures, paragraph 1.4, "Job Mock-Up".

2 Products

2.1 MATERIALS

.1 To meet specified requirements of CSA A179-M1976.

2.2 MATERIAL SOURCE

.1 Use same brands of materials and source of aggregate for entire project.

2.3 MORTAR TYPES

.1 Mortar for exterior brick masonry above grade: Type N.

.2 Mortar for brick masonry at or below grade: Type M.

.3 Mortar for concrete masonry in exterior walls: Type S.

.4 Mortar for interior concrete masonry: Type N.

2.4 MORTAR MIXES

.1 Mix mortars as specified in CSA Standard A179-M1976. Use only dry aggregate. Test for bulking to determine accurate proportioning.

.2 Use grey mortar.

3 Execution

3.1 MIXING

.1 Mix grout to semi-fluid consistency.

END OF SECTION

1 General

1.1 RELATED WORK

.1	Masonry Procedures:	Section 04 05 00
.2	Masonry Reinforcing and Tying:	Section 04 16 00
.3	Unit Masonry:	Section 04 20 00
.4	Air Barrier:	Section 07 19 00

2 Products

2.1 MATERIALS

.1 Control joint filler: purpose-made elastomer to ASTM D2240-81 of size and shape indicated.

.2 Expansion Joint Filler: -DA 2015 by Dur-O-Wall or Blok-Lok equivalent, size and shape indicated.

.3 Horizontal Soft Joint: DA 2010 by Dur-O-Wall or Blok-Lok equivalent.

.4 Weep hole vents and Brick Vents: Standard PVC Brick Vent by GOODCO, offset "T" shape.

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

.6 Masonry through wall flashing: SBS modified bitumen, self adhesive sheet membrane complete with a cross laminated polyethylene film having the following properties:

.1 Thickness 1 mm (40 mils) min.

.2 Film thickness: 0.225 mm (9.0) min.

.3 Tensile strength (film) 34500 kpa, 5000 psi

.4 Colour: black or yellow

.5 Acceptable Product: Bakor Blueskin TWF or Architect approved equal.

.6 Corners and End Dams for Lintels

.1 Stainless Steel by Blok-lok

.7 Cavity drainage:

.8 .1 Mortar net by Mortar Net Solutions.

3 Execution

3.1 CONTROL JOINTS

.1 Install continuous control joint fillers in control joints at locations indicated.

3.2 MASONRY FLASHING

.1 Install flexible through wall flashings in masonry in accordance with CAN3-S304-M78 and as follows:

.1 Install flashings under exterior masonry bearing on foundation walls, slabs, shelf angles, and steel angles over openings. Install flashings under weep hole courses and as indicated. Secure to air barrier at walls.

.2 Coat surfaces of metal in contact with masonry with two coats of bituminous paint.

.3 Install 12" wide piece of flashing centered over all joints between shelf angles and as indicated. Bond flashing to angles as recommended by manufacturer.

.4 In double wythe walls carry flashings from front edge of masonry, under outer wythe, then up backing not less than 8".

.5 Lap joints 6" and seal as per manufacturer's instructions.

END OF SECTION

1 General

1.1 REFERENCE STANDARDS

.1 Do masonry reinforcing and tying in accordance with CAN3-S304-M78 and NBCC Latest Edition Part 9 unless specified otherwise.

1.2 QUALITY CONTROL

.1 The brick tie manufacturer shall visit the site for a kick-off meeting with the Contractor and the Architect, supervise the first tie installation and provide satisfactory pull out tests for at last ten tie installations

2 Products

2.1 Materials

.1 For tying brick to back up walls:

.2 BL-407 masonry Fastener System including:

.1 BL-407 Veneer Anchor, stainless steel, c/w 3/16” stainless steel tie, both sized to suit the cavity.

.2 Fasteners: BL Stainless steel fastener, stainless steel washer and stainless steel screw sized to penetrate stud by at least 2 -1/2”

.3 Mechanical insulation fastener: Wedge-Lok® fastener

2.2 ALTERNATE MANUFACTURER

.1 Dur-o wal in identical configurations and materials to above.

3 Execution

3.1 JOINT REINFORCEMENT

.1 Install joint reinforcement in all new masonry veneer in complete accordance with Manufacturer’s instructions.

.2 Place reinforcement continuously in horizontal joints at 16" o/c., beginning with course 16" above bearing and 24’ o/c vertically, unless otherwise specified or indicated.

END OF SECTION

1 General

1.1 RELATED WORK

.1	Masonry Procedures:	Section 04 05 00
.2	Masonry Mortar and Grout for Masonry	Section 04 10 00
.3	Masonry Accessories	Section 04 15 00
.4	Masonry Reinforcing and Tying	Section 04 16 00

1.2 WORK INCLUDED BUT SPECIFIED ELSEWHERE

.1	Sheet and Vapor Air barrier	Section 07 19 00
.2	Building Insulation	Section 07 21 00
.3	Caulking of Control Joints	Section 07 90 00

1.3 JOB MOCK-UP

.1 Construction sample panels in accordance with Section 04 05 00.

2 Products

2.1 FACE BRICK

.1 Concrete Face Brick: to CSA A82.1-M87.

- .1 Type: FBS
- .2 Grade: SW
- .3 Size: Standard modular
- .4 Include special shapes as required
- .5 Stock pile brick required for entire project from same production run before work commences to ensure uniform colour and range for each selection.

.2 Acceptable Products:

- .1 L.E. Shaw – Red Concrete brick

3 Execution

3.1 LAYING MASONRY

.1 Unless otherwise specified, lay masonry to meet specified requirements of CAN3-S304-M78.

.2 Bond: running stretcher, soldier coursing, header coursing, corbelling, as indicated on drawings.

.3 Coursing height: 200 mm for three bricks and three joints. 200 mm for one block and one joint.

.4 Jointing: concave where exposed or where paint or similar thin finish coating is specified.

.5 Masonry surfaces that flashings rest against are to be flushed smooth with mortar to ensure that they are not punctured.

.6 Remove laitence, loose rust, scale and other foreign materials from supporting bed surfaces to ensure bonding.

.7 Wet clay and shale masonry units before placing. Do not wet concrete units. Wet faces of work in place before laying new work. Ensure that units have no water adhering to their surfaces when laid, but shall be wet only to ensure that complete hydration takes place.

3.2 AIR BARRIER

.1 Install air barrier membrane to meet specified requirements of Section 07 19 00.

3.3 FLASHINGS

.1 Install flashings as per Section 04 15 00 & 07 19 00.

3.4 CAVITY WALL INSULATION

.1 Install cavity wall insulation to meet specified requirements of Section 07 21 29.

3.5 CAULKING OF CONTROL JOINTS

.1 To meet requirements of 07 90 00.

3.6 CLEANING AND ADJUSTMENT

.1 Patch masonry walls damaged by installation of Work of this Section, and which have been rejected as defective or otherwise damaged.

.2 Point all holes in brick masonry mortar joints except weepholes.

.3 Cut out defective mortar joints and repoint.

.4 Wash down and brush brick walls to remove mortar and stains. Use only detergents, or proprietary masonry cleaners as recommended by the manufacturer.

.5 Do not use wire brushes for cleaning.

.6 Should specified cleaning methods be insufficient, proceed with other methods only with approval.

.7 Protect adjacent materials and Work from damage while cleaning.

END OF

SECTION

1 General

1.1 RELATED WORK

.1 Section 03 30 00: Cast-In-Place Concrete

.2 Section 04 05 00: Masonry Procedure

.3 Section 09 90 00: Painting

1.2 REFERENCES

.1 ASTM A53_87b Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.2 ASTM A269_87a Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

.3 ASTM A307_87 Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.

.4 CGSB 1_GP_40M_79 Primer, Structural Steel, Oil Alkyd Type.

.5 CGSB 1_GP_181M_77 Coating, Zinc_Rich, Organic, Ready Mixed.

.6 CAN/CSA_G40.21_M87 Structural Quality Steels.

.7 CSA G164_M1981 Hot Dip Galvanizing of Irregularly Shaped Articles.

.8 CAN/CSA_S16.1_M89 Limit States Design of Steel Structures.

.9 CSA W47.1_1983 Certification of Companies for Fusion Welding of Steel Structures.

.10 CSA W55.3_1965 Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.

.11 CSA W59_1989 Welded Steel Construction Metal Arc Welding.

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 30 00-Submittals.
.2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Collect, separate and recycle all site generated waste materials.

1.5 LEED DOCUMENTATION

.1 Not used

2 Products

2.1 MATERIALS

.1 Steel sections and plates: to CAN/CSA_G40.21, Grade 300W and 350W.

.2 Steel pipe: to ASTM A53 galvanized finish.

.3 Welding materials: to CSA W59.

.4 Bolts and anchor bolts: to ASTM A307.

.5 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m^2 to CSA G164.

.6 Stainless steel tubing: to ASTM A269, Type 302 Commercial grade.

.7 Chromium plating: chrome on steel with plating sequence of 0.009 mm thickness of copper, 0.010 mm thickness of nickel and 0.0025 mm thickness of chromium.

.9 Shop coat primer: to CGSB 1_GP_40M.

.10 Zinc primer: zinc rich, ready mix to CGSB 1_ GP_181M.

.11 Grout: non-shrink, non-metallic, flowable, 24h, MPa 15, pull-out strength 7.9 MPa.

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 Where possible, fit and shop assemble work, ready for erection.

.4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

2.3 SHOP PAINTING

.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. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7☜C.

.3 Clean surfaces to be field welded; do not paint.

3 Execution

3.1 ERECTION

.1 Do welding work in accordance with CSA W59 unless specified otherwise.

.2 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding, CSA W55.3 for resistance welding.

.3 Provide certification that all welded joints are certified by Canadian Welding Bureau.

.4 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.

.5 Provide suitable means of anchorage acceptable to Architect such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.

.6 Exposed fastening devices to match finish and be compatible with material through which they pass.

.7 Provide components for building by other sections in accordance with shop drawings and schedule.

.8 Make field connections with high tensile bolts to CAN/CSA_S16.1, or weld.

.9 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.

.10 Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection with primer.

.11 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

.12 Promptly as the work proceeds and on completion, clean up and remove from the premises all rubbish and surplus materials resulting from the work of this section.

3.2 SCHEDULE OF MISCELLANEOUS ITEMS

1. General: This section includes work to complete metal items manufactured to detail, not specified in other sections and summarized but not restricted to the following:
2. Steel Railings: Other than stairs, sized and formed to shapes as indicated on drawings joined by flush type fittings and welding, or by fully notching intersecting members to pipe contour and welding minimum pipe diameter: 1 ½ “. Installed as detailed. Finish: Prime paint at interior, galvanized (after fabrication) at exterior.
3. Galvanized bent plate Overhead door jambs and head as per drawings.
4. Galvanized ships ladder
    1. As per details on structural drawings
    2. Design stair to meet all current code and safety requirements.
5. Miscellaneous Metals: Provide and install all miscellaneous angles, channels, plates and brackets required to complete the project and any miscellaneous steel not specified or noted on the structural drawings.

END OF SECTION

1 General

1.1 GENERAL CONDITIONS

.1 The General Conditions of the contract as well as provisions of Division 1 at the beginning of these specifications shall be deemed to apply and be a part of this section of the specification.

1.2 WORK INCLUDED

.1 To complete the addition & renovations as shown or specified and summarized but not restricted to the following:

1. Building framing.
2. Blocking for wall mounted accessories.
3. Rough carpentry as required to complete the project.

1.3 RELATED WORK

1. Painting Section 09 91 10

1.4 SOURCE QUALITY CONTROL

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

.2 Plywood identification: by grade mark in accordance with applicable CSA standards.

.3 All wood products used in this section shall be FSC certified.

2 Products

2.1 LUMBER MATERIAL

.1 In conformance with minimum lumber grades for specific end uses of the NBC-1990.

.2 Moisture content of lumber at time of building in shall not exceed 19%.

.3 Provide pressure treated lumber and pressure treated plywood for all window and louver blocking, roof curbs, cants and all other exterior blocking.

2.2 PLYWOOD

.1 Douglas Fir plywood (DFP): to CSA 0121-M1978, standard construction.

.2 Canadian softwood plywood (CSP): to CSA 0151-M1978, standard construction.

2.3 BLOCKING

.1 Shall be ¾" plywood.

2.4 FASTENERS

.1 Nails, spikes and staples: to CSA B111-1974. Galvanized.

.2 Bolts: 1/2" diameter galvanized unless indicated otherwise, complete with nuts and washers.

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

.4 Galvanizing: to CSA G164-M92, use galvanized fasteners for all work.

2.5 WOOD PRESERVATIVE

.1 Surface applied wood preservative: coloured, copper napthenate or 5% pentachlorophenol solution, water repellent preservative to meet specified requirements of CSA 080-1983.

2.6 DAMP PROOF MEMBRANE

.1 6 mils polyethylene film.

3 Execution

3.1 CONSTRUCTION

.1 Comply with requirements of NBC, Part 9, Latest Edition supplemented by the following paragraphs.

3.2 ERECTION

.1 Install members true to line, levels and elevations.

.2 Construct continuous members from pieces of longest practical length.

.3 Install spanning members with "crown-edge" up.

3.3 NAILING STRIPS, GROUNDS & ROUGH BUCKS

.1 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work. Apply felt paper against exterior masonry walls before installation of strapping.

3.4 CANTS, CURBS, BACKING

.1 Install wood cants, fascia backing, nailers, curbs and other wood fascia supports as indicated on drawings and secure using galvanized fasteners.

3.5 SURFACE-APPLIED WOOD PRESERVATIVE

.1 Treat all cut surfaces of pressure treated lumber and plywood with wood preservative, before installation.

.2 Apply preservative by dipping, or by brush to completely saturate and maintain wet film on surface for minimum 3 minute soak on lumber and one minute soak on plywood.

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

3.6 DAMPPROOFING

.1 Install dampproof membrane between wood members and concrete in contact with earth or on grade.

3.7 ADJUSTMENT

.1 Ensure that bolted fasteners are drawn up tightly.

3.8 INSTALLATION OF PRESSED STEEL FRAMES

.1 Install pressed steel frames supplied under Section 08 11 10 in locations other than steel stud partitions.

.2 Set in place for building into masonry, and anchor frames to floor as provided by anchor clips.

.3 Brace frames in place to prevent displacement until anchored into masonry and remove spreaders at floor after frames are anchored.

END OF SECTION

1 General

1.1 GENERAL CONDITIONS

.1 The General Conditions of the contract as well as provisions of Division 1 at the beginning of these specifications shall be deemed to apply and be a part of this section of the specification.

1.2 DESCRIPTION

.1 Work Included: to complete prefabricated structural wood as shown or specified herein and on drawings and details and summarized but not restricted to:

.1 Supply and install prefabricated structural wood trusses, wood beams, parallam beams, etc.

.2 Design of trusses, beams, etc. in accordance with N.B. C. 1995 and the Truss Plate Institute of Canada (T.I.P.C.)

.2 Related Work Specified in Other Sections

.2	Section 05 50 00:	Metal Fabrications
.3	Section 06 10 00 :	Rough Carpentry

1.3 QUALITY ASSURANCE

.1 Allowable Tolerances:

.1 Ensure that dimensions of finished Work are within the following tolerances.

.2 Connector Locations:

- Toothed connectors: 1/4" from location shown on shop drawings.

.3 Square end cuts: Square within 1/16" in 1'-0" of depth and width.

.4 Openings Between Members of Assembled Trusses:

- Tension members: Maximum 1/16"
- Compression members: Maximum 1/32"

1.4 SUBMITTALS (see also 1.7)

.1 Shop Drawings

.1 Submit shop drawings to show wood species, loading design assumptions, connections and other construction details.

.2 Affix to shop drawings and design calculations seal of structural design engineer registered to practice in Nova Scotia who is responsible for Work.

.2 Design Calculations: Submit, with shop drawings, calculations pertaining to the design of structural members, including anchorage and connections, and in the same manner as for shop drawings.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

.1 Handle, transport and store the Work of this Section by methods devised or approved, or both, by fabricator to prevent staining, soiling and damage.

.2 Store Work of this Section to clear ground or other bearing surfaces, to prevent overstress, warp, twist, accumulation of water and snow, and to afford free movement of air on all sides of each unit.

1.6 WASTE MANAGEMENT AND DISPOSAL

Not Used.

1.7 LEED DOCUMENTATION

Not Used.

2 Products

2.1 GENERAL

.1 All wood products in this section shall be FSC certified.

.2 Include in Work of Section all hardware required for its execution.

.3 Moisture content of wood at time of installation shall be kiln dried.

2.2 MATERIALS

.1 Conform to requirements of: National Building Code of Canada 2010, Section 4.3 for lumber and fastenings.

.2 Lumber:
- .1 Minimum chord size for all trusses shall be 2" x 4".
- .2 All trusses shall be manufactured using lumber graded by NLGA rules, with allowable unit stresses as per latest edition of CSA 086.
- .3 Roof trusses shall be manufactured with No. 1 or No. 2 grade lumber or better for top and bottom chords.

.4 Connector Plates:
- .1 Metal connector plates shall be prime commercial quality steel, meeting the mechanical requirements as established in ASTM A 446, for Grade A or higher grade steel.
- .2 Corrosion resistant coating shall be to ASTM A 525 "specification for steel sheet, zinc coated by the hot dip process", and ASTM A 591 "standards specification for electrolytic coated steel sheets".
- .3 Provide hold down clips, etc., as per drawings and as per NBCC where not shown on drawings.

2.3 FABRICATION

.1 Wood Trusses: to meet specified requirements of CSA Standard 086-M84.

.2 Cut members to accurate length, angle, and size to assure tight joints for finished Work of this Section.

.3 Assemble members in design configuration by securing tightly in jigs or with clamps.

.4 Include design camber when positioning members.

.5 Fabricate end joints of plain scarf joints not less than 8" in length, or finger joints of a type that conform to CSA 0122-M89.

.6 Shop coat prefabricated structural wood with one coat of sealer to all sides and to ends after final cutting. Apply sealer after all working and cutting has been completed.

.7 Fabricate structural steel hardware in accordance with CSA Standard CAN3-S16.1 and welded in accordance with CSA Standard W59-M89 to details indicated on Drawings.

3 Execution

3.1 EXAMINATION

.1 Ensure that surfaces to receive Work of this Section are free of irregularities and debris.

.2 Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 ERECTION

.1 Erect prefabricated structural wood members in accordance with manufacturer's instructions.

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

.3 Supply anchors, bearing plates, bolts, and inserts, required for attachment of the Work of this Section, to those performing the Work of other Sections and who are responsible for their installation.

.4 Include in Work rough hardware such as bolts, nuts, washers, connectors, and strap iron required for installation of Work of this Section for temporary use.

.5 Install structural wood members with cables, spreader bars or strongbacks as required at designated lift points.

.6 Exercise care to keep out-of-plane bending of structural wood members to minimum.

.7 Install temporary horizontal and cross bracing to hold structural wood members plumb and in safe condition until permanent bracing is installed.

.8 Install permanent horizontal and cross bracing and related components before application of loads to prefabricated structural wood members.

.9 Tighten loose connectors.

.10 Restrict construction loads to prevent overstressing of structural wood members.

.11 Do not cut or bore holes in structural wood members without approval.

3.3 ADJUSTMENT AND CLEANING

.1 Refinish damaged and defective Work before completion of Project, and to ensure that no discernible variation in appearance results.

.2 Verify that bolted connections and anchors are drawn up tightly.

END OF SECTION

1 General

1.1 GENERAL CONDITIONS

1. The General Conditions of the contract as well as provisions of Division 1 at the beginning of these specifications shall be deemed to apply and be a part of this section of the specification.

1.2 WORK INCLUDED

1. To complete finish carpentry as shown or specified and summarized but not restricted to the following:

    1. Wood paneling, trim, etc
    2. Installation of finish door hardware as specified in Section 08 71 00.

1.3 WORK INSTALLED BUT FURNISHED BY OTHER SECTIONS

1. Finish Hardware: Section 08 71 00
2. Doors: Section 08 11 00

1.4 RELATED WORK SPECIFIED ELSEWHERE

2. Rough Carpentry: Section 06 10 00

1.5 PROTECTION

1. Protect the work of this section and be responsible for all damage incurred. Replace damaged work with perfect materials at no additional cost.

2. Protect work of all other sections from damage resulting from the work of this section. Arrange and pay for the restoration of any such damage incurred.

1.6 EXAMINATION

1. Examine all work performed by other trades upon which the work of this section depends and be responsible for checking all dimensions at the site affecting this work.

2. Do not install the work of this section until all previous work which is to receive it and site conditions are satisfactory. Commencement of the work will indicate acceptance of the previous work and site conditions.

1.7 LEED ACCREDITATION

Not Used.

1.8 LEED DOCUMENTATION

Not Used.

1.9 WASTE MANAGEMENT AND DISPOSAL

.1 Collect, separate and recycle all site generated waste materials.

2 Products

2.1 GENERAL

1. Include Work of Section rough hardware required for its execution. Use non-corrosive hardware at exterior location.

2. Ensure that the use of adhesives in fabrication of laminated assemblies, do not contain urea formaldehyde.

3. All wood products used in this section shall be FSC certified.

2.2 MATERIALS

.1 Wood and Plywood

.1 Wood: Grade mark hardwood lumber by the appropriate association under authority of the National Lumber Grades Authority. Where not exposed to view, use wood of grades suitable for fabrication, utility and structural needs. Where exposed to view, use wood to meet requirements of AWMAC Custom Grade Standard. Hardwood to be white maple.

.2 Hardwood plywood: to CSA 0115-M1982 of species and thickness indicated, flat cut book match veneer. Use veneer core with Type II bond. Select veneers to provide book match with a minimum variation of grains and colours from veneer to veneer and within units of cabinetry. Good grade where exposed to view and sound grade where not. Veneer to be maple.

3 Execution

3.1 INSTALLATION - GENERAL

1. Install Work plumb, level and straight, and fasten it securely to backing to support it and anticipated imposed loads.

2. Build work into construction as indicated on drawings or specified in other sections of this specification, or both.

3. Co-operate with other trades and proceed promptly with the work of this section as rapidly as job conditions permit.

4. Carefully read all other sections of the specifications describing work which is affected by the work of this section. Notify the Architect in writing of any condition which may adversely affect the proper execution of the work of this section.

3.2 INSTALLATION – FINISHED CARPENTRY

1. Set and secure materials and components in place, rigid plumb and square.
2. Apply water resistant building paper, (bituminous coating), over wood framing members in contract with masonry or cementitious construction.
3. Install work plumb, true and square, neatly scribed to adjoining
4. Make allowances around perimeter where fixed objects pass through or project into laminated plastic work to permit normal movement without restriction.
5. Provide cutouts for inserts, sinks, outlet boxes, etc. Round internal corners, chamfer edges and seal exposed core.
6. Build work into construction as indicated on drawings or specified in other sections of this specification, or both.
7. Co-operate with other trades and proceed promptly with the work of this section as rapidly as job conditions permit.
8. Touch up external and semi-exposed surfaces to provide complete finish. Remove all stickers and wipe down all surfaces. Trim and sand smooth all edges.
9. Wipe out interior surfaces, trim and sand smooth all edges.
10. Remove excess adhesive with recommended solvent.

3.3 INSTALLATION OF DOORS

Not Used

3.4 INSTALLATION OF FINISH HARDWARE

1. Install finish hardware where specified under Section 08 71 00.

2. Accurately locate and adjust hardware to meet manufacturer's instructions. Use special tools, jigs and templates as required.

3.5 ADJUSTMENT AND CLEANING

1. Adjust hinged doors to swing freely and easily, to remain stationary at any point of swing, to close evenly and tightly against stops without binding, and to latch positively when doors are closed with moderate force.

2. Adjust hardware so that latches and locks operate smoothly and without binding, and closers act positively with the least possible resistance in use. Lubricate hardware if required by supplier's instructions.

3. Clean hardware after installation in accordance with supplier's instructions.

4. Sand clean woodwork to leave free from finish defects in any exposed part.

3.6 CLEAN-UP

1. Promptly as the work proceeds and upon completion, clean up and remove from the premises all rubbish and surplus materials resulting from the work of this Section.

END OF SECTION

1 General

1.1 GENERAL CONDITIONS

.1 The General Conditions of the contract as well as provisions of Division 1 at the beginning of these specifications shall be deemed to apply and be a part of this section of the specification.

1.2 WORK INCLUDED

.1 To supply and install millwork as shown or specified and summarized but not restricted to the following:

1. Cabinets, casework , countertops, etc. as detailed on the drawings

1.3 REFERENCE STANDARDS

.1 Do millwork to Quality Standards of Architectural Woodwork Manufacturers Association of Canada (AWMAC), current edition.

.2 Thermofused Melamine to NEMA LD3-95 grade VGL-HGL.

.3 Particle board: ANSI A 208.1, 1993, grade M3, density 640-800 kg/m^3.

.4 Medium density fibreboard: ANSI A 208.2, 1994, grade MD, density 640-800 kg/m^3.

1.5 SUBMITTALS

.1 Provide shop drawings for cabinets in accordance with Section 01 33 00.

1. Clearly indicate details of construction, profiles, jointing, fastening.

1.6 SAMPLES

.1 If requested, submit to the Architect for approval prior to fabrication, full size samples of any or all of the following, as selected by the Architect:

.1 Any base cabinet
.2 Any wall cabinet
.3 Any or all counter top materials as supplied under this Section
.4 Any hardware items
.6 Samples of colours proposed for finishes.

.2 Arrange and pay for the shipment of all samples requested to the job site.

.3 Samples will be subject to testing at the discretion of the Architect within the limits of this specification. Samples undamaged by testing may be used to form part of the work.

1.7 PROTECTION

.1 All materials shall be delivered to the project site properly protected.

.2 Materials shall be stored flat and level in a fully enclosed space, preferably in the room in which they will be installed. Units shall be stored off the floor.

.3 Care in handling shall be exercised to avoid damage. Do not allow material to become wet.

.4 Protect the work of this section and be responsible for all damage incurred. Replace damaged work with perfect materials at no additional cost.

.5 Protect work of all other sections from damage resulting from the work of this section. Arrange and pay for the restoration of any such damage incurred.

1.8 ENVIRONMENTAL REQUIREMENTS

.1 Installation shall be done only when the temperature and humidity closely approximates the interior conditions that will exist when the building is occupied.

.2 The heating system shall be operating before, during, and after installation.

.3 Prior to the start of installation, all wet trades' work must be completed, and thoroughly dry.

.4 Do not install work in any area unless satisfied that work in place has dried out, and that no further installation of damp materials is contemplated.

1.9 EXAMINATION

.1 Examine all work performed by other trades upon which the work of this section depends and be responsible for checking all dimensions at the site affecting this work.

.2 Do not install the work of this section until all previous work which is to receive it and site conditions are satisfactory. Commencement of the work will indicate acceptance of the previous work and site conditions.

2 Products

2.1 GENERAL

.1 Include in Work of Section all hardware required for its execution.

.2 Moisture content of wood at time of installation shall be kiln dried.

.3 Use only adhesives and fastenings that develop sufficient strength for intended use, are non-staining, and are unaffected by the environment to which exposed.

2.2 MATERIALS

.1 Wood and Plywood

.1 Wood: Grade mark softwood and hardwood lumber by the appropriate association under authority of the National Lumber Grades Authority. Where not exposed to view, use wood of grades suitable for fabrication, utility and structural needs. Where exposed to view, use wood to meet requirements of AWMAC Custom Grade Standard. Hardwood to be white maple.

.2 Hardwood plywood: to CSA 0115-M1982 of species and thickness indicated, flat cut book match veneer. Use veneer core with Type II bond. Select veneers to provide book match with a minimum variation of grains and colours from veneer to veneer and within units of cabinetry. Good grade where exposed to view and sound grade where not. Veneer to be maple.

.3 Canadian softwood plywood: to CSA 0151-1978. Sanded exterior grade, solid two sides where both sides are exposed to view and good one side where only one side exposed to view.

.4 Douglas fir plywood: to CSA 0121-M1978, good two sides where both sides are exposed to view and good one side where only one side exposed to view.

.2 Post-formed Plastic Laminate Material

.1 All plastic laminate shall be Formica, Arborite, Wilsonart, Pionite as designated by Architect - maximum of 4 colours, chosen from full colour range.

.2 Laminated plastic - post forming grade material .030 conforms to requirements of CAN3-A172-M79.

.3 Type of adhesive used in fabrication of Casework shall be at option of the Manufacturer and approved by the Manufacturer.

.4 Substrate - medium density fibreboard 45 lb Type 1 - Class 2 (CS-236-66) Thickness 19 mm, as per ANSI Standard A208.2, 1994.

.5 180N Bull Nose Edge.

.6 Refer to details sheet for location of side splash requirements.

.3 Plastic Laminated Materials

.1 All plastic laminate shall be Formica, Arborite, Pionite or Wilsonart as designated by Architect - maximum of four (4) colours, chosen from full colour range.

.2 Laminated plastic for flatwork: Commercial Grade to CAN 3-A172-M79, 1.3mm thick based on solid colour range with suede finish.

.3 Laminated plastic backing sheet: Liner grade supplied by same manufacturer as facing sheet; not less than 0.76 mm thick, same thickness and colour as face laminated sanded one side.

.4 Plywood core: to CSA 0121-M1978 Douglas Fir solid two sides, 3/4" thick.

.5 Adhesives:
- .1 All adhesives used in Millwork shall conform to CSA 0112M, as applicable.
- .2 Type of adhesives used in fabrication of millwork shall be at the option of the Manufacturer and approved by the manufacturer of the plastic laminate.
- .3 Appropriate adhesives shall be utilized for the various intended applications.

.4 Thermofused Melamine

.1 To NEMA LD-3-95 grade VGL-HGL.
.2 Decorative paper impregnated and saturated with melamine resin

thermally fused under heat and pressure to 5/8" and 3/4" medium density fibreboard.

.3 Medium density fibreboard to have both sides faced with melamine.

.4 Medium density fibreboard to ANSI A 208.2, 1994; to ASTM E 1333-1990, grade MD, density 740 kg/m³.

.5 Edging: 3 mm PVC edging, coloured to match finish of melamine.

.6 All exposed edges are to be clad with 3mm PVC edging where exposed and melamine where not exposed, in order to eliminate off-gassing of MDG.

.7 Thickness: 3/4" except where 5/8" is specifically called for.

.8 Colours: To be selected by Architect.

.9 Acceptable manufacturers: Panval, Panolam, Tafisa, Flakeboard.

.5 Cabinet Hardware

.1 Hinges: Blum 95M553 complete with 195 H110-180 adjuster.

.2 Catches: Magnet Hager No. 1437.

.3 Drawer and Cabinet Pull: Stanley HB 4041-Brass.

.4 Drawer Slides: Blum Series 230 M Full Ext. Accuride Guides.

.5 Cabinet Lock: Corbin 02067 where noted on drawings.

.6 Standards: Richelieu

- .1 Shelf supports, 128-130, chrome, 1/4".
- .2 Receptacle, 129-130, chrome, 5/16".

.7 Concealed door hinge: Stanley Hardware #2010.

.8 Roller Latch: Stanley Hardware #23.

.6 General Materials

.1 Nails and Staples:
CSA B111-1974 galvanized.

.2 Fastenings:
Melamine screws.

.3 Grommets:

- .1 Countersunk head BNP fasteners manufactured by MW Fasteners, plastic, coloured to match laminate.

.4 Metal Fabricated Support for Vanity Counter:

- .1 1" H.S.S. galvanized and steel channels galvanized as per details.
- .2 Hiliti Anchor fasteners.

.5 Sealant:
Silicone sealant, Tremco “Proglaze”.

.6 Draw Bolts & Splines: As recommended by fabricator.

2.3 FABRICATION

.1 Plastic Laminate

.1 Comply with CSA A172-1974, Appendix "A".
.2 Obtain governing dimensions before fabricating items which are to be accommodated or abut partitions, services and other materials.
.3 Ensure adjacent parts of continuous laminate work match in colour and pattern.
.4 Veneer laminated plastic to core material in accordance with adhesive manufacturer's instructions. Ensure core and laminate profiles coincide to provide continuous support and bond over entire surface. Use continuous lengths up to 8 ft. Keep joints 24" from cutouts.
.5 Counter tops and splash backs shall be composed of high pressure laminated plastic bonded to specified core material with an appropriate adhesive, under manufacturer recommended bonding pressure and conditions. Exposed edges shall be faced with 3 mm PVC edging, radius edges, coloured to match laminate..
.6 Apply laminate backing sheet to reverse side of core of plastic laminate work.
.7 The temperature of the materials surfacing core and adhesive, and the area in which the actual fabrication is to be done should not be less than 21NC with a relative humidity of not less than 35% and not more than 80%. All inside corners of cutouts in decorative laminate shall be radiused as large as possible, minimum 3mm to prevent radial cracking. Edges of the radius shall be filed smooth and free of cracks and grazing.

.2 Thermofused Melamine Casework Fabrication

.1 General

.1 Fabricate casework to AWMAC custom grade.
.2 Cabinets to be AWMAC reveal overlay casework.
.3 Fabricate casework from thermofused melamine.
.4 Provide cutouts for plumbing fixtures, insert appliances, outlet boxes and other fixtures.
.5 Shelving to cabinetwork adjustable unless noted otherwise.
.6 Shelves are not to exceed 32" in length. Provide intermediate bulkhead as required to maintain this maximum dimension.
.7 Shop install cabinet hardware for doors, shelves and drawers.
.8 Recess shelf standards unless noted otherwise.
.9 Shop assemble work for delivery to site in size easily handled and to ensure passage through building openings.

.10 Provide filler pieces approximately 1" wide (colour and material to match cabinet work) between cabinet work and wall and at inside corners of cabinetry.

.11 All edges of thermofused melamine board are to be finished, whether exposed or not.

.2 Base Cabinets:

.1 Assemble cases with properly machined, dowel joints. Attach gable to top and bottoms with dowels.

.2 Gables - 3/4" thick.

.3 Backs – ½ "or 5/8" thick - removable where access to service is required.

.4 Bottoms - 3/4" thick.

.5 Shelves - 3/4"thick. Adjustable on metal pilaster strips and shelf clips.

.6 Doors - 3/4" thick.

.7 Wood Base - 3/4" x 3 3/4". Provide four adjustable levellers per cabinet.

.8 Knee-Space Units - Apron is 3/4" x 3 3/4" (unless otherwise noted) fastened to adjacent cabinets.

.9 Supply spring loaded drawer stop.

.10 Drawer Cabinets - Construction is the same as for base cabinets with 3/4 x 2" centre vertical rail and 3/4" x 1" intermediate rails.

.1 Drawer fronts are to be 3/4" thick.

.2 Drawers to be Blum Metabox.

.3 Suspended Upper Cabinets:

.1 Gables - 3/4" thick.

.2 Top and Bottom - 3/4" thick.

.3 Shelves - 3/4" thick. Make shelves adjustable and support metal pilaster strips and clips.

.5 Backs – ½" or 5/8" thick.

.4 Fastening – Dowel construction.

.5 Fabrication

.1 Incorporate services, fixtures and trim in Work of this Section as indicated on Drawings as specified in Division 15 or 16, or both. Make necessary cutouts to template information.

.2 Assemble custom work in mill units as large as possible. Design units to fit together as one unit if site assembly is required. Cabinets to be modular.

3 EXECUTION

3.1 INSTALLATION

.1 Set and secure materials and components in place, rigid plumb and square.

.2 Provide heavy duty fixture attachments for wall mounted casework.

.3 Apply water resistant building paper, (bituminous coating), over wood framing members in contract with masonry or cementitious construction.

.4 Install work plumb, true and square, neatly scribed to adjoining

.5 Make allowances around perimeter where fixed objects pass through or project into laminated plastic work to permit normal movement without restriction.

.6 Use draw bolts and splines to countertop joints. Maximum spacing 16" o.c., 3" from edge. Make flush hairline joints.

.7 Provide cutouts for inserts, sinks, outlet boxes, etc. Round internal corners, chamfer edges and seal exposed core.

.8 Build work into construction as indicated on drawings or specified in other sections of this specification, or both.

.9 Co-operate with other trades and proceed promptly with the work of this section as rapidly as job conditions permit.

.10 At junction of laminated plastic counter back splash and adjacent wall finish, apply small bead of sealant.

.11 Touch up external and semi-exposed surfaces to provide complete finish. Remove all stickers and wipe down all surfaces. Trim and sand smooth all edges.

.12 Wipe out interior surfaces, trim and sand smooth all edges.

.13 Remove excess adhesive with recommended solvent.

3.2 ADJUSTMENT AND CLEANING

.1 Adjust hinged doors to swing freely and easily, to remain stationery at any point of swing, to close evenly and tightly against stops with binding, and to latch

positively when doors are closed with moderate force.

.2 Adjust hardware so that latches, locks and drawers, etc., operate smoothly without binding, and closers act positively with the least possible resistant in use. Lubricate hardware if required by supplier's instructions.

.3 Clean hardware after installation in accordance with supplier's instructions.

.4 Sand clean woodwork to leave free from finish defects in any exposed part.

.5 All work that cannot be successfully cleaned or repaired shall be removed and replaced.

3.3 CLEAN-UP

.1 Promptly as the work proceeds and upon completion, clean up and remove from the premises all rubbish and surplus materials resulting from the work of this Section.

END OF SECTION

1 General

1.1 RELATED WORK

.1	Rough Carpentry	Section 06 10 00
.2	Building Insulation	Section 07 21 00
.3	Standing Seam Metal Roofing	Section 07 41 10
.4	Sealants	Section 07 90 00
.5	Pressed Steel Frames	Section 08 11 00
.6	Vinyl Windows	Section 08 61 00

2 Products

2.1 MEMBRANE AIR BARRIER

.1 Non-Permeable air barrier membrane. Blueskin 40 mil thick as manufactured by Henry. See drawings for locations.

.2 Permeable air barrier membrane. Blueskin VP 160 as manufactured by Henry. See drawings for locations.

.3 SPRAY-ON AIR BARRIER (only for hard to access areas or where membrane air barrier cannot be applied)
.1 Bakor Airbloc 06, 90 Mil

.4 Approved Manufacturers: Provide equivalent products to architects satisfaction.
Sopra Seal; W.R Grace; Nord- Bitumi; : Fibreglas

2.2 SHEET VAPOUR BARRIER

.1 Polyethylene Film: to CAN2-51.34-M86, Type CMHC approved, Milrol-2000, 0.15 mm thick.

2.3 ACCESSORIES

.1 Joint sealing tape: air resistant pressure sensitive adhesive tape, type recommended by vapour barrier manufacturer, 2" wide for lap joints and perimeter seals.

.2 Sealant: in accordance with Section 07 90 00.

.3 Primer: asphalt based solvent primer for use with air barrier membrane.

.4 Moulded box vapour barrier: factory-moulded polyethylene box for use with recessed electric switch and outlet device boxes.

3 Execution

3.1 AIR BARRIER INSTALLATION

.1 Apply air barrier where indicated, including to walls and roof sheathing..

.2 Apply an additional 6” band of non permeable membrane air barrier around all window openings. Connect air barrier to thermal break of window and to adjacent air barrier.

.3 Apply in strict accordance with manufacturer's instructions.

.4 Roll completely after each sheet is applied.

.5 Prime substrate as per manufacturer's recommendations for the intended application.

.6 All side laps to be min. 2" and end laps min. 6".

.7 Lap air barrier with vapour barrier at all openings.

.8 Connect air barrier to window frames and door frames to provide air tight seals.

.9 Apply spray on air barrier to any difficult detail areas which do not allow for easy installation of the sheet membrane.

.10 Ensure continuity of air barrier by lapping spray on and roll on membrane air barriers.

3.2 SHEET VAPOUR BARRIER INSTALLATION

1. Install sheet vapour barrier on warm side of exterior wall and ceiling assemblies prior to installation of gypsum board to form continuous barrier.

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

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

4. Cut sheet vapour barrier to form openings and ensure material is lapped and sealed to door and window frames.

5. Lap and seal air barrier membrane over vapour barrier at openings to provide continuity.

6. Seal perimeter of sheet vapour barrier as follows:

7. Apply continuous bead of sealant to substrate at perimeter of sheets.

8. Lap sheet over sealant and press into sealant bead.

9. Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

10. Seal lap joints of sheet vapour barrier as follows:
    1. Attach first sheet to substrate.
    2. Apply continuous bead of sealant over solid backing at joint.
    3. Lap adjoining sheet minimum 6" and press into sealant bead.
    4. Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring over sealant.

11. Seal electrical switch and outlet device boxes that penetrate vapour barrier as follows:
    1. For sheet-type vapour barriers, install moulded box vapour barrier.
    2. Apply sealant to seal edges of flange to main vapour barrier and seal wiring penetrations through box cover.

END OF SECTION

1 General

1.1 WORK INCLUDED

.1 To complete thermal insulation for resistance of heat transfer as shown or specified and summarized but not restricted to:

- .1 Rigid insulation other than noted in Mechanical Division 15 and other than roof insulation.
- .2 Exterior stud mineral wool cavity wall insulation
- .3 Exterior continouos insulation c/w strapping system
- .4 Roof truss insulation.

1.2 RELATED WORK SPECIFIED IN OTHER SECTIONS

.1 Section 09 21 16: Gypsum Board Assemblies

.2 Section 31 23 10: Earthwork

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

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

.2 Store insulation materials in dry areas, protected from wetting and traffic.

.3 Store insulation board flat, on a flat surface, and to prevent edge damage and placing of materials on top of stored boards.

.4 Protect polystyrene insulation from sunlight at all times until permanent cover is installed.

2 Products

2.1 GENERAL

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

2.2 FOUNDATION WALL AND SLAB INSULATION

.1 Extruded polystyrene (XPS) , min R-20 wall.

.2 Acceptable Material: DOW Styrofoam Brand SM Extruded Polystyrene Foam Insulation or approved alternate.

2.3 EXTERIOR STUD WALL INSULATION

.1 Cavity Fill: Mineral wool batt insulation to meet specified requirements of ASTM-C-612, Class 1 with a thermal resistance as noted on the drawings as manufactured by Roxul Inc. or approved alternate.

2.4 EXTERIOR CONTINUOUS INSULATION

.1 Non-combustible, rigid, water repellent, mineral wool insulation board to ASTM C612, Type IVB.

- .1 Size: 24 x 48 inches.
- .2 Thickness: 4 inches.
- .3 Acceptable Material: Roxul Inc., COMFORTBOARD™ 110.

.2 Strapping:

- .1 1”x 4” wood.

.3 Fasteners

- .1 Screws shall be stainless steel, compatible with strapping and cladding material.
- .2 Screws shall be sized to accommodate all loads including torque loads and shall have a countersunk head.

2.5 ROOF TRUSS INSULATION

.1 Blown in fiberglass insulation

.2 Acceptable Material: AtticCat Expanding Blown-In Insulation by Owens Corning or approved alternate.

3 Execution

3.1 EXAMINATION

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

.2 Ensure that furring is installed to suit insulation sizes and thicknesses, and to ensure proper support.

3.2 INSTALLATION

.1 Exterior Stud Wall Insulation

.1 Ensure that insulation is supported to prevent settlement.

.2 Install friction fit batts snugly between framing members.

.3 Fit batt insulation snugly and without compression into every void to ensure full thickness for full length of construction, and to prevent air movement simultaneously on both sides of insulation.

.2 Exterior Continuous Insulation

.1 Install in strict accordance with manufacturer's instructions unless specified otherwise.

.2 Strapping : Vertical

.1 Spacing to match stud spacing, maximum spacing 16" o/c.

.3 Fastening:

.1 Minimum #12 stainless steel screws.

.2 Minimum embedment in stud back up: 1-1/2 "

.3 Maximum screw spacing: 12" vertical

.3 Roof truss insulation:

.1 Provide continuous installation .

.2 Provide installers certificate to confirm that final installed thickness meets or exceed R values shown on drawings.

3.3 ADJUSTMENT AND CLEANING

.1 Fill all voids in insulation systems with insulation.

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

END OF SECTION

1 General

1.1 WORK INCLUDED

.1 To complete gutters, downspouts, fascias and soffits summarized but not restricted to:

1..3 Prefinished aluminum fascia, soffit and rake trim.
2..4 Seamless Aluminum Gutter & Downspouts
3..5 Miscellaneous trim associated with roof, eaves and soffits.

1.2 RELATED WORK

1. Rough Carpentry: Section 06 10 00
2. Standing Seam Metal Roofing Section 07 41 10

1.3 SAMPLES

.1 Submit metal samples and profiles to Architect prior to manufacturing

2 Products

2.1 MATERIALS

1. Drip Edge: Aluminum drip edge on eaves and rake.
2. Eave Troughs and Down spouts
    1. Form eaves troughs and down spouts from 0.032 gauge thick aluminum.
    2. Sizes and profiles as shown on drawings, minimum size 5”
    3. Provide aluminum support brackets @24” o/c for eaves troughs.
    4. Form eaves troughs and gutters continuous lengths.
    5. Colors: Boncor white #701
3. Sheet Metal Flashing: for eave and rake trim and all other trim 0.032" thick aluminum embossed sheet. Colour: White. Note: Separate pieces are required, one for each horizontal "plank" in the fascia detail. Maximum length of aluminum without a joint is 8’ - 0".
4. Soffits: Perforated aluminum soffit, colour: white.
    1. Solid and perforated aluminum soffit where indicated
    2. Minimum thickness: 0.025 in.

3 Execution

3.1 APPLICATION

.1 Workmanship shall be of best standard area practice and done in accordance with applicable Manufacturer's Written Instructions for the items of roofing specified herein.

.2 Metal Drip Edge: Install metal drip edge along eaves and up rakes. Lap joints 4" and set in Selvage Roofing Cement. Nail at 10" centres maximum

.3 Flashings: Application of Metal Trim and Flashings

- .1 Flashings shall be as detailed with "West Coast" or "S" lock to provide for expansion, and with clip strips.
- .2 Flashing shall meet best CRCA Specs as noted or required.
- .3 Sheet metal work and metal counter flashing shall be as detailed and to CRCA Standard Details FL-500, FL-600 series as applicable.
- .4 Metal flashings shall have concealed fasteners wherever possible. Exposed fasteners shall be compatible type screws c/w watertight gaskets to the approval of the Architect, including location of fasteners.
- .5 Exposed edges of all sheet metal work shall be doubled back ½" in such a manner as to conceal them from view and to provide stiffeners.

.4 Install metal flashing and trim to best CRCA Standards.

3.2 PROTECTION

.1 Protect the surrounding surfaces from damage resulting from the work of this section.

3.3 CLEANING

.1 Promptly, as the work proceeds, and on completion, clean up and remove from the premises all rubbish and surplus materials resulting from the foregoing work.

.2 Clean metal flashing at completion of work.

.3 Remove deposits of cement from adjacent surfaces completely.

END OF SECTION

1 General

1.1 GENERAL CONDITIONS

.1 The General Conditions of the contract as well as provisions of Division 1 at the beginning of these specifications shall be deemed to apply and be a part of this section of the specification.

1.2 DESCRIPTION

.1 Work Included:

.2 Supply and installation of pre-finished 7/8" Galvalume siding where indicated in the Architectural drawings c/w supports as required.

1.3 OTHER WORK INCLUDED IN THIS SECTION

.1 Caulking of metal panels to metal and to adjacent surfaces. Section 07 90 00

1.4 RELATED WORK

.1 Sheet Vapour & Air Barrier Section 07 19 00

.2 Building Insulation Section 07 21 00

.3 Painting Section 09 90 10

1.5 SHOP DRAWINGS

.1 Submit Shop Drawings in accordance with Section 01 33 00

.2 Indicate panels, returns, flashings, , steel studs, bridging, fastenings, air barriers, insulation etc.

1.6 PRE-INSTALLATION MEETING

.1 Convene one week before starting work of this section.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

.1 Package materials to protect finished surfaces of siding from staining and marring.

.2 Store materials flat at site under protection to prevent staining from the ground or from collection of water on material, or both; and secured against wind damage.

2 Products

2.1 MATERIALS

.1 Exterior sheet-wall: factory preformed 7/8" corrugated galvalume sheet 28 gage, pre-finished from manufacturer's standard profiles. Include closures, gaskets, caulking, flashing and fasteners to effect weather-tight installation. Cut ends of sheets square and clean.

.1 Exterior corners-wall: of material to match finish and profile of adjacent cladding material, shop cut and brake formed to correct angle.

.2 Accessories to exterior wall cladding, brake or bend to shape, of material and finish to match wall cladding, comprising cap flashings, drip flashings, internal corner flashings, copings and closures for head, jamb, sill & corners.

.3 All fasteners shall be stainless steel.

.2 Supports:

.1 Provide supports as per drawings and as per para. 3.3

.3 Air barrier membrane:

.1 Air barrier membrane as per 07 19 00.

2.2 FINISHES

.1 Face sheet shall have a Weather XL finish (Vicwest) or equivalent. Architect to select from full range of colours

2.3 APPROVED EQUALS

.1 Flynn Canada, Canadian Metal Rolling Mills, Peerless, Robertson and Caradon to match Vic West profile noted above and to match specified liner panel and finish.

2.4 FLASHINGS

.1 Provide pre-finished flashings, etc. as per drawings and as required to complete the installation.

2.5 CAULKING

.1 One part polyurathane sealant: to meet specified requirements of CGSB Specification 19-GP-24M. Dymanic by Tremco or Vulkem by Mameco.

2.6 FABRICATION

.1 Roll form profiled panels, and other work unless impossible because of special design. Use other forming methods only with approval.

.2 Form bends sharp and true.

.3 Fabricate systems to conform to shop drawings, and to allow for structure movements within the systems.

.4 Fabricate systems with fasteners of same material as siding unless required otherwise for structural design, and of same colour as siding where exposed to view.

.5 Fabricate systems to prevent entry of water into building and from collection within assembly, and to prevent infiltration of air through system.

.6 Join intersecting parts together to provide tight, accurately fitted joints with adjoining surfaces in true planes.

.7 Fabricate systems to conform to requirements of reference standards specified.

.8 Erect systems by its fabricator, or franchised agent.

.9 Provide manufacturer's recommended separation materials where steel siding meets aluminum work.

.10 Provide all miscellaneous angles, fittings, etc. as required to complete the project.

3 Execution

3.1 EXAMINATION

.1 Take site measurements to ensure that work is fabricated to fit structure; surrounding construction; around obstructions and projections in place, or as shown on Drawings; and to suit locations of services.

.2 Verify that backup construction is aligned for proper installation of siding before commencing erection.

3.2 QUALIFICATIONS

.1 Installation to be by trades people authorized by the manufacturer of the siding.

3.3 ERECTION

.1 Erect systems complete with flashings forming part of the systems, clips, fasteners, and closures and caulking to meet same design criteria as specified for fabrication.

.2 Cut and flash panel penetrations.

.3 Erect work in straight lines that are true, level, and plumb.

.4 Provide for different thermal and structural movement between systems and structure as well as between elements of systems.

.5 Attach systems to sheathing and strapping and to other system components with fasteners of the same material and colour as the panels.

.6 Erect systems by its fabricator, or franchised agent.

.7 Provide manufacturer's recommended separation materials where steel siding meets aluminum work.

.8 Provide all miscellaneous angles, fittings, flashings, etc. as required to complete the project.

3.4 ADJUSTMENT AND CLEANING

.1 After erection, touch up prefinished coatings removed and damaged during erection.

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

.3 Refinish shop applied finishes in field only with approval.

.4 Clean off dirt resulting from erection from surfaces exposed to view.

END OF SECTION

1 GENERAL

1.1 SECTION INCLUDES

1.1.1 Standing seam metal roofing system.

1.1.2 Standing seam metal roofing accessories.

1.2 RELATED SECTIONS

1.2.1 Section 06 10 10 - Framing and Sheathing: Plywood roof deck substrate.

1.2.2 Section 07 90 00 - Joint Sealers

1.3 REFERENCES

1.3.1 ASTM A 240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

1.3.2 ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

1.3.3 ASTM A 792/A 792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

1.3.4 ASTM A 875 - Standard Specification for Steel Sheet, Zinc-5 % Aluminum Alloy-Coated by the Hot-Dip Process

1.3.5 ASTM B 101 - Standard Specification for Lead-Coated Copper Sheet and Strip for Building Construction.

1.3.6 ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

1.3.7 ASTM B 370 - Standard Specification for Copper Sheet and Strip for Building Construction.

1.3.8 ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

1.3.9 ASTM D 1056 - Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.

1.3.10 ASTM D 2178 - Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.

1.3.11 ASTM D 3575 - Standard Test Methods for Flexible Cellular Materials made from Olefin Polymers.

1.3.12 ASTM E 84 - Standard Test for Surface Burning Characteristics of Building Materials.

1.3.13 ASTM E 283 - Standard Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

1.3.14 ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

1.3.15 ASTM E 1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.

1.3.16 ASTM E 1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.

1.3.17 ASTM E 1680 - Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems.

1.3.18 ASTM E 2140 - Standard Test Method for Water Penetration of Metal Roof Panel Systems by Static Water Pressure Head.

1.3.19 AAMA 501.1 - Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure.

1.3.20 ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

1.3.21 FM 4470 Approval Standard for Class 1 Panel Roofs.

1.3.22 FM 4471 - Class 1 Panel Roof; Factory Mutual Research Corporation.

1.3.23 UL 263 - Fire Tests of Building Constructions and Materials.

1.3.24 UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies.

1.3.25 UL 790 - Standard Test Methods for Fire Tests of Roof Coverings.

1.3.26 UL 1897 - Uplift Test for Roof Covering Systems.

1.3.27 ICC-ES AC166 - Test Procedure for Wind Driven Rain Resistance of Metal Roof Coverings.

1.3.28 SMACNA - Architectural Sheet Metal Manual.

1.3.29 National Coil Coating Association (NCCA)

1.3.30 NRCA - The NRCA Roofing and Waterproofing Manual.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

1.4.1 Standing Seam Roofing System: R-Mer Loc
- 1.4.1.1 Thermal Expansion and Contraction:
  - 1.4.1.1.1 Completed metal roofing and flashing system shall be capable of withstanding expansion and contraction of components caused by changes in temperature without buckling, producing excess stress on structure, anchors or fasteners, or reducing performance ability.
  - 1.4.1.1.2 Design temperature differential shall be not less than 200 degrees F.
  - 1.4.1.1.3 Interface between panel and clip shall provide for unlimited thermal movement in each direction along the longitudinal direction.
  - 1.4.1.1.4 Location of metal roofing rigid connector shall be at roof ridge unless otherwise approved by the Architect. Metal ridge connector may require design as per job conditions by specified manufacturer.
- 1.4.1.2 Uniform wind load capacity:
  - 1.4.1.2.1 Installed roof system shall withstand negative (uplift) design wind loading pressures complying with the following criteria.
    - 1.4.1.2.1.1 Design Code: ASCE 7, Method 2 for Components and Cladding.

1.4.1.2.1.2 Safety Factor: 1.67 after any load reduction or material stress increase.
1.4.1.2.1.3 Wind Speed: 120 mph.
1.4.1.2.1.4 Ultimate Pullout Value: 1000 pounds per each of the two fasteners holding the panel anchor to the roof decking or framing system.
1.4.1.2.1.5 Exposure Category: high.
1.4.1.2.1.6 Design Roof Height: 50 feet.
1.4.1.2.1.7 Roof Pitch: 2 inches per foot.

1.4.1.2.2 ASTM E 1592: Capacity shall be determined using pleated airbag method in accordance with ASTM E 1592, testing of sheet metal roof panels. Allowable safe working loads shall be determined by dividing the ultimate test load by the safety factor specified above.

1.4.1.2.3 Underwriters' Laboratories, Inc., (UL), wind uplift resistance classification: Roof assembly shall be classified as Class 1-90, as defined by UL 580

1.4.1.3 Uniform Positive Load Capacity.

1.4.1.3.1 Installed roof system shall be capable of resisting the following positive uniform roof loads: Roof Live Load of 20 psf; Roof Snow Load of 100 psf.

1.4.1.3.2 Dead Load: Loading of the roof structure, due to tear off of existing, and/or installation of new roofing materials shall not exceed the present loading due to weight of the existing roofing system.

1.4.1.3.3 Installed roof system shall carry positive uniform design loads with a maximum system deflection of L/180 as measured at the rib (web) of the panel.

1.4.1.4 Underwriters' Laboratories, Inc., (UL):

1.4.1.4.1 Underwriters' Laboratories, Inc., (UL) fire resistance P ratings for roof assemblies: If applicable, panel system shall be approved for use in an appropriate Construction Assembly, as defined by UL 263.

1.4.1.4.2 Underwriters' Laboratories, Inc., (UL) Class A fire rating per UL 790.

1.4.1.5 ASTM E 1680: Static pressure air infiltration (roof panels):

1.4.1.5.1 Pressure Leakage Rate

1.4.1.5.1.1 1.57 PSF 0.0054 cfm/sq.ft.
1.4.1.5.1.2 6.24 PSF 0.0054 cfm/sq.ft.
1.4.1.5.1.3 20.0 PSF 0.0027 cfm/sq.ft.

1.4.1.6 ASTM E 1646: Static pressure water infiltration (roof panels):

1.4.1.6.1 Pressure Result:

1.4.1.6.1.1 5 Gal/Hr per S.F. and Static No Leakage
1.4.1.6.1.2 Pressure of 20.0 Psf. for 15 minutes

1.4.1.7 Capacities for gauge, span or loading other than those tested may be determined by interpolation of test results within the range of test data. Extrapolation for conditions outside test range is not acceptable.

1.4.1.8 Submit third party validation of environmental claims, prepared UL Environment, for all metal roof panels containing recycled content and/or bio based content.

1.5 SUBMITTALS

1.5.1 Submit under provisions of specification.

1.5.2 Product Data: Submit product data, test reports, and certifications in accordance with quality assurance and performance requirements specified herein.

1.5.3 Design Loads: Submit manufacturer's minimum design load calculations according to ASCE 7, Method 2 for Components and Cladding. In no case shall the design loads be taken to be less than those specified herein.

1.5.4 Dead Load Evaluation: Provide documentation from a licensed structural engineer of a structural evaluation of the roof structure and it's suitability for the new imposed roofing loads.

1.5.5 Shop Drawings: Prepared specifically for this project; showing dimensions of metal roofing and accessories, fastening details and connections and interface with other products.

1.5.6 Selection Samples: For each finish product specified, two complete sets of samples representing manufacturer's full range of available colors and textures.

1.5.7 Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and textures.

1.5.8 Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.5.9 Closeout Submittals:
- 1.5.9.1 Provide manufacturer's maintenance instructions that include recommendations for periodic checking and maintenance of installed roof system.
- 1.5.9.2 Provide executed copy of manufacturer's warranty.

1.6 QUALITY ASSURANCE

1.6.1 Manufacturer Qualifications: Manufacturer shall have in place a documented, standardized quality control program such as ISO-9001 approval.

1.6.2 Installer Qualifications: Certified and approved installer of the sheet metal roofing manufacturer.

1.6.3 Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
- 1.6.3.1 Finish areas designated by Architect.
- 1.6.3.2 Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
- 1.6.3.3 Refinish mock-up area as required to produce acceptable work.

1.7 PRE-INSTALLATION CONFERENCE

1.7.1 Convene a pre-roofing conference approximately two weeks before scheduled commencement of roofing system installation and associated work.

1.7.2 Require attendance of installers of deck or substrate construction to receive roofing, installers of rooftop units and other work in and around roofing which must precede or follow roofing work including mechanical work, Architect, Owner, roofing system manufacturer's representative.

1.7.3 Objectives include:
- 1.7.3.1 Review foreseeable methods and procedures related to roofing work, including set up and mobilization areas for stored material and work area.
- 1.7.3.2 Tour representative areas of roofing substrates, inspect and discuss condition of substrate, roof drains, curbs, penetrations and other preparatory work.
- 1.7.3.3 Review structural loading limitations of deck and inspect deck for loss of flatness and for required attachment.
- 1.7.3.4 Review roofing system requirements, Drawings, Specifications and other Contract Documents.
- 1.7.3.5 Review and finalize schedule related to roofing work and verify availability of

materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.

1.7.3.6 Review required inspection, testing, certifying procedures.

1.7.3.7 Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing.

1.7.3.8 Record conference including decisions and agreements reached. Furnish a copy of records to each party attending.

1.8 DELIVERY, STORAGE, AND HANDLING

1.8.1 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

1.8.2 Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

1.8.2.1 Store materials above ground, on skids.

1.8.2.2 Protect material with waterproof covering and allow sufficient ventilation to prevent condensation buildup or moisture entrapment on the materials.

1.9 PROJECT CONDITIONS

1.9.1 Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.10 WARRANTY

1.10.1 Warranty:

1.10.1.1 20 year limited watertight warranty for roofs with a 1:5 to 3:12 slope.

1.10.1.2 Provide installers 2 year warranty covering roofing system installation and water-tightness.

2 PRODUCTS

2.1 MANUFACTURERS

2.1.1 Acceptable Manufacturers: Robertson, Armco, Butler,

2.1.2 Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

2.2 STANDING SEAM METAL ROOFING

2.2.1 R-Mer Loc: Panel with 1-3/4 inch high standing seam with 3/8-inch high clearance between panel and substrate.

2.2.1.1 Width of Panel:

2.2.1.1.1 18 inches.

2.2.1.2 Seam Height: 1-3/4 inch.

2.2.1.3 Slope: Open Purlins, Slopes down to 3:12.

2.2.1.4 Slope: Solid Substrate, no framing components, Slopes down to 1-1/2 :12.

2.2.1.5 Panel Clips: Minimum 18 gauge, stainless steel. Two-piece clips are unacceptable.
2.2.1.6 Passes:
2.2.1.6.1 ASTM E 1592
2.2.1.6.2 ASTM E 1680
2.2.1.6.3 ASTM E 1646
2.2.1.6.4 Class A Fire Rating, UL-790.
2.2.1.6.5 UL (Class 90) 580.
2.2.1.7 Panel material:
2.2.1.7.1 Galvalume steel, type AZ-55, smooth as per ASTM A 792, 22 gauge.
2.2.1.8 Flashing and flat stock material: Fabricate in profiles indicated on Drawings of same material, thickness, and finish as roof system, unless indicated otherwise.
2.2.1.9 Accessory Components:
2.2.1.9.1 Gable anchor clips shall be minimum 18 gauge, galvanized steel or stainless steel.
2.2.1.9.2 Fasteners:
2.2.1.9.2.1 Concealed fasteners: Corrosion resistant steel fasteners (zinc plated or equal) designed to meet structural loading requirements. Provide #14 as minimum fastener size.
2.2.1.9.2.2 Exposed fasteners: Series 410 stainless steel fasteners or one-eighth (1/8) inch diameter stainless steel waterproof rivets. All exposed fasteners shall be factory painted to match the color of the standing seam panels.
2.2.1.9.3 Closures: Factory precut closed cell foam meeting ASTM D 1056 or ASTM D 3575, with metal trim matching panels when used at hip, ridge, jamb, and rake.
2.2.1.9.4 Provide all miscellaneous accessories for complete installation.

2.3 STANDING SEAM METAL ROOFING ACCESSORIES

2.3.1 Underlayment:
2.3.1.1 40 mil minimum high temp self adhesive membrane, installed in accordance with manufacturer's recommendations.

2.3.2 Bearing Plates:
2.3.2.1 Galvanized steel bearing plates 3 inches by 5 inches by 16 gauge, minimum.
2.3.2.2 Pre-punch with a hole pattern matching that of the panel anchor clips. Slotted holes are acceptable.

2.3.3 Sealant:
2.3.3.1 Exposed Applications: UV Resistant Tripolymer Sealant - Geocel Corporation, 2300 Tripolymer Sealant, or equal.

3 EXECUTION

3.1 EXAMINATION

3.1.1 Examine surfaces to receive metal roofing. Notify the Architect in writing of any defective conditions encountered. Starting of work shall constitute acceptance of such conditions.

3.1.2 Structural Deck Substrate:
3.1.2.1 Inspect roof deck to verify deck is clean and smooth, free of depressions, waves, or projections, and properly sloped.
3.1.2.2 Verify deck is dry and joints are solidly supported and fastened.

3.1.2.3 Verify wood nailers are installed and correctly located. Do not use pressure-treated wood containing salt-based preservatives or materials corrosive to steel.

3.1.3 Structural Framing Substrate:

3.1.3.1 Verify primary and secondary framing members are installed and fastened, properly aligned and sloped.

3.1.3.2 Verify damaged shop coatings are repaired with touch up paint.

3.1.4 Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, reglets are in place, and nailing strips located.

3.1.5 Correct defective conditions before beginning work.

3.2 INSTALLATION

3.2.1 Install in conformance with the NRCA Roofing and Waterproofing Manual and Manufacturers installation requirements.

3.2.2 Form panel shape as indicated on Drawings, accurate in size, square, and free from distortion or defects.

3.2.3 Install underlayment and eave protection sheet underlayment as recommended by the Manufacturer.

3.2.4 Coordinate with installation of rigid board insulation as specified in Section 07200.

3.2.5 Install all panels continuous from ridge to eave. Transverse seams are not permitted.

3.2.6 Panel lengths that exceed maximum shipping lengths shall be field rolled on equipment owned by the panel manufacturer. Seam sealant must be factory applied.

3.2.7 Exposed fasteners, screws and/or roof mastic are unacceptable and will be rejected. System configuration only allows for exposed fasteners at panel overlap, if required, and at trim details in accordance with the Manufacturer's requirements.

3.2.8 Where not otherwise indicated conform to SMACNA details including flashings and trim.

3.2.9 Install sealants where indicated to clean dry surfaces only without skips or voids..

3.3 PROTECTION

3.3.1 Protect installed products until completion of project.

3.3.2 Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

1 General

1.1 SECTION INCLUDES

.1 Sealants and caulking.

.2 Backer rods.

.3 Flexible epoxy joint fillers.

1.2 WORK INCLUDED

.1 To complete joint sealants as shown or specified and summarized but not restricted to the following:

.1 Caulking between door frames and adjacent material, interior and exterior.

.2 Caulking between members of vinyl windows.

.3 Caulking in connection with roof flashing.

.4 Caulking of control joints.

.5 Caulking of metal flashing.

.6 Joints between water closets, urinals, walls and floor.

.7 Exposed joints, between dissimilar materials and not concealed from view.

.8 Miscellaneous construction joints.

.9 Exterior caulking as required.

1.3 RELATED WORK

.1 Section 03 30 00 - Cast-In-Place Concrete

.2 Section 04 05 00 - Masonry Procedures

.3 Section 07 27 00 - Fire-stopping

.4 Section 07 55 10 - Modified Bitumen Roofing System and Flashing

.5 Section 08 61 00 - Vinyl Windows

.6 Section 08 80 00 - Glazing

1.4 REFERENCES

.1 ASTM C 321-00 - Standard Test Method for Bond Strength of Chemical-Resistant Mortars.

.2 ASTM C 834-05 - Standard Specification for Latex Sealants.

.3 ASTM C 919-98 - Standard Practice for Use of Sealants in Acoustical Applications.

.4 ASTM C 920-05 - Standard Specification for Elastomeric Joint Sealants.

.5 ASTM C 1330-02 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.

.6 ASTM C 882-05 - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.

1.5 SUBMITTALS

.1 Manufacturer's Technical Data Guides and application procedures.

.2 Submit samples illustrating colors selected.

.3 Submit laboratory tests or data validating product compliance with performance criteria specified. Include SWRI validation certificate where required.

.4 Upon completion of the project the sealant applicator must submit copies of the

.1 Manufacturer’s Weather-seal and the Warranty Applicator’s Workmanship

.2 Warranty.

1.6 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Company regularly engaged in manufacturing and marketing of products specified in this section.

.2 Installer Qualifications: Qualified to perform work specified by reason of experience or training provided by the product manufacturer.

.3 Installer must submit a reference list including a minimum of three projects of similar size and scope.

.4 Mock-Ups: Include a minimum of 5 linear feet of sealant to show compatibility with substrate, proper adhesion to substrate and chosen color.

.1 Apply mock-up with specified joint filler types and with other components noted. Installer must provide both primed and un-primed mock up to asses whether a primer is required for the project.

.2 Locate where directed by architect.

.3 Mock-up may remain as part of work if acceptable to architect.

.5 Adhesion pull tests: the number of adhesion pull tests is to be determined by the manufacturer’s weather seal warranty. Adhesion pull tests are to be conducted by or in the presence of the manufacturer’s representative. The manufacturer is to supply the architect / owner with the results of the adhesion pull tests. The sealant installer is responsible for repairing areas where adhesion pull tests are conducted.

.6 Access: Installer must coordinate with manufacturer’s representative to provide access to completed work areas until such time as adhesion pull tests can be completed.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Deliver products in original factory packaging bearing identification of product, manufacturer, and batch number. Provide Material Safety Data Sheets for each product.

.2 Store products in a location protected from freezing, damage, construction activity, precipitation, and direct sunlight in strict accordance with manufacturer's recommendations.

.3 Condition products to approximately 60 to 70 degrees F (16 to 21 degrees C) for use in accordance with manufacturer's recommendations.

.4 Handle all products with appropriate precautions and care as stated on Material Safety Data Sheet.

1.8 PROJECT CONDITIONS

.1 Do not use products under conditions of precipitation or freezing weather. Use appropriate measures for protection and supplementary heating to ensure proper curing conditions in accordance with manufacturer's recommendations if application during inclement weather occurs.

.2 Ensure substrate is dry.

.3 Protect adjacent work from contamination due to mixing, handling, and application.

1.9 WASTE MANAGEMENT AND DISPOSAL

.1 Coordinate all work related to Section 01 35 50 Waste Management Disposal with Contractor.

1.10 LEED DOCUMENTATION

.1 Not Used.

2 Products

2.1 MANUFACTURERS

.1 Acceptable Manufacturers:

.1 BASF Building Systems

.2 Tremco Sealant and Waterproofing.

.3 Sika Canada Inc.

.4 Dow Corning

.2 Provide all joint materials of the same type from a single manufacturer.

2.2 MATERIALS

.1 Single Component, Non-Sag Polyurethane Sealant with plus or minus 25 percent movement capability for vertical joints; ASTM C 920, Type S, Grade NS, Class 25, uses NT, M, A, O & I; SWRI validated. Acceptable material:

.1 Sonolastic NP1 by BASF Building Systems

.2 Tremco Dymonic by Tremco Sealant & Waterproofing

.3 Sikaflex 1a by Sika Canada Inc.

.2 Single component texturized polyurethane sealant with plus or minus 25 percent joint movement capability for horizontal or vertical joints; ASTM C 920, Type S, Grade NS, Class 25, uses NT, M, A, O. Acceptable material:

.1 Sonolastic TX1 by BASF Building Systems

.2 Vulkem 116 by Tremco Sealant & Waterproofing

.3 Single component security sealant with plus or minus 25 percent joint movement capability; ASTM C 920, Type S, Grade NS, Class 25, uses NT, T, M, A, G, I; SWRI validated. Acceptable materials:

.1 Sonolastic Ultra by BASF Building Systems

.4 Single component low modulus high movement fast-curing silyl terminated polyether sealant with plus 100 and minus 50 percent joint movement capability; ASTM C 920, Type S, Grade NS, Class 100/50, uses NT, M, A, G, O; ASTM C 1382. Acceptable materials:

.1 Sonolastic 150 with VLM technology by BASF Building Systems

.5 Multi-component tintable low modulus high movement fast-curing silyl terminated polyether sealant with plus 100 and minus 50 percent joint movement capability; ASTM C 920, Type M, Grade NS, Class 100/50, uses NT, M, A, G, O. Acceptable materials:

.1 Sonolastic 150 Tint Base by BASF Building Systems

.6 Multi-Component, Polyurethane Sealant with Plus or minus 50 percent joint movement capability; ASTM C 920, Type M, Grade NS, Class 25, uses NT,T, M, A, O, G and I; UL classified (fire resistance). Acceptable materials:

.1 Sonolastic NP2 by BASF Building Systems

.2 Dymeric 240 by Tremco Sealant & Waterproofing

.3 Sikaflex 2C NS by Sika Canada Inc.

.7 Single component self-leveling polyurethane sealant with plus or minus 25 percent movement capability for horizontal joints; ASTM C 920, Type S, Grade P, Class 25 uses T & M. Acceptable materials:

.1 Sonolastic SL1 by BASF Building Systems

.2 Vulkem 45 by Tremco Sealant & Waterproofing

.3 Sikaflex 1C SL by Sika Canada Inc.

.8 Multi-Component, Self-Leveling Polyurethane Sealant with plus or minus 25 percent movement capability for horizontal joints; ASTM C 920, Type M, Grade P, Class 25 uses NT, T, A, I & M. Acceptable materials:

.1 Sonolastic SL2 by BASF Building Systems

.2 Vulkem THC 900 by Tremco Sealant & Waterproofing

.3 Sikaflex 2C SL by Sika Canada Inc.

.9 Two component polysulfide sealant with plus or minus 25 percent joint movement capability; ASTM C 920, Type M, Grade NS Grade NS, Class 25 uses T, G, M, A, O. Acceptable material:

.1 Sonolastic Polysulfide Sealant by BASF Building Systems

.2 Duoflex NS by Sika Canada Inc. Acceptable material:

.10 Single component synthetic rubber sealant purpose made for use in acoustical applications. Acceptable material:

.1 Tremco Acoustical Sealant

.11 Poured flexible 100% solids epoxy joint filler: properties.

.1 Shore A Hardness: greater than 75.

.2 Shore D Hardness: greater than 30.

.3 Elongation: 75 percent.

.4 Tensile Strength: 4.5 MPa

.5 Acceptable material:

.1 Epolith-P by BASF Building Systems

.2 Loadflex 2 by Sika Canada Inc.

.12 Gunned flexible 100% solids epoxy joint filler. Two component gun-grade epoxy joint filler with flexible, pick-proof properties for sloped or vertical areas.

.1 Shore A Hardness: 90.

.2 Shore D Hardness: 50.

.3 Elongation: 50 percent.

.4 Tensile Strength: 6.2 MPa plus or minus 0.07 MPa

.5 Slant Shear Strength: 6.0 MPa per square inch per ASTM C 882.

.6 Slant Shear Strength: 0.8 MPa per square inch per ASTM C 321.

.7 Acceptable material:

.1 Epolith-G by BASF Building Systems

2.3 ACCESSORIES

.1 Primer: Type recommended by the sealant manufacturer and compatible with joint forming materials.

.1 NOTE: It must be assumed that all surfaces are to be primed for bidding purposes.

.2 Joint Cleaner: Non-corrosive and non-staining type recommended by sealant manufacturer and compatible with joint forming materials.

.3 Soft Backer Rod: non-gassing, reticulated closed-cell polyethylene rod designed for use with cold-applied joint sealants.

.1 Comply with ASTM C 1330.

.2 Size required for joint design.

.4 Closed-Cell Backer Rod: closed-cell polyethylene rod designed for use with cold-applied joint sealants for on-grade or below-grade applications.

.1 Comply with ASTM C 1330.

.2 Size required for joint design.

.5 Joint Filler: closed-cell polyethylene joint filler designed for use in cold joints, construction joints, or isolation joints wider than 1/4 inch (6 mm).

.1 Size required for joint design.

.6 Bond Breaker: Pressure-sensitive tape recommended by sealant manufacturer to suit application.

2.4 COLOR

.1 Sealant Colors: Selected by architect/owner/engineer:

.1 Manufacturer's "Rainbow of Colors" range.

.2 Custom color matching submittal of job site substrate samples.

3 Execution

3.1 EXAMINATION

.1 Inspect all areas involved in work to establish extent of work, access, and need for protection of surrounding construction.

.2 Conduct pre application inspection of site verification with an authorized manufacturer's representative.

.3 Occupied areas: where high VOC materials are utilized investigate occupants to determine the measures to be taken to accommodate them.

3.2 PREPARATION

.1 Remove loose materials and foreign matter which could impair adhesion of the sealant.

.2 Clean joints and saw cuts by grinding, sandblasting, or wire brushing to expose a sound surface free of contamination and laitance.

.3 Ensure structurally sound surfaces are, dry, clean, free of dirt, moisture, loose particles, oil, grease, asphalt, tar, paint, wax, rust, waterproofing, curing and parting compounds, membrane materials, and other foreign matter.

.4 Where the possibility of sealants staining adjacent areas or materials exists, mask joints prior to application.

.1 Do not remove masking tape before joints have been tooled and initial cure of joint filler has taken place.

.2 Work stained due to failure of proper masking precautions will not be accepted.

3.3 INSTALLATION

.1 Priming:

.1 Prime all surfaces to receive sealant with recommended primer unless the mock-up proves otherwise.

.2 Back-Up Material:

.1 Install appropriate size backer rod, larger than joint where necessary according to manufacturer's recommendations.

.2 Install polyethylene joint filler in joints wider than 1/4 inch (6 mm) to back-up material per manufacturer's recommendations.

.3 Bond Breaker:

.1 Install bond-breaker strip in joint to be sealed on top of back-up material to prevent adhesion of sealant to back-up material; install per manufacturer's recommendations.

.4 Sealant:

.1 Prepare sealants that require mixing; follow manufacturer's recommended procedures, mixing thoroughly.

.2 Mix only as much material as can be applied within manufacturer's recommended application time period.

.3 Apply materials in accordance with manufacturer's recommendations; take care to produce beads of proper width and depth, tool as recommended by manufacturer, and immediately remove surplus sealant.

.4 Apply materials only within manufacturer's specified application life period. Discard sealant after application life is expired or if prescribed application period has elapsed.

3.4 CLEANING

.1 Remove uncured sealant with Reducer 990, xylene, toluene, or MEK. Remove cured sealant by razor, scraping, or mechanically.

.2 Remove all debris related to application of sealants from job site in accordance with all applicable regulations for hazardous waste disposal.

END OF SECTION

1 General

1.1 RELATED WORK

.1	Steel door frames	Section 08 11 10
.2	Glazing:	Section 08 80 00
.3	Painting:	Section 09 90 00

1.2 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 30 00.

.2 Indicate door types and cutouts for glazing and louvres.

1.3 WASTE MANAGEMENT AND DISPOSAL

Not Used.

2 Products

2.1 MATERIALS

.1 Sheet steel: 18 ga. base thickness, commercial grade steel to ASTM A366-72, Class 1 finished to ASTM A526(1975) W25 wiped zinc finish.

.2 Glazing stops: minimum 20 ga. base thickness sheet steel with W25 wiped zinc finish to ASTM A525-80a screw fixed.

.3 Door Core:

.1 Exterior Doors: Hollow steel, vertically stiffened with steel ribs and all voids filled with incombustible, semi-rigid fibrous insulation or urethane, 1.5 lb./cu.ft., minimum density.

.2 Interior Doors: Honeycomb, structural core consisting of kraft paper having 3/4" cell size to thickness indicated.

.4 Fire Doors: Fire doors shall carry a Fire Underwriter's Laboratory label of classes as required by the drawings.

.5 Primer: for touch up to CGSB 1-GP-181M+Amdt-Mar-78.

2.2 FABRICATION

.1 The following fabricators are approved to perform work of this section:

Apex Machine Works Ltd., S.W. Flemming Ltd., Macotta Co. of Canada Ltd., Daybar Industries Ltd., Artek.

.2 Fabricate steel doors as detailed, in accordance, with Canadian Steel Door and Frame Manufacturer's Association, "Canadian Manufacturing Specifications for Steel Doors and Frames", 1978 for hollow steel construction, except where specified otherwise.

.3 Mortise, reinforce, drill and tap doors and reinforcements to receive hardware using templates provided by finish hardware supplier. Reinforcement gauges to meet or exceed CSDFMA specification.

.4 Make provision for louvres and glazing as indicated and provide necessary glazing stops.

.5 Construct rail and stile doors in same manner as flush doors.

.6 Conceal weld where possible; if exposed, grind and buff smooth to match adjacent surfaces.

.7 Touch up doors with primer where galvanized finish damaged during fabrication.

.8 All exterior door joints to be sealed to prevent moisture penetration.

.9 Top of all exterior doors to be fitted with vinyl cap.

.10 Weep holes to be provided in bottom closure channel of all exterior doors.

3 Execution

3.1 INSTALLATION

.1 Installation of hollow metal doors supplied by this Section and finishing hardware supplied under Work of Section 08 71 00 is specified under Work of Section 06 20 00.

3.2 ADJUSTMENT AND CLEANING

.1 Refinish damaged and defective work before completion of project.

.2 Adjust operable parts for correct function.

END OF SECTION

1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

.1	Unit Masonry	Section 04 21 00
.2	Rough Carpentry	Section 06 10 00
.3	Sealants	Section 07 90 00
.4	Steel hollow metal doors	Section 08 11 00
.5	Wood doors	Section 08 21 00
.6	Door Hardware	Section 08 71 00
.7	Glazing	Section 08 80 00
.8	Gypsum Board Assemblies	Section 09 21 16
.9	Painting	Section 09 90 00

1.2 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 30 00.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Coordinate all work related to Section 01355 Waste Management Disposal with Contractor.

1.4 LEED DOCUMENTATION

Not Used.

2 Products

2.1 MATERIALS

.1 Sheet steel: commercial grade steel to ASTM A366-72, Class 1 finished to ASTM A526(1975) W25 wiped zinc finish.

.1 Frames: generally 16 ga. base thickness steel.

.2 Floor anchors, channel spreaders and wall anchors: minimum 16 ga. base thickness steel.

.3 Guard boxes: minimum 22 ga. base thickness steel.

.5 Glazing stops: minimum 20 ga. base thickness steel, tamperproof.

.2 Reinforcing channel: to CSA G40.21-M1978, type 300W.

.3 Door bumpers: black neoprene single stud.

.4 Primer: to CGSB 1-GP-181M+Amdt-Mar-78.

2.2 FABRICATION

.1 The following fabricators are approved to perform work of this section:

Apex Machine Works Ltd., S.W. Fleming, Macotta Co. of Canada Ltd., Daybar Industries Ltd., Artek

.2 Fabricate frames as detailed, to Canadian Steel Door and Frame Manufacturer's Association, "Canadian Manufacturing Specifications for Steel Doors and Frames", 1978; except where specified otherwise.

.3 Exterior door frames to be thermally broken.

.4 Cut mitres and joints accurately and weld continuously on inside of frame profile.

.5 Grind welded corners and joints to flat plane, fill with metallic paste filler and sand to uniform smooth finish.

.6 Touch up frames with primer where galvanized finish damaged during

fabrication.

.7 Provide adjustable jamb anchors for fixing at floor.

.8 Prepare frames for specified hardware with mortises and reinforcement. Drill and tap to template information.

.9 Construct thermally broken frames using steel core, separating exterior portion of frame from interior portion with polyvinyl chloride thermal breaks.

.10 Install 3 bumpers on strike jamb for each single door.

.11 Reinforce head of frames wider than 4'-0" in unsupported width.

.12 Provide labelled fire rated frames where required.

3 Execution

3.1 INSTALLATION

.1 Set frames plumb, square, level and at correct elevation.

.2 Secure anchorages and connections to adjacent construction.

.3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 4'-0" wide. Remove temporary spreaders after frames are built-in.

.4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.

3.2 CLEANING AND ADJUSTMENT

.1 Refinish damaged and deflective Work before completion of Project. Refinish exposed surfaces to ensure that no variation in appearance is discernible.

.2 Clean Work for specified finishing at completion of installation.

END OF SECTION

1 General

1.1 WORK INCLUDED

.1 To provide powered exterior overhead sectional door installations where noted on the drawings.

1.2 REFERENCES

.1 ANSI/DASMA 102 American National Standard Specification for Sectional Overhead Doors

.2 ASTM A123 Zinc hot dipped galvanized coatings

.3 ASTM A126 Specification for Sectional Overhead Doors

.4 ASTM A229 Steel wire for mechanical springs

.5 ASTM A653 Sheet steel, zinc coated hot dipped galvanized, commercial quality

.6 ASTM E330 Structural performance of windows, and doors by uniform static air pressure difference

.7 ASTM E83 Standard test method for determining rate of air leakage

1.3 RELATED WORK

.1 General Requirements: Division 1

.2 Steel plate door frames: Section 05 50 00

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 30 00 - Shop Drawings, Product Data, Samples and Mock-ups.

.2 Indicate materials, operating mechanisms, required clearances and electrical connections.

1.5 MAINTENANCE DATA

Provide operation and maintenance data for overhead door hardware for incorporation into Operation and Maintenance Manual.

1.6 QUALITY ASSURANCE

.1 Overhead door shall be installed by an authorized representative of the door manufacturer.

1.7 EXTENDED WARRANTEE

.1 Submit a warranty of the Work of this Section covering the period for four years beyond the expiration of the performance bond specified in General Conditions.

.1 Defective work shall include but not be restricted to loosening of whole or parts of the units, breakage or deformation of work, and fading or discolouration of factory applied finishes.

.2 Ten years' conditional warranty on the finish of the pre-painted galvanized steel or aluminium skins. Five years against delamination and one year on materials and workmanship.

1.8 DELIVERY STORAGE AND HANDLING

.1 Reference Section 01 66 00 Product Storage and Handling Requirements. B. Follow manufacturer's instructions.

2 PRODUCTS

2.1 MATERIALS

.1 Door panels, exterior doors:

.1 .Sections to be steel inner and outer skins with polyurethane rigid insulation sandwiched between them. Air infiltration of no more than0.09cfm at 15mph.

.2 Exterior skin to be 28 gauge (0.015") hot dipped galvanized steel.

.3 Exterior finish to be factory applied polyester finish in white .

.4 Section ends to be fitted with 18 gauge full height galvanized steel end caps.

.5 Interior skin to be 28 gauge (0.015") hot dipped galvanized steel with embossed finish. Interior finish to be factory applied polyester finish in white.

.6 Insulation 3" thick (51mm) of CFC and HCFC free, foamed in place polyurethane insulation. The inner and outer skin shall be separated with an extruded thermal break. The thermal value of the door shall be R25. Insulated sections to be tested to ASTM E84 for a flame spread of no more than 75 and a smoke developed of no more than 450.

.7 Door to be designed to withstand the wind loading requirements of ANSI/DASMA 102 as well as the National Building Code. However the door shall at least be designed to withstand wind load of 120 km/hr with a maximum horizontal deflection of 1/240th of the opening width.

.8 Provide at least the following weatherstripping in continuous lengths for the door:

.1 Bottom section to be fitted with a flexible bulb type weather seal at the bottom

.2 Exterior jamb seal fully adjustable

.3 Provide full width lintel weatherstripping to limit air infiltration at the door head

.9 Glazing

As shown: full vision sealed glass units within aluminum framing. Glazing to be 1/2" thick sealed units with 6mm thick clear glass inside and out.

.10 Fabricate interlocking sections with high strength cast iron end locks on alternate slats each secured with rivets. Provide windlocks as required to meet NBC wind load for the specified location.

.11 Exterior Slat Finish:

.1 ColorCoat (tm) Coating System to include an ASTM A 653 galvanized base coating, bonderized coating for prime coat adhesion, and factory applied thermosetting powder coating applied with a minimum thickness of 2.5 mils. The color shall be white.

.2 Track and Hardware

.1 Track shall be high lift and 3" deep, designed by manufacturer to withstand loads imposed upon it. Track shall also be aligned so that jamb and lintel weatherstripping makes full contact in the closed position. Provide structural reinforcement for horizontal runs of track. All track parts and supports to be fabricated from galvanized steel

.2 Brackets and 11 ga hinges to be fabricated from hot dipped galvanized steel

.3 Rollers to be case hardened steel to fit 3" track and with ball bearings

.4 Provide a lock on the inside right side engaging the vertical track and with a heavy-duty rim cylinder on the inside

.5 Counterbalance - torsion type springs rated for at least 100,000 cycles of use

.3 Operators:

.1 Operation: Electrically operated, gear head, heavy duty hoist

.1 Operator: Heavy duty jack shaft operator acceptable manufacturers are: Manaras, Lift Master, or Micanan

.2 In the event of a power failure, door can be manually operated by a floor level chain.

.3 Motor to have overload and under-voltage protection.

.4 Full roller chain driven carriage

.5 Limit switches to be fully adjustable in both directions to allow precise drive travel adjustment.

.6 Motor to be instantly reversible. Reversing controller shall be heavy duty industrial type with mechanical interlock.

.7 Controls

.1 Each door shall be equipped with a three button (open/close/stop) fully guarded control.

.2 Each door shall be equipped a pneumatic safety edge complete with a spring tensioned take up reel for wiring.

.3 Reverse action is to be timer delayed by 1 second.

.4 Approved Products

.1 Manufacturers:

.1 Exterior :Richard Wilcox T300MR, Wayne Dalton , Thermomark 530

3

4 EXECUTION

4.1 EXAMINATION

.1 Examine substrates upon which work will be installed and verify conditions are in accordance with approved shop drawings.

.2 Coordinate with responsible entity to perform corrective work on unsatisfactory substrates.

.3 Commencement of work by installer is acceptance of substrate.

4.2 INSTALLATION

.1 General: Install door and operating equipment with necessary hardware, anchors, inserts, hangers and supports.

.2 Follow manufacturer's installation instructions.

.3 Installers must be factory authorized.

.4 Coordinate with adjacent work to ensure proper clearances.

.5 Doors must close tightly against weatherstripping, smoothly, and steadily.

4.3 ADJUSTING

.1 Following completion of installation, including related work by others, lubricate, test, and adjust doors for ease of operation, free from warp, twist, or distortion.

4.4 CLEANING

.1 Clean surfaces soiled by work as recommended by manufacturer.

.2 Remove surplus materials and debris from the site.

4.5 DEMONSTRATION

.1 Demonstrate proper operation to Owner's Representative.

.2 Instruct Owner's Representative in maintenance procedures.

END OF SECTION

1 General

1.1 GENERAL CONDITIONS

.1 The General Conditions of the contract as well as provisions of Division 1 at the beginning of these specifications shall be deemed to apply and be a part of this section of the specification.

1.2 RELATED WORK

.1	Contract Close Out	Section 01 70 00
.2	Unit Masonry	Section 04 21 00
.3	Rough Carpentry	Section 06 10 00
.4	Finish Carpentry	Section 06 20 00
.5	Air Barrier Membrane	Section 07 19 00
.6	Sealants	Section 07 90 00

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Collect, separate and recycle all site generated waste materials in accordance with Section 01 35 50 Waste Management Disposal.

1.5 REFERENCE STANDARDS

.1 Do windows in accordance with CSA 0132.1-M1977 except where specified otherwise. PVC windows to meet A440, M90, A3 B5, C5, F2.

1.6 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 30 00.

.2 Indicate materials and large scale details for head, jamb, and sill, profiles of components, elevations of unit, anchorage details, description of related components.

1.7 SAMPLE WINDOWS

.1 Submit a full size sample window with the Shop Drawings complete with sash restricter and pre- painted vinyl.

.2 Do not manufacture windows until the Architect approves sample.

1.8 APPROVED WINDOWS

.1 Atlantic Windows, Designer Series, High Performance

.2 Kohler

.3 Alternate manufacturers able to meet all of the requirements of this Section will be considered by the Architect prior to tender closing upon submittal of sample window and frame cut away.

Note: Windows not able to meet C5 requirement will not be considered.

2 Products

2.1 MATERIALS

.1 Windows generally comprising: Fixed all with insulating lites. Window units shall be of size, layout and fenestrations as shown on the drawings. Fixed windows to have sash profile to match manufacturer's single hung windows.

.1 Frame and sash shall be welded PVC, reinforced to meet C 5, assembled and with operating hardware installed.
- Frame depth shall be 3 1/4"
- Frame shall have a minimum of 9 closed wall chambers

.2 Multiple weather stripping.

.3 Dry glazing, complete with an exterior point bead of caulking - GE Brand SCS2800 "Silglaze II"

.4 Inside glass stop.

.5 Galvanized steel installation brackets

.6 Glazing: insulating glass with 1/2" air space with low E argon glass, solar ban 60 (or ES72) on number 3 surface and warm edge spacer. Provide muntin bars as per drawings.

.7 Jamb extensions to be all PVC ¾ " return, supplied by window manufacturer, as per drawings.

.8 Brick mould to be all PVC supplied by window manufacturer, as per drawings and to be large enough to cover rough buck. Secure with acrylic adhesive.

.9 Colour: White vinyl interior finish. All exterior vinyl to be prepped, primed and painted at the window manufacturer's factory.

.2 Sealants: in accordance with Section 07 90 00, colour selected by Architect.

.3 Air seal interface gasket: 60 mil self-adhering membrane of rubberized asphalt. (Blueskin or Architect approved equal.)

2.2 FABRICATION

.1 Fabricate fixed, and single hung windows as indicated on drawings and to requirements of CSA as per 1.3 Reference Standards.

.2 Brace frames to maintain squareness and rigidity during shipment and installation.

2.3 GLAZING

.1 Factory glaze windows .

.2 Provide exterior point bead caulking to exterior face of sealed units as per manufacturer's instructions.

3 Execution

3.1 INSTALLATION

.1 Set window units in prepared openings plumb, square and level, free from warp, twist or superimposed loads.

.2 Install windows in strict accordance with Manufacturer's instructions.

.3 Back caulk all windows with a generous bead of caulking.

.4 Secure work adequately and accurately to structure in required position, in manner not restricting normal movement of PVC windows. Use galvanized installation brackets.

.5 Secure rubberized asphalt air seal (Bueskin) to window frame and wall sheathing as per details on drawings. Seal Blueskin to building air barrier. Note special detail for carrying Blueskin under window sills.

.6 Fill void between wood framing and window frame with batt insulation and caulk between interior side of window frame and wood framing, all as per details on drawings.

3.2 CAULKING

.1 Seal joints between frame members, fixed window units and other non-operating components of window assembly with sealant to provide weather tight seal at outside and air vapour seal at inside. Provide backer rods and caulking as per drawings.

.2 Apply sealant in accordance with Section 07 90 00. Conceal sealant within window components except where exposed use is permitted by Architect.

END OF SECTION

1.1 General Requirements

.1 The Executed Agreement including General Conditions and Supplementary Conditions, Division 01, applicable drawings and amendments are part of and are to be read in conjunction with this Section.

1.2 Section Includes

.1 The supply only of door hardware as specified in this section and listed in the schedule 3.3.

1.3 Related Work

.1 Conventional doors section 08 11 13 **steel** and section 08 14 16 **wood**

.2 Electrical Division **26** to provide conduit, wiring for magnetic hold open devices, electric hardware, electric strikes, card readers, door operators and accessories.

.3 Aluminum doors and Frames section 08 40 00 - installation of hardware supplied by this section.

1.4 Reference Standards

.1 Standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufactures' Association.

.2 CAN/CGSB-69.18-M90/ANSI/BHMA A156.1-1981, Butts and Hinges.

.3 CAN\-69.29-M90\ANSI\BhmA A156.13-1980, Mortise Locks and Latches.

.4 CAN/CGSB-69.19-M89/ANSI/BHMA A156.3-1984, Exit Devices.

.5 CAN/CGSB-69.20-M90/ANSI/BHMA A156.4-1986, Door Controls (Closers).

.6 CAN/CGSB-69.21-M90/ANSI/BHMA A156.5-1984, Auxiliary Locks and Associated Products.

.7 CAN/CGSB-69.22-M90/ANSI/BHMA A156.6-1986, Architectural Door Trim.

.8 CAN/CGSB-69.24-M90/ANSI/BHMA A156.8-1982, Door Controls - Overhead Holders.

.9 CAN/CGSB-69.34-M90/ANSI/BHMA A156.18-1984, Materials and Finishes.

1.5 Requirements Regulatory Agencies

.1 Use ULC/ULI listed and labeled hardware for doors in fire separations and exit doors.

1.6 Samples

.1 Submit samples in accordance with General conditions of contract

.2 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.

.3 After approval samples will be returned for incorporation in the Work.

1.7 Hardware List

.1 Submit hardware schedule prepared by a qualified Architectural Hardware Consultant (AHC) to Door and Hardware (DHI) formula in accordance with Section 01 33 00 Submittals.

.2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.

1.8 Maintenance Data

.1 Provide operation and maintenance data for door closers, locksets, door holders and fire exit hardware for incorporation into manual specified in Section 01 33 00 Submittals.

.2 Brief maintenance staff regarding proper care, cleaning, and general maintenance.

1.9 Maintenance Materials

.1 Supply two sets of wrenches for door closers locksets and fire exit hardware.

1.10 Delivery and Storage

.1 Store finishing hardware in locked, clean and dry area.

.2 Package each item of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.

PART 2 – PRODUCTS

2.1 Hardware Items

.1 Work of this section includes the supply of hardware listed in the hardware schedule at the end of this section Item 3.3

.2 Use one manufacturer's products only for all similar items.

.3 Quantities listed under each hardware group number are for each single or pair of doors.

.4 Finishes - Unless otherwise noted, the finish for all hardware will be as

Hinges	630
Locksets	630
Exit Devices	630
Door Closers	EN
Push plates, Door Pulls	630
Floor Stops	630

.5 Manufacturers - All numbers and symbols used in the preparation following hardware schedule have been taken from the catalogues of the following manufacturers.

Hinges	Markar
Locksets	Sargent
Exit Devices	Sargent
Door Closers	Sargent
Power supplies	Securitron
Electric strikes	HES
Push plates, Door Pulls,	Rockwood
Weather strip & Thresholds	Pemko

.6 Manufacturers numeric designation in schedules does not imply that another manufacturers products will not be acceptable, unless they are not equal in design, size, weight, material, finish, function, or other quality of significance, or unless specifically noted otherwise. Application for alternate product must be submitted in writing 10 days prior to tender close. All acceptance is final. Substitution after tender close will not be accepted.

2.2 Approved alternative products to those listed in the hardware schedule.

The following manufacturers products are approved as alternatives to the products listed in the hardware schedule. Provided they meet the intended function and have the specified features and options of the products specified

LOCKSETS

SARGENT	YALE	CORBIN
8200 line	**8800**	**ML2000**

DOOR CLOSERS

SARGENT	LCN	NORTON
351	**4040**	**7500**

EXIT DEVICES

SARGENT	CORBIN	VON DUPRIN
80	**5000**	**98**

2.1 Hardware Materials

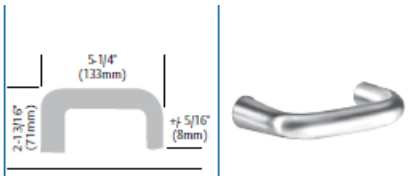
.1 Hinges

.1 All hinges are continuous stainless steel to suit the door height and undercut.

.2 Locksets:

.1 All locks and latch sets are to be SARGENT 8200 LNJ

J



.2 Lever designs as listed in the hardware schedule.

.3 Exit Devices:

.1 All exit devices are to be ANSI 156.3 Grade 1. To be listed under "Panic Hardware" in ULC Accident Hazard Section. All exit devices regardless of type shall be of matching design. Use labeled fire exit devices on fire doors. All trim for exit devices shall be thru bolted to the lock style case. Where required exit devices shall have touch bar locked down by inside cylinder feature. Finishes shall be in accordance with the finish section of this specification and as listed in the hardware schedule. All exit devices must be of plated finish- painted finishes are not acceptable.

.4 Door Closers

.1 Door closers are to be of modern design with full cover, rack and pinion, multi sized or sized as listed in the hardware schedule. Shall meet ANSI A156.4 Grade 1 operational tests and have a minimum 10 year warranty Closer body shall be warranted for the life of the building. Piston shall be 11/2" minimum diameter.The pinion shaft shall be 5/8" diameter. Back check feature shall be controlled by two valves strength and position Non handed.

.5 Kick plates

.1 Kick plates are to be applied to the push side of doors Polishing lines or dominant direction of any surface pattern to run across the door.
.2 Material: 16 ga. thick 304 stainless steel
.3 Size: Height as listed, width - door width less 2" single doors, 2" less for pairs of doors.

.4 Fasteners: No, 6 screws spaced equal distance along a centre line, ½" from edge all around plate and counter sunk.

.6 Overhead Stops and Holders

.1 As listed in the schedule, steel arms on interior doors, bronze arms for exterior doors, standard or heavy duty as indicated.

.7 Thresholds:

.1 Width as listed x full width of door opening, plus 101mm to cope around the face of jambs finish, serrated surface, as listed in the hardware schedule.

.8 Weather stripping:

.1 As listed in the schedule to be applied continuously around perimeter of head, jambs and mullions.

2.4 Miscellaneous Hardware

.1 None required

2.5 Fastenings

.1 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.

.2 Exposed fastening devices to match hardware.

.3 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.

.4 Use fasteners compatible with material through which they pass.

2.6 Keying

.1 Keys and cylinders are to be sourced from the school's usual supplier as part of this contract and keyed as directed by the school.

(Existing cylinders from the demolition are to be turned over to NSCC).

.2 Provide keys in duplicate for every lock in this Contract.

.3 Provide three master keys for each MK or GMK group.

.4 Stamp keying code numbers on keys and cylinders.

PART 3 – EXECUTION

3.1 Installation

.1 No operating hardware shall be installed at a height of more than 1200 mm above the finished floor (NBCC 3.4.6.15.5.)

.2 Unless otherwise noted all hardware will be mounted according to manufacture templates and installation instruction sheets.

.3 Product not usually supplied with this information shall be mounted according to National Building Code and the Door and Hardware Institute publication "A Recommended Locations for Standard Steel Doors and Frames".

.4 Provide installers with all necessary information prior to start of hardware installation.

.5 Closers shall be installed according to Manufactures templates and installation instructions. Unless required otherwise installation shall be on pull side of door.

.6 Where closer or arm is installed on door sex bolts, finished to match other hardware, will be used.

.7 Degree of opening to be as shown on the plans and indicated on the reviewed hardware schedule.

.8 Installation of all Automatic Operators items to be performed by Manufacture certified and authorized personnel including connections to hardware products installed by others.

.9 Seal all Weather, soundproof and light proof stripping and thresholds with suitable caulking to ensure gaps are properly closed.

.10 Remove construction keying when directed by project manager, verify permanent keys and check operation of all locks.

3.2 Field Quality Control

.1 Suppliers qualified hardware consultant to review and examine quality and installation of finished hardware as follows:

.2 First inspection will be made upon delivery of hardware and after product is unpacked and stored for shelving. Materials will be examined and compared to approved hardware schedule. At this time contractor installers should be available to review any special requirements or equipment needed to install products correctly.

.3 Second inspection will be made when fifty (50) percent of installation is completed. Product will be examined as to proper installation according to approved hardware schedule and keying schedule. Any problems with hardware should be reviewed and Architect/Contractor notified in writing with the suggested solution.

.4 Third inspection will be made at completion of installation of all products. A detailed report will be made in writing to the Architect and Contractor concerning any problems which affect the proper operation of hardware. Installers should be present to make any adjustments to materials as determined by this inspection.

.5 Fourth inspection will be made ten months after occupancy. A detailed report will be made in writing to the Architect and Contractor concerning any problems which affect

the proper operation of hardware.

3.3 Schedule

.1 Provide hardware as listed for each door number' s group of doors as listed in the hardware groups.

HARDWARE SET 1
1 SINGLE DOOR 100 EXTERIOR FROM TEACHING AREA LHR
1 SINGLE DOOR 103 EXTERIOR FROM TEACHING AREA LHR
EACH TO HAVE
1 CONTINUOUS HINGE MCKINNEY MCK12HD X DOOR HEIGHT 628
1 EXIT DEIVICE SARGENT 16 8804 ETL 630
2 MORTISE CYLINDERS TO SUIT GMK TO EXISTING KEY SYSTEM 626
1 DOOR CLOSER SARGENT 351 OZ X 351B MOUNTING PLATE EN
1 OVER HEAD STOP RIXSON 8HD STOP -SIZE AND DEGREE OF OPENING TO SUIT 630
1 KICKPLATE STANDARD METAL K10A 8" X DOOR WIDTH LESS 2" 630
1 THRESHOLD PEMKO X FRAME OPENING PLUS 4" 628
1 DOOR SWEEP PEMKO X DOOR WIDTH 628
1 DRIP CAP PEMKO X DOOR WIDTH 628

HARDWARE SET 2
1 SINGLE DOOR 102 TEACHING AREA TO WASHROOM LH
EACH TO HAVE
3 HINGES MCKINNEY TA2714 X 41/2 X 4 652
1 PRIVACY LOCKSET 10U65 LL 626
1 KICKPLATE STANDARD METAL K10A 8" X DOOR WIDTH LESS 2" 630
1 FLOOR STOP STANDARD METAL S102L 626

HARDWARE SET 3
1 OVERHEAD DOOR 104 EXTERIOR FROM TEACHING AREA
EACH TO HAVE
HARDWARE SUPPLIED CONPLETE BY DOOR SUPPLIER

HARDWARE SET 4 - 1 SLIDING BARN DOOR 101 TEACHING AREA TO STORAGE CRIB

EACH TO HAVE
1 TRACK
4 BRACKETS
2 HANGARS
2 STOPS
3 GUIDES
1 GUIDE CHANNEL
2 BOW HANDLES
1 HASP
1 PADLOCK

END OF SECTION

1 GENERAL

1.1 GENERAL CONDITIONS

.1 The General Conditions of the contract as well as provisions of Division 1 at the beginning of these specifications shall be deemed to apply and be a part of this section of the specification.

1.2 WORK INCLUDED

.1 The intent of this section of the specification is to complement the drawings in describing all of the glass and glazing work for the project.

.2 Note that the installation of glass for windows described in Sections 08 1116 and 08 50 50 of this Division is part of the work of those Sections.

1.3 EXTENDED WARRANTY

.1 Submit a warranty of the Work of this Section covering the period for four years beyond the expiration of the performance bond specified in the General Conditions.

.2 Defective Work shall include, but not be restricted to: leaking, loosening of whole or of parts of units, breakage or deformation of work, glass breakage (other than by accidental cause), seal failure and fading or discolouration of factory applied finishes.

2 PRODUCTS

2.1 WORK INCLUDED

.1 Clear Sheet Glass: to CAN2-12.2-M76 B quality.

.2 Polished Plate or Float Glass to CAN2-12.3-M76, glazing quality.

.3 Clear wired glass: to CAN2-12.11-M76, Type 1, wire mesh style 4, 1/4"

thick.

.4 Vision Glass, Insulating Glass Units: Factory sealed double glazed units. Outer lite 6mm heat resistant, colours to be light blue to match existing windows in link and dark blue, see drawings for locations. Architect to make final selection from the full range of blue colours; Inner lite 6 mm tempered, low E solar ban 60 (or ES72) on number 3 surface float glass; with a hermetically sealed space of ½" width complete with low E argon and warm edge spacer.

.5 Translucent Glass Units: Not used

.6 Spandrel panels: One lite 6mm heat strengthened glass. Clear tempered glass: to CAN2-12.1-M79, Type 2, Class B 1/4" thick. Colours: Architect to make final selection from the full range of colours. There will be two colours: Light blue and dark blue. See drawings for location.

2.2 GLAZING AND SEALING COMPOUND MATERIALS

.1 Glazing Compound: oil base, to CGSB 19-GP-6M, Type 1.

.2 Sealant Compound: one component acrylic base, to CGSB 19-GP-5M+Amdt-Nov-79, gun grade.

.3 Glazing Tape: glazing gaskets, 10-15 durometer hardness, paper release.

.4 Setting Blocks: neoprene, Shore "A" durometer hardness 70-90.

.5 Spacer shims: neoprene, Shore "A" durometer hardness 40-50.

.6 Primer-sealers and cleaners: to glass manufacturer's standard.

3 EXECUTION

3.1 WORKMANSHIP

.1 Remove protective coatings and clean contact surfaces with solvent and wipe dry.

.2 Apply primer-sealer to contact surfaces.

.3 Place setting blocks as per manufacturer's instructions.

.4 Install glass, rest on setting blocks, ensure full contact and adhesion at perimeter.

.5 Install removable stops, without displacing tape or sealant.

.6 Provide edge clearance of 1/8" minimum.

.7 Insert space shims to center glass in space. Place shims at 2'-0" o.c. and keep 1/4" below sight line.

.8 Apply cap bead of sealant at exterior void.

.9 Apply sealant to uniform and level line, flush with sightline and tooled or wiped with solvent to smooth appearance.

.10 Do not cut or abrade tempered glass.

3.2 INSTALLATION

.1 All glass units will be glazed using one of the two methods described below:

.1 Glass units shall be bedded to the exterior with Butyl tape; a heel bead of acoustic sealant shall be applied to the complete interior perimeter of the glass unit to seal the unit to the sash or frame. An interior finish of removable vinyl "Vision Strip" shall be applied and inserted into the open channel and anchored into the acoustic heel bead.

.2 Glass units shall be bedded to the exterior with Butyl tape, recessed 1/8" minimum. Fill the recess with a bead of Silglaze. Glass unit to be further bedded in a seal of acoustic sealant around the complete interior perimeter to seal glass unit to the sash or frame. An interior finish of Butyl tape shall be used to bed the interior stop to the glazing unit.

3.3 ADJUSTMENT AND CLEANING

.1 Replace scratched, etched, or defective glazing resulting from manufacture, setting, handling, or storage before or during installation.

.2 Immediately remove sealant and compound droppings from finished surfaces. Remove labels after work is completed.

END OF SECTION

1 General

1.1 GENERAL CONDITIONS

.1 The General Conditions of the contract as well as provisions of Division 1 at the beginning of these specifications shall be deemed to apply and be a part of this section of the specification.

1.2 WORK INCLUDED

.1 To complete all interior & exterior gypsum board & steel stud on walls and ceilings as shown or specified and summarized but not restricted to:

.1 Metal stud partitions.

.2 Suspended gypsum board ceilings and bulkheads.

.3 Furring systems and enclosures as described herein and indicated on drawings.

.4 Installation of pressed steel frames in steel stud partitions.

.5 Miscellaneous drywall as required to complete the project.

1.3 RELATED WORK

.1 Section 06 10 00: Rough Carpentry

.2 Section 08 11 10: Pressed Steel Frames

1.4 REFERENCE STANDARDS

.1 Do work in accordance with CSA A82.31-M1980 except where specified otherwise.

1.5 LEED DOCUMENTATION

.1 Not Used.

2 Products

2.1 GYPSUM BOARD

.1 Plain: to CSA A82.27-M1977 standard and Type X, thickness as noted on drawings, 4'-0" wide x maximum practical length, ends square cut, edges tapered.

.2 Water resistant board: to CSA A82.27-M1977 Standard ½" thick, 4'-0" wide x maximum practical length.

.3 Abuse resistant drywall to be Fiberock VHI, 5/8" thick.

.1 Acceptable Alternate: Comfort Guard IR by Temple Inland.

2.2 METAL FURRING AND SUSPENSION SYSTEMS

.1 Metal furring runners, hangers, tie wires, inserts, anchors: to CSA A82.30-M1980, galvanized.

.2 Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.

.3 Resilient drywall furring: 0.5 mm base steel thickness galvanized steel for resilient attachment of gypsum board, except 16 ga. for drywall secured to existing steel structure.

2.3 FASTENINGS AND TIES

.1 Screws: to CSA A82.31-M1980. Self-drilling, self-tapping, case hardened, Philips head, drywall screws, with corrosion resistant finish.

.2 Hangers: 9 ga. galvanized soft annealed steel wire.

2.4 ACCESSORIES

.1 Casing beads, corner beads fill type: 0.5 mm base thickness commercial grade sheet steel with Z275 zinc finish to ASTM A525M-80, perforated flanges; one piece length per location.

.2 Acoustic Sealant: to CGSB 19-GP-21M as manufactured by Tremco Manufacturing Co. or Inmont Presstite Ltd.

.3 Polyethylene: to Can 2-51.33-M80, 6 mil.

.4 Joint Compound: to CSA A82.31-M1980, asbestos free.

.5 Joint Tape: 2" x 0.012" thick, perforated paper with chamfered edges.

.6 Control Joists: Crimped rolled-formed zinc, with flanges for tape reinforcement, or two casing beads, set with gap for movement and backed with flexible air seal membrane.

.7 Special purpose made angles and channels as required and as detailed to support radiant heating panels.

2.5 PARTITION SYSTEM

.1 Interior Steel Studs: 25 ga. steel, galvanized, having knurled flanges 1 1/4" wide edges double back at least 3/16", with girts as required, and with service access holes. Sizes as indicated on drawings.

.2 Partition Runners: as specified for studs, with flanges a minimum of 7/8" high, and to suit width of studs.

.3 Bracing Channels: 18 ga. 1 1/2" x 3/4" cold rolled steel, wipe coated.

.4 Hanger Devices: Zinc coated annealed steel wire; 9 ga. to support a maximum weight of 310 lbs. per hanger.

2.6 ACOUSTIC INSULATION

.1 Type: Unfaced glass fiber acoustical insulation complying with ASTM C665, Type I.

.2 Size: to fill stud cavity.

.3 Surface Burning Characteristics:

.1 Maximum flame spread: 10

.2 Maximum smoke developed: 10

.4 Combustion Characteristics:

.1 Passes ASTM E 119 test.

.5 Sound Transmission Class: STC 45.

3 Execution

3.1 METAL STUD SYSTEM

.1 Align partition tracks at floor and ceiling and secure at 2'-0" o.c. maximum.

.2 Install damproof course under stud shoe tracks of partitions on slabs on grade.

.3 Place studs vertically at 16" o.c. and not more than 2" from abutting walls, and at each side of openings and corners. Position studs in tracks at floor and ceiling. Cross brace studs as required to provide rigid installation to manufacturer's instructions.

.4 Erect metal studding to tolerance of 1:1000.

.5 Attach studs to bottom and ceiling track using screws.

.6 Co-ordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.

.7 Co-ordinate erection of studs with installation of door/window frames and special supports or anchorage for work specified in other Sections.

.8 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified. Secure studs together, 2" apart using column clips or other approved means of fastening place alongside frame anchor clips.

.9 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs. Secure track to studs at each end, in accordance with manufacturer's instructions. Install intermediate studs above and below openings in same manner and spacing as wall studs.

.10 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.

.11 Provide 1 1/2" stud or furring channel secured between studs for attachment of fixtures behind laboratory basins, toilet and bathroom accessories, and other fixtures including grab bars and towel rails, attached to steel stud partitions.

.12 Install steel studs or furring channel between studs for attaching electrical and other boxes.

.13 Extend partitions from floor to underside of structure except where noted otherwise on drawings.

.14 Install two continuous beads of acoustical sealant under studs and tracks around perimeter of sound control partition.

.15 Install mineral wood insulation to fill steel stud cavity in exterior wall assembly.

3.2 SUSPENDED AND FURRED CEILINGS

.1 Erect hangers and runner channels for suspended gypsum board ceilings in accordance with CSA A82.31-M1980 except where specified otherwise.

.2 Support light fixtures by providing additional ceiling suspension hangers within 6" of each corner and at maximum 2'- 0" around perimeter of fixture.

.3 Support heating panels as per mechanical details.

.4 Install work level to tolerance of 1:1200.

.5 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles.

.6 Install furring channels parallel to, and at exact locations of steel stud partition header tracks.

.7 Fur for gypsum board faced vertical bulkheads within or at termination of ceilings.

.8 Fur above suspended ceilings for gypsum board fire and sound stops as indicated.

3.3 WALL FURRING

.1 Install wall furring for gypsum board wall finishes in accordance with CSA A82.31-M1980, except where specified otherwise.

.2 Fur openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.

.3 Fur beams, duct shafts, columns, pipes and exposed services where indicated.

3.4 GYPSUM BOARD APPLICATION

.1 Do not apply gypsum board until bucks, anchors, blocking, electrical and mechanical work are approved.

.2 Apply gypsum board to metal furring or framing using screw fasteners. Maximum spacing of screws 12" o.c.

.3 Extend all drywall to u/s of structure except where noted otherwise on the drawings.

.4 Where partitions call for acoustic insulation, apply 1/2" 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, ducts, etc., in partitions where perimeter sealed with acoustical sealant.

3.5 ACCESSORIES

.1 Erect accessories straight, plum 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 6"o.c.

.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 Install insulating strips continuously at edges of gypsum board or casing beads abutting metal window or exterior door frames, to provide thermal break.

.5 Install acoustic insulation where indicated on drawings.

3.6 CONTROL JOINTS

.1 Locate control joints in all gypsum board walls over 30' in length or height. Space joints at 30' on centre horizontally and vertically.

.2 Construct control joints of preformed units set in gypsum board facing and supported independently on both sides of joint.

.3 Provide continuous polyethylene dust barrier behind and across control joints.

.4 Install control joints straight and true.

3.7 TRIM

.1 Install trim as indicated.

.2 Minimize joints; use corner pieces and splicers.

3.8 ACCESS DOORS

.1 Install access doors to electrical and mechanical fixtures specified in respective Sections.

.2 Rigidly secure frames to furring or framing systems.

3.9 ACOUSTIC INSULATION AND APPLICATION

.1 Obtain installer's written report listing conditions detrimental to performance of work in this section. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

.2 Comply with manufacturer's instructions for particular conditions of installation in each case.

.3 Sound Attenuation Batts may be friction-fit in place until the interior finish is applied. Install batts to fill entire stud cavity. If stud cavity is less than 96" in height, cut lengths to friction-fit against floor and ceiling tracks. Walls with penetrations require that insulation be carefully cut to fit around outlets, junction boxes and other irregularities.

.4 Where walls are not finished on both sides of insulation does not fill the cavity depth, supplementary support must be provided to hold product in place.

.5 Where insulation must extend higher than 8 feet, temporary support shall be provided to hold product in place until the finish material is applied.

3.10 INSTALLATION OF PRESSED STEEL FRAMES IN STEEL STUD PARTITIONS

.1 Install hollow metal door frames supplied under Section 08111.

.2 Brace frames in place to prevent displacement until anchored into masonry and remove spreaders at floor after frames are anchored.

3.11 TAPING AND FILLING

.1 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.

.2 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.

.3 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after painting is completed.

.4 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.

.5 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for painting.

3.12 ADJUSTMENT AND CLEANING

.1 Remove droppings and excess of joint compound from Work of others, and from Work of this Section, before it sets.

.2 Make good to cut-outs for services and other Work, fill in defective joints, holes and other depressions with joint compound.

.3 Make good defective work, and ensure that surfaces are smooth, evenly textured and within specified tolerances to receive finish treatments.

END OF SECTION

1 General

1.1 GENERAL CONDITIONS

.1. The general conditions of the contract as well as provisions of Division 1 at the beginning of these specifications shall be deemed to apply and be a part of this section of the specification.

1.2 WORK INCLUDED

.1 Supply and install acoustic panels as specified and indicated on the drawings.

1.3 RELATED WORK

.1 Section 09 25 00: Gypsum Board

.2 Mechanical Services: See drawings.

.3 Electrical Services: See drawings.

1.4 ENVIRONMENTAL CONDITIONs

.1 Permit wet work to dry before commencement of installation.

.2 Maintain uniform minimum temperature of 15°C and humidity of 20-40% before and during installation.

.3 Store materials in work area 48 hours prior to installation.

1.5 SAMPLES

.1 Submit duplicate samples of acoustic panels in accordance with Section 01300.

1.6 EXTRA STOCK

.1 Provide three additional acoustic wall panels. Deliver to Owner as directed.

2 Products

2.1 MATERIALS

1. Sound Absorbing Acoustic Panels:

1. . Provide 2" thick panels to walls and ceilings as per drawings, 7 pound per cubic foot fibreglass with fabric covering with flame spread rating of 25 or less. Fabric to be Guilford of Maine FR 701, Style 2100. Bull-nosed edges. Colour to be selected by Architect from complete colour selection.
2. Standard of Acceptance: Fabrifinish Acoustics.
3. Acceptable Manufacturer/installer: Progressive Acoustic Interiors (49 Grandview Dr. Truro, NS, (902) 897-0642) are an acceptable alternate manufacturer/installer.

3 Execution

3.1 INSTALLATION

1. Sound Absorbing Panels:
   1. Install acoustical wall panels according to manufacturer's instructions.
   2. Install acoustical wall panels to 1"x3" wood strapping. Fill void behind panels with rigid fibreglass or mineral wool acoustic insulation.
   3. Cut wall panels neatly around mechanical and electrical fixtures, outlets, etc. Re glue fabric to match factory finish.
   4. Suspend ceiling panels as recommended by manufacturer.

3.2 ADJUSTMENT AND CLEANING

.1 Replace acoustical panels which are visibly damaged, marred or discoloured.

END OF SECTION

1 General

1.1 RELATED WORK

.1 Finish Carpentry — Section 06 20 00

.2 Doors and frames: — Section 08 11 10, 08 21 00

.3 Gypsum Board Assemblies: — Section 09 21 16

.4 Colour code marking bands for identification of piping: — Division 15

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Collect, separate and recycle all site generated waste materials.

1.3 LEED DOCUMENTATION

.1 Not Used.

1.4 REFERENCE STANDARDS

.1 The best practices specified or recommended in CAN2-85.100-M81 shall govern for materials, methods and procedures.

1.5 ENVIRONMENTAL REQUIREMENTS

.1 Do not apply paint finish in areas where dust is being generated.

.2 Ensure that all areas in which paint is applied are well-ventilated and broom clean.

.3 Do not apply paint unless a uniform minimum 50°F air temperature has been achieved in the installation area for 24 hours prior to and after application.

1.6 PROTECTION

.1 Cover or mask surface adjacent to those receiving finish to protect work of others from damage and soil.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

.1 Deliver to site each container sealed and labelled with manufacturer's name, catalogue number or brand name, colour, formulation type, reducing instructions, and reference standard specification number if applicable.

.2 Store only acceptable project materials at site, and in an area specifically set aside for purpose that is locked, ventilated, maintained at a temperature of over 4°C, and protected from direct rays of sun. Ensure that health and fire regulations are complied with in storage area.

1.8 EXTRA STOCK

.1 Deliver to Owner on completion of Work, and as he directs, sealed containers of each finish painting material applied, and in each colour. Label each container as for original, including mixing formula. Provide one litre of extra stock when less than 40 litres are used for project, 4 litres of extra stock when 40 to 50 litres are used, and 8 litres of extra stock when over 150 litres are used.

1.9 ECO-LOGO

.1 All paint products are to be "Eco-Logo" approved products. Supply appropriate certificate from manufacturer.

.2 All paints to be premium low order, zero VOC.

1.10 TECHNICAL REPRESENTATION

.1 Manufacturer's Obligations

.1 The manufacturer shall play an active role in the application of his product during the period of this contract. The manufacturer shall be represented at all these meetings by a qualified technical representative, trained as a paint inspector with a minimum of 5 years experience. The technical representative shall be approved by the Architect.

.2 The project shall be subdivided into "Sectors of Work":

.1 A minimum of three inspections per sector from the Manufacturer's representative must be made prior to and during application of this work to ensure proper application.

.2 After each visit provide a written report to the Architect within 5 working days.

.3 30 days prior to any painting, a prejob conference shall be held to confirm methods, materials, etc. for this contract. Items to be present: specifications, finish schedule, colour schedule, product data sheets - MSDS.

1.11 PREJOB CONFERENCE

.1 After the award of this contract and prior to the preparation of a mock sample area, a pre-job conference shall be held with the following people present:

.1 The Architect, Owner and Project Manager

.2 The applicator and his designated inspectors and crew supervisors who will be working on site on this project

.3 The paint manufacturer's trained paint inspector.

1.12 COLOUR SELECTION

.1 Colours will be selected by the Architect.

.2 There is no limit to the number of colours that will be selected.

2 Products

2.1 MATERIALS

.1 Acceptable Manufacturers: Benjamin Moore or approved equal.

.2 Stain and varnish finish on wood doors and millwork only flame retardant.

.3 Paint materials: to Ecologo and CGSB Standards listed in Finishing Formulae.

.4 Paint materials for each coating formulae to be products of a single manufacturer.

3 Execution

3.1 EXAMINATION

.1 Ensure that surfaces to receive finishing materials are satisfactory for specified materials; have been provided as specified in the Work of other Sections; will not adversely affect execution, permanence, or quality of Work; and can be put into an acceptable condition by means of preparation specified in this section.

.2 Defective painting and finishing Work resulting from application to unsatisfactory surfaces will be considered the responsibility of those performing the Work of this Section.

3.2 EXTENT OF WORK

.1 All new work in finished areas is to be painted.

.2 Where a room or surface is called to be painted, all work in the room or surface other than pre-finished work is to be painted.

3.3 PREPARATION OF SURFACES

.1 General:

.1 Vacuum clean interior areas immediately before finishing work commences.

.2 Remove from surfaces: grease, oil, dirt, dust, ridges, and other soil and materials that would adversely affect the adhesion or appearance of finish coatings.

.3 Rust on surfaces primed under work of other Sections shall be removed and the areas re-primed under the Work of these Sections.

.4 Finish, patch and smooth surfaces to remove cracks, holes, ridges, and similar blemishes.

.5 Touch-up damaged prime coats on shop primed metals with same priming material. Feather out edges of shop coat and smooth repair coat into shop coat surfaces.

.6 Scrub mildewed surfaces with a solution of tri-sodium phosphate, bleach with a solution of one part sodium hypochlorite (Javex) to three parts water, and rinse with clear water.

.2 Masonry:

.1 Fill minor holes and cracks in concrete, and concrete masonry with Portland cement grout.

.2 Remove dirt, scale, loose mortar, and similar foreign matter by brushing.

.3 Touch up shop paint primer on steel with CGSB 1-GP-40M to CGSB 85-GP-14M.

.4 Prepare galvanized steel and zinc coated surfaces to CGSB 85-GP-16M.

.5 Gypsum Board:

.1 Fill minor holes and depressions, caused by accidental damage, with drywall joint compound, and sand smooth when it is set, taking care not to raise nap of paper cover.

.6 Wood:

.1 For existing exterior wood: Remove all existing paint.

.2 Sand finish surfaces smooth with No. 00 sandpaper.

.3 Clean soiled surfaces with an alcohol wash.

.4 Wipe off dust and other loose dirt, or vacuum clean before application of coatings.

.5 Seal knots, pitch, and sapwood with two coats of uncut orange shellac, or an application of special sealer. Use only sealer that is compatible with transparent finish.

.6 After prime coat is dry and sanded, fill nail and screw holes, and cracks with wood filler, or with putty for interior work and caulking compound for exterior work. Colour fillers to match wood or stain if surfaces are given clear final coatings. Smooth, sand and prime fillers when set.

3.4 APPLICATION

.1 Consult with Architect before proceeding with application of finishes to surfaces for which a formula is given in specification.

.2 Apply paint to concrete block by spray and back roll method.

.3 Sand and dust between each coat to remove defects.

.4 Finish bottoms, edges, tops and cutouts of doors after fitting as specified for door surfaces.

.5 Finish closets and alcoves as specified for adjoining rooms.

.6 Apply each coat only after preceding coat is dry and hard, or as otherwise directed by material manufacturer.

.7 Priming and Back Priming:

.1 Verify, by review of other sections of this specification, the extent of surfaces primed under work of other sections. Priming of un-primed surfaces shall be included in Work of this Section.

.2 Back-prime exterior and interior woodwork, frames, fitments and similar work as soon as it is delivered and before installed. Use exterior primer compatible to finish coat for exterior work, and enamel under-coater for interior work to receive paint or enamel finishes. Prevent primer from running over faces.

.3 Back-prime exterior and interior woodwork receiving clear finishes with gloss varnish reduced 25% by mineral spirits. Prime all exterior doors and frames.

.4 Prime tops and bottoms of painted wood doors with enamel under-coater, and tops and bottoms of clear finished doors with gloss varnish. When doors are stained apply varnish after staining. Remove doors to prime and finish.

.5 Brush out and force primers into grain of wood, and into crevices, cracks and joints in all materials.

3.5 MECHANICAL AND ELECTRICAL EQUIPMENT

.1 Paint exposed conduits, pipes, hangers and other mechanical and electrical equipment occurring in finished areas. Colour and texture to match adjacent surfaces, except as noted otherwise.

.2 Paint all rooftop mechanical and electrical units and equipment, and exterior louvres, etc.

.3 Keep sprinkler heads free from paint.

.4 Paint both sides of plywood backboards for equipment before installation.

3.6 COLOURS

.1 Colours of paints, including shades of stains, shall be applied to match approved samples.

.2 Colours will be selected by the Architect.

3.7 INTERIOR FINISHES

.1 Formula 7: for gypsum board walls apply: one coat latex primer-sealer ICI #8130 Spedwall primer, two coats latex eggshell enamel. ICI #59311 No VOC Lifemaster

.2 Formula 9: for gypsum board ceilings, apply: one coat primer sealer ICI # 8130 Spedwall primer one coat flat paint ICI #59170 No VOC Lifemaster

.3 Formula 16: for primed ferrous metal surfaces apply: one coat enamel undercoat ICI # 9431 Ultra, two coats gloss enamel Devoe #4208 Devflex

.4 Formula 18: for woodwork to receive natural finish apply: one coat shellac CGSB 1-GP-16M-Amdt-Feb-81, Type 2; two coats varnish gloss CGSB 1-GP-36M, Type 1, PPG #77-5 series; one coat varnish satin finish CGSM 1-GP-36M, Type 2, PPG #77-9

.5 Formula 17: for galvanized and zinc coated metal apply (after etching): one coat galvanized metal primer two coats enamel semi-gloss enamel Devoe #4216 Devflex one coat varnish satin finish ICI #1880 Varnish

.6 Formula 20: for metal doors: one coat enamel undercoat primer Devoe # 4020 Devflex primer, two coats finish coats Devoe #4216 Devflex acrylic

.7 Formula 22: Interior metal door frames: spray two coats Devoe #4216 Devflex in desired colour-satin finish

.8 Formula 24: for insulation covering apply: one coat tinted enamel undercoat ICI # 250 Gripper, one coat egg shell enamel ICI # 59311 No VOC Lifemaster

3.8 EXTERIOR FINISHES

.1 Formula 30: for galvanized and zinc coated metal apply: New spancaled galvanized metal - Abrade with fine sand paper to remove passivation. Apply: 1 coat Pitt-Tech Primer, Devoe # 4020 Devflex Primer, 2 coats Pitt-Tech Gloss, Devoe #4208 Devflex

.2 Formula 31: for all exterior doors, frames, miscellaneous trim, mechanical and electrical equipment: 1 coat Pitt-Tech Primer, Devoe #4020 Devflex Primer, 2 coats Pitt-Tech Gloss, Devoe #4208 Devflex

END OF SECTION

1 General

1.1 DESCRIPTION

.1 Work Included: To supply and install bath accessories as shown or specified.

.2 Section Includes: Furnish, deliver and install all Bathroom Accessories as indicated on the drawings and as required by actual conditions at the building.

1.2 SUBMITTALS

.1 Samples: Submit samples of accessories that are requested.

.2 Shop Drawings: Submit shop drawings in accordance with Section 01 33 00 indicating materials, finish, hardware, attachment devices, building-in details and mounting heights.

1.3 PRODUCT DELIVERY, STORAGE & HANDLING

.1 Package accessories and label with description of contents and installation location.

.2 Deliver accessories where designated at site by Contractor.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Collect, separate and recycle all site generated waste materials.

2 Products

2.1 WASHROOM ACCESSORIES

.1 Specified manufacturer's catalogue references establish minimum acceptable standards for Work of this Section.

.2 Unspecified materials which form a part of complete assemblies shall be of manufacturer's standard.

2.2 ACCESSORY LIST

.1 Toilet Tissue Dispensers:

.1 Location: One at each toilet

.2 Supplied by toilet tissue supplier, installed by this section

.2 Grab Bars/Towel Bars:

.1 Location:

.1 2 in washroom:

.1 1 x 24" Bobrick B5806.99

.2 1 x 30" Bobrick B5806.99

.2 Construction:

.1 Tube: Min. 1 1/4" dia. 304 stainless steel

.2 Flanges: 3" nom. dia. Concealed mounting flange

.3 Finish: Satin finish, Peened grip

.3 Model: as noted

.4 Acceptable Alternatives

.1 Bradley 832: 1 1/4" Heavy Duty stainless Steel Grab bar with concealed mounting.

.2 ASI 3800p

.3 Tilt Mirror:

.1 Location: One per Accessible Washroom

.2 Size – 18” x 36”

.3 Construction: Frame: Type 304 stainless steel, satin finish

.4 Glass: 1/4" No. 1 Quality float/plate glass mirror

.5 Mounting: Recess mounted

.6 Model: Bobrick B-293 - 1836

.7 Acceptable Alternatives

.1 Bradley 740

.2 ASI 0535A

.4 Soap Dispensers, Tissue holders, paper towel holders:

.1 Location: As per Drawings

.2 To be provided by owner and installed by this contractor

.5 Robe Hooks:

.1 Location: One in each washroom

.2 Construction: One piece brass casting with satin nickel plated finish

.3 Mounting: Locks to wall plate for theft proof mounting

.4 Model: Bobrick B-2116 or Gamco RH2S or ASI 0751

2.3 FABRICATION

.1 Include reinforcing, anchorage and mounting devices required for the installation of each product.

.2 Fit joints and junctions between components tightly and in true planes, conceal and weld joints where possible.

.3 Fabricate products with materials and component sizes, metal gauges, hardware, reinforcing, anchors, and fastenings of adequate strength to ensure that Work will remain free of warping, buckling, opening of joints and seams, and distortion within limits of intended use.

3 Execution

3.1 INSTALLATION

.1 Provide manufacturer's handling instructions, anchorage information, roughing-in dimensions, and templates for installation of Work of this Section.

.2 Install Work only as specified by manufacturer.

.3 Verify location and mounting heights of products with Architect before roughing-in or installation.

.4 Install Work plumb, level, straight, tight and secure to mounting surfaces, and centred between joints on masonry and tile walls.

.5 Attach accessories to walls with only:

.1 1 1/2" long expansion shields in solid masonry or in concrete

.2 toggle bolts in cells of hollow masonry units

.3 sheet metal screws into metal framing at metal stud partitions

.4 wood screws into wood framing

.6 Use only fasteners that match material and finish of fastened Work where exposed to view.

.7 Ensure that grab bars are installed to withstand a minimum downward force of 900 lbs. per grab bar. Test to be completed in presence of Architectural Rep

3.2 ADJUSTMENT AND CLEANING

.1 Adjust operating units to ensure free-acting, tightly closing and properly function operation. Lubricate as required.

.2 Refinish damaged or deflective Work so that no variation in surface appearance is discernible. Refinish Work at site only if approved.

.3 Final cleaning is specified in Section 01 70 00.

END OF SECTION

General

1.1 DESCRIPTION

.1 Work Included: To supply and install washroom accessories as shown or specified.

Section Includes:
Furnish, deliver and install all Washroom Accessories as indicated on the drawings and as required by actual conditions at the building.

1.2 SUBMITTALS

.1 Samples: Submit samples of accessories that are requested.

.2 Shop Drawings: Submit shop drawings in accordance with Section 01 33 00 indicating materials, finish, hardware, attachment devices, building-in details and mounting heights.

1.3 PRODUCT DELIVERY, STORAGE & HANDLING

.1 Package accessories and label with description of contents and installation location.

.2 Deliver accessories where designated at site by Contractor.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Collect, separate and recycle all site generated waste materials.

2 Products

2.1 WASHROOM ACCESSORIES

.1 Specified manufacturer's catalogue references establish minimum acceptable standards for Work of this Section.

.2 Unspecified materials which form a part of complete assemblies shall be of manufacturer's standard.

2.2 ACCESSORY LIST

.1 Toilet Tissue Dispensers:
Location: One at each toilet
Supplied by toilet tissue supplier, installed by this section

.2 Grab Bars/Towel Bars:
Location:
2x30 ” in each Bathroom – Bobrick B5806.99 x 24
Construction: Tube: Min. 1 1/4" dia. 304 stainless steel
Flanges: 3" nom. dia. Concealed mounting flange
Finish: Satin finish, Peened grip

Model: as noted

.3 Tilt Mirror:
Location: Where indicated on Drawings
Construction: Existing mirrors to be salvaged and re-installed by this contractor.

.7 Soap Dispensers, Tissue holders, paper towel holders:
Location: As per Drawings
Existing will be salvaged and re-installed by this contractor

.9 Horizontal Wall Mounted Baby Changing Station:
Location: Where indicated on Drawings
Construction: 18-gauge, type 304 satin stainless steel exterior finish with molded grey color polyethylene interior. Unit 35 ¼" W, 20" H (890 x 510 mm). Depth (closed) 4' (100 mm). Extension 15 3/16" (385mm)
Model: Bobrick KB110-SSWM

10. Counter Bracket:
Location: Where indicated on Drawings
Construction: 24 – ¼" Large Basic Work Surface Support - #SWS4-92 Grey
Size: 24 ¼" x 18 ¼" – 400 lb capacity per- pair.
Maximum work surface depth 24"

2.3 FABRICATION

.1 Include reinforcing, anchorage and mounting devices required for the installation of each product.

.2 Fit joints and junctions between components tightly and in true planes, conceal and weld joints where possible.

.3 Fabricate products with materials and component sizes, metal gauges, hardware, reinforcing, anchors, and fastenings of adequate strength to ensure that Work will remain free of warping, buckling, opening of joints and seams, and distortion within limits of intended use.

3 Execution

3.1 INSTALLATION

.1 Provide manufacturer's handling instructions, anchorage information, roughing-in dimensions, and templates for installation of Work of this Section.

.2 Install Work only as specified by manufacturer.

.3 Verify location and mounting heights of products with Architect before roughing-in or installation.

.4 Install Work plumb, level, straight, tight and secure to mounting surfaces, and centred between joints on masonry and tile walls.

.5 Attach accessories to walls with only:
- 1 1/2" long expansion shields in solid masonry or in concrete
- toggle bolts in cells of hollow masonry units
- sheet metal screws into metal framing at metal stud partitions
- wood screws into wood framing

.6 Use only fasteners that match material and finish of fastened Work where exposed to view.

.7 Ensure that grab bars are installed to withstand a minimum downward force of 900 lbs. per grab bar. Test to be completed in presence of Architectural Rep

.8 Provide all blocking for installation of all accessories.
- Swing up grab bars – provide 2 layers of ¾" plywood to all swing up grab bars, etc.
- Baby Change Table – Provide 2 layer of ¾" plywood in Baby change table.

3.2 ADJUSTMENT AND CLEANING

.1 Adjust operating units to ensure free-acting, tightly closing and properly function operation. Lubricate as required.

.2 Refinish damaged or deflective Work so that no variation in surface appearance is discernible. Refinish Work at site only if approved.

.3 Final cleaning is specified in Section 01 70 00.

END OF SECTION

1 General

1.1 DESCRIPTION

.1 Work included: To complete excavation, placement and compaction of earth including the addition and/or disposal of earth necessary to complete as shown, specified or required and summarized but not restricted to:

.1 Refer to 01 00 00 for detailed scope of work.

1.2 TESTS AND INSPECTIONS

.1 Do not begin backfilling or filling operations until material has been approved for use by the Architect.

.2 Not later than 48 h before backfilling or filling with approved material, notify Architect so that compaction tests can be carried out by the designated testing agency. Compaction testing Agency will be selected and paid for by the Owner. Submit for Architect's approval, a program and schedule of tests.

1.3 JOB CONDITIONS

.1 Existing Conditions

.1 Protect adjacent property from damage by excavating, trenching, and grading work; by removing, stockpiling, and transporting of materials; by blown sand, dirt, and dust during Work; by collapse or movement of excavated banks and stockpiles; and by storm water from altered drainage courses.

.2 Immediately repair damage to trees, buried and above-ground services, bench marks, and survey monuments should it occur.

.2 Protection

.1 Support existing walks, roads, and services. Prevent cave-ins of excavated banks.

.2 Prevent damage to sides and bottoms of excavated pits and trenches from exposure to sun and rain which would cause cave-ins or softening of beds on which foundations and drains rest. Prevent flow of water and earth fines into excavated pits and trenches. Seal or divert flow from springs that fill excavations.

.3 Bail, pump out, or divert water from excavations, from whatever cause, as it accumulates, and until the time foundations are placed. Pumping pits shall be below excavation depths.

.4 Protect newly graded and filled areas from washouts and settlements caused by rain and water drainage. Fill and grade settled or washed out areas to required levels and slopes under Work of this Section, before completion of Project.

1.4 BURIED SERVICES

.1 Before commencing work verify the location of all buried services on and adjacent to the site.

2 Products

2.1 MATERIALS

2.2 FILL AND BEDDING AGGREGATE:

.1 Fill Type 1: For fill against walls to be waterproofed. A 3/4" blend of crushed stone or crushed gravel, of uniform grading and quality, and grades within the following limits as expressed by the percentage of aggregate passing dimensioned square sieve openings:

.1 100% - 1"; 85 to 100% - 3/4"; 55 to 100% - 5/8"; 30 to 70% - 1/2"; 15 to 40% - 3/8". No more than 10% may pass a #4 screen.

2.3 PROTECTION BOARD

.1 Cement board panels, min 1/2" thick, in 8' lengths.

3 Execution

3.1 EXAMINATION

.1 Ensure in examination of the site that all possible factors concerning earthwork are investigated, and that the following are known in particular:

.1 Methods and means available for material handling, disposal, storage, and transportation.

.2 Physical conditions of site, including ground water table and drainage courses.

.3 Conformation and condition of ground surfaces.

.4 Character, quality, and quantity of surface materials.

3.2 PREPARATION

.1 Top Soil: Remove topsoil completely from areas of excavation for construction, f Store good topsoil, acceptable for reuse, in stockpiles as directed by Architect and provide measured quantity of stockpiled material immediately after stripping. Remove surplus topsoil from site.

.2 Unsuitable Soil: Completely remove unstable soil and soil containing humus, sod, roots, and organic debris from under areas which are to receive pavement, slabs, surfacing, or other construction.

3.3 EXCAVATION GENERALLY

.1 Excavate beyond wall faces sufficiently to allow for installation insulation, min 48" horizontally and 24" deep, or more where indicated on drawings.

.2 Dispose of all excess and unsuitable excavated materials away from site.

.3 Observe the rules and regulations governing the respective utilities during excavation. Report existing un-located services encountered, and do not continue with excavation without directions. Repair damages to services should they occur.

.4 Protect from freezing excavated surfaces against which concrete or fill is placed.

3.4 INSULATION

.1 Install insulation as per drawings.

3.5 PROTECTION BOARD

.1 Install top of protection board level with top of floor slab.

.2 Install protection. board level and true.

.3 Bottom of protection board to be a minimum of 30" below finish floor level, and more where indicated on drawings.

.4 Install protection board in 8' lengths, full height of excavation, except where shorter pieces are required at building corners etc.

.5 Install protection tight to insulation with edges tightly butted together.

.6 Hold protection board in place until backfilling is completed.

3.6 COMPACTION DENSITY

.1 Compact fill to the following minimum densities in accordance with specified reference standards:

.1 Backfilling of walls to 98% standard Proctor.

.2 Under concrete paving and asphalt paving to 100% Standard Proctor.

3.7 SERVICE TRENCH EXCAVATING, BEDDING AND BACKFILLING

.1 Service trenches: where encountered:

.1 Ensure that trenches have been inspected and approved before backfilling commences.

.2 Bedding: Place bedding materials in trenches for underground services at sides of pipes simultaneously and in layers of 6" maximum depth, in full width of trench. Compact to 95% Standard Proctor compaction density. Center pipes, on trenches.

.3 Place granular bedding material around pipe.

.1 Note: Plastic pipes require 2" of crusher dust all round.

.2 Electrical Trenches Exterior to Building: Place plastic "Buried Cable" marker 6" below finished grade over buried electrical service

3.8 FIELD QUALITY CONTROL

.1 Submit affidavits that fill materials placed under Work of this Section have been compacted to specified density and approved by the soils consultant.

.2 Inspection and testing will include:

.1 Submit for Architect's approval a program and schedule of tests.

.2 Sampling of fill materials intended for use to determine:

.1 natural moisture content.

.2 optimum moisture and density.

.3 amount of moisture to be deleted from or added to fill to ensure correct moisture content for compaction and maximum density.

.3 Verification that sub-grade has been compacted to specified density.

.4 Verification that fill has been placed and compacted as specified and to specified compaction density.

.3 .Submit required material samples to inspection and testing company as directed.

3.9 ADJUSTMENT

.1 Replacement of Defective Work: Correct and make good areas where settlement has occurred during the guarantee period of Contract.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 This section specifies requirements for constructing chain link fence. Work includes excavation; supply and installation of concrete footings, chain link fence, gates and accessories, and reinstatement.

1.2 REFERENCES

.1	CAN/CGSB-138.1-M	Fabric for Chain Link Fence
.2	CAN/CGSB-138.2-M	Steel Framework for Chain Link Fence
.3	CAN/CGSB-138.3-M	Installation of Chain Link Fence
.4	CAN/CGSB-138.4-M	Gates for Chain Link Fence
.5	CAN/CGSB-1.181	Organic Zinc-Rich Coating

1.3 CERTIFICATES

.1 Submit manufacturer's test data and certification that products and materials meet the requirements of the section.

1.4 SUBMITTALS

.1 Submit shop drawings for fence and gateS to Consultant for approval.

1.5 HANDLING AND STORAGE

.1 Handle and store fence materials in such a manner as to avoid damage. Do not damage coatings.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Collect, separate and recycle all site generated waste material.

PART 2 PRODUCTS

2.1 GENERAL

.1 Height, fabric type and style, class and grade of coating as indicated.

2.2 MATERIALS

.1 Concrete mixes and materials: Cast-in-place concrete with compressive strength 20MPa minimum at 28 days.

.2 Chain-link fence fabric and coating: to CAN/CGSB-138.1.
- .1 Type 1, Class A, galvanized 9 gauge wire, knuckled selvedge top and bottom.
- .2 Height of fabric: as indicated.

.3 Posts, braces and rails: to CAN/CGSB-138.2. Schedule 40, galvanized steel pipe. Dimensions in accordance with the following:

FENCE HEIGHT (Metres) 2.0

LINE POSTS	
O.D. (mm)	60.3
Length (m)	to suit fence height
END, & CORNER POSTS	
O.D. (mm)	88.9
Length (m)	to suit fence height
GATE POSTS	
O.D. (mm)	150
Length (m)	to suit fence height
RAILS	
O.D. (mm)	42.2

.4 Top and bottom tension wire: to CAN/CGSB-138.1, Table 2, single strand, galvanized steel wire, 5 mm diameter.

.5 Tie wire fasteners: to CAN/CGSB-138.1, Table 4 aluminum wire.

.6 Tension bar: to ASTM A525M, 5 mm x 20 mm minimum galvanized steel.

.7 Gate and accessories: to CAN/CGSB-138.4, type as indicated.

1. Framing dimensions in accordance with the following table:

GATE TYPE	OPENING (m)	FRAMING OD (mm)	FRAMING WALL THICKNESS (mm)
Double and Single swing- refer to drawings		48.3	2.5

2. Fabricate gates with electrically welded joints, and hot-dip galvanized after welding.

3. Furnish gates with galvanized malleable iron hinges, latch and latch catch with provision for padlock which can be attached and operated from either side of installed gate.

.8 Fittings and hardware: to CAN/CGSB-138.2, cast aluminum alloy, galvanized steel or malleable or ductile cast iron. Tension bar bands: 3 mm x 20 mm minimum galvanized steel or 5 mm x 20 mm minimum aluminum. Post caps to provide waterproof fit, to fasten securely over posts and to carry top rail. Turnbuckles to be drop forged.

.9 Organic zinc rich coating: to CAN/CGSB-1.181.

PART 3 EXECUTION

3.1 GRADING

.1 Remove debris and correct ground undulations along fence line to obtain smooth uniform gradient between posts. Provide clearance between bottom of fence and ground surface of 30 mm to 50 mm.

3.2 ERECTION OF FENCE

.1 Erect fence along lines as indicated and in accordance with CAN/CGSB-138.3.

.2 Excavate post holes for straining, corner, end and gates posts to depth of 1.2 metres minimum by methods approved by Consultant. All other line posts to be installed by pneumatic driver.

.3 Install line posts maximum 3.0 m apart max., measured parallel to ground surface. Line posts to be pneumatically driven using a pneumatic fence post driver (Rhino post driver or approved equivalent).

.4 Install end post at end of fence. Install gate posts on both sides of gate openings.

.5 Install straining posts at sharp changes of grade and where directed by Consultant.

.6 Install corner posts where change in alignment exceeds 10 degrees.

.7 Place concrete in post holes (gate, straining, corner and end only), then embed posts in concrete to depths indicated. Extend concrete 50mm above ground level and slope to drain away from posts. Brace to hold posts in plumb position and true to alignment and elevation until concrete has set.

.8 When setting posts in bedrock, depth and diameter of drill holes and grouting compound shall be as approved by Consultant.

.9 Do not install fence fabric until concrete has cured sufficiently.

.10 Install brace between end and gate posts and nearest line post, placed in centre of panel and parallel to ground surface. Install braces on both sides of corner and straining posts in similar manner.

.11 Install caps on posts and gate frames.

.12 Install top rail between posts and fasten securely to posts and secure waterproof caps.

.13 Install bottom tension wire; stretch tightly and fasten securely to end, corner, gate and straining posts with turnbuckles and tension bar bands.

.14 Lay out fence fabric. Stretch tightly to tension recommended by manufacturer and fasten to end, corner, gate and straining posts with tension bar secured to post with tension bar bands spaced at 300 mm intervals. Knuckled selvedge at top
and bottom.

.15 Secure fabric to top rails, line posts and bottom tension wire with tie wires at 450 mm intervals. Give tie wires minimum two twists.

.16 Where posts sit on a concrete pad provide base plates as required.

3.3 INSTALLATION OF GATES

.1 Install gate in location indicated on drawing A100.

.2 Level ground between gate posts and set gate approximately 50mm above ground surface.

.3 Cast gate rests in concrete as directed. Dome concrete above ground level to shed water.

.4 Install gate stops as directed.

.5 Install hardware to accept padlocks to secure gate as indicated.

3.4 TOUCH UP

.1 Clean damaged surfaces with wire brush, removing loose and cracked coatings. Apply two coats of organic zinc-rich paint to damaged areas. Pre-treat damaged surfaces according to manufacturer's instructions for zinc-rich paint.

3.5 CLEANING

.1 Clean and trim areas disturbed by operations. Dispose of surplus material and replace damaged asphalt or gravels with new asphalt or gravels, and turf with 150mm topsoil and sod as directed by Consultant.

END OF SECTION

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 01 are part of and to be read in conjunction with this Section.

.2 This section covers items common to all sections of Division 20, 21, 22, 23, 24 and 25.

1.2 RELATED SECTIONS THAT ARE PART OF DIVISION 20 TO 25 WORK

.1 Section 25 05 01 BAS: General Requirements

1.3 INTENT

.1 It is the intent of these specifications to outline the method, materials, and quality of equipment to be furnished and installed hereinafter specified and/or shown on the drawings.

.2 The Mechanical Contractor shall be responsible for the installation of all equipment, materials, and accessories, and the labour required for the completion of this contract to the full satisfaction and acceptance of the Consultant. Misinterpretation of either the drawings or the specifications will not relieve the Contractor of responsibility.

1.4 DEFINITIONS

.1 "CONCEALED" - mechanical services and equipment in hung ceiling spaces and non-accessible chases and furred spaces.

.2 "EXPOSED" - will mean "not concealed" as defined herein.

.3 "Domestic Water" includes domestic cold water, domestic hot water, tempered hot water.

.4 “Provide” will mean “Supply and install”.

1.5 REFERENCE STANDARDS

.1 The most stringent requirements of local municipal by-laws, provincial codes and following codes and standards shall be followed.

.2 In no instance shall the Standard established by the contract documents be reduced by the application of any other codes.

.3 General

.1 Nova Scotia Building Code Regulations Effective April 1, 2017.

.2 National Building Code of Canada - 2015.

.3 National Fire Code of Canada - 2015.
.4 National Plumbing Code of Canada - 2015.
.5 The following standards/codes are referenced in the above codes:
  .1 ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
  .2 ASTM A795/A795M Standard Specification for Black and Hot-Dipped
  .3 CSA B52 Mechanical Refrigeration Code.
  .4 CSA C22.1 Canadian Electrical Code, Part 1 Safety Standard for Electrical Installations.
  .5 CSA C22.2 No. 155 Electric Duct Heaters.
  .6 SMACNA Round Industrial Duct Construction Standards
  .7 TIAC Mechanical Insulation Best Practice Guide

1.6 EQUIPMENT INSTALLATION

.1 Unions or flanges: provide for ease of maintenance and disassembly.

.2 Space for servicing, disassembly and removal of equipment and components: provide as recommended by manufacturer or as indicated.

.3 Equipment drains: pipe to floor drains.

.4 Install equipment, rectangular cleanouts and similar items parallel to or perpendicular to building lines.

1.7 ANCHOR BOLTS AND TEMPLATES

.1 Supply anchor bolts and templates for installation by other divisions.

1.8 COORDINATION

.1 Closely coordinate the installation of Plumbing System piping and placement of Plumbing System equipment with other Trade Contractors, including but not limited to, Structural steel Contractor, Ceiling Contractor, Air Distribution Contractor, Controls Contractor and Electrical Contractor

.2 Closely coordinate the installation of Air Distribution System piping and placement of Air Distribution System equipment with other Trade Contractors, including but not limited to, Structural steel Contractor, Plumbing Contractor, Controls Contractor and Electrical Contractor

.3 Closely coordinate the installation of Controls System and placement of Controls System equipment with other Trade Contractors, including but not limited to, Plumbing Contractor, Heating Contractor, Air Distribution Contractor and Electrical Contractor.

1.9 ELECTRICAL

.1 Electrical work to conform to Electrical Contract including the following:

.1 Supplier and installer responsibility is indicated in Motor, Control and Equipment Schedule on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings.

.2 Control wiring and conduit is specified in Electrical Contract except for conduit, wiring and connections which are related to mechanical control systems specified in Mechanical Contractor. Refer to Electrical Contract for quality of materials and workmanship.

.2

Coordinate with Electrical Contractor to ensure that all controlled equipment is correctly connected for operation in accordance with plans and specifications, including supplying all necessary electrical interconnection information and location to Electrical Contractor.

1.10 EXISTING SYSTEMS

.1 Connections into existing systems to be made at time approved by Consultant. Request written approval of time when connections can be made.

.2 Be responsible for damage to existing plant by this work.

.3 Ensure that all plumbing, heating, ventilation and other mechanical systems and services remain operational during the course of the renovation of the existing building and, if necessary, this Contractor shall be responsible for providing such temporary services by cutting off, altering, adapting, relocating and connecting existing services and disconnecting and removing such temporary or existing services upon providing new permanent services as detailed on all drawings. The site shall be examined to determine the extent of the temporary services and all co-ordination shall be made with the Owner's Representative. All costs shall be included in the Tender Price.

.4 Existing equipment, piping, ducting, etc. not being re-used under new schemes, shall be removed whether shown on drawings or not. The General Contractor shall repair all openings resulting from the removal of existing mechanical equipment and services. All costs shall be included in the Tender Price.

1.11 CUTTING AND PATCHING

.1 Refer to Division 01.

1.12 DRAWINGS

.1 The drawings accompanying this specification are to be considered as diagrammatic only and do not show all the structural and construction details. Any information involving measurements of the building shall be taken from the architectural and structural drawings, and at the building site. Make without additional charge any necessary changes or additions to the runs to accommodate structural conditions.

.2 The Mechanical drawings are not to be scaled.

.3 The drawings and the specifications shall be considered an integral part of the contract documents. Neither the drawings nor the specifications shall be used alone. Misinterpretation of any requirements of either plans or specifications shall not change the requirements of the specifications for proper completion of the work to the full approval of the Consultant.

.4 Except where dimensioned, indicate general Mechanical layouts only. Because of the small scale of Mechanical drawings, it is not possible to show all offsets, fittings and accessories which may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves and accessories which are required to meet the conditions.

.5 The drawings indicate the general location and route to be followed by the pipes, ducts, conduits, etc., which are installed under this contract. Where the required conduit work, piping, ductwork, etc., is not shown on the plans or only shown diagrammatically, these shall be installed as tight as possible to structural members, concrete, ceilings, and walls to interfere as little as possible with the free use of the space through which they pass.

.6 The drawings and specifications are intended to supplement each other so that any details shown on the drawings are not mentioned in the specifications, or vice versa, shall be executed in the same manner as if contained in the specifications and shown on the drawings.

.7 Should any discrepancy appear between these specifications and the drawings to cause doubt as to the true meaning and intent of the drawings ad specifications, a ruling shall be obtained from the Consultant before submitting the tender. If this is not done it will be assumed that the more expensive alternative has been included in the contract.

.8 Layouts on the Mechanical drawings are based on the specified equipment, including mechanical and electrical connections and physical dimensions. Alternate equipment and systems proposed by the Contractor for use on this project, which necessitates changes in service connections to perform the specified functions may be considered by the Consultant, however, any required modifications or additions shall be done at no additional cost to the Owner. Furthermore, if it is found that the provisions made regarding space conditions and code required clearances are not met, the right is reserved by the Consultant to require installation of the equipment specified.

1.13 CONTRACT DOCUMENTS

.1 Before submitting tender for his work, each Contractor shall examine the contract documents (entire specifications, electrical drawings, structural drawings and architectural drawings) to ascertain that the work can be carried out as shown on these drawings and herein specified. No extra will subsequently be allowed to cover any omission and/or oversight for not having made a thorough inspection of the contract documents.

1.14 EXAMINE THE SITE AND CONDITIONS

.1 Each Contractor shall visit and examine the site and the local conditions affecting this work. No allowance will be made later for any expenses occurred through failure to make these examinations.

1.15 USE OF MECHANICAL SYSTEMS DURING CONSTRUCTION

.1 **Use of the permanent ventilating systems for supplying ventilation during the construction period is not permitted.**

.2 **Use of the permanent heating equipment within the boiler room for supplying heat during the construction period is not permitted.**

1.16 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with the Project Waste Reduction Workplan. Refer to Division 01.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Project Waste Management Plan

1.17 LOW VOC MATERIALS

.1 All site applied coatings, adhesives & sealants must conform to low VOC content requirements.

.2 Provide Material Safety Data Sheets for all products and materials of these types incorporated into the work.

2 Products

2.1 MATERIAL

.1 For the purpose of uniformity similar materials shall be by one manufacturer.

.2 Standard of Acceptance and/or Acceptable Material:

.1 Means that item named and specified by manufacturer and/or catalogue number forms part of specification and sets standard regarding performance, quality of material and workmanship and when used in conjunction with a referenced standard, shall be deemed to supplement the standard.

.3 Acceptable Manufacturer:

.1 Means that item manufactured by named and specified manufacturer, meeting the specification and referenced standard regarding performance, space constraints, electrical requirements, quality of material and workmanship shall be deemed acceptable.

.4 Refer to "Instruction to Bidders" for method of applying for Alternatives Products/Systems prior to close of tender.

2.2 ELECTRICAL DEVICES AND PANELS.

.1 All electrical equipment and devices to be CSA certified and manufactured to standard quoted.

.2 The assembly of combinations of electrical components, such as, relays, current transformers, BAS devices, transformers, fuse blocks, transducers or other certified components in an enclosure to form an overall electrical assembly shall be CSA certified.

.3 Where field modifications are made to certified electrical equipment, arrange and pay for field certification by CSA.

2.3 MOTORS

.1 Provide motors for mechanical equipment as specified.

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

.3 3 phase motors, 745 Watts (1.0 HP) and larger: Minimum (NEMA Premium) nominal efficiency in accordance with CAN/CSA C390 "*Test Methods, Marking Requirements and Energy Efficiency Levels for Three-Phase Induction Motors*"

.4 Motors under 370 Watts (1/2 HP): speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, 120 V, 60 Hertz, unless otherwise specified or indicated.

.5 Motors 370 Watts (1/2 HP) and larger: EEMAC Class B, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, 3 phase, 208 V, 60 Hertz, maximum temperature rise 40° C, unless otherwise specified or indicated.

.6 Service factor 1.15.

.7 Totally enclosed fan cooled (TEFC) where specified.

2.4 BELT DRIVES

.1 Fit reinforced belts in sheaves 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 7.5kW (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 7.5kW (10 HP) and over: sheaves with split tapered bushing and keyway having fixed pitch unless specifically required for item concerned. Provide sheaves of correct size to suit balancing.

.5 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.

2.5 GUARDS

.1 Provide guards for unprotected drives.

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

.3 Guards for belt drives:
- .1 Expanded metal screen welded to steel frame.
- .2 Minimum 1.3 mm (18 Ga.) thick sheet metal tops and bottoms.
- .3 38 mm (1 1/2") diameter holes on both shaft centers for insertion of tachometer.
- .4 Removable for servicing.

.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 (16 Ga.) 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, 20 mm (3/4") 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 EQUIPMENT SUPPORTS

.1 Equipment supports supplied by equipment manufacturer: specified elsewhere in Mechanical Contractor.

.2 Equipment supports not supplied by equipment manufacturer: fabricate from structural grade steel.

.3 Exterior supports to be hot dipped galvanized. Touch up field welds and bolt holes with cold galvanized paint

.4 Mount interior base mounted equipment on chamfered edge housekeeping pads, supplied by General Contractor.
- .1 Nominal 100 mm (4") high and minimum 100 mm (4") larger all around than equipment.
- .2 Slabs to be pinned to floor by General Contractor.
- .3 Provide detailed drawing to Others showing location of pads.
- .4 Ensure bases are level prior to placement of equipment.

.5 Mount exterior base mounted equipment on chamfered edge reinforced housekeeping pads, supplied by General Contractor.
- .1 Minimum 300 mm (12") high and minimum 100 mm (4") larger all around than equipment.
- .2 Provide detailed drawing to Others showing location of pads.
- .3 Ensure bases are level prior to placement of equipment.

2.7 PAINT

.1 Apply at least one coat of primer paint to ferrous supports, pipe hangers and site fabricated work.

.2 Primer to be The Master Painters Institute MPI #23 with VOC < 351 grains/L

2.8 PIPE PENETRATION THROUGH WALLS AND FLOOR

.1 Do not grout or bond drainage waste and vent piping and domestic water solid to walls or floors.

.2 For all waste piping, plumbing vent piping, domestic water and control conduits through all masonry walls, provide cylindrical sleeves. Maintain a minimum uniform 1/4" (6 mm) clearance all around or as required for smoke seal, acoustic seal and/or fire stopping.

.3 For all drainage waste piping, plumbing vent piping, domestic water, and control conduits through all drywall walls, coordinate with other trades to ensure there is minimum uniform 6 mm clearance all around or as required for smoke seal, acoustic seal and/or fire stopping.

.4 Insulation on domestic cold water piping and hydronic piping to be continuous through Walls.

.5 Ensure no contact between copper tube / pipe and ferrous sleeve or concrete.

.6 Coat exposed exterior surface of ferrous sleeves with heavy application of zinc rich paint to CAN/CGSB-1.181-92 coating, zinc-rich organic, ready mixed.

2.9 PIPE SLEEVES

.1 For walls, provide 1.6 mm (16 Ga.) galvanized round sleeves with tack welded longitudinal joints.

.2 Center sleeves on centerline of pipe.

2.10 DUCT SLEEVES

.1 Refer to Section 24 33 16 Dampers-Fire and details on drawings for sleeves at fire dampers.
- .1 Clearance between wall and sleeve shall not exceed requirements.

2.11 SMOKE SEAL AND/OR ACOUSTIC SEAL

.1 Firestop all pipe penetration through fire rated walls and fire rated floor.
- .1 Refer to Section 20 05 04 Firestopping for Mechanical

.2 Where non rated walls extend from floor to floor or floor to roof deck and non-rated floors.
- .1 Smoke seal and/or acoustic seal all pipes, both sides of wall/floor.
- .2 Smoke seal and/or acoustic seal between duct and wall, both sides of wall/floor.

2.12 FIRESTOPPING

.1 Firestopping material and installation within annular space between pipes, ducts, insulation and adjacent fire separation
- .1 Refer to Section 20 05 02 Mechanical Submittals for firestopping submittals.
- .2 Refer to Section 20 05 04 Firestopping for Mechanical and Section 07 84 00 Firestopping.

2.13 ESCUTCHEONS

.1 On pipes passing through walls, partitions, floors and ceilings in finished areas.

.2 Chrome or nickel plated brass or Type 302 stainless steel, split piece type.
- .1 Standard of Acceptance:
  - .1 Grinnell Fig 2 and 13.

.3 Outside diameter to cover opening or sleeve.

.4 Inside diameter to fit around finished pipe.

2.14 ACCESS DOORS

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

.2 Size:
- .1 Sized to access concealed services
- .2 Minimum 600 x 600 mm (24" x 24") for body entry
- .3 Minimum 300 x 300 mm (12" x 12") for hand entry
- .4 Minimum 150 mm (6”) larger than access door in ductwork.
- .5 Unless otherwise noted.

.3 Door flush with frame.

.4 For unrated construction
- .1 Allen Key lock(es)
- .2 Flat door type
  - .1 Rounded safety corners
  - .2 One piece outer flange welded to mounting frame
  - .3 One piece concealed hinge
- .3 Formed door type

.5 For fire rated construction
- .1 Pull ring or raised knurled knob operated latch bolt
- .2 Interior latch release
- .3 Automatic closer
- .4 Hinged door
- .5 Flanged frame
- .6 For walls:
  - .1 1- 1/2 hour 'B' label
- .7 For ceiling membrane:
  - .1 1 hour label

.6 Material:
- .1 Special areas such as tiled or marble surfaces: use stainless steel with brushed satin or polished finish as directed by Consultant.
- .2 Remaining areas: use prime coated steel.

.7 Installation:
- .1 Locate so that concealed items are accessible.
- .2 Locate so that hand or body entry (as applicable) is achieved.
- .3 Install in accordance with manufacturer's recommendation

.8 Acceptable material:

	Unrated Walls	**Fire Rated Walls**	**Fire Rated Ceilings**
Acudor	EB-2002 or UF-5000	FB-5050	FW-5050
Cendrex	AHD	PFI	
Mifab	UA	MPFR	MPFR

2.15 DIELECTRIC COUPLINGS

.1 Lead Free

.2 Compatible with and to suit pressure rating of piping system.

.3 Where pipes of dissimilar metals are jointed.

.4 Pipes NPS 2 and under: isolating unions.
- .1 Acceptable material:
  - .1 Watts LF3000 Series

.5 Pipes NPS 2-1/2 and over: isolating flanges.

2.16 DRAINS VALVES

.1 In accordance with Section 23 05 23 Valves.

2.17 HANGERS AND SUPPORTS

.1 As per Section 23 05 29 Hangers and Supports.

2.18 IDENTIFICATION

.1 As per Section 23 05 53 Mechanical Identification.

2.19 INSULATION

.1 As per Section 23 07 00 Mechanical Thermal Insulation.

3 Execution

3.1 INSTALLATION

.1 Install all work in accordance with authorities having jurisdiction and manufacturer's requirements. In case of conflicting requirements, the more stringent shall apply.

3.2 PROTECTION OF OPENINGS

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

.2 No fans to be started until the project has been cleaned to the satisfaction of the Consultant.

3.3 TESTS

.1 Give 4 working days written notice of date for tests.

.2 Insulate or conceal work only after testing by contractor and review by Consultant.

.3 Conduct tests in presence of Consultant or representative authorized by the Consultant.

.4 Bear costs including retesting and making good.

.5 Test drainage, waste and vent piping for leakage in accordance with National Plumbing Code of Canada and authorities having jurisdiction. Maintain test pressure without loss for a minimum of 1 hour for water test and 2 hours for air test otherwise specified.

.6 Test domestic hot, recirculation and cold water piping at 1 1/2 times system operating pressure or minimum 860 kPa (125 psig), whichever is greater. Maintain test pressure without loss for a minimum of 2 hours otherwise specified.

.7 Test backflow preventers in accordance with manufacturer's recommendation and the requirements of the local water utility.

.8 Refer to Section 22 11 16 Domestic Water Piping for Potable water testing

.9 Equipment: test as specified in relevant sections.

.10 Prior to tests, isolate all equipment or other parts which are not designed to withstand test pressures of test medium.

.11 Provide signed copies of all tests within 2 weeks of completion of each test.

3.4 PAINTING

.1 Prime and touch up marred finished paintwork to match original.

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

.3 Paint the balancing damper handles where concealed.

3.5 BACnet

.1 When equipment is specified to be supplied with a communication card and is to be connected to the BAS network and "communicate to the BAS" using the BACnet standard, the equipment includes:

- .1 BACnet communication media
  - .1 For unitary equipment, BACnet communication over RS485 2- wire network and a 76,800 baud rate is acceptable.
  - .2 For major mechanical equipment BACnet communication over an Ethernet is acceptable.
- .2 Equipment shop drawings are to include:
  - .1 Job specific wiring diagrams with details on interface wiring including, wire type and detailed wire termination drawings.
  - .2 Details on site specific addressing requirements and confirmation there will be no conflicts with the existing system architecture.
  - .3 Details as to what type of information can be read from the device and also what type of information can be written or defined from the BAS.
  - .4 Specified or intended sequence of the equipment and how the equipment will operate to meet your sequence a building requirements.
- .3 Complete with all configuration and programming software. Including any specific cables and proprietary software required to connect to and program the equipment. The owner will have full access to the equipment sequence at turnover of project. Equipment sequence is to be fully programmable by the Factory Trained Authorized Manufacturer Service Technician on site.
- .4 Field start-up to be performed by Factory Trained Authorized Manufacturer Service Technician.
- .5 Factory Trained Authorized Manufacturer Service Technician to be on site for start-up, commissioning and be available for technical support when required during the installation, setup and customer training.

.2 BAS ready equipment.

- .1 Complete with a terminal strip and receive direct hardwired control commands from the BAS.
- .2 BAS will directly control the equipment using analog and digital signals. This will allow the BACnet BAS to have direct control of the equipment and sequence. The only internal controls are the high/low safety limits that are “hardwired” inside the equipment.

END OF SECTION

1 General

1.1 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 In accordance with 01

.2 Shop Drawings to be Project Specific

.3 Prior to submitting shop drawings, the Mechanical Contractor to review the shop drawing to ensure that they meet the requirements of the contract documents in all respects, that they are clear and legible, all options are being provided are clearly indicated and that the dimensions, weights, power requirements, quantities and capacity are consistent with the requirements of the contract documents.

.4 Assembled in groups by **Specification Section** and bound in sets.

.5 On cover/front page indicate total number of pages in submission.

.6 Consecutively number each page.

.7 Shop Drawings to list components that are shipped loose.

.8 Shop Drawings to include **Project Specific** wiring diagrams.

.9 Shop Drawings for items with BACnet® control to include **Project Specific** list of BACnet® read/write variables. Also refer to Section 21 05 01 Mechanical General Requirements and Section 25 05 02 BAS: Submittals

.10 Attach a Mechanical Contractor's Shop Drawing Review Confirmation to each shop drawing confirming the following:

- .1 The mechanical shop drawings have been reviewed by the Mechanical Contractor and all items are in conformance with the contract documents __ Yes __ No
- .2 Project specific model numbers and/or options are indicated __ Yes __ No
- .3 Mechanical Contractor: _____
- .4 Mechanical Contractor Project Representative: _____
- .5 Mechanical Contractor Signature: _____
- .6 Item: _____
- .7 Specification Section and item number: _____
- .8 Drawing reference: _____

.11 Where specified in Division 01, submit electronic copies of shop drawings. In addition to the electronic shop drawing, submit one hard copy to the office of the mechanical consultant.

.12 Section 21 05 04 Firestopping for Mechanical
- .1 Submit Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of ULC or cUL firestop systems to be used and manufacturer's installation instructions to comply with Division 01.
- .2 Provide data showing firestopping method for mechanical services including but not limited to the following:
  - .1 Pipe through rated Wall (Separate for masonry and for drywall)
    - .1 Type W1: Steel pipe
    - .2 Type W2: Copper pipe
    - .3 Type W3: Insulated DCW Copper Pipe (Insulation and vapor barrier continuous through wall)
    - .4 Type W4: Cast iron pipe
    - .5 Type W5: NPS 1½ to 2 PVC pipe
    - .6 Type W6: NPS 3 to 6 PVC pipe
    - .7 Type W7: over NPS 6 PVC pipe
    - .8 Type W8: up to NPS 4 PEX pipe
  - .2 Smoke sealing of angles at fire dampers
  - .3 Smoke sealing of pipes through no-rated walls
- .3 Name of qualified installer.
- .4 Manufacturer's engineering judgment identification number and drawing details when no ULC or cUL system is available for an application. Engineering judgment must include both project name and contractor's name who will install firestop system as described in drawing.
- .5 Submit material safety data sheets provided with product delivered to job-site.

.13 Section 22 42 01 Plumbing Specialties.
- .1 Floor Drains.
- .2 Cleanouts.
- .3 Water Hammer Arrestors.
- .4 Backflow Preventers.
- .5 Trap Seal Primers.

.14 Section 22 42 03 Plumbing Fixtures.
- .1 Label each sheet as to fixture type.
- .2 Indicate roughing-in dimensions incorporating dimensions indicated on drawings.

.15 Section 22 30 05 Domestic Water Heaters.
- .1 Relief Valves.
- .2 Heater/Storage Tank.

.16 Section 23 05 19 Thermometers and Pressure Gauges
- .1 Direct reading thermometers.

.17 Section 23 07 00 Mechanical Thermal Insulation
- .1 Each type of insulation
- .2 Canvas

.18 Section 24 33 16 Dampers - Fire.
- .1 Integral Sleeve Fire Dampers.
- .2 Fire damper installation instruction.

.19 Section 24 34 25 Package Exhausters.
- .1 Fan curves and sound rating data showing point of operation.

.20 Section 24 37 13 Air Terminals

.21 Section 24 37 14 Welding Arms

.22 Section 24 37 20 Louvers.
- .1 Free area of each unit.

.23 Section 24 44 00 HVAC Air Filtration.

.24 Section 24 72 00 Energy Recovery Equipment.
- .1 Performance at conditions specified.
- .2 Wiring Diagram
- .3 Motor characteristics.

.25 Section 24 81 34 Ductless Split System Units

.26 Section 25 05 01 BAS: General Requirements.
- .1 Refer to Section 25 05 02 BAS: Submittals
- .2 Copy of Control Wiring Electrical Wiring Permit

.27 Shop drawings and product data shall show:
- .1 Mounting arrangements.
- .2 Operating and maintenance clearances, e.g. access door swing spaces.

.28 Shop drawings and product data shall be accompanied by:
- .1 Detailed drawings of bases, supports, and anchor bolts.
- .2 Acoustical sound power data, where applicable.
- .3 Points of operation on performance curves.
- .4 Manufacturer to certify as to current model production.
- .5 Certification of compliance to applicable codes.
- .6 Wiring diagrams and electrical characteristics specified for unit supplied.

1.3 MATERIAL ON SITE

.1 Refer to General Conditions of Contract.

.2 All claims for material on site must be supported by supplier’s invoices showing supplier’s unit prices including taxes.

.3 Material on site shall not be claimed under the "work complete" portion of the claim.

.4 Material eligible to be claimed as "material on site" must be project specific equipment, such as plumbing fixtures, DHW tanks, pumps, air handling equipment, exhaust fans, control panels, etc.

.5 General material which is not considered project specific such as piping, fittings, control conduit, control wire, ductwork, small tools, etc., are not eligible to be claimed as "material on site."

.6 Project specific equipment may be claimed as "material on site" subject to the following:
- .1 Claim to show previous material on site and deduct the amount of previously claimed material that was incorporated into the work during the current month.
- .2 Claim to show material brought on site this month supported by a copy of the supplier's invoices showing supplier's unit prices including taxes.

.7 Invoices submitted for a "material on site" claim will not be considered by the engineer unless they are examined and initialed by both the mechanical contractor and the General Contractor.

1.4 PROGRESS ESTIMATES

.1 Refer to General Conditions of Contract.

.2 Submit monthly progress estimates broken down as follows:
- .1 Mechanical Contractor Mobilization
- .2 Section 21 05 03 Mechanical Contract Closeout.
  - .1 Minimum 1% of mechanical contract for items included with application for Substantial Performance certificate.
  - .2 Minimum 1% of mechanical contract for items included with application for release of final payment
- .3 Section 23 07 00 Mechanical Thermal Insulation
- .4 Section 22 10 00's Plumbing Piping Rough-In
- .5 Section 22 30 05 Domestic Water Heaters
- .6 Section 22 42 01 Plumbing Specialties
- .7 Section 22 42 03 Plumbing Fixtures
- .8 Section 24 73 11 Section 24 72 00 Energy Recovery Equipment and Section 24 44 00 HVAC Air Filtration
- .9 Section 24 81 34 Ductless Split System Units
- .10 Section 24 37 14 Welding Arms
- .11 Section 24 33 00 Ductwork and 24 33 00, Air Ductwork Accessories
- .12 Section 24 34 25 Packaged Exhausters
- .13 Section 24 37 20 Louvers and Section 24 37 13Air Terminals
- .14 Section 24 05 93 Balancing (TAB) of Mechanical Systems
- .15 Section 25 05 01 BAS: General Requirements.
  - .1 BAS Control Rough-in.

.2 BAS Control Equipment and Installation
.3 BAS Control Programming and verification.
.4 BAS Control Maintenance Contract.

.3 The first mechanical progress estimate may be withheld until such time as the shop drawings, progress estimate break down and hourly labor rate are submitted.

.4 Claims for Material on Site to have itemized list which are updated monthly.

1.5 CONTRACT CHANGES

.1 Hourly Labor Rates
.1 Refer to General Conditions of Contract.
.2 Submit separate hourly labor rate for each of the following:
.1 Insulator
.2 Plumber
.3 Heating Installer
.4 Sheet metal Installer.
.5 BAS Control Electrician.
.6 BAS Control Technician
.3 Total Payroll costs as follows:

Base Rate	$
Vacation and Holiday Pay	$
Apprentice Council	$
Promotion fund	$
Training and Union Fund	$
Pension	$
Safety Training	$
Health Benefits	$
Liability Insurance	$
Worker's Compensation Board	$
Employment Insurance	$
CPP	$
Safety Equipment	$
SUBTOTAL	$
Small Tools 5% of Subtotal	$
Site Supervision 5% of Subtotal	$
TOTAL	**$**

.4 Overhead and Fee as per General Condition of Contract.

.2 Contract Changes
.1 Less than $1,000.00, provide lump sum price.
.2 Over $1,000 provide breakdown showing the following:
.1 Labour hours times hourly labor rate.
.2 List of Materials with unit costs.
.3 Provide breakdown for credit materials and labour.

1.6 START UP REPORT MANUAL

.1 Custom designed and contain material pertinent to this project only and to provide full and complete coverage of subjects referred to in this section.

.2 Operating and maintenance manual to be approved by and final copies deposited with Consultant before final inspection.

.3 Organize by specification section.

.4 Conform to requirements of Division 01, supplemented and modified by requirements specified in this section.

.5 Start Up and Performance data to include:
- .1 Equipment manufacturer's performance data sheets with point of operation as left after commissioning is complete.
- .2 Start up and verification reports
- .3 Testing, adjusting and balancing reports as specified in Section 24 05 93, Testing, Adjusting and Balancing (TAB) of Mechanical Systems.

.6 Submittals:
- .1 Submit a copy of the complete Start Up Report Manual to Consultant for Review.
- .2 Start Up Report Manual Part 1
  - .1 Start up and verification reports as required with application for substantial performance certificate as per Section 21 05 03, Common Work Results for Mechanical Contract Closeout.
- .3 Start Up Report Manual Part 2
  - .1 Start up and verification reports as required with application for release of final payment as per Section 21 05 03, Common Work Results for Mechanical Contract Closeout.
- .4 Submission of individual data will not be accepted unless so directed by Consultant.
- .5 Make changes as required and re-submit as directed by Consultant.
- .6 Refer to Division 01 for quantity of Manuals (minimum 2).
- .7 Hard-back, 25 mm (1") 3 ring, D-ring binders.
- .8 Binders to be 2/3 maximum full.
- .9 Provide index to full volume in each binder.
- .10 Identify contents of each manual on cover and spine.
- .11 Include names, addresses, telephone numbers of each sub-contractor having installed equipment, local representative for each item of equipment, each system.
- .12 Provide full Table of Contents in each manual. Assemble each manual to conform to Table of Contents with tab sheets placed before instructions covering subject.

1.7 OPERATING AND MAINTENANCE (O&M) MANUAL

.1 Operating and maintenance manual to be reviewed by the Consultant and final copies deposited with Consultant before application for substantial performance certificate

.2 Organize by specification section.

.3 O&M Manuals to be custom designed and contain material pertinent to this project only and to provide full and complete coverage of subjects referred to in this section.

.4 Customize O&M data from manufacturer's to suit this project.
- .1 Provide site specific manual or
- .2 Neatly cross out non applicable generic information in the manual.
- .3 In Manufacturer's literature, highlight model supplied for this project.

.5 Provide Maintenance Program Schedule in table format (See Below) for each mechanical system and each piece of mechanical equipment including all items for which shop drawings have been submitted. Reference specification sections. List piece of equipment, items to be checked and frequency, tab in manual and page within section.

EQUIPMENT	ITEMS TO BE CHECKED	FREQUENCY	TAB & PAGE
Section 22 42 01 Plumbing Specialties	Clean and confirm flow from trap primer.	Monthly or as required.	22 42 01

.6 Conform to requirements of Division 01, supplemented and modified by requirements specified in this section.

.7 Project records and O&M manuals specified in this section are to be completely separate entity from those specified in Division 01.

.8 Operation data to include:
- .1 Control schematics for each system including environmental controls.
- .2 Description of each system and its controls.
- .3 Description of operation of each system at various loads together with reset schedules and seasonal variances.
- .4 Operation instruction for each system and each component.
- .5 Description of actions to be taken in event of equipment failure.
- .6 Valves schedule.
- .7 Color coding chart.

.9 Maintenance data shall include:
- .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
- .2 Data to include schedules of tasks, frequency, tools required and task time.

.10 Submittals:
- .1 Include a copy of all reviewed mechanical shop drawings.
- .2 Submit a copy of the complete O&M Manual to Consultant for Review.
- .3 Submission of individual data will not be accepted unless so directed by Consultant.
- .4 Make changes as required and re-submit as directed by Consultant.
- .5 Refer to Division 01 for quantity of Manuals (minimum 2).
- .6 Hard-back, 50 mm (2") 3 ring, D-ring binders.
- .7 Binders to be 2/3 maximum full.
- .8 Provide index to full volume in each binder.
- .9 Identify contents of each manual on cover and spine.
- .10 Include names, addresses, telephone numbers of each sub-contractor having installed equipment, local representative for each item of equipment, each system.
- .11 Provide full Table of Contents in each manual. Assemble each manual to conform to Table of Contents with tab sheets placed before instructions covering subject.

.11 Provide maintenance data for the following:
- .1 Section 22 42 01 Plumbing Specialties and Accessories.
  - .1 Backflow preventer
- .2 Section 22 42 03 Plumbing Fixtures:
  - .1 Thermostatic Mixing Valves
- .3 Section 22 30 05 Domestic Water Heaters
- .4 Section 24 72 00 Energy Recovery Equipment
- .5 Section 24 34 00 HVAC Fans
- .6 Section 24 34 00 Packaged Fans
- .7 Section 24 37 13 Air Terminals
- .8 Section 24 81 34 Ductless Split System Units

.12 Prepare and insert into operation and maintenance manual, additional data when need for same becomes apparent during demonstrations and instructions specified above.

1.8 AS BUILT DRAWINGS

.1 In accordance with Division 01.

.2 Site Records:
- .1 Make available for reference purposes and inspection at all times. Provide sets of white prints as required for each phase of the work. Mark thereon all changes as work progresses and as changes occur. This shall include change orders, site instructions, and changes to existing mechanical systems, control systems and low voltage control wiring.
- .2 Obtain AutoCAD drawing files from the consultant. The Contractor to update at his own expense the AutoCAD files to show the as-built conditions.
- .3 On a regular basis, transfer information to the AutoCAD files, revising drawings to show all work as actually installed. These AutoCAD files will at their completion, become the as-built drawings for this project.

.4 Ensure that the modifications follow the same standard as the original file, that is, layer control, line weights, line types, etc.

.5 Make available for reference purposes and inspection at all times.

.3 As Built Drawings:

.1 Prior to start of Testing, Adjusting and Balancing (TAB), finalize production of As Built Drawings.

.2 Identify each drawing in lower right hand corner in letters at least 13 mm (1/2") high as follows: -"AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (date).

.3 Include on the As Built Drawings the identification number off all terminal units and as installed location.

.4 Include on the As Built Drawings as installed location of all temperature sensors and/or thermostats

.5 Submit to Consultant for approval and make corrections as directed.

.6 TAB to be performed using as-built drawings.

.7 Submit completed hard copy of as-built drawings with Operating and Maintenance Manuals.

.8 Submit computer disk with the AutoCAD files to the consultant at the time specified in Division 01.

.9 Include all sections shown on interference drawings.

.4 Where products are specified by manufacturer and/or model, update AutoCAD file to show installed manufacturer and model.

2 Products N/A

3 Execution N/A

END OF SECTION

1 General

1.1 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Common Work Results for Mechanical.

1.2 SUBMITTALS

.1 Start-up Report.
- .1 Provide start-up reports as listed below.
- .2 Reports to show model number, serial number, voltage and rated amperes.
- .3 If during start up there is an operation concern, repeat start-up after operation concern has been corrected.

.2 Section 20 05 02 Mechanical Submittals.
- .1 Maintenance Materials and Spare Parts.
- .2 Special Tools.
- .3 Operation and Maintenance Manuals.
- .4 Record drawings.

.3 Section 20 05 03 Common Work Results for Mechanical Contract Closeout.
- .1 Confirmation of Demonstration and Operating and Maintenance Instruction.

.4 Section 20 91 13 Mechanical Systems Testing and Verification
- .1 Form V-22 10 10 - DHW Recirculation Pump
- .2 Form V-22 10 10 - Sump Pump
- .3 Form V-22 30 05 - Domestic Hot Water Tank
- .4 Form V-22 42 01 - Backflow Preventer
- .5 Form V-22 42 01 – Cleanouts
- .6 Form V-22 42 01 - Floor Drains
- .7 Form V-22 42 01 – Interceptors
- .8 Form V-22 42 01 - Roof Drains
- .9 Form V-22 42 01 - Trap Primers
- .10 Form V-22 42 01 - Wall Hydrant
- .11 Form V-22 42 03 - Emergency Shower and Emergency Eye Wash
- .12 Form V-22 42 03 – Lavatory
- .13 Form V-22 42 03 - Mop Sink
- .14 Form V-22 42 03 - Refrigerated Water Cooler
- .15 Form V-22 42 03 – Shower
- .16 Form V-22 42 03 – Sinks
- .17 Form V-22 42 03 – Urinal
- .18 Form V-22 42 03 - Water Closet Flush Tank Type
- .19 Form V-22 42 03 - Water Closet Flush Valve Type
- .20 Form V-23 11 13 - Facility Fuel-Oil Piping and Storage Tank
- .21 Form V-23 21 23 - Hydronic Pumps
- .22 Form V-23 52 00 - Boiler

.23 Form V-23 57 00 - Heat Exchanger
.24 Form V-24 34 25 - Fans
.25 Form V-24 37 13 - Terminal Unit
.26 Form V-24 73 11 - Air Handling Unit
.27 Form V-24 73 11 - Variable Frequency Drives
.28 Form V-24 73 11 - Magnetic Coupled Drives
.29 Form V-24 84 13 – Humidifier

.5 Section 21 13 13 Sprinkler Systems:
.1 Inspection Report from Office of the Fire Marshal.

.6 Section 23 05 53 Mechanical Identification.
.1 Valve Chart.
.2 Fire Damper Chart

.7 Section 22 11 16 Domestic Water Piping.
.1 Confirmation of disinfection of Water System.

.8 Section 23 21 14 Hydronic Specialties.
.1 Glycol percentage test report.

.9 Section 22 42 01 Plumbing Specialties.
.1 Backflow Preventor Test Report.

.10 Section 22 42 03 Plumbing Fixtures.
.1 Shower mixing valve test report.
.2 Emergency devices mixing valve test report.
.3 Thermostatic control mixing valve test report.

.11 Section 23 11 23 Gas Piping
.1 Gas system test report

.12 Section 23 21 23 Hydronic Pumps.
.1 For each Variable Frequency Drive, perform output waveform tests. Submit test results to the Consultant.

.13 Section 23 52 00 Heating Boilers.
.1 Factory Boiler Test Report.
.2 On site Boiler Test Report.
.3 Test boiler prior to installation of jacket at two (2) times the boiler back pressure.

.14 Section 23 64 19 Water Chillers.
.1 Chiller Installation Check List.
.2 Chiller Start-Up Report.
.3 Letter confirming maintenance during warranty period.

.15 Section 23 65 10 Heat Rejectors
- .1 For each Variable Frequency Drive, perform output waveform tests. Submit test results to the Consultant.

.16 Section 24 73 11 Packaged Air Handling Units.
- .1 Drain pan Report
- .2 For each Variable Frequency Drive, perform output waveform tests. Submit test results to the Consultant.

.17 Section 24 81 23 Computer Room Air Conditioning System.
- .1 Installation Check List.
- .2 Start-up Report.

.18 Section 24 74 00 Packaged Outdoor HVAC Equipment.
- .1 Installation Check List.
- .2 Start-up Report.
- .3 For each Variable Frequency Drive, perform output waveform tests. Submit test results to the Consultant.

.19 Section 24 84 13 Humidifier.
- .1 Humidifier Start-Up Report.

.20 Section 24 72 00 Energy Recovery Equipment.
- .1 Start-up Report.

.21 Section 24 35 15 Dust Collector
- .1 Installation Check List.
- .2 Start-up Report.

.22 Section 24 05 93 Balancing (TAB) of Mechanical Systems.
- .1 TAB Report.

.23 Section 25 05 01 BAS: General Requirements.
- .1 BAS start-up report including all field programmable software settings including demand expand setpoint and schedules.
- .2 Letter confirming maintenance contract during warranty period.
- .3 Printout of alarm limits.
- .4 Printout of program.
- .5 Copy of program on disks.
- .6 Final Inspection certificate from Inspection Authority for Control Wiring Electrical Wiring Permit
- .7 For each Variable Frequency Drive, perform output waveform tests. Submit test results to the Consultant.

.24 With application for substantial performance certificate
- .1 Section 20 05 02 Mechanical Submittals.
  - .1 Start Up Report Manual Part 1
  - .2 Operation and Maintenance Manuals.

.2 Section 20 05 02 Mechanical Contract Closeout.
- .1 Confirmation of Demonstration and Operating and Maintenance Instruction.
- .2 Letter confirming testing and commissioning to satisfaction of Owner.

.3 Section 20 91 13 Mechanical Systems Testing and Verification
- .1 Form V-22 10 10 - DHW Recirculation Pump
- .2 Form V-22 30 05 - Domestic Hot Water Tank
- .3 Form V-22 42 01 - Backflow Preventer
- .4 Form V-22 42 03 - Emergency Shower and Emergency Eye Wash
- .5 Form V-22 42 03 – Lavatory
- .6 Form V-22 42 03 - Mop Sink
- .7 Form V-22 42 03 – Shower
- .8 Form V-22 42 03 – Sinks
- .9 Form V-23 11 13 - Facility Fuel-Oil Piping and Storage Tank
- .10 Form V-23 21 23 - Hydronic Pumps
- .11 Form V-23 52 00 – Boiler
- .12 Form V-23 57 00 - Heat Exchanger
- .13 Form V-24 34 25 – Fans
- .14 Form V-24 37 13 - Terminal Unit
- .15 Form V-24 73 11 - Air Handling Unit
- .16 Form V-24 73 11- Magnetic Coupled Dives

.4 Section 21 13 13 Sprinkler Systems:
- .1 Inspection Report from Office of the Fire Marshal.

.5 Section 21 30 00 Packaged Fire Pump
- .1 Test Report

.6 Section 22 11 16 Domestic Water Piping.
- .1 Confirmation of disinfection of Water System.
- .2 Laboratory test report for potable water

.7 Section 22 42 01 Plumbing Specialties.
- .1 Backflow Preventer Test Report.

.8 Section 22 42 03 Plumbing Fixtures.
- .1 Thermostatic Shower Test Report.

.9 Section 23 52 00 Heating Boilers.
- .1 On site Boiler Test Report.

.10 Section 24 72 00 Air-to-Air Energy Recovery Equipment.
- .1 Start-up Report.

.11 Section 24 35 15 Dust Collectors.
- .1 Installation Check List.
- .2 Start-up Report.

.12 Section 24 05 93 Testing, Adjusting and Balancing (TAB) for Mechanical Systems.
- .1 TAB Report.

.13 Section 25 05 01 BAS: General Requirements.
- .1 BAS start-up report including all field programmable software settings including demand expand setpoint and schedules.
- .2 Final Inspection certificate from Inspection Authority for Control Wiring Electrical Wiring Permit

.25 With application for release of final payment
- .1 Section 20 05 02 Common Work Results for Mechanical - Submittals.
  - .1 Start Up Report Manual Part 2
  - .2 Maintenance Materials and Spare Parts.
  - .3 Special Tools.
  - .4 Record drawings.
- .2 Section 20 91 13 Mechanical Systems Testing and Verification Forms not previously submitted.
- .3 Section 23 05 53 Mechanical Identification.
  - .1 Valve Chart.
- .4 Section 23 21 14 Hydronic Specialties.
  - .1 Glycol percentage test report.
- .5 Section 24 84 13 Humidifier.
  - .1 Humidifier Start-Up Report.
- .6 Section 25 05 01 BAS: General Requirements.
  - .1 Letter confirming maintenance contract during warranty period.
  - .2 Printout of alarm limits.
  - .3 Printout of program.
  - .4 Copy of program on disks.

.26 During Warranty Period
- .1 20 05 01 Common Work Results for Mechanical - General.
  - .1 Maintenance Service Reports
- .2 Section 24 84 13 Humidifier.
  - .1 Quarterly Humidifier Maintenance Report.
- .3 Section 25 05 01 BAS: General Requirements
  - .1 Quarterly Control Maintenance report.

1.3 DEMONSTRATION AND OPERATING AND MAINTENANCE INSTRUCTIONS

.1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.2 Use operation and maintenance manual, as-built drawings, audio visual aids, etc. as part of instruction materials.

.3 Instruction duration time requirements at Substantial Performance as follows:
- .1 Sprinkler: 4 hours.
- .2 Plumbing: 4 hours.
- .3 Heating: 4 hours.
- .4 Boilers: 4 hours
- .5 Air Distribution: 8 hours.
- .6 Dust Collector: 4 hours
- .7 Controls: 24 hours. Spread over 3 sessions, 30 days apart.

.4 Instruction duration time requirements at month 8 of building warranty as follows:
- .1 Sprinkler: 2 hours.
- .2 Plumbing: 2 hours.
- .3 Heating: 2 hours.
- .4 Boilers: 2 hours
- .5 Air Distribution: 2 hours.
- .6 Dust Collector: 4 hours

.5 Where deemed necessary, Owner may record these demonstrations on video tape for future reference.

.6 Utilize factory trained technicians for humidifier

.7 Utilize factory trained technicians for Dust Collector.

.8 Utilize factory trained technicians for Variable frequency A/C motor drives.

1.4 EXTENDED WARRANTIES

.1 Section 22 42 03 Plumbing Fixtures.
- .1 For hermetically sealed refrigeration compressors, the building warranty period is extended to 5 years

.2 Section 23 52 00 Heating Boilers.
- .1 For boilers, the non-prorated warranty period is extended to ten (10) years. Signed by authorized representative of the original manufacturer.
- .2 For burner, controls and other included equipment, the non-prorated warranty period is extended to two (2) years. Signed by authorized representative of the original manufacturer.

.3 Section 24 81 34 Ductless Split System Units
- .1 For refrigeration compressors, the building warranty period is extended to 5 years.

.4 Section 24 84 13 Humidifiers.
- .1 For humidifier, the warranty period is extended to two (2) years. Signed by authorized representative of the original manufacturer.

.5 Section 24 72 00 Energy Recovery Equipment.
- .1 For Heat Reclaim Devices, the warranty period is extended to two (2) years. Signed by authorized representative of the original manufacturer.

1.5 SERVICE DURING WARRANTY PERIOD

.1 Section 23 25 00 HVAC Water Treatment Systems
- .1 Letter confirming service during warranty period.

.2 Section 24 84 13 Humidifier.
.1 Letter confirming service during Building and extended warranty period.

.3 Section 24 72 00 Energy Recovery Equipment.
.1 Letter confirming service during Building and extended warranty period.

.4 Section 25 05 01 BAS: General Requirements.
.1 Letter confirming maintenance contract during warranty period.

2 Products N/A

3 Execution

3.1 CLEANING

.1 Clean mechanical (building) systems in accordance with Division 01.

.2 Clean all pipe systems strainers.

.3 Vacuum interior air handling units.

.4 Wipe down exterior of air handling units.

.5 Wash interior of air handling units.

.6 In preparation for final acceptance, clean and refurbish all equipment and leave in operating condition including replacement of all filters in all air and piping systems.

3.2 VERIFICATION

.1 In context of this paragraph "verify" to include "demonstrate" to consultant.

.2 Timing: commission only after start-up deficiencies rectified.

.3 Access doors: verify size and location relative to items to be services.

.4 Adjust to suit site conditions, including, but not necessarily limited to, following:
.1 Floor drains:
.1 Verify proper operation of trap primer.
.2 Verify security and removability of strainers.
.2 Roof Drains:
.1 Verify installation at low points in roof.
.2 Verify security and removability of dome.
.3 Verify provision for movement of roof and integrity of roof drain piping system.

.3 Cleanouts:
- .1 Verify covers are gastight, secure and easily removable.
- .2 Verify that cleanout rods can properly reach as far as next cleanout.

.4 Non-freeze wall hydrants:
- .1 Verify complete drainage.
- .2 Verify operation of vacuum breaker.

.5 Backflow preventers, vacuum breakers:
- .1 Verify installation of correct type to suit application.
- .2 Adjust as necessary to ensure proper operation.
- .3 Verify visibility of discharge.

.6 Pressure regulators:
- .1 Adjust settings to suit installed locations, required flow rates.

.7 Backwater valves:
- .1 Verify accessibility of cover, valve.

.8 Trap seal primers:
- .1 Verify operation.
- .2 Adjust flow rate to suit site conditions.

.9 Grease interceptors:
- .1 Activate, using manufacturer's recommended activation procedures and materials.

.10 Air handling units
- .1 Verify installation in accordance with manufacturer's recommendation.
- .2 Verify accessibility.

.11 Magnetic coupled drives
- .1 Verify installation in accordance with manufacturer's recommendation.
- .2 Verify accessibility.

.12 Heat pumps.
- .1 Verify installation in accordance with manufacturer's recommendation.
- .2 Verify accessibility.

.5 Boilers: Refer to Section 23 52 00 Heating Boilers.

.6 Variable Frequency Drive: Refer to Section 24 74 00 Packaged Outdoor HVAC Equipment.

.7 Humidifiers: Refer to Section 24 84 13 Humidifiers.

.8 Controls: Refer to Section 25 05 01 BAS: General Requirements.

.9 Verification reports:
- .1 Record all results on approved report forms.
- .2 Include signature of tester and supervisor.

.10 Verification:
- .1 Notify Consultant 24 hour before commencing tests.

END OF SECTION

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE SECTIONS

.1 Section 07 84 00 Firestopping

1.3 SUBMITTALS

.1 In accordance with the following Sections:
- .1 Section 07 84 00 Firestopping
- .2 Section 20 05 02 Mechanical Submittals

2 Products

2.1 MATERIALS

.1 In accordance with the following Section 07 84 00 Firestopping

3 Execution

3.1 INSTALLATION

.1 In accordance with the following Section 07 84 00 Firestopping

3.2 FIRESTOPPING

.1 Firestopping material and installation within annular space between pipes, ducts, insulation and adjacent fire separation

.2 Uninsulated unheated pipes not subject to movement: no special preparation.

.3 Uninsulated heated pipes subject to movement: wrap with non-combustible smooth material to permit pipe to move without damaging firestopping material.

.4 Insulated pipes and ducts: ensure integrity of insulation and vapor barrier at fire separation.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

1.3 RELATED WORK

.1 General requirements: Division 1.

.2 Section 24 05 93 Testing, Adjusting and Balancing (TAB) of Mechanical Systems

1.4 GENERAL

.1 The verification of all Mechanical systems installed on this project is the responsibility of the Mechanical Contractor. Manufactured systems or components shall be commissioned by factory trained technicians representing the manufacturer, in the presence of the Owner's designated representatives, and under the direction of the Mechanical contractor.

.2 The Mechanical contractor will provide assistance to the Owner's representatives and ensure that the manufacturer's representative is on site during functional performance testing.

.3 Tests shall be performed by qualified plumber, heating technicians, sheet metal technician, electricians or other technicians as required by the nature and complexity of the test.

1.5 QUALITY ASSURANCE

.1 Be responsible for quality assurance and whenever necessary, to ensure compliance with operating requirements, CSA, these contract documents, the Authority having Jurisdiction and other requirements and codes as applicable.

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

1.6 SCOPE

.1 Testing are called for throughout the individual specifications, however, this does not relieve this Division from providing all testing necessary to ensure that systems and equipment operate as required and that they interface other systems and equipment as required.

.2 Testing of manufactured systems or components shall be performed by factory trained technicians representing the manufacturer.

.3 Perform test by qualified technicians as required by the nature and complexity of the test.

1.7 SYSTEM PERFORMANCE VERIFICATION

.1 When systems are ready for performance verification, arrange a time with the Consultant.

.2 Tested systems prior to this demonstration and be confident that all systems will operate as required.

.3 Systems shall be ready for performance verification at the time prior to final inspection.

1.8 CONTRACTOR'S RESPONSIBILITIES

.1 Prepare each system for testing and verification.

.2 Co-ordinate the efforts of testing and verification.

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

.4 Provide all necessary test and calibration equipment, temporary facilities, meters, sensors, etc. necessary to simulate and verify correct operating conditions.

.5 Co-ordinate and pay for all costs associated with testing and verification, including but not limited to costs for travel, labour, equipment, testing agencies, manufacturers, testing and any other costs incurred to test and verify equipment and systems.

.6 Make test instruments available to Consultant to facilitate spot checks during testing.

.7 Retain possession of test instruments and remove at completion of services.

.8 Verify system installation is complete and in continuous operation.

.9 Where systems or equipment do not operate as required, make the necessary corrections or modifications, re-test and re-commission.

1.11 FINAL REPORT

.1 Assemble all testing data and verification reports and submit them to the Consultant.

.2 Each form shall bear signature of recorder, date of test, and all relevant information in clear and legible form.

.3 Identify each instrument used, and latest date of calibration of each.

.4 Include written confirmation by Owner's representatives that all verification, testing, instruction and demonstrations have been completed to the Owner's satisfaction.

2 Products N/A

3 Execution

3.1 SYSTEM PERFORMANCE VERIFICATION

.1 When systems are ready for performance verification, arrange a time with the Consultant.

.2 Tested systems prior to this demonstration and be confident that all systems will operate as required.

.3 Systems shall be ready for performance verification at the time prior to final inspection.

3.2 VERIFICATION

.1 In context of this paragraph "verify" to include "demonstrate" to consultant.

.2 Timing: verification only after start-up deficiencies rectified.

.3 Access doors: verify size and location relative to items to be services.

.4 Verification reports:
- .1 Record all results on approved report forms.
- .2 Include signature of tester and supervisor.

.5 Verification:
- .1 Notify Consultant 24 hr before commencing tests.

Form V-22 42 01 - Floor Drains

EQUIPMENT DETAILS: (Identification)
Floor Drains
Manufacturer: _____

PRE-REQUISITES: Water available. Drainage pipe pressure tested. Trap Primer operational. Final sewer connection completed.

PROCEDURES: (Place checkmark in space provided)	*Room #* _____	*Room #* _____	*Room #* _____
.1 Verify security and removability of strainer.	_____	_____	_____
.2 Confirm floor drains are clear.	_____	_____	_____
.3 Served by Trap Primer #	_____	_____	_____
.4 Operate Trap Primer and Confirm flow at individual traps.	_____	_____	_____

PROCEDURES: (Place checkmark in space provided)	*Room #* _____	*Room #* _____	*Room #* _____
.1 Verify security and removability of strainer.	_____	_____	_____
.5 Confirm floor drains are clear.	_____	_____	_____
.6 Served by Trap Primer #	_____	_____	_____
.7 Operate Trap Primer and Confirm flow at individual traps.	_____	_____	_____

COMMENTS/EVALUATIONS:

_____

_____

_____

SIGN OFF:
Mechanical
Contractor: _____ Signature: _____ Date: _____

Form V-22 42 01 - Cleanouts

EQUIPMENT DETAILS: (Identification)
Cleanouts
Manufacturer: _____

PRE-REQUISITES: Drainage pipe pressure tested. Final sewer connection completed. Cleanouts for under slab drainage brought to floor level. Access doors installed for stack cleanouts. Access available for cleanouts in ceiling spaces.

PROCEDURES: (Place checkmark in space provided) Floor Cleanouts	*Left Wing*	*Center Wing*	*Right Wing*
.1 Verify cleanout is accessible.	_____	_____	_____
.8 Verified covers can easily be removed.	_____	_____	_____
.9 Verify cover is gas tight.	_____	_____	_____
.10 Verify that cleanout rod can properly reach as far as next cleanout.	_____	_____	_____

PROCEDURES: (Place checkmark in space provided) Above grade Cleanouts.	*Left Wing*	*Center Wing*	*Right Wing*
.1 Verify cleanout is accessible.	_____	_____	_____
.11 Verified covers can easily be removed.	_____	_____	_____
.12 Verify cover is gas tight.	_____	_____	_____

COMMENTS/EVALUATIONS:

_____

_____

_____

_____

SIGN OFF:
Mechanical
Contractor: _____ Signature: _____ Date: _____

Form V-22 42 01 - Trap Primers

EQUIPMENT DETAILS: (Identification)
Trap Primer
Manufacturer: _____ Model: _____

PRE-REQUISITES: Water system operation. Drainage pipe pressure tested.
Final sewer connection completed. Power connected to trap primer.

PROCEDURES: (Place checkmark in space provided)	*TP#*	*TP#*	*TP#*
	_____	_____	_____
.1 *Number Trap Primer on record Drawings*	_____	_____	_____
	_____	_____	_____
.2 *Verify time setting.*	_____	_____	_____
.13 *Verify solenoid valve opens by visual inspection.*	_____	_____	_____
.14 *Operate Trap Primer*	_____	_____	_____
.15 *Verify that solenoid valve closes completely.*			

PROCEDURES: (Place checkmark in space provided)	*TP#*	*TP#*	*TP#*
	_____	_____	_____
.1 *Number Trap Primer on record Drawings*	_____	_____	_____
	_____	_____	_____
.2 *Verify time setting.*	_____	_____	_____
.16 *Verify solenoid valve opens by visual inspection.*	_____	_____	_____
.17 *Operate Trap Primer*	_____	_____	_____
.18 *Verify that solenoid valve closes completely.*			

COMMENTS/EVALUATIONS:

_____

_____

_____

SIGN OFF:
Mechanical
Contractor: _____ Signature: _____ Date: _____

Form V-22 42 01 - Backflow Preventer

EQUIPMENT DETAILS: (Identification)
Backflow Preventer
Manufacturer: _____ Model: _____

PRE-REQUISITES: Water system operation, Drainage system operational.

PROCEDURES: (Place checkmark in space provided)	*BFP #*	*BFP #*	*BFP #*
	_____	_____	_____
.1 Verify installation of correct type to suit application.	_____	_____	_____
.19 Adjust as necessary to ensure proper operation.	_____	_____	_____
.20 Verify visibility of discharge.			
	_____	_____	_____

COMMENTS/EVALUATIONS:

_____

_____

_____

_____

_____

SIGN OFF:
Mechanical
Contractor: _____ Signature: _____ Date: _____

Form V-22 42 01 - Interceptors

EQUIPMENT DETAILS: (Identification)
Interceptors
Manufacturer: _____ Model: _____

PRE-REQUISITES: Drainage pipe pressure tested. Final sewer connection completed.

PROCEDURES: (Place checkmark in space provided)	*Room* _____	*Room* _____	*Room* _____
.1 *Verify cover air tight.*	_____	_____	_____
.2 *Verify that cover can be easily removed.*	_____	_____	_____
	_____	_____	_____
.21 *Verify removability of basket where applicable.*			

PROCEDURES: (Place checkmark in space provided)	*Room* _____	*Room* _____	*Room* _____
.1 *Verify cover air tight.*	_____	_____	_____
.2 *Verify that cover can be easily removed.*	_____	_____	_____
	_____	_____	_____
.22 *Verify removability of basket where applicable.*			

COMMENTS/EVALUATIONS:

_____

_____

_____

SIGN OFF:
Mechanical
Contractor: _____ Signature: _____ Date: _____

Form V-22 42 03 - Water Closet Flush Tank Type

EQUIPMENT DETAILS: (Identification)
Water Closet Flush Tank Type
Manufacturer: _____ Model: _____

PRE-REQUISITES: Water system operational. Drainage pipe pressure tested. Final sewer connection completed.

PROCEDURES: (Place checkmark in space provided)	*Room*	*Room*	*Room*
	_____	_____	_____
.1 *Confirm stop works.*	_____	_____	_____
.2 *Run adjacent lavatories until hot water is present. Flush each water closet twice to confirm water supply is cold.*	_____	_____	_____
	_____	_____	_____
.3 *Check flush cycle.*	_____	_____	_____
.23 *Verify water closet secure.*	_____	_____	_____
.24 *Verify water closet seat secure.*	_____	_____	_____
.25 *Verify flush tank secure.*	_____	_____	_____

COMMENTS/EVALUATIONS:

_____

_____

_____

_____

SIGN OFF:
Mechanical
Contractor: _____ Signature: _____ Date: _____

Form V-22 42 03 - Lavatory

EQUIPMENT DETAILS: (Identification)
Lavatory
Manufacturer: _____ Model: _____
Faucet
Manufacturer: _____ Model: _____

PRE-REQUISITES: Domestic Hot and Cold Water system operational.
Drainage pipe pressure tested. Final sewer connection completed. .

PROCEDURES: (Place checkmark in space provided)	*Room* _____	*Room* _____	*Room* _____
.1 *Verify faucet handle on left controls hot water and handle on right controls cold water.*	_____	_____	_____
.2 *Verify faucet handles properly labeled.*	_____	_____	_____
.3 *Verify supplies shut off water flow.*	_____	_____	_____
.4 *Verify drain functions.*	_____	_____	_____
.5 *Verify overflow works by filling sink with water.*	_____	_____	_____
.6 *Check water outlet for debris.*	_____	_____	_____
.7 *Record DHW temperature at faucet.*	_____	_____	_____

COMMENTS/EVALUATIONS:

_____

_____

_____

_____

SIGN OFF:
Mechanical
Contractor: _____ Signature: _____ Date: _____

Form V-22 42 03 - Mop Sink

EQUIPMENT DETAILS: (Identification)
Mop Sink
Manufacturer: _____ Model: _____
Faucet
Manufacturer: _____ Model: _____

PRE-REQUISITES: Domestic Hot and Cold Water system operational.
Drainage pipe pressure tested. Final sewer connection completed

PROCEDURES: (Place checkmark in space provided)		*Room*	*Room*	*Room*
.1	*Verify faucet handle on left controls hot water and handle on right controls cold water.*	_____	_____	_____
.26	*Verify faucet handles properly labeled.*	_____	_____	_____
.27	*Verify supplies shut off water flow.*	_____	_____	_____
.28	*Verify drain functions.*	_____	_____	_____
.29	*Check water outlet for debris.*	_____	_____	_____
.30	*Record DHW temperature at faucet.*	_____	_____	_____
.31	*Verify vacuum breaker operation.*			

COMMENTS/EVALUATIONS:

_____

_____

_____

_____

SIGN OFF:
Mechanical
Contractor: _____ Signature: _____ Date: _____

Form V-22 42 03 - Emergency Eye Wash

EQUIPMENT DETAILS: (Identification)
Shower
Manufacturer: _____ Model: _____

PRE-REQUISITES: Domestic Hot and Cold Water system operational.
Drainage pipe pressure tested. Final sewer connection completed.

PROCEDURES: (Place checkmark in space provided)	*Room*	*Room*	*Room*
	_____	_____	_____
.1 Verify label installed.	_____	_____	_____
.2 Verify supplies shut off water flow.	_____	_____	_____
.3 Verify flow and valve closes after use	_____	_____	_____
.4 Record supply water temperature.	_____	_____	_____
	_____	_____	_____
	_____	_____	_____

COMMENTS/EVALUATIONS:

_____

_____

_____

_____

_____

SIGN OFF:
Mechanical
Contractor: _____ Signature: _____ Date: _____

Form V-22 30 05 - Domestic Hot Water Tank

EQUIPMENT DETAILS: (Identification)
Domestic Hot Water Tank
Tank #_____
Manufacturer: _____ Model: _____
Serial #: _____ Relief Valve Model: _____

Tank #_____
Manufacturer: _____ Model: _____
Serial #: _____ Relief Valve Model: _____

Tank #_____
Manufacturer: _____ Model: _____
Serial #: _____ Relief Valve Model: _____

PRE-REQUISITES: Domestic water system operational.
Drainage pipe pressure tested. Final sewer connection completed.

PROCEDURES: (Place checkmark in space provided)		*Tank #*	*Tank #*	*Tank #*
.1	*Verify isolation valves operational*	_____	_____	_____
.6	*Verify vacuum relief valve installed*	_____	_____	_____
.7	*Record leaving water supply temperature under no flow conditions.*	_____	_____	_____
.8	*Record leaving water supply temperature under flow conditions.*	_____	_____	_____
.9	*Verify lamecoid identification mechanically fastened.*	_____	_____	_____

COMMENTS/EVALUATIONS:

_____

_____

_____

SIGN OFF:
Mechanical
Contractor: _____ Signature: _____ Date: _____

Form V-24 34 25 - Fans

EQUIPMENT DETAILS: (Identification)
Fan # _____ Replacement Belt # _____
Manufacturer: _____ Model: _____ Serial #: _____
Fan # _____ Replacement Belt # _____
Manufacturer: _____ Model: _____ Serial #: _____
Fan # _____ Replacement Belt # _____
Manufacturer: _____ Model: _____ Serial #: _____

PRE-REQUISITES: Power and ductwork complete.
Balancing Report complete.
BAS Control report complete.

PROCEDURES: (Place checkmark in space provided)	*Fan #* _____	*Fan #* _____	*Fan #* _____
1. Use balancing report to verify air flow with design.			
2. Verify there is no unusual vibration (i.e.: belt guard is secure).	_____	_____	_____
3. Check belt tension (if applicable.)	_____	_____	_____
4. Verify power is correct.			
5. Verify rotation by "bumping" fan.	_____	_____	_____
6. Verify lamecoid identification mechanically fastened.	_____	_____	_____
	_____	_____	_____

COMMENTS/EVALUATIONS:

_____

_____

_____

_____

_____

SIGN OFF:
Mechanical
Contractor: _____ Signature: _____ Date: _____

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

1.3 LEAD FREE

.1 In accordance with NSF/ANSI 372 Drinking water system components – Lead Content or California Health and Safety Code (Section 116875; commonly known as AB1953) or Vermont Bill S.152

2 Products

2.1 PIPING

.1 Domestic hot, tempered and, cold tubing, within building.
- .1 Above ground: copper tube, hard drawn, type L to ASTM B88.

.2 Underground Piping between buildings
- .1 PEX Pressure Tubing to CAN/CSA-B137.5
  - .1 Flame spread not more than 25 and smoke developed classification not more than 50
  - .2 Cold flare connections.
  - .3 All PEX Pressure Tubing and fittings to be by one Manufacturer.
  - .4 Acceptable Material:
    - .1 Uponor ASTM Ecoflex Potable PEX Single with Uponor AquaPEX® service pipe protected by multi-layer, PEX-foam insulation and covered by a corrugated, watertight, HDPE jacket and rubber end caps.

.3 Trap Primer lines
- .1 Where exposed and concealed above grade: Copper tubing as above.
- .2 Below grade: PEX Pressure Tubing to CAN/CSA-B137.5 as above
  - .1 Acceptable Material:
    - .1 Uponor with ProPEX Connections.
    - .2 Rehau with Everloc Connections.
    - .3 ViegaPEX Ultra with PEX Press Connections.

2.2 FITTINGS FOR COPPER

.1 ASME/ANSI B16 Series

.2 Brass or bronze flanges and flanged fittings.

.3 Cast brass or bronze threaded fittings, Class 125 & 250.

.4 Cast bronze or wrought copper and bronze.
- .1 NPS 2 and under: Lead free solder to ASTM B32.
- .2 NPS 2 1/2 and over: Roll Grooved or Silfos.

.5 Press Fitting:
- .1 Copper and copper alloy press fittings conforming to material requirements of ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117.
- .2 EPDM sealing elements for press fittings.
- .3 Factory installed sealing elements.
- .4 Press ends with leakage path feature that assures leakage of liquids from inside the system past the sealing element of an unpressed connection. The function of this feature is to provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.
- .5 Acceptable Material: Viega Copper ProPress fittings.

2.3 FITTINGS FOR PEX

.1 To manufacturer's requirements.

2.4 JOINTS FOR COPPER

.1 Solder/brazing: lead free to ASTM B32.

.2 Press connections: Copper and copper alloy press connections in accordance with the manufacturer's installation instructions.

2.5 JOINTS FOR PEX

.1 To manufacturer's requirements using tools recommended by PEX manufacturer.

2.6 HANGERS AND SUPPORTS

.1 Support as per manufacturer's requirements and National Plumbing Code of Canada.

.2 Copper
- .1 As per Section 23 05 29 Hangers and Supports.

2.7 MECHANICALLY FORMED TEE CONNECTIONS

.1 Mechanically extracted collars formed in a continuous operation, consisting of drilling a pilot hole and drawing out the tube surface to form a collar having a height of not less than three times the thickness of the tube wall.

.2 Mechanically Formed Tee Connections can be used on NPS 1 and larger pipe. Use only where branch is a minimum of one size smaller than run pipe.

.3 Branch notched to conform with the inner curve of the run tube, dimpled to insure penetration of the branch tube into the collar is of sufficient depth for brazing and that the branch tube does not obstruct the flow in the main line tube.

.4 Brazed joints.

2.8 VALVES

.1 As per Section 23 05 23 Valves.

2.9 INSULATION

.1 As per Section 23 07 00 Mechanical Thermal Insulation

3 Execution

3.1 INSTALLATION

.1 Connect to fixtures and equipment in accordance with manufacturer's instructions unless otherwise indicated.

.2 Install pipes close to building structure to minimize furring, conserve headroom and space. Run piping parallel to walls. Group piping wherever possible.

.3 Install groups of piping parallel to each other, spaced to permit application of insulation, identification, and service access, on individual hangers or trapeze hangers.

.4 Cut square, ream and clean tubing and tube ends, clean recesses of fittings and assemble without binding.

.5 Wipe all pipes of soldering flux as the joint is completed.

.6 Assemble all piping using fittings manufactured to ANSI standards.

.7 Install DCW piping below and away from DHW and all other hot piping so as to maintain temperature of cold water as low as possible.

.8 Where pipe sizes differ from connection sizes of equipment, install reducing couplings close to equipment. Reducing bushings are not permitted.

.9 Lay copper tubing so that it is not in contact with dissimilar metal and will not be kinked or collapsed.

.10 Use non-corrosive lubricant or Teflon tape applied to male thread.

.11 Provide di-electric couplings wherever piping of dissimilar metals are joined.

.12 Install swing or swivel joints to connect risers to mains.

.13 Buried water tubing and buried trap priming tubing:
- .1 Refer to Division 33 for bedding.
- .2 Buried potable water tubing
  - .1 Direct bury continuous without joints.
  - .2 Transition to copper within 12" AFF
  - .3 Brace pipe at both ends.
  - .4 Provide end caps at both ends.
- .3 Buried trap priming tubing:
  - .1 Direct bury continuous without joints.

3.2 PEX INSTALLATION

.1 In accordance with manufacturer's instructions unless otherwise indicated.

.2 Have a copy of manufacturer's instructions on site.

3.3 PRESS CONNECTION INSTALLATION

.1 In accordance with the manufacturer's installation instructions.

.2 Fully inserted tubing into the fitting and the tubing marked at the shoulder of the fitting.

.3 Check the fitting alignment against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting.

.4 Pressed the joints using the tool(s) approved by the manufacturer.

3.4 MECHANICALLY FORMED TEE CONNECTIONS

.1 Mechanically Formed Tee Connections can be used on NPS 1 and larger pipe. Use only where branch is a minimum of one size smaller than run pipe.

3.5 DISINFECTION & TESTING

.1 Potable Water
- .1 Flush out, disinfect and rinse entire potable water system to requirements of authority having jurisdiction.
- .2 Upon completion, provide bacteria and full chemical analysis laboratory test reports on water quality confirming that the potable water meets Guidelines for Canadian Drinking Water Quality
- .3 Test entire potable water system to requirements of authority having jurisdiction and in accordance with Division 1.

.2 Provide full chemical analysis laboratory test results for the following:
- .1 Raw water into building
- .2 Treated water

.3 Provide bacteria test results in the following locations:
- .1 At end of longest run,
- .2 At end of any run over 20 meters (65 feet).

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

2 Products

2.1 PIPING, FITTINGS AND JOINTS

.1 NPS 1 ¼ and larger: Type DWV Copper to ASTM B306.
- .1 Fittings:
  - .1 Cast brass: to CSA B158.1.
  - .2 Wrought copper: to ANSI B16.29.
- .2 Solder/brazing: Lead free to ASTM B32.

.2 Cast Iron Pipe: to CAN/CSA-B70 Cast Iron Soil Pipe, Fittings and Means of Joining.
- .1 Buried Sanitary Storm and vent minimum NPS 3, to CAN/CSA B-70 with one layer of bituminous coating. Product to be manufactured in ISO 9000 and ISO 14001 Facility
- .2 Above Ground Sanitary Storm and Vent to CSA B-70, Product to be manufactured in ISO 9000 and ISO 14001 Facility
- .3 Acceptable material for pipe.
  - .1 Bibby Ste-Croix: All sizes.
  - .2 Tyler: up to and including NPS 4
- .4 Hub & Spigot Joint.
  - .1 Self-locking positive compression EPDM gasket
  - .2 Acceptable material.
    - .1 Bibby Ste-Croix Bi-Seal.
    - .2 Tyler Ty-Seal.
- .5 Cast Iron Pipe Mechanical Joints: to and listed to CAN/ULC S-102.2-10 and CAN/CSA-B602 Mechanical couplings for drain, waste, and vent pipe and sewer pipe
- .6 Acceptable material.
  - .1 Bibby Ste-Croix
    - .1 Series 2000.
    - .2 Husky SD4000 Heavy Duty
  - .2 Tyler MJ (No hub) coupling.

.3 PVC to CAN/CSA-B181.2, CAN/CSA-B182.1 and CAN/CSA-B182.2
- .1 PVC DWV 25-50: with solvent weld joints with flame spread not more than 25 and smoke developed classification not more than 50.
  - .1 Pipe and fittings by one manufacturer.
  - .2 Acceptable material:
    - .1 IPEX System XFR™ 15-50
- .2 PVC DWV: with solvent weld joints
- .3 SDR ≤ 35 PVC DWV up to and including NPS 6: solvent weld joints
- .4 SDR ≤ 35 PVC DWV 8 and over: locked in gasket and integral bell joint.

	Copper	**Cast Iron**	**PVC DWV**	**PVC DWV 25 -50**	**SDR ≤ 35 PVC DWV**
Below Grade Sanitary & Vent	N/A	Y	Y	Y	N
Above Grade Sanitary& Vent	Y	Y	N	Y	N
Pumped Sanitary	Y	N	N	N	N

2.2 RELIEF VALVE PIPING AND DRAINS

.1 All sizes: copper tube, hard drawn, type L to ASTM B88
- .1 Applications: relief valve piping, etc.

.2 NPS 1 ¼ and larger: Copper DWV or PVC DWV 25-50 as described above
- .1 Applications: air handling drains, plenums, A/C drains, etc.

2.3 HANGERS SUPPORTS

.1 As per Section 23 05 29 Hangers and Supports.

2.4 INSULATION

.1 As per Section 23 07 00 Mechanical Thermal Insulation

3 Execution

3.1 INSTALLATION

.1 Install piping parallel to building lines and close to walls and ceilings to conserve headroom and space and to grade indicated.

.2 Locate underground piping to accommodate a minimum of 300 mm (12”) of backfill below slab over the pipe.

.3 For NPS 4 or less pipe, use 90^0 elbows which have center-line radius equal or greater than pipe size or double 45^o fittings to make 90^0 change in direction

.4 Cast Iron
  .1 In accordance with manufacturer requirements.
  .2 Torque coupling connections to manufacturer requirements.

3.2 RELIEF VALVE PIPING AND DRAINS

.1 Turn down at floor drain.

.2 Cut end of discharge pipe at 45°.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

2 Products

2.1 GENERAL

.1 Capacity: As per schedule on drawing.

2.2 ELECTRIC TANKS

.1 Immersion type elements,

.2 Surface mounted or immersion type adjustable thermostats.

.3 Glass lined steel tank, 50 mm (2") insulation, enameled steel jacket, hose threaded drain valve.

.4 Meet or exceed the standby loss requirements of ASHRAE Standard 90.1b-2001.

.5 Working pressure of 150 psi.

.6 Magnesium anode rods rigidly supported.

.7 Relief valve
- .1 ASME rated temperature and pressure.
- .2 Rated and listed by CGA.
- .3 Test lever.
- .4 Bronze body construction.
- .5 Temperature rated at 100° C.
- .6 Pressure rated at 860 kPa (125 psi).
- .7 Capacity to suit tank

.8 Standard of Acceptance:
- .1 Rheem as per drawings

.9 Acceptable Manufacturer:
- .1 John Wood.
- .2 Giant
- .3 Bradford White

2 Execution

3.1 RELIEF VALVES

.1 Pipe relief valves full size to nearest drain

.2 Refer to Section 22 13 17 Drainage Waste and Vent Piping for material.

.3 Cut end of discharge pipe at 45°.

.4 Provide unions on discharge piping of relief valves.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

1.3 LEAD FREE

.1 In accordance with NSF/ANSI 372 Drinking water system components – Lead Content or California Health and Safety Code (Section 116875; commonly known as AB1953) or Vermont Bill S.152

2 Products

2.1 FLOOR DRAINS

.1 FD: Coated cast iron body with integral seepage pan, membrane clamping collar, nickel bronze adjustable head and heavy duty round strainer. reversible membrane clamping collar,

.2 FD-1: Coated cast iron body with integral seepage pan, sediment bucket, membrane clamping collar and 200 mm (8") round non-tilting secured grate.

.3 FD-F: Coated cast iron body with integral seepage pan, membrane clamping collar, nickel bronze adjustable head, integral oval funnel and round strainer (open at funnel).

.4 Acceptable material:

	Jay R. Smith	Mifab	Watts Drainage	Zurn
FD	2005-A5HD	F1100-C-5-1	FD-100-C-A5-1	ZXN-415-5A
FD-1	2320-B	F1320C-5	FD-320-5-	Z-556-AR-Y
FD-F	2005-3591 OT-NB	F1100-C-EG-1	FD-100-C-EG-1	ZN-415-BF

2.2 CLEANOUTS

.1 CO For Floors: Cast iron body, round adjustable secured nickel bronze full 13 mm (1/2") thick top with neoprene gasket, cast iron extension and gas tight ABS expansion plug.

.1 Acceptable Material:

.1 Jay R. Smith SQ-4-1753-CONB-SP-4HD

.2 Mifab C1100-XR-1-34

.3 Watts CO-100-C-RX-1-34G

.4 Zurn ZXN-1612-SP

.2 For stacks, concealed in block wall: install a Malcolm style in a TY with face of cleanout within 50mm (2") of wall face. Provide access door.

.3 For stacks, concealed in drywall: Barrett style with access door.

.4 For exposed stacks: Barrett style.

2.3 WALL HYDRANTS

.1 WH: Encased recessed non-freeze wall hydrant with integral self-draining vacuum breaker and NPS 3/4 hose outlet. Removable operating key. Polished nickel bronze finish.

.2 Acceptable Material:
- .1 Jay R. Smith 5509 QT
- .2 Mifab MHY-26
- .3 Watts Drainage HY-725
- .4 Zurn ZN 1320/Z1322

2.4 WATER HAMMER ARRESTORS

.1 WHA: Stainless steel construction, bellows type: to Plumbing and Drainage Institute Standard PDI-WH 201-77.

.2 Acceptable Material:
- .1 Jay R. Smith 5000
- .2 Watts Drainage SG-SS
- .3 Zurn Z-1700

2.5 BACK FLOW PREVENTERS

.1 CSA B64.4 Certified.

.2 Double Check backflow preventer.
- .1 NPS 3/4 to 2.
  - .1 Lead Free
  - .2 Bronze body construction.
  - .3 Quarter turn ball valve shut-offs.
  - .4 Bronze ball valve test cocks.
  - .5 Replaceable seats.
  - .6 Soft seat check valve
  - .7 Air gap piped to drain.
  - .8 Acceptable Material:
    - .1 Watts LF007 QT

2.6 HOSE BIBBS

.1 Ball valve in accordance with Section 23 05 23 with Cap & Chain.

.2 Lead Free Hose end vacuum breakers except where otherwise protected.
.1 Acceptable Material:
.1 Watts No. 8P

2.7 TRAP SEAL PRIMERS – MULTI DRAINS

.1 Electronic solenoid valve with brass body, atmospheric vacuum breaker, inlet isolation valve, 24 hour timer, manual override switch, adjustable timer and manifold with NPS 5/8 compression for NPS ½ copper tube connections, galvanized steel wall box, prime coated access door with Allen key lock. 120 volt single point power connection. All internal piping to be copper. Valve and manifold inside enclosure.
.1 Acceptable Material:
.1 Precision Plumbing Products PT-FM series-TMR-1-ADJ-120V

.2 Provide water hammer arrestor for each trap primer.

.3 Each trap seal primer connection to run independent to each floor drain.

.4 For floor drain in slab on grade, NPS 1/2 tubing connection between trap primer and floor drain.

.5 For floor drains above grade, NPS 1/2 tubing between primer and floor drain. Pipe to be in ceiling space.

.6 Provide trap seal primer connection to all floor drains except where floor drains connect to a primed running trap.

.7 Provide trap seal primer connection to all air handling unit drains connections.

2.8 TRAPS

.1 Deep seal traps.

2.9 FIXTURE CARRIER

.1 Type L: For wall hung lavatories, heavy duty steel uprights with feet, concealed arms. Single or double as required.

.2 Acceptable material:

	Jay R. Smith	**Mifab**	**Watts Drainage**	**Zurn**
L	710/710D	MC-41/41D	CA-411/411-D	ZX-1231/1233

2.10 VACUUM RELIEF VALVE

.1 Lead Free

.2 Tested and rated under ANSI Z21.22.

.3 Acceptable Material:
- .1 Watts LF N36 NPS 3/4.
- .2 Wilkins 34XL-VR10

2.11 DOMESTIC HOT WATER EXPANSION TANK

.1 Lead Free

.2 Suitable for Potable Water

.3 Pressurized expansion tank.

.4 Capacity as indicated.

.5 Suitable for 70° C operating temperature.

.6 Maximum working pressure: 1035 kPa (150 psig.)

.7 Air precharged to 275 kPa (40 psig) (initial fill pressure of system).

.8 Standard of Acceptance:
- .1 Watts as per drawings.

.9 Acceptable Manufacturer:
- .1 Amtrol
- .2 Apollo
- .3 Wilkins
- .4 Taco

2.12 INTERCEPTORS

.1 Oil Interceptor
- .1 Epoxy coated fabricated steel body, baffles and removable internal flow control.
- .2 Non-slip scoriated aluminum recessed cover with gasket and inspection cover.
- .3 Mounted flush with finish floor.
- .4 Extension to suit construction.
- .5 Anchoring flange.
- .6 Capacity: 20 USgpm.

.2 Acceptable material:

	Watts Drainage
Oil	WO-320-O (4”) –X (18”)

3 Execution

3.1 CLEANOUTS

.1 In addition to those required by code, an easily accessible cleanout shall be provided at each 135 degree change in direction in soil or waste pipe and at the base of each stack.

.2 Bring cleanouts to wall or finished floor unless serviceable from below floor.

.3 Running trap cleanouts to extend to finish floor.

.4 For stacks with access door, locate centerline of cleanout a minimum of 300 mm (12") AFF.

.5 Building drain cleanout and stack base cleanouts: line size to maximum NPS 4.

3.2 FLOOR DRAINS

.1 Refer to Architectural drawings for floor slope.

.2 Service fixtures as follows:

Fixture	Waste Minimum NPS	Vent NPS
Individual Shower	3	1 1/2
Floor Drain	3	1 1/2

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

1.3 FIXTURES AND TRIM

.1 All plumbing fixtures of same type to be by one Manufacturer.

.2 All vitreous china plumbing fixtures in any one washroom or location to be the product of one manufacturer.

.3 Trim of same type to be product of one manufacturer.

.4 Exposed plumbing brass to be chrome plated.

1.4 LEAD FREE

.1 In accordance with NSF/ANSI 372 Drinking water system components – Lead Content or California Health and Safety Code (Section 116875; commonly known as AB1953) or Vermont Bill S.152

2 Products

2.1 WATER CLOSETS

.1 BWC-1 Bowl and Tank: floor mounted, flush tank, maximum 4.8 liter/flush, vitreous china, siphon jet, close-coupled closet combination, elongated rim, bolt caps, flush assembly, tank liner, bolt down cover. Nominal 410 mm (16") high. Minimum MaP Test Rating: 1000 grams.

- .1 Acceptable Material:
  - .1 American Standard Cadet Pro Right Height Elongated 215AA 054
  - .2 Kohler Highline K-3999-U flush at 4.8 Lpf
  - .3 Mansfield Maverick 114-112LT flush at 4.8 Lpf

.2 SWC-2 Seat: white open front, elongated, molded antimicrobial solid plastic with cover, check hinge, stainless steel hinge.

- .1 Acceptable Material:
  - .1 Centoco AM820STS.
  - .2 Bemis 7850TDG.
  - .3 Zurn Z5957SS-EL-AM-STS

.3 Water Closet Schedule

Symbol	Bowl	Seat	Supplies
WC-1	BWC-1	SWC-2	SUP-2

2.2 LAVATORY & SINK TRIM

.1 T-1 Lead Free Trim: chrome plated brass, 100 mm centerset supply fitting, mixing spout, vandal resistant laminar flow 5.7 L/min outlet, 62 mm lever handles with vandal resistant screws, NPS 1/2 IPS male inlets and coupling nuts.

.1 Acceptable Material:

.1 Delta Commercial Cambridge Brass 21C123.

.2 Chicago Faucet AB1802A-1000VP-E36VP.

.3 Kohler K-15240-4-CP and outlet as noted above.

.4 Zurn Z81103XL-18M.

2.3 DRAINS

.1 D-2 Drain: chrome plated cast brass offset waste fitting with perforated open grid strainer suitable for lavatory with overflow and NPS 1 1/4 tail piece.

.1 Acceptable Material:

.1 Belanger B20-5700PC

.2 Delta Commercial Cambridge Brass 33T290 drain.

.3 McGuire 155WC drain.

.4 Oakville Stamping & Bending 3700WC drain.

.5 Watts Brass & Tubular Products 628203WC drain.

.6 Zurn Z8746-PC.

2.4 P- TRAP

.1 PT-1 P- Trap: Chrome plated NPS 1 1/4 cast brass P-trap with cleanout and deep flange.

.1 Acceptable Material:

.1 Belanger B10-5302PC

.2 Delta Commercial Cambridge Brass 33T311 trap.

.3 McGuire 8872C trap.

.4 Oakville Stamping & Bending 95 trap.

.5 Watts Brass & Tubular Products 502173 trap.

.6 Zurn Z8700BD-PC

2.5 FIXTURE SUPPLIES

.1 Lead Free chrome plated ¼ turn fixture supplies with chrome plated flexible copper riser wheel handle stops, screwed inlet with chrome plated brass nipple and escutcheons on each service to each fixture.

.1 SUP-1 Acceptable Materials for Lavatories:

.1 Brasscraft KTR400A C-w/NIP Lead Free.

.2 Zurn Z8802Q-XL-LR-PC Lead Free

2.6 LAVATORIES

.1 SSL-1: wall hung, stainless steel, integral back splash up, supply openings on 100 mm centers, NPS 1 ½ waste assembly with brass tailpiece.
- .1 Mounted on wall bracket.
- .2 Acceptable Material:
  - .1 Franke Commercial WHB1819-3.
  - .2 AMI Novanni 8100.

.2 Lavatory Schedule

Symbol	Lavatory	Trim	Drain	Trap	Supplies
L-9	SSL-1	T-1	D-2	PT-1	SUP-1

2.7 THERMOSTATIC CONTROL VALVE

.1 TV-M Master Mixer: Lead Free Thermostatic control with check stops, removable cartridge with strainer, thermal motor, rough bronze finish, built in limit stops. ASSE 1017
- .1 Application: DHW tanks
- .2 Standard of acceptance:
  - .1 Powers as per Schedule on drawings
- .3 Acceptable material
  - .1 Powers LFlM49010

2.8 EMERGENCY DEVICES

.1 EW: Eye-Wash
- .1 Gentle spray eye wash with high impact plastic bowl.
- .2 Wall Bracket
- .3 Emergency sign.
- .4 Barrier Free.
- .5 Tempered water blending system
  - .1 Thermostatic mixing valve liquid filled thermal motor built-in limit stops.
  - .2 Shuts off all incoming hot water if cold water supply fails.
  - .3 Check valve.
  - .4 Outlet temperature gauge.
  - .5 Cabinet where exposed.
- .6 Provide union and isolation valve on inlets and outlet.
- .7 Acceptable Material:
  - .1 Acorn S04020 with ET71-1-OTG
  - .2 Bradley S19-220ABF S19-2000 EFX8
  - .3 Guardian G1724P-TP with TMV G3600LF
  - .4 Haws 7260B 9201EFE with Outlet temperature gauge

2.9 SERVICE SINKS

.1 MS-1: Floor mounted Stainless steel Mop Service sink with 450 mm integral splashguard on side ide (left or right as per plans)and back, 16 gauge, type 316 stainless steel. Polished satin finish, 250 mm (10") deep, radius coved bowl corners factory installed drain body with NPS 2 stainless steel dome strainer. Nominal Size: 600 x 600 x 250 mm (24" x 24" x 10").

- .1 Acceptable Material:
  - .1 Franke Commercial FSSR or L 222210/316-1
  - .2 AMI Novanni 9500/316 R or L with 450 mm (18”) integral splashguard
- .2 Control Valve: Single handle pressure balancing mixing control valve cycles from Cold to Hot, polished chrome plated finish trim, lever handle, service stops. NPS ½ Inline check valves as per section 23 05 23 Valves
  - .1 Acceptable Material for Control Valve:
    - .1 Chicago Faucet 17900-VOCCP with NPS ½ Inline check valves as per Section 23 05 23 Valves
    - .2 Delta Commercial Cambridge Brass 53TS111
    - .3 Kohler K-T10277-4
    - .4 Zurn Z7300–SS-MT-SSC –Z70000-SC spring check valves
- .3 Trim: wall mount lever handle diverter, 2 rigid wall spouts with top brace and garden hose end.
  - .1 Acceptable Material for trim:
    - .1 Delta Commercial Cambridge Brass (See above)
    - .2 Chicago Faucet two 140 mm Spouts with pail hook and wall brace and Symmons 4-458 lever handle Diverter.
    - .3 Kohler K-10290-4 and CB060424A Spouts
    - .4 Zurn two G61995 Spouts and Z-700-DV-3P Diverter.
- .4 Wallmount vacuum breaker, NPS 1/2 with union and set screw wall flanges. Spill Resistant elevated vacuum breaker suitable for continuous pressure.
  - .1 Acceptable Material for Spill Resistant Vacuum Breaker:
    - .1 Watts 008QT.
    - .2 Wilkins 460XL
    - .3 Apollo SVB 4W.

2.10 FIXTURE TRAPS

.1 P-traps complete with cleanouts on all fixtures which do not have built-in traps.

.2 Separate cleanout in stack is required where two or more sinks or lavatories connect to common stack using double sanitary tee.

.3 Running traps where indicated on drawing.

2.11 ROUGHING-IN OF FIXTURES

.1 For equipment supplied by others, provide rough-in complete with valved supplies, wastes and vents, capped.

3 Execution

3.1 FIXTURE INSTALLATION

.1 Connect fixtures complete with supplies and drains, trapped, supported level and square.

.2 Hot water faucets shall be on left.

.3 Fixtures on outside walls to have supplies from floor; other fixtures to be served from wall.

.4 For counter top lavatories and stainless steel sinks, see architectural drawings for counter top heights and location of fixtures.

.5 For other fixtures refer to drawings for mounting heights.

.6 Ensure floor mounted fixtures are on a level base continuous around perimeter.

.7 In accordance with Nova Scotia Building Code, National Building Code and National Plumbing Code of Canada.

.8 Caulk wall hung lavatories to wall.

.9 Caulk floor mounted water closets to floor.

.10 Caulk floor mounted mop sinks to floor and wall. Caulk stainless steel wall trim to sink and wall.

.11 Service fixtures as follows:

Fixture	Waste NPS	Vent NPS	Cold Water NPS	Hot Water NPS
Lavatory	1 1/4	1 1/4	1/2	1/2
Water Closet (tank)	3	1 1/2	1/2	-
Individual Shower	3	1 1/2	1/2	1/2
Floor Drain	3	1 1/2	-	-

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 Water closets: flushing action.
- .2 Outlets: operation, cleanliness.
- .3 Vacuum breakers, backflow preventers: operation under all conditions.
- .4 Refrigerated water coolers: operation, temperature settings.

.4 Thermostatic controls.
.1 Verify temperature settings, operation of control, limit and safety controls.

.5 Manufacturer's representative to visit the site and test each water closet and urinal to confirm that the fixture flushes with the specified volume of water.

3.3 LAVATORY TRIM

.1 Provide key for vandal resistant outlets.

.2 Clean outlet screens.

3.4 THERMOSTATIC CONTROL VALVES

.1 Verify temperature settings, operation of control, limit and safety controls.

.2 Install in accordance to manufacturer's recommendations.

.3 Master mixing valve Manufacturer's service technician to visit the site and adjust Master mixing valve at full demand and no DHW demand.

.4 Test and adjust each thermostatic control mixing valve. Set limit stops as follows:

	TEMPERATURE ^{O}F	**TEMPERATURE ^{O}C**
DHW Tank	140	60
Master Mixing Valve	120	60
Emergency Devices Mixing Valves	95	35

3.5 BRASS TRAPS, SUPPLIES AND ASSOCIATED PIPE

.1 Where exposed to view, paint with aluminum paint.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

2 Products

2.1 GENERAL

.1 Design point to be midpoint of scale or range.

.2 Dual Scale:
- .1 Water Thermometers: 0 to 115° C, 30° to 240° F.

.3 Direct Reading Thermometers
- .1 Industrial variable angle type 225 mm (9") scale length.
- .2 Liquid filled or Solar powered
- .3 Aluminum case

.4 Thermometer Wells
- .1 Copper pipe: use copper or bronze. For steel pipe use stainless steel.
- .2 Steel Pipe:
  - .1 Open systems use stainless steel.
  - .2 Closed systems use brass.

.5 Acceptable Material

	Direct Reading Thermometers
Trerice	BX 9140 or SX9140305
Weiss	A9VS9
Winters	9IT with Aluminum case
Weksler	EG5H-9 with Aluminum Case

3 Execution

3.1 GENERAL

.1 Provide thermometers and gauges so they can be easily read from floor or platform. If this cannot be accomplished, install remote reading thermometers and gauges.

.2 Provide between equipment and first fitting or valve.

.3 Increase pipe size at well to minimum NPS 2 to accommodate well.

.4 Well to extend 6 mm to 12 mm into the pipe.

3.2 DIRECT READING THERMOMETERS

.1 Provide in wells on all piping. Provide heat conductive material inside well.

.2 Provide in the following locations:
- .1 DHW tank outlets.
- .2 In other locations as indicated.

.3 Use extensions where thermometers are installed through insulation.

END OF SECTION

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

1.3 MANUFACTURED ITEMS

.1 All valves of one type to be by one manufacturer.

1.4 LEAD FREE

.1 In accordance with NSF/ANSI 372 Drinking water system components – Lead Content or California Health and Safety Code (Section 116875; commonly known as AB1953) or Vermont Bill S.152

2 Products

2.1 VALVES NPS 2 AND UNDER

.1 Lead Free Ball Valves NPS 2 and under soldered and screwed:
- .1 Application
  - .1 Section 22 11 16 Domestic Water Piping
- .2 Quarter-turn: 4130 kPa (600 psi) W.O.G., bronze, large port.

.2 Lead Free Swing Check Valves NPS 2 and under, soldered and screwed:
- .1 Application
  - .1 Section 22 11 16 Domestic Water Piping
- .2 1380 kPa (200 psi) W.O.G., bronze body, bronze swing disc, screw in cap, regrindable seat.

.3 Acceptable material:

NPS 2 and under	Lead Free Ball	Lead Free Check
Apollo	77CLF-100/77CLF-200	161S-LF/161T-LF
Crane	LF9201/LF9202	LF37/LF1340
Milwaukee	UPBA150/ UPBA100	UP1509/UP509
Apollo	77CLF-100/77CLF-200	161S-LF/161T-LF
Nibco	S-685-80-LF /T -685-80-LF	S-413-Y-LF / T-413-Y-LF
Kitz	868/869	822T/823T
Watts	LFB6080/ LFB6081	LFCV/LFCVS

2.2 DRAIN VALVES AND GAUGE COCKS

.1 Lead Free Drain Valves
- .1 Locate at low points of mains, branches and risers.
- .2 At domestic water branch isolation valves, provide drain unless branch can be drained through a fixture.
- .3 Equipment drain valves line size.
- .4 Minimum NPS 1/2 unless otherwise specified.
- .5 Ball valve with hose end male thread and cap with chain.

.2 Lead Free Gauge Cocks
- .1 NPS 1/4 screwed.
  - .1 Application
    - .1 Pressure Gauge
    - .2 Where indicated
- .2 Quarter-turn: 1725 kPa (250 psi) W.O.G., bronze.

.3 Acceptable material:

	Drain valves	**Gauge Cocks**
Apollo	77CLF-100-HC/77CLF-200-HC	77CLF-100/77CLF-200
Kitz	868/869 w/cap and chain.	868/869
Nibco	S-685-80-LF-HC /T -685-80-LF-HC	S-685-80-LF /T -685-80-LF
Watts	LFB6080/ LFB6081 w/cap and chain	LFB6080/ LFB6081
Milwaukee	UPBA150/ UPBA100 w/cap and chain	UP1509/UP509

3 Execution

3.1 GENERAL

.1 Install valves with stems upright or horizontal unless approved otherwise.

.2 Line size.

3.2 CIRCUIT BALANCING VALVES

.1 Maintain Manufacturer's recommended minimum straight pipe diameters.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

2 Products

2.1 GENERAL

.1 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

2.2 UPPER ATTACHMENTS

.1 Welded eye rod:
- .1 Wood.
- .2 Zinc plated.
- .3 Application: Piping and ductwork

.2 Coach screw with flatten end with hole for threaded rod:
- .1 For side attachment to Wood.
- .2 Application: Piping and ductwork

.3 Coach screw and machine thread rod:
- .1 Wood.
- .2 Zinc plated.
- .3 Application: Piping and ductwork

.4 Acceptable material:

	CCTF/Hunt	**E. Myatt & Co**	**Taylor Pipe Supports**	**Anvil**	**Carpenter and Paterson Pipe Hangers Ltd.**
Welded eye rod	95	440		278	
Coach screw with Flattened end		#3 size 2			
Coach screw	58N	461	61	142	

.5 For pipes and ducts parallel to steel structure:
- .1 Insert into floor slab above or

.2 Steel member from structural member to structural member.
.3 Double locking nuts.

.6 Concrete:
.1 Inserts for cast-in-place concrete: galvanized steel wedge to MSS-SP-58, type 18. ULC listed for pipe NPS 3/4 through NPS 8.

2.3 MIDDLE ATTACHMENT (ROD)

.1 Cadmium plated steel threaded rod:
.1 Acceptable Material:
.1 Carpenter & Paterson Pipe Hangers Ltd. Fig. 94.
.2 CCTF/Hunt Fig. 99P.
.3 Anvil Fig. 146.

2.4 PIPE ATTACHMENT

.1 Acceptable material:

	CCTF/ Hunt	**E. Myatt & Co**	**Taylor Pipe Supports**	**Anvil**	**Carpenter and Paterson Pipe Hangers Ltd.**
Adjustable clevis hanger	32N	124	24Z	260	100
Long adjustable clevis hanger	32U	124L	24L	300	286
Copper plated or epoxy coated clevis hanger	30C/E	151CT or 56	52	CT65	100CT
Black carbon steel riser clamp	40	183	82	261	126
Copper plated riser clamp	42C	150CT	85	CT121	126CT

.2 Double hook with double locking nut.
.1 Application: Insulated and uninsulated cast iron pipe: NPS 6 and under.
.2 Acceptable Material:
.1 Bibby Ste. Croix 6602 to 6606

3 Execution

3.1 PIPE SUPPORT SPACING

.1 Plumbing: Spacing and middle attachment (rod) diameter as specified in paragraphs below or as in table below, whichever is more stringent
.1 Plumbing piping: to National Plumbing Code of Canada.
.2 Authority having jurisdiction.
.3 Flexible joint roll groove pipe: in accordance with table below, but not less than one hanger at joints and not less than one hanger per pipe length over 1200 mm (4’0”).
.4 Within 300 mm (12") of each elbow.
.5 Risers at each floor.

.6 Minimum hanger rod size as per full size manufacturer's recommendation and table below, whichever is greater.

Pipe Size: NPS	Rod Diameter	Maximum Spacing Steel	Maximum Spacing Copper
up to ¾	10 mm (3/8")	2100 mm (7'0")	1500 mm (5'0")
1 to 1-1/4	10 mm (3/8")	2100 mm (7'0")	1800 mm (6'0")
1-1/2	10 mm (3/8")	2750 mm (9'0")	2400 mm (8'0")
2	10 mm (3/8")	3000 mm (10'0")	2750 mm (9'0")
2-1/2	10 mm (3/8")	3350 mm (11'0")	3000 mm (9'10")
3	13 mm (1/2")	3650 mm (12'0")	3000 mm (9'10")
4	13 mm (1/2")	4250 mm (14'0")	3000 mm (9'10")

Pipe Size: NPS	Rod Diameter	Maximum Spacing Cast Iron	Maximum Spacing PVC
Up to 4	10 mm (3/8")	3000 mm (9'10")	1200 mm (4'0")
Over 4	13 mm (1/2")	3000 mm (9'10")	1200 mm (4'0")

.7 PEX: Support horizontal pipe at National Plumbing Code of Canada and manufacturer's requirements.

.2 At Steel Joists
- .1 Locate hangers at panel points of OWSJ for piping perpendicular to OWSJ.
- .2 Locate steel support members at panel points of OWSJ for piping parallel to OWSJ.
- .3 For parallel runs of piping NPS 2 ½ and over.
  - .1 Where perpendicular to OWSJ support on alternating OWSJ.

3.2 PLUMBING PIPE ATTACHEMENT APPLICATIONS

.1 Upper Attachment as noted above.

.2 Middle attachment as noted above.

.3 Pipe Attachment Application
- .1 Copper pipe: All sizes.
  - .1 Copper plated or epoxy coated adjustable clevis hanger.
- .2 PVC: All sizes.
  - .1 Adjustable clevis hanger.
- .3 PEX: All sizes.
  - .1 Epoxy coated Adjustable clevis hanger.

3.3 DUCT HANGERS

.1 In accordance with Section 24 31 13 Metal Ducts - Low Pressure to 500 Pa

3.4 MIDDLE ATTACHMENT (ROD)

.1 Trim excess threaded rod off within 13 mm (1/2") of attachment nut.

3.5 HANGER INSTALLATION

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

.2 Adjust hangers to equalize load.

.3 Provide double nuts at middle attachment (rod) top and bottom.

.4 Where building structural members or inserts are not suitably located provide supplementary steel channels or angles, support these channels and angles only from the top of structural members. Drill holes in the channels and angles for insertion of hanger rods. If the holes are cut out with a torch, provide a back-up steel plates with drilled holes for inserting hanger rods. Secure each hanger rod to the channels and angles using a steel back-up plate where applicable and steel washers and a lock-nut system. All channels, angles and hanger rod upper supports shall have a load capacity of five (5) times the load to be supported from them.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

2 Products

2.1 MANUFACTURERS NAMEPLATES

.1 Provide metal nameplate on each piece of equipment, mechanically fastened complete with raised or recessed letters. Locate nameplates so that they are easily read. Do not insulate or paint over nameplates.

.2 Include registration plates (e.g. Pressure vessel, Underwriters' Laboratories and CSA Approval). Indicate size, equipment model, manufacturer's name, serial number, voltage, cycle, phase and power of motors.

2.2 SYSTEM NAMEPLATES

.1 Color:
- .1 Hazardous: white letters, red background
- .2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

.2 Construction:
- .1 2.4 mm (3/32") thick, laminated plastic or white anodized aluminum, matte finish, square corners, letters accurately aligned and machine engraved into core.

.3 Minimum Sizes:
- .1 Conform to following table:

Size 1	10 mm x 50 mm (3/8" x 2")	1 line	5 mm (0.2") high letters
Size 3	16 mm x 75 mm (3/4" x 3")	2 line	5 mm (0.2") high letters
Size 7	25 mm x 100 mm (1" x 4")	2 line	6 mm (1/4") high letters
Size 8	50 mm x 150 mm (2" x 6")	2 line	13 mm (1/2") high letters

- .2 Equipment type, number and service or area or zone of building it serves to be identified.
- .3 Use average of 25 letters/numbers (maximum) per nameplate.
- .4 Use Size 1.
  - .1 Control Components.

.5 Use Size 3.
- .1 Domestic water tanks.
- .2 Packaged fans.
- .3 Trap Primers
- .4 Backflow preventers
- .5 Fire dampers
- .6 Packaged fans less than 560 watts (3/4 HP)
- .7 Reheat coils
- .8 Motorized Dampers
- .9 Mixing valves

.6 Use Size 7.
- .1 Exhaust fans more than 750 watts (1 HP)
- .2 Control panels.
- .3 Junction boxes.
- .4 Relay panels.

.7 Use Size 8.
- .1 Air handling units.

.4 Mechanically fasten nameplates.

2.3 EQUIPMENT CONCEALED IN CEILING

.1 At valves, balancing dampers, air vents, drains and electrical components located above T-bar ceiling or access doors, provide self-adhering color disc as near as possible to where item is located.

.2 Where valves, balancing dampers, air vents, drains or electrical component has primary and secondary color, provide a 20 mm (3/4") primary color disc with a 10mm (3/8") secondary color disc centered on the primary disc.

.3 Where primary color only, provide a 20 mm (3/4") primary color disc.

.4 In addition to the System Nameplates noted above provide a second size 2 identical plate on the underside of the ceiling grid or access door frame as close as possible to the location of the following:
- .1 Backflow preventers
- .2 Packaged fans less than 560 watts (3/4 HP)
- .3 Reheat coils
- .4 Motorized Dampers

.5 Mechanically fasten nameplates to equipment.

.6 Fasten nameplates to ceiling grid or access door frame with contact cement.

2.4 PIPE IDENTIFICATION

.1 General: Identify medium by lettered legend, classification by primary and secondary colors, direction of flow by arrows.

.2 Primary color bands: 50 mm (2") wide.

.3 Secondary color bands: 50 mm (2") wide, 75 mm (3") in from one end of primary color band.

.4 Legend: block capitals to following table:

Outside Diameter of Pipe or Insulation	**Size of Letters**
Up to 1 1/4"	1/2"
1 1/2" to 2"	3/4"
2 1/2" to 6"	1 1/2"
Over 6"	2"

.5 Arrows:
- .1 Outside diameter of pipe/insulation 75 mm (3") and greater: 150 mm long x 50 mm high. (6" long x 2" high.)
- .2 Outside diameter of pipe/insulation less than 75 mm (3"): 100 mm long x 50 high (4" long x 2" high.)
  - .1 Use double headed arrows where flow is reversible.

.6 Material:
- .1 Paint for Stencil: Low VOC and environmentally friendly
- .2 Color bands:
  - .1 Plastic coated cloth material with protective overcoating and waterproof contact adhesive undercoating, suitable for 100% RH and continuous operating temperature of 150° C and intermittent temperature of 200° C. Apply to prepared surfaces. Wrap tape around pipe or pipe covering with ends overlapping one (1) pipe diameter. Cut band to length, don't tear off.
  - .2 Acceptable Manufacturer:
    - .1 WH Brady Inc.
    - .2 Seton Name Plate Corp.

.7 Colors:
- .1 Where not covered by table below, submit legend, primary and secondary classification colors to Consultant for approval.

.8 Table: Pipe and valve identification.

Pipe Marker Legend	**Valve Legend**	**Tag Primary Color**	**Secondary Color**
Dom. Cold Water	DCW	Green	None
Dom. Hot Water	DHW	Green	None

Dom. Hot Water Tempered	DHWT	Green	None
Sanitary Sewer	-	Green	None
Vent (plumbing)	-	Green	None
Refrigerant Suction (Include Refrig No.)	REF.S (No.)	Yellow	Black
Refrigerant Liquid (Include Refrig No.)	REF.L (No.)	Yellow	Black
Refrigerant Hot Gas (Include Refrig No.)	REF.HG (No.)	Yellow	Black
Trap Seal Primer	TSP	Green	None

.9 Legend and arrows:
.1 Black or white to contrast with primary color.

2.5 DUCTWORK

.1 50 mm (2") high black stenciled letters and directional flow arrows 150 mm long x 50 mm high (6" long x 2" high).

.2 Indicate “Supply”, “Exhaust”, "Washroom Exhaust”, with directional arrow and “Fan System No.”

2.6 VALVE TAGS

.1 38 mm (1 1/2") square laminated plastic with corner hole.

.2 Horizontal 13 mm (1/2") letters accurately aligned and machine engraved into core.

.3 Face color to match primary color of piping identification.

.4 Core color to match secondary color of piping identification.

2.7 CEILING COLOR DISCS

.1 At valves, balancing dampers, air vents, drains and electrical components located above T-bar ceiling or access doors, provide self-adhering color disc as near as possible to where item is located.

.2 Where valves, balancing dampers, air vents, drains or electrical component has primary and secondary color, provide a 20 mm (3/4") primary color disc with a 10mm (3/8") secondary color disc centered on the primary disc.

.3 Where primary color only, provide a 20 mm (3/4") primary color disc.

2.8 ELECTRICAL COMPONENTS SUPPLIED BY DIVISION 20 TO 25

.1 Identify electrically fed equipment supplied by Division 25 as per Section 25 05 03 BAS Identification.

2.9 WARNING SIGNS

.1 Equipment (e.g. motors, starters) under remote automatic control: provide orange colored signs warning of automatic starting under control of BAS.

.2 Sign to read: "Caution: This equipment is under automatic remote control of BAS" or equivalent to Consultant's approval.

3 Execution

3.1 GENERAL

.1 Provide ULC and CSA registration plates as required by Respective agency.

3.2 MANUFACTURERS NAMEPLATES

.1 Locate nameplates so that they are easily read.

.2 Do not insulate or paint over plates.

3.3 SYSTEM NAMEPLATES

.1 In conspicuous location to facilitate easy reading from operating floor to properly identify equipment and/or system.

.2 Provide stand-offs for nameplates on hot surfaces and insulated surfaces.

3.4 LOCATION OF PIPING AND DUCTWORK IDENTIFICATION

.1 On long straight runs in open areas in boiler rooms and equipment rooms, so that at least one is clearly visible from any one viewpoint in operating areas or walking isles and not at more than 50' intervals.

.2 In addition to above, label Non Potable Cold Water not at not more than 7.5 meter (25') intervals.

.3 Adjacent to all changes in direction.

.4 At least once in each small room through which piping passes.

.5 Both sides of visual obstruction or where run is difficult to follow.

.6 On both sides of any separation such as walls, floors and partitions.

.7 Where piping or ductwork is concealed in service chase, or other confined space, at entry and leaving points and adjacent to each access opening and not more than 15 meter (50') intervals.

.8 At beginning and end points of each run and at each piece of equipment in run.

.9 At point immediately upstream of major manually operated or automatically controlled valves or damper. Where this is not possible, place identification as close to valve or damper as possible, preferably on upstream side.

.10 Legend to be easily and accurately readable from usual operating areas and all readily accessible points.

.11 Plane of legend to be approximately at right angles to most convenient line of sight with consideration of operating positions, lighting conditions, reduced visibility of color or legends caused by dust and dirt and risk of physical damage.

.12 Stencil over final finish only.

.13 Beside each access door.

3.5 VALVE TAGS

.1 Secure tags to valve handle with non-ferrous chains or closed "S" hooks for valves except at plumbing fixtures and radiation.

.2 Provide one copy of valve schedule mounted in frame with non-glare glass where directed by Consultant. Provide one copy in each operating and maintenance instruction manual.

.3 Consecutively number valves in system.

3.6 DUCTWORK & PIPING

.1 In finished public areas where piping and ductwork are exposed ductwork and piping does not require identification.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

1.3 DEFINITIONS

.1 Refer to Section 20 05 01 Mechanical General Requirements.

.2 Legend
- .1 ASJ: All Service Jacket
- .2 SSL: Self-Sealing Lap
- .3 FSK: Foil-Scrim-Kraft; jacketing
- .4 PSK: Poly-Scrim-Kraft; jacketing
- .5 PVC: Polyvinyl Chloride

1.4 ENVIRONMENTAL REQUIREMENTS

.1 Maintain ambient conditions required by manufacturers of tapes, adhesives, mastics, cements and insulation materials.

.2 Follow manufacturer's recommended handling practices.

2 Products

2.1 GENERAL

.1 Components of insulation system to have maximum flame spread rating of 25 and maximum smoke developed rating of 50 in accordance with CAN/ULC-S102.

.2 Materials to be tested in accordance with ASTM C411.

2.2 PIPE INSULATION

.1 P-2 Formed Mineral Fiber with ASJ Vapour Barrier to 454° C
- .1 Application for piping, valves and fittings on:
  - .1 Domestic water piping
  - .2 A/C drain lines.
  - .3 Where indicated.

.2 Material:
- .1 CAN/CGSB 51.9 Mineral Fiber Thermal Insulation for Piping
- .2 CGSB 51-GP-52 Vapour Barrier Jacket and Facing Material.
- .3 Self-seal lap closure including ASJ butt strips.

.3 Thermal Conductivity "k" shall not exceed 0.034 W/m° C at 24° C mean temperature when tested in accordance with ASTM C335.

.4 Thickness:
- .1 Domestic Cold Water
  - .1 13 mm (1/2") on NPS 1/2 pipe.
  - .2 25 mm (1") on NPS 3/4 and over.
- .2 Domestic Hot Water, Tempered Domestic Hot Water.
  - .1 13 mm (1/2") on NPS 1/2 pipe on branch vertical drops concealed in walls (25 mm (1") on horizontal to the branch vertical drops concealed in walls.)
  - .2 25 mm (1") on NPS 1/2 to NPS 2.
  - .3 38 mm (1 1/2") on NPS 2 1/2 and over.

.5 All pipe insulation shall be by one manufacturer.

.6 Copper tube size for copper pipe.

.2 Acceptable Material:

	Owens-Corning	**Manson Insulation Inc.**	**Knauf Fiber Glass**	**Johns Manville Insulations**
P-2	Fiberglas SSL-II	Alley K-APT	ASJ-SSL	Micro Lok AP-T

2.3 DUCT INSULATION

.1 D-2 Mineral Fiber Blanket with ASJ Vapour Barrier 4° to 120° C
- .1 Application: on concealed cold or dual temperature ducting.
  - .1 Outside air intake from louver to unit.
  - .2 All relief air ducting and exhaust ducting to the motorized damper or for minimum of 3 meters (measured on centerline of duct), whichever is greater, from exterior wall.
  - .3 Where indicated.
- .2 Material
  - .1 CAN/CGSB 51.11 Mineral Fiber Blanket.
  - .2 CGSB 51-GP-52 Vapour Barrier Jacket and Facing Material.
- .3 Thickness:
  - .1 Two layers of duct insulation for outside air intakes to heat recovery ventilators.
  - .2 Two layers of duct insulation for exhaust from heat recovery devices in heat recovery ventilators.
  - .3 One layer of duct insulation for exhaust air ducting
  - .4 One layer of duct insulation for outside air for boiler rooms,

.2 D-4 Mineral Fiber Rigid with ASJ Vapour Barrier to 4° to 120° C
- .1 Application: on exposed cold or dual temperature ducting.
  - .1 Outside air intakes from louver to unit.

.2 All relief air ducting and exhaust ducting to the motorized damper or for minimum of 3 meters (measured on centerline of duct), whichever is greater, from exterior wall.
.3 Exhaust air discharge from heat recovery unit.
.4 Where indicated.

.2 Material:
.1 CAN/CGSB 51.11 Rigid Mineral Fiberboard.
.2 CGSB 51-GP-52 Vapour Barrier, Jacket and Facing Material.

.3 Thickness:
.1 One 51 mm (2") layer of duct insulation for outside air intakes to heat recovery ventilators.
.2 One 51 mm (2") layer of duct insulation for exhaust from heat recovery ventilators.

.3 Acceptable Material:

	Owens-Corning	**Manson Insulation Inc.**	**Knauf Fiber Glass**	**Johns Manville Insulations**
D-2	All Service Faced Duct Wrap	Alley Wrap FSK	Duct Wrap - FSK	Microlite Fiber Glass Duct Wrap Insulation.
D-4	Vapor Seal Duct Insulation AF-530	AK Board FSK	Insulation Board FSK	814 Spin Glass

2.4 FASTENINGS

.1 Tape: self-adhesive, 100 mm (4") wide. ULC labeled for less than 25 flame spread and less than 50 smoke developed.
.1 Standard of Acceptance:
.1 S. Fattal Insultape.

.2 Fire resistive lap seal adhesive: quick-setting for joints and lap sealing of vapour barriers.
.1 Standard of Acceptance:
.1 Monsey Bakor Inc. 230-39.

.3 Fire resistive lagging adhesive: for cementing canvas lagging cloths to pipe insulation.
.1 Standard of Acceptance:
.1 Monsey Bakor Inc. 120-09.

.4 For insulation system underside of roof drain body.
.1 Contact adhesive: quick-setting for seams and joints.
.2 Tape: self-adhesive PVC.

.5 Fire restrictive contact adhesive: quick setting.
.1 Standard of Acceptance:
.1 Monsey Bakor 230-38.

.6 Pins:
- .1 Weld pins 4 mm (5/32") diameter, with 32 mm (1 1/4") diameter head for installation through the insulation. Length to suit thickness of insulation.
- .2 Standard of Acceptance:
  - .1 Duro Dyne, Clip-Pin
- .3 Weld pins 4 mm (5/32") diameter, for installation prior to applying insulation. Length to suit thickness of insulation. Nylon retain clips 32 mm (1 1/4") round.
- .4 Standard of Acceptance:
  - .1 Duro Dyne Spotter Pins with Spotter-Clips.

2.5 JACKETS

.1 Canvas.
- .1 Plain weave, cotton fabric at 6.5 oz/yd² (220 g/m²).
- .2 ULC label every 600 mm (2 ft.)
- .3 Standard of Acceptance:
  - .1 S. Fattal Thermocanvas
- .2 Application:
  - .1 Exposed insulated piping
  - .2 Exposed insulated ductwork

.2 PVC.
- .1 CGSB 51-GP-53M PVC sheets.
- .2 0.4 mm (0.015") thick minimum.
- .3 Fitting covers, one piece, premoulded to match.
- .4 Application on exposed insulated piping where noted below:
  - .1 Section 22 11 16 Domestic Water Piping for elbows and mechanical couplings only
- .5 Standard of Acceptance:
  - .1 Proto.
  - .2 The Sure-Fit System.
  - .3 Zeston 2000 PVC.

2.6 REMOVABLE PRE-FABRICATED INSULATION PADS

.1 Application:
- .1 Backflow preventers.

.2 To permit periodic removal and replacement without damage to adjacent insulation.

3 Execution

3.1 APPLICATION

.1 Apply insulation after required tests have been completed and approved by Consultant.

.2 Verify that all piping, equipment, and ductwork are tested and approved prior to insulation installation.

.3 Verify that all surfaces are clean, dry and without foreign material before applying insulation materials.

.4 Surfaces shall be clean and dry when installed and during application of insulation and finishes.

.5 Apply insulation materials, accessories and finishes in accordance with manufacturer's recommendations and as specified herein.

.6 All surface finishes shall be extended in such a manner as to protect all raw edges, ends and surfaces of insulation.

.7 On piping with insulation and vapour barrier, maintain integrity of vapour barrier over full length of pipe without interruption at sleeves, fittings and supports.

.8 On ductwork with insulation and vapour barrier, maintain integrity of vapour barrier over full length of duct or surface, without penetration for hangers, standing duct seams and without interruption at sleeves. Do not break continuity of insulation vapour barrier with hangers or rods. Insulate strap hangers 100 mm (4”) beyond insulated duct.

3.2 PIPE INSULATION INSTALLATION

.1 Performed: sectional up to NPS 12, sectional or curved segmented above NPS 12.

.2 Multi-layered: staggered butt joint construction.

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

.4 Expansion joints in insulation: terminate single layer and each layer of multiple layers in straight cut at intervals recommended by manufacturer. Leave void of 25 mm (1”) between terminations. Pack void tightly with P-3 flexible mineral insulation.

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

.6 Expansion joints in piping: provide for adequate movement of expansion joint without damage to insulator or finishes.

.7 Insulation is not required for:
- .1 Chrome plated piping, valves and fittings.

.8 Fastenings
- .1 Secure pipe insulation by tape at each end and center of each section, but not greater than 900 mm (36") on centers.

3.3 DUCT INSULATION INSTALLATION

.1 General:
- .1 Adhere and seal vapour barrier using vapour seal adhesives.
- .2 Stagger longitudinal and horizontal joints, on multilayered insulation.

.2 Board Insulation fastenings:
- .1 On rectangular ducts, use 50% coverage of insulating cement and weld pins at 1 pin per square foot, but not less than 2 rows per side and bottom.
- .2 Secured with speed washers.
- .3 All joints, breaks and punctures sealed with appropriate pressure-sensitive foil tape or glass fabric and vapor barrier mastic.
- .4 Apply 20 gauge galvanized sheet metal corners to all duct work in mechanical rooms.
- .5 Seal duct insulation vapor barrier to air handling unit.
- .6 At exterior wall, Seal duct insulation vapor barrier to building envelope air barrier.

.3 Flexible Blanket Insulation fastenings:
- .1 Firmly butt all joints.
- .2 The longitudinal seam of the vapor barrier must be overlapped a minimum of 50 mm (2”).
- .3 All penetrations and damage to the facing shall be repaired using pressure-sensitive foil tape, or mastic prior to system startup.
- .4 Pressure-sensitive foil tapes shall be a minimum 75 mm (3”) wide and shall be applied with moving pressure using a squeegee or other appropriate sealing tool.
- .5 Secured to the bottom of rectangular ductwork over 600 mm (24”) wide using mechanical fasteners on 450 mm (36”) centers. Care should be exercised to avoid over-compression of the insulation during installation.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

2 Product

2.1 TUBING

.1 For halongenetic refrigerants.

.2 Deoxidized, dehydrated and sealed.

.3 Hard copper tube: to ASTM B88, type ACR.

.4 Annealed copper tube: to ASTM B280, with minimum wall thickness as per CSA B52 and ANSI/ASME B31.5.

.5 Size: as per manufacturer's recommendations.

2.2 FITTINGS

.1 Service: design pressure 2000 kPa (300 psi) and temperature 121° C.

.2 Long radius type for elbows and return bends.

.3 Wrought copper or forged brass solder type, except that flared fittings may be used for soft annealed copper tubing.

.4 Brazed: wrought copper to ANSI/ASME B16.22.

.5 Flanged: bronze or brass, to ANSI B16.24, Class 150 and Class 300.

.6 Flexible connections: 10 mm (3/8") nominal or less shall be made using coiled soft copper tubing. For larger sizes, use seamless flexible bronze hose with bronze wire braid covering. Use factory sealed neoprene jacket unit where freezing may occur.

2.3 JOINTS

.1 Brazing: silver solder, 45% AG-15% Cu or copper-phosphorous, 95% Cu-5%P.

.2 Gaskets: to ANSI/AWWA C111/A21.11, non-metallic.

.3 Brazing materials shall conform to ANSI/AWS A5.8 and be SIL-FOS-15 phosphor-copper-silver alloy for copper piping jointed by copper fittings; silver solder for brass fittings; 95-5 solder for connections to equipment or accessories.

2.4 VALVES

.1 Meet ANSI/ASME-B16.34 for valve construction.

.2 Service valves:
- .1 Forged brass Class 500 up to 3450 kPa (500 psi) packless and cast bronze Class 375 up to 2415 kPa (350 psi).
- .2 Moisture proof seal type for below freezing applications.
- .3 Back seated and ball check for inspection and replacement under pressure.
- .4 Removable seal cap and gauge port for control capillary connections for compressors.
- .5 Stop valves:
  - .1 22 mm (7/8") nominal OD or less shall be diaphragm packless type with integral mounting bracket, forged brass bodies and bonnets, globe and angle, on-directional type.
  - .2 Positive sealing, self-aligning, heavy nylon disc.
  - .3 Purge, drain, charging, angle or globe type with flare or brazing type outlet connection shall have stem for socket wrench and removable seal cap.

.3 Relief Valves:
- .1 Safety relief type with fusible plug or rupture disc in forged brass body.
- .2 Reseating type with forged brass body.
- .3 Duplex valves as indicated or by code regulations arranged so that only one can be rendered inoperative at a time.

.4 Check valves:
- .1 Spring operated, guided piston type, forged brass body in flare connection sizes up to 22 mm (7/8") nominal OD.
- .2 Guided piston type, spring operated with bolted bonnet or cover plate in sweat connections 29 mm (1 1/8") nominal OD and above.

.5 Solenoid valves:
- .1 With field replaceable coil, serviceable without removing valve from line. For pump downs, use manual lift stem. Rate coils according to temperature service.
- .2 Provide upstream of thermostatic expansion valves and strainers.

.6 Expansion valves, to ANSI/ASHRAE-17.
.1 Thermostatic type with external equalizer, adjustable superheat setting, capacity and bulb charge to suit operating conditions.

2.5 INSULATION

.1 Components of insulation system to have maximum flame spread rating of 25 and maximum smoke developed rating of 50 in accordance with CAN/ULC-S102.

.2 Flexible elastomeric pipe insulation
.1 Application: All refrigeration discharge, hot gas and liquid lines.
.2 Thickness: 25 mm (1”).
.3 Acceptable Material:
.1 AP Armaflex by Armacell

.3 Insulation Support System
.1 Application at: Pipe Supports.
.2 Thickness: As per adjacent insulation.
.3 Acceptable Material:
.1 Armafix IPH pipe hanger by Armacell

.4 Joint Sealer
.1 Acceptable Material:
.1 Armstrong 520

.5 Insulation Tape
.1 Acceptable Material:
.1 Armstrong AP Tape by Armacell

.6 Exterior finish
.1 Aluminum alloy: Apply in accordance with ASTM B209M.
.2 Application: Exterior refrigerant piping.
.3 Crimped or embossed jacketing 0.4 mm (0.016") thick with longitudinal slip joints and 50 mm (2”) end laps with factory attached protective liner or interior surface. Aluminum alloy butt straps with mechanical fasteners.
.4 On fittings: 0.4 mm (0.016") thick, die shaped components with factory attached protective liner on interior surface.

2.6 INSULATION JACKETS AND FINISHING

.1 Exterior finish Aluminum Alloy
.1 Aluminum alloy: Apply in accordance with ASTM B209M.
.2 Application: Exterior refrigerant piping.
.3 Crimped or embossed jacketing 0.4 mm (0.016") thick with longitudinal slip joints and 50 mm (2”) end laps with factory attached protective liner or interior surface. Aluminum alloy butt straps with mechanical fasteners.

.4 On fittings: 0.4 mm (0.016") thick, die shaped components with factory attached protective liner on interior surface.

.2 Interior Finish Canvas.
- .1 Plain weave, cotton fabric at 6.5 oz/yd² (220 g/m²).
- .2 ULC label every 600 mm (2 ft.)
- .3 Standard of Acceptance:
  - .1 S. Fattal Thermocanvas
- .3 Application: Exposed interior insulated refrigeration piping.

.2 PVC.
- .1 CGSB 51-GP-53M PVC sheets.
- .2 0.4 mm (0.015") thick minimum.
- .3 Fitting covers, one piece, premoulded to match.
- .4 Application: interior exposed refrigeration piping elbows only.
- .5 Standard of Acceptance:
  - .1 Proto.
  - .2 The Sure-Fit System.
  - .3 Zeston 2000 PVC.

2.7 REPRIGERANT PIPE SUPPORTS

.1 Securing Channels
- .1 Free Standing Pipe Supports
  - .1 Acceptable Material: Unistrut P-1000 Channels
- .2 Wall Supports
  - .1 Acceptable Material: Unistrut P-3300 Channels
- .3 Suspended Supports
  - .1 Acceptable Material: Unistrut P-1001 Channels

.2 Angle Fittings
- .1 Acceptable Material: Unistrut P-2626

.3 Pipe Clamps
- .1 At wall and suspended Pipe Supports
  - .1 Acceptable Material: Unistrut Pipe Clamp

3 Execution

3.1 PRE-INSTALLATION START-UP MEETING

.1 Arrange a start-up meeting with the mechanical consultant prior to commencing the installation of any refrigeration piping systems and equipment.

3.2 INSTALLATION AND TESTING

.1 Piping/tubing runs are to be individually insulated

.2 Piping/tubing runs are to be individually supported. Grouping multiple runs of piping/tubing in a single hanger will not be permitted.

.3 Install and test in accordance with CSA B52 and ANSI/ASME B31.5.

.4 Support and protect exposed refrigerant piping on roof to Consultant's satisfaction.

.5 Locate vibration and noise isolation as indicated. Where units are supplied with sound attenuator, conform to manufacturer's instructions. Ensure adequate base or foundation.

.6 Run piping/tubing parallel to building lines.

.7 Where soft cooper tubing is used, use tube bender to radius tube.

.8 Support each pipe/tube independently.

.9 Refer to Section23 05 29 Hangers and Supports for spacing of supports.

.10 Meet with consultant prior to commencing installation

3.3 INSTRUCTIONS

.1 Post instructions in frame with glass cover in accordance Division 01 and CSA B52.

3.4 ACCESSIBILITY

.1 Provide clearance around all equipment and components for observation of operation, inspection, service and maintenance without removal of any equipment, components or piping.

3.5 PIPING

.1 Purge refrigerant lines and fittings.

.2 When multiple runs are installed, spread pipes 6” minimum to allow for expansion and contraction.

.3 Install straight, parallel and close to walls and ceilings, with specified pitch.

.4 Keep elbows and fittings to minimum.

.5 Correlate equipment provided with Consultant and propose changes to line sizing required, before proceeding with installation.

.6 Grade horizontal pipe carrying gases 1:240 down in direction of flow.

.7 Locate double risers in hot gas or suction piping as required by manufacturer.

.8 Install piping to prevent condensate or oil from flowing back into compressor or evaporator.

.9 Connect branch suction lines from top of suction main using wye-fitting. Install ancillaries and accessories such as back pressure compensating regulators and back pressure regulators horizontal.

.10 To avoid interference with services to compressor, do not obstruct view of oil level bulls-eye or run piping.

.11 Enclose tubing exposed to mechanical injury in rigid or flexible conduit.

.12 Keep piping joints sealed except when fabricating.

.13 Limit breakable joints to equipment connections not normally brazed. Limit flared joints to 10 mm (3/8") nominal OD for field assembly and 16 mm (5/8") nominal OD for factory assembly.

.14 Bleed dry nitrogen into piping when sweating connections.

.15 Braze flexible pipe vibration isolators and stub connectors on sealed hermetic compressors using alloys which melt at 620° C, 600° C or below.

.16 Directly connect vibration isolators to compressor and firmly anchor other end.

3.6 PIPE INSULATION

.1 Seal all joints. Orient seams to face down

.2 Provide insulation support system at each pipe support. Seal insulation to insulation support system.

3.7 FIELD QUALITY CONTROL

.1 Perform leak test before evacuating system. Meet requirements of CSA B52, but not less than a gauge pressure of 300 psi high side and 150 psi low side.

.2 Use refrigerant gas as tracer with dry nitrogen to develop pressure.

.3 Compressors with refrigerant holding charge shall remain isolated from system. Protect accessories when performing test.

.4 Build 35 kPa initial refrigerant pressure in high and low side and add dry nitrogen to field test pressure.

.5 Test for leaks with electronic or halide detector.

.6 Repair leaks and retest.

3.8 CLEANING

.1 Pressurize system with 5 psi of refrigerant approved by Consultant and hold charge for 2 h.

.2 Reclaim refrigerant by pumping down through filtration system.

3.9 DEHYDRATION

.1 Carry out work in presence of Consultant.

.2 Evacuate using two stage vacuum pump with gas ballast on second stage capable of pulling vacuum of 50 microns. Fill pump with fresh dehydrated oil.

.3 Do not use refrigerant compressors to pull vacuum.

.4 Maintain ambient temperature of 13° C or higher throughout refrigeration system for at least 12 h before and during dehydration.

.5 Connect high vacuum hose or seamless copper tubing jumper lines to both high and low pressure sides. Line size not less than ¼" nominal OD for units up to 70 L internal volume and 3/8" nominal or ½" nominal OD for larger units.

.6 Install thermo couple vacuum gauge with micron scale to measure system pressure. Locate manual isolating valve between pump and gauge and take readings only with system isolated from pump.

.7 When compressor/condensing unit has refrigerant holding charge intact, service valves shall remain closed during evacuation. Evacuate any equipment received with dry air, wrong refrigerant, or lost holding charge.

.8 Triple evacuate field installed system as follows: twice to 1500 microns and hold for 4 h. Break vacuum to a gauge pressure of 2 psi each time with refrigerant. For final evacuation, continue pumping through minimum 12 h after reaching 500 microns. After completion of final evacuation, isolate pump from system and make graphic record of rate of any increase in vacuum reading which may take place inside following hours. Continue readings until vacuum has stabilized. Provide readings until vacuum has stabilized. Provide Consultant with 3 copies of graphic record. Charge through filter drier.

3.10 CHARGING

.1 Give initial charge through side charging valve with pressure gauge and new filter-drier installed in connection to charging valve.

.2 Charge only amount of refrigerant necessary for proper operation of refrigeration system. When amount has been charged, close liquid charging valve. With system in operation, observe sight glass near receiver outlet to recheck.

.3 When refrigerant container must be changed during charging process, re-purge charging line.

.4 Low side charging shall be permitted only for charging small amounts in gaseous state.

.5 Provide 2 days' notice of leak testing, dehydration and charging.

.6 Prime oil separation with operating charge of compressor oil.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

1.3 GENERAL

.1 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do all other work as specified in this section.

.2 Standard: TAB to be to most stringent of this section or TAB standards of AABC NEBB, SMACNA and ASHRAE.

.3 TAB of all systems, equipment, components and controls specified Mechanical Contractor.

1.4 PURPOSE OF TAB

.1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads

.2 Adjust and regulate equipment and systems so as to meet specified performance requirements and to achieve specified interaction with all other related systems under all normal and emergency loads and operating conditions.

.3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

1.5 EXCEPTIONS

.1 TAB of systems and equipment regulated by codes, standards to be to satisfaction of authority having jurisdiction.

1.6 CO-ORDINATION

.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule so as to ensure completion before acceptance of project.

.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.7 PRE-TAB REVIEW

.1 Review contract documents before project construction is started and confirm in writing to Consultant adequacy of provisions for TAB and all other aspects of design and installation pertinent to success of TAB.

.2 Review specified standards and report to Consultant in writing all proposed procedures which vary from standard.

.3 During construction, coordinate location and installation of all TAB devices, equipment, accessories, measurement ports and fittings.

1.8 START-UP

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

.2 Follow special start-up procedures specified elsewhere in Mechanical Contractor.

1.9 OPERATION OF SYSTEMS DURING TAB

.1 Operate systems for length of time required for TAB and as required by Consultant for verification of TAB reports.

1.10 START OF TAB

.1 Notify Consultant 7 days prior to start of TAB.

.2 Start TAB only when building is essentially completed, including:

- .1 Installation of ceilings, doors, windows, other construction affecting TAB.
- .2 Application of weather-stripping, sealing, caulking.
- .3 All pressure, leakage, other tests specified elsewhere Mechanical Contractor.
- .4 All provisions for TAB installed and operational.
- .5 Start-up, verification for proper, normal and safe operation of all mechanical and associated electrical and control systems affecting TAB including but not limited to:
  - .1 Proper thermal overload protection in place for electrical equipment.
  - .2 Air systems:
    - .1 Filters in place, clean.
    - .2 Duct systems clean.
    - .3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.
    - .4 Correct fan rotation.
    - .5 Fire and volume control dampers installed and open.
    - .6 Coil fins combed, clean.
    - .7 Access doors, installed, closed.
    - .8 All outlets installed, volume control dampers open.

1.11 APPLICATION TOLERANCES

.1 Do TAB to following tolerances of design values:
  .1 HVAC systems except Dust Collector: plus 10%, minus 5%.

1.12 ACCURACY TOLERANCES

.1 Measured values to be accurate to within plus or minus 2% of actual values.

1.13 INSTRUMENTS

.1 Prior to TAB, submit to Consultant list of instruments to be used together with serial numbers.

.2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.

.3 Calibrate within 3 months of TAB. Provide certificate of calibration to Consultant.

1.14 TAB REPORT

.1 Format to be in accordance with reference standard.

.2 TAB report to show all results in units specified on drawings and to include:
  .1 System schematics.

.3 Submit 3 copies of TAB Report to Consultant for verification and approval, in D-ring binders, complete with index tabs.

1.15 VERIFICATION

.1 All reported results subject to verification by Consultant.

.2 Provide manpower and instrumentation to verify up to 30% of all reported results.

.3 Number and location of verified results to be at discretion of Consultant.

.4 Bear costs to repeat TAB as required to satisfaction of Consultant.

1.16 SETTINGS

.1 After TAB is completed to satisfaction of Consultant, replace drive guards, close all access doors, lock all devices in set positions, ensure sensors are at required settings.

.2 Permanently mark all settings to allow restoration at any time during life of facility. Markings not to be eradicated or covered in any way.

1.17 COMPLETION OF TAB

.1 TAB to be considered complete only when final TAB Report received and approved by Consultant.

1.18 AIR SYSTEMS

.1 TAB all systems, equipment, components, controls specified Mechanical Contractor.

.2 Measurements: to include, but not limited to, following as appropriate for systems, equipment, components, controls:
- .1 Air velocity.
- .2 Static pressure.
- .3 Velocity pressure.
- .4 Air flow rate.
- .5 Cross sectional area
- .6 RPM: Fan and Motor
- .7 Electrical power:
  - .1 Voltage
  - .2 Current draw

.3 Locations of equipment measurements: To include, but not be limited to, following as appropriate:
- .1 Inlet and Outlet of each:
  - .1 Fan
  - .2 Coil
  - .3 Filter
  - .4 Damper
  - .5 Other auxiliary equipment

.4 Locations of systems measurements to include, but not be limited to, following as appropriate:
- .1 Main ducts
- .2 Main branch ducts
- .3 Sub-branch ducts
- .4 Each supply, exhaust and return air inlet and outlet
- .5 Other auxiliary equipment
- .6 All areas served by system

2 Products (N/A)

3 Execution

3.1 TAB AGENCIES:

.1 Acceptable Agencies
- .1 Atlantic Indoor Air Audit Co.

.2 Barrington Air Balance Service
.3 Griffin Air Balance Limited
.4 Scotia Air Balance 1996 Limited
.5 System Balance Limited

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

2 Products

2.1 SEAL CLASSIFICATION

.1 Ductwork classification as follows:

Maximum Pressure	SMACNA Seal Class
500 Pa	C

.2 Class C: transverse joints and connections made air tight with gaskets, sealant and tape or combination thereof. Longitudinal seams unsealed.

2.2 GALVANIZED STEEL

.1 Lock forming quality: to ASTM A653, Z90 zinc coating.

.2 Thickness, fabrication and reinforcement: to ASHRAE and SMACNA or as indicated.

.3 Minimum 26 gauge

.4 Satin coat for all exposed ductwork outside mechanical rooms.

.5 Use oil free material and take all necessary measures to prevent contamination

.6 Joints: to ASHRAE and SMACNA and/or proprietary manufactured duct joint.
- .1 Acceptable Material: for proprietary joints:
  - .1 Ductmate Canada Ltd.
  - .2 Exanno Nexus

2.3 RECTANGULAR DUCTWORK

.1 Cross break ducts 450 mm (18") and larger for stiffening.

.2 Same gauge on all sides and based on the greater cross sectional dimension.

.3 Reinforce flat slip joints of ducts over 450 mm (18").

2.4 ROUND DUCTWORK

.1 Factory fabricated conduit consisting helically wound galvanized steel straps with spiral lock seams.

.2 For concealed branch ductwork up to 350 mm (14") diameter, longitudinal seams.

.3 Rectangular ductwork may be convert to equivalent size round provided that the project space limitations are properly addressed.

.4 Use conical "T"s for 90^0 Branch takeoff

.5 Use long radius elbows where space permits.

.6 Galvanized steel of the following minimum gauges:

Duct Diameter	Straight Lengths of Spiral Duct Gauge	Round Duct fittings	Plain Duct Gauge
8" and smaller	26	24	24
9"-14"	26	24	24
15"-26"	24	20	N/A
27"-36"	22	20	N/A
37"-50"	20	20	N/A

2.5 FITTINGS

.1 Fabrication: to SMACNA.

.2 Radiused elbows:
- .1 Rectangular: Standard radius (Centerline radius 1.5 times width of duct) or short radius with single thickness turning vanes.
- .2 Round: Smooth radius or 5 piece. Centerline radius is 1.5 times diameter.

.3 Mitered elbows, rectangular:
- .1 To and including 400 mm: Single thickness turning vanes.
- .2 Over 400 mm: Double thickness turning vanes.

.4 Branch Ducts
- .1 Rectangular: Refer to Details on drawings.
- .2 Round: Conical T as per SMACNA

.5 Main supply duct branches without splitter damper. Provide branch and main duct balancing dampers.

.6 Sub branch duct with 45° entry and balancing damper on branch.

.7 Transitions:
.1 Diverging: 20° maximum included angle.
.2 Converging: 30° maximum included angle.

.8 Offsets: square elbows and/or full radiused elbows as indicated.

.9 Obstruction deflectors: maintain full cross-sectional area. Maximum included angles as for transitions.

2.6 FIRESTOPPING

.1 Retaining angles all around duct, on both sides of fire separation.

.2 Firestopping material and installation must not distort duct.

2.7 SEALANT

.1 Sealant: non-flammable, water base duct sealant.

.2 Temperature range of -30° C to +93° C.

.3 Flame spread rating of not more than 25.

.4 Smoke developed classification of not more than 50.

.5 Standard of Acceptance:
.1 Duro Dyne DSW

2.8 TAPE

.1 Poly-vinyl treated, open weave fiberglass tape.

.2 50 mm (2") wide.

.3 Standard of Acceptance.
.1 Duro Dyne FT-2.

2.9 HANGERS AND SUPPORTS

.1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.

.2 Maximum size rectangular and round duct supported by strap hanger: 500 mm (20").

.3 Rectangular Hangers: angle iron with steel rods to ASHRAE and SMACNA following table:

Duct Size	Angle Size	Rod Size	Spacing
up to 30"	1" x 1" x 1/8"	1/4"	8'
31 to 36"	1 1/2" x 1 1/2" x 1/8"	1/4"	8'
37 to 60"	1 1/2" x 1 1/2" x 1/8"	3/8"	8'

.4 Round Hangers: strap/band with steel rods to ASHRAE and SMACNA following table:

Duct Size	Strap Size	Rod Size	Spacing
up to 610 mm	25 x 0.85 mm	6 mm	2400 mm
611 to 900 mm	25 x 1 mm	10 mm	2400 mm

.5 Upper attachment:
- .1 As per Section 23 05 29 Hangers and Supports

.6 Middle attachment (Rod):
- .1 As per Section 23 05 29 Hangers and Supports

3 Execution

3.1 GENERAL

.1 Install ducts in accordance with ASHRAE and SMACNA.

.2 Support risers in accordance with ASHRAE and SMACNA.

.3 Install breakaway joints in ductwork on each side of fire separation.

.4 Seal between ducts and walls of mechanical room.

.5 Where ducts are shown passing through rated fire separations provide fire dampers (in accordance with Section 24 33 16, Dampers Fire) and associated angle frames as per fire damper manufacturer's recommendations

3.2 HANGERS

.1 Strap hangers: install in accordance with SMACNA.
- .1 Minimum 25 mm (1") wide extending down 2 sides and 50 mm (2") under duct.
- .2 Fasten to sides and bottom of duct.

.2 Angle hangers: complete with locking nuts and washers.
- .1 Rod attached to angle within 50 mm (2") of the duct sides.

3.3 SEALING & TAPING

.1 Apply sealant to outside of joint to manufacturer's recommendations.

.2 Bed Tape in sealant and recoat with minimum of 1 coat of seal and to manufacturer's recommendation.

3.4 WATERTIGHT DUCT

.1 Provide water tight duct for:
- .1 Outside air intake plenums.
- .2 As indicated.

.2 Form bottom of horizontal duct without longitudinal seams. Weld joints of bottom and 150 mm (6") up side sheets. Seal all other joints with duct sealer and tape.

.3 Slope bottom of duct/plenum to drain.

.4 Duct connections to plenum to be minimum 50 mm (2") above bottom of plenum.

.5 Provide NPS 1 1/4 drain with deep seal trap from outside air intake plenums and louvered exhaust air plenums to floor drain. Provide 150 mm deep trap for drains.

3.5 PROTECTION AND CLEANING

.1 Seal and protect open ends of ductwork continuously during construction.

.2 Wash down inside of intake duct and plenum from louver to unit prior to starting units.

3.6 CONTROL DAMPERS

.1 Install control dampers supplied by Section 24 33 15 Dampers - Operating and supplied with fans.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

2 Products

2.1 ACCESS DOORS IN DUCTS

.1 Non-insulated ducts:
- .1 Sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 26 Ga. thick complete with sheet metal angle frame.
  - .1 Gasketted, Frameless or Framed.

.2 Insulated ducts:
- .1 Sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 26 Ga. thick complete with sheet metal angle frame and insulation thickness as per adjacent duct.

.3 Intake and exhaust plenums:
- .1 Hinged.
- .2 Gasketted
- .3 Flanged mounted.
- .4 Sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 26 Ga. thick complete with sheet metal angle frame and insulation thickness as per adjacent duct.
- .5 Standard of Acceptance:
  - .1 Kees FH-IS with insulation thickness as per adjacent duct.

.4 Hardware for framed:
- .1 Up to 300 x 300 mm (12" x 12") 2 sash locks
- .2 325 mm to 450 mm (13" to 18") 4 sash locks
- .3 Safety chain except for hinged.
- .4 Lift out handle for access doors 450 x 450 mm (18" x 18") and over.
- .5 Access doors into intake and exhaust plenums.
  - .1 Gasketted
  - .2 Hinged
  - .3 Flanged mounted.
  - .4 Insulation stop

.5 For round ducts up to 16", provide sheet metal rolled to duct size with gasket, hinge and latches (file of sharp edges of duct opening). For round ducts over 16", provide square duct adapter and access doors.

2.2 FLEXIBLE CONNECTIONS

.1 Frame: galvanized sheet metal frame 1.6 mm (16 Ga.) thick with fabric clenched by means of double locked seams.

.2 Material: Fire resistant, self extinguishing, neoprene coated glass fabric, temperature rated at -40° to +90° C, density of 1.3 kg/m 2.

2.3 TURNING VANES

.1 Factory or shop fabricated single thickness without trailing edge, to recommendation of SMACNA.

2.4 BALANCING DAMPERS

.1 Standoffs for insulated ducts.

.2 Splitter Dampers
- .1 Single thickness construction of same material as duct but one sheet metal thickness heavier.
- .2 Control rod with locking device.
- .3 Bend end of rod to prevent end from entering duct.
- .4 Pivot: piano hinge.

.3 Single Blade Dampers
- .1 Of same material as duct, but one sheet metal thickness heavier. V-groove stiffened.
- .2 Size and configuration to SMACNA, except maximum height 250 mm (10").
- .3 Locking quadrant.
- .4 Inside and outside end bearings.

.4 Multi-Bladed Dampers
- .1 Factory manufactured of material compatible with duct.
- .2 Opposed blade: configuration to SMACNA.
- .3 Maximum blade height: 100 mm (4").
- .4 Bearings: pin in bronze bushings.
- .5 Linkage: shaft extension with locking quadrant.
- .6 Channel frame of same material as adjacent duct, complete with angle stop.

2.5 BOND CONECTIONS

.1 6 mm x 40 mm long grounding bolts

.2 Hex nuts and star washers.

.3 #12 AWG bonding conductor with Green jacket or round tinned Copper Braid with crimped lugs of equivalent AWG.

3 Execution

3.1 INSTALLATION

.1 Install in accordance with recommendations of SMACNA

.2 Flexible connections.
- .1 Length of connection: 150 mm (6").
- .2 Minimum distance between metal parts when system in operation: 75 mm (3").

.3 Bond connections
- .1 Bond across each flexible duct connection.
- .2 Bonding bolts: drill hole, install bolt with star washers both sides and secure with nut.
- .3 Length of bond connection determined by contractor.
- .4 Locate bond connection so they are visible from the floor level.

.4 Access doors:
- .1 Size:
  - .1 600 x 600 mm (24" x 24") for person size entry and plenums.
  - .2 300 x 300 mm (12" x 12") for service entry.
- .2 Location:
  - .1 At fire dampers.
    - .1 Minimum 300 x 300 mm (12" x 12") for ducts where both dimensions are under 450 mm (18").
    - .2 Minimum 450 x 450 mm (18" x 18") for ducts where both dimensions are 450 mm (18") and over.
    - .3 Locate as close as possible to fire damper.
    - .4 If requested, Demonstrate that fire damper links can be replaced.
  - .2 At control dampers, person size for view the operation of the damper blades and access to linkage.
  - .3 At plenums, intake and exhaust.
  - .4 At devices requiring maintenance.
  - .5 At locations required by code.

3.2 BALANCING DAMPERS

.1 Install balancing dampers for all branch supply, return and exhaust ducts.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

2 Products

2.1 OPERATING DAMPERS

.1 Sizes:
- .1 Blades maximum 150 mm (6") wide and 1200 mm (48") long.
- .2 Modular maximum 1525 mm (60") wide and 1525 mm (60") high.
- .3 Multiple sections with stiffening mullions and separate actuators.

.2 Materials:
- .1 Frame: extruded aluminum.
- .2 Blades: extruded aluminum.
- .3 Bearings: Nylon.
- .4 Provide additional thrust bearings for vertical blades.
- .5 Linkage: zinc plated steel.
- .6 Seals: PVC and/or SS spring on side, top and bottom of frame and along all blade edges and blade ends.

.3 Performance characteristics:
- .1 2% maximum allowable leakage against 2.5 kPa (10" w.g.) differential.
- .2 Temperature range minus 40° C to 90° C.

.4 Flanged to duct connection

.5 Insulated Dampers:
- .1 For outside air damper
- .2 For exhaust air damper.
- .3 R6 insulation.

.6 Standard of Acceptance:
- .1 Insulated: T. A. Morrison Series 9000.

.7 Acceptable Manufacturer
- .1 Alumavent
- .2 Nailor Industries

.3 Ruskin with T-Flange Frame
.4 Trolec
.5 Ventex

3 Execution

3.1 INSTALLATION

.1 Install in accordance with recommendations of SMACNA

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

2 Products

2.1 FANS GENERAL

.1 Capacity: airflow, static pressure, rpm, bhp, motor, model, size, sound power data and as indicated on schedule.

.2 Fans: statically and dynamically balanced, constructed in conformity with AMCA 99.

.3 Sound ratings: comply with AMCA (Air Moving and Conditioning Association) 301, tested to AMCA 300.

.4 Performance ratings: based on tests performed in accordance with ANSI/AMCA 210, and ANSI/ASHRAE 51.

.5 Motors: In accordance with Section 20 05 01 Common Work Results for Mechanical General.

.6 Accessories and hardware: matched sets of V-belt drives, adjustable slide rail motor bases, belt guards, coupling guards, fan safety screens, and as indicated.

.7 Factory primed before assembly in colour standard to manufacturer.

.8 Bearing lubrication systems plus extension lubrication tubes where bearings are not easily accessible.

.9 Vibration isolation: to Section 23 05 48 - Vibration Controls.

.10 Flexible duct connections: to Section 24 33 00 – Air Duct Accessories.

2.2 CENTRIFUGAL FANS

.1 Fan wheels:
- .1 Welded steel construction.
- .2 Maximum operating speed of centrifugal fans not more than 50% of first critical speed.
- .3 Air foil, forward curved, backward inclined blades, as indicated.

.2 Bearings: split pillow-block grease lubricated ball or roller self-aligning type with oil retaining, dust excluding seals and a certified minimum rated life of 200,000 h in accordance with (Anti-Friction Bearing Manufacturers Association) AFBMA L-10 life standard. Bearings to be rated and selected in accordance with AFBMA 9 and AFBMA 11.

.3 Housings:
.1 Volute with inlet cones: fabricated steel for wheels 300 mm or greater, steel for smaller wheels, braced, and with welded supports.

2.3 IN-LINE CENTRIFUGAL FANS

.1 Characteristics and construction: as for centrifugal fan wheels, with axial flow construction and belt drive.

.2 Provide AMCA arrangements 1 or 9 as indicated with stiffened flanges, smooth rounded inlets, and stationary guide vanes.

2.4 FAN SELECTIONS

.1 Based on Manufacturer named as Standard of Acceptance. The approval of equipment of other manufacturers named in the acceptable materials list shall be subject to meeting the performance and sound power levels. The fan manufacturer shall also be responsible for all electrical changes caused by the change in motor size.

3 Execution

3.1 FAN INSTALLATION

.1 Install fans as indicated, complete with resilient mountings specified in Section 23 05 48 - Vibration Controls, flexible duct connections in accordance with Section 24 33 00 – Air Duct Accessories.

.2 Provide sheaves and belts required for final air balance.

.3 Access doors and access panels to be easily accessible.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

2 Products

2.1 FANS GENERAL

.1 In accordance with Section 24 34 00 HVAC Fans.

.2 Motor: In accordance with Section 20 05 01 Common Work Results for Mechanical - General

.3 Capacity: airflow/static pressure rpm, motor, model and size and sound ratings as per schedule on drawings.

.4 Statically and dynamically balanced.

.5 Bear AMCA Certified Air Performance Rating Seal.

.6 Bearings: sealed lifetime bearings or of self-aligning type with oil retaining, duct excluding seals and a certified minimum rated life of 80,000 h in accordance with AFBMA L10 life standard. Bearings to be rated and selected in accordance with AFBMA9 and AFBMA 11.

2.2 CENTRIFUGAL CABINET FAN

.1 Centrifugal direct drive.

.2 Back draft damper.

.3 Galvanized steel housing.

.4 Disconnect within fan housing.

.5 Inlet grille or inlet collar as indicated.

.6 Acoustically lined housing.

.7 Standard of Acceptance:
.1 Loren Cook Co. as per schedule on drawings.

.8 Acceptable Manufacturer:
- .1 Acme
- .2 PennBarry
- .3 Greenheck.
- .4 Jenco Fan Inc.

3 Execution

3.1 INSTALLATION

.1 Provide fan sheaves required for final air balance.

.2 Coordinate wall openings with other trades.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

1.3 MANUFACTURED ITEMS

.1 Product of one manufacturer for generic type, i.e. grilles and registers by one, diffusers by one, or same.

2 Products

2.1 GENERAL

.1 Capacity: As per schedule on drawing.

.2 Provide standard product to meet capacity, throw, noise level, throat and outlet velocity.

.3 Frames:
- .1 Steel: standard with exposed welded joints and mitered corners.
- .2 Aluminum: extruded with mechanical fasteners and mitered corners.

.4 Finish: Off white baked enamel.

.5 Diffusers
- .1 Square type.
- .2 Fixed pattern.
- .3 Adjustable pattern where noted.
- .4 Plaster frame where installed in drywall ceilings.

.6 Standard of Acceptance:
- .1 E. H. Price as per schedule.

.7 Acceptable Manufacturer:
- .1 Krueger
- .2 Titus
- .3 Nailor Industries

2.2 MODULATING ELECTRIC DUCT HEATERS

.1 Bear CSA label.

.2 Galvanized steel frame.

.3 Open coil elements made of nickel-chromium designed for minimum airflow.

.4 Ceramic coil support.

.5 SCR time – proportioning type controller.

.6 Modulating output based in input signal.

.7 Control transformer with fused secondary.

.8 Built-in, prewired pressure differential switch.

.9 Power and control terminals.

.10 Primary thermal cutout (Hi Limit).

.11 Disconnect switch.

.12 Accessories: Duct sensor.

.13 Suitable for airflow indicated.

.14 Standard of Acceptance.
- .1 Thermolec as per drawings.

.15 Acceptable Material:
- .1 E. H. Price
- .2 PM Wright
- .3 Titus

3 Execution

3.1 INSTALLATION

.1 Install with flat head cadmium plated screws in countersunk holes where fastenings are visible.

3.2 ELECTRIC DUCT HEATERS

.1 Submit start-up report for each unit following TAB including the following:
- .1 Measured voltage
- .2 Measured Amperage
- .3 Control sequenced verification

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

2 Products

2.1 STATIONARY EXTERIOR LOUVERS

.1 Louvers licensed to bear AMCA Certified Ratings Seal.

.2 Ratings based on tests and procedures performed in accordance in accordance with AMCA Publication 511-07 (Rev. 8/08) Certified Ratings Program -Product Rating Manual for Air Control Devices and comply with the requirements of the AMCA Certified Rating Program.

.3 AMCA Certified Ratings Seal applies to air performance and water penetration ratings.

.4 All welded construction with exposed joints ground flush and smooth.

.5 Minimum 12 gauge (0.081") extruded aluminum alloy 6063-T5.

.6 Drainable pattern blade.

.7 One piece extruded aluminum frame, head, still and jamb.

.8 Stainless steel fastenings (Society of Automotive Engineers) SAE-194-8F with SAE-194-SFB nuts and resilient neoprene washers between aluminum and head of bolt, or between nut, stainless steel washer and aluminum body.

.9 Aluminum birdscreen on inside face of louvers in formed U-frame.
- .1 Removable extruded aluminum frame.
- .2 13 x 1.6 mm or 20 x 1.3 mm (1/2" x 0.063" or 3/4" x 0.051") mesh.

.10 For louvers over 1800 mm (72") wide.
- .1 Exposed interlocking mullion or;
- .2 Concealed mullion.

.11 Finish:
- .1 Chemical cleaned, pretreated and finished after assembly with oven cured baked enamel, on all surfaces. No mill finish exposed.
- .2 Colour selected by Consultant.

.12 Standard of Acceptance:
.1 Ruskin Model ELF6375D as per drawings

.13 Acceptable Material:
.1 E. H. Price Model DE635 All welded construction..
.2 McGill DSP 635 All welded construction.
.3 Ventex Inc. Model 2630 All welded construction.

3 Execution

3.1 INSTALLATION

.1 Install in accordance with recommendations of SMACNA.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

2 Products

2.1 GENERAL

.1 Filters: suitable for air at 100% RH and air temperatures between -40° and +50° C.

2.2 POLYESTER PANEL PRE-FILTERS

.1 Disposable Polyester media.

.2 Moisture resistant

.3 Multi-ply progressive density polyester with an odorless flame retardant non-migrating tackifier adhesive applied to the media

.4 Internal steel wire support.

.5 Individual panels.

.6 MERV-8

.7 Permanent 2 mm (14 Ga.) minimum thick galvanized steel media holding frame with 3 mm diameter hinged wire mesh screen.

.8 Acceptable Material:
- .1 AFF AMER-Seal Type SS.
- .2 Camfil Farr type to the requirements listed above
- .3 Flanders TEP Tack-E Panels and Panel Links.

2.3 MERV 13 EXTENDED SURFACE PLEATED PANEL FILTER

.1 Disposable pleated non-woven reinforced cotton and synthetic filter media.

.2 Welded wire support grid bonded to air leaving side of the filter media.

.3 High-wet strength, moisture resistant beverage board frame with diagonal media support members.

.4 Pleated media pack bonded to the inside of the frame on all four edges.

.5 ULC Class-2 listed and labeled.

.6 Nominal thickness: 50 mm (2").

.7 MERV 13.

.8 Acceptable Material:
- .1 AAF Am-Air 1300.
- .2 Flanders MERV 13 Pleated

3 Execution

3.1 INSTALLATION

.1 Install with adequate access for removal.

.2 Filters to be removed from the units and properly stored.

3.2 REPLACEMENT MEDIA

.1 Replace all Pre-Filters with new Pre-Filters upon acceptance of project.

.2 Clean final filters install just prior to acceptance of project can remain.

3.3 SPARE FILTER MEDIA

.1 In accordance with Section 20 05 02 Common Work Results for Mechanical – Submittals.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

2 Products

2.1 ENTHALPY TYPE AIR TO AIR ROTARY HEAT EXCHANGER

.1 Certifications:
- .1 Listed by Underwriters Laboratories (UL 1812) and UL listed for Canada (cUL 1812).
- .2 ARI certified in accordance with the ARI *Air-to Air Energy Recovery Ventilation Equipment Certification Program*.
- .3 Bear the AMCA certified ratings seal for air performance.

.2 Construction:
- .1 Bolted construction utilizing corrosion resistant fasteners.
- .2 Housing minimum 18 gauge galvanized steel, bolted to a minimum 16 gauge galvanized steel base with integral lifting lugs.
- .3 Insulated top, side and interior panels utilizing 1" thick, three pound density foil faced insulation, manufactured and tested to meet NFPA 90A and UL 181 requirements.
- .4 Insulation fastened to the panels with weatherproof adhesive and weld pins.
- .5 Energy recovery wheel mounted in a slide track for easy inspection and cleaning.
- .6 Separate blower and motor provided for supply and exhaust airstream for independent system balancing.
- .7 Blower and motor assemblies mounted on rubber vibration isolators. Two inch thick, 30 percent efficient pleated
- .8 MERV 13 filters provided for supply and exhaust airstreams.
- .9 Removable side panels for easy access to motors, blowers, filters and energy recovery wheel.
- .10 Engraved aluminum nameplate indicating design CFM, static pressure, and maximum fan RPM.

.3 Energy Wheel: Total energy recovery wheel constructed of fluted synthetic fiber-based media impregnated with a non-migrating water selective 4 angstrom molecular sieve desiccant.

.4 Fan Wheel: DWDI centrifugal forward curved type, constructed of painted steel. Wheel balanced in accordance with AMCA Standard 204-05, *Balance Quality and Vibration Levels for Fans.*

.5 Motors: NEMA design B with class B insulation rated for continuous duty and furnished at the specified voltage, phase and enclosure.

.6 Controls and Electrical: All internal electrical components for single point power connection. Internal control panel UL listed with hinged access door and interlocking NEMA 3R disconnect switch.
- .1 Per Motor:
  - .1 Motor starter combination providing fuseless disconnect, over-current, overload and motor starting functions.
  - .2 Remote start terminals
- .2 24 volt circuit provided to allow remote on/off control of ERV by BAS.
- .3 Short circuit protection provided on primary and secondary of control power transformer.

.7 Bearings: Permanently lubricated, sealed ball type selected for a minimum L50 life in excess of 200,000 hours at maximum cataloged operating speed.

.8 Belts and Drives: oil and heat resistant, static conducting belts. Drives precision machined cast iron type, keyed and securely attached to the wheel and motor shafts. Drives sized for 150 percent of the installed motor horsepower. The variable pitch motor drive factory set to the specified fan RPM.

.9 Standard of Acceptance:
- .1 Loren Cook Company as per drawings

3 Execution

3.1 INSTALLATION

.1 Support independently of adjacent ductwork.

3.2 START-UP

.1 Utilize factory trained technician.

.2 Submit written start-up report for each unit including the following:
- .1 Confirmation of equipment installation is in accordance with manufacturer's recommendations.
- .2 Signature of those present.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

1.3 WARRANTY

.1 For refrigeration compressors, the 12 months warranty period prescribed Division 0 and 1 is extended to 5 years.

2 Products

2.1 GENERAL

.1 DX refrigeration.

.2 Bear CSA label.

.3 Provide a dry air holding charge in the evaporator.

.4 VRF (variable refrigerant flow) Heat Pump system.

.5 Air cooled condensing unit supplying indoor evaporator unit.

.6 Variable Refrigerant System: two pipe configuration capable of providing cooling/heating to the designated zone.

2.2 PERFORMANCE

.1 Based on 26.6° C DB, 19.4° C WB for the indoor unit and 35° C DB, 23.8° C WB for the outdoor unit.

2.3 OUTDOOR UNIT

.1 General: Designed specifically for use with the indoor units.

.2 Completely factory assembled, piped and wired. Triple frame outdoor units will be field piped with factory designed and supplied Y-branch kits to manifold them together into a single refrigerant circuit.

.3 Each unit run tested at the factory.

.4 Capable of having connected nominal capacity of all indoor air units between 50% to 130% of outdoor unit nominal capacity.

.5 Capable of a minimum total connected refrigerant piping length of 3280 ft.

.6 Constructed from steel plate with powder coat backed enamel paint.

.7 Fabricated of galvanized steel, bonderized and finished with a powder coated baked enamel. Units cabinets with Seacoast Protection able to withstand 960 hours of Salt Spray

.8 Coil:
- .1 Non-ferrous construction with aluminum louvered fins on copper tubing.
- .2 Factory applied “Gold-fin”, or “Electro-fin” hydrophobic coating.
- .3 Corrosion coatings on coil surfaces tested to withstand a 6000 hour salt spray test in accordance with ASTM B117
- .4 Set in a ‘V’ formation with air being drawn in through two sides of the unit and discharged out of the top of the unit.
- .5 Each outdoor unit section to be equipped with two up-blast variable speed propeller type fans.

.9 Compressor:
- .1 One inverter digitally controlled hermetic scroll compressor capable of controlling the compressor frequency 25% to 105% per
- .2 Mounted to avoid the transmission of vibration.
- .3 Capable of operating at -18° C ambient temperature. Wind baffle if required.
- .4 Extra sub-cooling provided by a Heat Interchange Circuit (HIC), which allows better refrigerant distribution and control with electronic expansion valves.
- .5 The refrigeration process of the outdoor unit maintained by pressure and temperature sensors controlling solenoid valves, check valves and bypass valves.
- .6 One liquid discharge pipe which will supply high pressure liquid to the indoor units or to the condensing unit, depending on the mode of operation.
- .7 Refrigerant return to the outdoor unit via one suction pipe.
- .8 Crankcase heater(s) factory mounted on the compressor(s).Each compressor capable of modulation down to 19% of rated capacity.

.10 Electrical:
- .1 208 volts, 3 phase, 60 hertz.
- .2 Starting current of no more than 10 amps.
- .3 Control via a 30vdc signal generated by the outdoor unit.
- .4 Control signal sent to the indoor units via non polar screened cable.

.11 Sound pressure level (SPL) rating no higher than a maximum of 60 dB (A) individually or a collective maximum sound pressure rating of 65 dB (A) when combined with other modules in a system. The sound pressure rating is as measured a horizontal distance 1 m from the unit.

2.4 INDOOR UNIT

.1 Coil:
- .1 Pressure tested at the factory.
- .2 A condensate pan and drain provided under the coil.
- .3 Condensate pump able to raise drain water 825 mm (33") above the condensate pan.
- .4 Heat exchanger which shall be constructed from copper tubing with aluminum fins.
- .5 Flow of refrigerant through the heat exchanger controlled by a linear expansion valve controlled by two pipe thermistors and a return air thermistor and shall be capable of controlling the variable capacity of the indoor unit between 25% and 100%.

.2 Electrical:
- .1 208 volts, 1 phase, 60 hertz.
- .2 Control via daisy change control signal from all evaporators to the outdoor unit.

.3 Ducted Fan Coil Units
- .1 Galvanized steel plate insulated with closed cell expanded polyurethane foam.
- .2 Air discharged out of the front of the unit to allow for field supply ductwork and diffusers to distribute the air into the room.
- .3 Return air will brought in through the rear of the unit
- .4 Removable and washable factory supplied filters
- .5 Drain pan condensate pump.
- .6 Indoor unit fan an assembly with one or two Sirocco fan(s) direct driven by a single motor.
- .7 Statically and dynamically balanced and run on a motor with permanently lubricated bearings.
- .8 Fan speed modulated via a 0-10 V signal.
- .9 Ducted air outlet system and ducted return air system

2.5 CONTROLS

.1 Wall controller
- .1 Wall mounted
- .2 Hard wired to the indoor fan coil units via three conductor shielded cable.
- .3 Manufactured in ABS plastic with an LCD display
- .4 Control the following functions on up to sixteen indoor fan coil units:
  - .1 On/off.
  - .2 Set point.
  - .3 Fan speed.
  - .4 Louver position.
- .5 Display the following functions:
  - .1 On/off.
  - .2 Set point.

.3 Room air temperature
.4 Fan speed.
.5 Fault diagnosis
.6 Set point range can be limited.
.7 All remote controller functions can be locked off by the building BAS.
.8 Auto diagnostic display.

.2 All control wiring
.1 Refer to Section 25 30 03 BAS Field Wire and Components Installation
.2 Provide the interconnecting control wiring between the indoor and outdoor units and control wiring between wall controllers and relevant components.

.3 BACnet Gateway
.1 Protocol communication between the VRF air conditioning system and the buildings BACnet BAS control system.
.2 Capability to monitor and control up to 200 connected devices.
.3 Capability to monitor:
.1 Indoor Unit On/Off
.2 Operating Mode
.3 Fan Speed
.4 Temperature Set-point
.5 Locking Function
.6 Auto Swing
.7 Indoor Temperature
.8 Error Monitoring
.4 Capability to control:
.1 Indoor Unit On/Off
.2 Operating Mode
.3 Fan Speed
.4 Temperature Set-point reset
.5 Locking Function
.6 Auto Swing
.7 Indoor Temperature

2.6 REFRIGERATION PIPING

.1 Refer to Section 23 23 00 Refrigerant Piping

.2 Supply, install, test and commission all interconnecting refrigeration pipework between the outdoor and indoor units.

.3 All pipework must be suitable for R410A.

.4 After installation of pipework, and prior to sealing of insulation joints and starting of equipment, pipework should be pressure tested. 44 PSIG test for 3 minutes minimum, then 217 PSIG for 3 minimum, then 478 PSIG for 3 minutes minimum, then strength test

to 600 PSIG check the system for leaks and deformation, then lower the pressure back to 478 PSIG and pressure test for 24 hours and checked for leaks. Vacuumed/dehydrated to 300 microns, and hold at that vacuum for 12 hours (minimum)

.5 Refrigerant (R410A) charge weight must be calculated to the actual installed length of pipe work in accordance to manufacturer's recommendations.

.6 Carried out charging with an appropriate charging station.

.7 Label all refrigerant pipework with ID number (condensing unit ref.) at 3 meter (10 feet) intervals.

2.7 STANDARD OF ACCEPTANCE

.1 Mitsubishi to the requirements listed above.

2.8 ACCEPTABLE MANUFACTURER:

.1 L.G. to the requirements listed above.

3 Execution

3.1 INSTALLATION

.1 Install unit flat and level.

.2 Secure with hold-down bolts.

.3 Make all piping connections.

.4 Nothing to obstruct ready access to all components or to prevent removal of components for servicing.

.5 The fixing of all internal and external air conditioning equipment, installation of all refrigerant pipework and full commissioning shall be performed by a specialist refrigerant installer who shall be authorized to install VRF equipment.

.6 Provide condensate line for each fan coil unit.

3.2 START-UP

.1 Startup of unit to be performed by factory authorized and trained mechanics.

.2 In the presence of and in cooperation with the HVAC unit manufacturer's representative, Controls Contractor start-up the unit and ensure that the unit is capable of performing all steps in the sequence of operation.

.3 Allow for a minimum of 24 hours of assistance to coordinate with the controls contractor for BAS interface.

.4 Submit start-up report including the following information:
- .1 Complete unit description.
- .2 Voltage each phase.
- .3 Current draw by each piece of equipment.
- .4 All equipment setpoints which are field adjustable.
- .5 Refrigeration circuits operating conditions.
- .6 All information on manufacturer's start-up report.
- .7 Point-by-point BAS verification of all control points.

3.3 DRIP PANS

.1 Refer to Section 22 13 17 Drainage Waste and Vent Piping

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

1.3 RELATED SECTIONS

.1 Section 25 30 02 BAS: Field Control Devices.

.2 Section 25 30 03 BAS Field Wire and Components Installation

.3 Refer to Division 26 Electrical and Division 27 Communications for acceptable wiring materials and wiring methods.

1.4 BAS IDENTIFICATION

.1 Conform to requirements of Section 23 05 53 Mechanical Identification and Section 26 05 03 Electrical Identification supplemented and modified by requirements specified in this section.

1.5 WORK INCLUDED

.1 Except as otherwise indicated the system supplier shall secure and pay for all permits, inspections and certifications required for his work and arrange for necessary approvals by the governing authorities.

.2 Work covered by sections referred to above consists of fully operational BAS, including, but not limited to, following:

- .1 Expansion of existing BACnet® based Building Automation System.
- .2 Design and provide all new networking equipment, building controllers, field control devices, cabling and any other accessories or devices required to make new controls function as designed.
- .3 Modify existing BAS programming and graphics to suit new sensors and controlled devices. New graphics to the standard of the existing BAS Graphic User Interface.
- .4 Provide all necessary power required for BAS from local 120V/208V branch circuit panelboards including low voltage transformers.
- .5 Related work performed by other Sections.
  - .1 This section to mount control damper actuators on the control dampers supplied by Section 24 33 15 Dampers Operating
  - .2 This section to wire control damper actuators supplied by this section.

1.6 COORDINATION

.1 Coordinate location of exposed control sensors with plans and room details before installation.

.2 Coordinate controlled/monitored equipment from other divisions to achieve compatibility with BAS.

.3 Coordinate with the Owner's IT department for Ethernet communication cabling and TCP/IP address.

1.7 WARRANTY

.1 Control system failures during warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to Owner. Respond during normal business hours within 24 hours of Owner's warranty service request 24 hours Monday through Friday and 48 hours on Saturday and Sunday.

.2 Provide updates to operator workstation or web server software, project-specific software, graphic software, database software, and firmware that resolve Contractor-identified software deficiencies at no charge during warranty period. Coordinate updates or upgrades with Owner's representative.

.3 Provide for 16 hours of customized programming after verification by the original programmer

1.8 OWNERSHIP OF PROPRIETARY MATERIAL

.1 Project-specific software and documentation shall become Owner's property. This includes, but is not limited to:
- .1 Graphics
- .2 Record drawings
- .3 Database
- .4 Application programming code
- .5 Documentation

1.9 PERMITS, FEES AND INSPECTIONS

.1 Line and low voltage Control Wiring permit.
- .1 Wiring shall be installed by an Electrician.
- .2 Submit to Electrical Inspection Department and Supply Authority necessary quantity of Control Drawings and Control Specifications for examination and approval prior to commencement of work
- .3 Pay associated fees.
- .4 Furnish Certificates of Acceptance from Inspection Department and authorities having jurisdiction on completion of work.

1.10 MAINTENANCE CONTRACT DURING WARRANTY PERIOD

.1 Provide services, materials and equipment to maintain BAS for the building warranty period.

.2 Perform as minimum (4) equally distributed visits including during warranty period. Notify Consultant and Owner 24 hours in advance of each visit and Provide written report.

.3 Check, setup and calibrate a minimum of 33% of all devices and all dampers during each visit.

.4 Perform inspections during regular working hours

.5 Records and logs: maintain records and logs of each maintenance task

.6 System modifications: provide in writing. No system modification, including operating parameters and control settings, to be made without prior written approval of Consultant.

.7 Rectify deficiencies revealed by maintenance inspections and environmental checks.

1.11 SUBMITTALS

.1 In accordance with Section 20 05 02 Mechanical Submittals.
- .1 Submit control diagrams
  - .1 Sequences of operation for each system,
  - .2 All input/output object listings and an alarm point summary listing.
  - .3 Complete bill of materials
  - .4 Provide BACnet® Conformance
  - .5 Provide complete description and documentation of any proprietary (non-BACnet®) services and/or objects used in the system.
  - .6 Specification sheets for each item to include manufacturer's descriptive literature, specification, drawings, diagrams, performance and characteristic curves, catalogue cuts, manufacturer's name, trade name, catalogue or model number, nameplate data, size, layout, dimensions, capacity, other data to establish compliance.
  - .7 Sketch of site-specific system architecture.
  - .8 Specification sheets for each item including memory provided, programming language, speed, type of data transmission.
  - .9 Controller locations.
  - .10 Sensing element type and location.

.2 Record Drawings
- .1 Conform to requirements of Division 1 and Section 20 05 01 Common Work Results for Mechanical - General, supplemented and modified by requirements specified in this section.
- .2 Final Control Diagrams
- .3 Changes to contract documents as well as addenda and contract extras.

.4 Changes to interface wiring.
.5 Major routing of conduit and control air lines.
.6 Signal levels, setpoints, reset curves, schedules.

2 Products

2.1 GENERAL

.1 Control system installed to be "fail-safe".

.2 Provide all required adapters between "metric" and "Imperial" components.

2.2 PRODUCT

.1 Use new products the manufacturer is currently manufacturing and selling for use in new installations. Do not use this installation as a product test site unless explicitly approved in writing by Owner. Spare parts shall be available for at least seven years after completion of this contract.

.2 Each major component of equipment shall have the manufacturer's name and address and the model and serial number on a nameplate.

.3 Maintainability: Maintenance of any satellite panel or any peripheral device shall not affect the remainder of the system.

2.3 BUILDING CONTROLLERS

.1 Listed as a certified B-BC in the BACnet® Testing Laboratories (BTL) Product Listing.

.2 Fully programmable BACnet® Building Controllers that communicate on BACnet® Local Area Network (LAN) and BACnet® MS/TP Network (MS/TP)

.3 Controllers equal to or better than most recent expanded building controllers. Compatible with existing BACnet® BAS

.4 Provide UPS for each Building Controller

.5 Provide quantity as required to create a functional system.

2.4 LOCKABLE CONTROL ENCLOSURES

.1 Enclosures to bear the appropriate CSA designation i.e. CSA Enclosure 1 - General Purpose, CSA Enclosure 3 - Weatherproof.

.2 To have hinged doors equipped with standard keyed-alike cabinet locks, keyed to same key.

.3 Either free-standing or wall mounted enameled steel cabinets with hinged and key-locked front door.

.4 Modular multiple panels as required to handle requirements with additional space to accommodate future capacity without adding additional cabinets.

.5 Cabinets: 12 gauge furniture steel (12 gauge) with baked enamel finish on exterior and rust inhibitive paint on interior, for surface mounting, with hinged door, latch lock, 2 keys, complete with perforated metal mounting backboard.

.6 Factory installed bonding and neutral termination strips.

.7 Provide for conduit entrance from top, bottom or sides of panel.

.8 Cabinets to provide protection from water dripping from above, while allowing sufficient airflow to prevent internal overheating.

2.5 ACCEPTABLE MATERIAL AND INSTALLER

.1 Native BACnet® Building Automation System (BAS) throughout project. Building Controllers (B-BC) to be currently listed by BACnet® Testing Laboratories (BTL)

.2 Acceptable Installer and Material:

.1 Extension of existing Memco Controls with Automated Logic BTL Listed BACnet® Building Controllers (B-BC).

3 Execution

3.1 ELECTRICAL ENCLOSURES

.1 House all electrical equipment associated with the control system in separate dedicated enclosures provided by this section.

.2 House all controllers associated with the control system in lockable enclosures provided by this section.

.3 Top of lockable enclosure to be 1980 mm AFF.

3.2 BAS OBJECT TYPE SUMMARY

.1 Displays: System displays shall show all analog and binary object types within the system. They shall be logically laid out for easy use by the owner. Provide outside air temperature indication on all system displays associated

.2 Run Time Totalization: At a minimum, run time totalization shall be incorporated for each monitored piece of equipment (i.e. Fans, but not including, dampers etc.). Warning limits for each point shall be entered for alarm and or maintenance purposes.

.3 Trend log: All binary and analog object types (including zones) shall have the capability to be automatically trended.

.4 Alarm: All analog inputs (High/Low Limits) and selected binary input alarm points shall be routed (locally or remotely) with alarm message per owner's requirements.

.5 Database Save: Provide back-up database for all stand-alone application controllers on disk.

3.3 BAS POINT DESCRIPTORS & NOMENCLATURE

.1 Conform to existing naming conventions for buildings, zones, controllers and devices in use at building.

.2 Typical control device identification tag:

Point: XYZ _AH1_SAT Address: 1000300.AI2 Description: Supply Air Temperature Part No. XXX – XXXX	Point: XYZ _HX1_VLV Address: 1000100.AO9 Description: Heating Water Exchanger: Steam Valve Part No. XXX – XXXX
Point: XYZ _AH2_FSS Address: 1000500.BO1 Description: Fan Start/Stop Relay Part No. XXX – XXXX	Point: XYZ _ DHWR_PST Address: 1000200.BI4 Description: Domestic Hot Water Return: Pump Current Sensor Part No XXX - XXXX

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

2 Products

2.1 GENERAL

.1 External trim materials to be corrosion resistant. Internal parts to be assembled in vibration-proof, assembly.

.2 Terminations: use standard conduit box with slot screwdriver compression connector block unless otherwise specified.

.3 Account for hysteresis, relaxation time, maximum and minimum limits in applications of sensors and controls.

.4 Devices to be installed in user occupied space must not exceed Noise Criteria (NC) of 35. Noise generated by any device must not be detectable above space ambient conditions.

2.2 ETHERNET SWITCHES

.1 Conform to IEEE Standard 802.3 and UL508 Listed, Industrial Control Equipment.

.2 RoHS Compliant

.3 Data rate: 10/100Mbps using RJ-45 Connectors.

2.3 ELECTRICAL RELAYS

.1 Double voltage, DPDT, plug-in type with termination base

.2 Coils: rated for 120 VAC or 12 V DC. Other voltage: provide transformer

.3 Contacts: rated at 6 amps at 120 VAC

.4 Relay to have visual status indication

.5 Acceptable material: Veris Industries V100.

2.4 ANALOG CURRENT SENSORS

.1 Purpose: measure line current and produce proportional signal in one of following ranges:
- .1 4-20 mA DC
- .2 0-5 volt DC
- .3 2-10 volts DC

.2 Solid core AC current sensors.

.3 Frequency insensitive from 10 - 80 Hz.

.4 Accuracy to 0.5% full scale

.5 Zero and span adjustments. Field adjustable range to suit motor applications.

.6 Adjustable mounting bracket.

.7 Acceptable material: Greystone Model CS-650.

2.5 ELECTRONIC CONTROL DAMPER OPERATORS

.1 Spring return for "fail-safe" in Normally Open or Normally Closed position as indicated.

.2 Refer to Section 24 33 15 Dampers - Operating for damper size limits. Provide separate actuators per section for multiple section dampers.

.3 Operator: size so as to control dampers against maximum pressure or dynamic closing pressure (whichever is greater).

.4 Power requirements: 5 VA maximum at 24 VAC.

.5 Operating range: 0 - 20 VDC

.6 Provide adjustable external stops to limit stroke in either direction.

.7 For electric damper operators, use only 75% of the manufacturer’s rated motor torque in calculating damper operator requirements.

.8 Provide multiple operators wired to operate in unison where required.

2.6 DAMPER END SWITCHES

.1 Activated by damper blade movement and mounted securely on damper frame.

.2 Rotary action steel slotted lever with plastic roller.

.3 Two electrically isolated SPST changeover micro switches. One circuit to fan interlock and other circuit to BAS system.

.4 Contact rating of 10 amperes at 120 V AC.

.5 CSA approved and bear a ULC label.

3 Execution

3.1 GENERAL

.1 Controllers, relays: install in NEMA I enclosure or as required for specific applications. Provide for electrolytic isolation in all cases when dissimilar metals make contact.

.2 Support field-mounted transmitters, sensors on pipe stands or channel brackets.

.3 Duct and AH unit mounted devices: Seal duct and AH unit to prevent air leakage.

.4 Duct mounted devices: On insulated ducts, mount devices and associated wiring on standoffs.

3.2 FAN STATUS

.1 Fan status: determined via AI points connected to current-operated sensors.

.2 Auxiliary contacts on motor starters will not be acceptable for this function.

3.3 BAS CONTROL COMPONENTS AND MOTOR STARTERS

.1 AC Current sensors

.1 For motor control centers and for individual magnetic starters, AC Current sensors are supplied and installed by Electrical Contractor. Refer to Section 26 29 10 Motor Starters to 600 V and Section 26 24 19 Motor Control Devices. Provide necessary adapters to utilize these devices.

.2 For thermal overload switches, AC Current sensors are supplied and installed by Section 25 30 02 BAS Field Control Devices.

.2 Relays and Relay Bases

.1 For motor control centers and for individual magnetic starters, relays and relay bases are supplied and installed by Electrical Contractor. Refer to Section 26 29 10 Motor Starters to 600 V and Section 26 24 19 Motor Control Devices. Provide necessary adapters to utilize these devices.

.2 For thermal overload switches, relays and relay bases are supplied and installed by Section 25 30 02 BAS Field Control Devices.

.3 The AC Current sensors, Relays and Relay Bases that are provided by Electrical Contractor are for use by the BAS. Provide necessary hardware, adapters and devices as required for the BAS to utilize this equipment. Should modifications be required to the supplied devices to facilitate interfacing with the BAS, all necessary modifications, equipment, programming, etc. shall be carried out by the BAS contractor, at no additional cost to the Owner. Further, if the BAS Contractor modifies the control components located in the starter enclosures, the services of CSA will be required to visit the site and perform a field certification of each modified starter. Include all costs for the field certification in the BAS Contract.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 21 05 01 Mechanical General Requirements, Section 21 05 02 Mechanical Submittals and Section 21 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 21 05 01 Mechanical General Requirements.

1.3 RELATED DIVISIONS

.1 Divisions 26 Electrical

.2 Divisions 27 Communications

1.4 WIRING

.1 If departures from the contract drawings are deemed necessary, details of such departures, including changes in related portions of the project and the reasons therefore, shall be submitted to the Consultant with drawings for approval.

.2 Incorporate surge transient protection in the design of the system to protect all electrical components in all control equipment.

1.5 SYSTEM DESCRIPTION

.1 Electrical: Hard wiring between field control devices and BAS field panels.

2 Products

2.1 CONTROL SYSTEM WIRE AND CABLE

.1 In accordance with Section 26 05 20: Wire and Box Connectors - 0 - 1000 V

.2 Cable jacket:
- .1 FT6 jacket rated and bear the following labels: CSA 300 volts and FT6.
- .2 FT4 jacket rated and bear the following labels: CSA 600 volts and FT4.
- .3 Labeled with the following information, as a minimum:
  - .1 Cable type.
  - .2 FT rating.
  - .3 Temperature rating.
  - .4 CSA number.
  - .5 Rated voltage.
  - .6 Gauge and number of conductors.

.4 Application:
.1 Control wiring to 600 volt starters to be FT4 in conduit.
.2 All control wiring in conduit may be FT4.
.3 All other control wiring to be FT6.
.4 Colored as follows:

System Description	Jacket Colour
BAS	Yellow

.2 Below 50V control wiring:
.1 Minimum No. 14 stranded.
.2 Minimum two conductor No. 18 AWG solid copper or No. 20 AWG, stranded twisted pair for field wiring of each digital device.
.3 Minimum No. 22 AWG solid copper for multi-conductor wiring having four or more conductors.
.4 Minimum two conductor No. 18 AWG, solid copper, or No. 20 AWG, stranded twisted pair, shielded for field wiring of each analog input.

2.2 GROUNDING AND BONDING

.1 In accordance with Section 26 05 28 Grounding and Bonding

2.3 SPLITTER, JUNCTION, PULL BOXES AND CABINETS

.1 In accordance with Section 26 05 31: Splitters, Junction, Pull Boxes and Cabinets.

.2 Size to suit the wiring for the control system and to allow for future expansion capabilities specified for the system.

2.4 OUTLET AND CONDUIT BOXES

.1 In accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.

.2 Surface Mount Conduit Boxes
.1 Cast FS aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacles.
.2 Metal type "FS" device plates to be used on all type "FS" boxes unless noted otherwise.

2.5 CONDUITS

.1 In accordance with Section 26 05 34: Conduits, Conduit Fastenings and Conduit Fittings.

2.6 PATHWAYS

.1 In accordance with Section 27 05 28 Pathways for Communication System Wiring.

3 Execution

3.1 GENERAL

.1 Install all work in accordance with authorities having jurisdiction and manufacturer's requirements. In case of conflicting requirements, the more stringent shall apply.

.2 Install in a neat and ordered manner.

.3 Colour Coding: Refer to 25 05 03 BAS Identification.

3.2 INSTALLATIONS

.1 In accordance with the following:
- .1 Section 26 05 20: Wire and Box Connectors - 0 - 1000 V
- .2 Section 26 05 28: Grounding and Bonding
- .3 Section 26 05 31: Splitters, Junction, Pull Boxes and Cabinets.
- .4 Section 26 05 32: Outlet Boxes, Conduit Boxes and Fittings.
- .5 Section 26 05 34: Conduits, Conduit Fastenings and Conduit Fittings.
- .6 Section 27 05 28 Pathways for Communication System Wiring

3.3 INSTALLATION OF PATHWAYS

.1 BAS control cables installed within accessible ceiling spaces and not installed in a conduit system are to be secured directly to the steel deck, above the support structure. Provide supports at 1200 mm (48") intervals.

.2 **Do not use supports or equipment installed by other trade contractors for conduit or cable support.**

.3 **Do not attach conduit and cable to supports installed as part of a suspended ceiling installation (gypsum board or T-Bar for example).**

END OF SECTION

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section.

.2 This section covers items common to all sections of Divisions 26, 27 and 28.

1.2 FUNCTIONAL PERFORMANCE TESTING (FPT)

.1 Refer to Section 26 91 13 Electrical Systems Testing and Verification for Functional Performance Testing (FPT).

.2 The correction of all electrical deficiencies identified throughout the project associated with the Work shall be a condition of Substantial Performance and shall be corrected prior to achieving Substantial Performance.

.3 A condition of Substantial Performance shall be an Owner performed Functional Performance Testing (FPT) Program independent of other processes specified, upon receipt of written verification from the General Contractor that:

- .1 All systems are complete and operational in all respects.
- .2 All specified reports and documents have been submitted and approved.
- .3 All tests, commissioning and start-up processes described elsewhere in the specification are complete.
- .4 All demonstrations have been completed and documented.
- .5 All defects and deficiencies identified during the commissioning of all electrical systems have been corrected.

.4 Prior to Functional Performance Testing (FTP), submit the following documentation:

- .1 Record drawings.
- .2 Operations and maintenance manuals.
- .3 Documentations listed in Section 26 05 02 - Electrical Contract Closeout.
- .4 Written confirmation of System Demonstration and Operating and Maintenance Instructions have been performed in accordance with Section 26 05 02– Electrical Contract Closeout.

.5 Deficiencies or discrepancies discovered during the FPT process are to be immediately rectified by the Electrical Contractor. A condition of Substantial Performance shall be the correction of all electrical deficiencies identified throughout the project associated with this work.

.6 The contractor shall return copies of the deficiency lists to owner via the Engineer with all corrected items signed off.

1.3 INTENT

.1 It is the intent of these specifications to outline the method, materials, and quality of equipment to be furnished and installed hereinafter specified and/or shown on the drawings.

1.4 DEFINITIONS

.1 "CONCEALED" - electrical services and equipment in hung ceiling spaces and non-accessible chases and furred spaces.

.2 "EXPOSED" - will mean "not concealed" as defined herein.

.3 “PROVIDE”- means supply and install. Wherever in the Contract Documents the word "provide" is used in any form, it shall mean that the Work concerned shall include both supply and installation of the products required for completion of that part of the Work.

2 CODES AND STANDARDS

.1 Do complete installation in accordance with CSA C22.1-15 except where specified otherwise.

.2 Ensure that all electrical equipment is field marked to warn persons of the potential electric shock and arc flash hazards, as per CSA C22.1-15, Rule 2-306.

.3 CSA Z462-15 Workplace Electrical Safety Standard.

.4 Comply with CSA Certification Standards and Electrical Bulletins in force at time of tender submission.

.5 Comply with CAN/CSA C860-11 standard for Exit Lights.

.6 Do underground systems in accordance with CSA C22.3 No. 7-94 except where specified otherwise.

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

3 CARE, OPERATION AND START-UP

.1 Instruct operating personnel in the operation, care and maintenance of equipment.

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

.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.

4 VOLTAGE RATINGS

.1 Operating voltages: to CAN3-C235-83.

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

5 PERMITS, FEES, CONTRIBUTION TO CONSTRUCTION FEES AND UTILITY INSPECTION SERVICES

.1 Electrical Permits
- .1 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.
- .2 Pay associated fees.
- .3 Provide the Engineer with a copy of the permit (s).
- .4 Furnish Certificates of Acceptance from Inspection Department and authorities having jurisdiction on completion of work.

6 MATERIALS AND EQUIPMENT

.1 Provide materials and equipment in accordance Division 1.

.2 Equipment and material to be CSA certified, and manufactured to standard quoted.

.3 Factory assembled control panels and component assemblies.

.4 Arrange and pay for field certification by CSA, as may be required.

7 ELECTRIC MOTORS EQUIPMENT AND CONTROLS

.1 Supplier and installer responsibility is indicated on Motor Starter and Control List.

.2 Control wiring and conduit is the responsibility of the electrical contractor, except for conduit, wiring and connections which are related to control systems specified in the mechanical contract documents and shown on mechanical drawings.

8 FINISHES

.1 Shop finish metal enclosure surfaces by removal of rust and scale, cleaning, application of rust resistant primer inside and outside, and at least two coats of finish enamel.
- .1 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1-1958.

.2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.3 Clean, prime, and paint exposed hangers, racks, fastenings to prevent rusting.

9 WIRING TERMINATIONS

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

.2 Panel boards are to be equipped in the factory with proper sized lugs to suit the conductor size.

.3 All stranded conductors (including phase, neutrals, grounds and bonds) prior to terminating under device bolts; i.e. light switches, receptacles etc., are to be twisted together so as to form a single conductor.

.4 Ensure all bonding conductors entering electrical enclosures, such as panel tubs, splitters, junction and pull boxes 150 mm x 150 mm (6 in. x 6 in.) and larger, etc. are terminated on terminal strips which are electrically continuous and fastened to the metal non-current carrying portion of the enclosure with a minimum of two bolts, c/w lock washers.

10 MANUFACTURER'S AND CSA LABELS

.1 Visible and legible after equipment is installed.

11 WARNING SIGNS

.1 Provide warning signs, as specified and/or to meet requirements of Inspection Department.

12 SINGLE LINE ELECTRICAL DIAGRAM

.1 Provide a framed single line electrical Power distribution system riser drawing under Plexiglas. This drawing is to reflect the riser following this project. Locate in main electrical room.

.2 Provide a legend of the colour coding used to identify the system as detailed in 26 05 03. Locate in main electrical room.

.3 Drawing 600 mm x 600 (24 in. x 24 in.) mm minimum size.

13 OUTLETS

.1 Locate outlets in accordance with Division 1.

.2 Do not install outlets back-to-back in wall; allow minimum 150 mm (6 in.) horizontal clearance between boxes.

.3 All outlets shall have brushed stainless steel coverplates regardless of the system involved, including light switches, receptacles, communication outlets, etc.

.4 Change location of outlets at no extra cost or credit, providing distance does not exceed 3 metres (10 feet), and information is given before installation.

.5 Locate light switches on latch side of doors. Locate disconnect devices in mechanical rooms on latch side of door.

14 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 Verify mounting height of equipment before proceeding with installation.

.3 Confirm with Architectural elevations prior to mounting exterior electrical devices, lights, public address, etc.

.4 Install electrical equipment at the following heights unless indicated otherwise. Refer to device mounting height details on drawings.

- .1 Local switches: As indicated.
- .2 Wall receptacles:
  - .1 General: As Indicated.
  - .2 Above top of continuous baseboard heater: 178 mm (7 in.).
  - .3 Above top of counters or splash back: 178 mm (7 in.).
- .3 Panelboards: 1980 mm (78 in) AFF to top of 42 circuit panels.
- .4 Emergency Lights – 2286 mm AFF (90 in.) .
- .5 Emergency Remote Heads – 2286 mm AFF (90 in.) .

15 PROTECTION

.1 Protect exposed live equipment during construction for personnel safety.

.2 Shield and mark live parts "LIVE 120 VOLTS", or with appropriate voltage.

.3 Arrange for installation of temporary doors for rooms containing electrical distribution equipment. Keep these doors locked except when under direct supervision of electrician.

16 LOAD BALANCE

.1 Measure phase current to panelboards with normal loads and 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 Test and record phase and neutral currents on panelboards, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

17 CONDUIT AND CABLE INSTALLATION

.1 Install cables, conduits, and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

.2 All wiring is to be concealed unless noted otherwise. Where this is not possible due to existing construction, metal surface mounted raceways are to be used.

.3 Where conduits cross building expansion joints, provide conduit expansion joints with telescoping sleeve and insulated bushings.

.4 Any conduit which is installed under the ground floor slab and penetrates the ground floor slab must be sealed. Use appropriate bedding material for conduits.

18 SLEEVES AND FIRESTOPPING

.1 Where conduits and cables pass through assemblies, provide firestopping. Refer to Architectural Drawings for location of assemblies.

.2 Terminate sleeves flush with floor except in mechanical rooms, where sleeves will terminate 50 mm (2 in.) above finished floor.

19 FIELD QUALITY CONTROL

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

.2 Conduct and pay for tests of the following:
- .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 system where applicable.
.5 Polarity check on all receptacles.
.6 Fire Alarm System.
.7 Structured wiring system.
.8 Intrusion Detection System.
.9 Video Surveillance System.
.10 Public Address System.
.11 Emergency lighting system.
.12 Exit signage.

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

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

.5 Submit test results for Engineer's review.

20 DISTRIBUTION SYSTEM EQUIPMENT STARTUP CHECKS

.1 Panelboards.
.1 Review the installation of all panel boards. Include the cost of measuring phase currents and voltages. Clean all panel board tubs. Re-torque all connections within panel boards. Provide written report.

21 MOTOR OVERLOAD OVERCURRENT PROTECTION

.1 Set and record all motor overload devices in accordance with nameplate information, manufacturer's recommendations and the 2015 edition of the CEC. Ensure proper overcurrent devices are installed. Include these records in the Project Maintenance Manual.

22 SUPPLY CONDUCTOR INSULATION

.1 Ensure that the insulation rating on branch circuits feeding all electrical loads comply with the 2015 edition of the CEC, and the manufacturer's recommendations.

23 DRAWINGS

.1 Electrical drawings are not intended to show structural details or architectural features.

.2 The electrical drawings are not to be scaled.

.3 Electrical drawings, except where dimensioned, indicate general layouts only. Investigate structural and finish conditions and the work of all other trades affecting this work and arrange work accordingly.

.4 Coordinate the elevation of all outlet boxes with architectural drawings and report any conflicts to Engineer prior to installation.

.5 All electrical junction boxes must be accessible at the completion of the project. Coordinate the location of each junction box with the proposed location of mechanical services prior to installation.

.6 Layouts on the electrical drawings are based on the specified equipment (Standard of Acceptance), including electrical power connections, number of conductors and conduit sizes, and physical dimensions. Alternate equipment and systems proposed by the Contractor for use on this project (Acceptable Manufacturers) which necessitate changes in service connections, numbers of conductors and conduit sizes to perform the specified functions may be considered by the Engineer, however, any required modifications or additions to the electrical contract or the work of other trade contractors shall be done at no additional cost to the Owner. Furthermore, if it is found that the provisions made regarding space conditions and code required clearances are not met, the right is reserved by the Consultant to require installation of the equipment specified (Standard of Acceptance).

24 CONTRACT DOCUMENTS

.1 Before submitting tender for his work, each Contractor shall examine the contract documents (mechanical drawings, structural drawings, and architectural drawings and specifications) to ascertain that the work can be carried out as shown on these drawings and herein specified. No extra will subsequently be allowed to cover any omission and/or oversight for not having made a thorough inspection of the contract documents.

25 ACCESS DOORS

.1 The electrical contractor is to provide access doors to concealed electrical junction boxes, pull boxes and miscellaneous equipment for operating, inspecting, adjusting and servicing. Access doors are to be supplied which meet or exceed the fire resistance rating of the partition or ceiling in which they are being installed.

.2 Flush mounted 600 mm x 600 mm (24 in. x 24 in.) for body entry and 300 mm x 300 mm (12 in. x 12 in.) for hand entry unless otherwise noted. Doors to open 180 degrees, have rounded safety corners, concealed hinges, screwdriver latches and anchor straps.

.3 Material:

- .1 Special areas such as tiled or marble surfaces: use stainless steel with brushed satin or polished finish as directed by Consultant.
- .2 Remaining areas: use prime coated steel.
- .3 Fire rated where installed in fire rated construction.
- .4 Provide panels in glazed tile walls of 2.5mm (12 gauge) 304 stainless steel #4 finish, with recessed frames secured with counter-sunk flush-head screws.

.5 Provide panels in plaster surfaces with recessed doors with welded metal lath ready to accept plaster and with a plaster grommet for door key access.
.6 Provide other access doors of 2.5mm (12 gauge), flush with concealed hinges, anchor strap and lock, all factory prime coated.
.7 Supply details of doors prior to installation.
.8 Mark all lay-in tiles that are used for access in a manner approved by the Consultant.

.4 Installation:
.1 Locate so that concealed items are accessible.
.2 Locate so that hand or body entry (as applicable) is achieved.
.3 Installation is specified in applicable sections.

.5 Acceptable Manufacturers:
.1 Acudor
.2 LeHage
.3 SMS
.4 Zurn

26 CONNECTION OF EQUIPMENT

.1 Provide all connections required by the equipment supplied by this Division.

.2 Provide all connections required by equipment supplied by the Owner or by other Divisions. Examine all Drawings and Specifications and identify all requirements.

.3 Provide all necessary accessories to make connections, including flexible connectors, etc.

27 SPRINKLER PROOF HOODS

.1 All distribution equipment within ventilated enclosures (panelboards, transformers, etc.) located in the building shall be protected from the direct spray from sprinkler heads to the satisfaction of the Inspection Authority by the use of non-combustible hoods.

.2 Distribution conduits exiting or entering equipment enclosures equipped with sprinkler hoods shall be installed with rain-tight EMT connectors equipped with a rubber “O” Ring gasket.

28 CO-ORDINATION

.1 Co-ordinate the Work of this Division with all other Divisions for locations of openings, spaces, services, sleeves, ducts, pipes, supports, connections, etc. Where conflicts occur, reroute conduits, cable troughs, outlets, lighting, equipment, etc. as required. Advise Engineer of proposed changes, and obtain written authorization, prior to proceeding.

.2 Contractor is to review Architectural millwork drawings and advise the Engineer of any conflicts with lighting and/or electrical outlets. This review is to take place prior to electrical rough-in in all affected areas.

.3 The layout of electrical equipment within mechanical rooms is approximate only.

.4 Ensure that the location of all mechanical equipment within mechanical rooms is coordinated with the location of all electrical equipment which resides within these rooms.

.5 Provide pertinent information to Mechanical contractor to assist him in the installation of mechanical services. This would include routing of all major electrical conduits, etc. Make adjustments as required to coordinate the installation of electrical services and equipment with those of other trades.

.6 Coordinate with Mechanical Contractor to ensure that all mechanical equipment is correctly supplied with electrical connections in accordance with plans and specifications.

29 INSTALLATION REQUIREMENTS

.1 Install all products and services to follow building planes. Installation shall permit free use of space and maximum headroom to the satisfaction of the Consultant.

.2 Confirm the exact location of fixtures, outlets and connections. Confirm location of connection points for equipment supplied under other Divisions.

.3 Install all equipment and appurtenances to allow free access for adjustment, maintenance and/or replacement.

.4 Provide all hangers, supports and fasteners such that no undue stresses are imposed on the structure and systems. Ensure that the load onto structures does not exceed the maximum loading per square metre as shown on structural drawings. Equipment supports not supplied by equipment manufacturer are to be fabricated using structural grade steel.

.5 Exterior supports are to be galvanized, unless noted otherwise.

.6 Install all products and services in accordance with the respective manufacturer's recommendations.

.7 High velocity explosive activated tools shall not be used. Only low velocity system types are permitted.

.8 Provide caps and seal all open ends of installed conduits to prevent the entrance of foreign substances.

.9 Install all services capped for future possible use such that easy access is provided for future connections.

30 FIELD REVIEW

.1 The Consultant and Owner shall have access to the site at all times for review of the work.

.2 Correct any deficiencies as they are reported during the performance of the Work.

31 UNIFORMITY

.1 All equipment and materials which serve a similar function shall be from one manufacturer and one product line (i.e.: panelboards, starters, major systems, etc.).

32 CUTTING AND PATCHING

.1 It is the responsibility of the Electrical Contractor to provide all required cutting and patching associated with the installation of electrical systems, devices, conduit, wire, etc., unless noted otherwise. Refer to Division 1 for more information.

.2 Restore all surfaces to a finish acceptable to the Owner.

33 MATERIAL

.1 Standard of Acceptance:

.1 Means that item named and specified by manufacturer and/or catalogue number forms part of specification and sets standard regarding performance, quality of material and workmanship and when used in conjunction with a referenced standard, shall be deemed to supplement the standard.

.2 Acceptable Manufacturer:

.1 Means that item, manufactured by named and specified manufacturer, shall be deemed acceptable provided it meets the specification and referenced standard regarding performance and quality of material and workmanship, as outlined under Standard of Acceptance (above).

.3 Refer to Instructions to Bidders for requirements of additional Acceptable Manufacturers or Acceptable Material.

34 TORQUES FOR WIRE TERMINATIONS

.1 For proper termination of conductors, it is very important that field connections be made properly tight.

.2 Where possible, obtain and comply with Manufacturer’s instructions on the equipment.

.3 In the absence of Manufacturer’s instructions, make terminations in conformance with the values given in Tables D6 and D7 of the 2015 CEC.

35 CABLE TIES AND TYE WRAPS

.1 Cable ties and tye wraps are only permitted to be used to provide limited support for bundling purposes only. These devices are not intended to provide the primary support for conduits or cables.

.2 Cable Ties are not to be used for the support of cable or conductor runs between boxes and fittings.

36 WORKING SPACE ABOUT ELECTRICAL EQUIPMENT

.1 Arrange installation as required to maintain minimum working space around electrical equipment in conformance with CSA C22.1-15.

37 LOW V. O. C. MATERIALS

.1 All site applied coatings, adhesives & sealants must be low VOC content.

.2 Provide Material Safety Data Sheets for all products & materials of these types incorporated into the work.

38 PLYWOOD BACKBOARDS

.1 Electrical Contractor will provide all plywood backboards required for mounting electrical equipment.

.2 Paint all surfaces of plywood backboards with fire retardant paint prior to installation.

39 DUST CONTROL AND PROTECTION OF LIGHT FIXTURES

.1 Electrical Contractor will supply and install temporary protective sheeting for each light fixture to ensure that dust cannot enter the enclosure during the construction period.

.2 Electrical Contractor will remove and dispose of the protective sheeting at the end of construction related activities when the building is considered to be clean.

******END OF SECTION******

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section.

1.2 ELECTRICAL PERMITS AND RCDD CERTIFICATES

.1 Prior to submitting the first progress claim , provide the following permits and certificates:
  .1 As per Section 26 05 00 provide copies of the following electrical permit:
    .1 Electrical Wiring Permit.

1.3 HOURLY LABOUR RATE

.1 Submit the proposed hourly labour rate for review in a timely manner after contract award.

.2 Refer to General Conditions of Contract.

.3 The hourly labour rate will be based on the following components:

Base Rate	$
Holiday and Vacation Pay	$
Sub-Total	$
EI	$
WCB	$
Group Insurance	$
CPP	$
Group Pension	$
Other Payroll Burdens	$
IIF & Con Fund	$
Training and Education	$
ISO Program	$
Safety Program	$
Sub-Total	$
Total Payroll Hourly Cost	$
Small Tools	$
Site Supervision	$
Total Hourly Labour Cost	$

1.4 EQUIPMENT IDENTIFICATION

.1 As per 26 05 03 submit proposed nomenclature for all lamicoid plates for engineer's approval.

1.5 SHOP DRAWINGS

.1 In accordance with Division 1.

.2 All Shop Drawings to be Metric.

.3 Assembled in groups and bound in sets.

.4 On cover/front page indicate total number of pages in submission.

.5 Consecutively number each page.

.6 Where specified in Division 1, submit electronic copies of shop drawings. In addition to the electronic shop drawing, submit one hard copy to the office of the electrical consultant.

.7 Provide shop drawings for the following:
- .1 Through-Penetration Firestopping for Electrical Systems.
- .2 Wiring Devices.
- .3 Motor Starters to 600 V.
- .4 Molded Case Circuit Breakers.
- .5 Disconnect Switches Fused and Non-Fused.
- .6 Contactors.
- .7 Dry Type Transformers.
- .8 Panelboards Breaker Type.
- .9 Fuses - Low Voltage.
- .10 Lighting Equipment.
- .11 Exit Lights.
- .12 Unit Equipment for Emergency Lighting.
- .13 Structured Cabling for Communications Systems.
- .14 Public Address System.
- .15 Intrusion Detection.
- .16 Video Surveillance.
- .17 Access Control System
- .18 Multiplex Fire Alarm System.

1.6 PROGRESS CLAIMS

.1 Progress claims are to be submitted with the following breakdown:
- .1 Mobilization.
- .2 Conduit Rough-in.
- .3 Wire and Cable.
- .4 Wiring Devices.
- .5 Electrical Distribution.
- .6 Lighting Equipment and control systems.
- .7 Exit & Emergency Lighting systems.

.8 Electrical Systems Testing and Verification.
.9 Structured Wiring System.
.10 Public Address System.
.11 Video Surveillance system.
.12 Intrusion Detection system.
.13 Access Control System.
.14 Fire Alarm System.
.15 Commissioning.
.16 Contract Closeout Documentation.

.2 Ensure that each item in the Progress Claim breakdown includes all components required to provide a fully working system, including hardware, components and all associated conduit and wire.

.3 The first electrical progress claim may be withheld until such time as the required breakdown is submitted.

.4 Material on Site.
.1 Refer to General Conditions of Contract.
.2 All claims for material on site must be supported by supplier's invoices showing supplier's unit prices including taxes.
.3 Material on site shall not be claimed under the "work complete" portion of the claim.
.4 Material eligible to be claimed as "material on site" must be large, project specific equipment.
.5 General material which is not considered project specific such as conduit, connectors, fittings, wire, small tools, etc., are not eligible to be claimed as "material on site."
.6 Project specific equipment may be claimed as "material on site" subject to the following:
.1 Claim to show previous material on site and deduct the amount of previously claimed material that was incorporated into the work during the current month.
.2 Claim to show material brought on site this month supported by a copy of the supplier's invoices showing supplier's unit prices including taxes.
.7 Invoices submitted for a "material on site" claim will not be considered by the engineer unless they are examined and initialed by both the Electrical Contractor and the General Contractor.

1.7 OPERATING AND MAINTENANCE MANUAL

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

.2 Operation data to include:
- .1 Schematics for each system.
- .2 Description of each system and its controls.
- .3 Description of operation of each system.
- .4 Operation instruction for each system and each component.
- .5 Description of actions to be taken in event of equipment failure.
- .6 Colour coding chart.

.3 Maintenance data shall include:
- .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
- .2 Data to include schedules of tasks, frequency, tools required and task time.

.4 Performance data to include:
- .1 Equipment manufacturer's performance data sheets with point of operation as left after system verification is complete.
- .2 Equipment performance verification test results.
- .3 Insulation resistance testing and panelboard phase current measurement records.
- .4 Special performance data as specified elsewhere.

.5 Approvals:
- .1 Submit 2 copies of draft Operation and Maintenance Manual to Consultant for approval. Submission of individual data will not be accepted unless so directed by Consultant.
- .2 Make changes as required and re-submit as directed by Consultant.

.6 Provide maintenance data for the following:
- .1 Wiring Devices.
- .2 Motor Starters to 600 V.
- .3 Molded Case Circuit Breakers.
- .4 Disconnect Switches Fused and Non-Fused.
- .5 Contactors.
- .6 Panelboards Breaker Type.
- .7 Dry Type transformers.
- .8 Fuses - Low Voltage.
- .9 Lighting Equipment.
- .10 Exit Lights.
- .11 Unit Equipment for Emergency Lighting.
- .12 Structured Cabling for Communications Systems.
- .13 Public Address System.
- .14 Intrusion Detection.
- .15 Video Surveillance.
- .16 Access Control System.
- .17 Multiplex Fire Alarm System.

.7 Provide one copy of all approved shop drawings for each maintenance manual.

1.8 START UP REPORT MANUAL

.1 Custom designed and containing material pertinent to this project only and to provide full and complete coverage of subjects referred to in this section.

.2 Operating and maintenance manual to be approved by and final copies deposited with Consultant before final inspection.

.3 Organize by specification section.

.4 Conform to requirements of Division 1, supplemented and modified by requirements specified in this section.

.5 Start Up and Performance data to include:
- .1 Equipment manufacturer's performance data sheets after commissioning is complete.
- .2 Start up and verification reports as per Section 26 05 02, Electrical Contract Closeout.
- .3 Final inspection report from NSPI.

.6 Submittals:
- .1 Submit a copy of the complete Start Up Report Manual to Consultant for Review.
- .2 Refer to Division 1 for quantity of Manuals (minimum 3).
- .3 Hard-back, 25 mm (1") 3 ring, D-ring binders.
- .4 Binders to be 2/3 maximum full.
- .5 Provide index to full volume in each binder.
- .6 Identify contents of each manual on cover and spine.
- .7 Include names, addresses, telephone numbers of each sub-contractor having installed equipment, local representative for each item of equipment, each system.
- .8 Provide full Table of Contents in each manual. Assemble each manual to conform to Table of Contents with tab sheets placed before instructions covering subject.

1.9 SPARE PARTS AND MAINTENANCE MATERIALS

.1 Provide the following spare parts to the Owner or his designated representative. Retain a signed copy of transmittal and insert in operation and maintenance manuals.
- .1 Section 26 29 10 - Motor Control:
  - .1 Provide the following spare parts for each type and size of starter.
    - .1 Two (2) sets of auxiliary contacts.
    - .2 One (1) control transformer.
    - .3 Five (5) control fuses.
    - .4 Four (4) indicating LEDs.

.3 Section 26 52 00 - Unit Equipment for Emergency Lighting:
  .1 One (1) surface mount unit, 36 watt unit, c/w two heads.
  .2 Two (2) remote units, c/w two heads.

1.10 RECORD DRAWINGS

.1 Site records:
  .1 Provide sets of white prints as required for each phase of the work. Mark thereon all changes as work progresses and as changes occur. This shall include change orders, site instructions and changes to electrical systems.
  .2 Make available for reference purposes and inspection at all times.
  .3 Produce record drawings in accordance with Division 1.

.2 Where products are specified by manufacturer and/or model, update AutoCAD file to show installed manufacturer and model.

.3 Record Drawings:
  .1 Prior to start of Testing and System verification finalize production of as-built drawings.

  .2 Identify each drawing in lower right hand corner in letters at least 1/2" (13 mm) high as follows: -"RECORD DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW ELECTRICAL SYSTEMS AS INSTALLED" (DATE).
  .3 Submit to Consultant for approval and make corrections as directed.
  .4 Submit computer disk with the AutoCAD files and a 4 mil. Reproducible film hard copy to the consultant at the time specified in Division 1.

******END OF SECTION ******

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section.

1.2 FUNCTIONAL PERFORMANCE TESTING (FPT)

.1 Refer to Section 26 91 13 Electrical Systems Testing and Verification for Functional Performance Testing (FPT).

.2 The correction of all electrical deficiencies identified throughout the project associated with the Work shall be a condition of Substantial Performance and shall be corrected prior to achieving Substantial Performance.

.3 Deficiencies discovered during the FPT process are to be immediately rectified by the Electrical Contractor. A condition of Substantial Performance shall be the correction of all electrical deficiencies identified throughout the project associated with this work.

.4 The contractor shall return copies of the deficiency lists to Owner via the Engineer with all corrected items signed off.

.5 The FPT Deficiency list will form part of the Substantial Performance Inspection list specified in Division 1.

1.3 CLOSEOUT DOCUMENTATION

.1 Section 26 05 00: Common Work Results for Electrical
- .1 Copy of electrical permits from Utility.
- .2 Single line electrical diagrams.
- .3 Final Inspection certificate(s) from Inspection Authority.

.2 Section 26 05 01 - Electrical Submittals:
- .1 Shop drawing and product data.
- .2 Operating and Maintenance Manual.
- .3 Spare parts.
- .4 Record drawings.

.3 Section 26 05 03: Identification.
- .1 Submission of proposed equipment identification lamicoid plates for approval.

.4 Section 26 27 26: Wiring Devices.
- .1 Written confirmation of receptacle polarity check.

.5 Section 26 29 10: Motor Starters & Motor Controls.
- .1 Complete list of all motors, starters, motor hp, motor FLA and installed solid state overload.
- .2 Field report.

.6 Section 26 52 00: Unit Equipment for Emergency Lighting.
- .1 Written Guarantee.

.7 Section 26 91 13: Electrical Systems Testing and Verification.
- .1 Verification and Test Forms.

.8 Section 27 10 05: Structured Cabling for Communications Systems.
- .1 Testing and Verification Report & Certificate.

.9 Section 27 51 16 - Public Address System.
- .1 Testing and Verification Report & Certificate.

.10 Section 28 13 00 - Access Control System
- .1 Testing and Verification Report & Certificate.

.11 Section 28 23 00: Video Surveillance.
- .1 Testing and Verification Report & Certificate.

.12 Section 28 16 00: Intrusion Detection.
- .1 Security System Verification Report and Certificate.

.13 Section 28 31 00.01: Multiplex Fire Alarm System.
- .1 Fire Alarm Verification Report and Certificate.

1.4 EXTENDED WARRANTIES

.1 Section 27 10 05, Structured Cabling for Communications Systems
- .1 The minimum warranty requirement will be 25 years for the network passive components. Upon completion of the project, a certificate stating the warranty of the system must be supplied to the end user.

1.5 DEMONSTRATION AND OPERATING AND MAINTENANCE INSTRUCTIONS

.1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.2 Use operation and maintenance manual, as-built drawings, audio visual aids, etc. as part of instruction materials.

.3 Following the completion of each training and demonstration session, the contractor is to obtain an attendance sheet signed off by those personnel who have received training.

2 Products N/A

3 Execution N/A

********END OF SECTION ********

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section.

1.2 IDENTIFICATION REQUIREMENTS

.1 All electrical equipment shall be identified by the use of Lamicoid plates. This includes all distribution equipment (Branch Circuit Wiring Panels, etc.).

.2 All equipment and enclosures receiving connections to the building power distribution system shall have their panel and circuit number identified by the use of Lamicoid plates. This includes equipment supplied by the electrical contractor, the mechanical contractor and all other divisions.

.3 All equipment located on the roof which receives an electrical connection provided by the electrical contractor requires a lamicoid identification plate affixed to the equipment in a conspicuous location. This includes equipment supplied by the electrical contractor, the mechanical contractor and all other divisions.

.4 All electrical junction, pull boxes and splitters installed in areas with drop ceilings shall be colour coded inside and out with appropriate coloured paint. **All paint is to be applied prior to installation and not with-in the confines of the building.**

.5 All electrical junction, pull boxes and splitters installed in areas without drop ceilings (exposed) shall be colour coded on the inside only with appropriate coloured paint. **All paint is to be applied prior to installation and not with-in the confines of the building.** Install an appropriately coloured dot on the exterior of the cover plate to indicate box function.

.6 All conduit couplings installed in areas with drop ceilings shall be colour coded with appropriate coloured paint. **All paint is to be applied prior to installation and not with-in the confines of the building.**

.7 Where conduits are installed in a room where no conduit couplings are visible, appropriate colour bands are required to identify the conduit function.

.8 All junction boxes installed in areas with drop ceilings shall have the panel and circuit numbers contained with-in, identified on the exterior of the cover plate.

.9 All junction boxes installed in areas without drop ceilings (exposed structure) shall have the panel and circuit numbers contained with-in, identified on the interior of the cover plate.

.10 All wiring installed under this contract shall be identified through the use of self-laminating labels.

.11 All receptacles installed under this contract shall be identified through the use of Lamicoid plates.

.12 All voice, data outlets installed under this contract shall be identified through the use of Lamicoid plates.

.13 Permanently identify voice and data horizontal cabling at each end. The identification must be mechanically generated, not hand written. Indicate the originating Telecommunications Room (TR) and the consecutively numbered jack for voice and data. This labeling is to be identical on the originating end and in the outlet box. This same information is to appear on the patch panel and outlet jack location.

.14 All control panels and time clocks shall be identified through the use of Lamicoid plates.

.15 All emergency lighting battery packs shall be identified through the use of Lamicoid plates.

.16 All Exit signs shall be identified through the use of Lamicoid plates.

.17 All addressable fire alarm system devices shall be identified through the use of Lamicoid plates.

.18 All electrical devices (receptacles, communication outlets, multi-media outlets, relay panels and electrical equipment in concealed ceiling spaces shall be identified with two (2) Lamicoid plates, one on the device, junction box and equipment and one on the ceiling below.

2 Products

2.1 IDENTIFICATION NAMEPLATES

.1 Lamicoid identification plates.

.1 Lamicoid 1.5 mm thick plastic engraving sheet for all electrical systems, complete with rounded upper corners. Lamicoid characteristics are to be as follows, unless noted otherwise:

.1 Fire alarm systems to have red face with white core Lamicoid plates.

.2 Electrical equipment enclosures to have black face with white core Lamicoid plates.

.3 Receptacles to have white face with black core Lamicoid plates.

.4 Information outlets to have white face with black core Lamicoid plates.

.5 All ceiling mounted plates to have white face with black core.

.2	**Nameplate Sizes**		
Size 1	10 mm x 50 mm (3/8" x 2")	1 line	5 mm (0.2") high letters
Size 2	13 mm x 75 mm (1/2" x 3")	1 line	6 mm (0.25") high letters
Size 3	16 mm x 75 mm (3/4" x 3")	2 line	5 mm (0.2") high letters
Size 4	19 mm x 90 mm (3/4" x 3.5")	1 line	10 mm (3/8") high letters
Size 5	38 mm x 90 mm (1.5" x 3.5")	2 line	13 mm (1/2") high letters
Size 6	25 mm x 100 mm (1" x 4")	1 line	13 mm (1/2") high letters
Size 7	25 mm x 100 mm (1" x 4")	2 line	6 mm (1/4") high letters
Size 8	50 mm x 150 mm (2" x 6")	2 line	13 mm (1/2") high letters
Size 9	75 mm x 150 mm (3" x 6")	3 line	13 mm (1/2") high letters

.3 Identification to be in English.

2.2 COLOUR CODING OF ELECTRICAL BOXES

.1 The colour coding of splitters, junction boxes, pull boxes and outlet boxes will follow the schedule as listed:

System	Primary Colour	Secondary Colour
0volts to 50volts	VIOLET	-
51 volts to 240 volts	YELLOW	-
Above 240 volts	ORANGE	-
Fire Alarm	RED	-
Telephone	BLACK	-
P/A and Intercom	BLUE	
Security Systems	BROWN	
Ground or Bond	GREEN	
DC	YELLOW	BLACK
Energy Management	RED	WHITE
Data	BLUE	WHITE

.2 All various systems junction and/or pull boxes etc., where located above grid system, shall have location identified on underside or room side of t-bar spline, with (19 mm) or (6 mm on 19 mm) self adhering colour coded circular shaped discs, affixed directly to spline in close proximity to where concealed box is located. The same type of discs to be installed on ceiling or wall access cover plates.

- .1 6 mm (1/4") discs are all white in colour.
- .2 19 mm (3/4") discs are coloured as indicated.
- .3 6 mm (1/4") to be affixed to center or middle of 19 mm (3/4") discs as system colours dictates.

.3 All junction boxes and/or pull boxes, conduit fittings (and respective covers), complete with their respective cover plates as per the following:

- .1 Inside and out where one colour is required, with cover plate painted completely.
- .2 Inside where two colours are required, with cover plate painted diagonally with both colours.

.4 All junction boxes and/or pull boxes, where not concealed, are to have discs fastened to the outside of the box when architectural painting is complete.

2.3 WIRING IDENTIFICATION

.1 Wiring Labels:
- .1 Write on self-laminating labels.
- .2 Panduit No's PLD-1, PLD-2.

3 Execution

3.1 EQUIPMENT IDENTIFICATION

.1 Submit description of proposed equipment identification plates for engineer's approval.

.2 Do not manufacture Lamicoid plates prior to receiving written approval from the engineer.

.3 Lamicoid nameplates shall be applied to all electrical equipment including but not limited to the following:
- .1 All electrical equipment enclosures for starters, disconnect switches, relay panels, panelboards, splitter troughs, thermal overload switches, etc.
- .2 Where electrical equipment that could have identical types of removable covers are grouped together, their lamicoid nameplates are to be installed on the wall adjacent to these devices, rather than directly to their covers (this is to avoid the possibility of cover mix-up occurring), for example: magnetic starters, magnetic contactors, manual T.O.L. switches, and relays.

.4 Lamicoid nameplate fastening method shall be as follows:
- .1 Concrete or concrete block:
  - .1 Contact type cement (Note: Peel off type not acceptable). Contact type cement is to be applied (buttered) to complete rear side of plate, as opposed to several points or locations on same.
- .2 Plasterboard.
  - .1 Contact type cement (Note: Peel off type not acceptable). Contact type cement is to be applied (buttered) to complete rear side of plate, as opposed to several points or locations on same.
- .3 Equipment enclosures.
  - .1 Pop rivets. (Note: Screws not acceptable).
- .4 Ceiling and T-Bar spline.
  - .1 Contact type cement (Note: Peel off type not acceptable). Contact type cement is to be applied (buttered) to complete rear side of plate, as opposed to several points or locations on same.

.5 Identify equipment as follows:

.1 Lamicoid nameplates installed on distribution panelboards, motor control centres, splitter troughs, shall indicate the following:

.1 Designated name of equipment.
.2 Amperage of overcurrent protection device.
.3 Voltages, number of phases and wires.
.4 Designation of power source.
.5 Size 9.

EXAMPLE:
PANEL 1101 - 400 AMPS
120/208V - 3PH - 4W
FED FROM DISTRIBUTION PANEL DP1150

.6 Lamicoid nameplates installed on transformers shall indicate the following:

.1 Designated name of equipment and k VA
.2 Amperage of overcurrent protection device.
.3 Voltages, number of phases and wires.
.4 Originating feed.
.5 Equipment being feed from transformer.
.6 Designation of power source.
.7 Size 9.

EXAMPLE:
TRANSFORMER 3271- 112.5 k VA
125 AMPS
600/120/208V - 3PH - 4W
FED FROM MAIN DP3202
FEEDING PANEL 1101

.7 Lamicoid nameplates installed on combination starters, magnetic starters, manual starter and all various systems controls, control panels, disconnect switches, shall contain the following information:

.1 Designated name of equipment.
.2 Designated name of power source.
.3 Branch circuit breaker number(s) where possible.
.4 Voltage(s).
.5 Size 8

Example:
EXHAUST FAN NO. 5
PANEL 1101 - CCT. NO. 17
120V - 1 PH

.8 Lamicoid nameplates installed on fusible type disconnect switches are to also indicate maximum fuse size.

.9 Lamicoid nameplates are to be installed adjacent to each overcurrent device located in switchboards, CDP panels, etc. They need only indicate designated name and/or number of equipment they feed. Each unused or spare overcurrent device is to be identified with a Lamicoid plate indicating it as being a spare. Size #5.

3.2 RECEPTACLE IDENTIFICATION

.1 Submit description of proposed equipment identification plates for engineer's approval.

.2 Do not manufacture Lamicoid plates prior to receiving written approval from the engineer.

.3 Lamicoid nameplates are to be installed above all types of receptacles and abutted directly to tops of their respective device plates. Plates are to be the same width as the finish device plate.

.4 Identification is to indicate respective panel source c/w associated circuit breaker number(s) as per the following:

EXAMPLE: ***1101 - 20***

.5 Lamicoid nameplates installed above 120 volt receptacles protected by GFCI circuit breakers, or GFCI type receptacles (where their use is permitted) are to be identified as per the following:

EXAMPLE: **GFCI PROTECTED**
1101 - 22

3.3 TELLECOMMUNICATIONS IDENTIFICATION

.1 All telecommunications spaces within a building shall be uniquely identified as part of a complete administration system. The TR, ER or MTR shall be identified by the room designation assigned by the architectural design. The assigned number shall be used within the administration system identifier and shall be a “lamicoid” type plate minimum (50mm H) X (300mm L) as shown below and secured to the exterior of the door frame entering that space.

EXAMPLE: **TR-234**

.2 All telecommunications equipment racks within the telecommunications space require a unique component identifier as part of the administration system by a “lamicoid” nameplate, minimum (50mm H) X (600mm L) as shown below and secured to the upper horizontal rail of the equipment rack.

EXAMPLE: **TR-234 RACK 1**

.3 All ITS termination hardware within the telecommunications space requires a unique component identifier as part of the administration system. Identifiers must be self-adhesive thermal transfer type and placed appropriately to indicate all ports.

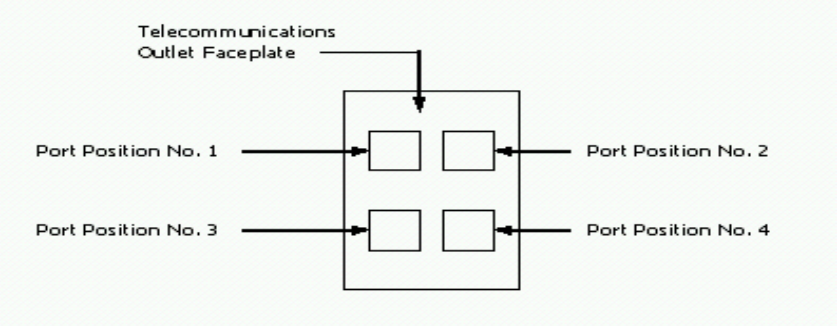
.4 All horizontal cabling shall be uniquely identified with a wrap type self-laminating adhesive label with mechanically generated (not hand written) identifier.

.5 Horizontal cable identifiers shall denote basic information transport system application and originating telecommunications space termination equipment port as shown;

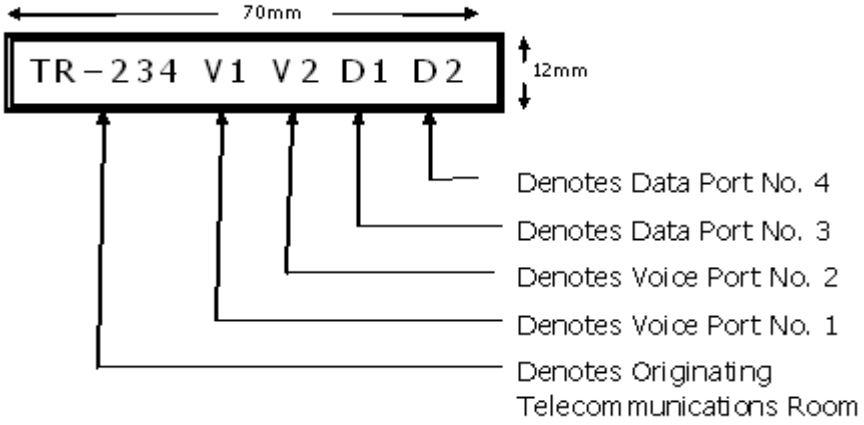
EXAMPLE: **D-024**

D = DATA
V = VOICE
DB = DATA BACKBONE

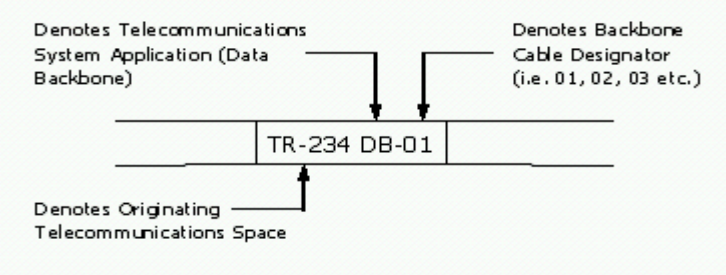
.6 All telecommunications outlet faceplates shall be standard four port configuration with port assignments as shown:



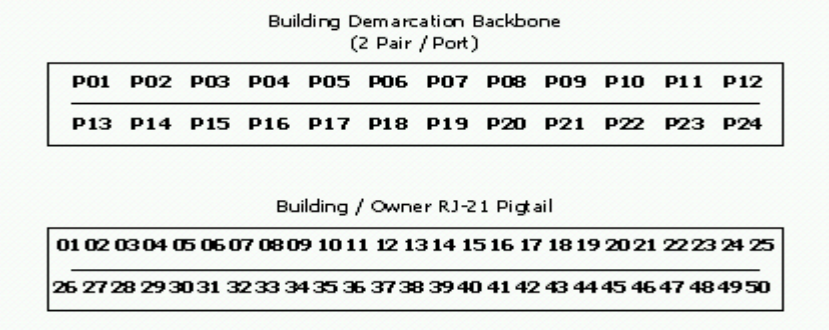
.7 All telecommunications outlet locations require a unique component identifier as part of the administration system by a "lamicoid" nameplate, minimum 120mm H X 70mm L and secured to the wall-space centered and above (min. 12mm) the telecommunications outlet faceplate. Telecommunications work area outlet identifiers must denote basic information transport system application, originating telecommunications space and termination equipment port as shown:



.8 All backbone system cabling shall be uniquely identified with a wrap type self-laminating adhesive label with mechanically generated (not hand written) identifier. Backbone cable identifiers shall denote basic information transport system application and originating telecommunications space as shown:



.9 All Building cross-connect hardware within the telecommunications space requires a unique component identifier as part of the administration system. Identifiers must be self-adhesive thermal transfer type and placed appropriately to indicate applicable pair assignments as shown:



.10 All information transport system demarcation backbone cabling shall be uniquely identified with a wrap type self-laminating adhesive label with mechanically generated (not hand written) identifier. All information transport system demarcation backbone cable identifiers shall denote basic telecommunications system application and originating telecommunications spaces.

3.4 EMERGENCY LIGHTING BATTERY PACK AND EXIT SIGN IDENTIFICATION

.1 Submit description of proposed equipment identification plates for engineer's approval.

.2 Do not manufacture Lamicoid plates prior to receiving written approval from the engineer.

.3 Lamicoid nameplate for each emergency lighting battery pack and Exit sign shall be installed adjacent each unit. Identification is to indicate panel number and circuit number, as per the following:

EXAMPLE: ***1101 – 20***

3.5 FIRE ALARM SYSTEM IDENTIFICATION

.1 Submit description of proposed equipment identification plates for engineer's approval.

.2 Do not manufacture Lamicoid plates prior to receiving written approval from the engineer.

.3 Lamicoid nameplate for Fire Alarm system addressable devices shall be installed above and abutted directly to top of their respective device. Identification is to indicate panel number, addressable loop number and device address.

EXAMPLE: ***01-02-125***

3.6 GROUND/BOND CONDUCTORS

.1 Lamicoid nameplate for each bonding and grounding conductor attached with a tye wrap at each termination point at all ground bars. Indicate the equipment that it is connected to or where it terminates, as per the following:

EXAMPLE: ***Communication Room 2020***

3.7 MECHANICAL EQUIPMENT CONNECTED TO THE ELECTRICAL DISTRIBUTION SYSTEM

.1 Lamicoid nameplate for each item of mechanical equipment (speed drives, humidifiers, trap primers, fans, pumps, etc.) fed from the electrical distribution system, shall contain the following information:

.2 Designated name of equipment.
.3 Designated name of power source.
.4 Branch circuit breaker number(s) where possible.
.5 Voltage(s).
.6 Size 8

Example:
TRAP PRIMER
PANEL 1101 - CCT. NO. 17
120V - 1 PH

3.8 IDENTIFICATION OF JUNCTION BOXES, PULL BOXES, SPLITTER TROUGHS AND OUTLET BOXES

.1 Colour Coding
- .1 Identification of electrical junction boxes, pull boxes, splitter troughs.
  - .1 Colour code as per 2.2.
  - .2 Apply colour coding prior to pulling conductors into boxes.
  - .3 Where primary colour only is indicated:
    - .1 Colour inside and outside of box.
    - .2 Colour all cover plates.
  - .4 Where primary and secondary colours are indicated:
    - .1 Paint inside and outside of box with the primary colour.
    - .2 Diagonally apply to each half of the cover plate the primary and secondary colours.
    - .3 Provide a legend of colour coding used under Plexiglas. Locate in main electrical room.

.2 Voltage and Originating Source Identification
- .1 Identification of electrical junction boxes, pull boxes, splitter troughs: smaller than 150 mm x 150 mm.
  - .1 Identify on the coverplate, using permanent indelible black marker the panel and circuit numbers contained with.
- .2 Identification of electrical junction boxes, pull boxes, splitter troughs: 150 mm x 150 mm and larger.
  - .1 Provide Lamicoid plate fastened to coverplate, indicating:
    - .1 Voltage and phase.
    - .2 Originating panel.
    - .3 Size 6.
    - .4 Example: "120/208 v, 3Ø, 4w, panel 'A'."
  - .2 Using permanent indelible black marker, identify the circuits contained within.

3.9 IDENTIFICATION OF SYSTEM CONTROL PANELS

.1 Provide Lamicoid plate fastened to equipment enclosure indicating:
- .1 System name.
- .2 Size 6.
- .3 Example: "Fire Alarm Control Panel".

3.10 IDENTIFICATION OF WIRING

.1 Identification of wiring:
- .1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Label each neutral conductor to indicate its associated phase conductors in each panelboard, distribution panel, pullbox and junction box it appears in. These labels are to be installed in a 'flagged' manner.
- .3 All circuit conductors are to be individually tie wrapped to their corresponding labeled neutral conductor in all panelboards, pull boxes and junction boxes. Each neutral conductor is to be identified to indicate its corresponding phase conductors.
- .4 Labeling of all branch circuit wiring including phase conductors, neutral, ground and/or bonding conductors to be done on both ends of all circuit wires plus in any junction and/or pull boxes located in between using approved product (refer to 2.3). These labels are to be installed in a 'flagged' manner around individual conductors.
- .5 Indicate panel and circuit number i.e.: Panel '1101', cct. #10.

END OF SECTION

1 General

1.1 GENERAL

.1 NOTE: Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE SECTIONS

.1 Section 07 84 00 Firestopping

1.3 SUBMITTALS

.1 In accordance with the following Sections:
- .1 Section 07 84 00 Firestopping
- .2 Section 26 05 01Electrical Submittals.

2 Products

2.1 MATERIALS

.1 In accordance with the following Section 07 84 00 Firestopping

3 Execution

3.1 INSTALLATION

.1 In accordance with the following Section 07 84 00 Firestopping.

3.2 FIRESTOPPING

.1 Firestopping material and installation within annular space around conduits and adjacent fire separation.

.2 Firestopping material and installation for cable tray assembly and adjacent fire separation.

.3 Firestopping material and installation inside conduit sleeves which penetrate an assembly with a fire resistance rating

********END OF SECTION ********

1 General

1.1 GENERAL

1. The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section.

1.2 REFERENCES

.1 CSA C22.2No.65-1956(R1965) Wire Connectors.

2 Products

2.1 MATERIALS

.1 Spring type pressure type connectors for all branch circuit wiring sized #10 AWG and smaller. Current carrying parts are to be made of copper or copper alloy and be complete with an appropriate size insulating cap. Cap is to completely fit, or cover all enclosed conductors as required, with current carrying parts of sized to fit conductors as required.

3 Execution

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors.

.2 All wire connectors are to be “plier-tightened’. Finger tight is not acceptable.

.3 Installation shall meet secureness tests in accordance with CSA C22.2 No.65.

********END OF SECTION *******

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section.

1.2 PRODUCT DATA

.1 Submit product data in accordance with Division 1.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.

.4 Divert unused metal and wiring materials from landfill to metal recycling facility.

2 Products

2.1 BUILDING WIRES

.1 Unless otherwise noted, all conductors (phase, neutral, bond, isolated ground) installed on this project shall be stranded, soft drawn copper, with RW90 XLPE insulation rated for a minimum of 600 VAC. The minimum wire size will be #12 AWG.

.2 Grounding and bonding conductors to have green coloured RW90 X-link insulation.

.3 Unless noted otherwise, phase colour coding as per C.E.C. rule 4-036, will apply.

.4 All phase conductors sized from #12 AWG up to and including #2 AWG to have appropriate coloured insulation (red, black & blue).

.5 All neutral, grounds and/or bond conductors sized #12 AWG up to and including #3/0 AWG to have appropriate coloured insulation (white or green).

.6 Isolated ground conductors to have green coloured insulation c/w yellow stripe.

.7 Where three and four way switches are indicated, the associated travelers are to complete with yellow coloured insulation.

.8 Coloured tape may only be utilized when phase conductors sized larger than noted in item 4 are used.

.9 Coloured tape may only be utilized when neutral, grounds or bond conductors sized larger than noted in item 5 are used.

.10 Multi-conductor AC-90 cables containing a single white coloured conductor are not to be used where more than one neutral conductor is required.

2.2 ARMORED CABLE

.1 Conductor: copper, size as indicated.

.2 Type AC-90.

.3 Bonding conductor sized to CEC Table 16.

.4 AC-90 cable connectors shall be as follows:
.1 Two-screw, steel-type similar to T & B #3301, 3312.

2.3 TECK CABLE

.1 Conductor: copper, size as indicated.

.2 Insulation Type: RW90-XLPE

.3 Ground conductor sized to CEC Table 16.

.4 Interlocking aluminum tape armour

.5 Outer jacket: PVC flame retardant to FT-4 requirements.

.6 Connectors to be Star Teck or equal.

2.4 VARIABLE SPEED DRIVE CABLE

.1 Conductor: copper, size as indicated.

.2 Corrugated continuous aluminum sheath.

.3 Three (3) bonding conductors.

.4 Rated voltage: 1000 V.

.5 Nexans DriveRx VFD Cable, c/w Nexans Type W connectors.

3 Execution

3.1 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:
- .1 In conduit systems in accordance with Section 26 05 34.
- .2 All stranded conductors, (neutrals, bonds and phase conductors) prior to terminating under device bolts i.e., circuit breakers, light switches receptacles etc., to be twisted together so as to form a single conductor.
- .3 All branch circuit phase conductors feeding light fixtures via junction and/or outlet boxes are to be complete with "pigtail" type leads to ensure minimal disruption of lighting circuits if fixtures are removed for future maintenance.
- .4 Each line voltage switch is to be wired with the neutral conductor extended to the device box.
- .5 All branch circuit phase conductors feeding receptacles via junction and/or outlet boxes are to be complete with "pigtail" type leads to ensure minimal disruption of receptacle circuits if receptacles are removed for future maintenance.
- .6 All branch circuit wiring feeding light fixtures will be installed complete with a separate neutral conductor for each circuit.
- .7 Where the application of coloured tape has been approved, apply as follows:
  - .1 Both ends of the conductor must be taped for all installed segments.
  - .2 Each location where the conductor is visible, i.e.; all junction and pull boxes.
  - .3 A minimum of 305 mm (12”) of tape to be applied for all phase conductors.
  - .4 All neutral, grounds and/or bond conductors must be taped for their entire visible length in all enclosures.

.2 Install variable speed drive cable between each VFD controller and its associated motor complete with steel connectors specifically listed for use with this cable and rated for wet applications.

.3 Use of AC-90 Cable.
- .1 The use of AC-90 cable is acceptable for this project as a general wiring method with several exceptions.
- .2 AC-90 cable is to be installed as per the following guidelines:
  - .1 All types of armoured cables are to be installed concealed, parallel and perpendicular to building lines and shall be adequately secured to the building structure at not less than 1.5M (5 foot) intervals or as otherwise indicated, in such manner as to ensure they are protected from potential mechanical damage. Install independent supports for cabling in ceiling spaces, and do not use those of other trades. Do not secure cables to mechanical systems piping or ducts, suspended ceiling support wires. The laying of cables directly atop ceiling grid system is strictly prohibited.

.2 Where possible, always install and secure cables directly to underside of decking and/or ceiling slabs where located in concealed ceiling spaces. Install supports to firmly secure AC90 to decking midway between OWSJ and when any change in direction occurs.

.3 The grouping together of AC-90 cables to form a "bundle" for securing purposes is acceptable providing the following procedures are adhered:

.1 In addition to securing type AC-90 cables at 1.5 M(5 foot) intervals to structure, multiple or bundled groups of armoured cables shall be tye-wrapped together at mid-point between each structure support and are to be secured together (between each structure support).

.2 Grouping of AC-90 cables shall be limited to a maximum of eight (8) current carrying conductors, including associated oversized neutral conductors where phase sharing occurs.

.4 The following examples incorporate uses of both, common and dedicated (separate) branch circuit neutral conductors:

.1 Maximum of two runs of #12/4 conductor cables, including common (oversized) branch circuit neutral in each.

.2 Maximum of two runs of #12/3 conductor cables, including (oversized) branch circuit neutrals (if not 3 phase, 3 wire), plus one run of #12/2 cable.

.3 Maximum of four runs of #12/2 conductor cables, each including a separate, dedicated branch circuit neutral conductor.

.5 Where dedicated or separate branch circuit neutral conductors are non phase sharing, they need not be sized larger than phase conductors they accompany unless specifically indicated otherwise.

.6 All AC-90 fixture feeds shall originate from the sides of outlet boxes and not from the box cover. Where 3 and/or 4 fixture drops extend from any one outlet box, the box shall not be sized smaller than 120 mm (4-11/16") square.

.7 Fixture drop is defined as that portion of AC-90 cable or flexible conduit being used to make final connection between accessible type junction or outlet box located in ceiling space (above T-Bar ceiling only) and its respective light fixture.

.1 Fixture drops are not to exceed 4.5 M (15 feet) in total length unless specifically indicated otherwise.

.2 There shall be not more than 4 drops permitted to be fed from any one box regardless of its size. All AC-90 cables used for fixture drops are to be secured within 300 mm (12 in.) of the junction box and the light fixture connection point. Each light fixture is to be complete with its own separate fixture drop originating from a junction box located within the ceiling of the same room as the fixture.

.3 With the exception of where "modular" type wiring has been approved for a particular application, within a T-Bar ceiling space, each light fixture shall be wired with a separate whip emanating from an overhead junction box.

.8 Separate pig-tail type leads shall be provided in each light fixture junction/outlet box for final connections to fixture drops. These pig-tail leads are to be only connected to light fixture returns and associated neutral conductors.

.3 The use of AC-90 cable for branch circuit home runs is not acceptable.

.1 A home run is defined as that portion of the branch circuit wiring that runs between the applicable panelboard and the room or area in which it terminates, and/or makes its final splice, for drop off, to the applicable branch circuit device. The home run conduit shall be continued until the final room destination splice or drop off is reached.

.2 Where the branch circuit has multiple splices and/or drop offs to multiple rooms, the use of AC90 for the drop off is permitted, however, the home run conduit shall be continued until the final room destination or drop off is reached.

.3 The use of AC-90 cable between rooms is not permitted.

.4 AC90 cables are not permitted to enter panelboards under any circumstances.

.4 Conductor Tie-wrapping:

.1 All circuit conductors are to be individually tie wrapped to their corresponding labeled neutral conductor in all panelboards, pullboxes and junction boxes. Suitable slack conductor length should be left to enable the ability to clamp the ground detector around the individually tie-wrapped circuit conductor and its corresponding labeled neutral. This wiring method is to be neat and of good workmanship quality.

.2 The tie-wrapping of the neutral with its respective phase conductors is to be made at the closest point of entry into panelboards, pullboxes and junction boxes.

.3 panelboards, etc. are to have their respective feeder phase and neutral conductors tye-wrapped together and enough slack conductor length to enable the ability to clamp the ground detector around each set of feeders. This wiring method is to be neat and of good workmanship quality.

.5 Final connection to receptacles and light fixtures:

.1 Separate pig-tail type leads shall be provided in each receptacle outlet box for final connections to receptacles and in each light fixture outlet box for final connection to the light fixture. These pig-tail leads are to be only connected to the phase and associated neutral conductors.

.6 Final connection to motors:

.1 The conductor phase colour coding as per C.E.C. rule 4-036 will carry through from the incoming service point to the motor starter and to the final connection to

each motor. In the instance that a three phase motor requires transposition of phase conductors to achieve proper rotation, the change is to take place at the motor terminal box. Changing the motor feeder phase conductors at any other point in the distribution system (for example at the starter) will not be acceptable.

.7 When a circuit enters a junction box, the bonding conductor on the line side shall terminate on the box bonding screw, or terminal strip as applicable, prior to connecting other bonding conductors present in the junction box.

.8 Testing:

.1 Perform testing in conformance with NSP Electrical Inspection Bulletin B-2-132 and CEC Rule 2-136. Contractors are to verify by testing that all interior wiring is; free from shorts, broken, open, or incorrect connections, proper polarity, and that neutrals are free from connections to ground beyond the supply side of the consumer's service box except as permitted in section 10 of the Canadian Electrical Code Part 1. (CEC).

.2 Prior to testing, ensure that all feeders or branch circuits which do not have neutral conductors are to have their respective phase conductors tye-wrapped together in accordance to the methods described previously.

.3 Prior to testing, ensure that voltage-sensitive devices such as ground fault circuit interrupters, arc-fault circuit interrupters, electronic ballasts, Surge Protective Devices (SPD) and other electronic equipment are not subjected to voltages that will damage the device.

.4 Megger testing is to be performed on all branch circuit wiring on the load side of a consumer's main overcurrent device, including main feeders and sub-feeders. Contractors shall record their results for all testing performed and shall have the testing results available for viewing by the inspection department upon request at the time of inspection. Ensure that the Megger reports are submitted to the Engineer for review and are incorporated into the O & M manuals.

3.2 VOLTAGE DROP

.1 It is the intent of this specification that each branch circuit will be strategically planned and installed to ensure that when tested, the CEC requirement that the voltage drop will not exceed 3% in a feeder or branch circuit; and 5% from the supply side of the Consumer's service to the point of utilization. The contractor will account for distance and routing for each branch circuit and that appropriate wire sizes will be employed to allow an acceptable voltage drop test to be carried out during commissioning. When testing for voltage drop, each branch circuit fed from a 15 amp circuit breaker will be subjected to a 12 ampere load, and branch circuit fed from a 20 amp circuit breaker will be subjected to a 16 ampere load.

.2 The following table is to include both vertical and horizontal lengths of conductor runs. Minimum size of branch circuit neutral where phase sharing occurs shall not be smaller than #10 AWG. Minimum size of branch circuit neutral where dedicated to its own branch circuit phase conductor shall be not be less than #12 AWG. Note that minimum size #10 AWG bond conductors to accompany #8 branch circuit conductors.

.3 AS A MINIMUM, THE FOLLOWING TABLE SHALL BE ADHERED TO:

Branch Circuit Length of Run Mm (feet)	**Phase Wire Size**	**Dedicated Neutral**	**Shared Neutral**	**Bond Wire Size**
Up to 24,384 (80)	#12	#12	#10	#12
Up to 38,100 (125)	#10	#10	#8	#12
Up to 56,390 (185)	#8	#8	#6	#10

.4 Oversized #10 AWG branch circuit wiring conductors to be extended to outlet box of device they feed (including switch legs). Oversized #8 AWG branch circuit wiring conductors to be extended from panelboard to junction box located on wall or ceiling directly above wall light switches and/or receptacles. #8 AWG wire to be reduced to #10 AWG for vertical portion of drop only.

********END OF SECTION ********

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement (DTIR Standard form of Agreement between Minister and Contractor) including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 REFERENCES

.1 CSA 22.2 No. 41.

2 Products

2.1 EQUIPMENT

.1 Insulated grounding conductors: green, insulation to Section 26 05 21 Wires and Cables 0-1000 V.

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

2.2 GROUND BARS

.1 Ground Busbars: 6 mm electro-tin plated copper, complete with insulators, stainless steel wall brackets and fasteners.

.2 Minimum acceptable dimensions, unless noted otherwise:
- .1 6 mm thick by 50 mm wide.
- .2 305 mm in length.

.3 Complete with 6 pairs of 8 mm diameter and 3 pairs of 11 mm pre-drilled holes.

.4 Standard of Acceptance:
- .1 Erico # TGBA12L06P

.5 Acceptable manufactures:
- .1 Cooper B-Line
- .2 Burndy.

2.3 CONDUCTOR IDENTIFICATION

.1 Provide identification for each conductor in accordance with 26 05 03.

3 Execution

3.1 INSTALLATION GENERAL

.1 Where EMT is used, install bonding conductor in each and every conduit.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Use mechanical connectors for grounding connections to equipment provided with lugs.

.5 Soldered joints not permitted.

.6 All metal raceways shall be bonded to ground including conduits housing low voltage and communications systems.

.7 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw.

.8 Make bonding connections in radial configuration only. Avoid loop connections.

3.2 GROUNDING BARS

.1 Install copper grounding busbars, mounted on insulated supports where indicated.

.2 Bond items as indicated to ground bus, using long barrel, copper, two bolt compression connectors. Provide bolts complete with hexagon nuts and lock washers.

.3 Where a pass through connector bolted to the ground busbar is required, use a Hyground Compression connector, similar to Burndy Type YG-B.

********END OF SECTION *******

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.

.4 Divert unused metal and wiring materials from landfill to metal recycling facility.

2 Product

2.1 SUPPORT CHANNELS

.1 U shape, size 45 mm X 45 mm, 3 mm thick, surface mounted as required.

2.2 BEAM CLAMPS

.1 Beam clamp for 10 mm threaded rod.

.2 cUL listed.

.3 Malleable iron, complete with hardened steel cup point set screw.

.4 Rated for a minimum of 227 Kg (400 pounds).

.5 Taylor Pipe Support, Wide Mouth Top Beam Clamp #407, or equal.

.6 Push-on type conduit clips are not to be used on this project.

3 Execution

3.1 INSTALLATION

.1 Secure equipment to hollow and solid masonry, tile and plaster surfaces with lead anchors.

.2 Secure equipment to poured concrete with expandable inserts.

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

.4 Fasten exposed conduit or cables to building construction or support system using straps.
- .1 One-hole steel straps to secure surface conduits and cables 35 mm (1-1/4 inch) and smaller.
- .2 Two-hole steel straps for conduits and cables 41 mm (1-1/2 inch) and larger.
- .3 Beam clamps to secure conduit to exposed steelwork.

.5 Suspended supports systems.
- .1 Support single or multiple cables or conduits on a common steel support channel system supported by 10 mm (3/8") diameter threaded rod hangers, washers and nuts where direct fastening to building construction is impractical. Channel is to be sandwiched between nuts and washers located on both upper and underside portions of channels.
- .2 Do not support a single conduit using a threaded rod and a conduit clip. This is not an acceptable means of installation as no lateral support is provided.

.6 For surface mounting of conduits use channels. Channels are to be securely attached to hangers with the maximum spacing not greater than:
- .1 Conduits of one size only:
  - .1 16 mm to 21 mm (1/2" to ¾") conduit 1524 mm (60")
  - .2 27 mm & 35 mm (1" to 1 ¼") conduit 1980 mm (78")
  - .3 41 mm (1 ½") & larger conduit 3050 mm (120")
- .2 Conduits of mixed size:
  - .1 Arrange supports so that maximum spacing of supports conforms to above, based on smallest conduit diameter.

.7 All suspended types of junction and pull boxes are to be supported using a minimum of 10 mm (3/8") threaded rod c/w nuts and flat washers. Secure threaded rods to boxes using one flat washer and nut installed on both sides of box. Provide as follows:
- .1 One rod required for all types of boxes sized less than150 X 150 mm (6 X 6 inches).
- .2 Two rods required for all types of boxes 150 X 150 mm (6 X 6 inches) but less than 304 X 304 mm (12 X 12 inches)
- .3 Four rods required for all types of boxes 304 X 304 mm (12 X 12 inches) and larger.

.8 All excess rod is to be cut-off within 13 mm (1/2") of channel bottom.

.9 Provide 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 Engineer.

.13 Do not attach electrical conduit and cable to supports installed as part of a suspended ceiling installation (gypsum board or T-Bar for example).

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

********END OF SECTION********

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data for cabinets in accordance with Division 1.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.

.4 Divert unused metal and wiring materials from landfill to metal recycling facility.

2 Products

2.1 SPLITTERS

.1 Sheet metal enclosure, minimum 14 gauge with continuously welded corner seams, and formed hinged cover suitable for locking in closed position. Suitable for exterior and/or interior use. Heat fused powder paint applied to enclosure.

.2 Splitter opening to have curled lip around all sides with poured in place gasket.

.3 Concealed hinges with captive pins. Quarter turn mechanisms to ensure positive closing.

.4 Bus bars for power distribution, neutral and ground. Tin plated copper material, drilled and tapped at 150 mm intervals, mounted on slanted insulators mounted on an interior panel.

.5 Main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.

.6 Complete with a bonding terminal strip for individual bonding conductor connections for each feeder.

2.2 JUNCTION AND PULL BOXES

.1 Welded steel construction with screw-on flat covers for surface mounting.

.2 Covers with 25 mm (1 inch) minimum extension all around, for flush-mounted pull and junction boxes.

.3 Junction boxes larger than 120 mm (4 11/16) to have a bonding terminal strip installed.

2.3 CABINETS

.1 Type D: 1.6 mm steel cabinet, built for surface or flush mounting. Flush cover lip 25 mm all around. Finish - ASA-61 grey enamel. Complete with screw on cover. Complete with bonding terminal strip.

.2 Type E: 1.6 mm steel cabinet, surface mount. Formed steel hinge with pull ring catch. Finish ASA-61 grey enamel. Complete with bonding terminal strip.

.3 Type T: 1.6 mm steel cabinet, 1.9 mm cover, latch lock, 2 keys. Finish - ASA - 61 grey enamel. Complete with bonding terminal strip.

3 Execution

3.1 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install all raceways in conformance with CEC, Section 12.

.2 Install pull boxes in inconspicuous but accessible locations. Box cover to be hinged on the side. **Do not install boxes with hinge on top.**

.3 Install pull boxes so as not to exceed 27 m (90 feet) of conduit run between pull boxes. Each run of raceway shall not have more than the equivalent of four 90 degree bends installed, including the bends located at an outlet or fitting. Pull boxes are to be sized in accordance with CEC Rule 12-3036.

.4 Terminate all bonding conductors on bonding terminal strip installed inside junction box.

.5 Where junction and or pull boxes are required to be 150 mm X 150 mm (6 inch X 6 inch) or larger Type E cabinets (hinged cover) shall be used. Do not use splitter troughs in lieu of pull boxes.

.6 Type T cabinets shall be used when equipment is required to be housed in a lockable enclosure.

.7 Where construction consists of metal Q deck and steel joists (Roof deck only), conduit boxes are to be installed in such a manner that the nearest outside surface of the electrical box is not less than 38 mm (1.5 inch) from the nearest surface of the metal roof deck.

.8 Location of junctions and/or pull boxes in suspended ceiling spaces, i.e., gyp-rock, T-bar, etc., are not to be greater than 760 mm (30 inch) above finish ceiling.

.9 All suspended types of junction and pull boxes are to be supported using a minimum of 10 mm (3/8 inch) threaded rod c/w nuts and flat washers. Secure threaded rods to boxes using one flat washer and nut installed on both sides of box. Provide as follows:

.1 One rod required for all types of boxes sized 150 X 150 mm (6 X 6 inches) or smaller.

.2 Two rods required for all types of boxes larger than 150 X 150 mm (6 X 6 inches) up to and including 304 X 304 mm (12 X 12 inches).

.3 Minimum of four rods required for all types of boxes sized larger than 304 X 304 mm (12 X 12 inches).

.10 Where junction boxes and pull boxes are secured to building structural components, they shall be mounted and secured in such a manner so as not to be "cantilevered" (ie, only supported on one side of the box). In rare instances where site constraints dictate the installation of a "cantilevered" box, threaded rods shall be installed to provide additional support on the opposite end.

.11 Colour Coding: Refer to 26 05 31. All electrical junction, pull boxes splitters and cabinets shall be colour coded inside and out with appropriate coloured paint. **All paint is to be applied prior to installation and not with-in the confines of the building.**

********END OF SECTION ********

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section.

1.2 RELATED WORK:

.1 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.

.4 Divert unused metal and wiring materials from landfill to metal recycling facility.

2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1-15.

.2 100-mm (4 inch) square or larger outlet boxes as required for special devices.

.3 Multi-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 or voltage are grouped.

.6 Where tile rings are installed on this project, they must be the welded type with square corners (Rounded corners will not be acceptable). For single device installations use Iberville BC52-C-49XX. For two device installations use Iberville # 52-C-52-XX. Select appropriate depth of tile ring to suit application.

.7 Adjustable type tile rings such as Iberville # 52C-ADJ are not permitted on this project.

2.2 SHEET STEEL OUTLET BOXES

.1 One or Two Device, Flush Installation, Suitable for Conduit and Armoured Cable Entry:

.1 Electro-galvanized steel single, flush device boxes for use in dry flush installation, shall be pressed steel, minimum size 100 mm (4 inch) square x 54 mm (2.125 inch) deep, minimum volume of 490 cubic centimetres (30 cu.in.), (similar to Iberville # 52171-K). Provide single device square cornered tile cover (similar to Iberville # BC52-C-49XX) or two device square cornered tile covers (similar to Iberville # 52-C-52-XX).

.2 Provide an outlet box for all communications outlets, c/w single gang raised tile ring and stainless steel cover plate, unless noted otherwise. Minimum dimensions as follows: 100mm (4 inch) x 100mm (4 inch) x 53mm (2.125 inch) deep, minimum volume of 490 cubic centimetres (30 cu.in.), (similar to Iberville # 52171-K).

.3 100-mm square or octagonal outlet boxes for lighting fixture outlets.

2.3 MASONRY BOXES

.1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls, minimum volume of 343 cubic centimetres (21 cu.in), 89 mm (3.5 in.) deep, (similar to Iberville # MBD).

2.4 SURFACE MOUNT CONDUIT BOXES

.1 Cast FS aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacles.

.2 Metal type "FS" device plates to be used on all type "FS" boxes unless noted otherwise.

2.5 MOUNTING BRACKETS

.1 Provide box mounting brackets for the installation of multiple boxes for drywall partitions, c/w tile rings.

.2 Acceptable material: Caddy RBS Type (16 or 24 as required), or equal.

2.6 FITTINGS - GENERAL

.1 Knock-out fillers to prevent entry of foreign materials.

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

2.7 COLOUR CODING

.1 Colour coding of system as per 26 05 03.

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 construction material.

.3 Install multiple box mounting brackets and mount boxes.

.4 For flush installations mount outlets flush with finished wall using tile rings to permit wall finish to come within 6 mm (1/4") of opening.

.5 The front edges of boxes, cabinets and fittings installed in noncombustible walls or ceilings shall not be set in more than 6 mm (1/4").

.6 The front edges of boxes, cabinets and fittings installed in combustible walls (ie, millwork) shall be flush with surface.

.7 Provide correct size of openings in boxes for conduit, mineral insulated and armored cable connections. Reducing washers not to be used.

.8 Install multi-gang boxes where more than one device is required. Sectional (gangable) boxes are not to be used on this project.

********END OF SECTION 26 05 32********

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section.

1.2 LOCATION OF CONDUIT

.1 Drawings do not show all conduits. Those shown are in diagrammatic form only.

1.3 REFERENCES

.1 Canadian Standards Association
- .1 CAN/CSA C22.2 No. 18-98 (R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
- .2 CSA C22.2 No. 45-M1981 (R2003), Rigid Metal Conduit.
- .3 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .4 CSA C22.2 No. 83-M1985 (R2003), Electrical Metallic Tubing.
- .5 CSA C22.2 No. 211.2-M1984 (R2003), Rigid PVC (Unplasticized) Conduit.
- .6 CAN/CSA C22.2 No. 227.3-05, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.

.4 Divert unused metal and wiring materials from landfill to metal recycling facility.

2 Products

2.1 CONDUITS

.1 Rigid galvanized steel threaded conduit: size as indicated.

.2 Electrical metallic tubing (EMT): with couplings, size as indicated.

.3 Rigid PVC conduit: size as indicated.

.4 Liquid-tight flexible metal conduit: size as indicated.

.5 Metal flexible conduit: size as indicated.

.6 ENT conduit is not permitted for use on this project.

2.2 CONDUIT FASTENINGS

.1 Fasten conduit to building construction or support system using straps, as follows:
- .1 One-hole steel straps to secure surface conduits and cables 35 mm (1-1/4 inch) and smaller.
- .2 Two hole steel straps for conduits and cables 41 mm (1-1/2 inch) and larger.

.2 Beam clamps to secure conduits to exposed steelwork.

.3 Channel type supports for one or more conduits.

.4 10-mm (3/8 inch) diameter threaded rods to support suspended channels.

2.3 CONDUIT FITTINGS

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

.2 Couplings for thinwall type EMT conduits shall be concrete tight, set screw, steel type, similar to Iberville Series CI-5500, unless noted otherwise.

.3 Conduits exiting equipment enclosures equipped with sprinkler hoods shall be installed with rain tight EMT connectors. These connectors will be equipped with a rubber "O" Ring gasket. In addition, any conduit couplings in the vertical portion of the conduit run over equipment enclosures equipped with sprinkler hoods shall be rain tight.

.4 Connectors for thinwall type EMT conduits shall be concrete tight, set screw, steel, c/w case hardened steel locknuts, similar to Iberville Series CI-5400-IT. Insulated throats are to be provided on connectors up to and including 27 mm (1 inch). Metal thread on bushings to be installed on all EMT connectors sized 35 mm (11/4 inch) or larger.

.5 Armoured cable connectors shall be two-screw, steel type similar to T & B #3301, 3312. The use of "snap-in" type connectors is not permitted. Provide insulating bushings (anti-shorts) for armoured cable connectors.

.6 Flexible metal conduit connectors shall be nylon insulated, steel or malleable iron type similar to T & B Tite-Bite #3115 thru 3124. Provide insulating bushings (anti-shorts) for flexible metal conduit connectors. Plastic thread on bushings to be installed on all flexible metal conduit connectors sized 35 mm (11/4 inch) or larger.

.7 Liquid-tight flexible metal conduit fittings:
- .1 Specifically listed for liquid tight flexible metal conduit.
- .2 Steel type, to match conduit size.
- .3 Fittings must incorporate a threaded grounding cone, a steel or plastic compression ring, and a gland for tightening.
- .4 Safe edge ground type.
- .5 Connectors shall have insulated throats.
- .6 T & B #5300 series or equal.

2.4 EXPANSION FITTINGS FOR RIGID PVC CONDUIT

.1 Provide expansion joints to the requirements of CEC Rule 12-1118 and the requirements of the manufacturer.

.2 Calculate the expansion of the conduit based on the maximum probable change in temperature during and after installation.

2.5 FISH CORD

.1 Polypropylene.

2.6 FISH CORD

.1 Polypropylene.

3 Execution

3.1 INSTALLATION

.1 Unless noted otherwise, conduits are to be installed as high as possible to conserve headroom, to reduce interference with other trades and cause minimum interference in spaces through which they pass.

.2 Conceal conduits except in service rooms and in unfinished areas.

.3 Conduits are to be installed as follows as high as possible in the space to conserve headroom.

.4 Use rigid galvanized steel threaded conduit where subject to injury.

.5 Use electrical metallic tubing (EMT) for the following:
- .1 Communication outlets between device box and accessible ceiling space in all walls and partitions. (Refer to 27 05 28 for definition of Communication System Wiring).

.2 Sleeves for communication wiring (Refer to 27 05 28 for definition of Communication System Wiring).
.3 All Fire alarm system wiring.
.4 All Intrusion Detection system wiring.
.5 All wiring within electrical rooms and mechanical rooms.
.6 All panel feeders.
.7 Structured wiring system fibre backbone cable.
.8 All exposed wiring.
.9 Home runs to panelboards for all branch circuit wiring. A home run is defined as that portion of the branch circuit wiring that runs between the applicable panelboard, and the room or area in which it terminates, and/or makes its first splice, for drop off, to the applicable branch circuit device. AC90 will not be acceptable for this application. Where the branch circuit has multiple splices and/or drop offs to multiple rooms, the use of AC90 for the drop off is permitted, however, the home run conduit shall be continued until the final room destination or drop off is reached.
.10 Where noted elsewhere in the contract documents.

.6 EMT shall be installed as a complete system and shall be securely fastened in place within 1 metre (39 inches) of each outlet box, junction box, cabinet, couplings, fittings and changes in direction and the spacing between supports as follows:
.1 Not greater than 1500 mm (five feet) for 16 mm (1/2 inch) and 21 mm (3/4 inch) EMT
.2 Not greater than 1800 mm (six feet) for 27 mm (1 inch) and 35 mm (1-1/4 inch) EMT
.3 Not greater than 3050 mm (ten feet) for 41 mm (1-1/2 inch) EMT or larger.

.7 Install supports to firmly secure conduits to metal decking when any change in direction occurs.

.8 All conduit runs shall be a maximum of 30 meters (100 feet) in length with a maximum of four (4) 90 degree bends between pull points. A pull box shall be placed in conduit runs where the sum of the bends exceeds 360 degrees, where the overall run exceeds 30 meters (100 feet) or there is a reverse bend in the run.

.9 Pull boxes shall be placed in straight sections of conduit run and shall not be used in lieu of a bend. Conduit fittings shall not be used in place of pull boxes or bends. The use of C, LB, LL, LR and T type fittings are prohibited on this project unless written permission is provided by the Engineer.

.10 Pull boxes are to be sized in conformance with CEC Rule 12-3036, unless noted otherwise.

.11 The use of corner pulling ELLs or corner pulling elbows is not permitted.

.12 Conduits shall be installed in a neat and ordered manner. When installed in a group, conduits shall be parallel and evenly spaced apart.

.13 Unless noted otherwise all conduit systems installed below grade or under concrete slabs to be rigid type PVC conduit. All PVC rigid conduits prior to exiting concrete slabs where exposed, to be adapted from PVC conduit to rigid galvanized conduit elbow, with transition to take place below grade.

.14 When underground rigid PVC conduits enter a switchboard, distribution panel, wireway, etc., they shall be equipped with bell ends. Allow for sufficient space to accommodate the bell ends when installing the conduits.

.15 Where PVC expansion joints are required, install as follows:

- .1 Mount expansion joints so that the piston can travel in a straight line.
- .2 Firmly attach the expansion joint so that it remains stationary. Ensure that the conduit is loosely mounted in supports to allow for lineal movement as it expands and contracts due to temperature changes.
- .3 Spacing of conduit supports must be in accordance with Section 12-1114 of the CEC.
- .4 Where more than one expansion joint is required in a run of conduit, consult manufacture's recommendations for proper installation procedures.

.16 Liquid tight metal flexible conduit is not to be used as a general purpose raceway. Use liquid tight flexible metal conduit (maximum length permitted to be 1.5 M) and liquid tight conduit fittings for:

- .1 Final connection to all mechanical equipment (fans, pumps, terminal units, etc.) and all vibrating equipment.
- .2 Final connection to **all** sprinkler system equipment (flow switches, supervised valves, alarm pressure switches, etc).
- .3 Final connection for primary, secondary and system ground conductors on all dry core transformers.

.17 Metal flexible conduit may be used for short runs for final connections (For example to fire alarm and security device boxes in suspended ceilings), unless noted otherwise. It must be securely fastened in place within 300 mm (12 inch) of each junction box, cabinet and device. Install specified connectors and bushings. Where supports are required, do not derive support from ceiling support wires on supports of other trades. Do not use liquid tight metal flexible conduit in lieu of metal flexible conduit unless specifically approved by the Engineer for that application.

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

.19 Mechanically bend steel conduit over 19-mm (3/4 inch) diameter.

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

.21 Install fish cord in empty conduits.

.22 Run 2 – 27 mm (1 inch) spare conduits up to nearest accessible ceiling space from each flush panel. Terminate these conduits in one 150-mm X 150 mm X 100 mm (6 inch X 6 inch X 4 inch) junction box in nearest accessible ceiling space or in case of an exposed concrete slab, terminate conduits in a flush concrete type box.

.23 Where conduits become blocked, remove and replace blocked section.

.24 Dry conduits out before installing wire.

.25 The installation of conduits above the structure, directly below roof insulation is strictly prohibited.

.26 All conduits to be complete with minimum #12 green insulated bond conductor.

.27 Ensure all metal raceways are bonded to ground, including those used for communication systems, fire alarm systems. Where a separate bonding conductor is run to a bonding bushing on an open end of a metal raceway, a #6 green RW90 shall be used.

3.2 SURFACE AND CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines. When installed in a wall cavity, conduit is to be installed vertically from outlet box to ceiling space, not run in an angled manner through the studs.

.2 Run conduits in flanged portion of structural steel.

.3 Group conduits wherever possible.

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

.5 Do not locate conduits closer than 75-mm (3 inch) parallel to hot water lines with a minimum of 25 mm (1 inch) at crossovers.

.6 Support of electrical systems raceway shall be independent of any type of suspended ceiling support rods, wires, etc. Toggle bolts shall not be used in Gypsum board construction.

3.3 CONCEALED CONDUITS

.1 Do not install horizontal runs in masonry walls.

.2 Do not install conduits in terrazzo or concrete toppings.

********END OF SECTION ********

1 General

1.1 GENERAL

1. The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Division 1.

1.3 PRODUCT DATA

.1 Comply with efficiency values as indicated in the latest version of CSA C802.2 Minimum Efficiency Values for Dry-Type Transformers. Transformer to bear label of verification agency logo near nameplate.

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Division 1.

.2 Indicate:
- .1 Physical dimensions.
- .2 Primary and secondary voltage.
- .3 Enclosure type.
- .4 Weight.
- .5 Insulation class.
- .6 Impedance.
- .7 Transformer losses.
- .8 CSA C802.2 compliance.
- .9 Noise level.
- .10 Winding material.
- .11 Primary and secondary connection lugs indicating conductor range for each point of connection.
- .12 Multi-barrel lugs for all parallel conductor terminations.

.3 Multi-Barrel Lugs
- .1 All primary and secondary conductors are to be terminated in **factory provided** multi-barrel lugs (Each conductor is to be provided with an individual, suitably sized connection point), with a single connection point at the transformer feed.
- .2 Transformers shipped to the site without the specified multi-barrel lugs will require field installation of the multi-barrel lugs and a Field Certification by an agency acceptable to the local inspection authority. A Label installed on the transformer by the Field Certification agency will be required.
- .3 The electrical contractor will include all costs associated with the Field Certification in his Tender.

2 Products

2.1 TRANSFORMERS

.1 Use transformers of one manufacturer throughout project.

.2 Design.

.1 Type: Electrostatic shielded, dry type, ANN.
.2 Two winding, three core type.
.3 Capacity & Voltage: as indicated.
.4 Voltage taps: Above Normal Full Capacity 2 @2.5%
Below Normal Full Capacity 2 @2.5%
.5 Total Winding Temperature 220°C (Ambient 40°C, Av. Rise 150°C)
.6 Basic Impulse Level (BIL): 10 KV.
.7 Mounting: floor.
.8 Finish: in accordance with Section 26 05 00 Common Work Results for Electrical
.9 Windings - copper.
.10 Transformers shall be K rated to a minimum of K13 unless designated otherwise.
.11 Neutral sized for 200% of rated phase current.
.12 Rubber anti-vibration pads.
.13 <u>Multi-barrel lugs with single connection point for all phase and neutral conductors.</u>
.14 System ground, primary and secondary bonds are to be terminated using a aluminum spade type dual rated transformer lug.
.15 Enclosure: EEMAC 3R.

.3 Sound Levels

.1 Transformer average sound levels shall not exceed the following ANSI and NEMA levels:

.1	10 to 50 KVA	45 dB
.2	51 to 150 KVA	50 dB
.3	151 to 300 KVA	55 dB
.4	301 to 500 KVA	60 Db

.4 Connections

.1 All secondary, primary and system ground connections are to be located at the front of the transformer and readily accessible when the front cover is removed.
.2 <u>Rear connection types are not acceptable.</u>

.5 Connecting lugs

.1 All primary and secondary conductors are to be terminated in factory provided multi-barrel lugs (Each conductor is to be provided with an individual, suitably sized connection point), with a single connection point at the transformer feed.
.2 System ground, primary and secondary bonds are to be terminated using an aluminum spade type dual rated transformer lug.

.6 Internal Space Inside Enclosure

.1 Ensure transformer internal space within enclosure is adequate to allow for code required cable bending radius for all primary and secondary conductors.

2.2 STANDARD OF ACCEPTANCE:

.1 Delta.

2.3 ACCEPTABLE MANUFACTURERS:

.1 Hammond

.2 Acme

.3 Bemag

2.4 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with 26 05 03.

3 Execution

3.1 INSTALLATION

.1 Mount each dry type transformer on a concrete housekeeping pad. Pads provided by General Contractor.

.2 Mount each dry type transformers on anti-vibration pads on all four corners. Secure each transformer to housekeeping pad.

.3 Ensure adequate clearance around transformer for ventilation. (Minimum 150 mm from non-combustible walls).

.4 Install transformer in level and upright position.

.5 Remove shipping supports only after transformer is installed and just before putting into service.

.6 Loosen anchoring bolts until no compression is visible on rubber pads.

.7 Make primary and secondary connections in accordance with wiring diagram. Do not make any connections through the top of the enclosure. Install primary and secondary connections in accordance with Detail 8, Drawing EP501. Use flexible, liquid tight, metal conduit where indicated. Provide insulated, liquid tight fittings and connectors.

.8 Provide system ground conductor to transformer in a conduit run independent of primary feeder conductors. Use flexible, liquid tight, metal conduit where indicated. Provide insulated, liquid tight fittings and connectors.

.9 System ground and secondary bonds are to be terminated using an aluminum spade type dual rated transformer lug, with sufficient lugs to terminate each conductor separately - ILSCO Cat # PET-4-350-Z or PET-6-350-Z. Attach to transformer enclosure with two 5/16 hex bolts, c/w lock washers. Tighten to manufacturer's recommended torque. System ground conductor is to be routed through PET lug first and then terminated on the Xo terminal of the transformer. Provide a minimum #3 green RW90 conductor from PET lug to transformer shield ground terminal.

.10 Bottom fed transformers located on slab-on-grade installations may be fed using rigid thick wall PVC conduits, C/W a transition to rigid galvanized conduit for entry into the bottom of the enclosure. Provide suitable lock nuts and bonding bushings for each conduit. Bond each conduit bushing to the PET lug with a green insulated #6 conductor.

.11 Install a non-fusible disconnect switch in the primary feed to each transformer when the overcurrent protection for the transformer is not located in the same room as the transformer.

.12 Energize transformers after installation is complete.

.13 Measure and record voltage at primary and secondary terminals of transformer. Adjust taps accordingly. Record data in project manual.

.14 Measure noise output of transformer, and compare readings with requirements of 2.1.3 above. Take corrective action as required to achieve required sound maximums.

3.2 COMMISSIONING

.1 Commission the system in accordance with 26 91 13.

********END OF SECTION ********

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section.

1.2 RELATED WORK:

.1 Electrical Contractor will provide all plywood backboards required for mounting electrical equipment.

1.3 RELATED SECTIONS:

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

.2 Section 26 28 21- Moulded Case Circuit Breakers.

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Division 1.

.2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

2 Products

2.1 LIGHTING & BRANCH CIRCUIT PANELBOARDS

.1 Panelboards: as indicated on drawings.

.2 Short Circuit Withstand Ratings:
- .1 All panelboards must be fully rated to withstand the voltage and available fault current at their terminals at the installed location in the distribution system.

.3 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.

.4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

.5 Two keys for each panelboard and key panelboards alike.

.6 Bus Bars:
- .1 Lugs to be rated for CU/AL.
- .2 Tin-plated aluminum.
- .3 Neutral to have same ampacity rating as main bus, unless noted otherwise.

.7 All feeder conductors (phase, neutral and bonds) are to be terminated in factory provided multi-barrel lugs (Each conductor is to be provided with an individual, suitably sized connection point) with a single connection point to the bus bar. Multiple conductor type connection lugs under one screw are not acceptable (For example CMC-LA- 750 (2) style).

.8 Mains: suitable for bolt-on breakers.

.9 All feeder conductors (phase, neutral and bonds) are to be terminated in factory provided multi-barrel lugs (Each conductor is to be provided with an individual, suitably sized connection point) with a single connection point to the bus bar.

.10 Provide trim and doors on all panelboards.

.11 Trim and door finish: grey enamel.

.12 All panelboards to have factory installed bonding terminal strip.

.13 Panel tubs to be a minimum of 508 mm (20 in.) wide, 146 mm (6 in.) deep, unless noted otherwise.

.14 Provide arc flash warning labels.

2.2 BREAKERS

.1 Breakers: to Section 26 28 16.02.

.2 Breakers with thermal magnetic tripping in panelboards, unless noted otherwise.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 03.

.2 Provide a complete circuit directory with typewritten legend indicating location and load of each circuit. All branch circuits such as lighting, receptacle, etc. to be identified by the room they terminate in. Panel directory is to be formatted so that odd numbered circuits appear on left of card; even numbered circuits appear on right. Identify all spare breakers. Panel directory is to include the number of breaker positions available in that particular panel, 72 circuit panel will require a single directory with a total of 72 spaces.

.3 Provide lamicoid identification plates for all breakers in Distribution Panelboards.

2.4 STANDARD OF ACCEPTANCE

.1 Lighting and branch circuit panelboards:
- .1 Cutler- Hammer
  - .1 POW-R-LINE 1 & 2
  - .2 POW- R-LINE 3a

2.5 ACCEPTABLE MANUFACTURERS TO THE REQUIREMENTS ABOVE:

.1 Square D

.2 Siemens.

3 Execution

3.1 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb true and square, to adjoining surfaces.

.2 Mount panelboards to height specified in Section 26 05 00 or as indicated. Ensure that the operating handle of the top mounted device is with-in two metres of the finished floor.

.3 Connect feeder conductors to panel lugs. For proper termination of conductors, it is very important that field connections be properly tightened. Obtain manufacturer's recommended torque for the type of connection and wire type and gauge. Using a properly set up torque wrench, torque each termination to manufacturer's setting. In the absence of Manufacturer's instructions, make terminations in conformance with the values given in Tables D6 and D7 of the 2015 CEC. Using a black felt tip marker, mark each terminal with a diagonal line to indicate a complete termination. The torque wrench being used for terminations must have been calibrated by a recognized company within the last year, indicated by a sticker on the torque wrench showing the date the calibration was done.

.6 Connect neutral conductors to common neutral bus.

.7 Connect bonding conductors to common bonding bar.

.8 Provide separate neutral conductors for all circuits feeding lighting equipment from lighting panelboards.

.9 AC-90 cables are not permitted to enter panelboards under any circumstances.

.10 Provide NSPI compliant ARC FLASH warning label.

3.2 PANELBOARD START-UP, VERIFICATION AND PERFORMANCE TESTING

.1 Start-Up
- .1 Perform start-up checks paying particular attention to:
  - .1 Name plate complete.
  - .2 Proper grounding.
  - .3 Clean equipment.
  - .4 Condition of insulation and insulators.
  - .5 Evidence of moisture damage.

.6 Cable lugs torqued to manufacturer's recommendation.
.7 Bus bolts torqued to manufacturer's recommendation.
.8 Doors and covers in place.
.9 Code required clearances around equipment.
.10 Exterior and paint finish.
.11 Insulation Megger tests.

.2 Verification
.1 Perform verification checks paying particular attention to:
.1 Manufacturer
.2 Voltage
.3 Main Bus Rating
.4 Copper Busing
.5 Copper Ground Bus
.6 Phase Rotation Test
.7 Feeder Breakers

.3 Performance
.1 Carry out performance checks:
.1 Test Feeder Breakers and Trip Units.

3.3 COMMISSIONING

.1 Carry out the commissioning in conformance with Section 26 91 13.

******END OF SECTION******

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 01 33 00- Submittal Procedures.

1.3 RELATED SECTIONS:

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 26 05 00 - Common Work Results Electrical.

.3 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.4 Section 26 28 20 - Ground Fault Circuit Interrupters Class A

1.4 REFERENCES:

.1 Canadian Standards Association (CSA International)
- .1 CSA-C22.2 No.42-99 (R2002), General Use Receptacles, Attachment Plugs and Similar Devices.
- .2 CSA-C22.2 No.42.1-00, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
- .3 CSA-C22.2 No.55-M1986 (July 2001), Special Use Switches.
- .4 CSA-C22.2 No.111-00, General-Use Snap Switches (Bi-national standard, with UL 20, twelfth edition).

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.

.4 Divert unused metal and wiring materials from landfill to metal recycling facility.

2 Products

2.1 SWITCHES

.1 20 A, 120 V single pole, three-way, four-way switches as indicated.

.2 Manually-operated general purpose AC switches, extra heavy duty, industrial series, toggle type, as indicated and with the following features:
- .1 Terminal holes approved for No. 10 AWG wire.
- .2 Silver alloy contacts.
- .3 Urea or melamine molding for parts subject to carbon tracking.
- .4 Suitable for back and side wiring.
- .5 White toggle.

.3 Maximum continuous current: 20 Amps.

.4 Switches of one manufacturer throughout project.

.5 Standard of Acceptance: Hubbell No. HBL1221WCN.

.6 Acceptable manufacturers: Cooper Wiring Devices, Leviton, Pass & Seymour.

2.2 RECEPTACLES

.1 Unless specified otherwise, duplex receptacles, CSA type 5-15 R, 125V, 15 A, U ground, specification grade, with the following features:
- .1 Reinforced thermoplastic base and deep nylon body.
- .2 Impact resistant nylon face, complete with finder grooves.
- .3 One piece brass mounting strap with integral ground contacts.
- .4 Suitable for No. 10 AWG for back and side wiring.
- .5 Break-off links for use as split receptacles.
- .6 Eight back wired entrances, four side wiring screws.
- .7 Double wipe contacts.
- .8 White in color.
- .9 Standard of Acceptance: Hubbell No. HBL5252WCN
- .10 Acceptable Manufacturers:
  - .1 Leviton #5262.
  - .2 Pass and Seymour #PS5262
  - .3 Cooper Wiring Device #AH5262W.

.2 Duplex receptacles where indicated: CSA 5-20R, 125V, 20A U ground as above, except Hubbell No. HBL5352 WCN.

.3 Duplex receptacles, ground fault where indicated: CSA 5-15R, 125V, 15A U ground as above, except Hubbell No. GF5262 WCN.

.4 Standard USB Charger Duplex receptacles, tamper resistant: Two (2) USB Type 2.0, 3.0 amps, 5 VDC and two (2) CSA 5-15R, 125 V, 15A U ground receptacles as above, Hubbell # USB15X2W.

.5 Two pole, three wire grounding receptacle where indicated: CSA 5-30R, 30 amp, single phase, 125 VAC, heavy duty, specification grade, Hubbell # HBL9308.

.6 Three pole, thirty amp, four wire grounding receptacle where indicated: CSA 14-30R, 30 amp, single phase, 125/250 VAC, heavy duty, specification grade, Hubbell # HBL9430A.

.7 Three pole, fifty amp, four wire grounding receptacle where indicated: CSA 14-50R, 50 amp, single phase, 125/250 VAC, heavy duty, specification grade, Hubbell # HBL9450A.

.8 Three pole, sixty amp, four wire grounding receptacle where indicated: CSA 15-60R, 60 amp, three phase, 250 VAC, heavy duty, specification grade, Hubbell # HBL8460A.

.9 Two pole, three wire, Surge Protective receptacle with light and alarm, blue colour: CSA 5-20R, 125V, 20A U ground, Hubbell No. HBL5362SA, 240 joules/20KA per mode.

.10 Receptacles of one manufacturer throughout project.

.11 Acceptable manufacturers: Leviton, Pass & Seymour.

2.3 COVER PLATES

.1 Cover plates are required for all wiring devices.

.2 Cover plates from one manufacturer throughout project.

.3 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

.4 Stainless steel, vertically brushed, 1 mm thick cover plates for wiring devices mounted in flush-mounted outlet box.

.5 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes, complete with four screws.

.6 For four inch square boxes in above ceiling applications, 3/8 inch (9.5 mm) raised surface covers as follows:
- .1 One duplex receptacle: Iberville Cat# BC-8365.
- .2 One toggle switch: Iberville Cat# BC-8361.

.7 Exterior receptacles shall be equipped with cover plates which are marked “Extra Duty” in compliance with CEC Rule 26-702 (2).

3 Execution

3.1 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 specified in Section 26 05 00 or as indicated.
- **.4 Each line voltage switch is to be wired with the neutral conductor extended to the device box.**

.2 Interior Receptacles:
- .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
- .2 Mount receptacles at height specified in Section 26 05 00 or as indicated.
- .3 All receptacles to be polarity tested.
- .4 Install with U-ground up.
- .5 Receptacles shall project a minimum of 3 mm (.125 in) from metal face plates.
- .6 All receptacles to be mounted level and plumb.
- .7 For above ceiling applications, outlet box is to be 100 mm (4 inch) square, c/w with raised surface covers.

.3 Exterior Receptacles:
- .1 Mount back box, recessed in wall at height specified in Section 26 05 00 or as indicated, to permit the receptacle to be installed flush with wall.
- .2 Wire and connect device and install with U-ground up.
- .3 Apply caulking compound to back of cover to provide waterproof seal.
- .4 All receptacles to be polarity tested.

.4 Cover plates:
- .1 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
- .2 Install suitable common cover plates where wiring devices are grouped.
- .3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.
- .4 Use "FS" coverplates for all "FS" boxes.
- .5 For weatherproof installations, use cast aluminum,“While-in-use” cover marked for extra duty.

.5 Identification:
- .1 Identify all receptacles as per 26 05 03.

3.2 COMMISSIONING

.1 Carry out the commissioning in conformance with Section 26 91 13.

********END OF SECTION ********

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Division 1.

1.3 DELIVERY AND STORAGE

.1 Ship fuses in original containers.

.2 Store fuses in original containers.

2 Products

2.1 FUSES GENERAL

.1 Low voltage, current limiting, HRC fuses, types as specified below and shall be CSA certified.

.2 Fuses shall meet the following parameters:

- .1 Fast Acting
  - .1 Rating: 1 – 600 amps.
    - .1 CSA certified to Standard C22.2 No. 248.8.
    - .2 200 KAIR.
    - .3 Class J.
    - .4 Ferraz Shawmut A4J.
- .2 Time Delay
  - .1 Rating: 1 – 600 amps.
    - .1 CSA certified to Standard C22.2 No. 248.8.
    - .2 200 KAIR.
    - .3 Class J.
    - .4 Ferraz Shawmut AJT.

.3 Fuses shall be so selected as to provide a fully coordinated system for both overload and short circuit fault conditions.

2.2 STANDARD OF ACCEPTANCE.

.1 FerrazShawmut

2.3 ACCEPTABLE MANUFACTURERS.

.1 Bussmann.

.2 English Electric.

3 Execution

3.1 INSTALLATION

.1 Install fast acting or time delay fuses, as indicated.

.2 Install fuses in mounting devices immediately before energizing circuit.

.3 All fusible equipment rated 600 amps or less shall be supplied with fuse clips to accept Class J fuses.

.4 Ensure correct fuses are fitted to physically matched mounting devices.

.5 Ensure correct fuses fitted to assigned electrical circuit.

******END OF SECTION******

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section.

1.2 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results for Electrical.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.

.4 Divert unused metal and wiring materials from landfill to metal recycling facility.

1.4 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CSA-C22.2 No. 5-02, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

1.5 SUBMITTALS

.1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

.2 Include time-current characteristic curves for breakers.

2 Products

2.1 BREAKER GENERAL

.1 Bolt-on molded case circuit breaker, quick make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees Celsius ambient.

.2 Plug-in molded case circuit breakers, not accepted.

.3 Common-trip breakers with single handle for multipole applications.

.4 Magnetic instantaneous trip elements in circuit breakers, to operate only when the value of current reaches setting.

.5 Short Circuit Interrupting Ratings:

.1 All circuit breakers must be fully rated to withstand the voltage and available fault current at their terminals at the installed location in the distribution system.

.2 Series rated combinations (Integrated Equipment Rating) of circuit breakers, as per CEC, Rule 14-014 is not acceptable and cannot be applied to this project.

.3 Unless otherwise noted, all panelboard assemblies are to be fully rated for a symmetrical short circuit fault current of not less than 10 KA @ 240 volts and 14 KA @ 600 volts.

2.2 THERMAL MAGNETIC BREAKERS

.1 Molded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping. Under overload conditions and instantaneous tripping for short circuit protection.

2.3 MAGNETIC BREAKERS

.1 Molded case circuit breakers to operate automatically by means of adjustable magnetic devices for motor circuit protection.

2.4 BREAKER TYPE GROUND FAULT CIRCUIT INTERRUPTER

.1 Single pole, Class A, ground fault circuit interrupter for 15 or 20 amp, as indicated, 120 VAC, single phase circuit, C/W test and reset facilities.

2.5 STANDARD OF ACCEPTANCE

.1 Cutler-Hammer.

2.6 ACCEPTABLE MANUFACTURERS

.1 Square D.

.2 Siemens.

3 Execution

3.1 INSTALLATION

.1 Install circuit breakers as indicated.

3.2 COMMISSIONING

.1 Carry out the commissioning in conformance with Section 26 91 13.

******END OF SECTION******

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section.

1.2 PRODUCT DATA

.1 Submit product data in accordance with Division 1.

2 Products

2.1 DISCONNECT SWITCHES

.1 Non-fusible and fusible disconnect switch in CSA Enclosure as indicated.

.2 Heavy Duty specification grade.

.3 Provision for padlocking in on-off switch position.

.4 Mechanically interlocked door to prevent opening when handle in ON position.

.5 Quick-make, quick-break action.

.6 ON-OFF switch position indication on switch enclosure cover.

.7 Fuse clips, where indicated to accommodate Class J only.

.8 Supply HRC-I-J fuses for all fused disconnect switches, unless indicated otherwise.

.9 Exterior disconnect switches to be stainless steel, Type 3R, c/w viewing window.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 03.

2.3 MANUFACTURERS

.1 Standard of Acceptance:
- .1 Cutler-Hammer.

.2 Acceptable Manufacturer:
- .1 Square D.
- .2 Siemens.

3 Execution

3.1 INSTALLATION

.1 Install disconnect switches as indicated.

.2 Install fuses in disconnect switches.

*****END OF SECTION******

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Division 1.

.2 Indicate:
- .1 Mounting method and dimensions.
- .2 Starter size and type.
- .3 Layout of identified internal and front panel components.
- .4 Enclosure types.
- .5 Wiring diagram for each type of starter.
- .6 Interconnection diagrams.
- .7 Equipment being controlled, making reference to the Motor Starter and Control list.

.3 Project Specific Wiring Diagrams:
- .1 Refer to the control drawings for individual motor starter control wiring diagrams and sequences of operation.
- .2 Submit with each starter a project specific wiring diagram indicating all interconnections.
- .3 Each starter shop drawing will indicate the equipment being controlled (For example- Supply fan #1).

1.3 OPERATION AND MAINTENANCE DATA

.1 Provide data for incorporation into maintenance manual specified in Division 1.

.2 Include operation and maintenance data for each type and style of starter.

1.4 SPARE PARTS

.1 Provide spare parts as indicated in 26 05 01.

2 Products

2.1 MATERIALS

.1 All individual starters and motor control centre starters are to be of one manufacturer.

.2 Starters: EEMAC E14-1.
.1 Half size starters not acceptable.

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: standard labeled as indicated.
.2 Indicating light: LED type and colour as indicated.
.3 Locking tab to permit padlocking in "ON" or "OFF" position.

2.3 FULL VOLTAGE MAGNETIC STARTERS

.1 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 solid state overload protective device in each phase ambient compensated, manually reset from outside enclosure, c/w
.1 One current sensor in each phase.
.2 Dial selectable overload protection.
.3 Phase loss protection.
.3 Power and control terminals.
.4 Project specific wiring and schematic diagram inside starter enclosure in visible location.
.5 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.

.2 Combination type starters to include magnetic only circuit breaker, where indicated 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 Locking in "ON" position.
.3 Independent locking of enclosure door.
.4 Provision for adjustable trip settings of 700 - 1300 % of motor FLA.

.3 Accessories:
.1 Selector switches: labeled as indicated.
.2 Indicating lights: LED type and colour as indicated.
.3 1-N/O and 1-N/C spare auxiliary contacts unless otherwise indicated.
.4 Manual overload reset button on enclosure exterior.
.5 Control transformer, voltage as indicated, minimum 150 VA.

.4 Wiring Diagrams:
.1 Each starter will be supplied with a project specific wiring diagram located inside the cover in a plastic sleeve.

2.4 CONTROL COMPONENTS

.1 Provide factory installed solid core current sensors to monitor line current and mechanical relay and relay base to switch the controlled load in each and every starter enclosure. Wire all connections to a factory installed terminal strip. Label each conductor and terminal accordingly.

.2 Confirm manufacturer and part number for the current sensor and control relay required by the Building Automation System (BAS) contractor for this project, prior to submitting shop drawings. For example:
.1 Typical Automated Logic Controls:
.1 Current Sensor: Greystone Model CS-650 R1.
.2 Control Relay: Veris Industries DPDT #VMD2B Relay with a 24 V coil and 120 VAC, 10 Amp contacts to switch motor control circuit and plug-in base.

.3 All components and entire assembly to be CSA approved.

.4 All items (current sensors, etc.) affecting starter CSA certification (or equivalent) are to be factory installed. Field certification is to be avoided.

2.5 ENCLOSURE

.1 Provide EEMAC 1 enclosures for all starters unless indicated otherwise.

2.6 COORDINATION

.1 Coordinate with mechanical contractor.

2.7 STANDARD OF ACCEPTANCE

.1 Cutler-Hammer MS Series manual motor starters.

.2 Cutler-Hammer – Freedom NEMA c/w CEP7 solid state overload relay.

2.8 ACCEPTABLE MANUFACTURERS

.1 Acceptable manufacturer: Furnas, Square D, Allen Bradley, Siemens.

3 Execution

3.1 INSTALLATION OF STARTERS

.1 Install starters, connect power and control as indicated.

.2 All manual motor starters are to be installed in a recessed backbox unless the starter is installed in a mechanical or an electrical room.

.3 Make field power and control connections as indicated. Refer to Motor Starter and Control drawings for division of responsibility.

.4 Final connection to motors:

.1 The conductor phase colour coding as per C.E.C. rule 4-038 will carry through from the incoming service point to the motor starter and to the final connection to each motor. In the instance that a three phase motor requires transposition of phase conductors to achieve proper rotation, the change is to take place at the motor terminal box. Changing the motor feeder phase conductors at any other point in the distribution system (for example at the starter) will not be acceptable.

.5 Before energizing the starter, conduct a thorough inspection to make certain that all foreign materials, scraps of wire and other debris are removed from the enclosure. Remove any accumulation of dust and dirt with a vacuum cleaner.

.6 Check all devices for damage. Make all necessary repairs or replacements, prior to energizing.

.7 Ensure that Motor Circuit Protectors (MCPs) adjustable current trip mechanisms match the full-load current shown on the nameplate of each motor and the manufacturer's setpoint table.

.8 Ensure that solid-state overload relays are installed and adjusted to match the full-load current shown on the nameplate of each motor and comply with CEC, Rule 28-306 and set to trip at no more than the following:

.1 125% of the FLA rating of a motor having a service factor of 1.15 or greater.

.2 115% of the FLA rating of a motor having a service factor that is unmarked or less than1.15.

.7 Provide NSPI compliant ARC FLASH warning labels.

3.2 MOTOR STARTER START-UP, VERIFICATION AND PERFORMANCE TESTING

.1 Start-Up

.1 Perform start-up checks paying particular attention to:

.1 Name plate complete.

.2 Proper grounding.
.3 Clean equipment.
.4 Evidence of moisture damage.
.5 Cable lugs torqued to manufacturer's recommendation.
.6 Doors and covers in place.
.7 Code required clearances around equipment.
.8 Exterior and paint finish.

.2 Verification
.1 Perform verification checks paying particular attention to:
.1 Manufacturer
.2 Voltage
.3 Phase Rotation Test
.4 Breakers (MCP and Thermal/magnetic type)

.3 Performance
.1 Carry out performance checks:
.1 Test overecurrent devices.
.2 Test overload Trip Units.

3.3 TESTS

.1 Operate switches to verify correct functioning.

.2 Perform starting and stopping.

.3 Check that starters operate as indicated and to requirements of the mechanical contractor.

3.4 RECORDS

.1 Obtain and record the following information for each motor.
.1 Motor horsepower.
.2 Motor voltage.
.3 Motor full load amps (both nameplate and site measured valves).
.4 Installed solid state overload unit's setpoint.
.5 Installed over current protection.
.6 Motor circuit protector setpoint, where applicable.

.2 Submit chart to Engineer for approval and make changes where instructed.

.3 Incorporate in maintenance manuals.

3.5 COMMISSIONING

.1 Carry out the commissioning in conformance with Section 26 91 13.

********END OF SECTION ********

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.2 Underwriters' Laboratories of Canada (ULC)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Packaging Waste Management: remove for reuse.

.3 Divert unused metal materials from landfill to metal recycling facility.

.4 Disposal and recycling of fluorescent lamps as per local regulations.

1.5 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit complete photometric data prepared by independent testing laboratory for luminaires specified, for review by Consultant. Include disc containing IES formatted photometric data.

1.6 SPARE PARTS

.1 Provide spare parts as per 26 05 01.

2 Products

2.1 LUMINAIRES

.1 Fluorescent luminaire:
  .1 Refer to light fixture schedule.

3 Execution

3.1 INSTALLATION

.1 Locate and install luminaires as indicated.

3.2 WIRING

.1 Connect luminaries to lighting circuits.

.2 Install separate #12 RW90 bonding conductor in fixture raceways when fixtures are continuously mounted in rows.

.3 Provide a separate neutral conductor for all lighting circuits.

3.3 LUMINAIRE SUPPORT

.1 For suspended ceiling installations support luminaires from ceiling grid. Additional ceiling suspension hangers are to be supplied and installed by Division 9. Hangers are to be installed within 150 mm of each corner of the fixture.

.2 For fixtures suspended using pendant or aircraft cable, supports are to be provided which are independent of any suspended ceiling components. Install to manufactures requirements.

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 COMMISSIONING

.1 Carry out the commissioning in conformance with Section 26 91 13.

******END OF SECTION******

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section.

1.2 PRODUCT DATA

.1 Submit product data in accordance with Division 1.

.2 Data to indicate system components, mounting method, source of power and special attachments.

.3 Units shall comply with CSA C22.2 No. 141.

1.3 WARRANTY

.1 For batteries, the 12 months warranty period is extended to 10 years.

1.4 SPARE PARTS

.1 Provide spare parts as per 26 05 01.

2 Products

2.1 EQUIPMENT

.1 Supply voltage: 120 VAC.
.2 Output voltage: 12 VDC.
.3 Operating time not case less than 30 min.
.4 Battery: sealed, lead acid, maintenance free.
.5 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.
.6 Solid state transfer circuit.
.7 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.
.8 Signal lights: solid state, for 'AC Power ON'.
.9 Lamp Type: LED.
.10 Heavy duty steel housing, c/w corrosion resistant undercoating.
.11 Auxiliary equipment:
    .1 Test switch.
    .2 Autotest feature.

2.2 WIRING OF REMOTE HEADS

.1 Conductors: RW90 type to Section 26 05 21 - Wires and Cables 0-1000 V.

.2 Conduit: type EMT, to Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 03

2.4 STANDARD OF ACCEPTANCE

.1 Lumacell Q-BIC-AT Series for surface mount units, c/w 5 Watt LED lamps and wire guards where indicated.

.2 Lumacell MQM2NX-2LED-12V-5W NEMA 4X C/W two 5 Watt LED Lamps for remote heads.

2.5 ACCEPTABLE MANUFACTURERS TO THE REQUIREMENTS ABOVE

.1 Emergilite

.2 Dual Lite

.3 Stanpro

.4 Aimlite

3 Execution

3.1 INSTALLATION

.1 Install battery units where indicated.

.2 Install remote heads where indicated.

.3 Install unit equipment and remote mounted fixtures.

.4 Direct heads.

.5 Where multiple DC feeds originate from a battery pack, install one feed from the battery pack to a suitably sized junction box. Feed multiple feeds from the junction box.

.6 Provide and post instructions for the operation and care of the emergency battery units and testing interval, in conformance with CEC Rule 46-102.

.7 Provide identification as per 26 05 03.

3.2 COMMISSIONING

.1 Carry out the commissioning in conformance with Section 26 91 13.

******END OF SECTION******

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section.

1.2 PRODUCT DATA

.1 Submit product data in accordance with Division 1.

1.3 WARRANTY

.1 For Exit lights, the 12 months warranty period is extended to 10 years.

1.4 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 03

1.5 SPARE PARTS

.1 Provide spare parts as per 26 05 01.

2 Products

2.1 SHOW ROOM, OFFICE, NEW VEHICLE DELIVERY, SERVICE RECEPTION AREAS (NON SERVICE)

.1 Pictogram style Exit sign, green and white.

.2 Industrial grade PVC NEMA 4X enclosure.

.3 Sealed, heavy duty, vandal-resistant, polycarbonate face plate.

.4 Tamper resistant concealed test switch with magnetic action.

.5 LED light source as follows:
- .1 Less than 3 Watt.
- .2 25 year life.
- .3 White.

.6 Each faceplate to have two legend films for pictogram and direction selection.

.7 120 VAC, two wire feed plus bond.

.8 Meet or exceed CSA 22.2 No, 141-10 standard.

.9 Tamper proof screws.

.10 Self-powered with sealed Nickel-Cadmium battery with a minimum of two hours operation on AC failure.

.11 Auto test function to execute automatic tests for 5 minutes every 30 days, 30 minutes every 60 days and two hours annually.

2.2 STANDARD OF ACCEPTANCE

.1 Lumacell LN-X-WU00-SD.

2.3 ACCEPTABLE MANUFACTURERS

.1 Emergilite

.2 Dual Lite

.3 Stanpro

.4 Aimlite

.5 Beghelli

3 Execution

3.1 INSTALLATION

.1 Install exit lights.

.2 Connect fixtures to exit light circuits.

.3 Provide circuit breaker lock-on devices for all circuits feeding exit lights.

3.2 COMMISSIONING

.1 Carry out the commissioning in conformance with Section 26 91 13.

******END OF SECTION******

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement (DTIR Standard form of Agreement between Minister and Contractor) including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 RELATED WORK

.1 General requirements: Division 1.

.2 Common Work Results for Electrical - Section 26 05 00.

1.3 PERFORMANCE TESTING AND COMMISSIONING

.1 The electrical and communications systems installed within this facility will require inspection, performance testing and commissioning.

.2 The electrical contractor will be responsible for inspection, performance testing and commissioning of the installed electrical and communications systems as part of this process.

.3 Manufactured systems or components shall be commissioned by factory trained technicians representing the manufacturer, in the presence of the Owner's designated representatives, and under the direction of the electrical contractor.

.4 The electrical contractor will provide assistance to the Owner's representatives and ensure that the manufacturer's representative is on site during functional performance testing (FPT).

.5 Tests shall be performed by qualified electricians or technicians as required by the nature and complexity of the test.

1.4 SCOPE

.1 Systems verification are called for throughout the individual specifications, however, this does not relieve this section from providing all testing and verification necessary to ensure that systems and equipment operate as required and that they interface with other systems and equipment as required.

1.5 QUALITY ASSURANCE

.1 The Electrical Contractor is responsible for quality assurance and whenever necessary, to ensure compliance with operating requirements, CSA, these contract documents, the Authority having Jurisdiction and other requirements and codes as applicable.

1.6 CONTRACTOR'S RESPONSIBILITIES

.1 Prepare each system for testing and verification.

.2 Co-ordinate the efforts of testing and verification.

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

.4 Provide all necessary test and calibration equipment, temporary facilities, meters, sensors, load banks, etc. necessary to simulate and verify correct operating conditions.

.5 Co-ordinate and pay for all costs associated with testing and verification, including but not limited to costs for: travel, labour, equipment, testing agencies, manufacturers, testing and any other costs incurred to test and verify equipment and systems.

.7 Make test instruments available to Engineer to facilitate spot checks during testing.

.8 Retain possession of test instruments and remove at completion of services.

.9 Verify system installation is complete and in continuous operation.

.10 Where systems or equipment do not operate as required, make the necessary corrections or modifications, re-test and re-commission.

1.7 SUBMITTALS

.1 The Contractor shall submit the following documentation prior to FPT:
- .1 Record drawings.
- .2 Operations and maintenance manuals.
- .3 A letter of acceptance from the local inspection authority. A copy is to be included in the operations and maintenance manuals.
- .4 A letter of guarantee. A copy is to be included in the operations and maintenance manuals.
- .5 Copies of the following test results (A copy is to be included in the operations and maintenance manuals):
  - .1 Insulation/megger tests.
  - .2 Load balance tests on all distribution panels.
  - .3 Load tests on all electric motors.

.4 Structured cabling system link tests.
.5 Fire alarm system.
.6 Intrusion Detection system.
.7 Video Surveillance system.
.8 P/A system.
.9 Access Control System.
.10 Receptacle polarity and voltage drop documentation.

.2 A Commissioning and/or Certification Report from the manufacturer for the following systems (A copy is to be included in the operations and maintenance manuals):
.1 Structured cabling system link tests.
.2 Fire alarm system.
.3 Intrusion Detection System.
.4 Video Surveillance system.
.5 P/A System.
.6 Access Control System.

.3 Written verification from the end user that demonstrations have been performed for the following (A copy is to be included in the operations and maintenance manuals):
.1 Fire alarm system.
.2 Intrusion Detection System.
.3 Video Surveillance system.
.4 Access Control System.

.4 Completed verification forms included with this section. When there are multiples of referenced equipment, devices or systems, electrical contractor is responsible for obtaining a suitable number of forms to complete the verification process for the entire project.

1.8 INSTRUCTION OF OWNER'S STAFF

.1 Provide the following:
.1 Necessary instruction of equipment and systems operation to Owner's staff.
.1 At least 72 hours advance notifications in writing.
.2 Provision of factory trained technicians where necessary.
.3 Provision of presentation with the use of as-built drawings and data books required in other sections of these specifications.

.2 Conduct presentation on project premises.

.3 Training for all systems shall take place in four separate training sessions.

1.9 FUNCTIONAL PERFORMANCE TESTING (FTP)

.1 The Owner may commence a Functional Performance Testing Program independent of

other processes specified, upon receipt of written verification from the electrical contractor that:

.1 All systems are complete and operational in all respects.
.2 All specified reports and documents have been submitted and approved.
.3 All tests and start-up processes described elsewhere in the specification are complete.
.4 All demonstrations have been completed and documented.

.2 During this program, for a period of not more than 12 working days, an FPT team will verify the operation of all systems. The FPT process may involve real or simulated conditions to determine the systems full operational capabilities. Copies of all specified reports and documents are to be made available to the site during the period.

.3 During the FPT process, the Electrical Contractor will provide within 48 hours notice, the following:

.1 An onsite representative familiar with all aspects of the work to assist with coordination of trades during FPT as needed.
.2 A full time onsite senior electrical or technical representative for each building system to assist with the FPT of systems and equipment.
.3 Equipment manufacturer's technical representatives shall be available for onsite and telephone consultation from time to time as required throughout the FPT.
.4 All tools and test equipment required to operate the systems in real or simulated mode.

.4 FPT shall be performed on all electrical systems referenced in the contract documents which may include, but not be limited to, the following:

.1 Life Safety Systems:
  .1 Emergency Lighting.
  .2 Exit Signs.
  .3 Fire Alarm System.
.2 Lighting System
.3 Power Distribution System.
.4 Structured Cabling System.
.5 Intrusion Detection System.
.6 Video Surveillance system.
.7 P/A System.
.8 Access Control Syatem.

.5 Deficiencies or discrepancies discovered during the FPT process are to be immediately rectified by the Electrical Contractor. The Electrical Contractor shall also provide arrangements for labor and materials required to correct deficiencies which prevent the satisfactory completion of the FPT process.

1.10 FINAL REPORT

.1 Assemble all testing data and verification reports and submit them to the Engineer.

.2 Each form shall bear signature of recorder, date of test, and all relevant information in clear and legible form.

.3 Identify each instrument used, and latest date of calibration of each.

.4 Include written confirmation by Owner's representatives that all verification, testing, instruction and demonstrations have been completed to the Owner's satisfaction.

2 Products N/A

3 Execution

3.1 INSULATION RESISTANCE TESTING

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

.2 Check resistance to ground before terminating cables and wires.

3.2 PANELBOARD PHASE CURRENT MEASUREMENT

.1 Energize all possible loads.

.2 Measure each phase and record voltage and current.

3.3 MOTOR INFORMATION FORM

.1 Record all pertinent motor information for each motor installed.

.2 Measure each motor full load amps, after the Balancing Technician has completed his final adjustments.

.3 Set and record the installed overload and overcurrent data.

3.4 OTHER TESTS

.1 Perform other tests, not mentioned in this section, but specified in individual specification sections, to the approval of the Engineer.

3.5 VERIFICATION TESTS AND FORMS.

.1 Perform tests as required to properly complete the verification forms included in this section.

.2 Deficiencies or discrepancies discovered during this process are to be immediately rectified by the Electrical Contractor. The Electrical Contractor shall provide exceptional arrangements for labor and materials as may be required to correct these deficiencies.

Form 26 52 00-Unit Equipment for Emergency Lighting

EQUIPMENT DETAILS: (Identification)

Manufacturer: _____ Model: _____ Serial #: _____

Room #: _____ Designation: _____ Capacity: _____

Item	Yes	No	Comments
Nameplate label ……..	☐	☐	
Battery fully charged ….....	☐	☐	
Lamicoid identification plate…..	☐	☐	
Connected to normal lighting system for area served...	☐	☐	
Remote heads functional …….	☐	☐	
Written guarantee provided …….	☐	☐	
Auto test feature installed ……	☐	☐	

FIELD MEASUREMENTS:	
AC supply voltage _____ DC output voltage prior to test _____ DC voltage at farthest remote unit _____ Battery operating time (not less than 30 min)___	

SIGN OFF:
Electrical
Contractor: _____ Signature: _____ Date: _____

Form 26 53 00- Exit Lights

EQUIPMENT DETAILS: (Identification)

Manufacturer: _____ Model: _____ Serial #: _____

Room #: _____ Designation: _____ Capacity: _____

Item	Yes	No	Comments
Nameplate label ……..	☐	☐	
Lamicoid identification plate…..	☐	☐	
Connected to dedicated exit light circuit.....	☐	☐	
Breaker lock on device ……	☐	☐	
NI-Cad sealed battery in place ……	☐	☐	

FIELD MEASUREMENTS:	
AC supply voltage _____ Exit light operating time (not less than 30 min)___	

SIGN OFF:
Electrical
Contractor: _____ Signature: _____ Date: _____

Form 26 29 10-Motor Starters

EQUIPMENT DETAILS: (Identification)

Manufacturer: _____ Model: _____ Serial #: _____

Room #: _____ Designation: _____ Bus Rating: _____

Item	Yes	No	Comments
Nameplate label ……..	☐	☐	
Cable phase identified correctly.	☐	☐	
Clearance from adjacent surfaces	☐	☐	
Properly grounded……..	☐	☐	
Cleaned……..	☐	☐	
Cable lugs torqued……..	☐	☐	
Lamicoid identification plate…..	☐	☐	
Auxiliary contacts …….	☐	☐	
BAS components installed …….	☐	☐	
MCP field adjustments ……	☐	☐	
Overloads field adjusted	☐	☐	
Control wiring diagrams……	☐	☐	
Ground installed…….	☐	☐	
Control transformer….	☐	☐	

FIELD MEASUREMENTS:

High Voltage
H1-H2 _____
H2-H3 _____
H3-H1 _____
Current
H1 _____
H2 _____
H3 _____

SIGN OFF:
Electrical
Contractor: _____ Signature: _____ Date: _____

Form 26 27 26-Wiring Devices

EQUIPMENT DETAILS: (Identification)

Manufacturer: _____ Part Number_____ Amp Rating _____

Room #: _____

Item	Yes	No	Comments
Receptacle Polarity tested.	☐	☐	
Receptacle properly grounded	☐	☐	
Lamicoid identification plate…..	☐	☐	
Cover plate installed	☐	☐	
GFCI tested	☐	☐	
Voltage drop tested within tolerance	☐	☐	
Installed plumb and level	☐	☐	
Protrudes min of 0.4 mm through plate	☐	☐	
	☐	☐	
	☐	☐	
	☐	☐	

FIELD MEASUREMENTS:	
Voltage L1-N _____	

SIGN OFF:
Electrical
Contractor: _____ Signature: _____ Date: _____

Form 26 24 16.01-Panelboards

EQUIPMENT DETAILS: (Identification)

Manufacturer: _____ Model: _____ Serial #: _____

Room #: _____ Designation: _____ Bus Rating: _____

Item	Yes	No	Comments
Nameplate label ……..	☐	☐	
Filler pieces in place …..	☐	☐	
Cable phase identified correctly……..	☐	☐	
Cable lugs bolted to MRT……	☐	☐	
Bus bolts torqued to MRT……..	☐	☐	
Properly grounded……..	☐	☐	
Interior and exterior Cleaned……	☐	☐	
Insulation resistance measured……	☐	☐	
Spare breakers installed……..	☐	☐	
Lamicoid identification plate……	☐	☐	
Panel directory typed and complete…….	☐	☐	
Hinged door and front cover installed…..	☐	☐	
Branch circuit breaker operation checked.	☐	☐	
Breaker lock on devices installed……..	☐	☐	
Breaker bolts torqued to MRT……	☐	☐	
All tools removed, doors covers replaced…	☐	☐	

FIELD MEASUREMENTS:	**Current**
Voltage	L1 _____
L1-L2 _____	L2 _____
	N _____

SIGN OFF:
Electrical
Contractor: _____ Signature: _____ Date: _____

******END OF SECTION******

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 SYSTEM DESCRIPTION

.1 Communication systems consist of, but may not be limited to, structured wiring system (voice and data), low voltage wiring associated with the lighting system, building automation system (BAS), Video Surveillance and Public Address system.

.2 Communications system wiring refers to all wiring associated with the systems indicated above.

.3 Related Work By Electrical Contractor:
- .1 Splitter, Junction, Pull Boxes and Cabinets.
- .2 Outlet Boxes, Conduit Boxes and Fittings.
- .3 Conduits, Conduit Fastenings and Conduit Fittings.
- .4 Lighting Control Devices.
- .5 Structured Cabling for Communications Systems.
- .6 Public Address System.
- .7 Video Surveillance.

.4 Related Work By Mechanical Contractor:
- .1 Building Automation System

2 Products

2.1 COMMUNICATION SYSTEMS WIRE AND CABLE.

.1 Low Voltage Cable:
- .1 Cable jacket:
  - .1 Labeled with the following information, as a minimum:
    - .1 Cable type.
    - .2 FT rating.
    - .3 Temperature rating.
    - .4 CSA number.
    - .5 Rated voltage.
    - .6 Gauge and number of conductors.

.2 Cable not identified as above will not be permitted to be installed on this project.

.3 Coloured as follows:

System Description	Jacket Colour
Voice	White
Data	Blue
Intercom/Access Control	Brown
Fire Alarm	Red
BAS	Yellow
Public Address	Grey
Video Surveillance	Yellow

3 Execution

3.1 WIRING METHODS.

.1 EMT type conduit wall-stub c/w flush installed device box are required in all partitions, regardless of construction material. Stubs shall be turned out into accessible ceiling space within the same room as the outlet box, c/w nylon insulated throat, Arlington bushing or threaded type bushing. Minimum size to be 27 mm (1 inch).

.2 Ensure that both the device box and accompanying conduit sleeve are bonded to ground, as follows:

.1 Outlet box installed in partition utilizing metal studs, adjacent to receptacle box:

.1 Provide a #12 green insulated RW90 bonding conductor between receptacle device box and communication outlet device box. Provide a push-on non-metallic insulated bushing on the end of the conduit stub, similar to Arlington Series EMT*** (T&B Insuliner sleeves not acceptable).

.2 Outlet box not otherwise bonded to ground:

.1 Where bonding connection is available from an overhead source (junction box, cable tray, etc), provide a #12 green insulated RW90 bonding conductor from the bonding connection, through the conduit sleeve to the device box. Terminate bond wire at the device box. Provide a push-on non-metallic insulated bushing on the end of the conduit stub similar to Arlington Series EMT*** (T&B Insuliner sleeves not acceptable).

.3 When cables not are required to pass through a partition separating a corridor from a room, or between rooms, EMT type conduit sleeves are required, sized in accordance with the information contained in this section. Sleeves shall be installed into accessible ceiling space, c/w nylon insulated throats or threaded type bushings and shall be secured to building structure. Provide a bonding bushing for all conduit sleeves. Seal the ends of all conduits after installation of cables. Firestop where required to maintain a fire resistance rating. Smoke seal where required.

.4 The electrical contractor is to supply and install a suitably sized electrical junction box for all wiring supplied by the electrical contractor, regardless of system voltage. This electrical box will contain all electrical connections associated with wiring for all electrical systems.

.5 Where grouping of various systems outlets or multiple type outlets in drywall type construction is required, the use of box mounting brackets as manufactured by Caddy #RBS16 or #RBS24 or approved equal, are to be installed between, and secured to both metal studs. Secure brackets to metal studs using low profile sheet metal screws. Install suitable sized 102 mm (4") square and/or 119 mm (4 11/16") boxes c/w single gang raised tile rings.

.6 All surface wiring installed in rooms and/or other areas not having any hung, or drop type ceilings, or where otherwise installed on, or to wall surfaces etc., are to always be contained or sleeved in EMT type conduits.

.7 All non-concealed, surface type wiring installed on either ceilings and/or walls, is to also be sleeved in EMT type conduit.

.8 All concealed wiring routed through rooms with drywall or other inaccessible ceiling types are to be installed in a conduit system. The installation of access doors or recessed light fixtures in these areas does not change these types of ceilings from inaccessible to accessible.

.9 Provide suitably sized EMT conduit sleeves for communications system cables which pass through common walls between classrooms, workrooms, etc. Bond all sleeves to ground. Conduit sleeves are to be rigidly fastened in place.

.10 Pull boxes are to be sized in conformance with CEC Rule 12-3036, unless noted otherwise. In addition, pull boxes installed on conduits used for the installation of communication systems for straight pulls, shall conform to the following minimum requirements:

.1 Minimum size of pull box: 150 X 150 X 100 (6 x 6 x 4 inch)
.2 35 mm (1-1/4 in): 150 wide X 510 long X 100 deep (6 x 20 x 4 inch).
.3 41 mm (1-1/2 in): 200 wide X 686 long X 100 deep (8 x 27 x 4 inch).
.4 50 mm (2 in): 200 wide X 914 long X 150 deep (8 x 36 x 4 inch).
.5 75 mm (3 in): 300 wide X 1220 long X 100 deep (12 x 48 x 6 inch).
.6 100 mm (4 in): 375 wide X 1525 long X 200 deep (15 x 60 x 8 inch).

.11 All communications systems wiring installed within millwork is to be installed in a conduit system. Flexible metal conduit is permitted between outlet box and pull box. Where liquid tight metal flexible conduit is used for this purpose, matching liquid tight connectors are required. Increase one trade size.

.12 All communications system wiring (with the exception of BAS and lighting control cables) installed within accessible type ceiling spaces and not otherwise contained in conduits, are to be secured directly to the structure via the use of wide base, beveled edge supports

approved, equal to, or better than those as manufactured by Caddy, CableCat cable type supports, Catalog # CAT16HP for up to 7 cables, Catalog # CAT32HP for up to 25 cables, Catalog # CAT48HP for up to 60 cables. Support of low voltage cables to the structure is not to be greater than 1200 mm (48 inch) intervals. In addition, cables are to be bundled together at midpoint between each support via the use of Velcro Softcinch wire management. Do not use nylon tye wraps for this purpose.

.13 BAS control cables installed within accessible ceiling spaces and not installed in a conduit system are to be secured directly to the steel deck, above the support structure. Provide supports at 1200 mm (48") intervals.

.14 All cable supports used for communications system wiring with the exception of BAS and lighting control cables are to be installed no more than 760 mm (30 inches) above a finished ceiling, to permit ready access for future additions.

.15 In addition to the above requirements, BAS control circuit wiring **50 volts and less** is to be installed as follows:

- .1 EMT conduits are to be extended to within 760 mm (30 inches) of all various control devices associated with the operation of any given piece of mechanical equipment or device they might feed.
- .2 Unless specifically indicated otherwise, liquid tight metal type conduit c/w matching liquid tight type connectors are to be used for final connection between end of EMT conduit and applicable control device.
- .3 Bonding conductors are not required in flexible metal conduits where the conduit terminates in a non-metallic electrical box.

.16 Maximum Conduit Fill for Voice and Data Wiring. Note that the minimum acceptable conduit size for communications pathways shall be 27 mm (1 inch), unless noted otherwise:

.1	27 (1)	Up to 3 Cat 6 cables
.2	35 (1 1/4)	4 to 8 Cat 6 cables
.3	41 (1 1/2)	9 to 10 Cat 6 cables
.4	53 (2)	11 to 17 Cat 6 cables
.5	63 (2 ½)	18 to 24 Cat 6 cables
.6	78 (3)	25 to 37 Cat 6 cables
.7	103 (4)	38 to 64 Cat 6 cables

********END OF SECTION ********

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 RELATED SECTIONS

.1 Common Work Results for Electrical

.2 Electrical Identification

.3 Electrical Systems Testing and Verification

.4 Pathways for Communications Systems

.5 Structured Cabling for Communications Systems

.6 Conduits, Conduit Fastenings and Conduit Fittings

.7 Video Surveillance (CCTV).

1.3 REFERENCE STANDARDS

.1 CAN/CSA Standards
- .1 CAN/CSA T527-94 (Reaffirmed 1999) Grounding & Bonding for Telecommunications in Commercial Buildings.
- .2 CAN/CSA T528-93 (Reaffirmed 1997) Design Guidelines for Administration of Telecommunications Infrastructure in Commercial Buildings.
- .3 CAN/CSA T529-95 (Reaffirmed 2000) Telecommunications Cabling Systems in Commercial Buildings.
  - .1 CAN/CSA T530-99. Commercial Building Standard for Telecommunications Pathways and Spaces.
- .4 Nova Scotia Government Structured Cabling Standards.
- .5 C22-1-15 Canadian Electrical Code

.2 ANSI/TIA/EIA Standards
- .1 ANSI/TIA/EIA-568-C.2 – Commercial Building Telecommunications Cabling, Part 2.

.2 ANSI/TIA/EIA-568-B.2.1 – Transmission Performance Specifications for 4-Pair 100 Ohm Category 6A Cabling.
.3 ANSI/TIA/EIA-569-A – Commercial Building Standard for Telecommunications Pathways and Spaces.
.4 ANSI/TIA/EIA-606 – The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
.5 J-STD-607A Commercial Building Grounding and Bonding Requirements for Telecommunications.
.6 ANSI/TIA/EIA TSB-67 – Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems.
Open Offices.
.7 ANSI/TIA/EIA-568-B.3. Optical Fiber Cabling Components Standard.
.8 ANSI/TIA/EIA-568-B.3-1. Optical Fiber Cabling Components Standard, Additional Transmission Performance Specifications for 50/125µm Optical Fiber Cables

.3 BICSI Standards
.1 BICSI/TDMM – Telecommunications Distribution Methods Manual. (13th. Edition)
.2 Information Transport Systems Installation Methods Manual (6th. Edition).

1.4 SCOPE OF WORK

.1 Provide a complete structured cabling system to carry voice and data, as indicated on the drawings. System components include but may not be limited to the following:
.1 Category 6 Modular Patch Panels.
.2 Category 6 Patch cords.
.3 Category 6 UTP wiring.
.4 Wall mount swing rack.
.5 Horizontal and vertical cable management.
.6 Information outlets and faceplates.
.7 IDC connectors and mounts.
.8 Backbone fibre cable OM4.
.9 12/24 port (1U) SC fibre patch panels.
.10 Conduit system.
.11 Grounding and bonding system.
.12 Identification of all network components, terminations, information outlets, etc.
.13 Complete project documentation and as built drawings.

1.5 STRUCTURED WIRING SYSTEM CONTRACTOR QUALIFICATIONS.

.1 The Structured Wiring System installation contractor must be an authorized installation agent for that particular manufacturer’s solution and provide that manufacturer's system warranty upon project completion.

.2 The Structured Wiring System installation contractor shall be a current member of BICSI "Building Industry Consulting Services International" and must provide an RCDD "Registered Communications Distribution Designer" as Communications System Project Manager for the duration of the project.

2 Products

2.1 GENERAL

.1 All products installed in this system must be part of a complete end to end solution by a single manufacturer. Approved cable partners for that particular solution will be acceptable provided appropriate documentation is submitted at the time of shop drawing submittal and a warranty level is provided in conformance with this specification.

2.2 FIBRE OPTIC DATA BACKBONE SYSTEM

.1 Cable
- .1 6 strand 50/125 micron, OM4, fibre optic cable.
- .2 OFNP FT6, Erika Violet colored Outer Jacket
- .3 CSA T529-95 Compliant
- .4 Belden IBDN Distribution Series or equivalent.

.2 Patch Panels
- .1 12/24 port (1U) SC patch panels
- .2 EIA-310-D 482 mm (19”) Rack Mount Compliant
- .3 Complete with 568-SC adapter plates
- .4 Complete with Plexiglas Front Cover
- .5 Belden IBDN Fibre Express Series panels or equivalent.

.3 Connectors
- .1 568-SC Type Connector with ceramic ferrule
- .2 CSA T529-95 Compliant
- .3 Belden IBDN Optimax or equivalent.

2.3 HORIZONTAL CABLING SYSTEM

.1 Cable
- .1 24 AWG 4 pair Category 6 cable.
- .2 CMP (FT-6 Rated).
- .3 Blue Outer Jacket for voice, White Outer Jacket for data.
- .4 CSA T529-95 Category 6 Compliant.
- .5 Belden IBDN GigaFlex 2400 series.

.2 Patch Panels
- .1 48 port (2U) 8 position modular patch panels.
- .2 E1A-310-D 482 mm (19") Mount Compliant.
- .3 Wiring Configuration T568A (ISDN).
- .4 Connectors shall be coloured as follows:
  - .1 Grey for data.
  - .2 Blue for voice.
  - .3 Yellow for special applications (CCTV, multi-media).
- .5 Belden IBDN 10GX series.
- .6 Complete with modular connectors colour coded to match active ports in all unused ports of each patch panel. (Fully populated).
- .4 Belden IBDN QPBIX PS6+ series.
- .5 Category 6 Compliant.

.3 Information Outlet:
- .1 Typical Recessed Installation:
  - .1 Outlet Boxes
    - .1 Provide an outlet box for all communications outlets, c/w single gang raised tile ring, unless noted otherwise. Minimum dimensions as follows: 100mm (4 inch) x 100mm (4 inch) x 53mm (2.125 inch) deep, minimum volume of 490 cubic centimetres (30 cu.in.), (similar to Iberville # 52171-K).
  - .1 Outlet boxes in common walls shall not be installed back to back and must provide a minimum 103mm (4 inch) lateral clearance.
  - .2 Grounding and bonding provided as per Section 27 05 28.
  - .3 Faceplate
    - .1 Single Gang faceplate.
    - .2 Brushed stainless steel, punched to accept flush mount keystone style insert in all non-resident areas.
    - .3 Four ports per plate.
    - .4 Blank to be supplied for unused ports.
    - .5 Belden/CDT #AX102011.
- .2 Typical Surface Installation
  - .1 Outlet Boxes
    - .1 Provide an outlet box for all communications outlets. Minimum dimensions as follows: 100mm (4 inch) x 100mm (4 inch) x 53mm (2.125 inch) deep, minimum volume of 490 cubic centimetres (30 cu.in.), (similar to Iberville # 52171-K).
    - .2 Grounding and bonding provided as per Section 27 05 28.
  - .2 Faceplate
    - .1 Single Gang faceplate.
    - .2 Steel, raised 3/8 inch raised, for two duplex receptacles, Iberville #BC8365
    - .3 Blank to be supplied for unused ports.
    - .4 Belden 106 adaptor, #AX104121.

.3 Inserts
- .1 8 position UTP category 6 module.
- .2 IDC-type connection.
- .3 Category 6 Compliant.
- .4 Blue in colour for voice.
- .5 Grey in colour for data.
- .6 Wiring Configuration T568A (ISDN).
- .7 Nordex GigaFlex PS6+ Module, Keystone.

2.4 RACK AND CABLE MANAGEMENT SYSTEMS

.1 Racks
- .1 16 gauge steel, black powder coat wall mount pivoting equipment rack, C/W Rear rail kit and mounting hardware and screws.
- .2 Overall dimensions of rack shall be 24" W x 29" D x 63" H
- .3 C/W PD-915RC-20 Rack mount power distribution unit, c/w:
  - .1 Eight 5-15R rear outlets.
  - .2 One 5-15R front outlet
  - .3 15 amp circuit breaker.
  - .4 Differential and common mode surge & spike protection.
  - .5 EMI filtering.
  - .6 6 M (20 foot) power cord.
- .4 Twenty-four (24) U minimum mounting spaces (rack units).
- .5 Rack shall include factory installed door with lock and key and security screws and security bit for tamper-proof backpan mating.
- .6 Standard of Acceptance shall be Middle Atlantic Products #SR-24-28.
- .7 Acceptable Manufacturer: B Line, Hoffman, R F Mote,Hammond.

.2 Horizontal Cable Management
- .1 E1A-310-D 482 mm (19") Mount Complaint.
- .2 2 U (rack unit)

.3 Vertical Cable Management
- .1 Minimum dimensions of 100 mm x 150 mm.
- .2 Hinged Front Door.
- .3 Two per rack.
- .4 Middle Atlantic Products #CK-45 or equivalent.

2.5 PATCH CORDS

Patch cords must be the same manufacturer type as the warranty solution being provided.

.1 Telecommunications Rooms
- .1 Copper Patch Cords for Structured Wiring Racks
  - .1 4 pair, 24 AWG Stranded Wire, 8MOD-8MOD
  - .2 Category 6 Compliant.
  - .3 Wiring Configuration T568A (ISDN).

.4 Blue in Colour.
.5 1m (3 foot) , 2m (6 foot), 3m (10 foot) in length for green field to blue field. (Provide 1/3 quantity of each).
.6 1m (3 foot) , 2m (6 foot), 3m (10 foot) in length for silver field to hubs. (Provide 1/3 quantity of each).
.7 Provide quantity of patch cords to meet immediate requirement plus 20%.
.8 Belden IBDN PS6 Modular Patch Cords.

.2 Work Area
.1 Copper Patch Cords
.1 4 pair, 24 AWG Stranded Wire, 8MOD-8MOD
.2 Category 6 Compliant.
.3 Wiring Configuration T568A (ISDN).
.4 White in colour.
.5 3m (10 foot) in length.
.6 Provide quantity of patch cords to meet immediate requirement plus 20%.
.7 Belden IBDN PS6 Modular Patch Cords.

2.6 STANDARD OF ACCEPTANCE

.1 Belden IBDN with a **25 year warranty on parts and labour.**

2.7 ACCEPTABLE MANUFACTURES, TO THE REQUIREMENTS ABOVE:

.1 Commscope with a **25 year warranty on parts and labour.**

.2 Panduit Pan-Net with a **25 year warranty on parts and labour.**

.3 Hubbell Premise Wiring with a **25 year warranty on parts and labour.**

.4 Leviton with a **25 year warranty on parts and labour.**

2.8 COVER PLATES

.1 Stainless steel, vertically brushed, 1 mm (0.04 in.) thick cover plates for devices, unless noted otherwise.

3 Execution

3.1 INSTALLATION

.1 The structured wiring system contractor must retain the services of at least one Registered Communication Distribution Designer (RCDD) for the duration of the project. The RCDD must be identified prior to the submittal of structured wiring system shop drawings. Provide a copy of the RCDD certificate and proof of membership in BICSI upon award of contract.

.2 The minimum warranty requirement will be 25 years for the network passive components. Upon completion of the project, a certification certificate stating the warranty of the system must be supplied to the end user.

.3 Provide a complete structured cabling system for voice, data services, including all components and wiring as indicated.

.4 Install wall mount enclosure where indicated.

.5 Install horizontal cabling in conformance with 27 05 28 Pathways for Communications Systems.

.6 Install a grounding and bonding system in conformance to J-STD-607A.

.7 Provide identification as per 26 05 03 Electrical Identification.

.8 Provide a slack loop of three (3) meters for all installed cables. The purpose of this service loop is to allow any future re-configuration and / or upgrade.

.9 Install fiber backbone cable in EMT raceway. Provide 3M slack loop in Server Room.

.10 Permanently identify voice and data horizontal cabling at each end. The identification must be mechanically generated, not hand written. Indicate the originating Telecommunications Room (TR) and the consecutively numbered jack for voice and data. This labeling is to be identical on the originating end and in the outlet box. This same information is to appear on the patch panel and outlet jack location.

.11 Install patch panels in racks. Fully populate all unused ports in each patch panel with modular connectors, colour coded to match the active ports.

.12 Provide a record drawing of each floor plan detailing all structured wiring cables and jacks.

.13 Perform a Permanent Link test of each installed cable. Submit test results for review. All cords tested must meet or exceed the minimum transmission requirements as per Category 6 requirements.

.14 Provide complete system documentation at completion of the work, c/w a hard copy of the following:

- .1 Cable test reports.
- .2 Record floor plan drawings in AutoCad format, indicating all communications racks, information outlet location and numerical identification.
- .3 Record drawings of the front elevation of each communication rack, detailing the location, size and description of all equipment.

.15 The AutoCad floor plan drawings indicating all communications racks, information outlet location and numerical identification are to be laminated and wall mounted in each telecommunications room.

3.2 COMMISSIONING

.1 Commission the system in accordance with 26 91 13.

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section.

1.2 DESCRIPTION OF SYSTEM

.1 The Access Control System (ACS) to consist of components, hardware, controls, software, firmware, wire and conduits for a complete operating system to provide monitoring and control of access points.

.2 The ACS shall be microprocessor based, fully scalable and shall support Ethernet communications via TCP/IP protocols. ACS shall use a fully distributed architecture. Key access decisions, event/action processing shall take place within the door control modules, allowing off line operations where the application software is not communicating with the door control modules.

.3 The battery backup for controllers and strikes (or other electrically operated door locking hardware) shall be sized for a minimum of eight (8) hours of operation.

.4 Monitored points will be supervised for such conditions as alarm, short circuit, ground, open and normal conditions. Each of the door controllers shall be supplied with its own AC power supply. Step-down transformer(s) shall be CSA approved. Each of the stand alone controllers will control / supply power for all electrically operated door locking hardware.

.5 Must be compatible with Kantech EntraPass Global Edition Access Control and Security Management Software, V5.0. already in place at the Halifax Regional School Board (HRSB) head office.

.6 System to include the following:

- .1 Door access control panels.
- .2 Combination Proximity card and keypad readers.
- .3 Proximity tags.
- .4 Security management and reporting software.
- .5 Power supplies associated with the Access Control System.
- .6 Door position switches (Supplied by Division 8).
- .7 Electrically operated door locking hardware (Supplied by Division 8).
- .8 Power door operators and controls (Supplied by Division 8).
- .9 Door holders/closures (Supplied by Division 8).
- .10 Power transfer hinges (Supplied by Division 8).
- .11 Power supplies for electrified door hardware not associated with the Access Control System (by Division 8).
- .12 Wiring and conduit for a complete operating system.

.7 This contractor shall configure and program the access control system to function as per the requirements of this specification. The Halifax Regional School Board (HRSB) will provide the contractor with access to their server. It is the contractor's responsibility to deliver a fully functioning access control system.

1.3 RELATED SECTIONS

.1 Related Sections:
- .1 08 71 10 Door Hardware General.
- .2 26 05 31 Splitter, Junction, Pull Boxes and Cabinets.
- .3 26 05 32 Outlet Boxes, Conduit Boxes and Fittings.
- .4 26 05 34 Conduits, Conduit Fastenings and Conduit Fittings.
- .5 26 91 13 Electrical Systems Testing and Verification.
- .6 28 13 27 Lockdown Annunciation System.
- .7 28 16 00 Intrusion Detection.

1.4 SHOP DRAWINGS

.1 Submit shop drawings of product and data before the supply of equipment. All equipment is to be CSA approved.

.2 Include:
- .1 Layout of equipment.
- .2 Complete **PROJECT SPECIFIC** Wiring Diagrams.
- .3 Provide 3 copies of an operational and maintenance manual for all product being supplied.

1.5 SYSTEM OPERATION

.1 Access control system components, locations and wiring diagrams are indicated on the electrical contract drawings.

.2 Refer to Division 8 specification for theory of operation is detailed for each door.

2 Products

2.1 DOOR ACCESS CONTROL PANEL

.1 Four readers/keypads per controller capability.

.2 Onboard Ethernet 128 bit AES-encrypted communication.

.3 100,000 card capability.

.4 Verify and configure IP settings with built-in web configuration page.

.5 256 outputs.

.6 Supervised door lock outputs.

.7 RS-485 communication between controllers.

.8 Tamper switch.

.9 120/16.5 VAC, 75 VA Power supply.

.10 12 volt, 7AH battery backup.

.11 Metal cabinet with lock.

2.2 DOOR CONTACTS

.1 Door contacts: vandal resistant, tamper proof, suitable for flush mounting on door.

.2 Rare earth magnet.

.3 Double pole, double throw.

.4 Hermetically sealed magnetic reed switch.

2.3 PROXIMITY CARD AND KEYPAD READERS

.1 Single gang electrical box mounting.

.2 Operating Range: -35 to +35 degrees C.

.3 LED red and green indicators and Piezo buzzer.

.4 Format: XSF.

.5 20 cm read range.

.6 Operating modes:
- .1 Card + PIN.
- .2 PIN +Card.
- .3 Card only.
- .4 PIN only.

.7 Weatherproof design.

2.4 SELF ADHESIVE IO PROX PROXIMITY TAG

.1 2.5 centimetre (1 inch) diameter.

.2 Self-adhesive tag.

.3 Kantech XSF format.

2.5 ACCESS CONTROL AND SECURITY MANAGEMENT SOFTWARE

.1 Must be compatible with Kantech EntraPass Global Edition Access Control and Security Management Software, Version 7.0.2.

2.6 STANDARD OF ACCEPTANCE

.1 Access control system components as follows:
- .1 Kantech EntraPass Global Edition Integrated Access Control System, c/w:
  - .1 KT-400 Ethernet Ready Door Controller and Enclosure.
  - .2 Power supplies, battery back-up, etc.
  - .3 P325KPXSF IoProx Reader, XSF with Integrated Keypad.
  - .4 P50TAG Self Adhesive Round Tag (Provide 100 tags with system delivery).
  - .5 GE #(R) 1076D magnetic door contacts for steel doors.

3 Execution

3.1 INSTALLATION

.1 Supply and install an access control system with all required components and wiring for a complete and fully functional system. The equipment manufacturer's certified representative will supply and install all the equipment, devices, and make all the connections.

.2 Verify wire type and gauge with manufacturer prior to installation. All access control system wiring is to incorporate a “Brown” coloured jacket and be in installed in a conduit system.

.3 Locate all components as indicated on drawings.

.4 Wire and connect to electrically operated door locking hardware supplied by Division 8. Confirm location of each device requiring a backbox or pathway prior to installation.

.5 Wire and connect to door holders/closures supplied by Division 8. Confirm location of each device requiring a backbox or pathway prior to installation. Connect to fire alarm relays where indicated.

.6 Wire and connect door position switches supplied by Division 8. Confirm location of each device requiring a backbox or pathway prior to installation.

.7 Install door controllers and connect to 120 volt circuit. Install and connect proximity readers where indicated.

.8 Provide all documentation associated with the access control system alarm panel to the Owner, **including all programming/contractor codes required for future modifications to the system**.

.9 This contractor shall configure and program the access control system to function as per the requirements of this specification. The Halifax Regional School Board (HRSB) will provide the contractor with access to their server. It is the contractor's responsibility to deliver a fully functioning access control system.

3.2 TESTS

.1 A written report shall be prepared detailing the access control system verification and submitted to the Engineer.

3.3 PROGRAMMING AND TRAINING

.1 Provide the initial programming, customizing and data entry.

.2 Provide Demonstration, Operating and Maintenance Instructions as per Section 26 05 02.

.3 Provide an initial five (5) hours of training to the Owner's designated representative.

.4 Visit site 30 days following substantial performance and provide an additional eight (8) hours of training. Visit site 60 days following substantial performance and provide an additional four (4) hours of training.

****** END OF SECTION ******

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 DESCRIPTION OF SYSTEM

.1 Intrusion detection system including control panel, door contacts, digital key pads, motion detectors, power supplies, battery back-up, wire and conduits for a complete operating system.

.2 The system will forward alarm and trouble conditions to the main DSC 4020 control panel in the main building.

.3 Related Work:
- .1 26 05 31 Splitter, Junction, Pull Boxes and Cabinets.
- .2 26 05 32 Outlet Boxes, Conduit Boxes and Fittings.
- .3 26 05 34 Conduits, Conduit Fastenings and Conduit Fittings.
- .4 26 91 13 Electrical Systems Testing and Verification.

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Division 1.

2 Products

2.1 INTRUSION DETECTION SYSTEM

.1 The Intrusion Detection system consists of the following major components:
- .1 Alarm Control Panel:
  - .1 Eight on board zones.
  - .2 Expandable to 32 zones.
  - .3 Two PGM outputs.
  - .4 Template programming.
  - .5 Connect up to eight supervised keypads.
  - .6 Two partitions.
  - .7 500 event buffer.
  - .8 Forty user codes.

.2 Power supplies
- .1 Fully supervised for AC failure, low battery.
- .2 Four programmable, high current voltage outputs.
- .3 Provides up to 1 amp at 12 VDC.

.4 Key Pads
- .1 Two line, 32 character LCD screen
- .2 Built-in buzzer for key beeps.
- .3 Liquid crystal display, adjustable keypad back light and buzzer.
- .4 Provide vandal resistant Plexiglas enclosure c/w lockable cover.

.5 Door Contacts
- .1 Door contacts: vandal resistant, tamper proof, suitable for flush mounting on door.

.6 Motion Detectors
- .1 Wall-mount motion detector with Fresnel lens in conjunction with a dual-element PIR with microwave pulse doppler, to provide 90º coverage. PIR element provides accurate detection regardless of the direction of motion. Rain and dust proof, IP66.

.2 System Operation

.1 Intrusion Detection
- .1 System will be armed by the keypads. At the time the ARM command is received, and the system is about to become armed, it will sound a distinctive warning, alerting anyone still inside the building. Following a programmed delay, the system shall become armed.
- .2 When the system is armed, motion detectors and/or door contacts will initiate an alarm condition when a violation is detected. At this time the Skilled Trades panel will forward a signal to the main building panel. The main building panel will initiate a call to a monitoring agency via a communication circuit.
- .3 System will revert to normal operation when control panel is reset.

2.2 STANDARD OF ACCEPTANC E

.1 DSC Security Products complete with the following components:
- .1 DSC PC1832NK.
- .2 DSC PC5204 power supply, c/w CSA-1 lockable enclosure.
- .3 DSC PK5516 keypads.
- .4 DSC LC-151 motion detectors, IP65 rated, rain and dust proof
- .5 Potter ODC59A overhead door contacts.
- .6 Standard door contact: GE Security 1078-N.

3 Execution

3.1 INSTALLATION

.1 Supply and install the Intrusion Detection system with all required components and wiring

for a complete and fully functional system. The equipment manufacturer's certified representative will supply all the equipment and devices, and make all final connections.

.2 Verify wire type and gauge with manufacturer prior to installation.

.3 Locate all components as indicated on drawings. Do not locate a motion detector within one meter of a supply air diffuser.

.4 Install key pads in lockable Plexiglas enclosures.

.5 All Intrusion Detection system wiring is to incorporate a “Brown” coloured jacket and be in installed in a conduit system.

.6 Make connection to the main alarm control panel (DSC 4020) in Communication Room A107.

.7 Provide all documentation associated with the security system alarm panel to the Owner, **including all programming/contractor codes required for future modifications to the system**.

3.2 TESTS

.1 A written report shall be prepared detailing the security system verification and submitted to the Engineer.

****** END OF SECTION ******

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section.

1.2 RELATED SECTIONS

.1 26 05 00 Common Work Results for Electrical

.2 26 05 03 Electrical Identification

.3 26 91 13 Electrical Systems Testing and Verification

.4 27 10 05 Structured Cabling for Communications Systems

.5 26 05 34 Conduits, Conduit Fastenings and Conduit Fittings

1.3 GENERAL REQUIREMENTS

.1 The work covered by this section includes the expansion of an existing Video Surveillance System and includes installation of additional equipment and field testing of a communications network to conduct video surveillance for the premises.

.2 The existing system is manufactured by Panasonic System Networks Company.

.3 The video surveillance system shall be an IP based, integrated system, interior and exterior High Definition IP cameras, patch panels, Power Over Ethernet (PoE) switch, copper patch cords, exterior enclosures, power supplies, site licenses, cable and connectors, wire and conduits, programming, training and commissioning as further specified.

.4 The work shall include all materials not specifically mentioned, but which may be deemed necessary to complete any portion of the work in compliance with the requirements of these specifications.

1.4 REFERENCE STANDARDS

.1 CAN/CSA Standards
- .1 CAN/CSA T527-94 (Reaffirmed 1999) Grounding & Bonding for Telecommunications in Commercial Buildings.
- .2 CAN/CSA T528-93 (Reaffirmed 1997) Design Guidelines for Administration of Telecommunications Infrastructure in Commercial Buildings.
- .3 CAN/CSA T529-95 (Reaffirmed 2000) Telecommunications Cabling Systems in Commercial Buildings.

.1 CAN/CSA T530-99. Commercial Building Standard for Telecommunications Pathways and Spaces.

.4 C22-1-15 Canadian Electrical Code

.2 ANSI/TIA/EIA Standards

.1 ANSI/TIA/EIA-568-C.2 – Commercial Building Telecommunications Cabling, Part 2.

.2 ANSI/TIA/EIA-568-B.2.1 – Transmission Performance Specifications for 4-Pair 100 Ohm Category 6A Cabling.

.3 ANSI/TIA/EIA-569-A – Commercial Building Standard for Telecommunications Pathways and Spaces.

.4 ANSI/TIA/EIA-606 – The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.

.5 J-STD-607A Commercial Building Grounding and Bonding Requirements for Telecommunications.

.6 ANSI/TIA/EIA TSB-67 – Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems.
Open Offices.

.3 BICSI Standards

.1 BICSI/TDMM – Telecommunications Distribution Methods Manual. (13th. Edition)

.2 BICSI/TDMM – Electronic Safety and Security Design Reference Manual. (2nd. Edition).

.3 BICSI/TCIM - Information Technology Systems Installation Methods Manual (6th Edition).

1.5 DESCRIPTION OF SYSTEM

.1 System includes but not limited to:

.1 High Definition Color exterior cameras, lenses, exterior mounts and adaptors.

.2 High Definition Color interior cameras, lenses, exterior mounts and adaptors.

.3 Power over Ethernet plus (PoE+) switch.

.4 NVR is existing (Avigilon).

.5 Rack mounting hardware and shelves.

.6 Power supplies and associated hardware.

.7 Cat 6 horizontal cables between rack mounted patch panels and Video Surveillance System 8P8C outlets.

.8 Cat 6 Patch cords between Video Surveillance System 8P8C outlet and IP Cameras.

.9 Cat 6 Patch cords associated with Video Surveillance System.

.10 Components, equipment and wire for a complete operating system.

.11 System commissioning and operator training.

1.6 ON-SITE SERVICES

.1 Include in the tender price the following services:
- .1 Provide the initial system software, programming, customizing and data entry.
- .2 Manufacturer's representative must visit the site to test and commission the equipment. Provide written verification report detailing this phase of the work.
- .3 Provide Demonstration, Operating and Maintenance Instructions.
- .4 Provide twelve (12) hours of training to the Owner's designated representative.
- .5 Provide install and configure all software and equipment as required to allow the video surveillance system to be monitored from a remote location.

1.7 SHOP DRAWINGS

.1 Submit shop drawings of product and data before the supply of equipment. All equipment is to be CSA approved.

.2 Include:
- .1 Layout of equipment.
- .2 Complete Wiring Diagram.
- .3 Provide 3 copies of an operational and maintenance manual for all product being supplied.

2 Products

2.1 CAMERAS

.1 <u>All Exterior Cameras</u>
- .1 Cameras shall be high-grade ruggedized, commercial quality, fixed direction, color, high definition, 5.0 Megapixel, day/night, network enabled, dome type. Cameras shall include weatherproof, rugged, high impact, vandal resistant, puncture proof enclosure, tamper resistant hardware, thermostatically controlled heater. Key features at a minimum shall include:
  - .1 Image Sensor -1/3 inch CMOS.
  - .2 Active Pixels – 2048 (H), 1536 (V).
  - .3 Minimum illumination 0.2 Lux (F1.2) in colour mode.
  - .4 Image Compression Method – H.264 (MPEG-4 Part 10/AVC).
  - .5 Image Rate – 30 fps at all resolutions.
  - .6 Communications Standards Compliance- Open Network Video Interface Forum (ONVIF) Conformant.
  - .7 Dynamic Range >50 dB.
  - .8 Lens: Varifocal 9 –22 mm, auto iris.
  - .9 Motion detection – Selectable sensitivity and threshold.
  - .10 Operating Temperature -40° to +55° C.
  - .11 Network interface: 10/100 Base-T auto sensing half / full duplex via 8P8C modular jack .
  - .12 Power Supply: PoE IEEE 802.3af compliant, 24 VDC

.13 Power consumption, 9 watts maximum.
.14 Vandal resistant dome enclosure, c/w tamper proof screws.
.15 IP66, NEMA 4X weatherproof enclosure, with heater and fan.
.16 Pendant mount.
.17 Standard of Acceptance shall be Avigilon 5.0L-H3-DP2.
.18 Acceptable Manufacturers: Axis, Pelco.

.2 Interior Camera

.1 Cameras shall be high-grade ruggedized, commercial quality, fixed direction, color, high definition, 3.0 Megapixel, day/night, network enabled, dome type. Cameras shall include rugged, high impact, vandal resistant, puncture proof domes and tamper resistant hardware. Key features, at a minimum shall include:

.1 Image Sensor - 1/4 inch RGB CMOS.
.2 Minimum illumination 0.9 Lux at F1.7.
.3 Video Compression Method – H.264.
.4 Resolution: 2048 x 1536.
.5 Image Rate – 30 fps in all resolutions.
.6 Lens: Varifocal 3 – 9 mm.
.7 Remote focus capability.
.8 Motion detection – Selectable sensitivity and threshold.
.9 Operating Temperature 0° to +50° C.
.10 Network interface via 8-pin RJ-45 connector.
.11 Power Supply: POE, 24 VDC
.12 Power consumption, 6 watts maximum.
.13 Vandal resistant dome enclosure, c/w tamper proof screws.
.14 ONVIF compliant.
.15 Standard of Acceptance shall be Avigilon 3.0-H4SL-D01-1R.
.16 Acceptable Manufacturers: Axis, Pelco,

2.2 NETWORK VIDEO RECORDER SERVER.

.1 The network video server is existing.

2.3 POWER OVER ETHERNET (POE+) SWITCH

.1 10 port rack mounted power over Ethernet plus (PoE+) switch.

.2 Conform to IEEE Standard 802.3at.

.3 30 Watts per port.

.4 Provide power to cameras.

.5 Fully featured WEB interface.

.6 SNMP.

.7 Internal power supply.

.8 Rack-mountable in a standard 19" rack. (1U space)

.9 Standard of Acceptance: TRENDnet #TPE-1010WS

2.4 VIDEO SURVEILLANCE SYSTEM COPPER HORIZONTAL CABLING SYSTEM

.1 Cable
- .1 24 AWG 4 pair Category 6 cable.
- .2 CMP (FT-6 Rated).
- .3 Yellow Outer Jacket.
- .4 CSA T529-95 Category 6 Compliant.
- .5 Belden IBDN GigaFlex 2400 series.

.2 Patch Panels
- .1 24 port (1U)/48 port (2U) 8 position modular patch panels.
- .2 E1A-310-D 482 mm (19") Mount Compliant.
- .3 Wiring Configuration T568A (ISDN).
- .4 Belden IBDN QPBIX PS6+ series.
- .5 Category 6 Compliant.

2.5 VIDEO SURVEILLANCE PATCH CORDS

.1 Patch cords must be the same manufacturer type as the warranty solution being provided.
- .1 Telecommunications Rooms
  - .1 Copper Patch Cords
    - .1 Four (4) pair, 24 AWG Stranded Wire, 8P8C – 8P8C.
    - .2 Category 6 Compliant to 568-C.2.
    - .3 Wiring Configuration T568A (ISDN).
    - .4 Grey in Colour.
    - .5 3m (10 foot) in length.
    - .6 Provide quantity of patch cords to meet immediate requirement plus 20%.

3 Execution

3.1 EQUIPMENT INSTALLATION

.1 Ensure that every system component is installed according to manufacturer recommendations, and specifications.

.2 Install patch panels in equipment rack and populate with modules. Provide blanks for unused ports.

.3 Install Power-Over Ethernet plus (PoE+) switch and connect to power source. Provide mounting hardware as required.

.4 Provide a slack loop of three (3) meters at the rack for all installed cables. The purpose of this service loop is to allow any future re-configuration and / or upgrade.

.5 Install exterior building mounted video cameras where indicated. Install domes, mounts, brackets and adapters.

.6 Install patch panels in racks where indicated.

.7 Permanently identify Video Surveillance System horizontal cabling at each end using mechanically generated alpha-neumeric symbols (not hand written). This same information is to appear on the patch panel and outlet jack location.

.8 Provide rough-in in locations where indicated for future connection by Owner.

3.2 WIRING

.1 As per the Canadian Electrical Code.

.2 All wiring must be Category 6 between cameras and PoE switches.

.3 All Video Surveillance System wiring is to be installed in conformance with Section 27 05 28.

.4 Use liquid tight flexible metal conduit for all exterior power and signal wiring, where not concealed.

3.3 AIMING

.1 Cameras are to be aimed as indicated. Final aiming of each camera will be required prior to final completion.

.2 Allow for two (2) additional site visits following substantial performance to re-adjust and re-aim cameras as directed by the Owner.

3.4 TEST

.1 At the end of installation, make all necessary tests in the presence of the user's representative.

.2 Perform an Augmented Category 6 permanent link test of each installed cable to 500 MHz performance parameters. Submit test results for review. All cables tested must meet or exceed the minimum transmission requirements as per Augmented Category 6 requirements.

3.5 PROGRAMMING AND TRAINING

.1 Update the video surveillance system software. Provide programming, customizing and data entry as required for the additional cameras.

.2 Provide Demonstration, Operating and Maintenance Instructions as per Section 26 05 02.

.3 Identify each camera in software to indicate area viewed.

.4 Provide an initial twelve (12) hours of training to the Owner's designated representative.

.5 Visit site 30 days following substantial performance and provide an additional eight (8) hours of training.

.6 Visit site 60 days following substantial performance and provide an additional four (4) hours of training.

3.6 DRAWINGS AND MANUALS

.1 Provide 3 copies of system operation and technical manuals.

.2 Provide complete system documentation at completion of the work, c/w a hard copy of the following:
- .1 Cable test reports.
- .2 Record floor plan drawings in AutoCad format, indicating all Video Surveillance System racks, camera location and numerical identification.
- .3 Record drawings of the front elevation of each communication rack, detailing the location, size and description of all equipment.

3.7 VERIFICATION

.1 Verify the operation of all devices.

.2 Verify the wiring to all equipment is complete.

.3 Provide a copy of inspecting technician's report to user. Identify each device by location and certify the test results.

.4 Issue a Certificate of Verification confirming the completion of the verification.

******END OF SECTION******

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 RELATED WORK

.1 26 05 21 Wires and Cables 0-1000V.

.2 26 05 34 Conduits, Conduit Fastenings and Conduit Fittings.

.3 26 91 13 Electrical Systems Testing and Verification.

1.3 REFERENCES

.1 CAN/ULC-S524-M01, Installation of Fire Alarm Systems.

.2 ULC-S525-1978, Audible Signal Appliances for Fire Alarm.

.3 ULC-S526, Visual Signal Appliance for Fire Alarm Systems.

.4 CAN/ULC-S527-M99, Control Units, Fire Alarm.

.5 CAN/ULC-S528-M91, Manual Pull Stations.

.6 CAN/ULC-S529-M87, Smoke Detectors, Fire Alarm.

.7 CAN/ULC-S530-M91, Heat Actuated Fire Detectors, Fire Alarm.

.8 CAN/ULC-S536-M97, Inspection and Testing of Fire Alarm Systems.

.9 CAN/ULC-S537-M97, Verification of Fire Alarm Systems.

.10 National Building Code of Canada, 2010.

.11 Nova Scotia Building Code, latest edition.

.12 Canadian Electrical Code C22.1-15, Section 32.

1.4 SYSTEM DESCRIPTION

.1 System includes:
- .1 Connection to existing, single stage, fire alarm control panel to carry out fire alarm and protection functions including receiving alarm signals, initiating general alarm, supervision system continuously, actuating zone annunciators, and initiating trouble signals.
- .2 Manual alarm stations.
- .3 Automatic alarm initiating devices.
- .4 Audible signal devices.
- .5 End-of-line devices.
- .6 Ancillary devices.

.2 Operation of any alarm initiating device to:
- .1 Cause signal devices to operate throughout building.
- .2 Transmit signal to fire department via automatic dialer.
- .3 Cause origin of alarm to be indicated on control panel and remote annunciators.
- .4 Cause fire doors to release.
- .5 Cause shunt trip breakers to operate where indicated.
- .6 Cause air handling systems to shut down, where indicated.

1.5 REQUIREMENTS OF REGULATORY AGENCIES

.1 System components: listed by ULC and comply with applicable provisions of National Building Code, Provincial Building Code, and meet requirements of local authority having jurisdiction.

1.6 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Division 1.

.2 Include:
- .1 Detail assembly and internal wiring diagrams for control unit.
- .2 Overall system riser wiring diagram identifying control equipment initiating zones signaling circuits; identifying terminations, terminal numbers, conductors and raceways.
- .3 Details for devices.
- .4 Details and performance specifications for control, annunciation and peripherals with item by item cross reference to specification for compliance.

1.7 OPERATION AND MAINTENANCE DATA

.1 Provide operation and maintenance data for fire alarm system for incorporation into manual specified in Division 1.

.2 Include:
- .1 Instructions for complete fire alarm system to permit effective operation and maintenance.
- .2 Technical data - illustrated parts lists with parts catalogue numbers.
- .3 Copy of approved shop drawings with corrections completed and marks removed except review stamps.

1.8 MAINTENANCE

.1 Provide one year's maintenance with two inspections by manufacturer during warranty period. Carry out first test six months after Substantial Performance. Carry out second test twelve months after Substantial Performance Inspection tests to conform to CAN/ULC-S536-97, Standard for The Inspection and Testing of Fire Alarm Systems. Each Inspection shall conform to the test procedures as stipulated under Section 6, Periodic Inspections and Tests-Yearly. Contractor is to complete forms as contained in Appendix E3 on each inspection. Submit inspection report to Engineer. Include all associated costs in this tender.

1.9 TRAINING

.1 Provide on-site lectures and demonstration by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system.

2 Product

2.1 MATERIALS

.1 Equipment and devices: ULC listed and labeled and supplied by single manufacturer.

2.2 SYSTEM OPERATION: SINGLE STAGE - SIGNALS ONLY

.1 Actuation of any alarm initiating device to:
- .1 Cause electronic latch to lock-in alarm state at central control unit.
- .2 Indicate zone of alarm at central control unit and at Remote Annunciator.
- .3 Cause audible signaling devices to sound continuously throughout building and at central control unit.
- .4 Cause strobe lights to flash.
- .5 Transmit signal to fire department or ULC approved monitoring agency.
- .6 Cause closer/holders to release causing fire doors to close automatically.
- .7 Cause electrified hardware to release where indicated.
- .8 Cause automatic shutdown of any air handling systems, where indicated.
- .9 Cause shunt trip breakers to operate where indicated.

.2 Acknowledging alarm: indicated at central control unit.

.3 Possible to silence signals by "alarm silence" switch at control unit, after 60 s period of operation.

.4 Subsequent alarm, received after previous alarm has been silenced, to re-activate signals.

.5 Actuation of supervisory devices to:
- .1 Cause electronic latch to lock-in supervisory state at central control unit.
- .2 Indicate respective supervisory zone at central control unit.
- .3 Cause audible signal at central control unit to sound.
- .4 Activate common supervisory sequence.
- .5 Transmit signal to fire department or ULC approved monitoring agency.

.6 Alarm and supervisory device not to return system indications/functions back to normal until control unit has been reset.

.7 Trouble on system to:
- .1 Indicate circuit in trouble at central control unit.
- .2 Activate "system trouble" indication, buzzer and common trouble sequence. Acknowledging trouble condition to silence audible indication; whereas visual indication to remain until trouble is cleared and system is back to normal.
- .3 Transmit signal to fire department or ULC approved monitoring agency.

.8 Trouble on system: suppressed during course of alarm.

.9 Trouble condition on any circuit in system not to initiate alarm conditions.

2.3 CONTROL PANEL

.1 Control Panel is existing (Edwards EST-2).

2.4 WIRING

.1 Twisted copper conductors: rated at not less than 300V (per CEC).

.2 To initiating circuits: 18 AWG minimum, “Red” coloured jacket and in accordance with manufacturer's requirements.

.3 To signal circuits: 14 AWG minimum, solid conductor and in accordance with manufacturer's requirements. Conductor insulation colour to “Red (Pos); “Black” (Neg). Clearly identify conductors as incoming and outgoing in device box.

.4 To control circuits: 14 AWG minimum, and in accordance with manufacturer's requirements.

.5 All conduits used for the installation of the fire alarm system are to contain a #12 RW90 green bonding conductor. The use of the shield component of a system cable is not an acceptable bonding method.

.6 Install all fire alarm wiring in a conduit system.

2.5 MANUAL ALARM STATIONS

.1 Addressable manual pull station.
- .1 Pull lever, semi-flush wall mounted type, single action, single stage, electronics to communicate station's status to addressable module/transponder over 2 wires and to supply power to station. Station address to be set on station in field.
- .2 Provide Polycarbonate vandal resistant cover over each pull station.

2.6 AUTOMATIC ALARM INITIATING DEVICES

.1 Addressable Multisensor Detectors.
- .1 Photoelectric and Thermal sensors.
- .2 Electronics to communicate detector's status to addressable module/transponder.
- .3 Detector address to be set on detector in field.
- .4 Sensitivity settings: settings determined and operated by control panel. No shifting in detector sensitivity due to atmospheric conditions (dust, dirt) within certain parameters.
- .5 Ability to annunciate minimum of 4 levels of detector contamination automatically with trouble condition at control panel.
- .6 Duct mounted where indicated.

.2 Addressable Interface Modules.
- .1 Provide addressable interface modules (AIM) as required for each digital normally open contact that may require an address (or zone) interfaced to addressable loop controller.
- .2 Addressable interface module address to be set in the field.

.3 Addressable Relay:
- .1 Addressable relays to perform control of magnetic door holders, solenoid valves, fan shutdown, elevator recall and other control functions as indicated.
- .2 Ability to be programmed as required by system sequence of operation with “and” and “and/or” functions as required.
- .3 Electronics to provide ability to communicate status and control commands over 2 wire addressable loop.
- .4 Address to be set in the field.

2.7 NOTIFICATION APPLIANCES

.1 Combination Bell/Strobe signals.
- .1 Flush mounted in electrical backbox.

.2 Bell/Strobe mounting plate, red in colour.
.3 Strobe (75 cd)
.4 Self-Synchronizing strobe.
.5 Six inch vibrating bell.
.6 Complete with wire guard.

2.8 END-OF-LINE DEVICES

.1 End-of-line devices to control supervisory current in signaling 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.

2.9 REMOTE BOOSTER POWER SUPPLIES

.1 24VDC, 10 Amp model.

.2 120 VAC input.

.3 Four independent 3 amp NACs.

.4 Field selectable input-to-outputs

.5 On-board LED Status indicators.

.6 Follow signal rate of main panels NAC.

.7 Built-in battery charger and power supplies.

.8 10 amp-hour battery, minimum capacity.

2.10 POLYCARBONATE SHIELD WITH WARNING HORN

.1 Tamper-proof clear Lexan polycarbonate shield.

.2 Warning tone emitted when lifted.

.3 9 volt alkaline battery.

.4 Mounting frame.

2.11 STANDARD OF ACCEPTANCE

.1 Edwards, to match existing.

3 Execution

3.1 INSTALLATION

.1 Fire Alarm Control Panel is existing (Edwards EST-2). Modify existing FACP as required to allow for expansion to new area as indicated.

.2 All fire alarm system wiring is to be in a conduit system. Flexible metal conduit may be used for the final connection of devices located in suspended ceilings, provided a junction box is installed within 1.5 meters (5 feet) of the device and a single flexible conduit is extended to the device box. Do not T-tap for initiating device wiring. Wire the addressable loop to the device input terminals and continue the addressable loop from the device output terminals.

.3 Install manual alarm stations and connect to addressable loop wiring.

.4 Locate and install detectors and connect to addressable loop wiring. Do not mount detectors within 914 mm (36 inches) of air outlets. Maintain at least 610 mm (24 inches) radius clear space on ceiling, below and around detectors.

.5 Maintain a minimum of 1200 mm (48 inches) clearance between every signaling appliance and lockdown annunciation signaling appliances.

.6 Maintain a minimum of 600 mm (24 inches) clearance between every addressable device and electronic ballasts.

.7 Install electronic bell/strobe signals and connect to signal circuits.

.8 Install remote booster power supplies as indicated and connect to nearest addressable data loop. Connect to local 120 VAC circuit. Provide a circuit breaker lock-on device for the branch circuit feeding the BPS.

.9 Install end-of-line devices at end of signal circuits.

.10 Install remote relay units to provide control function.

.11 Splices are not permitted for fire alarm system wiring.

.12 Provide necessary raceways, cable and wiring to make interconnections to terminal boxes, Annunciator equipment and CCU, as required by equipment manufacturer.

.13 Ensure that wiring is free of opens, shorts or grounds, before system testing and handing over.

.14 Identify circuits and other related wiring at central control unit, annunciators, and terminal boxes.

.15 Modify existing active graphic at front door to reflect addition of the Skilled Trades building.

.16 Provide lamicoid identification plates for all addressable devices.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work Results for Electrical and CAN/ULC-S537.

.2 Fire alarm system:

- .1 Test system and each new device and alarm circuit to ensure manual stations, smoke 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 signaling circuits to ensure proper operation of systems.
- .4 Addressable circuits system style DCLB:
  - .1 Test each conductor on all DCLB addressable links for capability of providing 3 or more subsequent alarm signals on line side of single open-circuit fault condition imposed near electrically most remote device on each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.
  - .2 Test each conductor on all DCLB addressable links for capability of providing 3 or more subsequent alarm signals during ground-fault condition imposed near electrically most remote device on each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.

.3 Provide final PROM program re-burn for system incorporating program changes made during construction.

.4 Provide written fire alarm system verification report and certificate following testing of system.

***** END OF SECTION *****

PART 1- GENERAL

NOTE: Prevention of sediment leaving the construction site is mandatory. As a prevention measure to ensure erosion and sediment is controlled during site construction the contractor **MUST** stage the grubbing, topsoil removal and mass earthwork cut/fill operation so that **no more than 500 m^2 (max) of site soils are exposed at any one time**. Prior to proceeding to expose additional area the previously exposed area must be covered with gravel, stone or 100mm of straw. Careful planning and scheduling of the site work is required by the contractor to ensure compliance with this stipulation. Non compliance will not be tolerated, no exceptions.

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 31 00 10 - Earthwork.

1.2 REFERENCES

.1 "Erosion and Sedimentation Control Handbook for Construction Sites" (Nova Scotia Department of the Environment - 1988).

.2 Division 7 of the Standard Specification Highway Construction and Maintenance (Nova Scotia Department of Transportation and Public Works - Latest Edition).

1.3 DEFINITIONS

.1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade environment aesthetically, culturally and/or historically.

.2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.4 REQUIREMENTS INCLUDED

.1 The provisions of this section shall apply to all sections.

1.5 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Contractor must have on site a person who has successfully completed the *Erosion and Sediment Control Course* provided by the NSTPW and the Centre for Water Resources, Dalhousie University, Halifax, NS. The contractor must submit a copy of

this person's Certificate prior to starting work on site as part of the Environmental Protection Plan.

.3 Prior to commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by the Consultant. Environmental Protection Plan is to present comprehensive overview of known or potential environmental issues which must be addressed during construction.

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

.5 Environmental protection plan: include:

.1 Name and contact number of person responsible for ensuring adherence to Environmental Protection Plan.

.2 Name and qualifications of person responsible for manifesting hazardous waste to be removed from site.

.3 Name and qualifications of person responsible for training site personnel.

.4 Descriptions of environmental protection personnel training program.

.5 Erosion and sediment control plan which identifies type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.

.6 Drawings showing locations of proposed temporary excavations or embankments for haul roads, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.

.7 Traffic control plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Plans include measures to minimize amount of mud transported onto paved public roads by vehicles or runoff.

.8 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use. Plan to include measures for marking limits of use areas including methods for protection of features to be preserved within authorized work areas.

.9 Spill Control Plan: including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.

.10 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.

.11 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and travel off project site.

.12 Contaminant prevention plan that: identifies potentially hazardous substances to be used on job site; identifies intended actions to prevent introduction of such materials into air, water, or ground; and details provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.

.13 Waste water management plan that identifies methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.

.14 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.

1.6 FIRES

.1 Fires and burning of rubbish on site **NOT** permitted.

1.7 DISPOSAL OF WASTES

.1 Collect, separate and recycle all waste materials as per instructions to Bidders, Provincial and Municipal Regulations.

.2 Do not bury rubbish and waste materials on site.

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

.4 Do not dispose of construction debris; wood, concrete, asphalt, etc., on site, but at a licensed disposal facility.

1.8 PRECAUTIONARY MEASURES

.1 Take every and all precautions to prevent discharge of materials to the environment. All necessary precautions, material, equipment and labour for the prevention of discharges shall be included in the Contract.

.2 Do not conduct work involving contaminated materials during precipitation.

.3 The Contractor shall report to NSE all spills on site of substances introduced to the site by the Contractor (e.g., fuel, lubricants). Adhere to spill reporting requirements as outlined in provincial and federal legislation.

.4 The Contractor shall take all necessary measures to remedy the effects any spill, whether of regulated or non-regulated substances, and shall assume full financial liability for all such remedial measures.

1.9 DRAINAGE

.1 Provide erosion and sediment control plan that identifies type and location of erosion and sediment controls to be provided. Plan: include monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.

.2 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.

.3 Do not pump water containing suspended materials into waterways, sewer or drainage systems.

.4 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.10 SITE CLEARING AND PLANT PROTECTION

.1 Protect trees and plants on site and adjacent properties where indicated from damage by work of this contract (See drawing C-101). Protect root systems within dripline of existing trees to remain.

.2 Protect, trees and shrubs adjacent to construction work, storage areas and trucking lanes, as per civil plan.

.3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.

.4 Minimize stripping of topsoil and vegetation.

.5 Restrict tree removal to areas indicated or designated by Consultant.

.6 Install and maintain fence barricades around trees and vegetation to remain as per Civil Plans.

.7 Contractor is to restrict soil disturbance and construction activity on and adjacent to the site to a minimum. Any existing concrete or asphalt disturbed during construction and not designated to be replaced shall be reinstated with similar material types and thicknesses meeting or exceeding the original. Any disturbed areas or exposed soils must be protected from the forces of erosion, prevented from leaving the construction site and reinstated with sod or other means recommended by the Consultant.

1.11 WORK ADJACENT

TO WATERWAYS

.1 Do not operate construction equipment in waterways.

.2 Do not use waterway beds for borrow material.

.3 Do not dump excavated fill, waste material or debris in waterways.

.4 Design and construct temporary crossings to avoid erosion to waterways.

.5 Do not skid logs or construction materials across waterways.

.6 Do not blast under water or within 100 m of indicated spawning beds.

1.12 STOCKPILING

.1 Impacted and excavated materials shall be stockpiled so as to prevent spread of impacts.

1.13 POLLUTION CONTROL

.1 Maintain temporary erosion and pollution control features installed under this contract. The Contractor shall carry out regular inspections and maintenance of all erosion and sedimentation controls ensuring proper installation and function, especially prior to and after major storm events.

.2 Control emissions from equipment and plant to local authorities' emission requirements.

.3 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area, by providing temporary enclosures.

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

.5 Provide a buffer zone in combination with appropriate erosion and sedimentation control when working adjacent to watercourse. Consult with regulatory agencies.

.6 The Contractor must not convey soils onto the existing road paved surface on truck tires. Any soils displaced and deposited onto the existing shared driveway or road asphalt surface must be swept clean immediately.

1.14 HISTORICAL / ARCHAEOLOGICAL CONTROL

.1 Provide historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on project site: and/or identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in area are discovered during construction.

.2 Plan: include methods to assure protection of known or discovered resources and identify lines of communication between Contractor personnel and Consultant.

1.15 NOTIFICATION

.1 Consultant or Regulatory Agency will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.

.2 Contractor: within 24 hours after receipt of such notice, inform Consultant or Regulatory Agency of proposed corrective action and take such action for approval by Consultant or Regulatory Agency.

.3 Consultant or Regulatory Agency 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.

1.16 PERMITS AND APPROVALS

.1 Obtain copies of any permits or approvals issued by approval agencies. Review and comply with all conditions contained in permit or approval.

.2 Where permits or approvals are required and not obtained at time of bidding: be responsible for obtaining permits or approvals.

.3 The Contractor will be responsible to obtain and pay for any and all required permits from the municipality including but not limited to: encroachments, streets and services, or topsoil removal.

.4 Ensure all staff and subcontractors are aware of all terms and conditions of any permit/approval issues and that they are adhered to.

1.17 EQUIPMENT MAINTENANCE

.1 All maintenance fluids shall be contained, handled and disposed of in accordance with applicable federal and provincial legislation and municipal bylaws. Spillage on the ground is prohibited. Any spills on site must be reported to the Environmental Emergency Number: 1(800)565-1633.

.2 All equipment and vehicles shall be equipped with a suitable dry chemical fire extinguisher.

.3 Vehicles and equipment, if fuelled at the work site, shall be undertaken in location approved by the Province, all in accordance with regulatory requirements.

End of Section

PART 1 - GENERAL

Note: All earthwork for this project will be completed by the Site contractor. Site Contractor will need to coordinate work with other Trades and schedule work with the General Contractor.

1.1 RELATED SECTIONS

.1 Section 01 35 43 - Environmental Procedures.
.2 Section 31 11 00 - Clearing and Grubbing
.3 Section 31 23 33 - Excavating, Trenching and Backfilling.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM
  .1 ASTM D698-00ae1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort 600kN-m/m^3.
.2 Canadian Standards Association (CSA International)
  .1 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  .2 CAN/CSA-A3000-03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    .1 CSA-A3001-03, Cementitious Materials for Use in Concrete.
.3 Nova Scotia Department of the Environment
  .1 Erosion and Sedimentation Control Handbook for Construction Sites.
.4 Nova Scotia Department of Transportation and Public Works (NSTPW) Standard Specification for Highway Construction and Maintenance latest Edition, latest edition.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
  .1 Submit to designated testing agency, sample of backfill for fill material proposed for use, no later than one week before backfilling or filling work.
.2 Quality Control: in accordance with Section 01 45 00 - Quality Control.

.1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article.
.2 Submit testing results and report as described in PART 3 - FIELD QUALITY CONTROL.

1.4 QUALITY ASSURANCE/REGULATORY REQUIREMENTS

.1 Shore and brace excavations, protect slopes and banks and perform work in accordance with Provincial and Municipal regulations whichever is more stringent.
.2 Comply with Explosives Act of Canada.
.3 Perform blasting in accordance with Provincial and Municipal regulations: repair damage as directed by Consultant.
.4 Do not blast within 3 m of building and where damage would result.
.5 Health and Safety Requirements: do construction in accordance with the Nova Scotia Occupational Health and Safety Act.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with instructions to Bidders, Provincial and Municipal Regulations..
.2 Divert unused vegetation materials from landfill to local facility.

1.6 EXISTING CONDITIONS

.1 Buried services:
  .1 Before commencing work verify location of buried services on and adjacent to site.
  .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
  .3 There are existing water, sewer, O/H & U/G power, and communications services located on the site as well as on adjacent properties. The water and sewers are to remain operational at all times.
.2 Soil conditions - Contractors must visit the site to satisfy themselves of the types, quantities, and properties of the existing site materials in consideration of the lump sum cost to complete the site to the grades indicated.
.3 Soil reports - Any soil reports available from the Owner will be made available for information purposes only and shall not form part of this contract unless specifically indicated on the

drawings or in written specifications. The Geotechnical Investigation report prepared by Conquest Engineering, has been included in the Tender documents at the end of this section. Based on Geotechnical report and the proposed building elevations a certain amount of bedrock breaking and removal will be required as part of the contractor's lump sum cost.

.4 Existing Trees - There are a number of Mature Healthy Trees which are to remain and be protected during construction (including roots & branches to the drip lines), These trees are to remain as part of the landscaping for the new building and are to be protected with temporary fencing. Contractor to review the site with Architect to confirm which trees are to be protected. See civil Plan for Protection details.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Contractor shall supply all required imported material and remove and dispose of all surplus material not required to complete the earthwork off site as part of the lump sum cost.

.2 Surplus, Borrow and Subgrade to NSTPW Standard Specification for Highway Construction and Maintenance latest Edition, Division 2, Sections 4, 5 and 6.

.3 Granular Type 1, 2, and 3 to NSTPW Standard Specification for Highway Construction and Maintenance latest Edition, Division 3, Section 2.

.4 FILL: approved, sand/gravel, able to be compacted to the specified requirements noted in Part 3.5, free of stones greater than 200 mm in diameter, organic matter and deleterious material, well graded from course to fine. Fill material can be select portions of existing site material or imported material provided they meet the required moisture and compaction criteria.

.5 ROCK FILL: well graded rock fill may be used as FILL in accordance with the following gradation requirements:

- .1 Maximum particle size shall be 200mm or less within 500mm of finished subgrade.
- .2 For rock fill between 500mm to 1200mm below finished subgrade maximum particle size shall be 300mm or less.
- .3 For rock fill 1200mm or more below finished subgrade maximum particle size shall be 600mm or less.

.4 Where such fill is used in the immediate area of building footings the base of the footing excavation shall be considered as finished subgrade elevation.

.6 Unshrinkable fill: proportioned and mixed to provide:
- .1 Maximum compressive strength of 0.4 MPa at 28 days.
- .2 Maximum Portland cement content of 25 kg/m^3.
- .3 Minimum strength of 0.07 MPa at 24 h.
- .4 Concrete aggregates: to CAN/CSA-A23.1/A23.2.
- .5 Cement: to CAN/CSA-A3001, Type GU.
- .6 Slump: 160 to 200 mm.

.7 STRUCTURAL FILL: 150mm minus well graded granular material with ‹10% Fines. This material must be used to support buildings and pavements (asphalt and concrete).

PART 3 - EXECUTION

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with NSE requirements.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

3.2 PREPARATION/ PROTECTION

.1 Protect excavations from freezing.

.2 Keep excavations clean, free of standing water, and loose soil.

.3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Consultant approval.

.4 Protect natural and man-made features that are required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.

.5 Protect buried services that are required to remain undisturbed. The existing water and sewer services, U/G power and on the property and on adjacent properties must

remain operational and undamaged during construction and upon final completion.

3.3 GRUBBING

.1 Remove trees, stumps, logs, brush, shrubs, bushes, vines, undergrowth, rotten wood, dead plant material, exposed boulders and debris within areas designated on drawings.

.2 Remove stumps and tree roots below footings, slabs, and paving, and to 300mm below finished grade elsewhere (See section 31 11 00).

.3 Dispose of grubbed material off site daily to permanent disposal area. Contractor is responsible for locating disposal site and costs associated with removal, transport and disposal and reinstatement of grubbed material.

3.4 EXCAVATION

.1 Strip topsoil and all other unsuitable materials over areas to be covered by new construction, over areas where grade changes are required, and so that excavated material may be stockpiled without covering topsoil.

- .1 Stockpile only the quantity of topsoil required for site reinstatement on site for later use and protect from forces of erosion and moisture.
- .2 Existing site topsoil is to be used for final site grading in areas to be seeded or sodded provided it meets the topsoil specifications and moisture.
- .3 All surplus topsoil or that rendered unsuitable due to moisture or soil specifications shall be removed from the site and disposed of off site at the Contractor's cost.
- .4 Any shortages of topsoil required for final site reinstatement shall be imported by the contractor as part of his work and included in this lump sum cost.

.2 Excavate as required to carry out work.

- .1 Do not disturb soil or rock below bearing surfaces.
- .2 Notify Consultant when excavations are complete.
- .3 If bearings are unsatisfactory, additional excavation will be required by the contractor at his cost. This will not be paid as an extra should the material become unsatisfactory because of exposure to weather (e.g. precipitation or freezing).
- .4 Excavation for foundations taken below depths shown without Consultant's written authorization to be filled with concrete of same strength as for footings at Contractors expense.

.5 Random organics and fill present over the entire site cannot provide acceptable bearing layer for footings, all footings must be founded directly on native undisturbed till, bedrock or imported structural fill.

.6 For slabs on grade, concrete pavers, asphalt pavements and other hardscape elements, the surface of the exposed till subgrade without organics should be heavily compacted and proof-rolled prior to the placement of any backfill, form work or concrete. A large roller compactor or fully loaded tandem truck should be used for the proof rolling operation where possible. Any local soft or wet areas that cannot achieve specified levels of compaction will require over-excavation and replacement with approved compacted structural fill to achieve a competent base for compaction or structural fills. Geotechnical engineer to confirm if any soft spots are to be removed.

.7 It should be noted that the random fill and Till soils on this site will be very difficult to work in wet and cold conditions. Some of these materials are not compactable above their optimum moisture content with standard construction equipment due to high fines contents. Re-use of these types of materials will require protection from exposure to moisture and freezing conditions. Construction activities should be coordinated with expected weather patterns and may be delayed during periods of precipitation and freezing conditions. Constructed works should be sealed and sloped to minimize the infiltration of surface water. Any areas deemed unsuitable must be removed , disposed of (off site) and replaced with Structural Fill Borrow. If excavated random fill soils are used to build up landscape subgrades, each lift should be proof-rolled in the presence of an experienced geotechnical inspector. Local areas which exhibit excessive displacement should be excavated and reconstructed to the satisfaction of the geotechnical inspector.

.8 The existing fill and organics must be excavated from within the footprint of the new building (including the 1H:1V zone of influence), the concrete or paved surfaces, and any other settlement sensitive structures included in redevelopment plans. Selective re-use of the existing fill may be viable for general site grading and building up sub-grades outside the

footprint of structures, but this material is not likely to meet specifications for structural fill applications.

.9 Asphalt and grubbing layers to be removed and disposed of off site.

.3 Excavate trenches to provide uniform continuous bearing and support for 150 mm thickness of pipe bedding material for sewers and water on solid and undisturbed ground.

.1 Trench widths 150mm below the pipe invert or at a point 300 mm above the pipe shall not exceed the diameter of the pipe plus 600 mm.

.4 Excavate for slabs and paving to subgrade levels (see C-101 for details).

.1 In addition, remove all topsoil, organic matter, debris and other loose and harmful matter encountered at subgrade level.

.5 All exposed soil surfaces shall be rolled with a static roller and shaped to prevent ingress of moisture and ponding water.

.6 Immediately after excavation and prior to placement of fill, proof roll subgrade with a 10 ton minimum vibratory roller to detect any soft areas and provide a uniform surface. Proof roll under the supervision of the Consultant.

.7 Contractor shall protect subgrade with 150 mm of gravel or 100 mm of straw cover as soon as grading of subgrade is complete.

.8 Any exposed soils rendered unsuitable due to moisture or construction activity shall be removed and replaced with acceptable Fill at the Contractor's Cost.

3.5 BACKFILLING

.1 Inspection: do not commence backfilling until fill material and spaces to be filled have been inspected and approved by Consultant.

.2 Remove snow, ice, construction debris, organic soil and standing water from spaces to be filled.

.3 Lateral support: maintain even levels of backfill around structures as work progresses, to equalize earth pressures.

.4 Compaction of subgrade: compact existing subgrade under walks, paving, and slabs on grade, to same compaction as specified for fill.

.1 Fill excavated areas with selected subgrade material compacted as specified for fill in all areas EXCEPT for fill required within the building footprint and pavement areas and their respective 1H:1V zone of influence.

.2 Fill within the building footprint, pavement and 1H:1V zone of influence MUST be completed using imported

well graded borrow material (150 mm minus well graded granular material with less than 10% fines). Extend granular fill for the building beyond the footings a distance equal to the required depth of fill (minimum 1H:1V for the zone of influence). Site fill will NOT be acceptable for use in this area as it is not anticipated to meet the required moisture content (see Geotechnical Report for details).

.5 Placing:
- .1 Place backfill, fill and base course material in 150 mm lifts: add water as required to achieve specified density.
- .2 Place unshrinkable fill in areas as indicated: consolidate and level unshrinkable fill with internal vibrators.

.6 Compaction: compact each layer of material to following Standard Proctor dry densities:
- .1 Under landscaped areas: 93%.
- .2 Under parking, driveways, sidewalks, walkways, other asphalt areas and patios: 98% (within 300mm of subgrade) and 95% below 300mm of subgrade.
- .3 Under building influence area: 100%.

.7 Under slabs and paving:
- .1 Use approved Fill up to bottom of granular base courses.
- .2 Use 200mm thick 25mm clear stone granular material below building floor slabs.
- .3 Use Type 1 granular material below asphalt paving (see Civil drawing C101).
- .4 Use Type 1 granular material below concrete walkways (see Civil drawing C101).

.8 In trenches:
- .1 Up to 300 mm above conduit: Sand placed by hand.
- .2 Over 300 mm above conduit: native material approved by Consultant.
- .3 Up to 300 mm above water or sewer pipes: Type 1 gravel.
- .4 Over 300 mm above water or sewer pipes: native material approved by Consultant.

.9 Under seeded and sodded areas: use site excavated material to bottom of topsoil except in trenches and within 1200 mm of foundations.

.10 Blown rock material, not capable of fine grading, is not acceptable, imported material must be placed on this type of material

.11 Against foundations (except as applicable to trenches and under slabs and paving): Structural Fill material with no stones larger than 200 mm diameter within 1200 mm of structures.

.12 Underground tanks: use sand to bottom of granular base courses, to bottom of topsoil or as per tank manufacturers recommendations, as applicable.

3.6 GRADING

.1 Grade so that water will drain away from buildings, walls and paved areas, to catch basins and other disposal areas approved by the Consultant.

.1 Grade to be gradual between finished spot elevations and contours shown on drawings.

.2 Maximum slope for landscaped areas shall be 3H:1V.

.3 Rough grade to the following approximate depths below finished grades;

.1 150mm for seeded or sodded areas.

.2 450mm for shrub planting areas.

.3 300mm for building floor slabs.

.4 375mm for asphalt areas.

.5 300mm for concrete walks.

3.7 FIELD QUALITY CONTROL

.1 Testing of materials and compaction of backfill and will be carried out by testing laboratory designated by Consultant.

.2 Not later than one week before backfilling or filling, provide to designated testing agency, samples of backfill as described in PART 1 - SUBMITTALS.

.3 Do not begin backfilling or filling operations until material has been approved for use by Consultant.

.4 Not later than 48 hours before backfilling or filling with approved material, notify Consultant so that compaction tests can be carried out by designated testing agency.

3.8 SHORTAGE AND SURPLUS

.1 Supply necessary fill to meet backfilling and grading requirements and with minimum and maximum rough grade variance. All necessary borrow material is the Contractor's responsibility and shall be included in the lump sum contract price.

.2 Remove and dispose of unsuitable and surplus material off site (site selection is the Contractor's responsibility and costs associated with removal/disposal, reinstatement/erosion Controls to be included in the lump sum contract cost).

3.9 CLEANING

.1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

End of Section

1PART - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures
.2 Section 03 30 00 - Cast-in-Place Concrete.
.3 Section 32 11 16 - Granular Sub-base.
.4 Section 32 11 23 - Aggregate Base Courses.
.5 Section 32 12 16 - Asphalt Paving for Building Sites.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM)
  .1 ASTM D4791-99, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
  .2 Nova Scotia Department of Transportation and Public Works (NSTPW) Standard Specification for Highway Construction and Maintenance, latest edition.

1.3 SAMPLES

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
.2 Allow continual sampling by Consultant during production.
.3 Provide Consultant with access to source and processed material for sampling.
.4 Install sampling facilities at discharge end of production conveyor, to allow Consultant to obtain representative samples of items being produced. Stop conveyor belt when requested by Consultant to permit full cross section sampling.
.5 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.
.6 Provide water, electric power and propane to Consultant laboratory trailer at production site.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Divert unused granular materials from landfill to local facility as approved by Consultant.

2PART - PRODUCTS

2.1 MATERIALS

.1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.
.2 Flat and elongated particles of coarse aggregate: to ASTM D4791.
  .1 Greatest dimension to exceed five times least dimension.

.3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:
- .1 Natural sand.
- .2 Manufactured sand.
- .3 Screenings produced in crushing of quarried rock, boulders, gravel or slag.

.4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:
- .1 Crushed rock.
- .2 Gravel composed of naturally formed particles of stone.

2.2 SOURCE QUALITY CONTROL

.1 Inform Geotechnical Consultant of proposed source of aggregates and provide access for sampling at least 4 weeks prior to commencing production.

.2 If, in the opinion of Consultant, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.

.3 Advise Consultant 4 weeks in advance of proposed change of material source.

.4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

3PART - EXECUTION

3.1 PREPARATION

.1 Handling
- .1 Handle and transport aggregates to avoid segregation, contamination and degradation.

.2 Stockpiling
- .1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Consultant. Do not stockpile on completed pavement surfaces.
- .2 Stockpile aggregates in sufficient quantities to meet Project schedules.
- .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
- .4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.

.5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.

.6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Consultant within 48 h of rejection.

.7 Stockpile materials in uniform layers of thickness as follows:

.1 Max 1.5 m for coarse aggregate and base course materials.

.2 Max 1.5 m for fine aggregate and sub-base materials.

.3 Max 1.5 m for other materials.

.8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.

.9 Do not cone piles or spill material over edges of piles.

.10 Do not use conveying stackers.

.11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.2 CLEANING

.1 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.

.2 Remove any unused aggregates from the site.

.3 For temporary or permanent abandonment of aggregate source, restore source to condition meeting requirements of authority having jurisdiction.

End of Section

PART 1- GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.
.2 Section 01 35 43 - Environmental Procedures.
.3 Section 31 23 33 - Excavation, Trenching and Backfilling.

1.2 MEASUREMENT PROCEDURES

.1 All clearing, grubbing and associated work forms part of the lump sum contract. All grubbing must be removed from site and disposed off site at a site selected by the site Contractor. Trees on this site may be impacted by the spruce beetle and removal and disposal must follow proper protocol to prevent spread to other areas.

1.3 REFERENCES

.1 Nova Scotia Department of the Environment Erosion and Sedimentation Control Handbook for Construction Sites.

1.4 DEFINITIONS

.1 Clearing consists of cutting off trees and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.
.2 Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.
.3 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris.
.4 Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of fallen timber and surface debris.
.5 Grubbing consists of excavation and disposal of stumps and roots to not less than specified depth below existing ground surface.

1.5 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
.2 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.6 QUALITY ASSURANCE

.1 Do construction in accordance with the Nova Scotia Occupational Health and Safety Act.
.2 Safety Requirements: worker protection.
  .1 Workers must wear eye protection and protective clothing when performing clearing operations.

1.7 STORAGE AND PROTECTION

.1 Prevent damage to fencing, trees, landscaping, natural features, bench marks, existing buildings, driveways, survey markers, existing pavement, utility lines, site appurtenances, water courses, and root systems of trees which are to remain.
  .1 Repair damaged items to approval of Consultant.
  .2 Replace trees designated to remain, if damaged, as directed by Consultant.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling with instructions to Bidders, Provincial and Municipal Regulations.

.2 Consider felled timber from which saw logs, pulpwood, posts, poles, ties, or fuel wood can be produced as saleable timber.
  .1 Trim limbs and tops, and saw into saleable lengths for saw logs, for pulpwood, for poles, for ties, and for fuel wood.
  .2 Stockpile adjacent to site. The Contractor will be the owner of the material and responsible for its removal from the site.

2Part - PRODUCTS

2.1 MATERIALS
.1 Chipped and mulched material shall be stockpiled on site in an area as directed by the Consultant.
.2 Timber - Hardwood or Softwood greater than 125mm diameter shall be sold to paper processors or saw mills. Contractor to obtain certification for quantity accepted by the end users.
.3 Soil Material for Fill (Existing Site Fill):
  .1 Excavated soil material: free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, deleterious, or objectionable materials.
  .2 Remove and store soil material for reuse. See Geotechnical Report for recommendations and suitable areas for Reuse. Site Fill is not to be presumed available for structural Fill. If moisture and compaction levels can be achieved it may be available for landscaped areas only.

3Part - EXECUTION

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL
.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties, walkways and streets according to sediment and erosion control drawings that complies with requirements of authorities having jurisdiction.
.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 PREPARATION
.1 Inspect site and verify with Consultant, items designated to remain.
.2 Locate and protect utility lines: preserve in operating condition active utilities traversing site.
  .1 Notify Consultant and Utility immediately of damage to or when unknown existing utility lines are encountered.
  .2 When utility lines which are to be removed are encountered within area of operations, notify Consultant in ample time to minimize interruption of service.
.3 Notify utility authorities before starting clearing and grubbing.
.4 Keep roads and walks free of dirt and debris.

3.3 CLEARING
.1 Clearing includes felling, trimming, and cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within cleared areas.
.2 Clear as indicated by Consultant, by cutting at height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.
.3 Cut off branches and cut down trees overhanging area cleared as directed by Consultant.

.4 Cut off unsound branches on trees designated to remain as directed by Consultant.

3.4 CLOSE CUT CLEARING

.1 Close cut clearing to within 100 mm of ground surface.
.2 Cut off branches down trees overhanging area cleared as directed by Consultant.
.3 Cut off unsound branches on trees designated to remain as directed by Consultant.

3.5 ISOLATED TREES

.1 Cut off isolated trees as directed by Consultant at height of not more than 300 mm above ground surface.
.2 Grub out isolated tree stumps.
.3 Prune individual trees as indicated.
.4 Trim trees designated to be left standing within cleared areas of dead branches 4 cm or more in diameter; and trim branches to heights as indicated.
.5 Cut limbs and branches to be trimmed close to bole of tree or main branches.
.6 Paint cuts more than 3 cm in diameter with approved tree wound paint.

3.6 UNDERBRUSH CLEARING

.1 Clear underbrush from areas as indicated at ground level.

3.7 GRUBBING

.1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots, and designated stumps from indicated grubbing areas.
.2 Grub out stumps and roots to not less than 300 mm below ground surface.
.3 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground.

3.8 REMOVAL AND DISPOSAL

.1 Remove cleared and grubbed materials to disposal area off site as selected by Contractor. Costs for removal, disposal, reinstatement, and erosion controls to be included in Lump Sum Cost.
.2 Cut timber greater than 125mm diameter in saleable lengths and stockpile as indicated. Timber becomes property of the Contractor.
.3 Dispose of cleared and grubbed materials by and burying.
.4 Burning of materials is **NOT** permitted on site.
.5 Chip or mulch and stockpile cleared and grubbed vegetative material on site as directed by Consultant.
.6 Remove diseased trees identified by Consultant and dispose of this material to approval of Consultant.

3.9 FINISHED SURFACE

.1 Leave ground surface in condition suitable for stripping of topsoil to approval of Consultant.

3.10 CLEANING

.1 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 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.
.2 Section 03 30 00 - Cast-in-Place Concrete.
.3 Section 31 00 00 - Earthwork.
.4 Section 32 11 16 - Granular Sub-base.

1.2 MEASUREMENT PROCEDURES

.1 This item forms part of the lump sum contract.

1.3 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
  .1 ASTM C117-04, Standard Test Method for Material Finer than 0.075 mm Sieve in Mineral Aggregates by Washing.
  .2 ASTM C136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  .3 ASTM D422-632002, Standard Test Method for Particle-Size Analysis of Soils.
  .4 ASTM D698-00ae1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m ^{3}).
  .5 ASTM D1557-02e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700 kN-m/m ^{3}).
  .6 ASTM D4318-05, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
.2 Canadian General Standards Board (CGSB)
  .1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
.3 Canadian Standards Association (CSA International)
  .1 CAN/CSA-A3000-03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    .1 CSA-A3001-03, Cementitious Materials for Use in Concrete.
  .2 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
.4 Nova Scotia Department of Transportation and Public Works (NSTPW) Standard Specification for Highway Construction and Maintenance, latest edition.
.5 Nova Scotia Department of the Environment “Erosion and Sedimentation Control Handbook for Construction Sites” - latest edition.

1.4 DEFINITIONS

.1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.

.1 Rock : solid material in excess of 1m ^{3} and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15m^3 bucket. Frozen material not classified as rock.

.2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.

.2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.

.3Topsoil: Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

.2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 mm in any dimension.

.4 Waste material: excavated material unsuitable for use in Work or surplus to requirements.

.5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work. This will also include materials from off the property.

.6 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.

.7 Unsuitable materials:

.1 Weak, chemically unstable site material with excess moisture and compressible materials, peat or organics.

.2 Frost susceptible materials:

.1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136 : Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2

.2 Table:

Sieve Designation	% Passing
2.00 mm	[100]
0.10 mm	[45 - 100]
0.02 mm	[10 - 80]
0.005 mm	[0 - 45]

.3 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve.

.8 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated (1 MPa Concrete).

1.5 SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Quality Control: in accordance with Section 01 45 00 - Quality Control:

- .1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.
- .2 Submit for review by Consultant proposed dewatering and heave prevention methods as described in PART 3 of this Section (see Conquest Geotechnical Report for recommendations).
- .3 Submit to Consultant written notice at least 7 days prior to excavation work, to ensure cross sections are taken.
- .4 Submit to Consultant written notice when bottom of excavation is reached.
- .5 Submit to Consultant testing results and report as described in PART 3 of this Section.

.3 Preconstruction Submittals:

- .1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.
- .2 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field, relocated and abandoned services, as required.

.4 Samples:

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Inform Consultant at least 4 weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.
- .3 Submit samples of type of fill specified including representative samples of excavated material.
- .4 Ship samples to Consultant in tightly closed containers to prevent contamination and exposure to elements.
- .5 At least 4 weeks prior to beginning Work, inform Consultant source of fly ash and submit samples to Consultant.
  - .1 Do not change source of Fly Ash without written approval of Consultant.

1.6 QUALITY ASSURANCE

.1 Qualification Statement: submit proof of insurance coverage for professional liability.

.2 Where Consultant is employee of Contractor, submit proof that Work by Consultant is included in Contractor's insurance coverage.

.3 Submit design and supporting data at least 2 weeks prior to beginning Work.

.4 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of Nova Scotia, Canada.

.5 Keep design and supporting data on site.

.6 Engage services of qualified professional Engineer who is registered or licensed in Province of Nova Scotia, Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.

.7 Do not use soil material until written report of soil test results are reviewed and approved by Consultant.

.8 Health and Safety Requirements:

.1 Do construction in accordance with the Nova Scotia Occupational Health and Safety Act.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with instructions to Bidders, Provincial and Municipal Regulations.

.2 Divert excess aggregate materials from landfill to local recycling facility for reuse as directed by Consultant.

1.8 EXISTING CONDITIONS

.1 Examination of soil conditions on site is the responsibility of the Contractor.

.2 Buried services:

.1 Before commencing work verify location of buried services on and adjacent to site.

.2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.

.3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.

.4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

.5 Prior to beginning excavation Work, notify applicable Authorities (Sir John A principal, Halifax Regional School Board & NSPI) having jurisdiction to establish location and state of use of buried utilities and structures.

Authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.

.6 Confirm locations of buried utilities by careful test excavations in presence of utility owner.

.7 Maintain and protect from damage, water, sewer, electric, telephone and other utilities and structures encountered.

.8 Where utility lines or structures exist in area of excavation, obtain direction of Consultant before removing or re-routing. Costs for such Work to be paid by Contractor.

.9 Record location of maintained, re-routed and abandoned underground lines.

.10 Confirm locations of recent excavations adjacent to area of excavation.

.3 Existing buildings and surface features:

.1 Conduct, with Consultant, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, pavement, survey bench marks and monuments which may be affected by Work.

.2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Consultant at Contractor's own expense.

.3 Where required for excavation, cut roots or branches as directed by Consultant in accordance with Section 31 11 00 - Clearing and Grubbing.

2Part - PRODUCTS

2.1 MATERIALS

.1Type 1 and Type 2 fill: properties to Section 31 05 16 - Aggregate Materials and the following requirements: Crushed, pit run or screened stone, gravel or sand.

.2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1 and CAN/CGSB-8.2.

.3 Table:

Sieve Designation	% Passing	
	Type 1	Type 2
75 mm	-	[100]
50 mm	-	-

Sieve Designation	% Passing	
	Type 1	Type 2
37.5 mm	-	-
25 mm	[100]	-
19 mm	[75-100]	-
12.5 mm	-	-
9.5 mm	[50-100]	-
4.75 mm	[30-70]	[22-85]
2.00 mm	[20-45]	-
0.425 mm	[10-25]	[5-30]
0.180 mm	-	-
0.075 mm	[3-8]	[0-10]

.2Type 3 fill: selected material from excavation or other sources, approved by Consultant for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials. Unshrinkable fill: proportioned and mixed to provide:

.1 Maximum compressive strength of 1.0 MPa at 28 days.

.2 Maximum cement content of 25 kg/m ^{3} with 40% by volume fly ash replacement: to CSA-A3001, Type GU.

.3 Minimum strength of 0.07MPa at 24 h.

.4 Concrete aggregates: to CSA-A23.1/A23.2.

.5 Cement: Type GU.

.6 Slump: 160 to 200 mm.

.4 Shearmat: honeycomb type bio-degradable cardboard 100 mm thick, treated to provide sufficient structural support for poured concrete until concrete cured.

.5 Geotextiles: to Section 31 32 19 - Geotextiles.

3Part - EXECUTION

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according

to sediment and erosion control drawings that complies with the requirements of Nova Scotia Department of the Environment. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

3.2 SITE PREPARATION

.1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

3.3 PREPARATION/PROTECTION

.1 Protect existing features in accordance with instructions to Bidders.

.2 Keep excavations clean, free of standing water, and loose soil.

.3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Consultant approval.

.4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.

.5 Protect buried services that are required to remain undisturbed.

3.4 STRIPPING OF TOPSOIL

.1 Begin topsoil stripping of areas as directed by Consultant after area has been cleared of brush, weeds, and grasses and removed from site.

.2 Strip topsoil to depths as directed by Consultant.

.1 Do not mix topsoil with subsoil.

.3 Stockpile in locations to not interfere with the staged work schedule.

.1 Stockpile height not to exceed 2 m and should be protected from erosion and precipitation.

.2 Contractor to cover stockpile with 10 mil poly to prevent excess moisture intrusion.

.4 Remove and dispose of unused topsoil off site as part of the site contractors Lump Sum Cost.

3.5 STOCKPILING

.1 Stockpile fill materials in areas appropriate to the staged work schedule.

.1 Stockpile granular materials in manner to prevent segregation.

.2 Protect fill materials from contamination, excess moisture and from freezing.

.3 Implement sufficient erosion and sediment control measures to prevent sediment release beyond construction boundaries and into water bodies.

3.6 COFFERDAMS, SHORING, BRACING AND UNDERPINNING

.1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with the Occupational Health and Safety Act for the Province of Nova Scotia.
  .1 Where conditions are unstable, Consultant to verify and advise methods.
.2 Obtain permit from Nova Scotia Department of the Environment for any temporary diversion of water course or for notification of any culverts to be installed in water courses.
.3 Construct temporary Works to depths, heights and locations as directed by Consultant.
.4 During backfill operation:
  .1 Unless otherwise indicated or directed by Consultant, remove sheeting and shoring from excavations.
  .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
  .3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 500 mm above toe of sheeting.
.5 When sheeting is required to remain in place, cut off tops at elevations as indicated.
.6 Upon completion of substructure construction:
  .1 Remove cofferdams, shoring and bracing.
  .2 Remove excess materials from site and restore watercourses as directed by Consultant.

3.7 DEWATERING AND HEAVE PREVENTION

.1 Keep excavations free of water while Work is in progress. The Geotechnical Investigation Reports indicate dewatering may be necessary during excavation and removal of loose moist Fill or Peat. Contractor to implement necessary measures to control the water table during construction.
.2 Provide for Consultant's approval details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.
.3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
  .1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
.4 Protect open excavations against flooding and damage due to surface run-off.

.5 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures to approved runoff areas and in manner not detrimental to public and private property, or portion of Work completed or under construction.

.1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

.2 Do not pump or direct silt laden water to public or private catch basins.

.6 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to adjacent ditches, watercourses, storm sewers or drainage areas.

3.8 EXCAVATION

.1 Advise Consultant at least 7 days in advance of excavation operations for initial cross sections to be taken. Excavate to lines, grades, elevations and dimensions as indicated.

.3 Excavation must not interfere with bearing capacity of adjacent foundations.

.4 Do not disturb soil within branch spread of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw.

.5 For trench excavation, unless otherwise authorized by Consultant in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.

.6 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Consultant.

.7 Restrict vehicle operations directly adjacent to open trenches.

.8 Dispose of surplus and unsuitable excavated material off site.

.9 Do not obstruct flow of surface drainage or natural water courses.

.10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

.11 Notify Consultant when bottom of excavation is reached.

.12 Obtain Consultant approval of completed excavation.

.13 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Consultant.

.14 Correct unauthorized over-excavation as follows: Fill under bearing surfaces and footings with Type 2 fill compacted to not less than 100% of Standard Proctor maximum dry density.

.2 Fill under other areas with Type 2 fill compacted to not less than 95% of Standard Proctor maximum dry density.

.3 For services installed under footings, Contractor to provide unshrinkable Fill (1MPa concrete) around the pipe from bottom of excavation to underside of footing.

.15 Hand trim, make firm and remove loose material and debris from excavations.

.1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

.2 Clean out rock seams and fill with concrete mortar or grout to approval of Consultant.

.16 Install geotextiles in accordance with Section 31 32 19 - Geotextiles.

3.9 FILL TYPES AND COMPACTION

.1 Use types of fill as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D698.

.1 Exterior side of perimeter walls: use Type 3 fill to subgrade level. Compact to 95% of Standard Proctor dry density (except where footing drains are indicated).

.2 Exterior walls with habitable interior rooms: Use 500 mm wide Type 2 from footing to top of subgrade. Compact to 95%. For remaining portion use Type 3 or approved imported structural Fill.

.3 Within building area: use 1200mm wide Type 2 or approved imported Structural Fill (150mm minus well graded granular material with ‹10% fines) to underside of Type 1 base course for floor slabs. Compact to 100% of Standard Proctor dry density.

.4 Under concrete slabs: provide 200 mm compacted thickness of 25mm clear stone. Compact base course to 100% Standard Proctor dry density.

.5 Retaining walls (excluding areas within the building footprint): use Type 2 Fill to subgrade behind wall for a minimum of 1.0 m from wall and compact to 95% for remaining portion, Use Type 3 Fill compacted to 95%.

.6 Place unshrinkable fill in all areas of excavation below footings and as indicated.

3.10 BEDDING AND SURROUND OF UNDERGROUND SERVICES

.1 Place and compact granular material for bedding and surround of underground services as indicated and as specified in Section 33 11 16 - Site Water Utility Distribution Piping, Section 33 31 13 - Public Sanitary Utility Sewerage Piping and Section 33 41 00 - Storm Utility Drainage Piping.

.2 Place bedding and surround material in unfrozen condition. Frozen bedding shall be considered unusable and removed from the site.

3.11 BACKFILLING

.1 Vibratory compaction equipment: minimum 10 ton.

.2 Do not proceed with backfilling operations until completion of following:

- .1 Consultant has inspected and approved installations.
- .2 Consultant has inspected and approved of construction below finish grade.
- .3 Inspection, testing, approval, and recording location of underground utilities.
- .4 Removal of concrete formwork.
- .5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.

.3 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.4 Do not use backfill material which is frozen or contains ice, snow or debris.

.5 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer. Backfilling around installations:

- .1 Place bedding and surround material as specified elsewhere.
- .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
- .3 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 500 mm.
- .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
  - .1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from or:
  - .2 If approved by Consultant, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Consultant.

.7 Place unshrinkable fill in areas as indicated.

.8 Consolidate and level unshrinkable fill with internal vibrators.

.9 Install drainage system in backfill as indicated by the Consultant.

3.12 RESTORATION

.1 Upon completion of Work, remove waste materials and debris in accordance with instructions to Bidders. Trim slopes, and correct defects as directed by Consultant.

.2 Replace topsoil as directed by Consultant.

.3 Reinstate lawns to elevation which existed before excavation.

.4 Reinstate pavements disturbed by excavation to thickness, structure and elevation which existed before excavation.

.5 Clean and reinstate areas affected by Work as directed by Consultant.

.6 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.

.7 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

1PART - GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation of polymeric geotextiles used in footing drainage systems, filtration, and drainage structures. Purpose of which is to:
- .1 Separate and prevent mixing of granular materials of different grading.
- .2 Act as hydraulic filters permitting passage of water while retaining soil strength of granular structure.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.
.2 Section 31 23 33 - Excavating, Trenching and Backfilling.

1.3 MEASUREMENT PROCEDURES

.1 This item forms part of the lump sum contract. No additional cost will be paid for this item.

1.4 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)
- .1 ASTM D4491-99a, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
- .2 ASTM D4595-86(2001), Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
- .3 ASTM D4716-01, Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
- .4 ASTM D4751-99a, Standard Test Method for Determining Apparent Opening Size of a Geotextile.

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-4.2 No. 11.2-M89(April 1997), Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).
- .2 CAN/CGSB-148.1, Methods of Testing Geotextiles and Complete Geomembranes.
  - .1 No.2-M85, Methods of Testing Geosynthetics - Mass per Unit Area.
  - .2 No.3-M85, Methods of Testing Geosynthetics - Thickness of Geotextiles.
  - .3 No.6.1-93, Methods of Testing Geotextiles and Geomembranes - Bursting Strength of Geotextiles Under No Compressive Load.

.4 No.7.3-92, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.

.5 No. 10-94, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.

.3 Canadian Standards Association (CSA International)

.1 CAN/CSA-G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.2 CAN/CSA-G164-M92(R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.

1.5 SUBMITTALS

.1 Submit to Consultant 2 copies of product data at least 4 weeks prior to start of Work, and in accordance with Section 01 33 00 - Submittal Procedures.

1.6 DELIVERY, STORAGE AND HANDLING

.1 During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with instructions to Bidders, Provincial and Municipal Regulations..

.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 accordance with Waste Management Plan.

.4 Fold up metal banding, flatten and place in designated area for recycling.

2PART - PRODUCTS

2.1 MATERIAL

.1 Geotextile: woven synthetic fibre fabric, supplied in rolls.

.1 acceptable product: Terrafix 270R or approved equivalent.

3PART - EXECUTION

3.1 INSTALLATION

.1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated.

.2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.

.3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.

.4 Overlap each successive strip of geotextile 600 mm over previously laid strip or 300 m around footing drain gravels or as indicated on the drawings.

.5 Pin successive strips of geotextile with securing pins at intervals recommended by the manufacturer.

.6 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.

.7 After installation, cover with overlying layer within 4 h of placement.

.8 Replace damaged or deteriorated geotextile to approval of Consultant.

.9 Place and compact soil layers in accordance with Section 31 23 33 - Excavating Trenching and Backfilling.

3.2 PROTECTION

.1 Vehicular traffic not permitted directly on geotextile.

End of Section

1PART - GENERAL

1.1 RELATED SECTIONS

.1 Section 31 00 00 - Earthwork.
.2 Section 31 05 16 - Aggregate Materials.
.3 Section 32 11 23 - Aggregate Base Courses.

1.2 MEASUREMENT PROCEDURES

.1 This item forms part of the lump sum contract. No additional cost will be paid for this item.

1.3 REFERENCES

.1 American Society for Testing and Materials (ASTM)
  .1 ASTM C117-95, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
  .2 ASTM C131-96, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  .3 ASTM C136-96a, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  .4 ASTM D422-63(1998), Standard Test Method for Particle-Size Analysis of Soils.
  .5 ASTM D698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600kN-m/m^3).
  .6 ASTM D1557-00, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700kN-m/m^3).
  .7 ASTM D1883-99, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
  .8 ASTM D4318-00, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
.2 Canadian General Standards Board (CGSB)
  .1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
.3 Nova Scotia Transportation and Public Works Standard Specification for Highway Construction and Maintenance Manual, latest edition.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with instructions to Bidders, Provincial and Municipal Regulations.
.2 Divert unused granular material from landfill to local facility as approved by Consultant.

2PART - PRODUCTS

2.1 MATERIALS

.1 Granular sub-base material (Type 2 gravel): in accordance with Section 31 05 16 - Aggregate Materials and following requirements:
  .1 Crushed, pit run or screened stone, gravel or sand.
  .2 Gradations to be within limits specified in the Nova Scotia Transportation and Public Works Standard Specification for Highway Construction and Maintenance Manual, latest Edition.
  .3 Other Properties as follows:
    .1 Liquid Limit: to ASTM D4318, Maximum 20.
    .2 Plasticity Index: to ASTM D4318, Maximum 3.
    .3 Los Angeles degradation: to ASTM C131. Max% Loss by mass: 40.
.2 Granular Sub-base thickness as per drawing C-101.

3PART - EXECUTION

3.1 PLACING

.1 Place granular sub-base after subgrade is inspected and approved by Consultant.
.2 Construct granular sub-base to depth and grade in areas indicated.
.3 Ensure no frozen material is placed.
.4 Place material only on clean unfrozen surface, free from snow or ice.
.5 Place granular sub-base materials using methods which do not lead to segregation or degradation.
.6 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Consultant may authorize thicker lifts (layers) if specified compaction can be achieved.
.7 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
.8 Remove and replace portion of layer in which material has become segregated during spreading.

3.2 COMPACTION

.1 Compaction equipment to be capable of obtaining required material densities.
.2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from Consultant before use.
.3 Equipped with device that records hours of actual work, not motor running hours.
.4 Compact to density of not less than 100% Standard Proctor dry density.
.5 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.
.6 Apply water as necessary during compaction to obtain specified density.

.7 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Consultant.

.8 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.3 PROOF ROLLING

.1 For proof rolling use standard roller of 45400 kg gross mass with four pneumatic tires each carrying 11350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm maximum.

.2 Obtain approval from Consultant to use non-standard proof rolling equipment.

.3 Proof roll at level in sub-base as indicated. If non-standard proof rolling equipment is approved, Consultant to determine level of proof rolling.

.4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.

.5 Where proof rolling reveals areas of defective subgrade:

.1 Remove sub-base and subgrade material to depth and extent as directed by Consultant.

.2 Backfill excavated subgrade with sub-base material and compact in accordance with this section.

.3 Replace sub-base material and compact.

.6 Where proof rolling reveals areas of defective sub-base, remove and replace in accordance with this section at no extra cost.

3.4 SITE TOLERANCES

.1 Finished sub-base surface to be within 25 mm of elevation as indicated but not uniformly high or low.

3.5 PROTECTION

.1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by Consultant.

End of Section

1PART - GENERAL

1.1 RELATED SECTIONS

.1 Section 31 05 16 - Aggregate Materials.
.2 Section 32 11 16 - Granular Sub-base.

1.2 MEASUREMENT PROCEDURES

.1 This item is included in the lump sum contract.

1.3 REFERENCES

.1 American Society for Testing and Materials (ASTM)
  .1 ASTM C117-95, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
  .2 ASTM C131-96, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  .3 ASTM C136-96a, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  .4 ASTM D698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600kN-m/m^3).
  .5 ASTM D1557-00, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700kN-m/m^3).
  .6 ASTM D1883-99, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
  .7 ASTM D4318-00, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
.2 Canadian General Standards Board (CGSB)
  .1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
.3 Nova Scotia Transportation and Public Works Standard Specification for Highway Construction and Maintenance Manual, latest edition.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Deliver and stockpile aggregates in accordance with Section 31 05 16 - Aggregate Materials. Stockpile minimum 50% of total aggregate required prior to beginning operation.
.2 Store cement in weathertight bins or silos that provide protection from dampness and easy access for inspection and identification of each shipment.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with instructions to Bidders, Provincial and Municipal Regulations.

.2 Divert unused granular material from landfill to local facility.

1.6 SUBMITTALS

.1 After completion of Placement of Aggregate base Course in Asphalt Areas Contractor to contact Consultant to inspect prior to placement of asphalt. Written approval is required from Consultant.

2PART - PRODUCTS

2.1 MATERIALS

.1 Granular base: material in accordance with Section 31 05 16 - Aggregate Materials and following requirements:
  .1 Crushed stone or gravel.
  .2 Gradations to be within limits specified in the Nova Scotia Transportation and Public Works Standard Specification for Highway Construction and Maintenance Manual, latest edition.
    .1 Liquid limit: to ASTM D4318, maximum 20
    .2 Plasticity index: to ASTM D4318, maximum 3
    .3 Los Angeles degradation: to ASTM C131. Max. % loss by weight: 40.
    .4 Crushed particles: at least 60% of particles by mass.
    .5 Soaked CBR: to ASTM D1883, min 100, when compacted to 100% of ASTM D1557.
.2 Granular aggregate base thickness as per drawing C-101.

3PART - EXECUTION

3.1 SEQUENCE OF OPERATION

.1 Place granular base after sub-base surface is inspected and approved by Consultant.
.2 Placing
  .1 Construct granular base to depth and grade in areas indicated.
  .2 Ensure no frozen material is placed.
  .3 Place material only on clean unfrozen surface, free from snow and ice.
  .4 Place material using methods which do not lead to segregation or degradation of aggregate.
  .5 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Consultant may authorize thicker lifts (layers) if specified compaction can be achieved.
  .6 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.7 Remove and replace that portion of layer in which material becomes segregated during spreading.

.3 Compaction Equipment

.1 Compaction equipment to be capable of obtaining required material densities.

.2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from Consultant before use.

.3 Equipped with device that records hours of actual work, not motor running hours.

.4 Compacting

.1 Compact to density not less than 100% Standard Proctor dry density.

.2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.

.3 Apply water as necessary during compacting to obtain specified density.

.4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Consultant.

.5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

.5 Proof rolling

.1 For proof rolling use standard roller of 45400 kg gross mass with four pneumatic tires each carrying 11350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm.

.2 Obtain approval from Consultant to use non-standard proof rolling equipment.

.3 Proof roll at level in granular base as indicated. If use of non-standard proof rolling equipment is approved, Consultant to determine level of proof rolling.

.4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.

.5 Where proof rolling reveals areas of defective subgrade:

.1 Remove base, sub-base and subgrade material to depth and extent as directed by Consultant.

.2 Backfill excavated subgrade with sub-base material and compact in accordance with Section 32 11 16 - Granular Sub-Base.

.3 Replace sub-base material and compact in accordance with Section 32 11 16 - Granular Sub-base.

.4 Replace base material and compact in accordance with this Section.

.6 Where proof rolling reveals defective base or sub-base, remove defective materials to depth and extent as directed by Consultant and replace with new materials in accordance with Section 32 11 16 - Granular Sub-base and this section at no extra cost.

3.2 SITE TOLERANCES

.1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

3.3 PROTECTION

.1 Maintain finished base in condition conforming to this Section until succeeding material is applied or until acceptance by Consultant.

End of Section

1PART -
GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for asphalt concrete pavement for existing driveway reinstatement, new driveway to the building and access to the new garbage pad.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.
.2 Section 01 45 00 - Quality Control.
.3 Section 31 05 16 - Aggregate Materials.
.4 Section 32 11 16 - Granular Sub-Base
.5 Section 32 11 23 - Aggregate Base Courses.

1.3 MEASUREMENT PROCEDURES

.1 Asphalt concrete pavement including granular forms part of the lump sum contract.

1.4 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)
  .1 ASTM C88-99a, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
  .2 ASTM C117-95, Standard Test Method for Material Finer Than 0.075 (No. 200) mm Sieve in Mineral Aggregates by Washing.
  .3 ASTM C123-98, Standard Test Method for Lightweight Particles in Aggregate.
  .4 ASTM C127-01, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
  .5 ASTM C128-01, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.
  .6 ASTM C131-01, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  .7 ASTM C136-01, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
  .8 ASTM D698-00a, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m^3).
  .9 ASTM D995-95b (2002), Standard Specification for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
  .10 ASTM D1557-00, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700 kN-m/m^3).

.11 ASTM D1559-89, Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus, was withdrawn in 1998 with no replacement.
.12 ASTM D2419-02, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
.13 ASTM D3203-94(2000), Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.
.14 ASTM D4318-00, Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
.15 ASTM D4791-99, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

.2 Asphalt Institute (AI)
.1 AI MS-2-1993 Sixth Edition, Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types.

.3 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-8.2-M88, Sieves Testing, Woven Wire, Metric.
.2 CAN/CGSB-16.1-M89, Cutback Asphalts for Road Purposes.
.3 CAN/CGSB-16.2-M89, Emulsified Asphalts, Anionic Type, for Road Purposes.
.4 CAN/CGSB-16.3-M90, Asphalt Cements for Road Purposes.

.4 Nova Scotia Transportation and Public Works Standard Specification for Highway Construction and Maintenance Manual, latest Edition.

1.5 SUBMITTALS

.1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
.2 Submit asphalt concrete mix design to Consultant for approval.
.3 Materials to be tested by testing laboratory approved by Consultant.
.4 Submit test certificates showing suitability of materials at least 4 weeks prior to commencing work.
.5 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
.6 Inform Consultant of proposed source of aggregates and provide access for sampling at least 4 weeks prior to commencing work.
.7 Submit samples of following materials proposed for use at least 4 weeks prior to commencing work:
.1 One 5 L container of asphalt cement.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with instructions to Bidders, Provincial and Municipal Regulations.
.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Divert unused asphalt materials from landfill to local facility as approved by Consultant.

.5 Divert unused aggregate materials from landfill to facility for reuse as approved by Consultant.

.6 Unused protective coating material must be disposed of at an official hazardous material collections site as approved by Consultant.

.7 Unused protective coating material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

.8 Fold up metal banding, flatten and place in designated area for recycling.

2PART - PRODUCTS

2.1 MATERIALS

.1 Asphalt concrete aggregates:

- .1 Gradations to be within limits specified in the Nova Scotia Transportation and Public Works Standard Specification for Highway Construction and Maintenance Manual, latest Edition.
- .2 Sand equivalent: to ASTM D2419, Minimum 50.
- .3 Magnesium Sulphate soundness: to ASTM C88. Max % loss by weight: aggregate 15.
- .4 Los Angeles Degradation: to ASTM C131. Max % loss by weight: coarse aggregate, 35.
- .5 Absorption: to ASTM C127. Max % by weight: coarse aggregate, 1.75.
- .6 Flat and elongated particles: to ASTM D4791, with length to thickness ratio greater than 4: Max % by weight: aggregate, 10.

.2 Asphalt base and surface course thicknesses shall be in accordance with the drawing C-101.

2.2 EQUIPMENT

.1 Pavers: mechanical grade controlled self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated.

.2 Rollers: sufficient number of type and weight to obtain specified density of compacted mix.

.3 Vibratory rollers:

- .1 Minimum drum diameter: 1200 mm.
- .2 Maximum amplitude of vibration (machine setting): 0.5mm for lifts less than 40 mm thick.

.4 Haul trucks: sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows:
- .1 Boxes with tight metal bottoms.
- .2 Covers of sufficient size and weight to completely cover and protect asphalt mix when truck fully loaded.
- .3 In cool weather or for long hauls, insulate entire contact area of each truck box.
- .4 Use only trucks which can be weighed in single operation on scales supplied.

.5 Hand tools:
- .1 Lutes or rakes with covered teeth for spreading and finishing operations.
- .2 Tamping irons having mass not less than 12 kg and bearing area not exceeding 310 cm^2 for compacting material along curbs, gutters and other structures inaccessible to roller. Mechanical compaction equipment, when approved by Consultant, may be used instead of tamping irons.
- .3 Straight edges, 4.5 m in length, to test finished surface.

2.3 MIX DESIGN

.1 Mix design as per Nova Scotia Transportation and Public Works Standard Specification for Highway Construction and Maintenance Manual, latest Edition.

.2 Mix Design must be approved by Geotechnical Consultant.

3PART - EXECUTION

3.1 PLANT AND MIXING REQUIREMENTS

.1 To ASTM D995 and as per Nova Scotia Transportation and Public Works Standard Specification for Highway Construction and Maintenance Manual, latest Edition.

3.2 PREPARATION

.1 Prior to laying mix, clean surfaces of loose and foreign material.

3.3 TRANSPORTATION OF MIX

.1 Transport mix to job site in vehicles cleaned of foreign material.

.2 Paint or spray truck beds with limewater, soap or detergent solution, or non-petroleum based commercial product, at least daily or as required. Elevate truck bed and thoroughly drain. No excess solution to remain in truck bed.

.3 Schedule delivery of material for placing in daylight, unless Consultant approves artificial light.

.4 Deposit mix from surge or storage silo to trucks in multiple drops to reduce segregation. Do not dribble mix into trucks.

.5 Deliver material to paver at uniform rate and in an amount within capacity of paving and compacting equipment.

.6 Deliver loads continuously in covered vehicles and immediately spread and compact. Deliver and place mixes at temperature within range as directed by Consultant, but not less than 135 degrees C.

3.4 PLACING

.1 Obtain Consultant's approval of base gravels prior to placing asphalt.

.2 Place asphalt concrete to thicknesses, grades and lines as indicated.

.3 Placing conditions:

.1 Place asphalt mixtures only when air temperature is above 5 degrees C.

.2 When temperature of surface on which material is to be placed falls below 10 degrees C, provide extra rollers as necessary to obtain required compaction before cooling.

.3 Do not place hot-mix asphalt when pools of standing water exist on surface to be paved, during rain, or when surface is damp.

.4 Place asphalt concrete in compacted lifts of thickness as indicated.

.5 Where possible do tapering and levelling where required in lower lifts. Overlap joints by not less than 300 mm.

.6 On airport runways and taxiways, aprons and parking lots commence spreading at high side of pavement or at crown and span crowned centerlines with initial strip.

.7 Spread and strike off mixture with self-propelled mechanical finisher.

.1 Construct longitudinal joints and edges true to line markings. Consultant to establish lines for paver to follow parallel to centerline of proposed pavement. Position and operate paver to follow established line closely.

.2 When using pavers in echelon, have first paver follow marks or lines, and second paver follow edge of material placed by first paver. Work pavers as close together as possible and in no case permit them to be more than 30 m apart.

.3 Maintain constant head of mix in auger chamber of paver during placing.

.4 If segregation occurs, immediately suspend spreading operation until cause is determined and corrected.

.5 Correct irregularities in alignment left by paver by trimming directly behind machine.

.6 Correct irregularities in surface of pavement course directly behind paver. Remove by shovel or lute excess material forming high spots. Fill and smooth indented areas with hot mix. Do not broadcast material over such areas.

.7 Do not throw surplus material on freshly screeded surfaces.

.8 When hand spreading is used:

.1 Use approved wood or steel forms, rigidly supported to assure correct grade and cross section. Use measuring blocks and intermediate strips to aid in obtaining required cross-section.

.2 Distribute material uniformly. Do not broadcast material.

.3 During spreading operation, thoroughly loosen and uniformly distribute material by lutes or covered rakes. Reject material that has formed into lumps and does not break down readily.

.4 After placing and before rolling, check surface with templates and straightedges and correct irregularities.

.5 Provide heating equipment to keep hand tools free from asphalt. Control temperature to avoid burning material. Do not use tools at higher temperature than temperature of mix being placed.

3.5 COMPACTING

.1 Roll asphalt continuously using established rolling pattern for test strip and to density of not less than 92% of maximum theoretical density. **Contractor to remove & replace any asphalt with less than 92% compaction at his own cost.**

.2 Do not change rolling pattern unless mix changes or lift thickness changes. Change rolling pattern only as directed by Consultant.

.3 General:

.1 Provide at least two rollers and as many additional rollers as necessary to achieve specified pavement density. When more than two rollers are required, one roller must be pneumatic tired type.

.2 Start rolling operations as soon as placed mix can bear weight of roller without excess displacement of material or cracking of surface.

.3 Operate roller slowly initially to avoid displacement of material. Do not exceed 5 km/h for breakdown and intermediate rolling for static steel-wheeled and pneumatic tired rollers. Do not exceed 9 km/h for finish rolling.

.4 Use static compaction for levelling course less than 25 mm thick.

.5 For lifts 50 mm thick and greater, adjust speed and vibration frequency of vibratory rollers to produce minimum of 25 impacts per metre of travel. For lifts less than 50 mm thick, impact spacing not to exceed compacted lift thickness.

.6 Overlap successive passes of roller by minimum of 200mm and vary pass lengths.

.7 Keep wheels of roller slightly moistened with water to prevent pick-up of material but do not over-water.

.8 Do not stop vibratory rollers on pavement that is being compacted with vibratory mechanism operating.

.9 Do not permit heavy equipment or rollers to stand on finished surface before it has been compacted and has thoroughly cooled.

.10 After traverse and longitudinal joints and outside edge have been compacted, start rolling longitudinally at low side and progress to high side. Ensure that all points across width of pavement receive essentially equal numbers of passes of compactors.

.11 When paving in echelon, leave unrolled 50 to 75 mm of edge which second paver is following and roll when joint between lanes is rolled.

.12 Where rolling causes displacement of material, loosen affected areas at once with lutes or shovels and restore to original grade of loose material before re-rolling.

.4 Breakdown rolling:

.1 Begin breakdown rolling with vibratory roller immediately following rolling of transverse and longitudinal joint and edges.

.2 Operate rollers as close to paver as necessary to obtain adequate density without causing undue displacement.

.3 Operate breakdown roller with drive roll or wheel nearest finishing machine. When working on steep slopes or super-elevated sections use operation approved by Consultant.

.4 Use only experienced roller operators.

.5 Intermediate rolling:

.1 Use pneumatic-tired, steel wheel or vibratory rollers and follow breakdown rolling as closely as possible and while paving mix temperature allows maximum density from this operation.

.2 Rolling to be continuous after initial rolling until mix placed has been thoroughly compacted.

.6 Finish rolling:

.1 Accomplish finish rolling with two-axle or three-axle tandem steel wheeled rollers while material is still warm enough for removal of roller marks. If necessary to obtain desired surface finish, use pneumatic-tired rollers as directed by Consultant.

.2 Conduct rolling operations in close sequence.

.7 Dust entire area of sheet asphalt pavements with hydrated lime immediately after rolling to eliminate tendency to pick-up under traffic.

3.6 JOINTS

.1 General:

.1 Remove surplus material from surface of previously laid strip. Do not deposit on surface of freshly laid strip.

.2 Construct joints between asphalt concrete pavement and Portland cement concrete pavement as indicated.

.3 Paint contact surfaces of existing structures such as manholes, curbs or gutters with bituminous material prior to placing adjacent pavement.

.2 Transverse joints:

.1 Offset transverse joint in succeeding lifts by at least 600mm.

.2 Cut back to full depth vertical face and tack face with thin coat of hot asphalt prior to continuing paving.

.3 Compact transverse joints to provide smooth riding surface. Use methods to prevent rounding of compacted surface at joints.

.3 Longitudinal joints:

.1 Offset longitudinal joints in succeeding lifts by at least 150 mm.

.2 Cold joint is defined as joint where asphalt mix is placed, compacted and left to cool below 100 degrees C prior to paving of adjacent lane.

.1 For airfield runway paving, avoid cold joint construction in mid 30 m of runway.

.2 If cold joint can not be avoided, cut back by saw cutting previously laid lane, by at least 150 mm, to full depth vertical face, and tack face with thin coat of hot asphalt of adjacent lane.

.3 Overlap previously laid strip with spreader by 25 to 50 mm.

.4 Before rolling, carefully remove and discard coarse aggregate in material overlapping joint with lute or rake.

.5 Roll longitudinal joints directly behind paving operation.

.6 When rolling with static or vibratory rollers, have most of drum width ride on newly placed lane with remaining 150 mm extending onto previously placed and compacted lane.

.4 Construct feather joints so that thinner portion of joint contains fine graded material obtained by changed mix design or by raking out coarse aggregate in mix. Place and compact joint so that joint is smooth and without visible breaks in grade. Location of feather joints as indicated.

3.7 FINISH TOLERANCES

.1 Finished asphalt surface to be within 5mm of design elevation but not uniformly high or low.

.2 Finished asphalt surface not to have irregularities exceeding 5mm when checked with 4.5m straight edge placed in any direction.

3.8 DEFECTIVE WORK

.1 Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required. If irregularities or defects remain after final compaction, remove

surface course promptly and lay new material to form true and even surface and compact immediately to specified density.

.2 Repair areas showing checking, rippling, or segregation.

.3 Adjust roller operation and screed settings on paver to prevent further defects such as rippling and checking of pavement.

.4 Remove and replace asphalt with less than 92% compaction at the installer's own cost.

End of Section

1PART - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.
.2 Section 03 20 00 - Concrete Reinforcing
.3 Section 03 30 00 - Cast-in-Place Concrete.
.4 Section 31 00 00 - Earthwork.
.5 Section 32 11 23 - Aggregate base courses.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
  .1 ASTM C117-04, Standard Test Method for Materials Finer than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
  .2 ASTM C136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  .3 ASTM D260-86(2001), Standard Specification for Boiled Linseed Oil.
  .4 ASTM D698-00ae1, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m^3).
.2 Canadian General Standards Board (CGSB)
  .1 CAN/CGSB-3.3-99(March 2004), Kerosene, Amend. No. 1, National Standard of Canada.
  .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
.3 Canadian Standards Association (CSA International)
  .1 CSA-A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

1.3 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
.2 Inform Consultant of proposed source of materials and provide access for sampling at least 4 weeks prior to commencing work.
.3 If materials have been tested by testing laboratory approved by Consultant within previous 2 months and have passed tests equal to requirements of this specification, submit test certificates from testing laboratory showing suitability of materials for this project.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:
  .1 Separate waste materials for reuse and recycling in accordance with instructions to Bidders, Provincial and Municipal Regulations.

2PART - PRODUCTS

2.1 MATERIALS

.1 Concrete mixes and materials: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.2 Reinforcing steel: in accordance with Section 03 20 00 - Concrete Reinforcing.

.3 Granular base: material to Section 31 05 16 - Aggregate Materials and as specified on drawing C-101.

.4 Non-staining mineral type form release agent: chemically active release agents containing compounds that react with free lime to provide water-soluble soap.

.5 Boiled linseed oil: to ASTM D260.

.6 Kerosene: to CAN/CGSB-3.3.

3PART - EXECUTION

3.1 GRADE PREPARATION

.1 Do grade preparation work in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.

.2 Construct embankments using excavated material free from organic matter or other objectionable materials.

.1 Dispose of surplus and unsuitable excavated material in approved location on site.

.3 Place fill in maximum 150 mm layers and compact to 98% in accordance to Section 31 00 00 - Earthwork.

3.2 GRANULAR BASE

.1 Obtain Consultant's approval of subgrade before placing granular base.

.2 Place granular base material to lines, widths, and depths as indicated.

.3 Compact granular base in maximum 150 mm layers to at least 100% Standard Proctor dry density to ASTM D698 (see Section 32 11 23 - Aggregate Base Courses).

3.3 CONCRETE

.1 Obtain Consultant's approval of granular base and reinforcing steel prior to placing concrete.

.2 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.3 Immediately after floating, give sidewalk surface uniform broom finish to produce regular corrugations not exceeding 2 mm deep, by drawing broom in direction normal to centre line.

.4 Provide edging as indicated with 10 mm radius edging tool.

.5 Slip-form pavers equipped with string line system for line and grade control may be used if quality of work acceptable to Consultant can

be demonstrated. Hand finish surfaces when directed by Consultant.

3.4 TOLERANCES

.1 Finish surfaces to within 3 mm in 3m as measured with 3m straightedge placed on surface.

3.5 EXPANSION AND CONTRACTION JOINTS

.1 Install tooled transverse contraction joints after floating, when concrete is stiff, but still plastic, at intervals of 50 m.

.2 Install expansion joints as indicated or as directed by Consultant.

.3 When sidewalk is adjacent to curb, make joints of curb, gutters and sidewalk coincide.

3.6 ISOLATION JOINTS

.1 Install isolation joints around manholes and catch basins and along length adjacent to concrete curbs, catch basins, buildings, or permanent structure.

.2 Install joint filler in isolation joints in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.3 Seal isolation joints with sealant approved by Consultant.

3.7 CURING

.1 Cure concrete by adding moisture continuously in accordance with CSA-A23.1/A23.2 to exposed finished surfaces for at least 1 day after placing, or sealing moisture in by curing compound as directed by Consultant.

.2 Where burlap is used for moist curing, place two prewetted layers on concrete surface and keep continuously wet during curing period.

.3 Apply curing compound evenly to form continuous film, in accordance with manufacturer's requirements.

3.8 BACKFILL

.1 Allow concrete to cure for 7 days prior to backfilling.

.2 Backfill to designated elevations with material as directed by Consultant.

.1 Compact and shape to required contours as indicated or as directed by Consultant.

3.9 LINSEED OIL TREATMENT

.1 Apply two coats of linseed oil mixture uniformly to surfaces of curbs, walks and gutters, after concrete has cured for specified curing time and when surface of concrete is clean and dry.

.2 Linseed oil mixture to consist of 50% boiled linseed oil and 50% mineral spirits by volume.

.3 Apply treatment when air temperature above 10 degrees C.

.4 Apply first coat at 135 mL/m^2.

.5 Apply second coat at 90 mL/m^2 when first coat has dried.

3.10 CLEANING

.1 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 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.
.2 Section 03 20 00 - Concrete Reinforcing.
.3 Section 03 30 00 - Cast-in-Place Concrete.
.4 Section 31 23 33 - Excavation, Trenching and Backfilling.
.5 Section 33 31 13 - Public Sanitary Utility Sewerage piping.

1.2 MEASUREMENT PROCEDURES

.1 Supply and install pump station wet wells, manholes and catch basins as required including excavation and backfilling, granular bedding and surround, adjusting tops, frames and covers/grates, testing and reinstatement will be all inclusive of this lump sum contract.

1.3 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
  .1 ASTM A48/A48M-00, Standard Specification for Gray Iron Castings.
  .2 ASTM C117-04, Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing.
  .3 ASTM C136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  .4 ASTM C139-05, Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
  .5 ASTM C478M-06, Standard Specification for Precast Reinforced Concrete Manhole Sections Metric.
  .6 ASTM D698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m^3).
.2 Canadian General Standards Board (CGSB)
  .1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
.3 Canadian Standards Association (CSA International)
  .1 CAN/CSA-A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  .2 CAN/CSA-A3000-03(R2005), Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    .1 CSA-A3001-03, Cementitious Materials for Use in Concrete.
    .2 CSA-A3002-03, Masonry and Mortar Cement.

.3 CAN/CSA-A165 Series-04, CSA Standards on Concrete Masonry Units (Consists of A165.1, A165.2 and A165.3).
.4 CAN/CSA-G30.18-M92(R2002), Billet Steel Bars for Concrete Reinforcement.
.5 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS).

.5 Design and Construction Specifications (Water Wastewater & Stormwater Systems) - Halifax Water, latest edition.

.6 Municipal Design Guidelines “Redbook” - Halifax Regional Municipality, latest edition.

.7 The Standard Specification for Municipal Services as published by the Nova Scotia Road Builders Association (NSRBA) - Nova Scotia Consulting Engineers Association Joint Committee on Contract Documents, latest edition.

1.4 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
.1 Submit 1 electronic copy of manufacturer’s shop drawings for each piece of infrastructure to the Consultant for approval.
.2 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.
.1 Submit manufacturer's shop drawings at least 4 weeks prior to beginning Work.
.2 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures and maintenance schedule.

1.5 QUALITY ASSURANCE

.1 Meet one week prior to beginning on-site installation, with contractor's representative and Consultant to:
.1 Review existing infrastructure location, depths, installation, and substrate conditions.
.2 Review manufacturer's installation instructions and warranty requirements.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with instructions to Bidders, Provincial and Municipal Regulations.

2Part - PRODUCTS

2.1 MATERIALS

.1 Cast-in-place concrete:

.1 In accordance with Section 03 30 00 - Cast-in-Place Concrete.

.2 Concrete reinforcement: in accordance with Section 03 20 00 - Concrete Reinforcing.

.2 Precast Pump Station manhole unit: to ASTM C478M, circular as manufactured by “Shaw”, “Strescon” or approved equal.

.1 Top sections flat slab top type with opening offset for vertical ladder installation.

.2 Monolithic bases to be approved by Consultant.

.3 Precast catch basin sections: to ASTM C478M.

.4 Joints: made watertight using rubber rings and bituminous compound epoxy resin chord as per HW standard detail.

.5 Mortar:

.1 Aggregate: sand.

.2 Masonry Cement: to CAN/CSA-A3002.

.6 Ladder rungs: Not Required.

.7 Adjusting rings: to ASTM C478M.

.8 Drop manhole pipe: same as sewer pipe. Interior drops for pipes smaller than 375mm and exterior drops for pipes 375mm and larger.

.9 Frames, gratings, covers to dimensions as indicated and following requirements:

.1 Metal gratings and covers to bear evenly on frames.

.1 Frame with grating or cover to constitute one unit.

.2 Assemble and mark unit components before shipment.

.2 Gray iron castings: to ASTM A48/A48M, strength class30B.

.3 Castings: coated with two applications of asphalt varnish.

.4 Manhole frames and covers: “IMP R10" heavy duty municipal type for road service.

.1 Cover cast without perforations and complete with two 25 mm square lifting holes.

.2 Manhole covers to be bolt down type where not installed in asphalt.

.5 Catch basin frames and covers: “IMP S361" for curbs and “IMP S441" for area type.

.6 Size: 762 mm clear diameter.

.10 Granular bedding (Type 1) and backfill: in accordance with Section 31 05 16 - Aggregate Materials (minimum 150 mm).

.11 Concrete mixes and materials: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.1 Unshrinkable fill: in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.

3Part - 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 data sheets.

3.2 EXCAVATION AND BACKFILL

.1 Excavate and backfill in accordance with Section 31 23 33 - Excavating Trenching and Backfilling and as indicated.

.2 Obtain approval of Consultant before installing manholes or catch basins.

3.3 CONCRETE WORK

.1 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.2 Place concrete reinforcement in accordance with Section 03 20 00 - Concrete Reinforcing.

.3 Position metal inserts in accordance with dimensions and details as indicated.

3.4 INSTALLATION

.1 Construct units in accordance with details indicated, plumb and true to alignment and grade.

.2 Complete units as pipe laying progresses.

.1 Maximum of three units behind point of pipe laying will be allowed.

.3 Dewater excavation to approval of Consultant and remove soft and foreign material before placing concrete base.

.4 Set precast concrete base on 150 mm minimum of Type 1 granular bedding compacted to 100% Standard Proctor dry density.

.5 Precast units:

.1 Set bottom section of precast unit on 150 mm minimum of Type 1 granular bedding.

.2 Make each successive joint watertight with Consultant's approved rubber ring gaskets and bituminous epoxy resin chord.

.3 Plug lifting holes with precast concrete plugs set in cement mortar or mastic compound.

.4 Provide a minimum of 300 mm of Type 1 bedding around the outside perimeter face of manhole (from bottom section of precast unit to sub base gravels).

.6 For sewers:

.1 Place stub outlets at elevations and in positions indicated.

.2 Bench to provide smooth U-shaped channel.

.1 Side height of channel to be 0.75 times full diameter of sewer.

.2 Slope adjacent floor at 1 in 20.

.3 Curve channels smoothly.

.4 Slope invert to establish sewer grade.

.7 Compact granular backfill to 95% Standard Proctor dry density.

.8 Place unshrinkable backfill in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.

.9 Installing units in existing systems:

.1 Where new unit is installed in existing run of pipe, ensure full support of existing pipe during installation and install cast-in-place based for new unit as specified in HW Standard Detail HWSD-1490.

.2 Make joints watertight between new unit and existing pipe.

.3 Where deemed expedient to maintain service around existing pipes and when systems constructed under this project are ready for operation, complete installation with appropriate break-outs, removals, redirection of flows, blocking unused pipes or other necessary work.

.10 Place frame and cover on top section to elevation as indicated.

.1 If adjustment required use concrete ring or cast-in-place formed concrete.

.11 Clean units of debris and foreign materials.

.1 Remove fins and sharp projections.

.2 Prevent debris from entering system.

.12 Install safety platforms in manholes having depth of 5 m or greater, as indicated.

3.5 FIELD QUALITY CONTROL

.1 Leakage Test: Install watertight plugs or seals on inlets and outlets of each new sanitary sewer manhole and test by vacuum method as outlined in the NSRBA.

.2 If permissible leakage is exceeded, correct defects. Repeat until approved by Consultant. Contractor to pay for all Testing

Labour and equipment including Consultant Time and expenses for Failed Tests and Re-inspections.

.3 Consultant will issue Test Certificate for each manhole passing test.

3.6 CLEANING

.1 Proceed in accordance with Section 01 77 00 - Closeout Procedures.

.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 Contractor shall refer to Halifax Water (HW) Design and Construction Specifications latest edition Section 33 11 00 for confirmation of acceptable products, installation and testing procedures. Should discrepancies arise the HW Specification will govern

1.2 SECTION INCLUDES

.1 Materials and installation for water mains, hydrants, valves, valve boxes, and valve chambers, including service connections.

1.3 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures..
.2 Section 31 23 33 - Excavating, Trenching and Backfilling.
.3 Section 03 20 00 - Concrete Reinforcing.
.4 Section 03 30 00 - Cast-in-Place Concrete.

1.4 REFERENCES

.1 American National Standards Institute/American Water Works Association (ANSI/AWWA)
  .1 ANSI/AWWA B300-99, Hypochlorites.
  .2 ANSI/AWWA B301-99, Liquid Chlorine.
  .3 ANSI/AWWA B303-00, Sodium Chlorite.
  .4 ANSI/AWWA C207-01, Steel Pipe Flanges for Waterworks Service, 100 mm through 3,600 mm.
  .5 ANSI/AWWA C208-01, Dimensions for Fabricated Steel Water Pipe Fittings. Type.
  .6 ANSI/AWWA C500-02, Metal-Seated Gate Valves for Water Supply Service (Includes Addendum C500a-95).
  .7 ANSI/AWWA C504-00, Rubber-Seated Butterfly Valves.
  .8 ANSI/AWWA C600-99, Installation of Ductile-Iron Water Mains, and Their Appurtenances.
  .9 ANSI/AWWA C602-00, Cement-Mortar Lining of Water Pipelines - 100 mm and Larger.
  .10 ANSI/AWWA C651-99, Disinfecting Water Mains.
  .11 ANSI/AWWA C800-01, Underground Service Line Valves and Fittings (Also Included: Collected Standards for Service Line Materials).
  .12 ANSI/AWWA C900-97, Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 100 mm - 300 mm, for Water Distribution.
.2 American Society for Testing and Materials International, (ASTM)
  .1 ASTM A53/A53M-02, Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless.
  .2 ASTM A307-02, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.

.3 ASTM B88M-99, Standard Specification for Seamless Copper Water Tube Metric.
.4 ASTM C117-95, Standard Test Method for Material Finer Than 75 MU m (No. 200) Sieve in Mineral Aggregates by Washing.
.5 ASTM C136-01, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
.6 ASTM C478M-97, Standard Specification for Precast Reinforced Concrete Manhole Sections Metric.
.7 ASTM D698-00a, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m^3).
.8 ASTM D2310-01, Standard Classification for Machine-Made "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe.
.9 ASTM D2657-97, Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings.
.10 ASTM D2992-01, Standard Practice for Obtaining Hydrostatic or Pressure Design Basis for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fitting.
.11 ASTM D2996-01, Standard Specification for Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe.
.12 ASTM F714-01, Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.

.3 American Water Works Association (AWWA)/Manual of Practice
.1 AWWA M11-1989, Steel Pipe - A Guide for Design and Installation.
.2 AWWA M17-1989, Installation, Field Testing, and Maintenance of Fire Hydrants.

.4 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-8.2-M88 Sieves, Testing, Woven Wire, Metric.
.2 CAN/CGSB-1.88-92, Gloss Alkyd Enamel, Air Drying and Baking.
.3 CGSB 41-GP-25M-77, Pipe, Polyethylene, for the Transport of Liquids.

.5 Canadian Standards Association (CSA International)
.1 CSA B137 Series-02, Thermoplastic Pressure Piping Compendium. (Consists of B137.0, B137.1, B137.2, B137.3, B137.4, B137.4.1, B137.5, B137.6, B137.8, B137.9, B137.10, B137.11 and B137.12).
.1 CSA B137.3-02, Rigid Polyvinyl Chloride (PVC) Pipe for Pressure Applications.
.2 CAN/CSA-G30.18-M92(R1998), Billet Steel Bars for Concrete Reinforcement.

.3 CAN/CSA-G164-M92(R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.

.6 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act, 1999 (CEPA).

.7 Transport Canada (TC)

.1 Transportation of Dangerous Goods Act, 1992 (TDGA)

.8 The Master Painters Institute (MPI)

.1 Architectural Painting Specification Manual - March 1998(R2002).

.9 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S520-1991, Hydrants.

.2 CAN4-S543-1984, Internal-Lug, Quick Connect Couplings for Fire Hose.

.10 Halifax Water (HW) Design and Construction Specifications, latest Edition.

.11 Standard Specification for Municipal Services - NSRBA and NSCEA, latest Edition.

.12 Canadian Drinking Water Standards, latest Edition.

1.5 SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Pipe certification to be on pipe.

1.6 CLOSEOUT SUBMITTALS

.1 Provide data to produce record drawings, including directions for operating valves, list of equipment required to operate valves, details of pipe material, hydrant details, maintenance and operating instructions in accordance with Section 01 77 00 - Closeout Procedures.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with instructions to Bidders, Provincial and Municipal Regulations.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal of paper, plastic, polystyrene, and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Separate for reuse and recycling and place in designated containers Steel, Metal, and Plastic waste in accordance with Waste Management Plan.

.5 Place materials defined as hazardous or toxic in designated containers.

.6 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.

.7 Ensure emptied containers are sealed and stored safely.

.8 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Consultant.

.9 Do not dispose of unused disinfection material into sewer system, into streams, lakes, onto ground or in other location where they will pose health or environmental hazard.

1.8 SCHEDULING OF WORK

.1 Schedule Work to minimize interruptions to existing services. Contractor to contact Halifax Regional School Board & Sir John A Principal to schedule the required connection at the building and to operate any existing building valves.

.2 Notify Consultant, Halifax Regional School Board & Sir John A Principal a minimum of 48 h in advance of interruption in service.

.3 Do not interrupt water service for more than 3 h and confine this period between 10:00 and 16:00 h local time unless otherwise authorized.

.4 Notify fire department of any planned or accidental interruption of water supply to hydrants.

.5 Provide "Out of Service" sign on hydrant not in use.

.6 Advise local police department, emergency ambulance, Fire Department, HRM, Halifax Regional School Board & Sir John A Principal of anticipated interference with movement of traffic.

1.9 EXTRA MATERIALS

.1 Provide Owner with following tools:

.1 none

2Part - PRODUCTS

2.1 PIPE, JOINTS AND FITTINGS

.1 PEX or Polyethylene pressure pipe: To CSA-B137.1, type PE, series 160 ASTM F714, Type PE, series DR 11.

.2 Polyethylene pipe joints: plastic insert type serrated sleeves with four stainless steel screws and band-type clamps per joint. No joints are permitted between buildings.

.3 Brass corporation stops: red brass to ASTM B62 having threads to ANSI/AWWA C800.

.4 Brass inverted key-type curb stops: red brass to ASTM B62, compression type with drains.

.5 Curb stops to have adjustable bituminous coated cast iron service box with stem to suit depth of bury.

.6 Top of cast iron box marked "WATER".

2.2 VALVES AND VALVE BOXES

.1 Valves to open counter clockwise.

.2 Gate valves: to ANSI/AWWA C500, standard iron body, solid resilient wedge valves with non-rising stems, suitable for 1380 kPa with mechanical joints.

.3 Underground type indicator valve where indicated. Indicator post to accurately indicate valve open or closed.

.4 Air and vacuum release valves: heavy duty combination air release valves employing direct acting kinetic principle.

.1 Fabricate valves of cast iron body and cover, with bronze trim, stainless steel floats with shock-proof synthetic seat suitable for 2 MPa working pressure.

.2 Valves to expel air at high rate during filling, at low rate during operation, and to admit air while line is being drained.

.3 Valve complete with surge check unit.

.4 Ends to be flanged to ANSI/AWWA C110/A21.10.

.5 Cast iron valve boxes: three piece sliding type adjustable over minimum of 450 mm complete with valve operating extension rod, 30 mm minimum diameter, 25 x 25 mm cross section, of such length that when set on valve operating nut top of rod will not be more than 150 mm below cover.

.1 Base to be large round type with minimum diameter of 300 mm. Acceptable product “IMP model V.1.”

.2 Top of box to be marked "SERVICE", "SPRINKLER", OR “HYDRANT”.

2.3 HYDRANTS

.1 Hydrants: compression type hydrant, to CAN/ULC-S520 designed for working pressure of 1380 kPa with two 65 mm threaded hose outlets, one 100 mm threaded pumper connection, 150 mm riser barrel, 125 mm bottom valve and 150 mm connection for main meeting the local water utility standards (manufacture, operation and colour).

.2 Hydrant paint: exterior to be “Yellow” to standard of HW.

2.4 PIPE BEDDING AND SURROUND MATERIAL

.1 Granular material “Type 1" to: Section 31 05 16 - Aggregate Materials.

.2 Concrete mixes and materials required for bedding cradles, encasement, supports, thrust blocks: to Section 03 30 00 - Cast-in-Place Concrete (minimum 25 MPa).

2.5 BACKFILL MATERIAL

.1 As indicated, in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.

2.6 PIPE DISINFECTION

.1 Undertake disinfection of water mains in accordance with the HW standards in conjunction with Standard Specifications for Municipal Services and dispose of as per NSE regulations.

3Part - EXECUTION

3.1 PREPARATION

.1 Clean pipes, fittings, valves, hydrants, and appurtenances of accumulated debris and water before installation.
  .1 Inspect materials for defects to approval of Consultant.
  .2 Remove defective materials from site as directed by Consultant.

3.2 TRENCHING

.1 Do trenching work in accordance with Section 31 23 33 - Excavating Trenching and Backfilling.
.2 Trench depth to provide cover over pipe of not less than 1.6 m from finished grade. Provide 600mm wide x 50mm HI-40 Rigid Insulation above water main installation in rock fill or where cover over pipe is less than 1.6m but greater than 1.2m.
.3 Trench alignment and depth require Consultant's approval prior to placing bedding material and pipe.

3.3 CONCRETE BEDDING AND ENCASEMENT

.1 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete.
  .1 Place concrete to details as indicated or as directed by Consultant.
.2 Pipe may be positioned on concrete blocks to facilitate placing of concrete. When necessary, rigidly anchor or weight pipe to prevent flotation when concrete is placed.
.3 Do not backfill over concrete within 24 hours after placing.

3.4 GRANULAR BEDDING

.1 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth as indicated. Place a minimum of 250 mm bedding below the bottom of the pipe and extend to a minimum of 450 mm above the top of the pipe (measured as compacted).
.2 Do not place material in frozen condition.
.3 Shape bed true to grade to provide continuous uniform bearing surface for pipe.
.4 Shape transverse depressions in bedding as required to suit joints.
.5 Compact each layer full width of bed to at least 95% of Standard Proctor dry density.
.6 Fill authorized or unauthorized excavation below design elevation of bottom of specified bedding in accordance with

Section 31 23 33 - Excavating Trenching and Backfilling with compacted bedding material.

3.5 PIPE INSTALLATION

.1 Terminate building water service inside building wall above floor slab, where indicated on the drawings. Cap pipe a minimum of 450 mm inside the proposed foundation wall and anchor back to the wall as indicated on the drawings.

.2 Lay pipes to manufacturer's standard instructions and specifications.

.3 Join pipes in accordance with manufacturer's recommendations.

.4 Handle pipe by methods recommended by pipe manufacturer. Do not use chains or cables passed through pipe bore so that weight of pipe bears on pipe ends.

.5 Lay pipes on prepared bed, true to line and grade.

.1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.2 Take up and replace defective pipe.

.3 Correct pipe which is not in true alignment or grade or pipe which shows differential settlement after installation greater than 10 mm in 3 m.

.6 Face bell ends of pipe in direction of laying. Face socket ends up-grade.

.7 Do not exceed permissible deflection at joints as recommended by pipe manufacturer.

.8 Keep jointing materials and installed pipe free of dirt and water and other foreign materials.

.1 Whenever work is stopped, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.9 Position and join pipes with equipment and methods approved by Consultant.

.10 Cut pipes in approved manner as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.

.11 Align pipes before jointing.

.12 Install gaskets to manufacturer's recommendations. Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

.13 Avoid displacing gasket or contaminating with dirt or other foreign material.

.1 Remove disturbed or contaminated gaskets.

.2 Clean, lubricate and replace before jointing is attempted again.

.14 Complete each joint before laying next length of pipe.

.15 Minimize deflection after joint has been made.

.16 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.

.17 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as otherwise approved by Consultant.

.18 When stoppage of work occurs, block pipes in an approved manner to prevent creep during down time.

.19 Recheck plastic pipe joints assembled above ground after placing in trench to ensure that no movement of joint has taken place.

.20 Do not lay pipe on frozen bedding.

.21 Do hydrostatic leakage test in the presence of the Consultant.

.22 For corrosion protection install polyethylene on ductile iron pipes and fittings as per HW Standard Detail HWSD-1020.

.23 Install zinc anodes on all valves and hydrant bases as per HW Standard Details HWSD-1030, 1040 & 1100.

3.6 VALVE INSTALLATION

.1 Install valves to manufacturer's recommendations at locations as indicated.

.2 Support valves located in valve boxes by means of concrete located between valve and solid ground. Bedding same as adjacent pipe for ductile iron pipe. Minimum length of pipe on each end of valve shall be 1 m. Valves not to be supported by pipe.

.3 Install underground post-type indicator valves as indicated.

3.7 SERVICE CONNECTIONS

.1 Terminate building water service inside building wall where indicated on the drawings. Cap pipe a minimum of 450mm inside the proposed foundation wall and anchor back to the wall as indicated on the drawings.

.2 Do not connect to building plumbing until satisfactory completion of hydrostatic and leakage tests of water main.

.3 Tappings on ductile iron may be threaded without service clamps.

.1 Double strap service connections with galvanized malleable iron body and neoprene gasket cemented in place may be used.

.4 Employ only competent workmen equipped with suitable tools to carry out tapping of mains, cutting and flaring of pipes.

.5 Tap main at 2:00 o'clock or 10:00 o'clock position only; not closer to joint nor closer to adjacent service connections than recommended by manufacturer, or 1 m, whichever is greater.

.6 Leave corporation stop valves fully open.

.7 In order to relieve strain on connections, install service pipe in "Goose Neck" form "laid over" into horizontal position.

.8 Install curb stop with corporation box on services NPS 2 or less in diameter.
- .1 Equip larger services with gate valve and cast iron box.
- .2 Set box plumb over stop and adjust top flush with final grade elevation.
- .3 Leave curb stop valves fully closed.

3.8 HYDRANTS

.1 Install hydrants, 150 mm gate and cast iron valve box on hydrant lead at locations as indicated.

.2 Set hydrants plumb, with hose outlets parallel with edge of pavement or curb line, with pumper connection facing roadway and with body flange set at elevation of 100mm above final grade.

.3 Place concrete thrust blocks as indicated and specified ensuring that drain holes are unobstructed. Confirm with HW to confirm if drain holes are to remain open or plugged.

.4 To provide proper draining for each hydrant, excavate pit measuring not less than 1 x 1 x 0.5 m deep and backfill with coarse gravel or crushed stone to level 150 mm above drain holes.

.5 Place appropriate sign on installed hydrants indicating they are not in service during construction.

3.9 THRUST BLOCKS AND RESTRAINED JOINTS

.1 For thrust blocks: do concrete Work in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.2 Place concrete thrust blocks between valves, tees, plugs, caps, bends, changes in pipe diameter, reducers, hydrants and fittings and undisturbed ground as indicated in the HW standard detail HWSD-1070 & 1080.

.3 Keep joints and couplings free of concrete and provide formwork for sides of concrete thrust blocks from pipe to undisturbed ground.

.4 Do not backfill over concrete within 24 hours after placing.

.5 For restrained joints: only use restrained joints approved by Consultant.

3.10 HYDROSTATIC AND LEAKAGE TESTING

.1 Do tests in accordance with ANSI/AWWA C600 and HW standard.

.2 Provide labour, equipment and materials required to perform hydrostatic and leakage tests. Notify Consultant at least 24 hours in advance of proposed tests. Perform tests in presence of Consultant.

.3 Where section of system is provided with concrete thrust blocks, conduct tests at least 5 days after placing concrete or 2 days if high early strength concrete is used.

.4 Upon completion of pipe laying and after Consultant has inspected Work in place, surround and cover pipes with approved granular material and backfill to a minimum of 1.4 m cover before performing any pressure tests.

.5 When testing is done during freezing weather, protect pipe, hydrants, valves and fittings from freezing.

.6 Secure caps, bends, tees, and valves, to prevent movement when test pressure is applied.

.7 Open valves.

.8 Expel air from main by slowly filling main with potable water.

.1 Install corporation stops at high points in main where no air-vacuum release valves are installed.

.2 Remove stops after satisfactory completion of test and seal holes with plugs.

.9 Apply hydrostatic leakage test pressure of 1380 kPa for period of 2 hours.

.10 Zero leakage is permitted in the 2 hours test.

.11 Locate and repair defects if leakage is greater than amount specified.

.12 Repeat test until zero leakage is provided for full length of water main.

3.11 PIPE SURROUND

.1 Upon completion of pipe laying and after Consultant has inspected Work in place, surround and cover pipes as indicated.

.2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.

.1 Do not dump material within 1m of pipe.

.3 Place layers uniformly and simultaneously on each side of pipe.

.4 Do not place material in frozen condition.

.5 Compact each layer from pipe invert to mid height of pipe to at least 95% of Standard Proctor dry density.

.6 Compact each layer from mid height of pipe to underside of backfill to at least 90% of Standard Proctor dry density.

3.12 BACKFILL

.1 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.

.2 Do not place backfill in frozen condition.

.3 Compact backfill to at least 95% Standard Proctor dry density.

3.13 HYDRANT FLOW TESTS

.1 Conduct flow tests on every hydrant to determine fire flows prior to painting hydrant caps and ports. Results of hydrant flow test shall be provided to Consultant by approved testing agency.

3.14 PAINTING OF HYDRANTS

.1 After installation, paint hydrant "Yellow" as per Halifax Water Standard and Bollards safety yellow.

3.15 FLUSHING AND DISINFECTING

.1 Flushing and disinfecting operations: witnessed by Consultant and local water work department.

.1 Notify Consultant and HW at least 4 days in advance of proposed date when disinfecting operations will begin.

.2 Flush water mains through available outlets with a sufficient flow of potable water to produce velocity of 1.5 m/s, within pipe for minimum 10 minutes, or until foreign materials have been removed and flushed water is clear.

.3 Flushing flows as follows:

Pipe Size NPS	Flow (L/s) Minimum
6 and below	38
8	75
10	115
12	150

.4 Provide connections and pumps for flushing as required.

.5 Open and close valves, hydrants and service connections to ensure thorough flushing.

.6 When flushing has been completed to Consultant approval, introduce strong solution of chlorine as approved by Consultant into water main and ensure that it is distributed throughout entire system.

.7 Disinfect water mains.

.8 Rate of chlorine application to be proportional to rate of water entering pipe.

.9 Chlorine application to be close to point of filling water main and to occur at same time.

.10 Operate valves, hydrants and appurtenances while main contains chlorine solution.

.11 Flush line to remove chlorine solution after 24 hours.

.12 Measure chlorine residuals at extreme end of pipe-line being tested.

.13 Perform bacteriological tests on water main, after chlorine solution has been flushed out.

.1 Consultant to take samples daily for minimum of two consecutive days.

.2 Should contamination remain or recur during this period, repeat disinfecting procedure. Failed tests repeated will be at the Contractor's expense.

.3 Consultant to provide certified copy of test results.

.14 Take water samples at hydrants and service connections, in suitable sequence, to test for chlorine residual.

.15 After adequate chlorine residual not less than 50 ppm has been obtained leave system charged with chlorine solution for 24 hours.

.1 After 24 hours, take further samples to ensure that there is still not less than 10 ppm of chlorine residual remaining throughout system.

.16 All required water is to be supplied by the Contractor. Municipal water will be available to directly fill the new main (Contractor to contact and make arrangements with HW).

3.16 SURFACE RESTORATION

.1 After installing and backfilling over water mains, restore surface to original condition as indicated on the drawings or as directed by the Consultant.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for gravity and pressure sanitary sewers.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.
.2 Section 03 30 00 - Cast-in-Place Concrete.
.3 Section 31 05 16 - Aggregate Materials.
.4 Section 31 23 33 - Excavating Trenching and Backfilling.
.5 Section 33 05 13 - Manholes and Catch Basin Structures.

1.3 MEASUREMENT PROCEDURES

.1 Measure excavation and backfill under Section 31 23 33 - Excavating Trenching and Backfilling.
.2 Measure supply and installation of sanitary sewer including testing and including excavation and backfilling and granular bedding and surround horizontally from manhole face to manhole face in metres of each size pipe and depth class installed.

1.4 PAYMENT PROCEDURES

.1 Contractor to carry out inspection of installed sanitary sewer pipes by video television camera and to provide a copy of video and report to Consultant.
.2 After television and photographic pipe inspections:
  .1 If no defective Work is found, Owner will pay costs for Consultant to review video report.
  .2 If defective Work is found, Contractor to pay for any repairs, cleaning, re-inspection, re-video, and for Consultant to review video reinspection report.

1.5 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)
  .1 ASTM D2680-01, Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly Vinyl Chloride (PVC) Composite Sewer Piping.
  .2 ASTM D3034-00, Standard Specification for Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings.
.2 Canadian General Standards Board (CGSB).
  .1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
.3 Canadian Standards Association (CSA International)
  .1 CSA B1800-02, Plastic Non-pressure Pipe Compendium - B1800 Series (Consists of B181.1, B181.2, B181.3,

B181.5, B182.1, B182.2, B182.4, B182.6, B182.7, B182.8 and B182.11).

.1 CSA B182.1-02, Plastic Drain and Sewer Pipe and Pipe Fittings.

.2 CSA B182.2-02, PVC Sewer Pipe and Fittings (PSM Type).

.3 CSA B182.6-02, Profile Polyethylene Sewer Pipe and Fittings for Leak-Proof Sewer Applications.

.4 CSA B182.11-02, Recommended Practice for the Installation of Thermoplastic Drain, Storm, and Sewer Pipe and Fittings.

.4 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act, 1999 (CEPA)

.5 Transport Canada (TC)

.1 Transportation of Dangerous Goods Act, 1992 (TDGA)

.6 Standard Specification for Municipal Services - NSRBA and NSCEA, latest edition.

.7 Halifax Water Design and Construction Specifications, latest edition.

1.6 DEFINITIONS

.1 Pipe section is defined as length of pipe between successive manholes and/or between manhole and any other structure which is part of sewer system.

1.7 SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Inform Consultant at least 4 weeks prior to beginning Work, of proposed source of bedding materials and provide access for sampling.

.3 Ensure certification is marked on pipe.

.4 Submit manufacturers information data sheets and instructions in accordance with Section 01 33 00 - Submittal Procedures.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Manufacturer's recommendations.

1.9 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with instructions to Bidders, Provincial and Municipal Regulations.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material in appropriate on-

site bins for recycling in accordance with Waste Management Plan.

.4 Separate for reuse and recycling and place in designated containers Steel, Metal, and Plastic waste in accordance with Waste Management Plan.

.5 Place materials defined as hazardous or toxic in designated containers.

.6 Divert unused metal materials from landfill to metal recycling facility as approved by Consultant.

.7 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.

.8 Fold up metal banding, flatten and place in designated area for recycling.

1.10 SCHEDULING

.1 Schedule Work to minimize interruptions to existing services and maintain existing sewage flows during construction.

.2 Submit schedule of expected interruptions for approval and adhere to approved schedule.

.3 Notify Consultant, affected customers and HW 48 hours minimum in advance of any interruption in service or pipe installation.

2Part - PRODUCTS

2.1 PLASTIC PIPE

.1 Type PSM Polyvinyl Chloride (PVC): to CSA-B182.2.

.1 Standard Dimensional Ratio (SDR): 35 (pipes 200mmØ and larger).

.2 Locked-in gasket and integral bell system.

.3 Nominal lengths: 4 and 6 m.

2.2 SERVICE CONNECTIONS

.1 Type PSM PolyVinyl Chloride (PVC): to CSA-B182.2.

.1 Acceptable material: DR28 (pipes smaller than 200mmØ) for gravity sewers.

.2 Acceptable material: DR26 for pressure sewers.

2.3 CEMENT MORTAR

.1 Portland cement: to CAN/CSA-A5, normal type 10.

.2 Mix mortar one part by volume of cement to two parts of clean, sharp sand mixed dry.

.1 Add only sufficient water after mixing to give optimum consistency for placement. Do not use additives.

2.4 PIPE BEDDING AND SURROUND MATERIALS

.1 Granular material (Type 1) to Section 31 05 16 - Aggregate Materials.
.2 Concrete mixes and materials for cradles, encasement, supports: to Section 03 30 00 - Cast-in-Place Concrete.

2.5 BACKFILL MATERIAL

.1 As indicated on the drawings & details.
.2 Unshrinkable fill: to Section 31 23 33 - Excavating, Trenching and Backfilling.

3Part - EXECUTION

3.1 PREPARATION

.1 Clean and dry pipes and fittings before installation.
.2 Obtain Consultant's approval of pipes and fittings prior to installation.

3.2 TRENCHING

.1 Do trenching Work in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.
.2 Do not allow contents of any sewer or sewer connection to flow into trench.
.3 Trench alignment and depth require approval of Consultant prior to placing bedding material and pipe.

3.3 GRANULAR BEDDING

.1 Place bedding in unfrozen condition.
.2 Place granular bedding materials in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.
.3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.
    .1 Do not use blocks when bedding pipe.
.4 Shape transverse depressions as required to suit joints.
.5 Compact each layer full width of bed to at least 95% Standard Proctor dry density.
.6 Fill excavation below bottom of specified bedding adjacent to manholes or structures with compacted bedding material.
.7 Provide Pipe Bedding thickness above and below the pipe (minimum 300mm above and 150mm below).

3.4 INSTALLATION

.1 Lay and join pipes in accordance with manufacturer's recommendations and to approval of Consultant.
.2 Handle pipe using methods approved by Consultant.
    .1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.

.3 Lay pipes on prepared bed, true to line and grade, with pipe invert smooth and free of sags or high points.
  .1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length. Tolerances: vertical 19mm or one half the rise per pipe length which ever is smaller.
.4 Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
.5 Do not exceed maximum joint deflection recommended by pipe manufacturer.
.6 Do not allow water to flow through pipe during construction, except as may be permitted by Consultant.
.7 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
.8 Install plastic pipe and fittings in accordance with CSA B182.11.
.9 Pipe jointing:
  .1 Install gaskets in accordance with manufacturer's recommendations.
  .2 Support pipes with hand slings as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
  .3 Align pipes before joining.
  .4 Maintain pipe joints free from mud, silt, gravel and other foreign material.
  .5 Avoid displacing gasket or contaminating with dirt or other foreign material. Gaskets so disturbed shall be removed, cleaned and lubricated and replaced before joining is attempted.
  .6 Complete each joint before laying next length of pipe.
  .7 Minimize joint deflection after joint has been made to avoid joint damage.
  .8 At rigid structures, install pipe joints not more than .45 m from side of structure.
  .9 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.
.10 When stoppage of Work occurs, block pipes as directed by Consultant to prevent creep during down time.
.11 Cut pipes as required for special inserts, fittings or closure pieces as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
.12 Make watertight connections to manholes.
  .1 Use suitable gaskets such as A-Lok or Kor-N-Seals or approved equal.

.13 Use prefabricated saddles or field connections approved by Consultant, for connecting pipes to existing sewer pipes. Joints to be structurally sound and watertight.

3.5 PIPE SURROUND

.1 Place surround material in unfrozen condition.

.2 Upon completion of pipe laying, and after Consultant has inspected pipe joints, surround and cover pipes as indicated.

.3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated. Do not dump material within 1 m of pipe.

.4 Place layers uniformly and simultaneously on each side of pipe.

.5 Compact each layer from pipe invert to mid height of pipe to at least 95% Standard Proctor dry density.

.6 Compact each layer from mid height of pipe to underside of backfill to at least 90% Standard Proctor dry density.

3.6 BACKFILL

.1 Place backfill material in unfrozen condition.

.2 Place backfill material, above pipe surround in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.

.3 Under paving and walks, compact backfill to at least 95% Standard Proctor dry density. In other areas, compact to at least 90% Standard Proctor dry density.

.4 Place unshrinkable fill in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.

3.7 SERVICE CONNECTIONS

.1 Install pipe to CSA B182.11 and manufacturer's instructions and specifications.

.2 Maintain grade for sewers at 1 vertical to 50 horizontal unless indicated otherwise.

.3 Service connections to main sewer: standard Tee fittings. Do not use break-in and mortar patch-type joints or saddle.

.4 Service connection pipe: not to extend into interior of main sewer.

.5 Make up required horizontal and vertical bends from 22-1/2 degree bends or less, separated by straight section of pipe with minimum length of four pipe diameters.

.1 Use long sweep bends where applicable.

3.8 FIELD TESTING

.1 Repair or replace pipe, pipe joint or bedding found defective.

.2 Clean the pipe to ensure that pipe is free of gravel, dirt or debris obstructions.

.3 Remove foreign material from sewers and related appurtenances by flushing with water.

.4 Perform low pressure air testing (28 kPa as per NSRBA requirements) as soon as practical after jointing and bedding are complete and service connections have been installed BUT BEFORE Connecting to the building sewer.

.5 Perform tests in presence of Consultant. Notify Consultant 24 hours in advance of proposed tests.

.6 Carry out tests on each section of sewer between successive manholes including service connections. Install air tight bulkheads in suitable manner to isolate test section from rest of pipeline and from building plumbing. Ideally test lateral prior to connecting to building plumbing.

.7 Repair and retest sewer line as required, until test results are within limits specified. Repair visible leaks regardless of test results.

.8 Television and photographic inspections:

.1 Carry out inspection of installed gravity sewers by television camera. Provide copy of video and report to Consultant. Sewer video must be clean and free from dirt and debris as part of Contractor's Lump Sum Cost.

.2 Provide means of access to permit Consultant to do inspections.

.3 If defective work or dirt/debris is found on the video, the Contractor shall pay for any re-inspection, cleaning or re-video.

END OF SECTION

SIR JOHN A MACDONALD HIGH SCHOOL
SKILLED TRADES BUILDING

UPPER TANTALLON, NS

ISSUED FOR TENDER

Halifax Regional School Board

SP DUMARESQ ARCHITECT LTD
6386 COBURG ROAD SECOND FLOOR HALIFAX, NS

BMR Structural Engineering

DUMAC ENERGY LIMITED CONSULTING ENGINEERS

SDMM
Servant, Dunbrack, McKenzie & MacDonald Ltd.
NOVA SCOTIA LAND SURVEYORS & CONSULTING ENGINEERS
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BAYERS LAKE BUSINESS PARK FAX: (902) 455-8479
HALIFAX, NS B3S 1C6 WEB: www.sdmm.ca

SP DUMARESQ ARCHITECT LTD

KEY PLAN

GENERAL NOTES

IF DIMENSION DOES NOT MEASURE 1" DRAWINGS IS NOTE PRINTED TO SCALE

DATE	#	ISSUE
2017-12-18	1	ISSUED FOR TENDER

REGISTERED MEMBER
S.P. DUMARESQ
ASSOCIATION OF ARCHITECTS

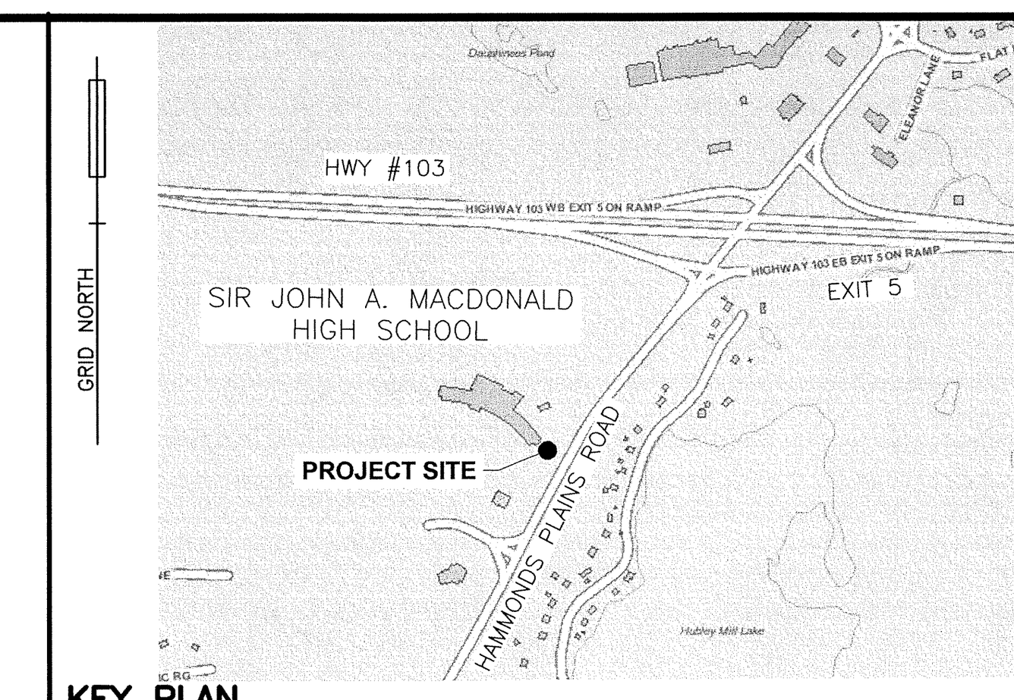
SCALE:	
DRAWN BY:	Author
REVIEWED BY:	
DATE:	DECEMBER 18 2017

PROJECT TITLE
SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

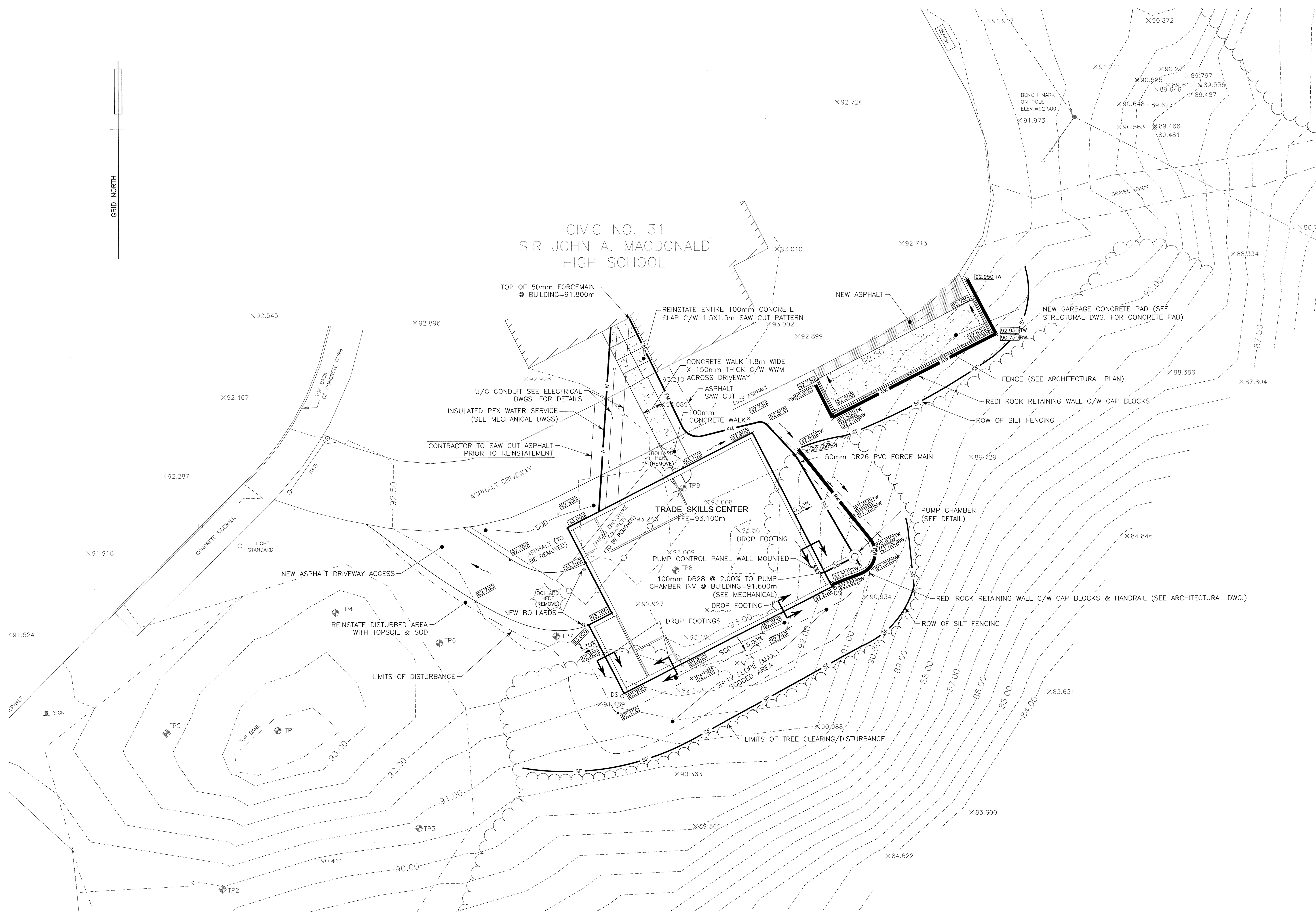
Project Number

SHEET TITLE
COVER SHEET

A000



KEY PLAN



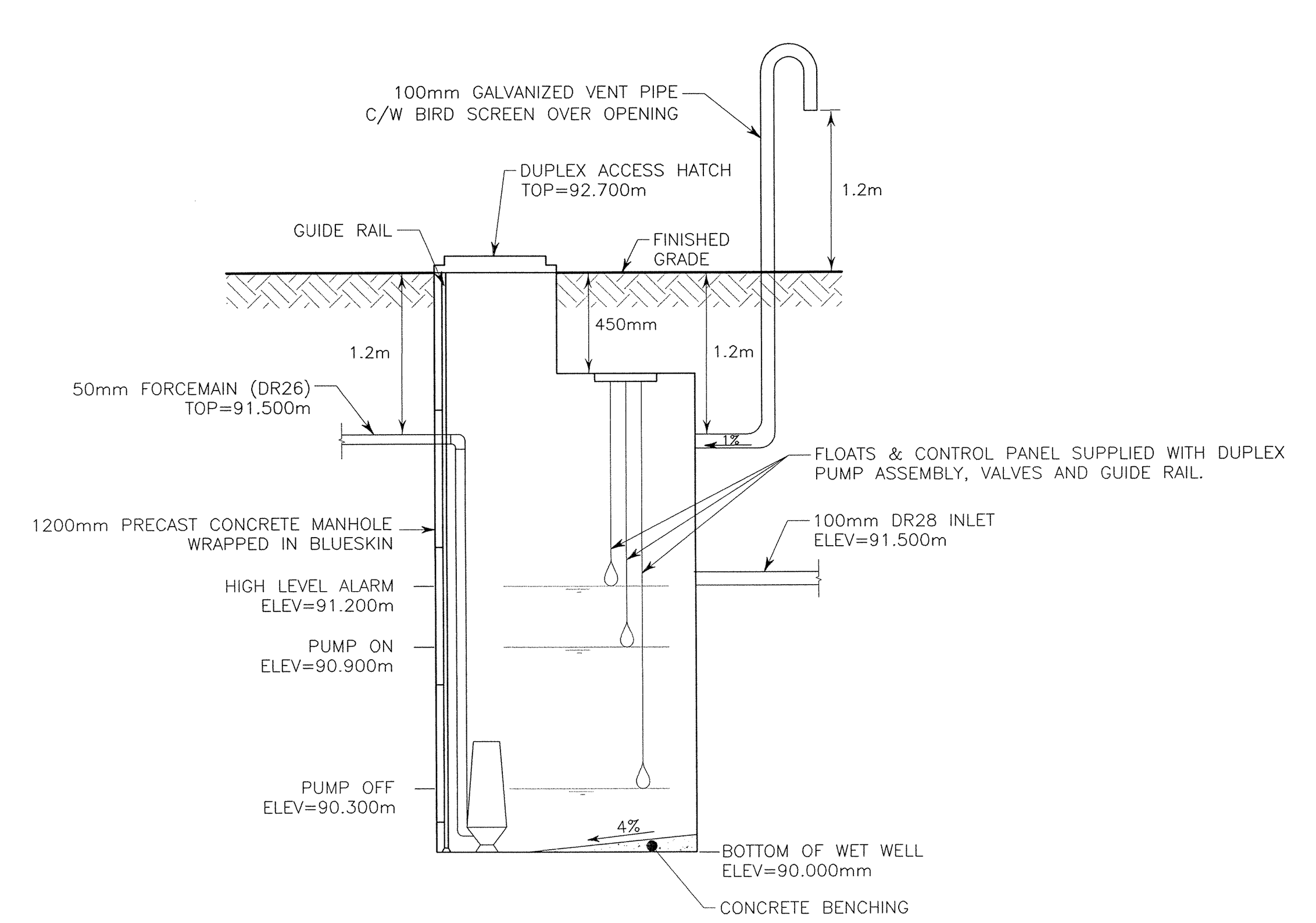
SITE PLAN
SCALE 1:200

LEGEND

EXISTING		PROPOSED
25.0	CONTOUR LINE	25.0
	CURB STOP/GATE/BUTTERFLY VALVE	
	FIRE HYDRANT	
	CONCRETE THRUST BLOCK	
	SIAMESE CONNECTION	
	CATCH BASIN/PIT	
	CULVERT	
RD	ROCK LINING/DAM	RD
	ROCK WALL/RETAINING WALL	
	POWER POLE & ANCHOR/LIGHT STANDARD	
	TREE	
	STREET SIGN/PARKING METER	
× 131.82	ELEVATION/GRADE	125.00
	TEST PIT	
	DRAINAGE/SWALE FLOW DIRECTION	
W	WATER MAIN/SERVICE	W
SAN	SANITARY MANHOLE & PIPE	SAN
STM	STORM MANHOLE & PIPE	STM
SAN/STM	COMBINED SEWER	SAN/STM
FM	FORCE MAIN	FM
GAS	GAS LINE	GAS
FL	100YR. FLOOD LIMIT	FL
	GUARD RAIL	
E	UNDERGROUND CONDUIT	E
	OVERHEAD WIRES	
	PROPERTY LINE/BOUNDARY	
	FENCE	
	BUILDING	
	TOP OF SLOPE	
	TOE OF SLOPE	
	TREELINE	
	LIMITS OF DISTURBANCE	
	DOWNSPOUT	DS

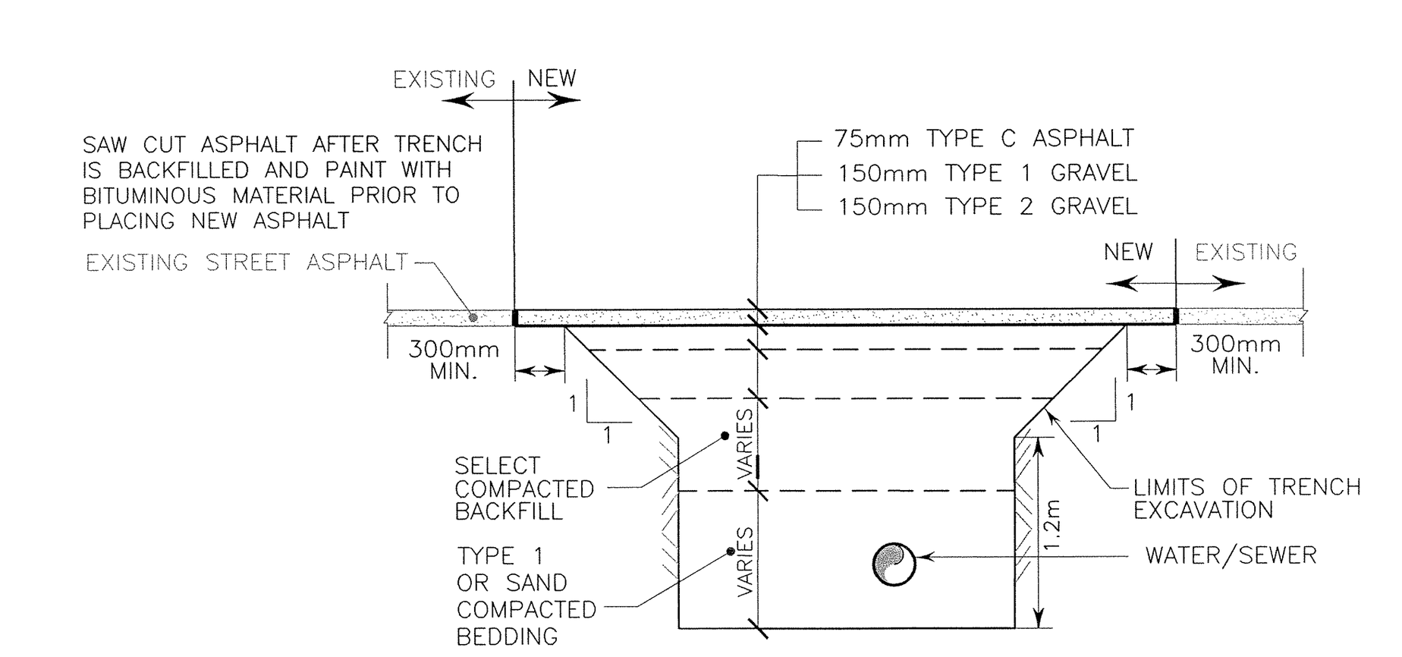
NOTES

1. SITE SURVEY COMPLETED BY THOMPSON CONN LIMITED, NOVEMBER 28, 2017 BASED GEODETIC CONTROL. MONUMENT NO. 222846, TOP ELEVATION = 75.959m. CONTOUR INTERVAL IS 0.5m.
2. CONTRACTOR TO FOLLOW LATEST EDITION OF THE STANDARD SPECIFICATIONS FOR MUNICIPAL SERVICES AS PREPARED BY NS ROAD BUILDERS ASSOCIATION AND CONSULTING ENGINEERS OF NS.
3. SEE MECHANICAL, ELECTRICAL, STRUCTURAL & ARCHITECTURAL DRAWINGS FOR COORDINATION.
4. CONTRACTOR TO REMOVE ALL EXISTING ASPHALT AND DISPOSE OF OFF SITE AT AN APPROVED FACILITY.
5. SEE CONQUEST GEOTECHNICAL INVESTIGATION REPORT FOR SOIL TEST PIT INFORMATION, SOIL CONDITIONS & RECOMMENDATIONS.
6. AREAS DISTURBED AND NOT FINISHED WITH ASPHALT OR CONCRETE SHALL BE FINISHED WITH 150mm OF TOPSOIL & SOD.
7. ROOF DOWNSPOUTS SHALL OUTLET TO SPLASH PADS.
8. ALL WORK TO BE DONE IN ACCORDANCE WITH NS DEPARTMENT OF LABOUR REQUIREMENTS, MUNICIPALITY OF THE COUNTY OF KINGS STANDARDS & LOCAL BY LAWS.
9. CONTRACTOR TO PROTECT THE CONSTRUCTION SITE ACTIVITY USING EROSION AND SEDIMENT CONTROLS AS PER NS ENVIRONMENT STANDARDS AND REGULATIONS.
10. PEX WATER SERVICE WITH LESS THAN 1.2m OF COVER SHALL HAVE 600mm HI-40 RIGID INSULATION INSTALLED ABOVE SERVICE ALONG IT'S LENGTH (MIN 600mm WIDE). (SEE MECHANICAL FOR BUILDING CONNECTION).
11. 50mm & 100mm SANITARY SERVICE WITH LESS THAN 1.2m OF COVER SHALL HAVE 50mm HI-40 RIGID INSULATION INSTALLED ABOVE SERVICE ALONG IT'S LENGTH (MIN 600mm WIDE)
12. ALL CONSTRUCTION ACTIVITES MUST BE SCHEDULED TO MINIMIZE SERVICE/SCHOOL ACCESS INTERRUPTION.
13. CONTRACTOR TO CONTACT SDMM PRIOR TO BACKFILL TO INSPECT SERVICES.
14. CONTRACTOR TO REFRAIN FROM ANY ACTION THAT MAY CAUSE SEDIMENT FROM LEAVING THE CONSTRUCTION SITE AREA. ENSURE ADEQUATE MAINTAINED SEDIMENT & EROSION CONTROLS ARE IN PLACE PRIOR TO ANY STORM EVENT.
15. CONTRACTOR TO COORDINATE CONSTRUCTION ACTIVITIES WITH SCHOOL PRINCIPAL AND SCHEDULED DELIVERIES/PICK UP, EXISTING DRIVEWAY ACCESS MUST BE MAINTAINED DURING CONSTRUCTION. EXISTING GARBAGE TO BE TEMPORARILY RELOCATED FOR DURATION OF CONSTRUCTION AS DIRECTED BY SCHOOL BOARD/PRINCIPAL.



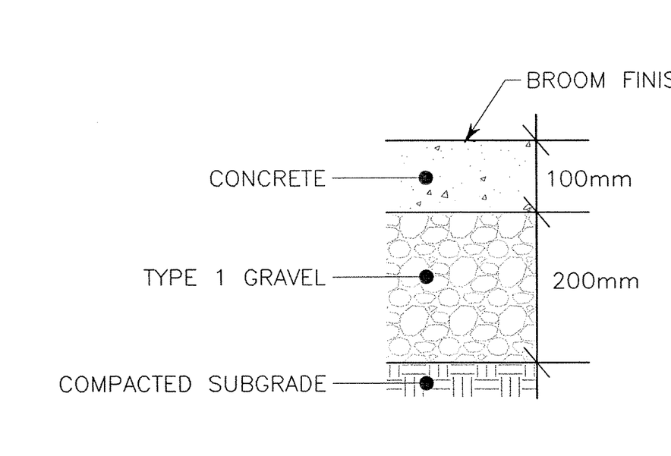
NOTE:
2X PUMPS EACH CAPABLE OF PROVIDING 12 USgpm @ 18' OF HEAD (GOULDS SEWAGE GRINDER PUMP OR APPROVED EQUAL)

PUMP CHAMBER DETAIL
N.T.S.



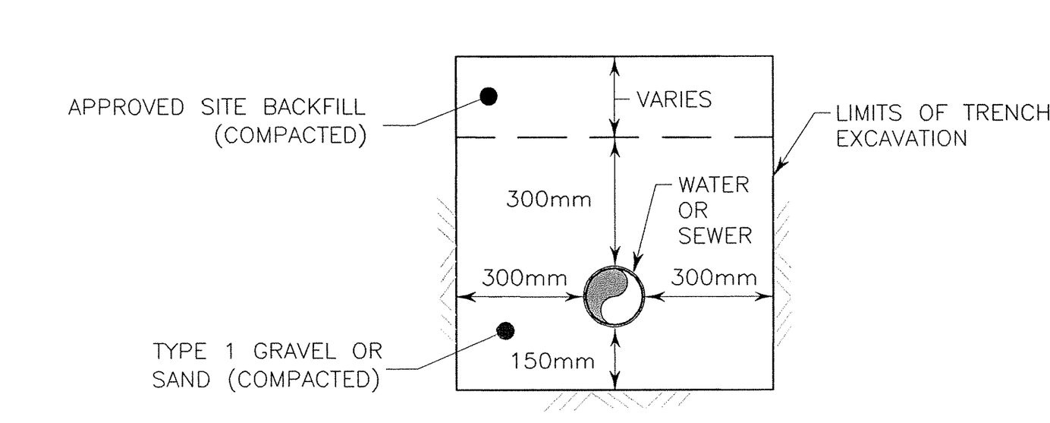
NOTE:
ASPHALT MUST BE CUT PARALLEL AND PERPENDICULAR TO THE INSTALLED PIPE.

NEW & REINSTATEMENT ASPHALT DETAIL
N.T.S.

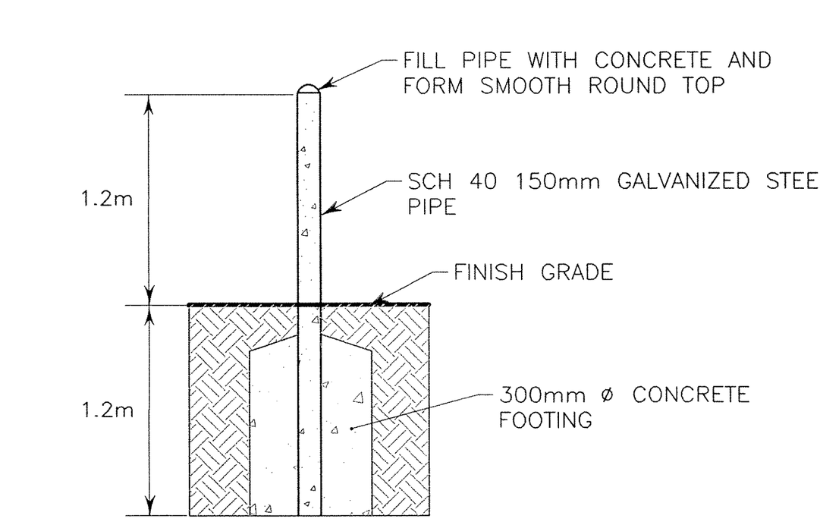


NOTE:
CONCRETE WALK ACROSS DRIVEWAY THICKENED TO 150mm C/W 150X150mm WWM.

CONCRETE PAD DETAIL
N.T.S.



PIPE BEDDING/BACKFILL DETAIL
N.T.S.



BOLLARD DETAIL
N.T.S.

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SDMM
Servant, Dunbrack, McKenzie & MacDonald Ltd.
NOVA SCOTIA LAND SURVEYORS & CONSULTING ENGINEERS

FILE NO. 1-13-8 (33061)
Plan No. 16-1631-0

Halifax Regional School Board

GENERAL NOTES

DATE	#	ISSUE
2017/12/18	0	ISSUED FOR TENDER

R. A. LANDRY
6647

SCALE: 1:200
DRAWN BY: S.S.
REVIEWED BY: R.L.
DATE: DECEMBER 18, 2017

PROJECT TITLE

SIR JOHN A. SKILLED TRADES BUILDING

Project Number

SHEET TITLE

SITE SERVICE & GRADING PLAN

C101

GENERAL NOTES

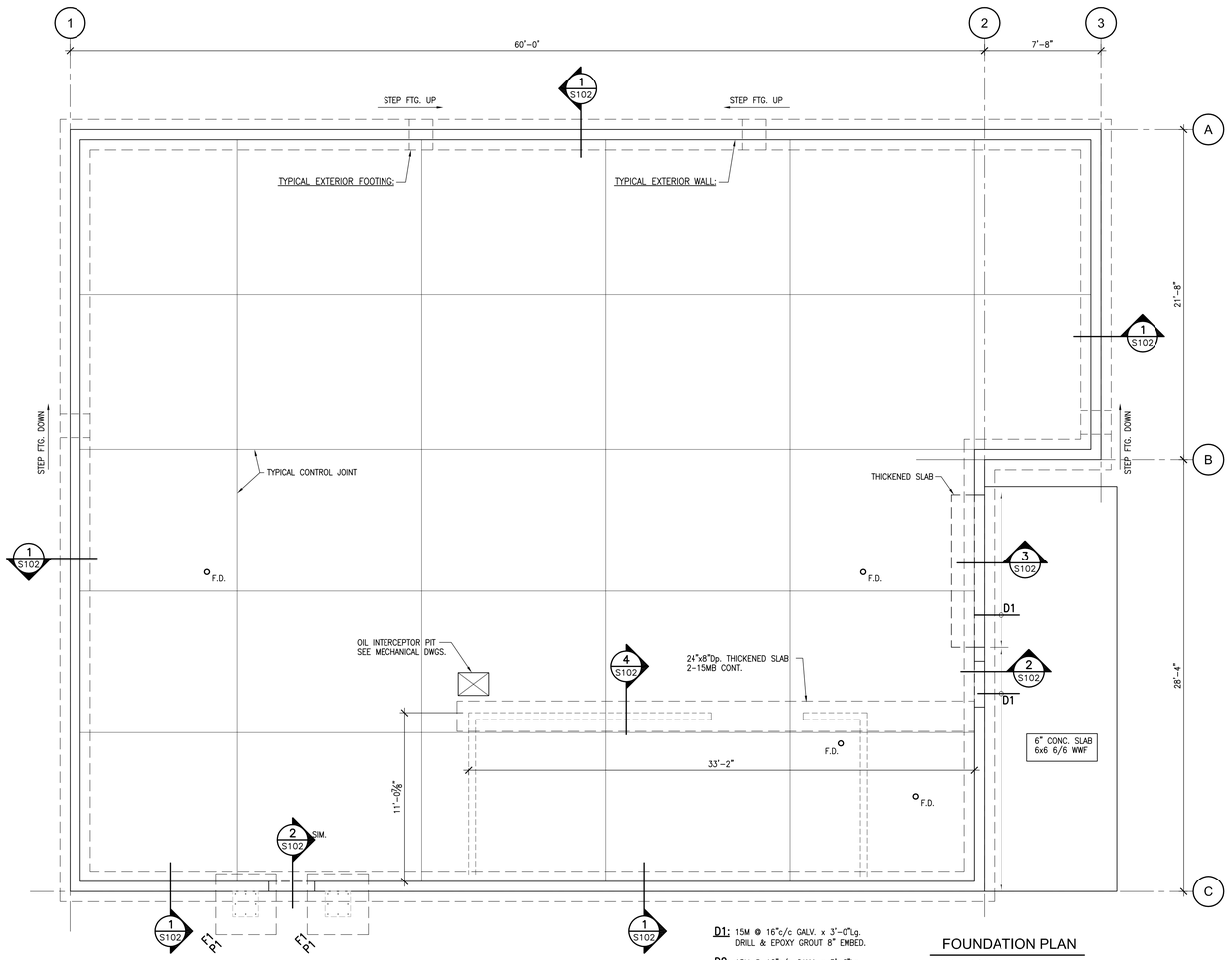
1. ALL WORK AND MATERIALS SHALL CONFORM TO THE LATEST ADOPTED EDITION OF THE NATIONAL BUILDING CODE.
2. DO NOT SCALE THE DRAWINGS.
3. THE CONTRACTOR SHALL EXAMINE ALL DRAWINGS AND CHECK ALL DIMENSIONS AGAINST SITE CONDITIONS AND REPORT ANY DISCREPANCIES BEFORE PROCEEDING WITH WORK.
4. CONTRACTOR SHALL DESIGN, INSTALL AND MAINTAIN ADEQUATE TEMPORARY BRACING AND SHORING OF ALL STRUCTURAL ELEMENTS FOR STABILITY AND SAFETY WHERE REQUIRED DURING CONSTRUCTION. (THE ABOVE WORK IS BEYOND THE SCOPE OF BMR STRUCTURAL ENGINEERING).
5. FOR OPENINGS THROUGH CONCRETE FLOOR SLABS, CONCRETE WALLS, WOOD WALLS, ETC. SEE MECHANICAL & ARCHITECTURAL FOR SIZE AND LOCATION.
6. ALL FOOTINGS SHALL BEAR ON UNDISTURBED SOIL, STRUCTURAL FILL OR SOUND CLEAN BEDROCK HAVING A MINIMUM ALLOWABLE BEARING CAPACITY OF 3000 psf. DO NOT PLACE CONCRETE IN FOOTING FORMS UNTIL BEARING CAPACITIES ARE CHECKED AND APPROVED IN WRITING BY THE GEOTECHNICAL ENGINEER. FOOTINGS MAY HAVE TO BE LOWERED TO ACHIEVE PROPER BEARING. DURING COLD WEATHER, SOILS SHALL BE PROTECTED AGAINST FREEZING TO PREVENT FROST HEAVE, LOSS OF BEARING CAPACITY, OR OTHER DAMAGE TO STRUCTURAL MEMBERS, SLABS ON GRADE, MASONRY, FORMWORK, AND OTHER ITEMS SUPPORTED THEREON.
7. ALL FOOTINGS SUBJECT TO FREEZING CONDITIONS SHOULD HAVE A MINIMUM OF FOUR FEET (4'–0") OF SOIL COVER FOR FROST PROTECTION.
8. REMOVE ALL LOOSE ROCK DOWN TO SOUND BEDROCK TO MAXIMUM REFUSAL DEPTH POSSIBLE WITH MECHANICAL EQUIPMENT. OBTAIN GEOTECHNICAL ENGINEER'S APPROVAL IN WRITING, OF ROCK BEARING CAPACITY BEFORE PLACING FOOTINGS.
9. ALL GEOTECHNICAL MATERIALS BENEATH SLABS ON GRADE (INCLUDING REMOVAL OF NON-ACCEPTABLE MATERIALS AND REPLACEMENT WITH APPROVED MATERIALS) SHALL BE PREPARED AS DETAILED IN THE SOILS REPORT UNLESS SPECIFICALLY NOTED OTHERWISE. SUB BASE UNDER SLABS ON GRADE SHALL BE COMPACTED TO 100% STANDARD PROCTOR DENSITY. COMPACTION SHALL BE VERIFIED IN WRITING BY THE SOILS ENGINEER PRIOR TO CASTING OF SLABS.

TIMBER FRAMING NOTES

1. ALL TIMBER AND LUMBER SHALL COMPLY WITH CSA–086–01.
2. ALL PLYWOOD SHEATHING SHALL COMPLY WITH CSA–O325.0 – CONSTRUCTION SHEATHING.
3. ROOF SHEATHING SHALL BE 3/4 EXTERIOR GRADE PLYWOOD.
4. ALL LUMBER USED FOR STUD BEARING WALLS, LINTELS AND POSTS SHALL BE NUMBER ONE GRADE S.P.F. UNLESS NOTED.
5. ALL EXTERIOR WALL SHEATHING SHALL BE 3/4" EXTERIOR GRADE PLYWOOD.
6. ALL DIMENSION LUMBER SHALL COMPLY WITH CSA O141.
7. CUTTING OF HOLES OR REMOVAL OF STRUCTURAL FRAMING BY TRADES FOR INSTALLATION OF PIPING, DUCTWORK, ELECTRICAL, ETC. SHALL NOT BE PERMITTED WITHOUT WRITTEN APPROVAL FROM THE ENGINEER.
8. ALL ROOF TRUSSES SHALL BE SPACED NOT MORE THAN 2'–0" c/c UNLESS NOTED OTHERWISE.
9. LOADS FOR PRE–ENGINEERED WOOD TRUSSES SHALL BE AS FOLLOWS:
   - 9.1. TOP CHORD LIVE LOAD TO BE DETERMINED IN STRICT ACCORDANCE WITH PART 4 OF THE N.B.C. (CALCULATE Cs & Ca IN ACCORDANCE WITH PART 4 OF THE N.B.C.)
     - 9.1.1. Ss = 1.9 kPa
     - 9.1.2. Sr = 0.6 kPa
     - 9.1.3. Cb = 0.8
     - 9.1.4. Cw = 1.0
   - 9.2. BOTTOM CHORD LIVE LOAD= 10 psf
   - 9.3. TOP CHORD DEAD LOAD= 6 psf (INCREASE TOP CHORD DEAD LOAD TO 12 psf IN LOCATIONS WHERE JACK TRUSSES ETC. ARE REQUIRED)
   - 9.4. BOTTOM CHORD DEAD LOAD= 9 psf
10. TRUSS SHOP DRAWINGS SHALL SHOW ALL STRUCTURAL INFORMATION INCLUDING MEMBER LOADS, MEMBER SIZES, CONNECTION DETAILS, BRACING, TRUSS PLACEMENT, FRAMING AROUND OPENINGS, ETC. AND MUST BE STAMPED AND SIGNED BY AN ENGINEER REGISTERED TO PRACTICE IN THE PROVINCE OF CONSTRUCTION AND SUBMITTED TO THE CONSULTANT FOR REVIEW PRIOR TO FABRICATION OF THE TRUSSES.
11. SUBMIT DETAILS AND CAPACITIES OF ALL TRUSS CONNECTIONS (HANGERS,ETC.) FOR APPROVAL BEFORE TRUSS FABRICATION.
12. ROOF TRUSS SUPPLIER SHALL PROVIDE TRUSS BEARING SHOES WHERE REQUIRED IF ALLOWABLE STRESS PERPENDICULAR TO GRAIN IS EXCEEDED. SUBMIT DETAILS FOR REVIEW.
13. HANGING OF SERVICES FROM CHORDS OF TRUSSES MUST BE STAGGERED AND APPROVED BY THE ENGINEER.
14. INSTALL WOOD SHEATHING TO STUD WALLS AND ROOF FRAMING WITH JOINTS STAGGERED AND ENDS BUTTED OVER FRAMING. NAIL WOOD SHEATHING WITH 2" Lg. COMMON NAILS AT 6" c/c ALONG EDGES AND 12" c/c ON INTERMEDIATE SUPPORTS.
15. TRUSSES SHALL BE FASTENED TO PLATES WITH 18 gauge ZINC COATED TIE DOWN ANCHORS TYPICAL EACH END.
16. TRUSSES SHALL BE HANDLED, INSTALLED AND TEMPORARILY BRACED IN ACCORDANCE WITH BUILDING COMPONENT SAFETY INFORMATION'S GUIDE TO GOOD PRACTICE FOR HANDLING, INSTALLING, RESTRAINING AND BRACING OF METAL PLATE CONNECTED WOOD TRUSSES – LATEST EDITION.
17. STRUCTURAL COMPOSITE LUMBER (SCL) SHALL BE EITHER LAMINATED VENEER LUMBER (LVL) OR PARALLAM (PSL) OR APPROVED EQUIVALENT, MINIMUM DESIGN PROPERTIES SHALL BE:
   - 17.1. Fb: 5360 psi
   - 17.2. Fv: 540 psi
   - 17.3. E: 2,000,000 psi

REINFORCED CONCRETE NOTES

1. ALL CONCRETE STRUCTURES SHALL CONFORM TO CSA–A23.3 UNLESS NOTED OTHERWISE.
2. ALL CONCRETE, CONCRETE MATERIAL, FORMS, PRACTICE, ETC., SHALL CONFORM TO CSA–A23.1 UNLESS NOTED OTHERWISE.
3. MINIMUM COMPRESSIVE STRENGTH OF CONCRETE AT 28 DAYS SHALL BE AS FOLLOWS:
   - 3.1. CONCRETE ELEMENTS UNLESS NOTED OTHERWISE . . . . . 4,000 psi
   - 3.2. EXTERIOR CONCRETE ELEMENTS EXPOSED TO WEATHER . . . . . 5,000 psi
   - 3.3. MUD SLAB . . . . . 2,000 psi
   - 3.4. FOOTINGS . . . . . 3000 psi
4. ALL CONCRETE TESTING SHALL CONFORM TO CSA–A23.2.
5. FOR COMPRESSIVE STRENGTH TESTING OF CONCRETE A MINIMUM OF 3 CYLINDERS ARE REQUIRED FOR:
   - 5.1. EACH DAYS POUR
   - 5.2. EACH TYPE OR GRADE OF CONCRETE
   - 5.3. EACH CHANGE OF SUPPLIER
   - 5.4. EACH 20 cu. yd. OR FRACTION THEREOF FOR COLUMNS.
   - 5.5. EACH 100 cu. yd. OR FRACTION THEREOF FOR ALL OTHER CONCRETE.
   - 5.6. ADDITIONAL TEST SPECIMENS SHALL BE TAKEN WHENEVER REQUESTED BY THE ENGINEER OR THE SUPERVISOR TO VERIFY THE CONCRETE QUALITY.
6. USE 3/4" MAX. AGGREGATE SIZE THROUGHOUT UNLESS NOTED. SLUMP TO BE 3" (±1") THROUGHOUT UNLESS NOTED.
7. ALL CONCRETE EXPOSED TO WEATHER OR FREEZING CONDITIONS SHALL BE AIR ENTRAINED TO 6.5% (±1.5%).
8. AT LEAST ONE SLUMP TEST SHALL BE TAKEN WITH EACH COMPRESSIVE STRENGTH TEST.
9. AT LEAST ONE AIR ENTRAINMENT TEST SHALL BE TAKEN WITH EACH COMPRESSIVE STRENGTH TEST AS APPLICABLE.
10. NO ADMIXTURES SHALL BE USED WITHOUT PRIOR APPROVAL FROM THE STRUCTURAL ENGINEER.
11. THE CONTRACTOR SHALL PROVIDE CONTINUOUS SUPERVISION DURING THE PLACEMENT OF CONCRETE TO ENSURE THAT THE REINFORCING STEEL IS MAINTAINED IN ITS CORRECT POSITION.
12. CONSTRUCTION JOINTS SHALL BE LOCATED SO AS TO LEAST IMPAIR THE STRENGTH OF THE STRUCTURE AND TO THE ENGINEER'S APPROVAL. CONSTRUCTION JOINTS SHALL BE KEYED AND 15M DOWELS x 3'–0" @ 24" c/c SHALL BE ADDED. REINFORCING SHALL NOT BE INTERRUPTED.
13. FORMWORK MUST NOT BE REMOVED UNTIL CONCRETE HAS ATTAINED SUFFICIENT STRENGTH TO SUSTAIN ALL LOADING.
14. FOR OPENINGS REQUIRED BY OTHER TRADES, SEE MECH. AND ARCH. DRAWINGS.
15. ALL REINFORCING STEEL SHALL HAVE A MINIMUM YIELD STRENGTH OF 400 MPa AND SHALL CONFORM TO CSA G30.18.
16. ALL WELDED WIRE MESH (WWM) SHALL CONFORM TO ASTM A–185.
17. ALL REINFORCING STEEL SHALL BE DETAILED, FABRICATED, PLACED AND SUPPORTED IN ACCORDANCE WITH "REINFORCING STEEL MANUAL OF STANDARD PRACTICE" BY THE REINFORCING STEEL INSTITUTE OF CANADA.



D1: 15M @ 16"c/c GALV. x 3'–0"Lg. DRILL & EPOXY GROUT 8" EMBED.

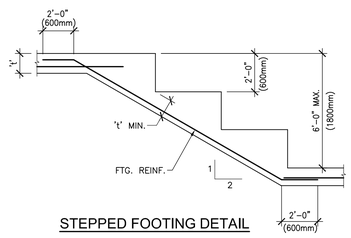
D2: 15M @ 16"c/c GALV. x 3'–0"Lg. DRILL & EPOXY GROUT 6" EMBED.

F1: 4'–0" x 4'–0" x 12"Dp. FOOTING r/w 5–15M E.W. T&B

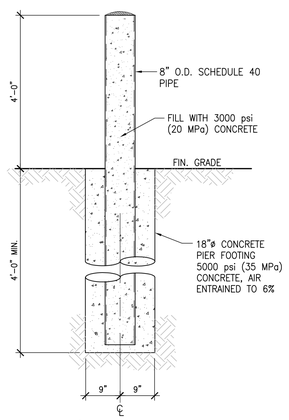
P1: 20" x 20" FUTURE CONC. PIER. PROVIDE 8–15M HOT DIP GALVANIZED VERTICAL DOWELS FOR FUTURE PIERS

FOUNDATION PLAN

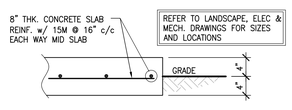
SCALE: 1/4"=1'–0"



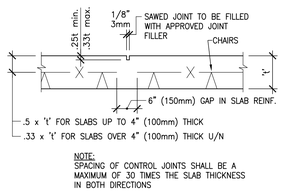
STEPPED FOOTING DETAIL



TYPICAL BOLLARD DETAIL

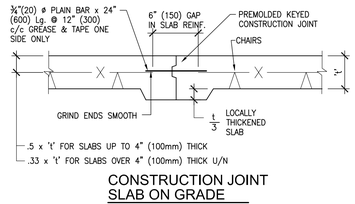


TYPICAL EXTERIOR UTILITY SLAB

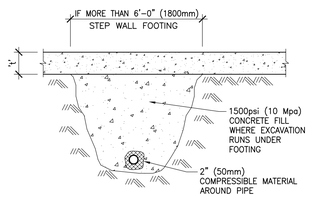


NOTE:
SPACING OF CONTROL JOINTS SHALL BE A MAXIMUM OF 30 TIMES THE SLAB THICKNESS IN BOTH DIRECTIONS

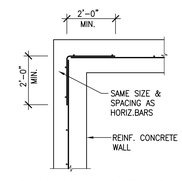
SECTION- CONTROL JOINT SLAB ON GRADE



CONSTRUCTION JOINT SLAB ON GRADE



BACKFILL DETAIL UNDER FTG.



PLAN -WALL CORNER

SP DUMARESQ ARCHITECT LTD
SIDNEY DUMARESQ MCAHILL SYDNEY FLINN HALIFAX, N.S.

BMR Structural|Engineering
5413 Doyle Street
Halifax, Nova Scotia B3J 1H9
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BMR Project No. 2017–486

KEY PLAN

GENERAL NOTES

IF DIMENSION DOES NOT MEASURE 1" DRAWINGS IS NOT PRINTED TO SCALE — 1"

DATE	#	ISSUE
18.DEC.2017	1	FOR TENDER

REGISTERED PROFESSIONAL ENGINEER PROVINCE OF NOVA SCOTIA
DATE 18/12/17
I.T.J. MacDonald
9859

SCALE:	AS NOTED
DRAWN BY:	R.L.
REVIEWED BY:	I.M.
DATE:	DECEMBER 18 2017

PROJECT TITLE

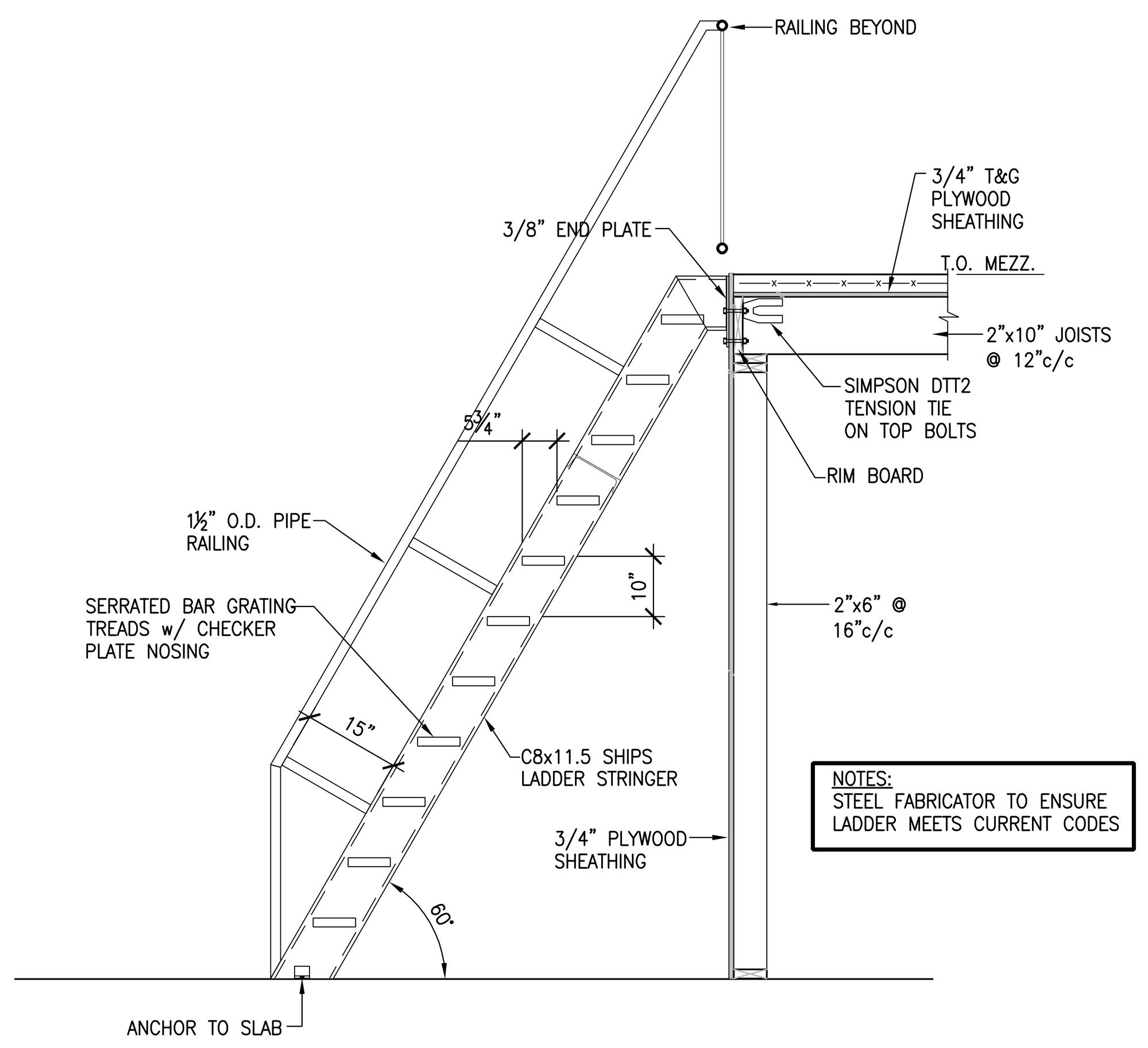
SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

Project Number

SHEET TITLE

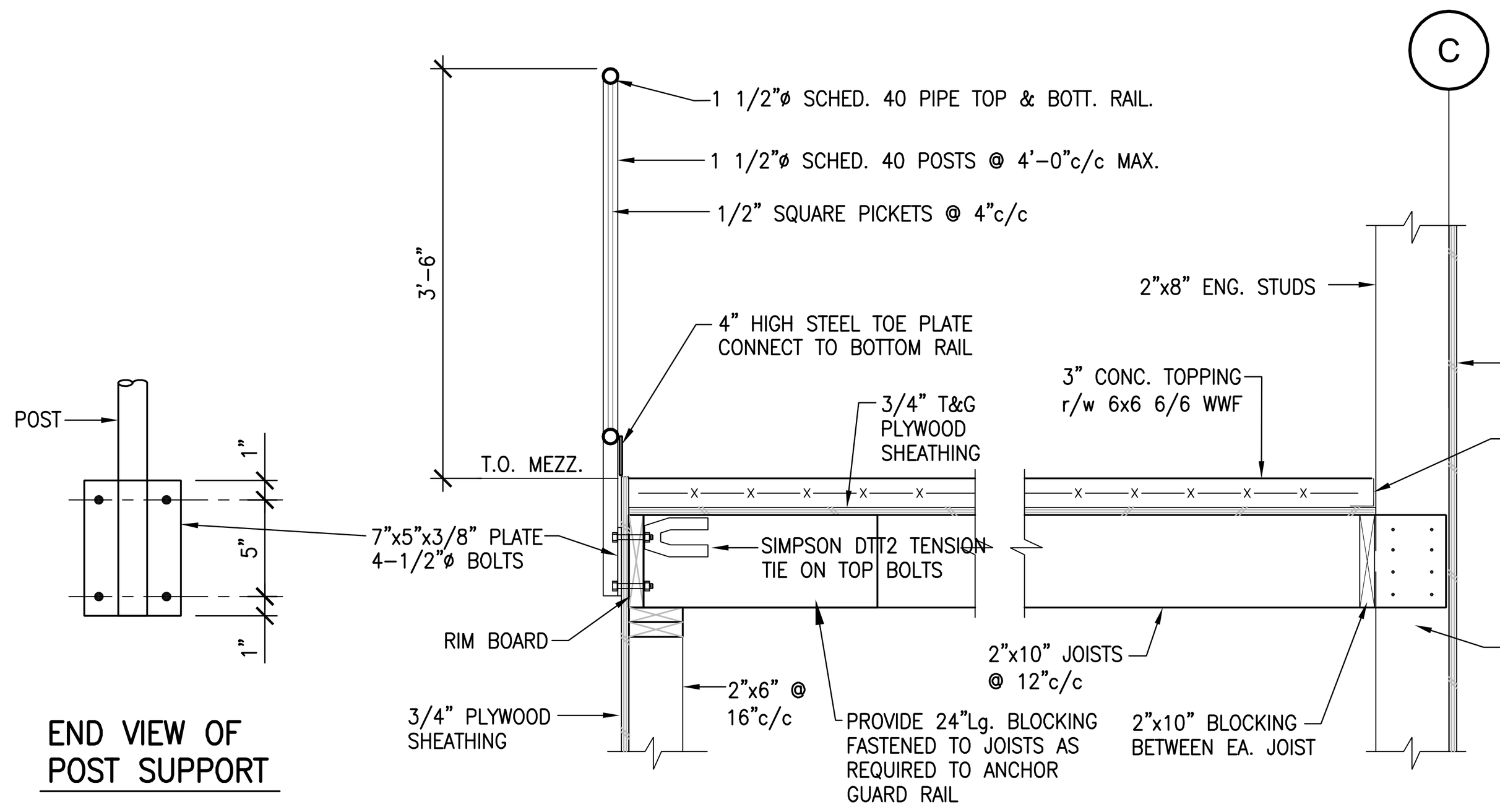
FOUNDATION PLAN AND NOTES

S100



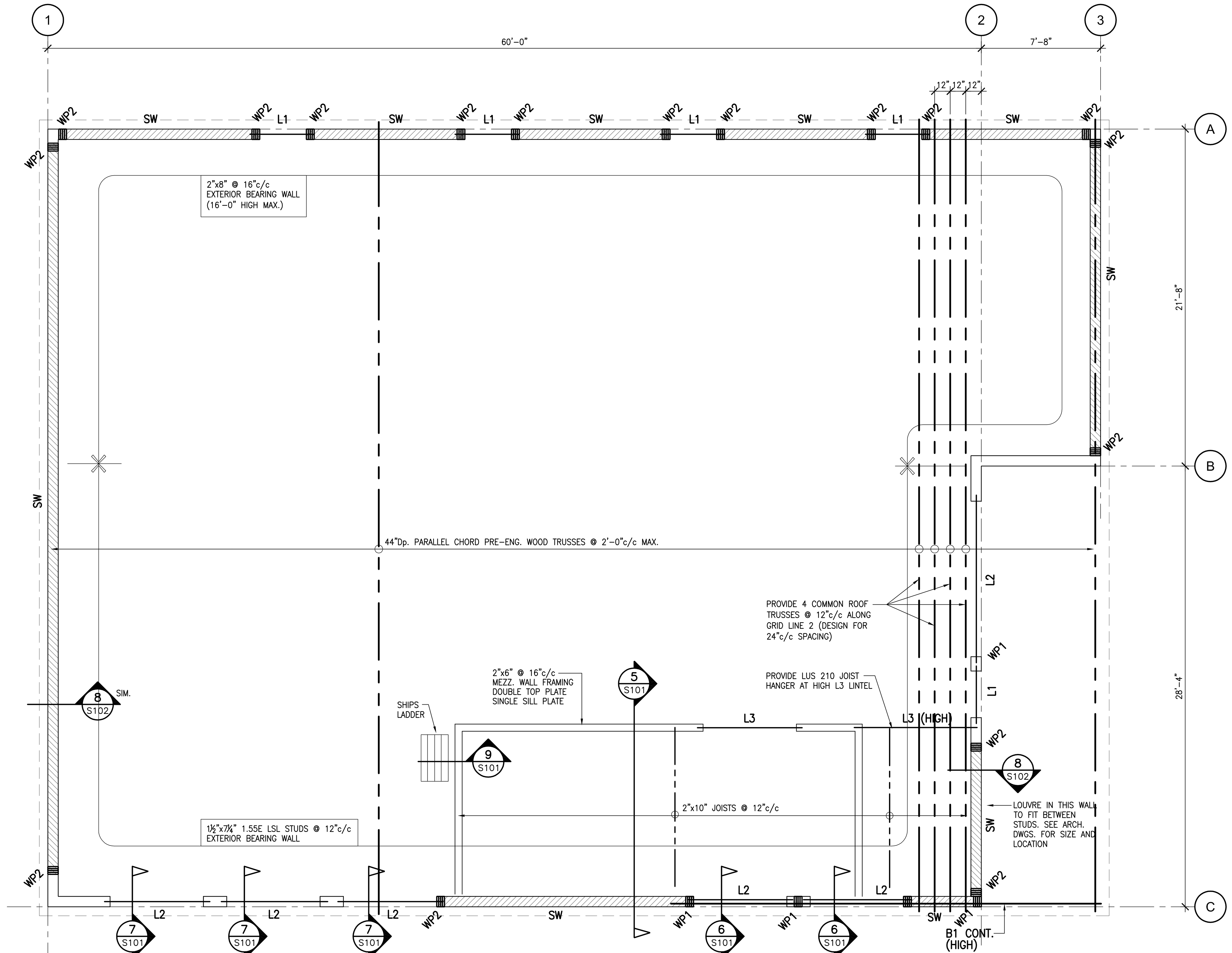
SHIPS LADDER SECTION 9 S101

SCALE: 1/2" = 1'-0"



SECTION 5 S101

SCALE: 3/4"=1'-0"



SW: REPRESENTS SHEARWALL, NO OPENINGS TO BE MADE WITHOUT ENGINEERS APPROVAL

WP1: 4 PLY 1¾"x 7¼" 2.0E LVL WOOD POST SIMPSON CCQ7.1"x7.1" SDS 2.5 POST CAP AND SIMPSON HDU8-SDS 2.5 HOLD DOWN AT BASE c/w ⅞"Ø THREADED ROD, DRILL AND EPOXY GROUT 16" EMBED.

WP2: 4 PLY BUILT-UP WOOD POST STUDS TO MATCH WALL FRAMING PROVIDE SIMPSON HDU8-SDS 2.5 HOLD DOWN AT BASE c/w ⅞"Ø THREADED ROD, DRILL AND EPOXY GROUT 16" EMBED.

L3: 3 PLY 2"x8"Dp. LINTEL 1-2"x6" JACK STUDS E.S. 2-2"x6" KING STUD E.S.

B1: 4 PLY 1¾"x16"Dp. 2.0E LVL BEAM

L1: 3 PLY 2"x8"Dp. SPF No.2 LINTEL 2-2"x8" JACK STUDS 3-2"x8" KING STUDS

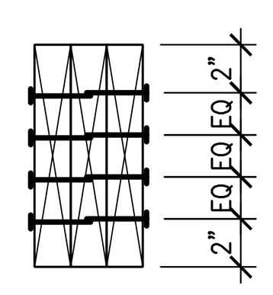
L2: 4 PLY 2"x12"Dp. SPF No.2 LINTEL, AT EACH END, PROVIDE 2-1¾"x7¼" 1.55E LVL JACK STUDS AND 3-1¾"x7¼" 2.0E LVL KING STUDS AND SIMPSON CBGT7⅛ -7 SDS 2.5 POST BASE, DRILL & EPOXY GROUT 16" INTO CONCRETE

ROOF FRAMING PLAN

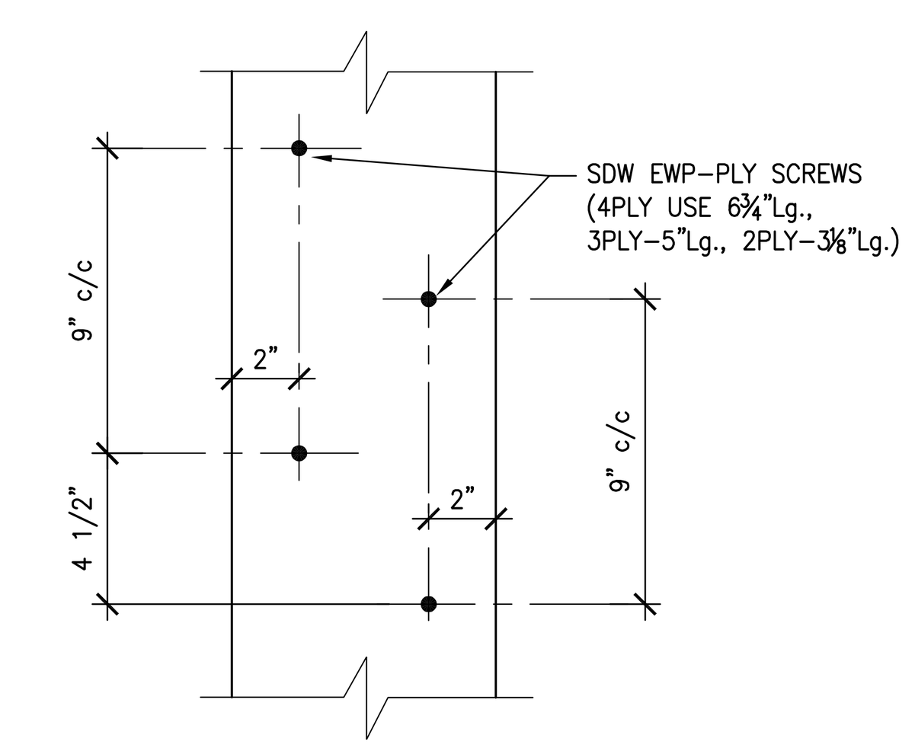
SCALE: 1/4"=1'-0"

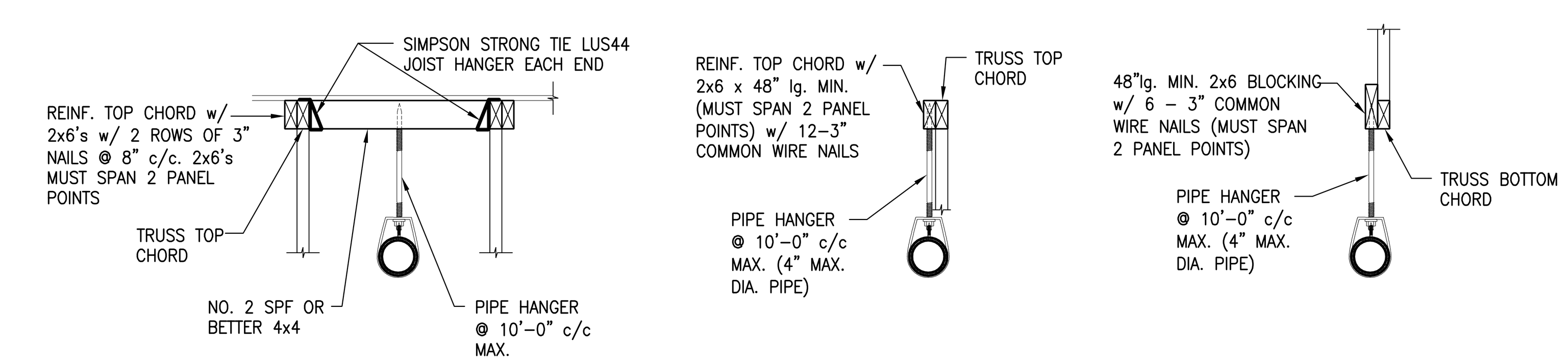
TYPICAL FASTENING PATTERN FOR LINTELS

MEMBER TYPE	DEPTH	FASTENERS	REMARKS
DIMENSIONAL	8"	10d (3") NAILS	3-ROWS @ 12" c/c EACH FACE
DIMENSIONAL	12"	10d (3") NAILS	3-ROWS @ 12" c/c EACH FACE
LVL	8"	SDW EWP-PLY	2-ROWS @ 6" c/c EACH FACE FOR 3-PLY @ 9"c/c STAGGERED
LVL	16"	SDW EWP-PLY	4-ROWS @ 6" c/c EACH FACE FOR 3-PLY @ 9"c/c STAGGERED



TYPICAL NAILING PATTERN





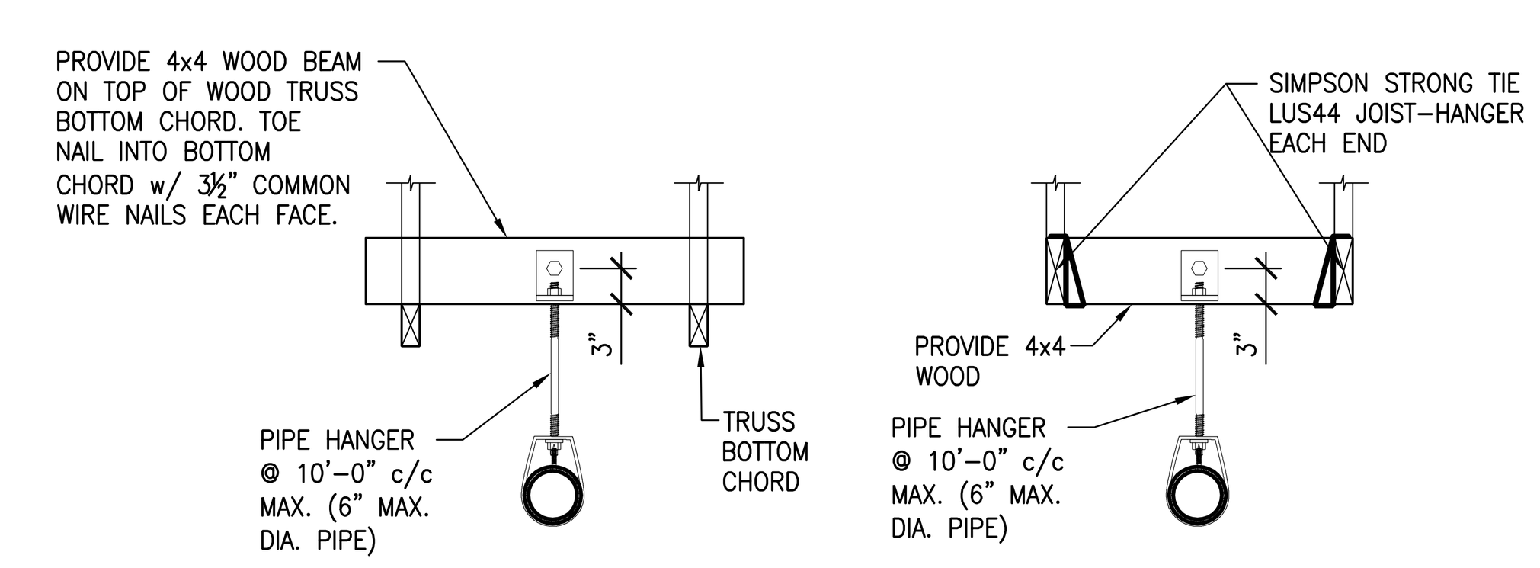
HANGING SERVICES FROM TOP CHORD OF TRUSS

HANGING SERVICES FROM TOP CHORD OF TRUSS

HANGING SERVICES FROM BOTTOM CHORD OF TRUSS

HANGING SERVICES FROM WOOD TRUSSES

4" MAX PIPE DIAMETER



OPTION 1

OPTION 2

HANGING SERVICES FROM WOOD TRUSS

6" MAX PIPE DIAMETER

SP DUMARESQ ARCHITECT LTD

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BMR Project No. 2017-486

KEY PLAN

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DRAWN BY:	R.L.
REVIEWED BY:	I.M.
DATE:	DECEMBER 18 2017

PROJECT TITLE

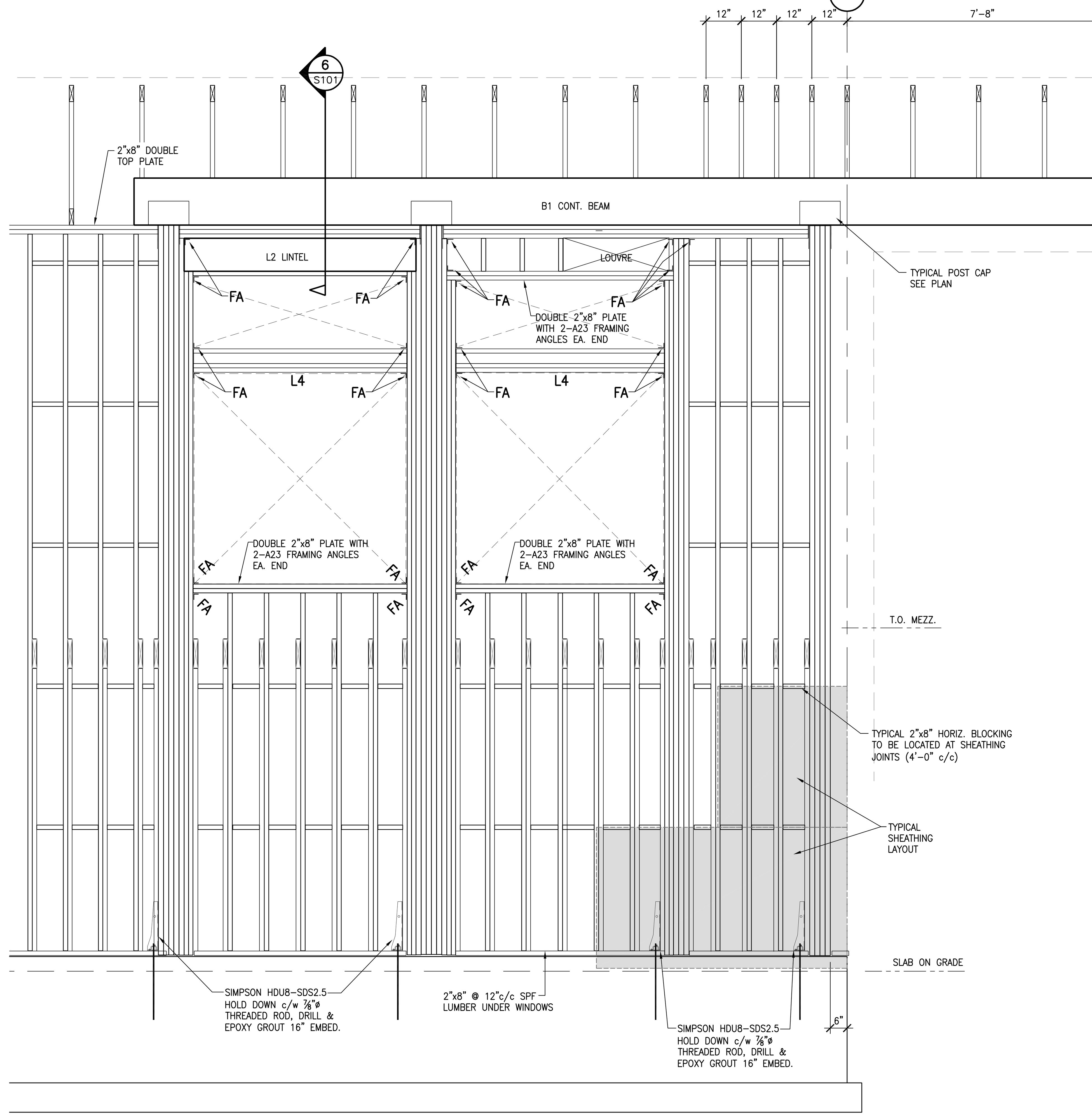
SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

Project Number

SHEET TITLE

ROOF FRAMING PLAN

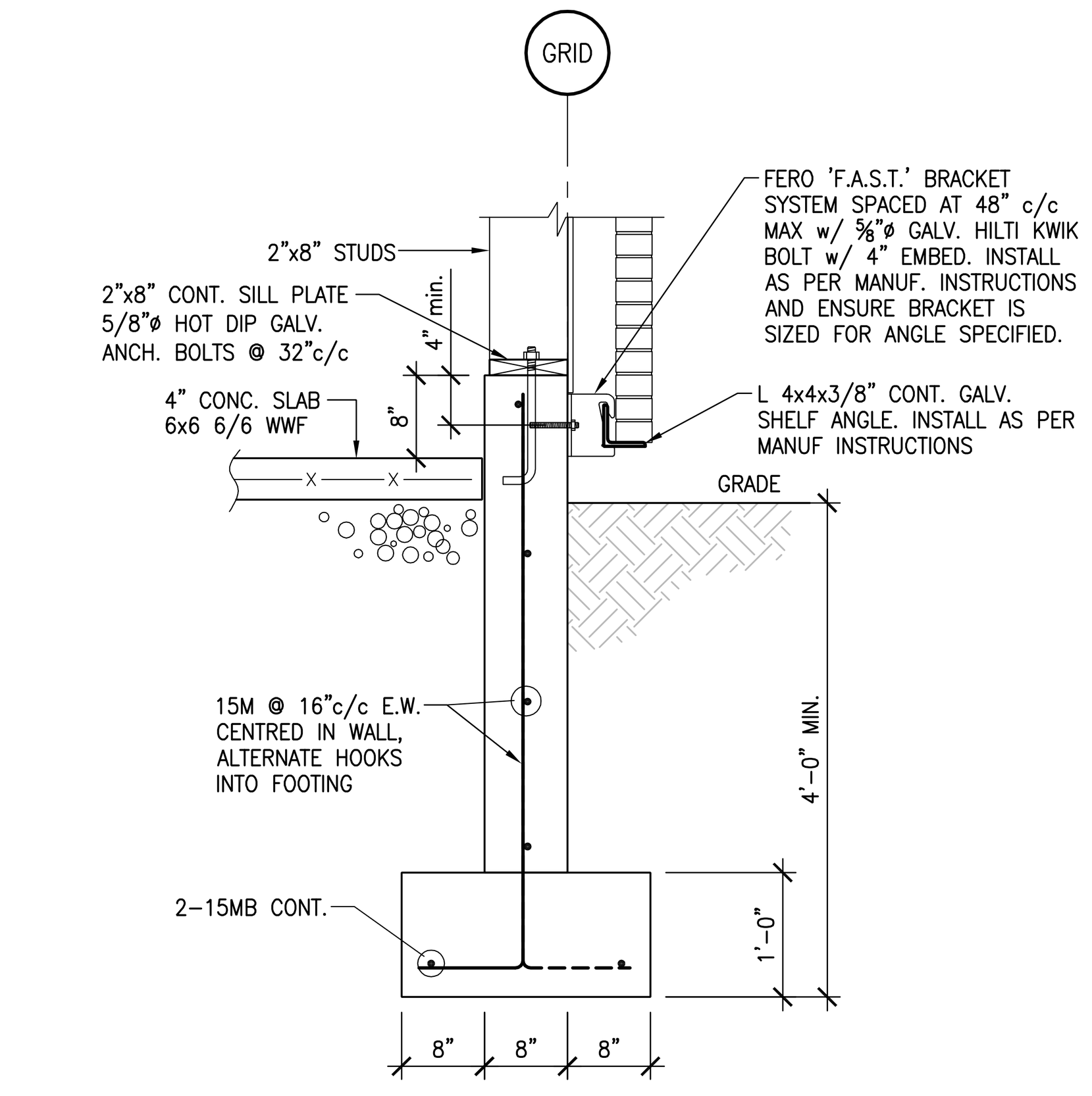
S101



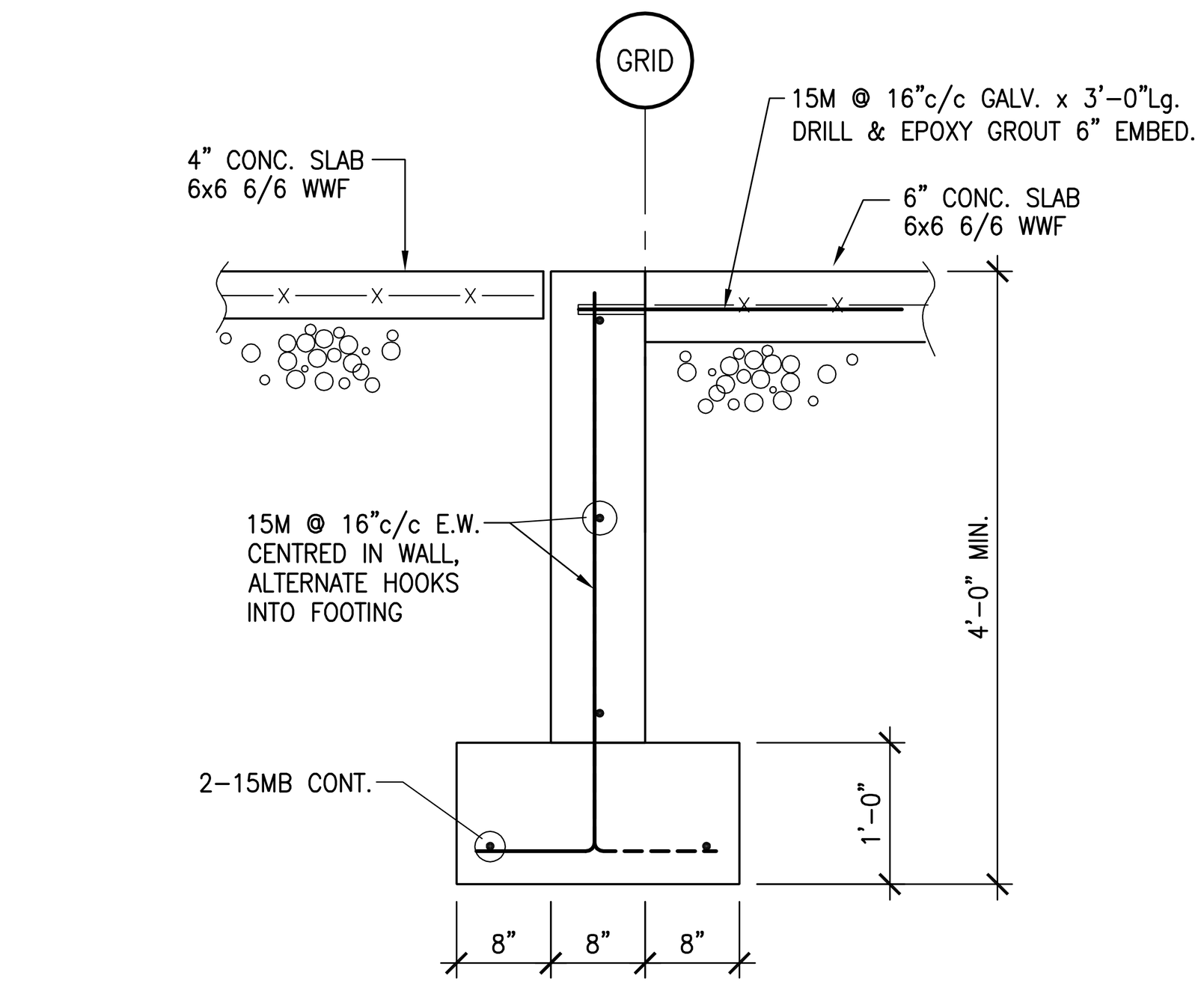
ELEVATION AA
SCALE: 1/2"=1'-0" S100

L4: 3- 2"x8" AND 1-2"x4" LINTEL CONNECT TO JAMB SUDS WITH FRAMING ANCHORS E.E.

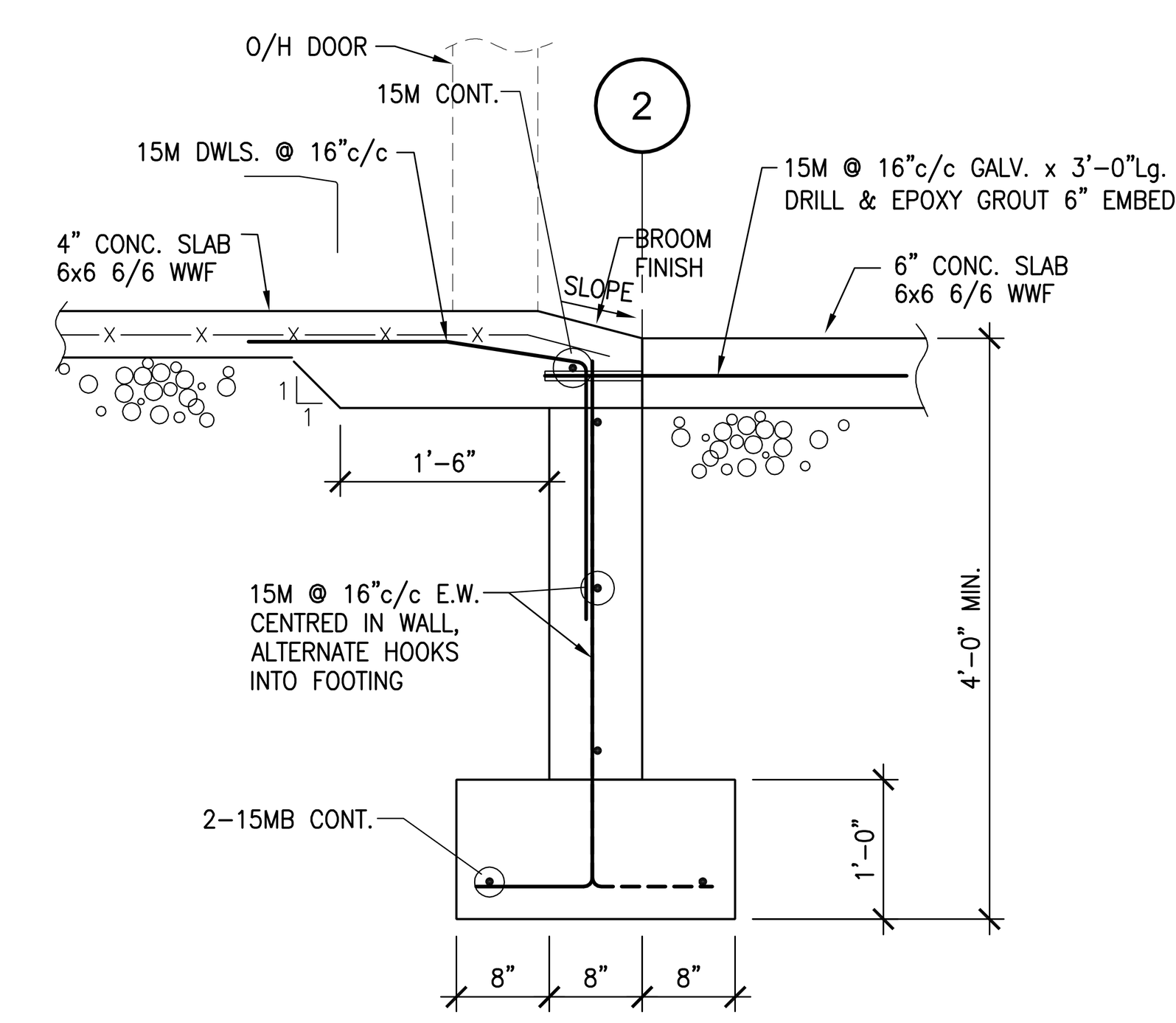
FA: 2-SIMPSON A23 FRAMING ANGLES AS SHOWN, TYPICAL



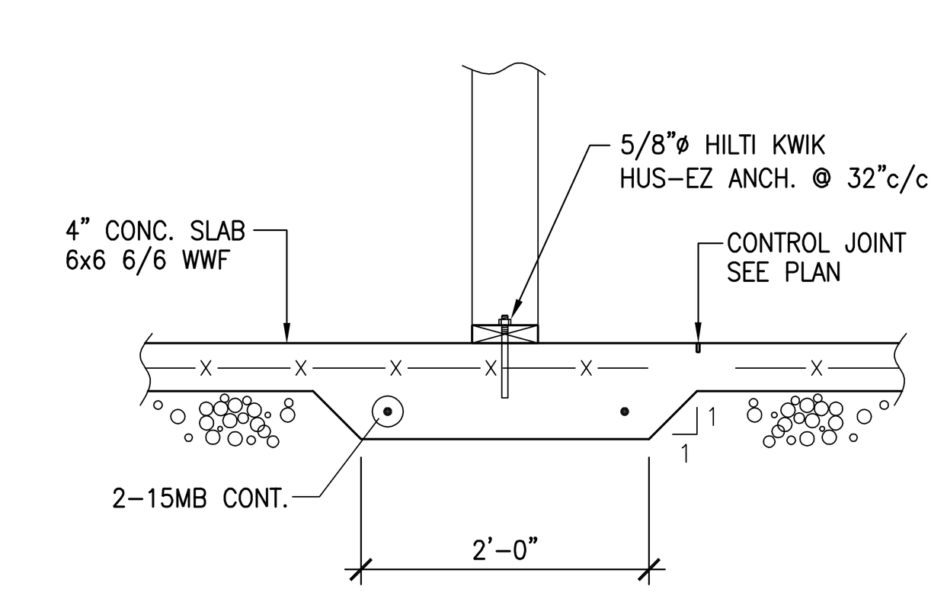
SECTION 1
SCALE: 3/4"=1'-0" S100



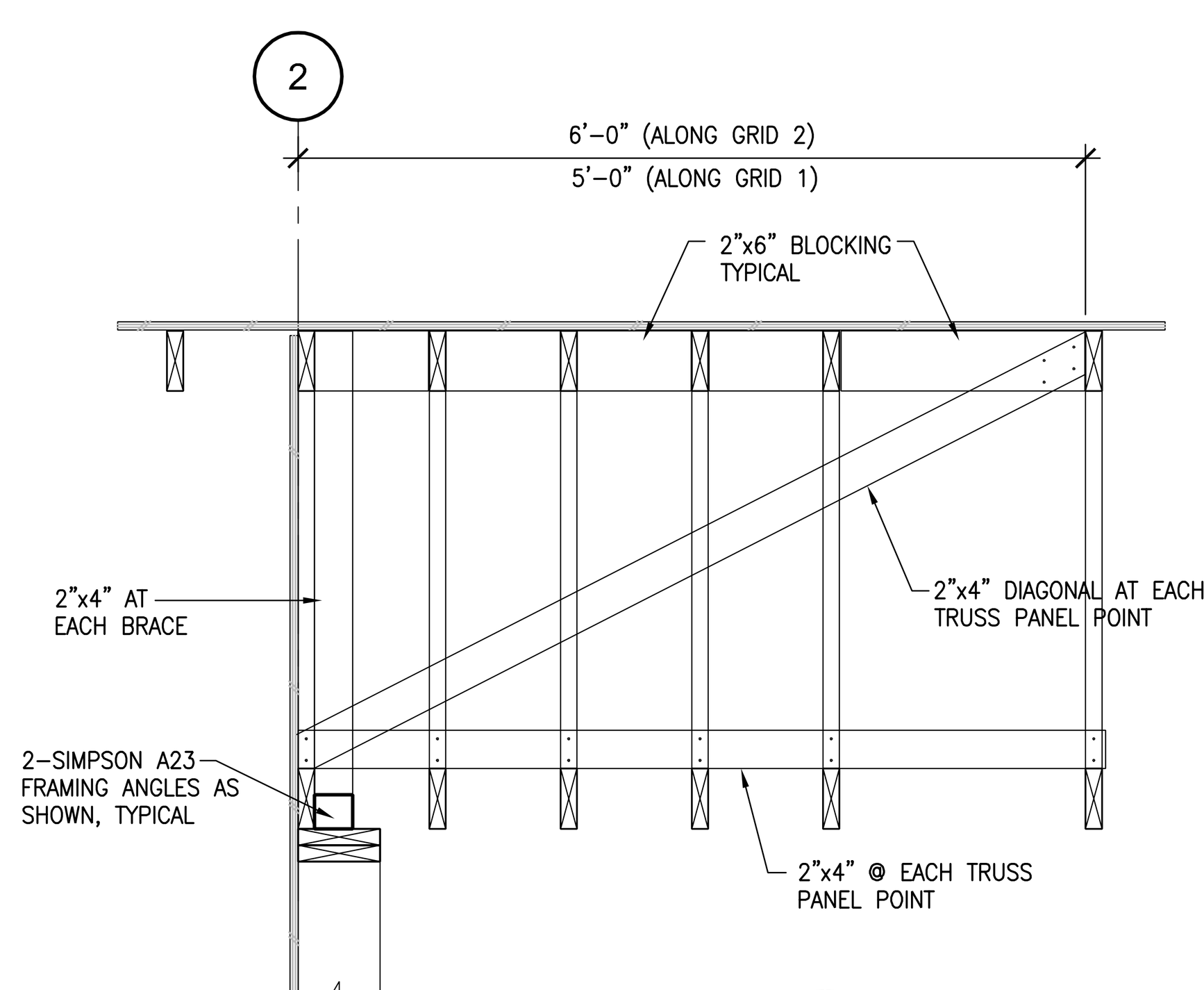
SECTION 2 TYPICAL AT MAN DOORS
SCALE: 3/4"=1'-0" S100



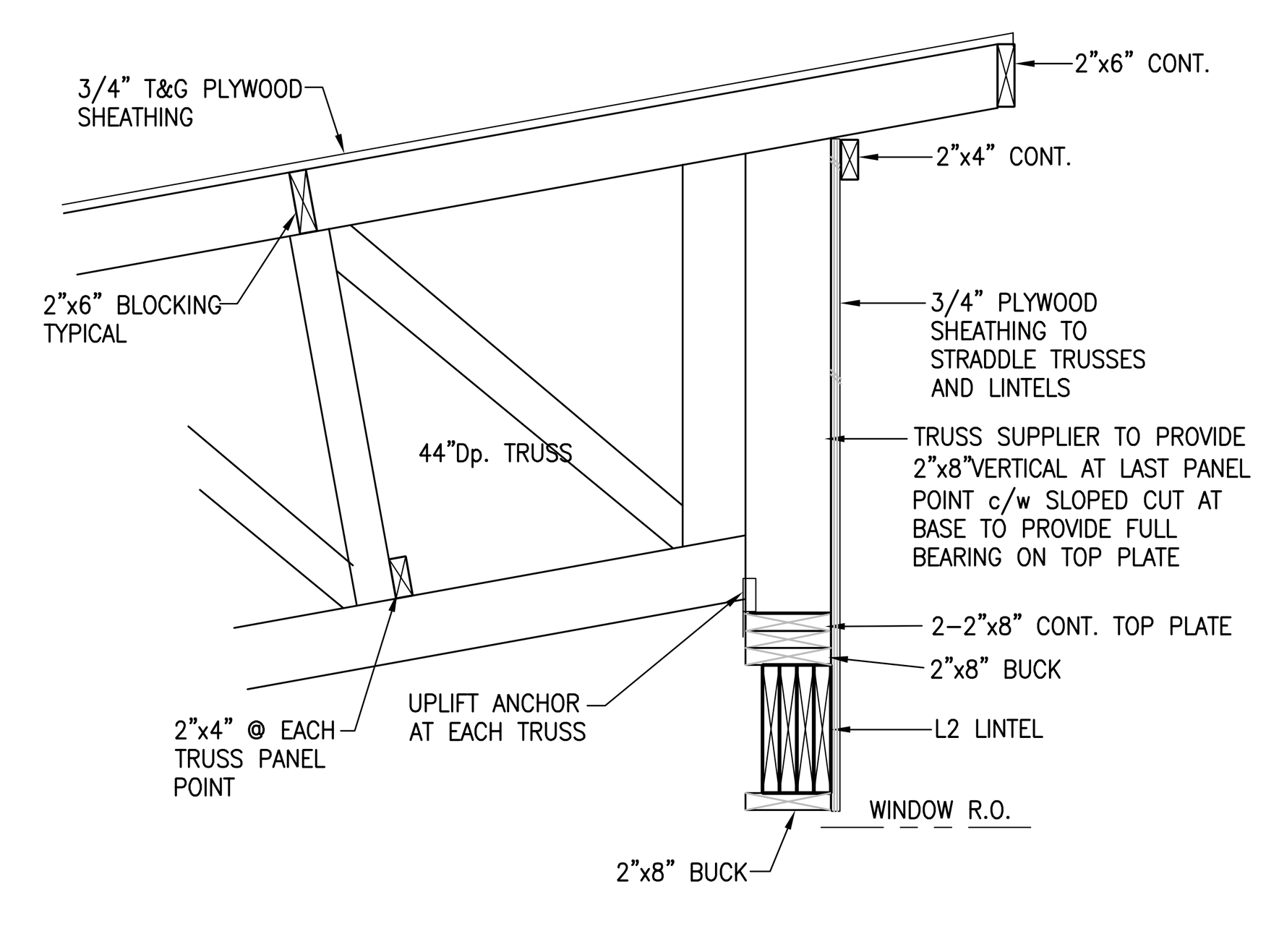
SECTION 3 AT O/H DOOR
SCALE: 3/4"=1'-0" S100



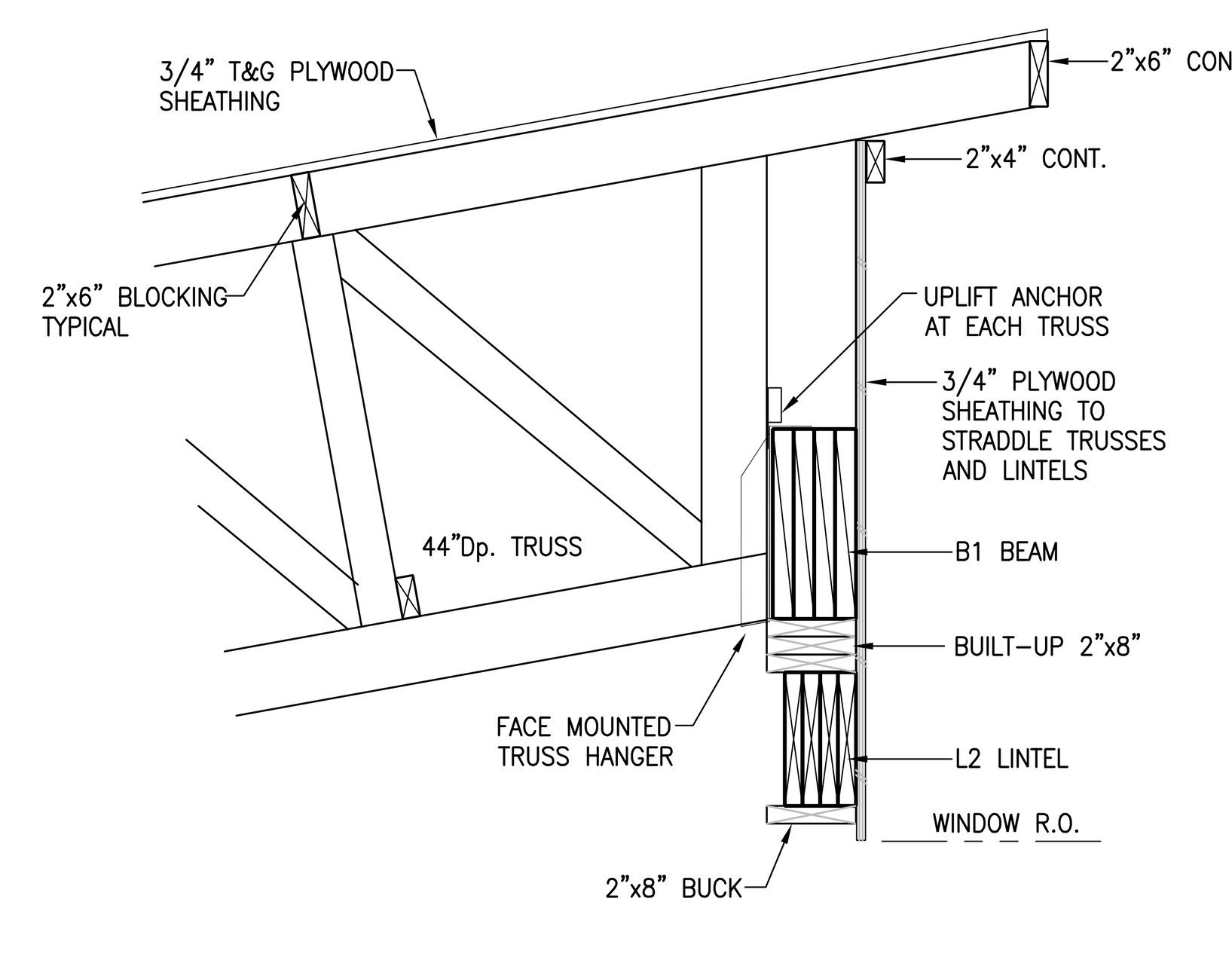
SECTION 4
SCALE: 3/4"=1'-0" S100



SECTION 8
SCALE: 3/4"=1'-0" S101



SECTION 7
SCALE: 3/4"=1'-0" S101



SECTION 6
SCALE: 3/4"=1'-0" S101

SP DUMARESQ ARCHITECT LTD

BMR Structural Engineering
BMR Project No. 2017-486

KEY PLAN

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PROJECT TITLE

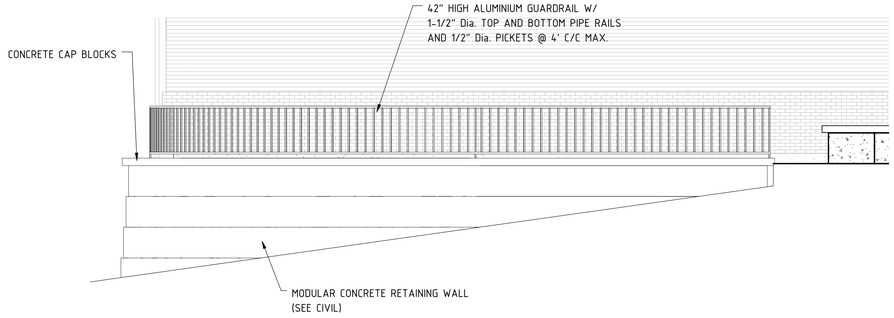
SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

Project Number

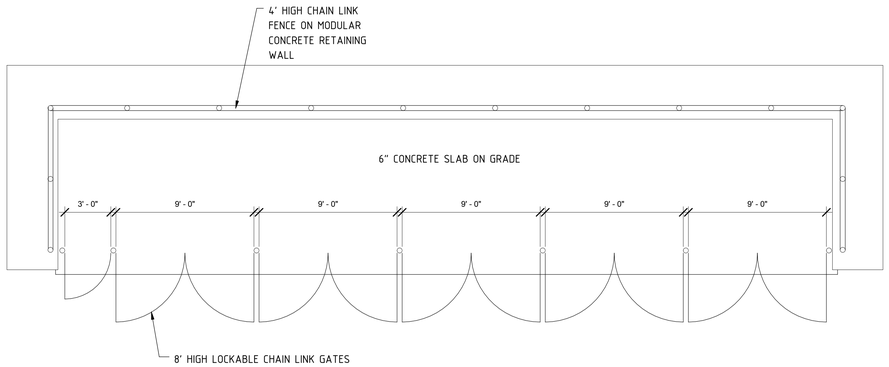
SHEET TITLE

SECTIONS

S102

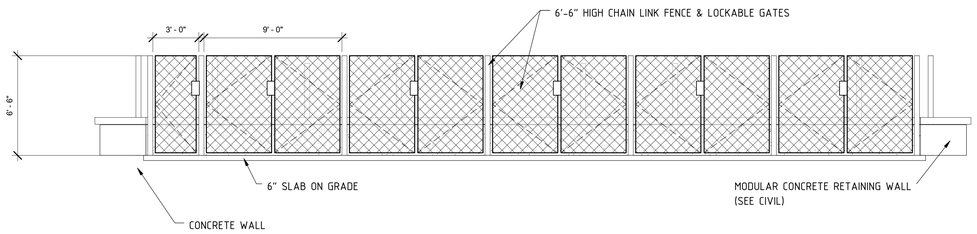


2 PARTIAL WEST ELEVATION AT RETAINING WALL
1/4" = 1'-0"



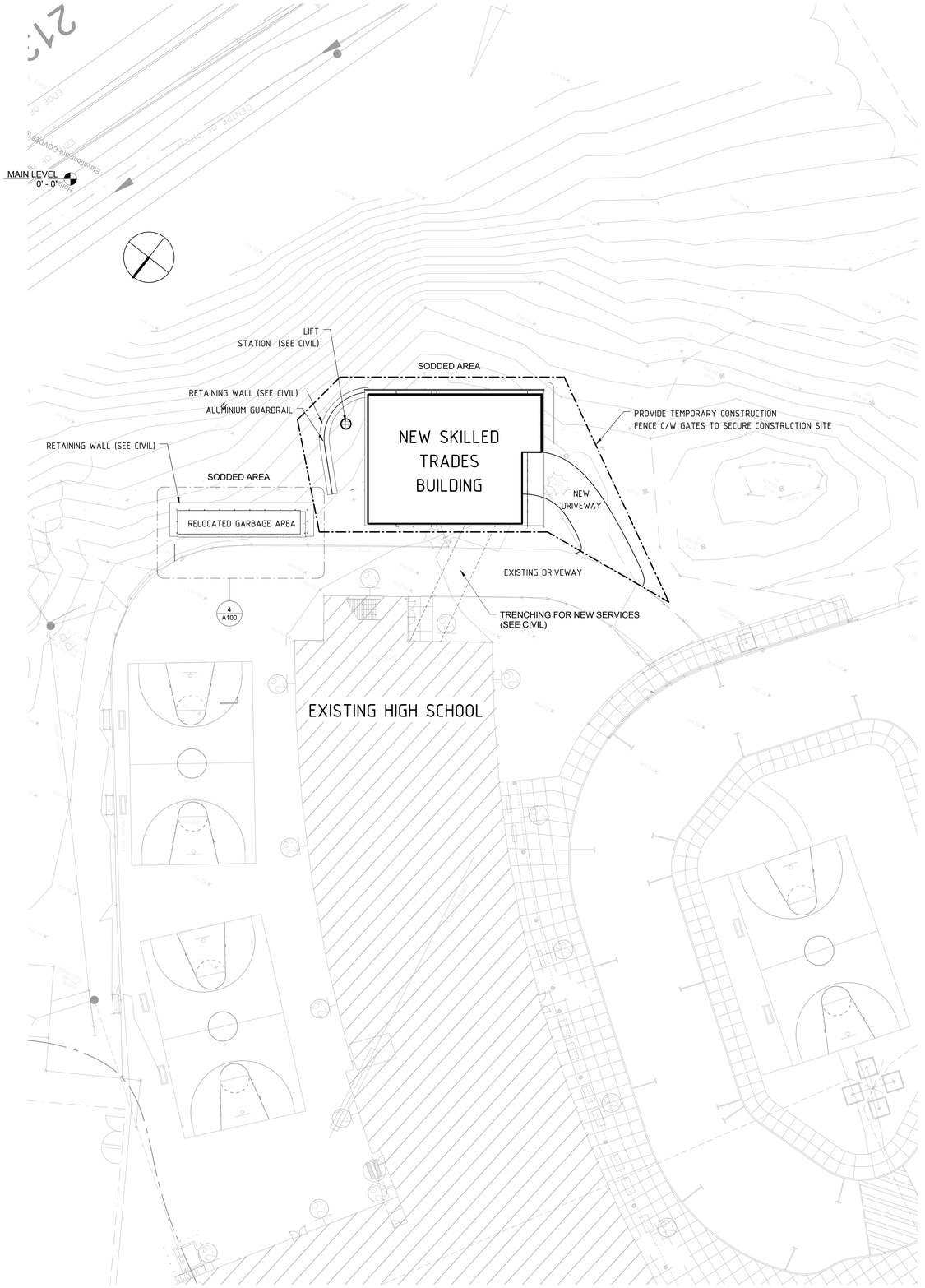
4 GARBAGE AREA PLAN
1/4" = 1'-0"

3
A100



3 GARBAGE AREA ELEVATION
1/4" = 1'-0"

NOTE:
PROVIDE TEMPORARY OR PERMANENT LOCATION FOR 5 DUMPSTERS PRIOR TO DEMOLISHING EXISTING GARBAGE PAD



1 SITE PLAN
1" = 20'-0"

SP DUMARESQ ARCHITECT LTD

KEY PLAN

GENERAL NOTES

IF DIMENSION DOES NOT MEASURE 1" DRAWINGS IS NOTE PRINTED TO SCALE

DATE	#	ISSUE
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REGISTERED MEMBER
S.P. DUMARESQ
ASSOCIATION OF ARCHITECTS

SCALE:	As indicated
DRAWN BY:	STAFF
REVIEWED BY:	
DATE:	DECEMBER 18 2017

PROJECT TITLE

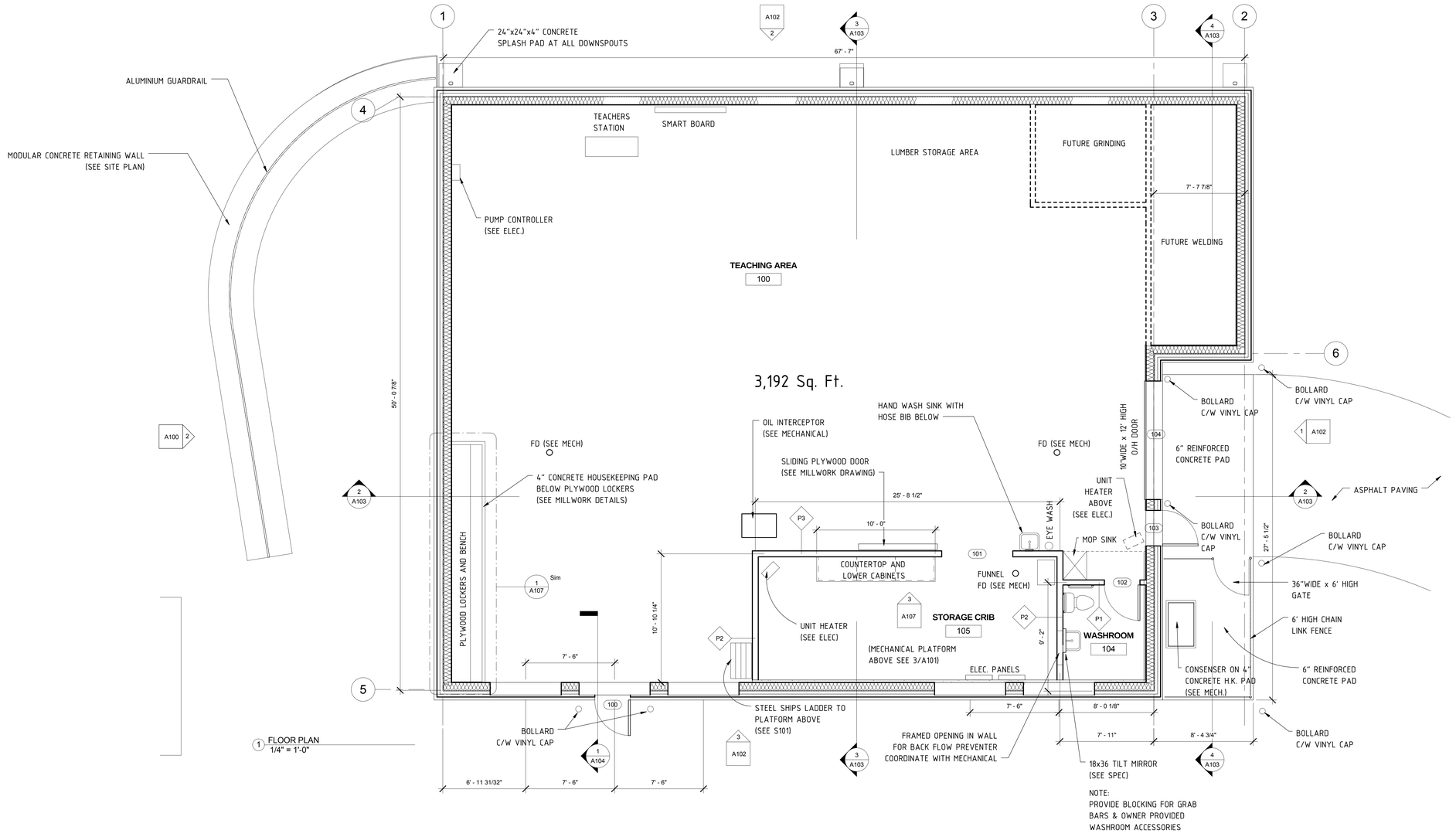
SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

Project Number

SHEET TITLE

SITE PLAN

A100



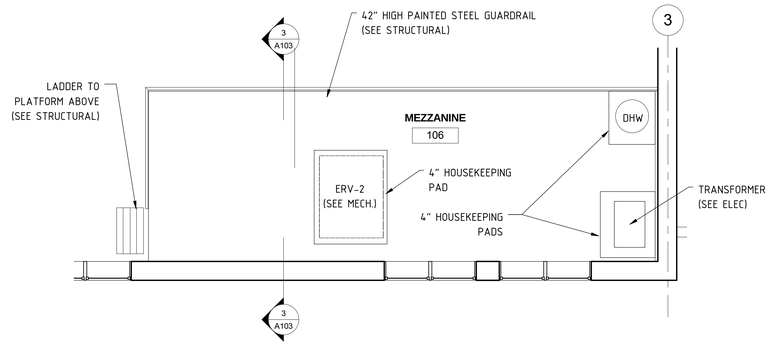
1 FLOOR PLAN
1/4" = 1'-0"

WALL TYPE P1
3/4" FINISH GRADE PLYWOOD W/ CLEAR FINISH
5/8" DRYWALL
2x4 STUDS @ 16" O/C FILLED WITH ACCOUSTIC INSULATION
5/8" DRYWALL

WALL TYPE P2
3/4" FINISH GRADE PLYWOOD W/ CLEAR FINISH
5/8" DRYWALL
2x6 STUDS @ 16" O/C FILLED W/ ACOUSTIC INSULATION
5/8" DRYWALL

WALL TYPE P3 - LOAD BEARING
3/4" FINISH GRADE PLYWOOD W/ CLEAR FINISH
5/8" DRYWALL
2x6 WOOD STUDS @ 16" O/C FILLED WITH ACCOUSTIC INSULATION
5/8" DRYWALL

WALL TYPES LEGEND
3/4" = 1'-0"



3 MEZZANINE FLOOR PLAN
1/4" = 1'-0"

SP DUMARESQ ARCHITECT LTD
KEY PLAN

GENERAL NOTES

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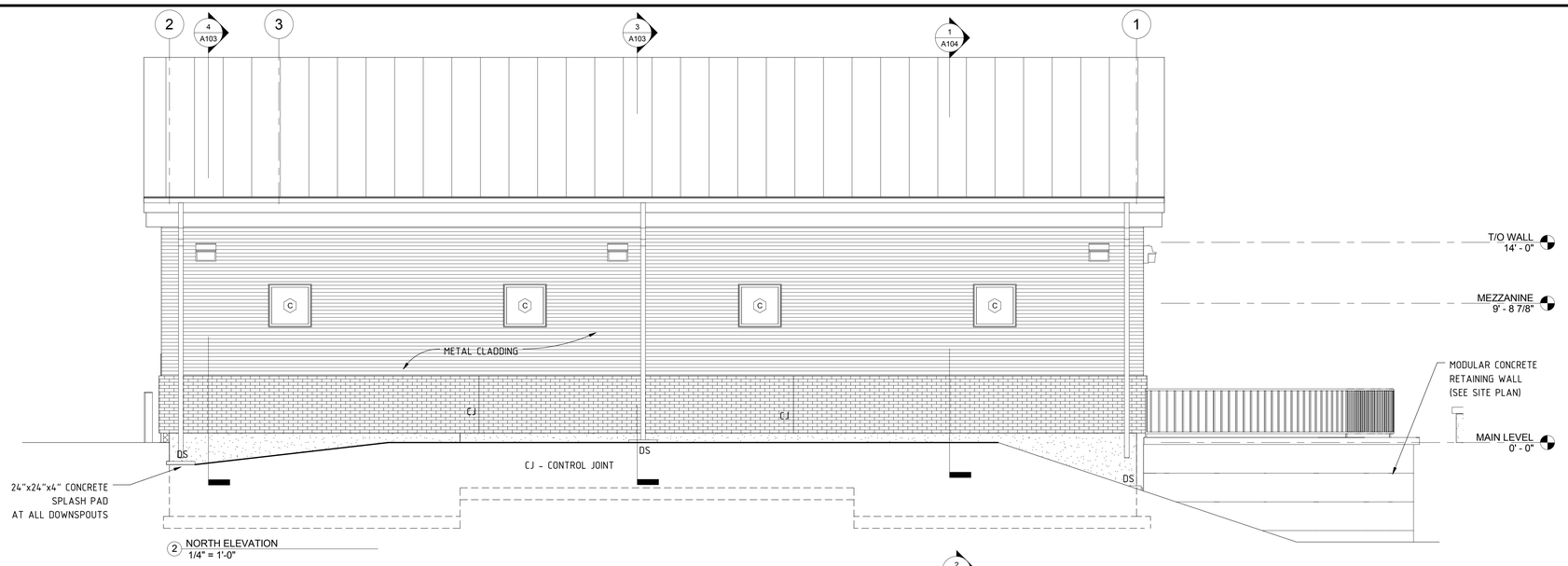
PROJECT TITLE
SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

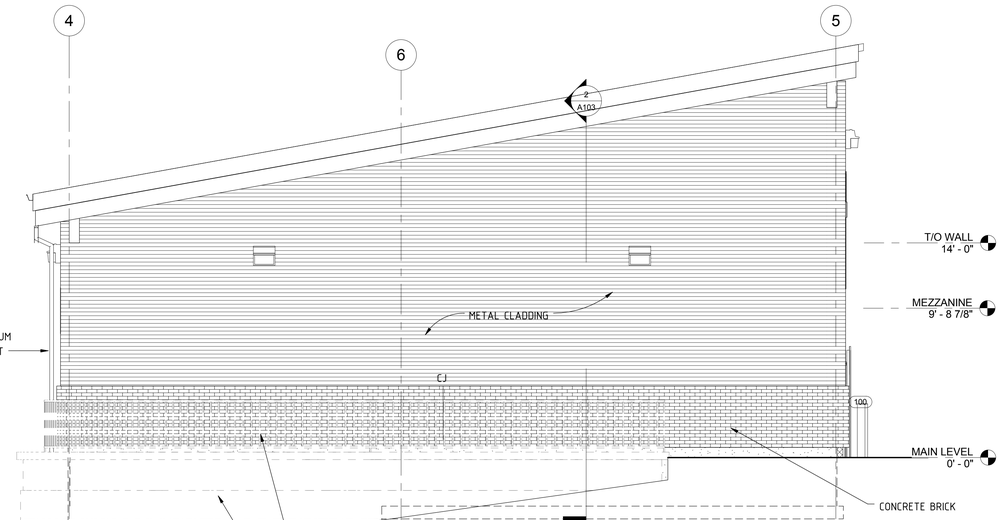
Project Number

SHEET TITLE
FLOOR PLANS

A101



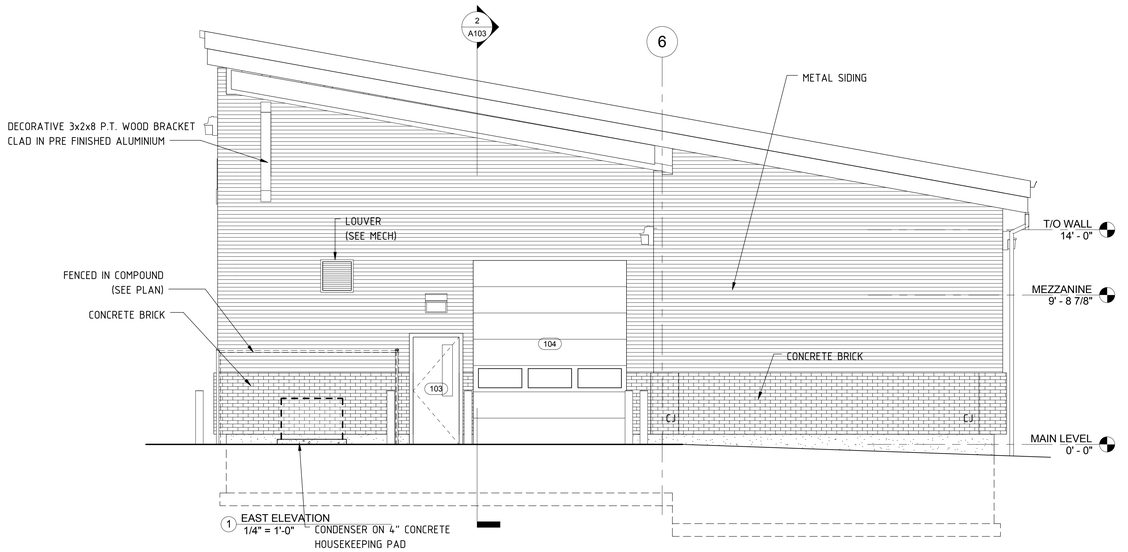
2 NORTH ELEVATION
1/4" = 1'-0"



4 WEST ELEVATION
1/4" = 1'-0"

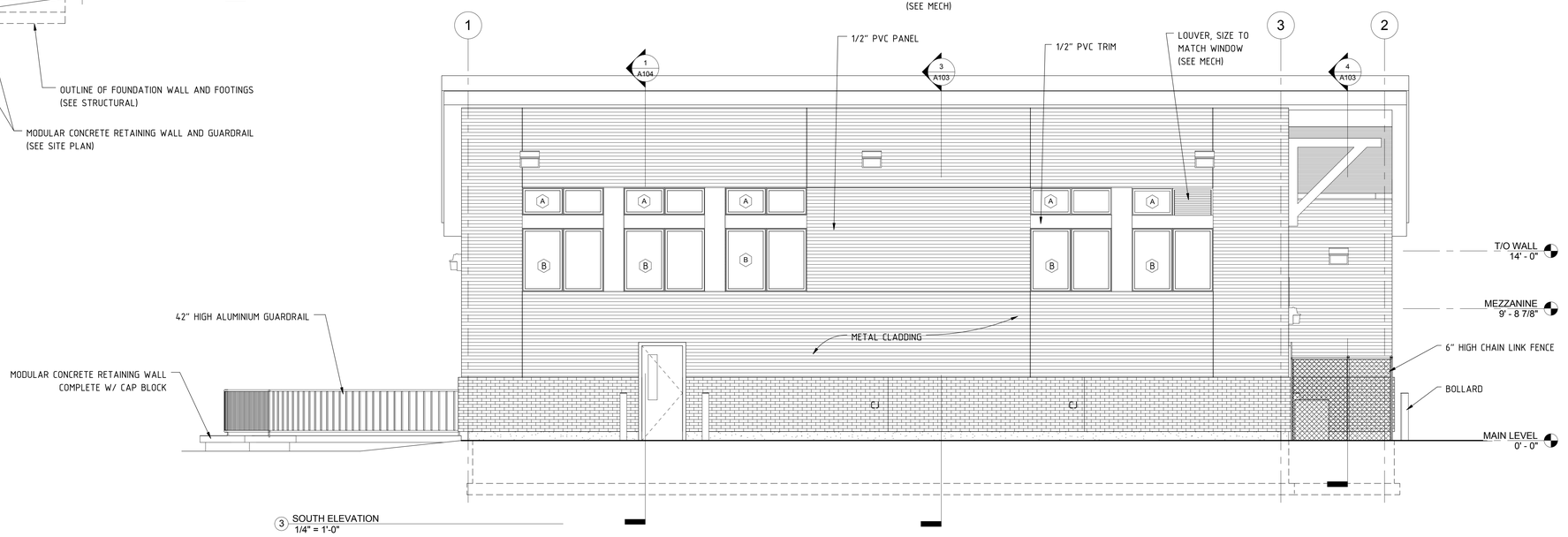
OUTLINE OF FOUNDATION WALL AND FOOTINGS (SEE STRUCTURAL)

MODULAR CONCRETE RETAINING WALL AND GUARDRAIL (SEE SITE PLAN)



1 EAST ELEVATION
1/4" = 1'-0"

CONDENSER ON 4" CONCRETE HOUSEKEEPING PAD (SEE MECH)



3 SOUTH ELEVATION
1/4" = 1'-0"

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DRAWN BY:	Author
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PROJECT TITLE

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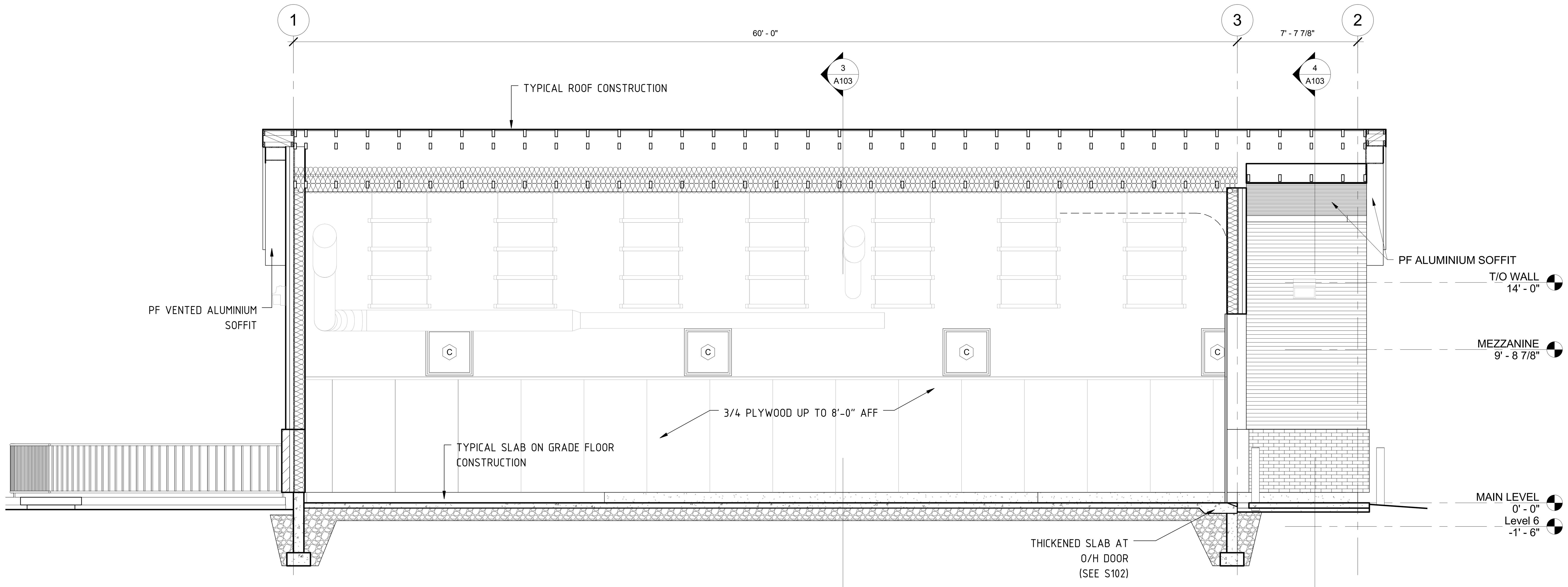
Project Number

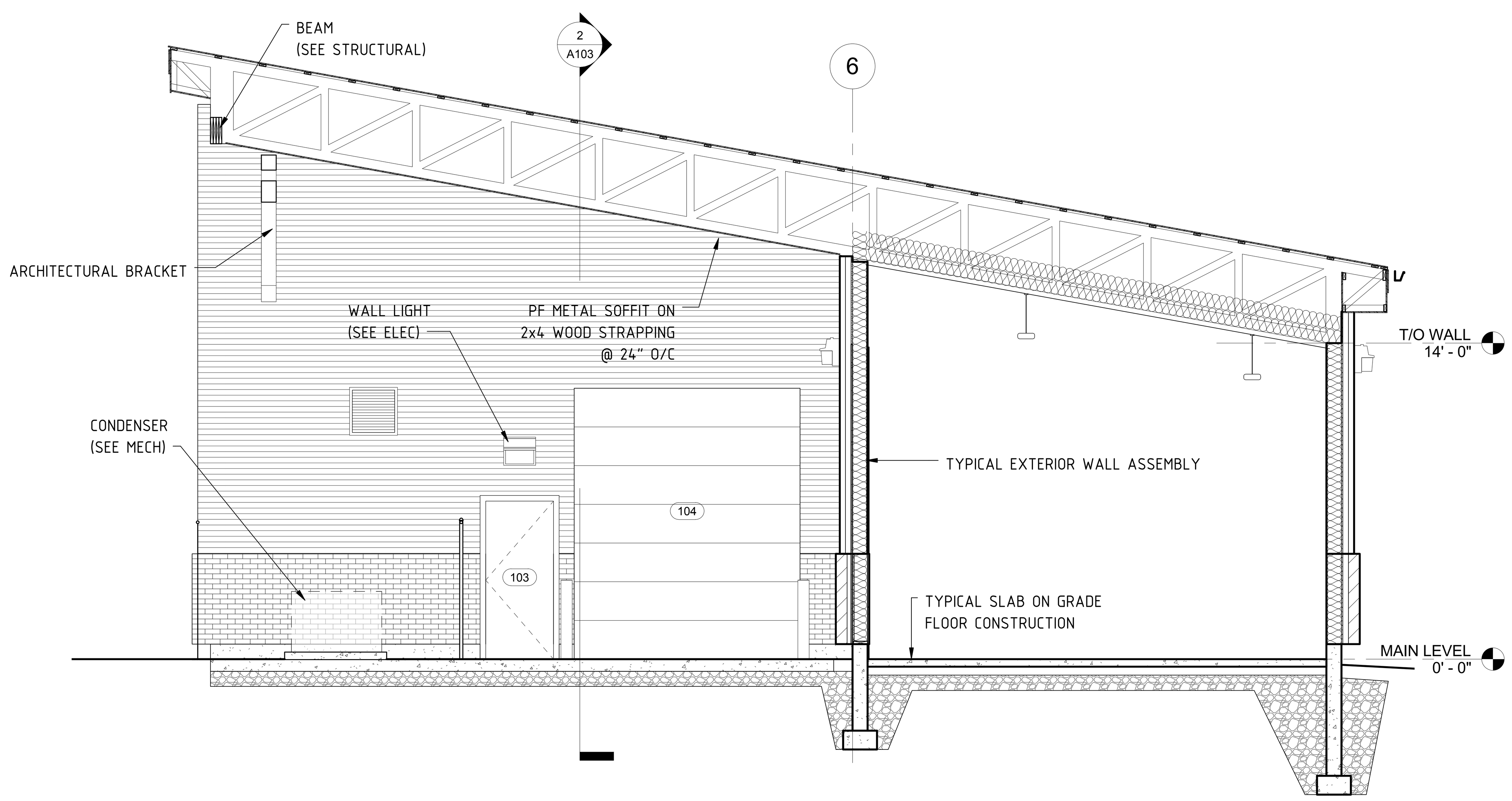
SHEET TITLE

ELEVATIONS

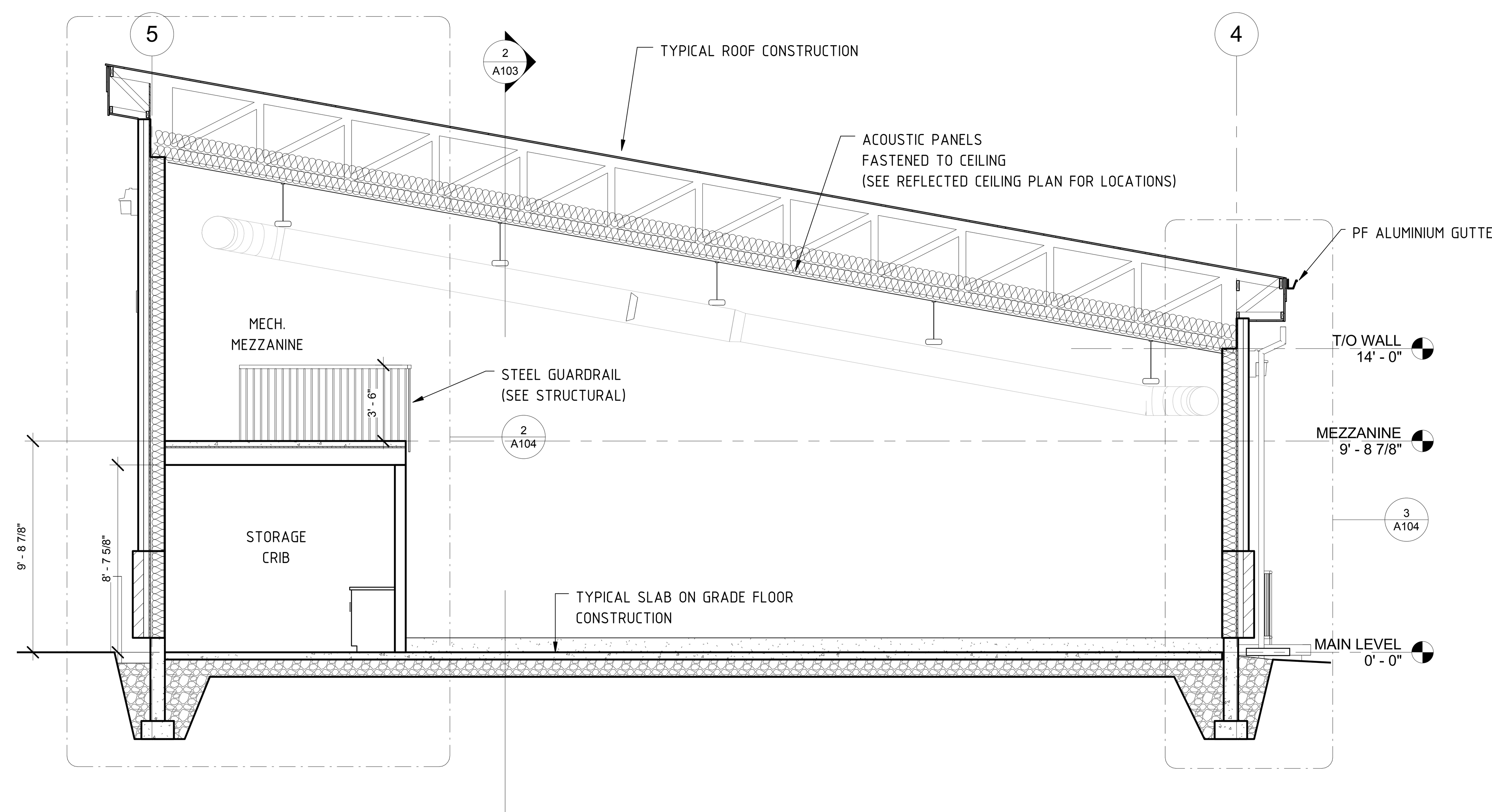
A102



2 CROSS SECTION 1
1/4" = 1'-0"



4 CROSS SECTION AT CANOPY
1/4" = 1'-0"



3 CROSS SECTION 2
1/4" = 1'-0"

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KEY PLAN

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PROJECT TITLE

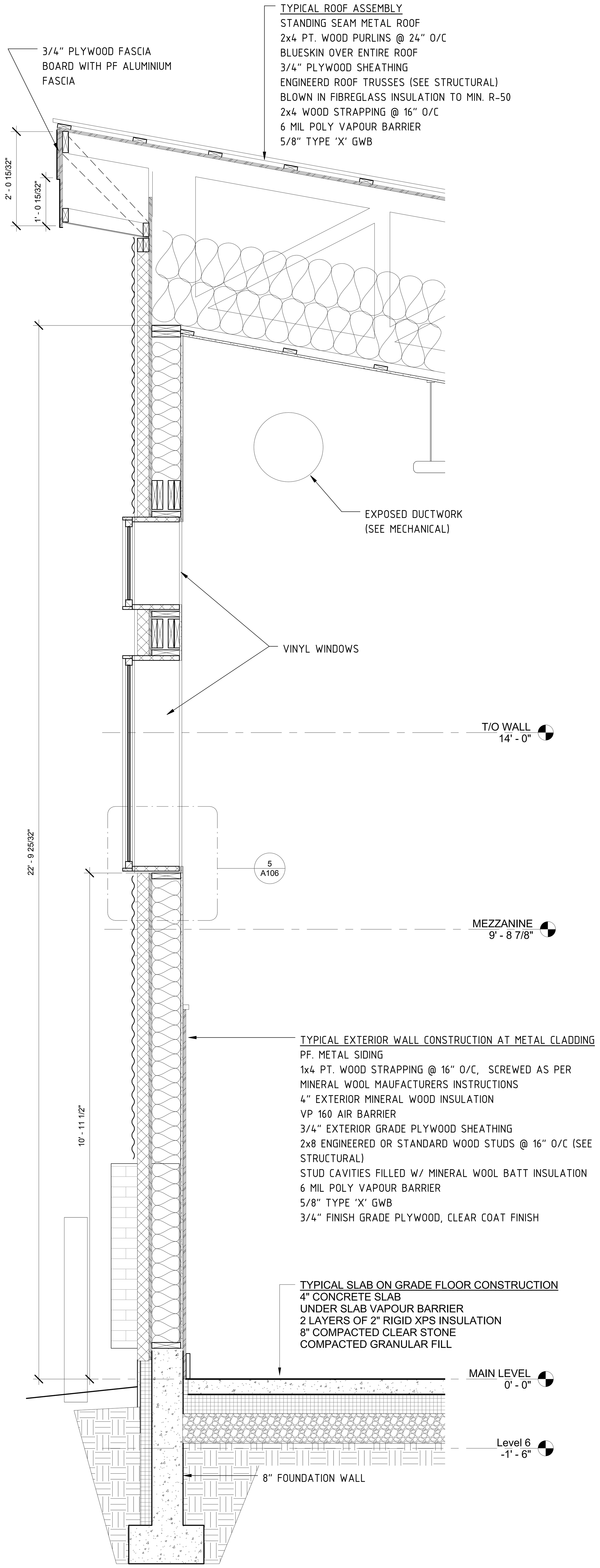
SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

Project Number

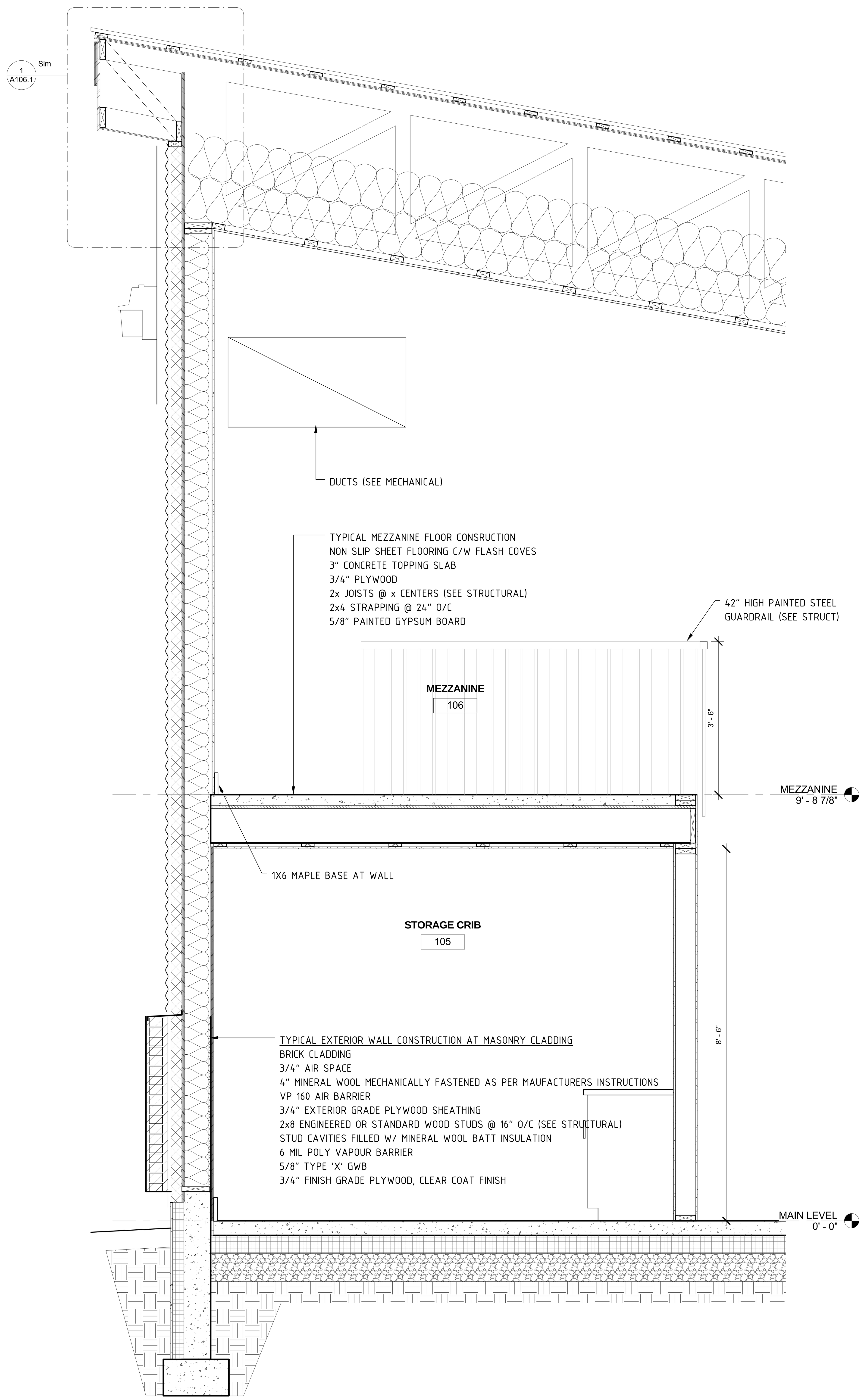
SHEET TITLE

SECTIONS

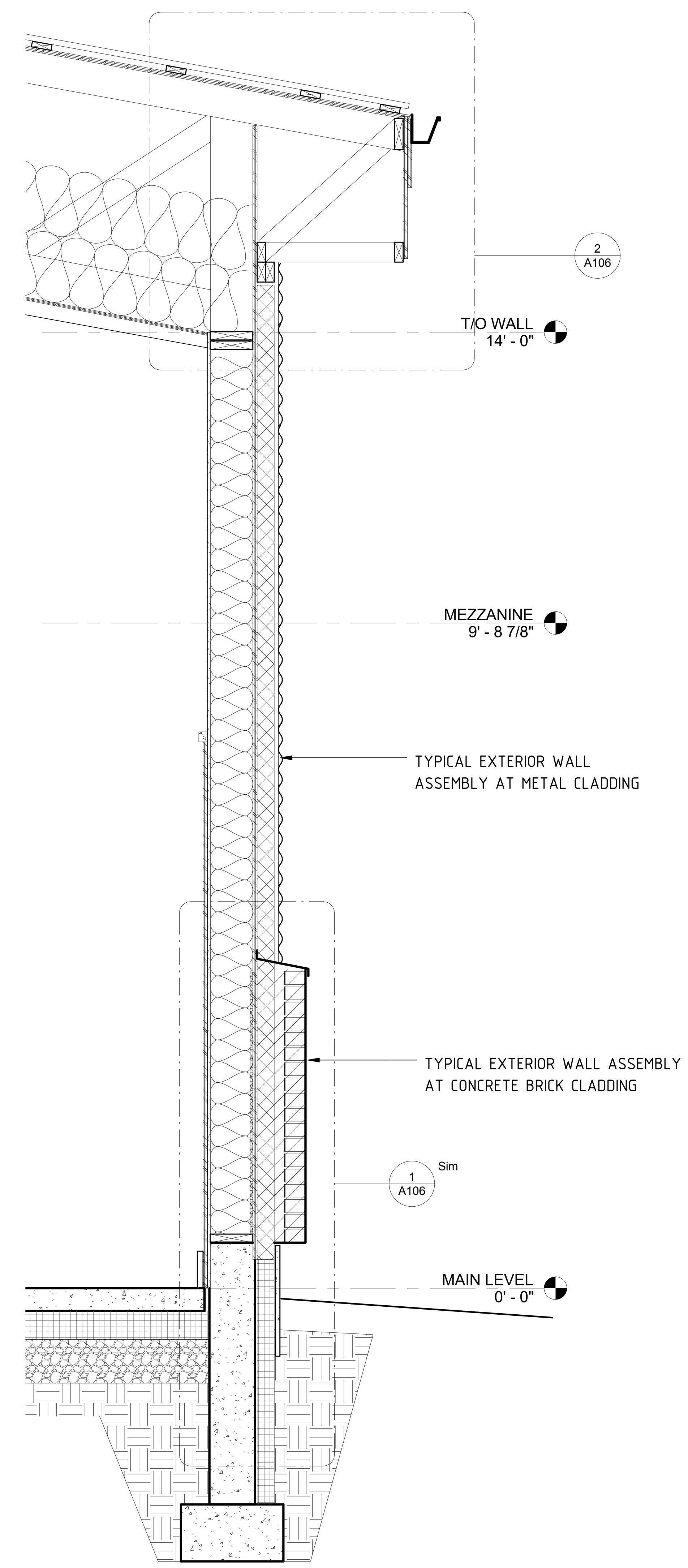
A103



1 TYPICAL WALL SECTION
3/4" = 1'-0"



2 SECTION AT MEZZANINE
3/4" = 1'-0"



3 WALL SECTION 2
3/4" = 1'-0"

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KEY PLAN

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SCALE: 3/4" = 1'-0"
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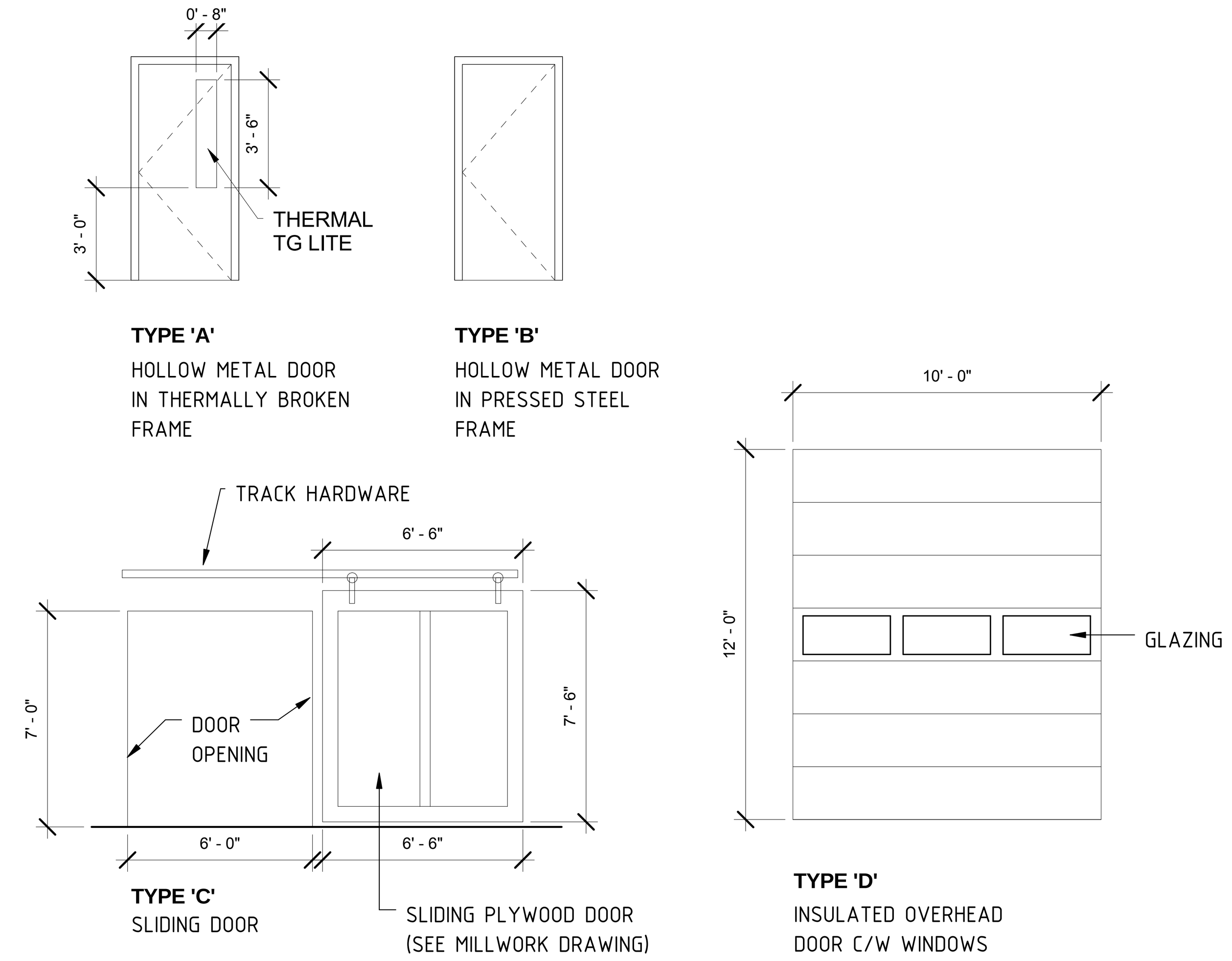
SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

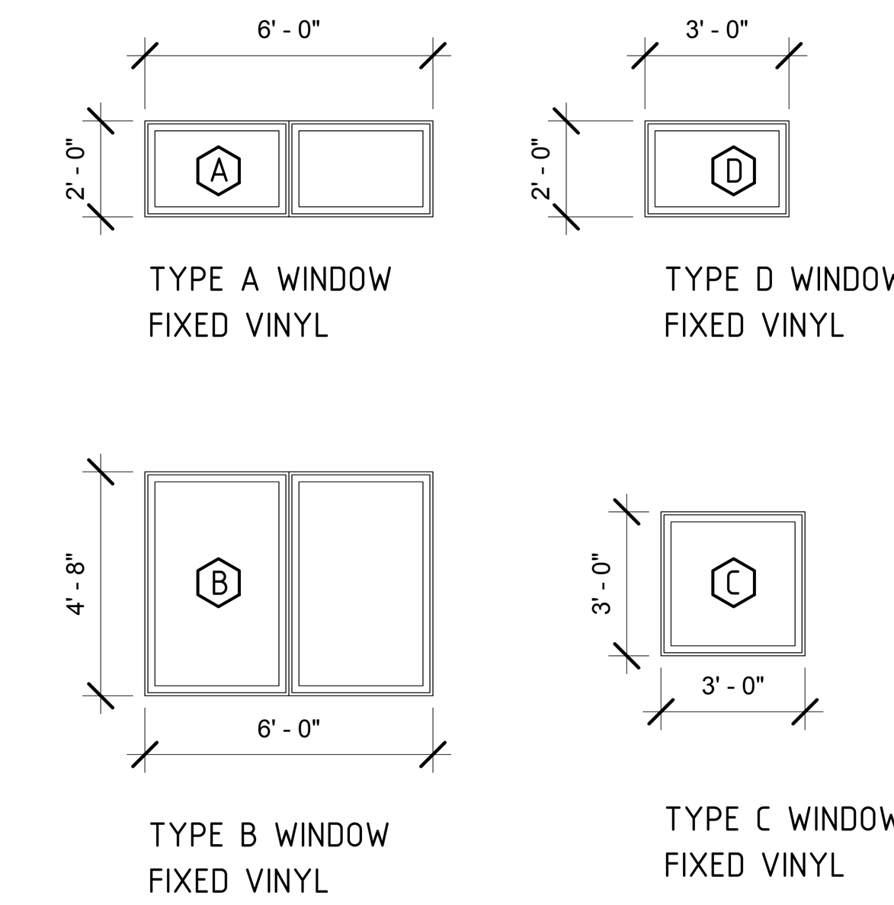
Project Number
SHEET TITLE

WALL SECTIONS

A104



DOOR LEGEND
1/4" = 1'-0"



WINDOW SCHEDULE
1/4" = 1'-0"

DOOR SCHEDULE											
DOOR NO.	LOCATION	DOOR TYPE	WIDTH	HEIGHT	DOOR THICKNESS	DOOR MATERIAL	DOOR FINISH	FRAME MATERIAL	FRAME FINISH	FIRE RATING	COMMENTS
100	EXTERIOR TO TEACHING AREA	A	36"	84"	1-3/4"	HM	P	TB PS	P	--	REQUIRES THERMALLY BROKEN FRAME
101	TEACHING AREA TO STORAGE CRIB	C	72"	84"	1-3/4"	PLYWOOD	CLEAR COAT	N/A	N/A	--	SEE DETAIL FOR DOOR CONSTRUCTION
102	WASHROOM	B	36"	84"	1-3/4"	HM	P	PS	P	--	
103	EXTERIOR TO TEACHING AREA	A	36"	84"	1-3/4"	HM	P	TB PS	P	--	REQUIRES THERMALLY BROKEN FRAME
104	OVERHEAD DOOR	D	120"	144"	3"	PF INSULATED	PF	CUSTOM	P	--	INSULATED OVERHEAD DOOR

DOORS ABBREVIATIONS LEGEND

P - PAINTED
HM - HOLLOW METAL
TB PS- THERMALLY BROKEN PRESSED STEEL
PS - PRESSED STEEL

PF INSULATED - PRE-FINISHED INSULATED
SCW - SOLID CORE WOOD

ROOM FINISH SCHEDULE									
Number	Name	WALL MAT'L	WALL FINISH	FLOOR MATERIAL	FLOOR FINISH	BASE MATERIAL	CEILING MAT'L	CEILING FINISH	COMMENTS
100	TEACHING AREA	GWB / PLY	P / CLEAR COAT	EXP CONCRETE	CHEM. HARDENER	WOOD	GWB	P	PLYWOOD ON GWB WALL UP TO 8' AFF
105	STORAGE CRIB	GWB / PLY	P / CLEAR COAT	EXP CONCRETE	CHEM. HARDENER	WOOD	GWB	P	PLYWOOD ON GWB WALL UP TO 8' AFF
104	WASHROOM	ABUSE RESIST. GWB	P	VCT	PF	RUBBER	GWB	P	
103	LUMBER STORAGE	GWB / PLY	P / CLEAR COAT	EXP CONCRETE	CHEM. HARDENER	WOOD	GWB	P	PLYWOOD ON GWB WALL UP TO 8' AFF
106	MEZZANINE	GWB	P	EXP CONCRETE	CHEM. HARDENER	WOOD	GWB	P	

FINISHES ABBREVIATIONS LEGEND

P - PAINTED
GWB - GYPSUM WALL BOARD
VCT - VINYL COMPOSITE TILE
EXP CONCRETE - EXPOSED CONCRETE

CHEM. HARDENER - CHEMICAL HARDENER
PF - PRE FINISHED
PLY - PLYWOOD

SP DUMARESQ
ARCHITECT LTD
5088 COBURG ROAD, THIRD FLOOR, HALIFAX, N.S.

KEY PLAN

GENERAL NOTES

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1"

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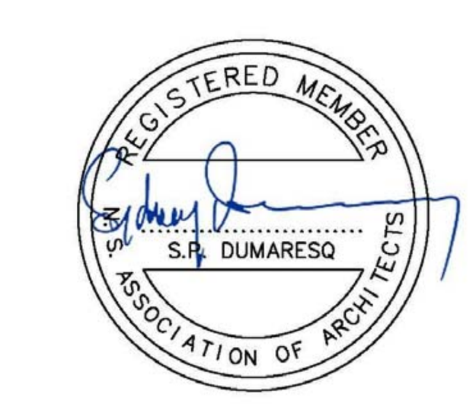

SCALE:	1/4" = 1'-0"
DRAWN BY:	Author
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PROJECT TITLE

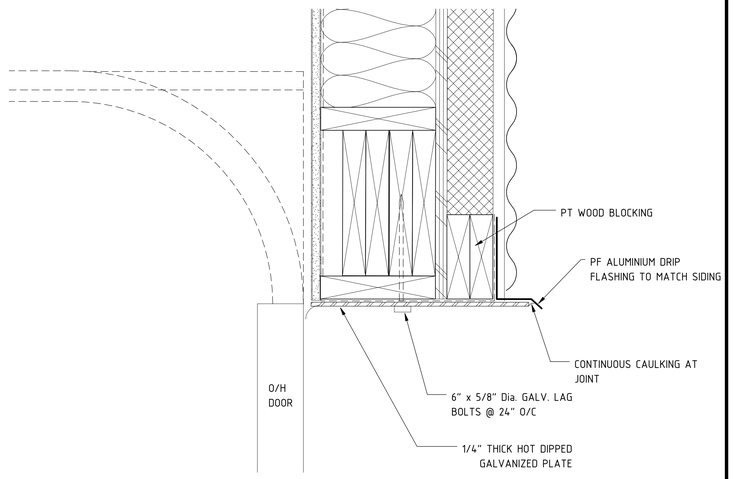
SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

Project Number

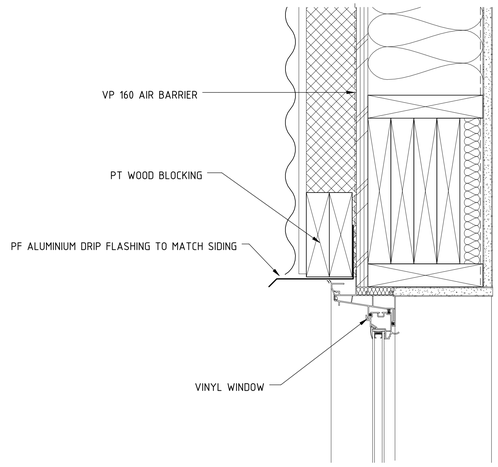
SHEET TITLE

DOOR, WINDOW AND FINISH SCHEDULES

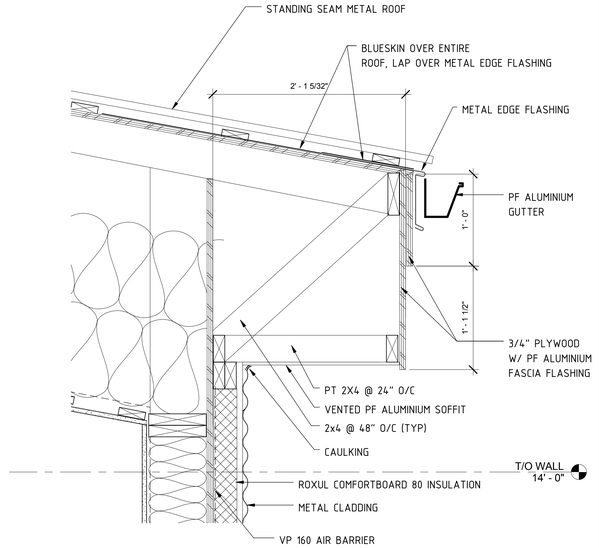
A105



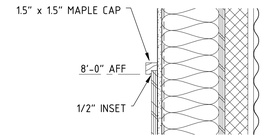
7 TYPICAL OVERHEAD DOOR HEAD DETAIL
3" = 1'-0"



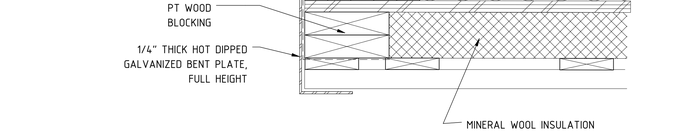
9 TYPICAL WINDOW HEAD DETAIL
3" = 1'-0"



2 TYPICAL EAVE DETAIL
1 1/2" = 1'-0"

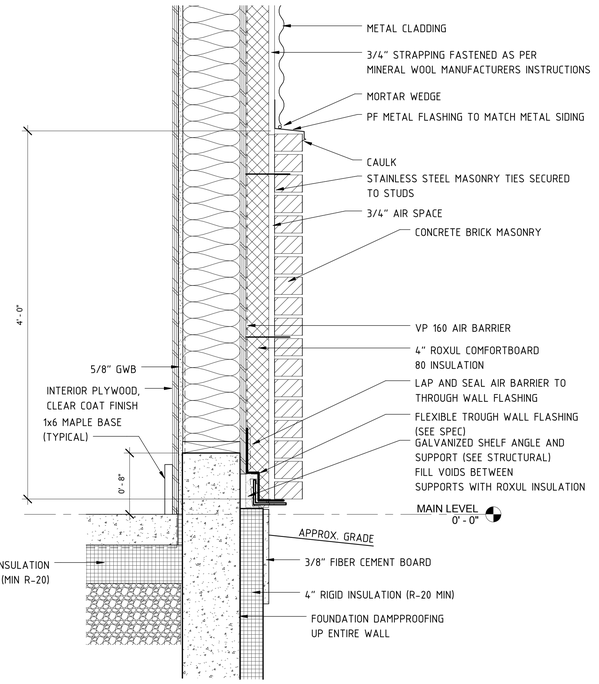


3 TYPICAL PLYWOOD CAP DETAIL
1 1/2" = 1'-0"

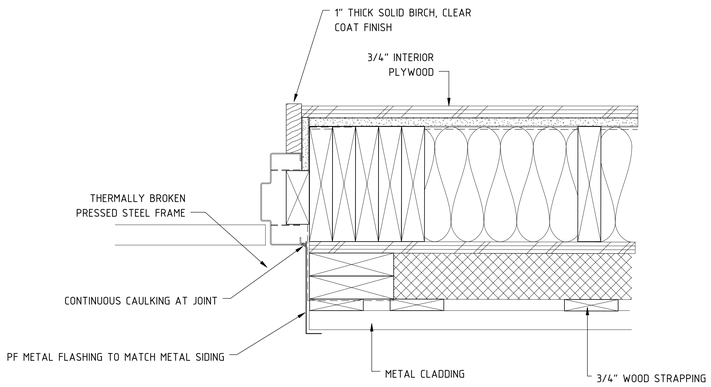


6 TYPICAL OVERHEAD DOOR JAMB DETAIL
3" = 1'-0"

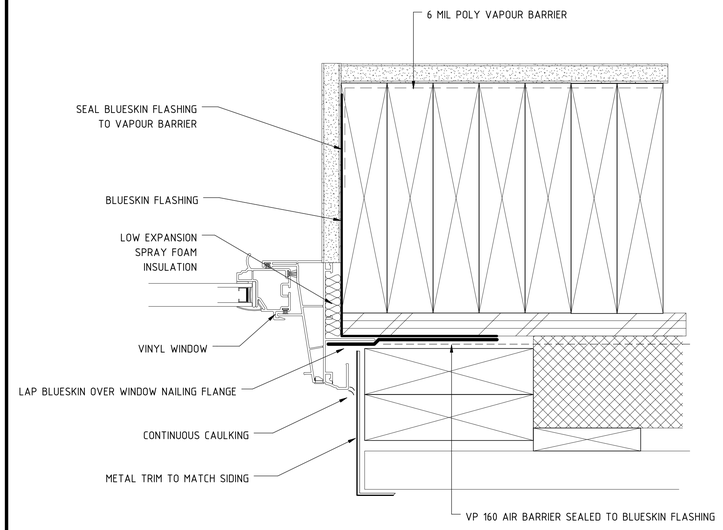
5 TYPICAL WINDOW SILL DETAIL
3" = 1'-0"



1 TYPICAL WALL BASE DETAIL
1 1/2" = 1'-0"



4 TYPICAL EXTERIOR DOOR JAMB DETAIL
3" = 1'-0"



8 TYPICAL WINDOW JAMB DETAIL 1
6" = 1'-0"

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KEY PLAN

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ASSOCIATION OF ARCHITECTS

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PROJECT TITLE

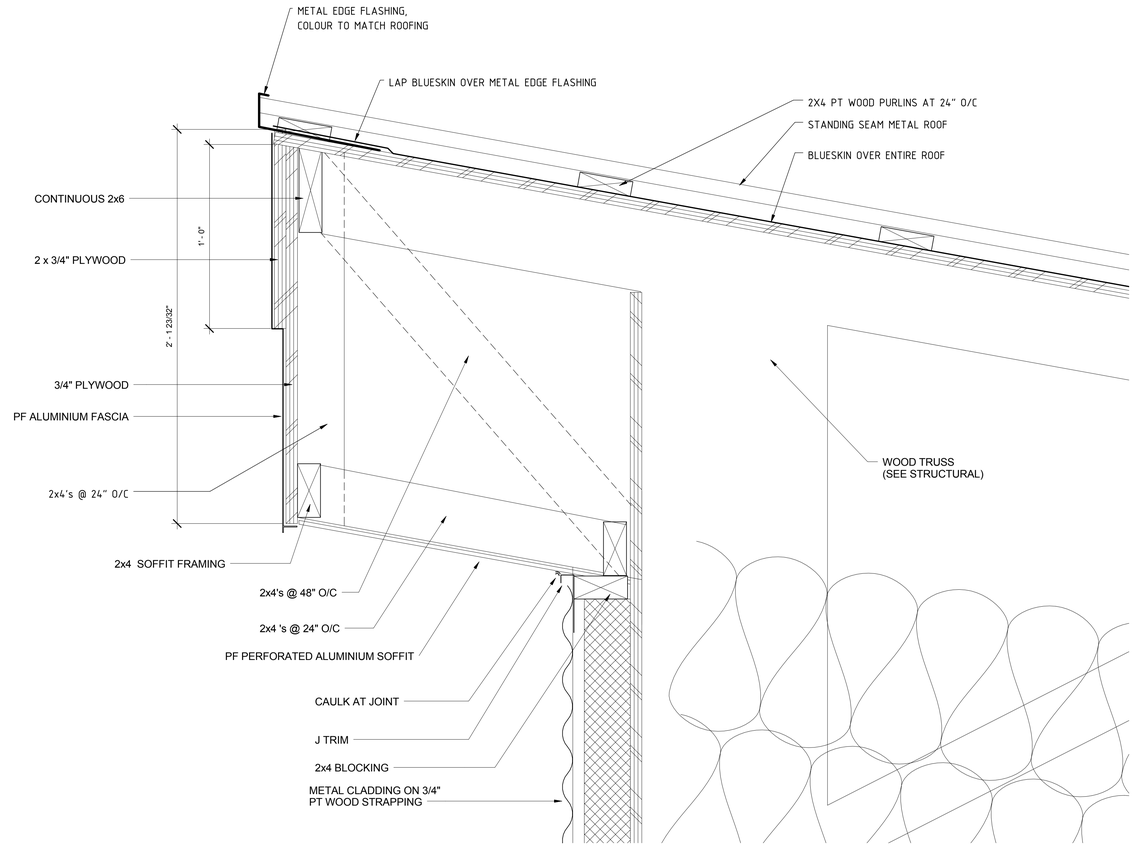
SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

Project Number

SHEET TITLE

DETAILS

A106



1 EAVE DETAIL
3" = 1'-0"

SP DUMARESQ ARCHITECT LTD

KEY PLAN

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REVIEWED BY:	
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PROJECT TITLE

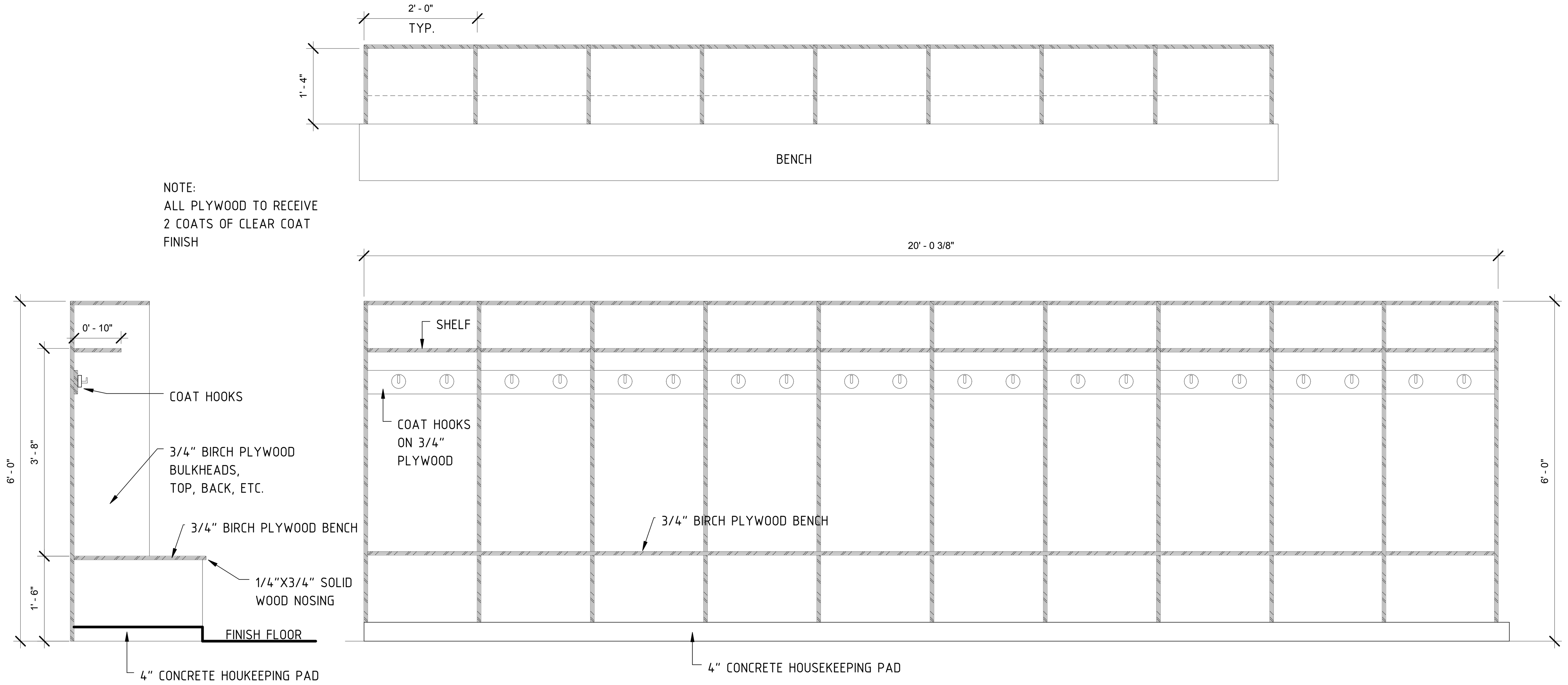
SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

Project Number

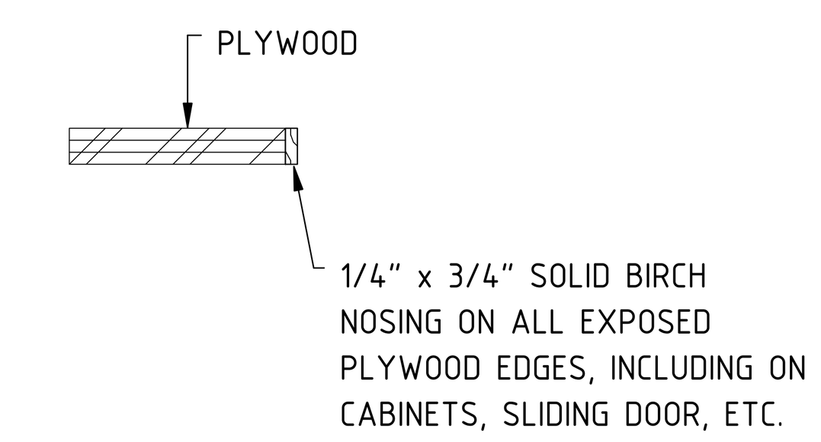
SHEET TITLE

DETAILS

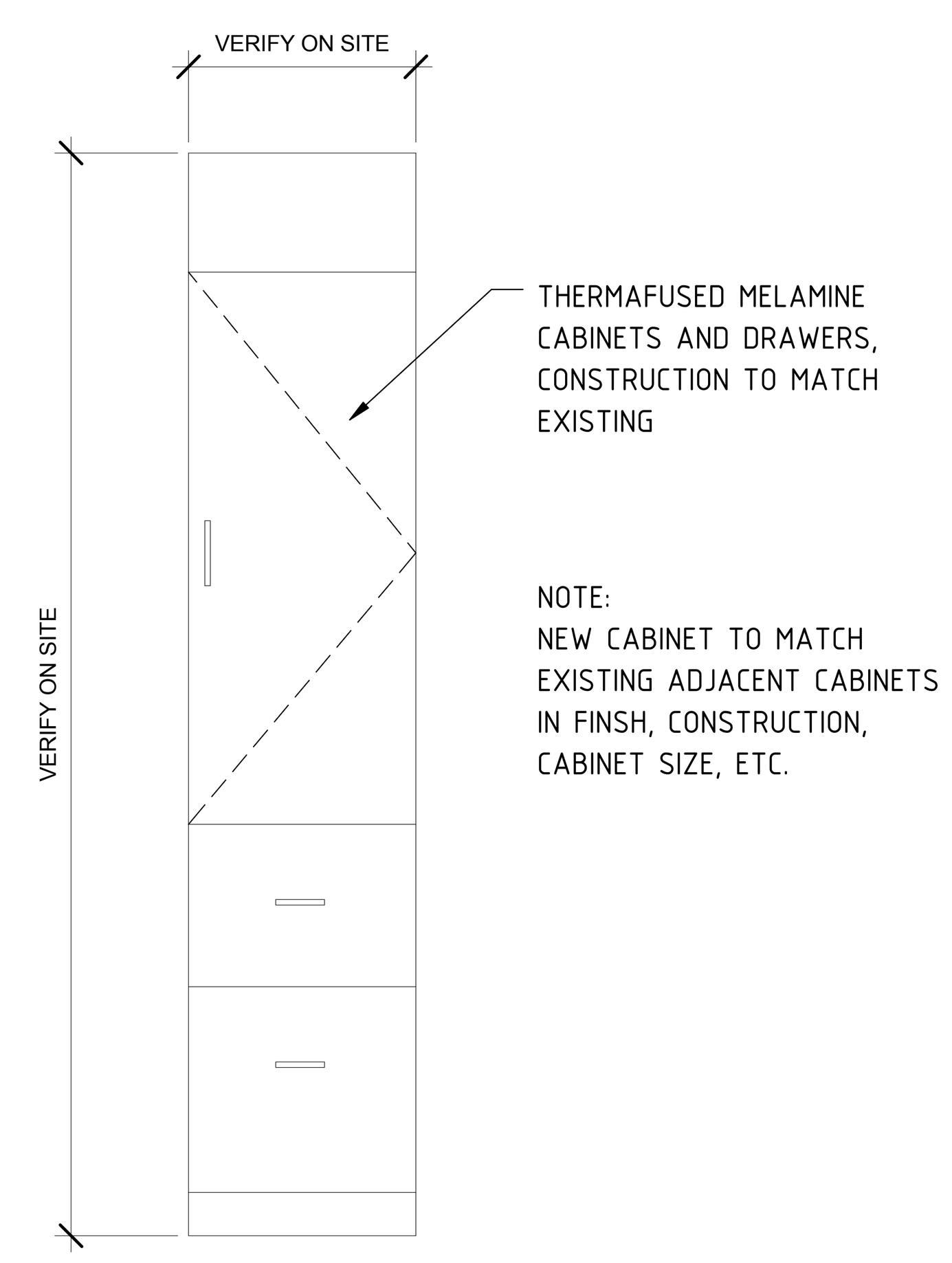
A106.1



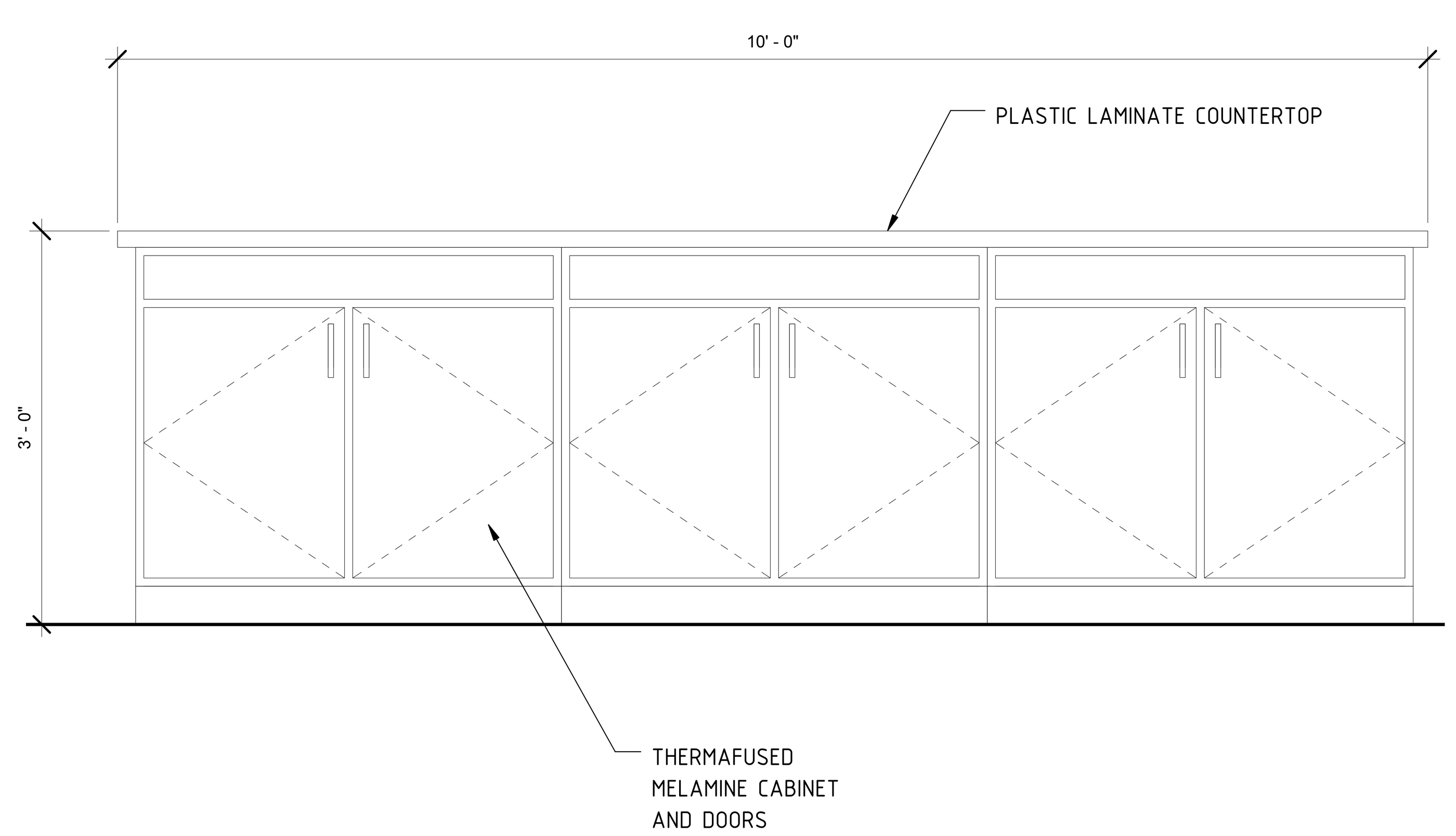
1 PLYWOOD LOCKERS DETAILS
3/4" = 1'-0"



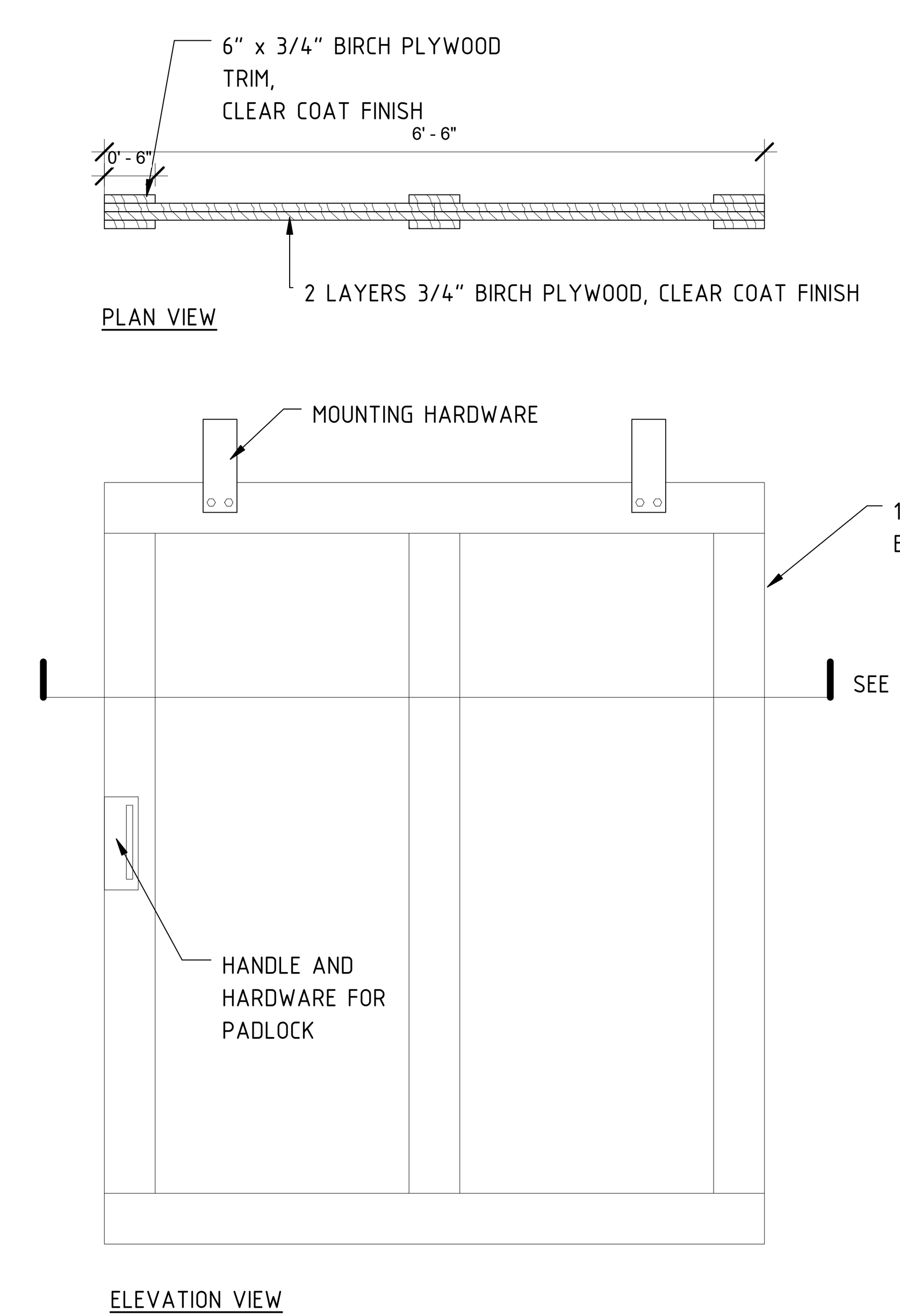
5 NOSING DETAIL
3" = 1'-0"



4 CLASSROOM CABINET
3/4" = 1'-0"



3 CABINET ELEVATION AT STORAGE CRIB
1" = 1'-0"



2 SLIDING DOOR DETAILS
3/4" = 1'-0"

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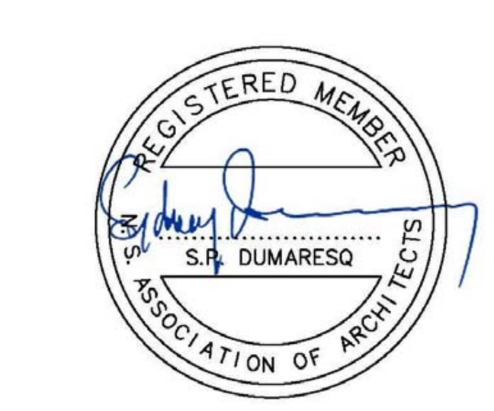

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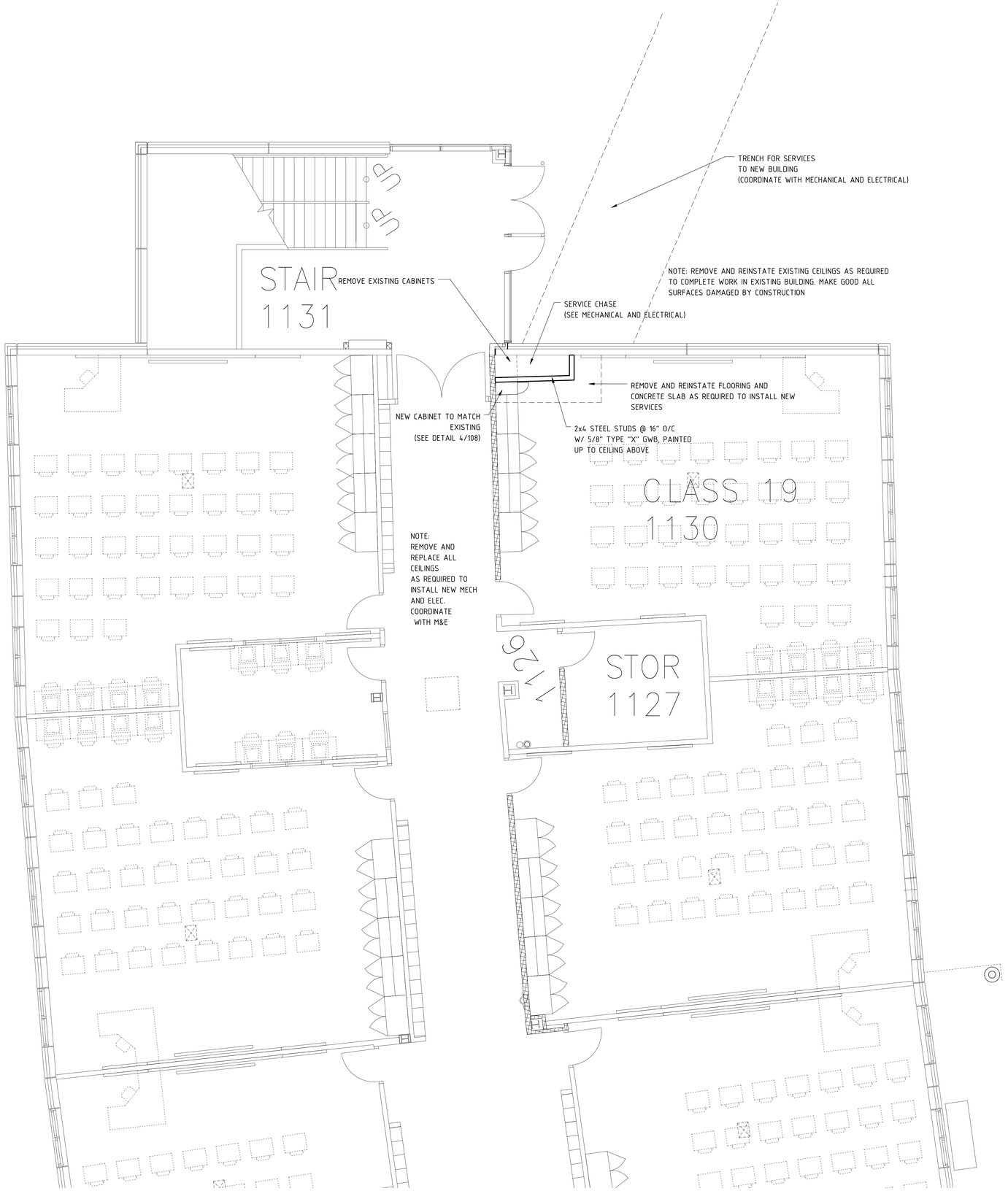
DATE: DECEMBER 18 2017
PROJECT TITLE
SIR JOHN A. MACDONALD SKILLED TRADES BUILDING
Project Number
SHEET TITLE
MILLWORK

A107



1 PARTIAL MAIN BUILDING FLOOR PLAN
1/4" = 1'-0"

SP DUMARESQ ARCHITECT LTD

KEY PLAN

GENERAL NOTES

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DATE	#	ISSUE
2017-12-18	1	ISSUED FOR TENDER

REGISTERED MEMBER S.P. DUMARESQ ASSOCIATION OF ARCHITECTS

SCALE:	1/4" = 1'-0"
DRAWN BY:	Author
REVIEWED BY:	
DATE:	DECEMBER 18 2017

PROJECT TITLE

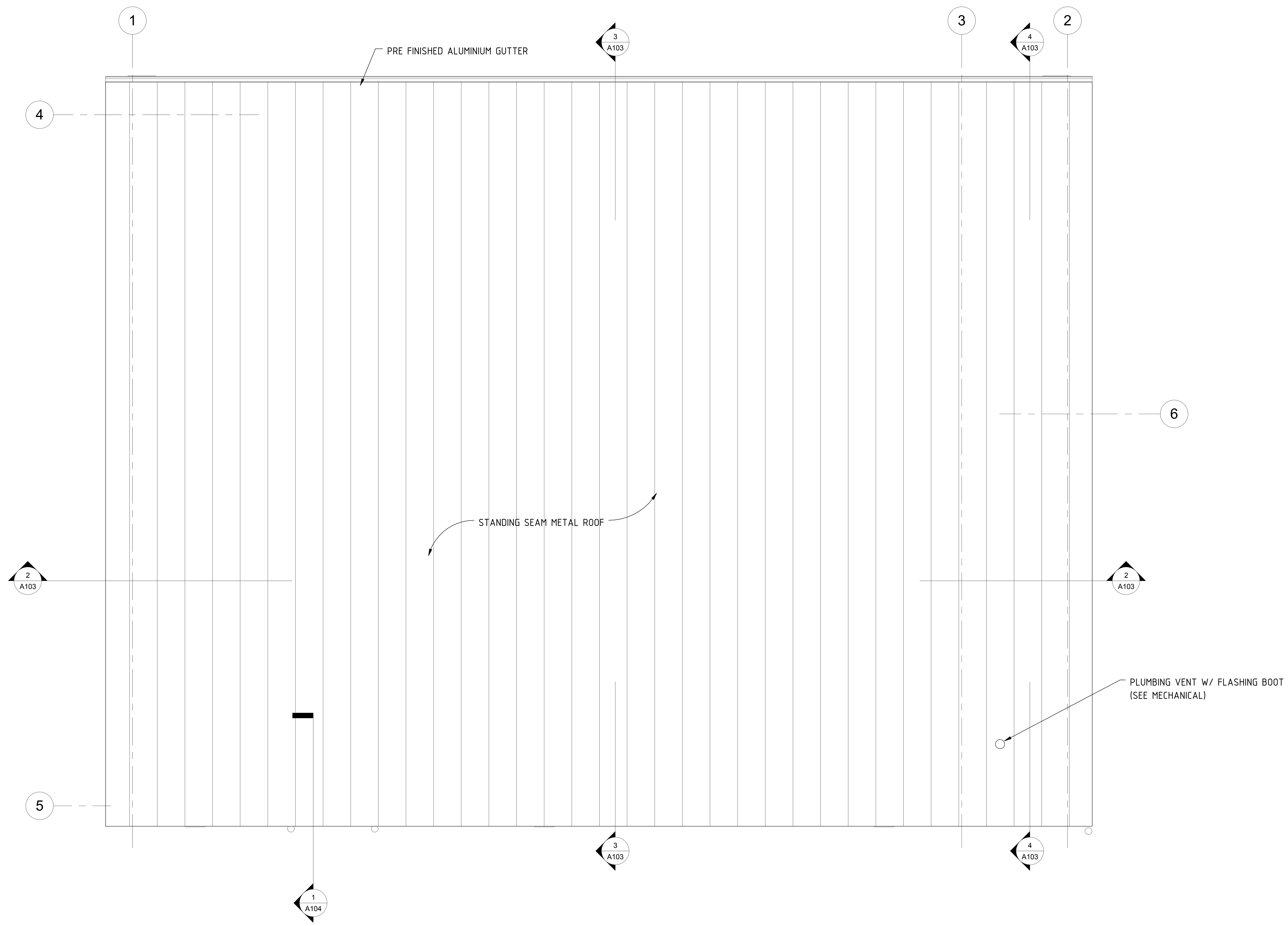
SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

Project Number

SHEET TITLE

PARTIAL FLOOR PLAN MAIN BUILDING

A108



SP DUMARESQ ARCHITECT LTD

KEY PLAN

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IF DIMENSION DOES NOT MEASURE 1" DRAWINGS IS NOTE PRINTED TO SCALE

1"

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REGISTERED MEMBER
S.P. DUMARESQ
ASSOCIATION OF ARCHITECTS

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DRAWN BY:	Author
REVIEWED BY:	
DATE:	DECEMBER 18 2017

PROJECT TITLE

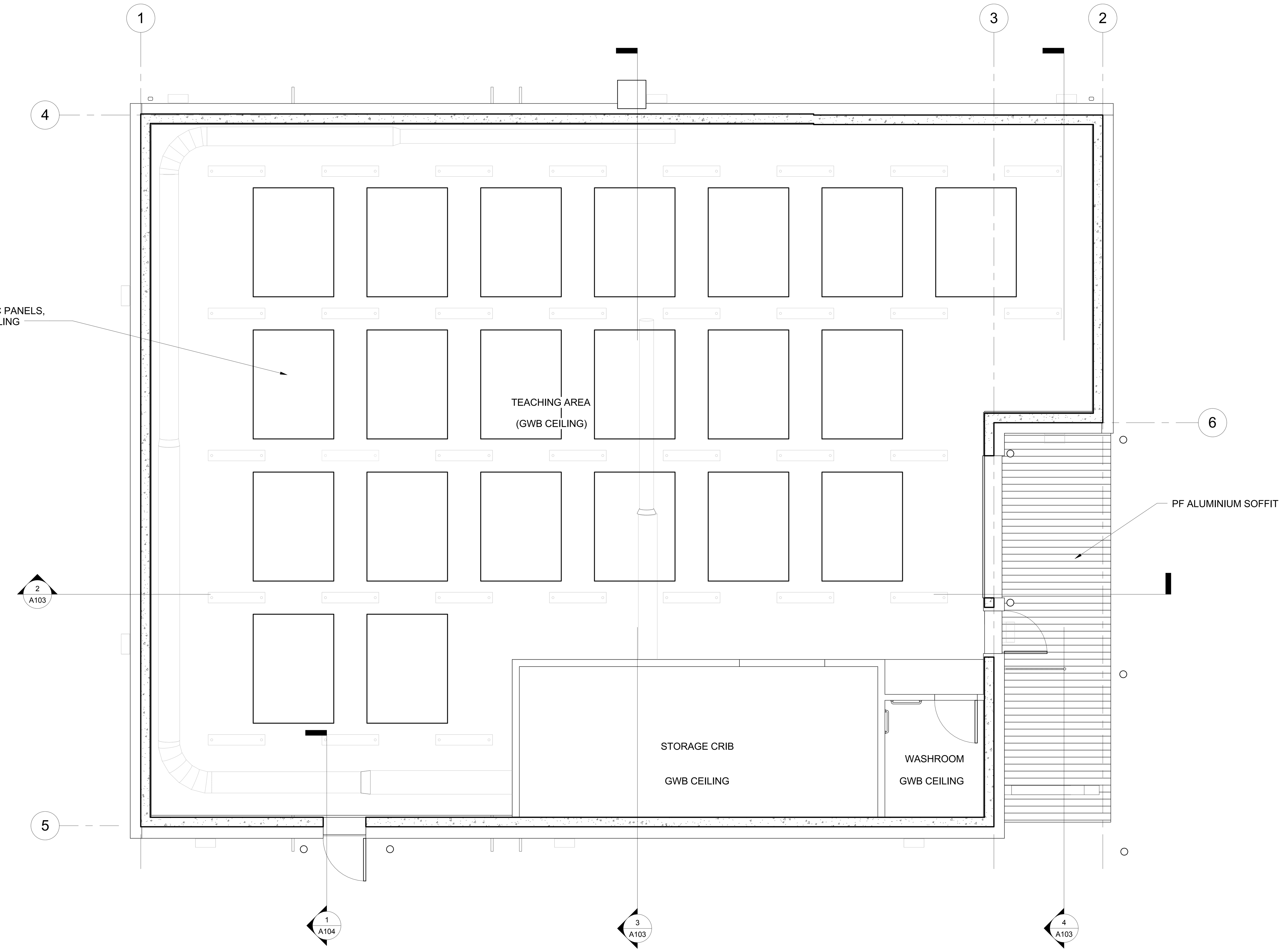
SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

Project Number

SHEET TITLE

ROOF PLAN

A109



SP DUMARESQ ARCHITECT LTD

KEY PLAN

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REGISTERED MEMBER S.P. DUMARESQ ASSOCIATION OF ARCHITECTS

SCALE:	1/4" = 1'-0"
DRAWN BY:	JC
REVIEWED BY:	
DATE:	DECEMBER 18 2017

PROJECT TITLE

SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

Project Number

SHEET TITLE

REFLECTED CEILING PLAN

A110

PLUMBING

SINK – SINGLE STAINLESS STEEL

SANITARY ABOVE FLOOR

SANITARY BELOW FLOOR

SANITARY VENT PIPE

CLEANOUT IN FINISHED FLOOR

CLEANOUT IN CEILING SPACE

FLOOR DRAIN WITH TRAP

WALL CLEANOUT

DOMESTIC COLD WATER

DOMESTIC HOT WATER

HOSE BIBB

WATER HAMMER ARRESTOR (# = SIZE)

VALVE (SEE SPEC FOR TYPE)

CHECK VALVE

ELBOW TURNED UP

ELBOW TURNED DOWN

TEMPERATURE SENSING BULB WELL WITH THERMOMETER

PRESSURE GAUGE WITH GAUGE COCK

DIRECTION OF FLOW

RELIEF VALVE PIPED TO DRAIN

HOSE END DRAIN VALVE

AIR DISTRIBUTION

RECTANGULAR AND ROUND DUCTWORK (NEW)

FLEXIBLE CONNECTIONS

BACKDRAFT DAMPER

FIRE DAMPER (VERTICAL)

FIRE DAMPER (HORIZONTAL)

MANUAL VOLUME CONTROL DAMPER

MANUAL BALANCING CONTROL DAMPER

TRANSITION (SQUARE TO ROUND)

TURNING VANES (SQUARE ELBOW)

TURNING VANES (RADIUS ELBOW)

CEILING MOUNTED RETURN GRILLE

CEILING DIFFUSER

WALL MOUNTED REGISTER

WALL MOUNTED RETURN GRILLE

FLEXIBLE DUCTWORK

GRILLE, DIFFUSER, REGISTER TYPE AIR FLOW IN L/S

CONTROLS

ANALOG OUTPUT

ANALOG INPUT

BINARY OUTPUT

BINARY INPUT

WIRING BY ELECTRICAL CONTRACTOR

WIRING BY CONTROLS CONTRACTOR

OUTSIDE AIR

RETURN AIR

SUPPLY AIR

EXHAUST AIR

TEMPERATURE SENSOR

MOTORIZED DAMPER

ELECTRICAL EQUIPMENT SEE ELECTRICAL DRAWING

ELECTRICAL EQUIPMENT SEE ELECTRICAL DRAWING

ELECTRICAL EQUIPMENT SEE ELECTRICAL DRAWING

ELECTRICAL EQUIPMENT SEE ELECTRICAL DRAWING

1000mm MINIMUM CLEARANCE

1980mm MAXIMUM

ELECTRICAL EQUIPTMENT SUCH AS VFD, BAS ETC.

ELECTRICAL EQUIPMENT CLEARANCE

SP DUMARESQ ARCHITECT LTD

DUMAC ENERGY LTD.
CONSULTING ENGINEERS
752 BEDFORD HIGHWAY
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Email: DUMAC@DUMAC.NS.CA

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REGISTERED PROFESSIONAL ENGINEER
M.G. DUMAC
3092
PROVINCE OF NOVA SCOTIA

SCALE:	N.T.S.
DRAWN BY:	STAFF
REVIEWED BY:	MGD
DATE:	2017-12-18

PROJECT TITLE

SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

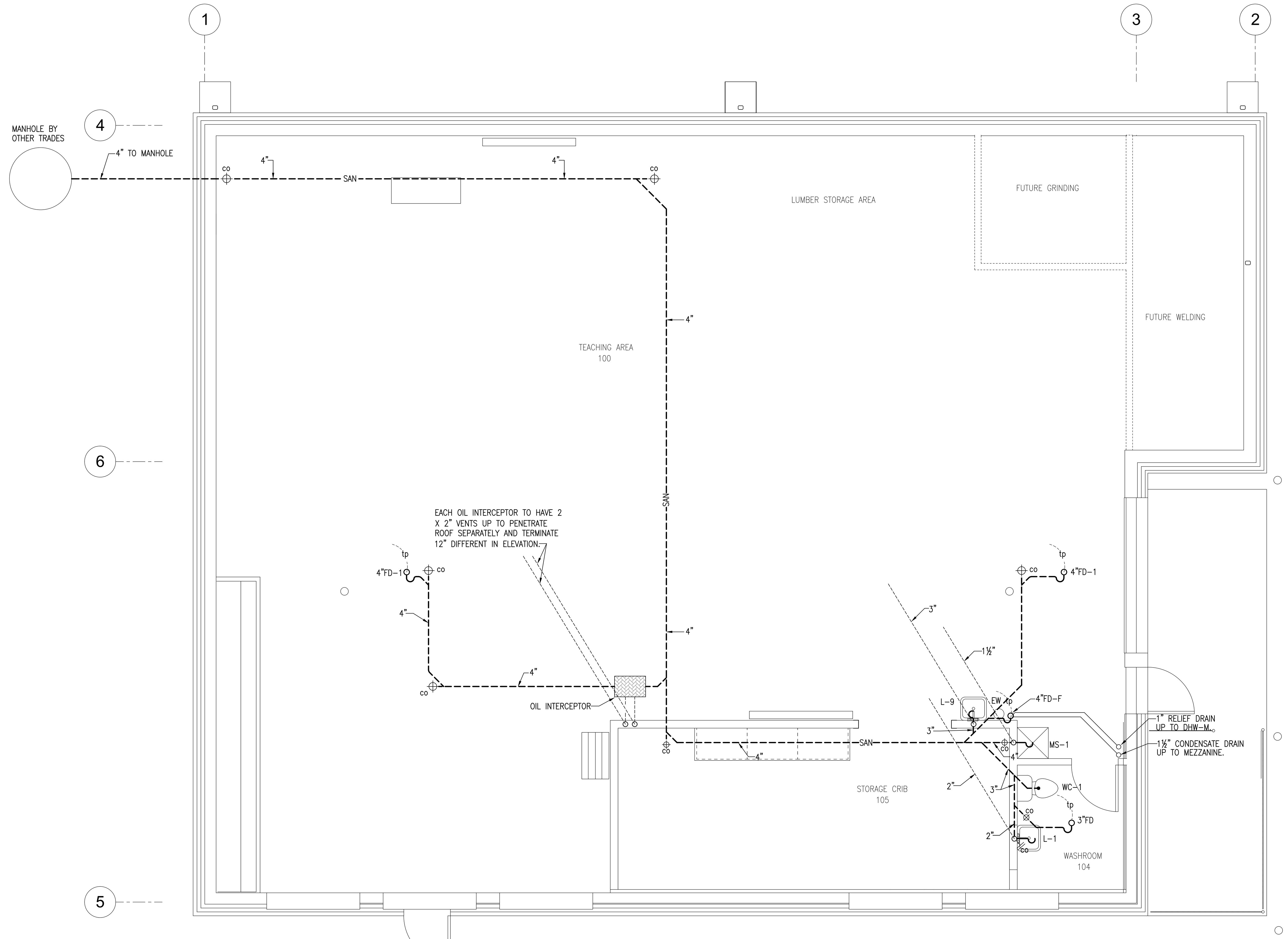
Project Number

SHEET TITLE

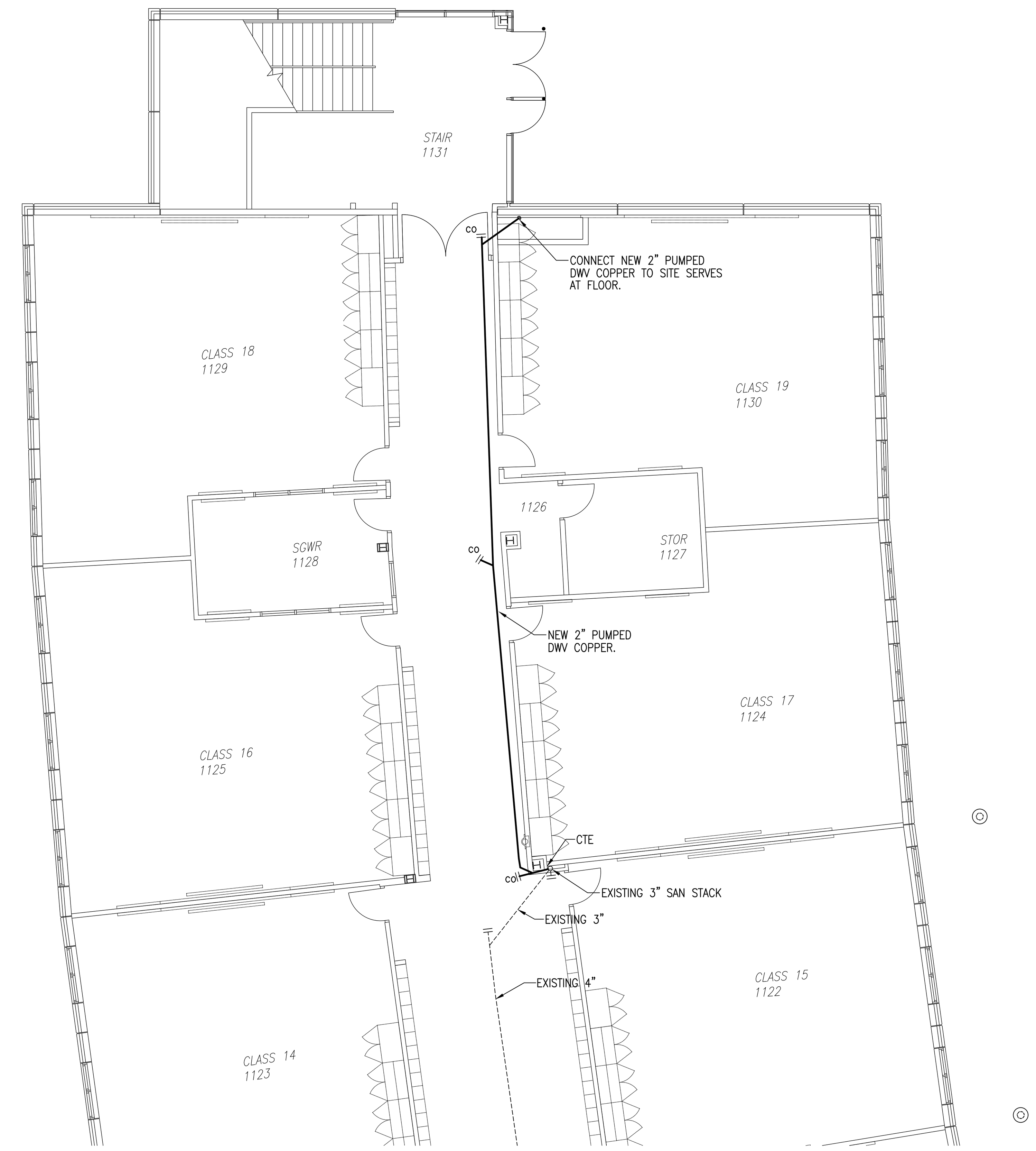
MECHANICAL LEGEND

M-100

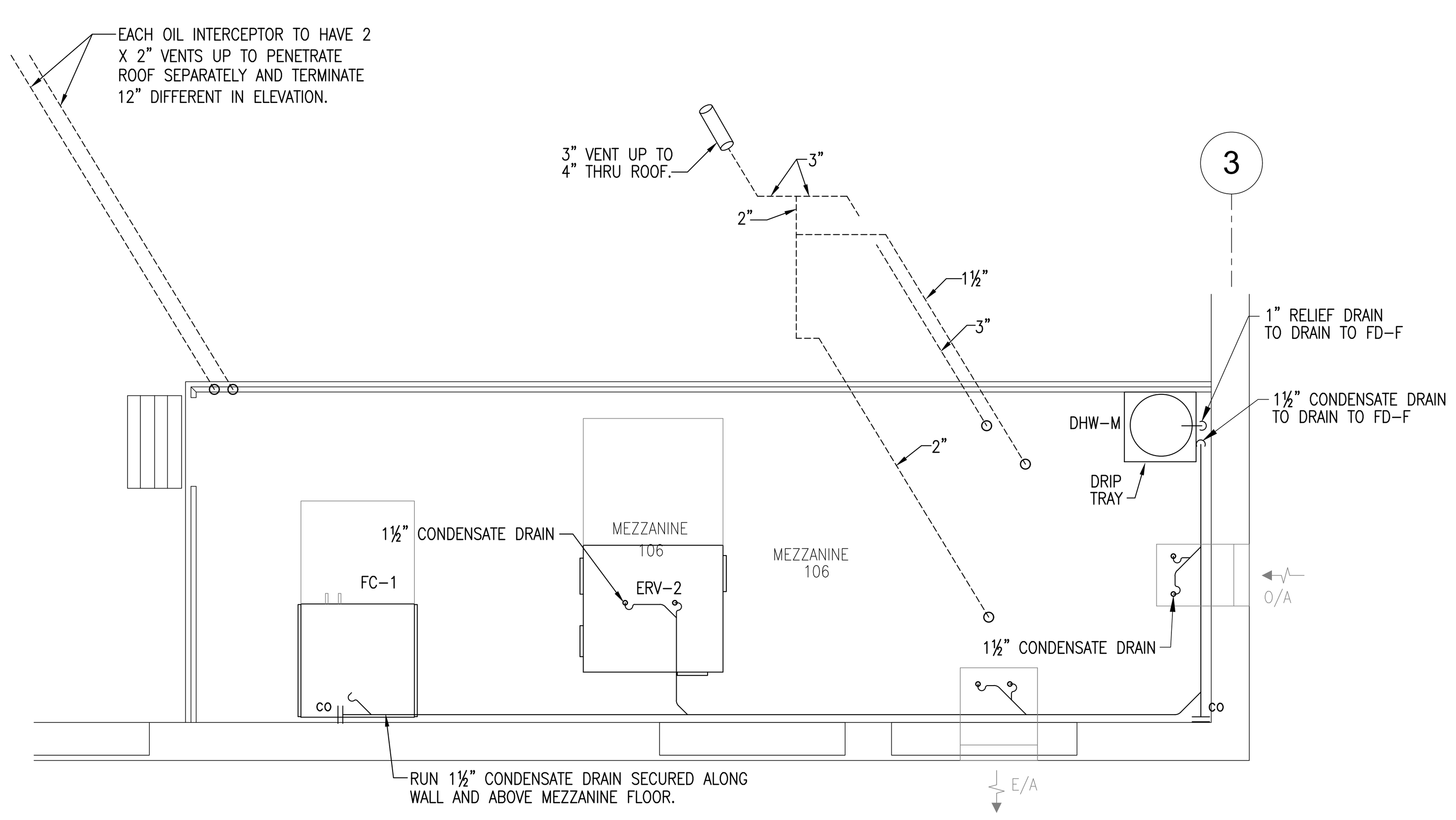
DUMAC #17-094



1 PS101 MAIN FLOOR PLAN-SANITARY & VENT
1/4"=1'-0"



3 PS101 PARTIAL EXISTING BLDG GROUND FLOOR
1/8"=1'-0"



2 PS101 MEZZANINE PLAN-SANITARY & VENT
1/4"=1'-0"

NOTES

1. REFER TO DWG. M-100 FOR MECHANICAL LEGEND.
2. ROUTE ALL PIPING AROUND COMM, ELECT ROOM.
3. ALL VENT PIPING TO BE 2" UNLESS OTHERWISE STATED.
4. ALL SANITARY PIPING RUN UNDER SLAB TO BE MINIMUM 2".
5. TRAP PRIMER LINES TO BE PROVIDED FROM INDICATED TRAPS TO TRAP PRIMERS LOCATED ON DRAWINGS. EXACT ROUTING AND NUMBER OF CONNECTIONS OF TRAP PRIMER LINES TO TRAP PRIMERS TO BE DETERMINED ON SITE.
6. ALL SANITARY PIPING THAT HAS A SIZE OF 3" OR LESS TO BE SLOPED AT MINIMUM 1:50. PIPES 4" OR GREATER TO BE SLOPED AT MINIMUM 1:100

DUMAC #17-094

SP DUMARESQ ARCHITECT LTD

DUMAC ENERGY LTD.
CONSULTING ENGINEERS
752 BEDFORD HIGHWAY
HALIFAX, N.S.

KEY PLAN

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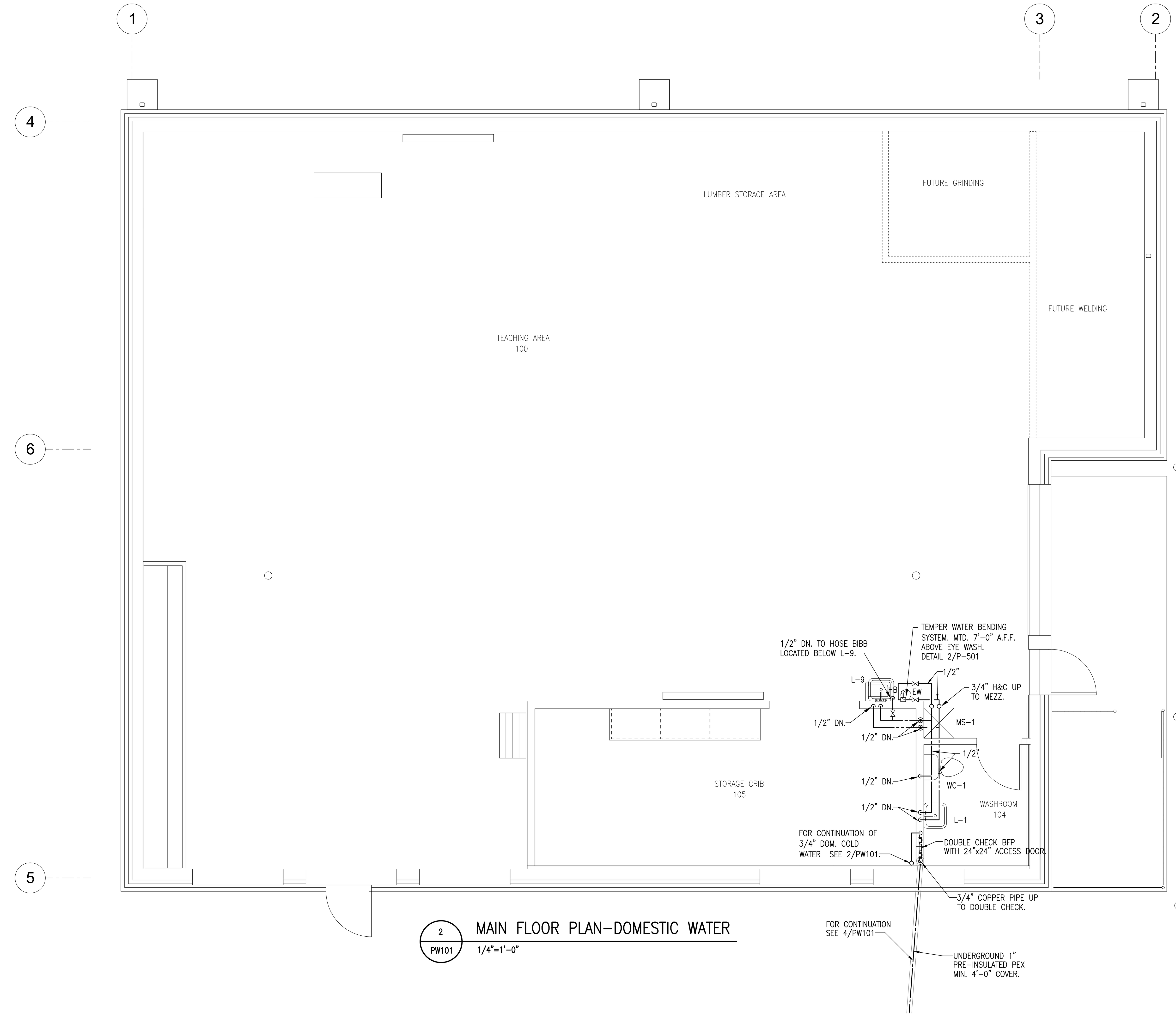
Project Number

SHEET TITLE

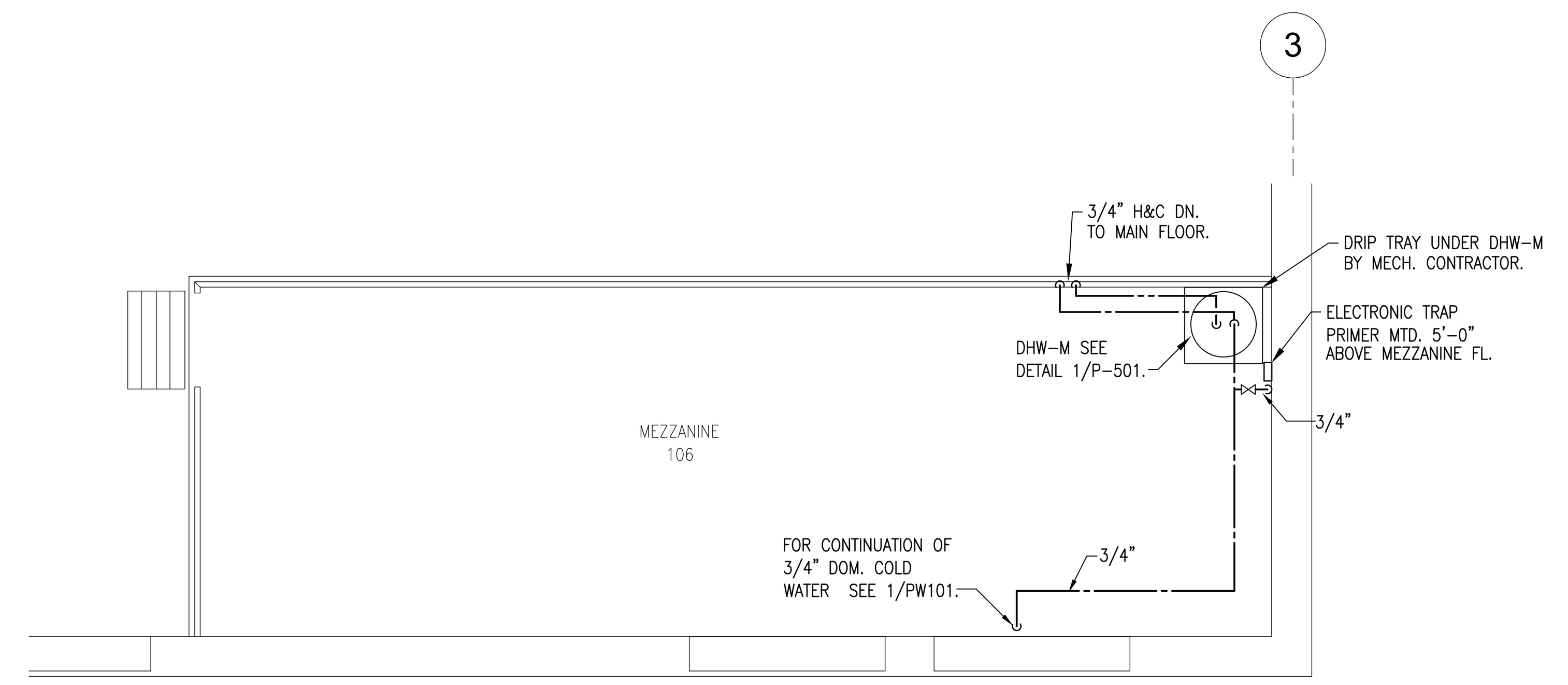
MECHANICAL FLOOR PLAN-SANITARY AND VENT

PS101

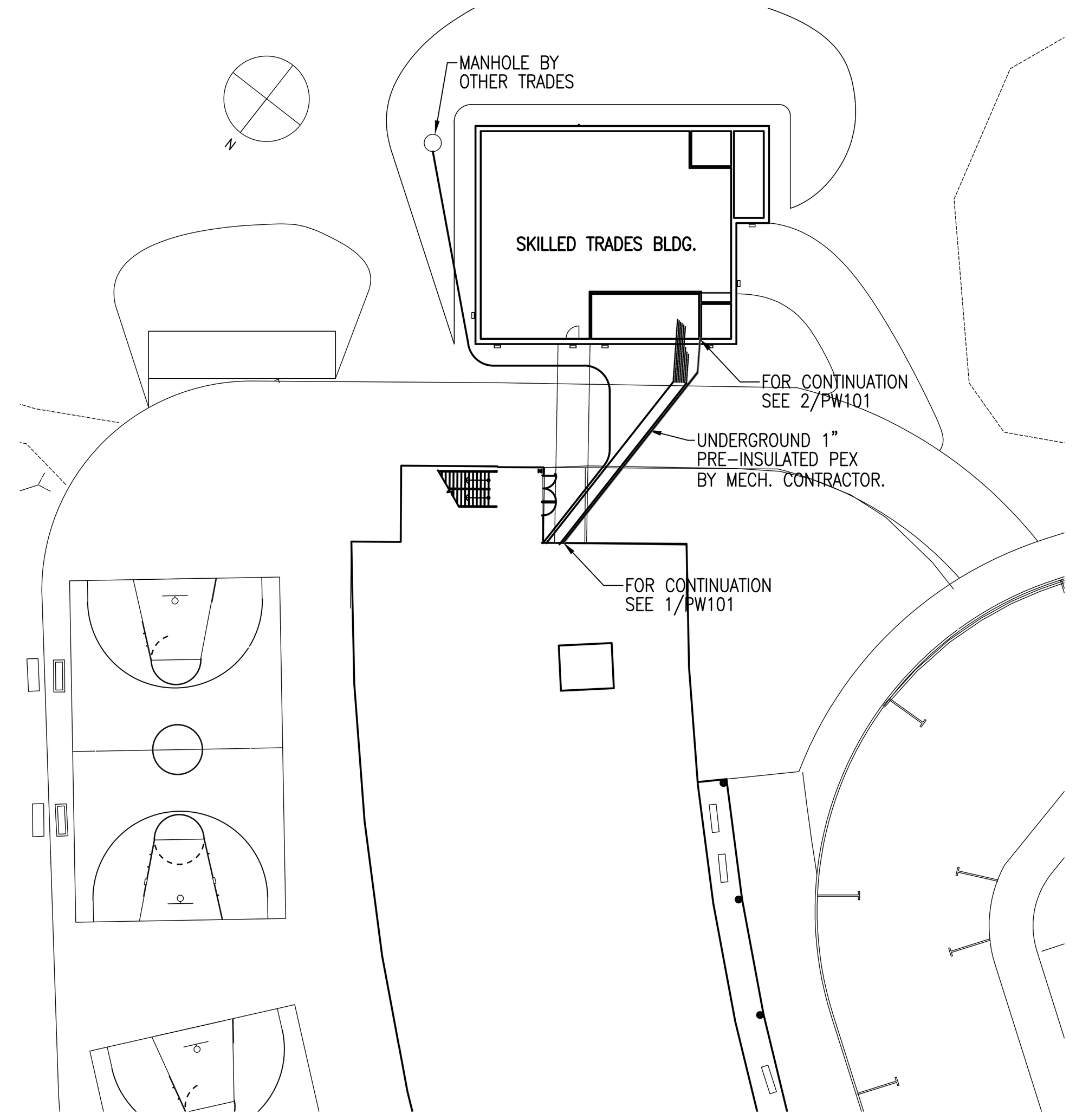
1 PW101 PARTIAL EXISTING BLDG GROUND FLOOR
1/8"=1'-0"



2 PW101 MAIN FLOOR PLAN-DOMESTIC WATER
1/4"=1'-0"



3 PW101 MEZZANINE FLOOR PLAN-DOMESTIC WATER
1/4"=1'-0"



4 PW101 PARTIAL SITE PLAN
1/32"=1'-0"

NOTES

1. REFER TO DWG. M-100 FOR MECHANICAL LEGEND.
2. ROUTE ALL PIPING AROUND COMM, ELECT ROOM.
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PROJECT TITLE

SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

Project Number

SHEET TITLE

MECHANICAL FLOOR PLAN-DOMESTIC WATER

PW101

DHW TANK SCHEDULE

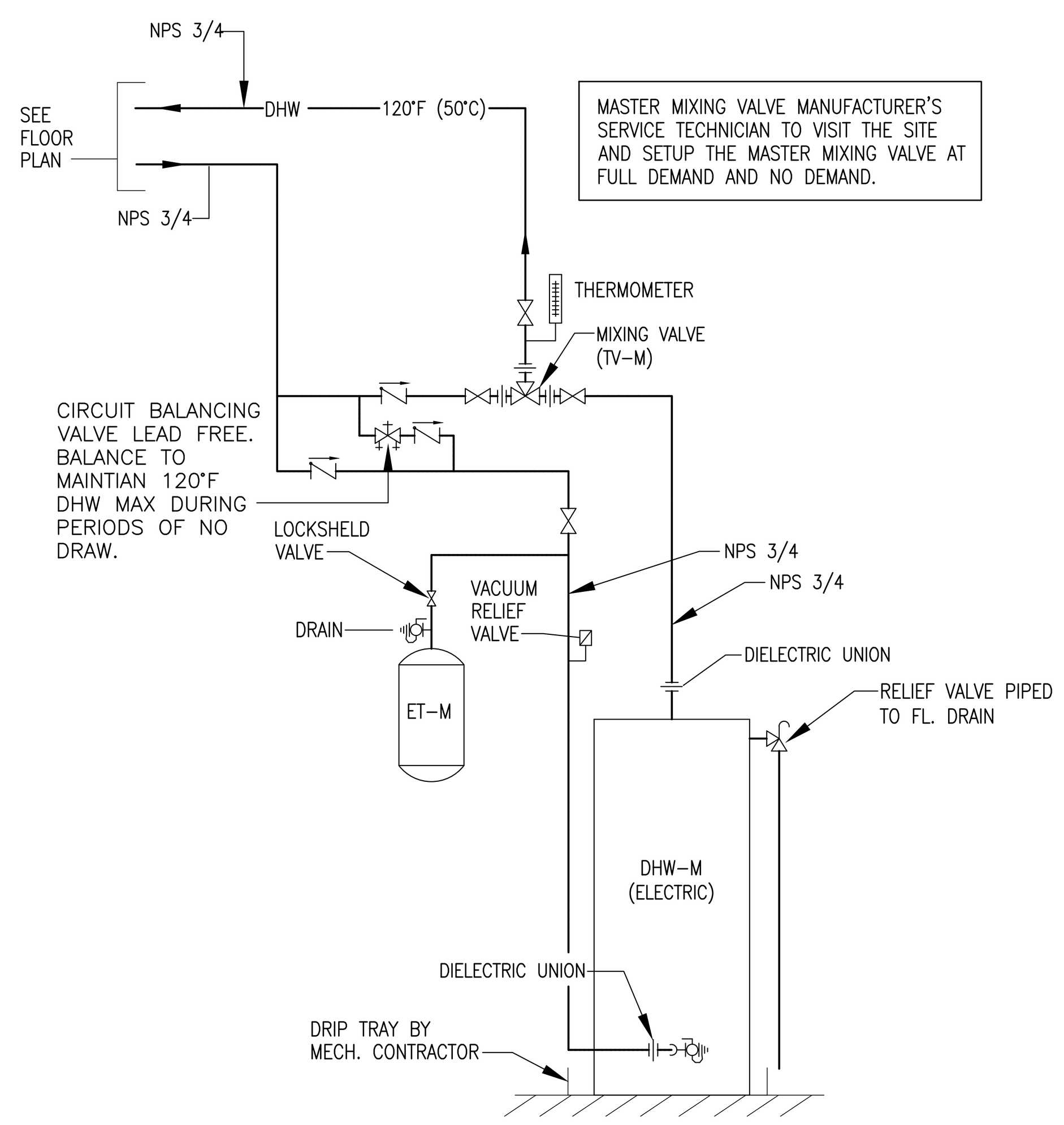
SYMBOL	SERVICE	LOCATION	STANDARD OF ACCEPTANCE		STORAGE	ELECTRIC		CAPACITY	ACCESSORIES &/OR REMARKS
			MANUFACTURER	MODEL		KW	VOLTS		
DHW-M	DOM HOT WATER	MEZZANINE	RHEEM	PRO425TM	45 USGAL (170 LITERS)	2.25	208/1	40° TO 140°F (4° TO 60°C)	T&P RELIEF VALVE

EXPANSION TANK SCHEDULE

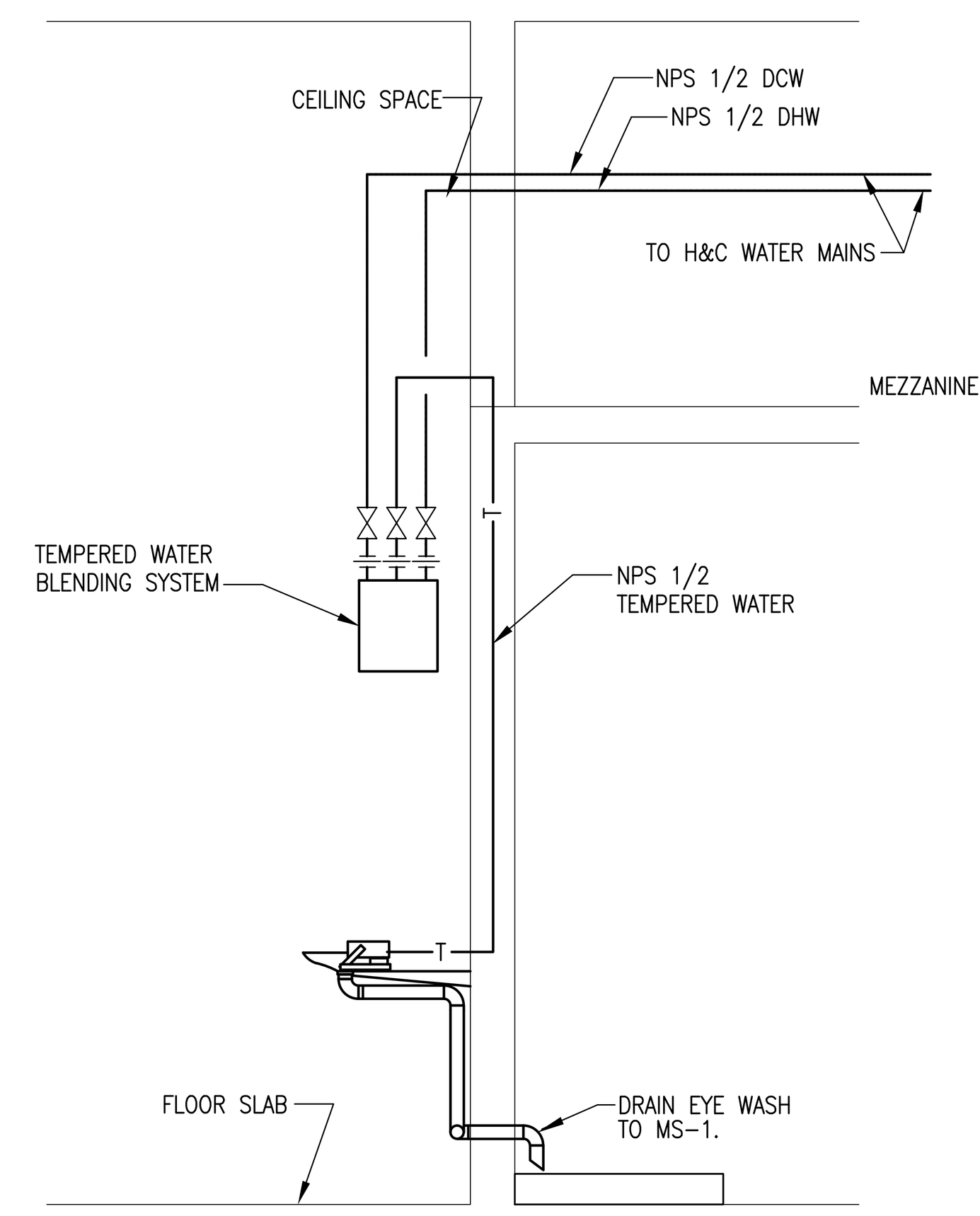
SYMBOL	SERVICE	LOCATION	STANDARD OF ACCEPTANCE		MINIMUM ACCEPTANCE VOLUME	TOTAL VOLUME	ACCESSORIES AND/OR REMARKS
			MANUFACTURER	MODEL			
ET-M	DOM. HOT WATER	MEZZANINE	WATTS	PLT-12	1.0 GAL (3.8 LITERS)	4.5 GAL (17.0 LITERS)	SUITABLE FOR POTABLE WATER

MIXING VALVE SCHEDULE

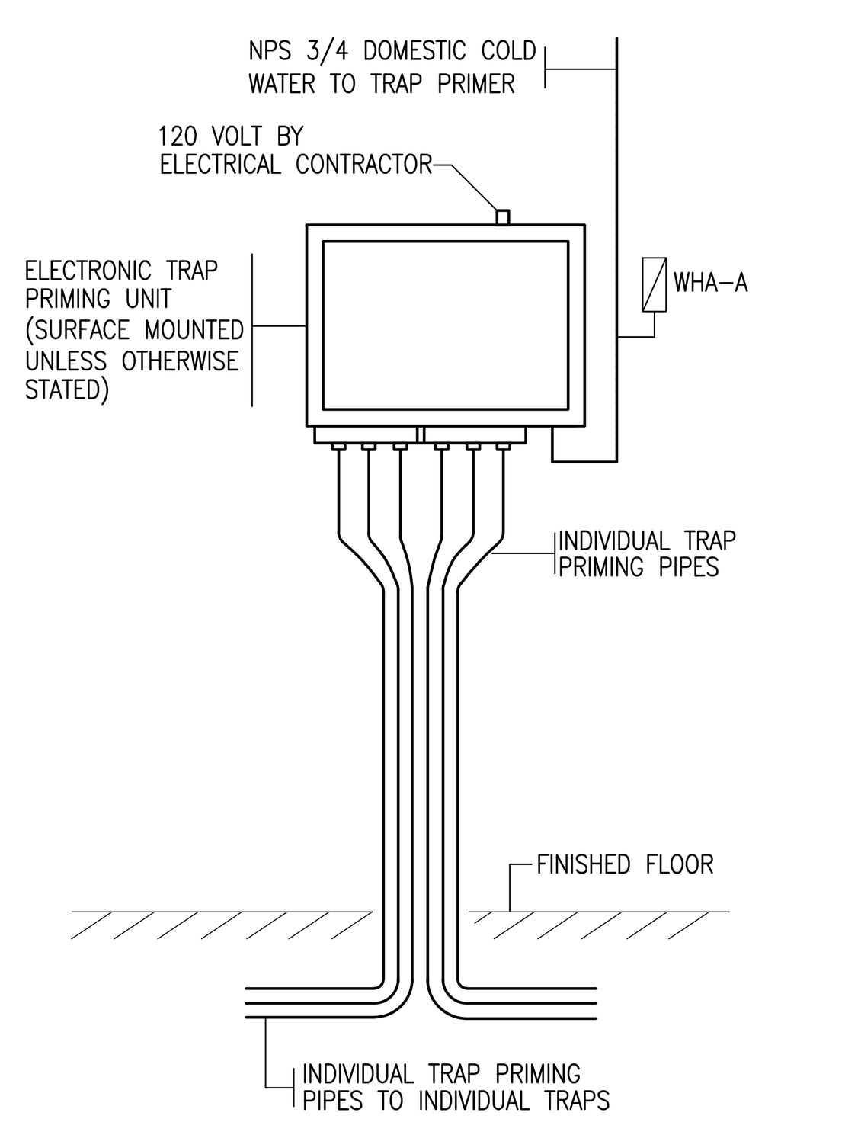
SYMBOL	SERVICE	LOCATION	STANDARD OF ACCEPTANCE		FLOW RATE	PRESSURE DROP	MIN. FLOW TO ASSE 1017	ACCESSORIES AND/OR REMARKS
			MANUFACTURER	MODEL				
TV-M	DOM HOT WATER	MEZZANINE	POWERS	LFLM49010	5.7gpm	10psi	0.5	LEAD FREE BRONZE



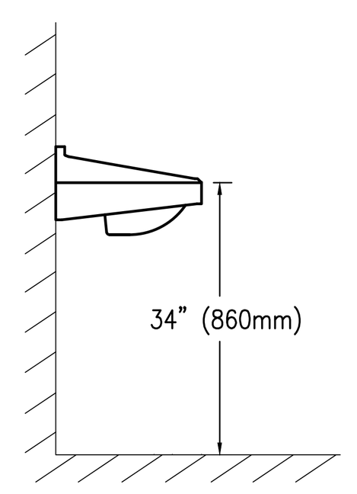
1 P-501 ELECTRIC DOM. HW. TANK SCHEMATIC
NTS



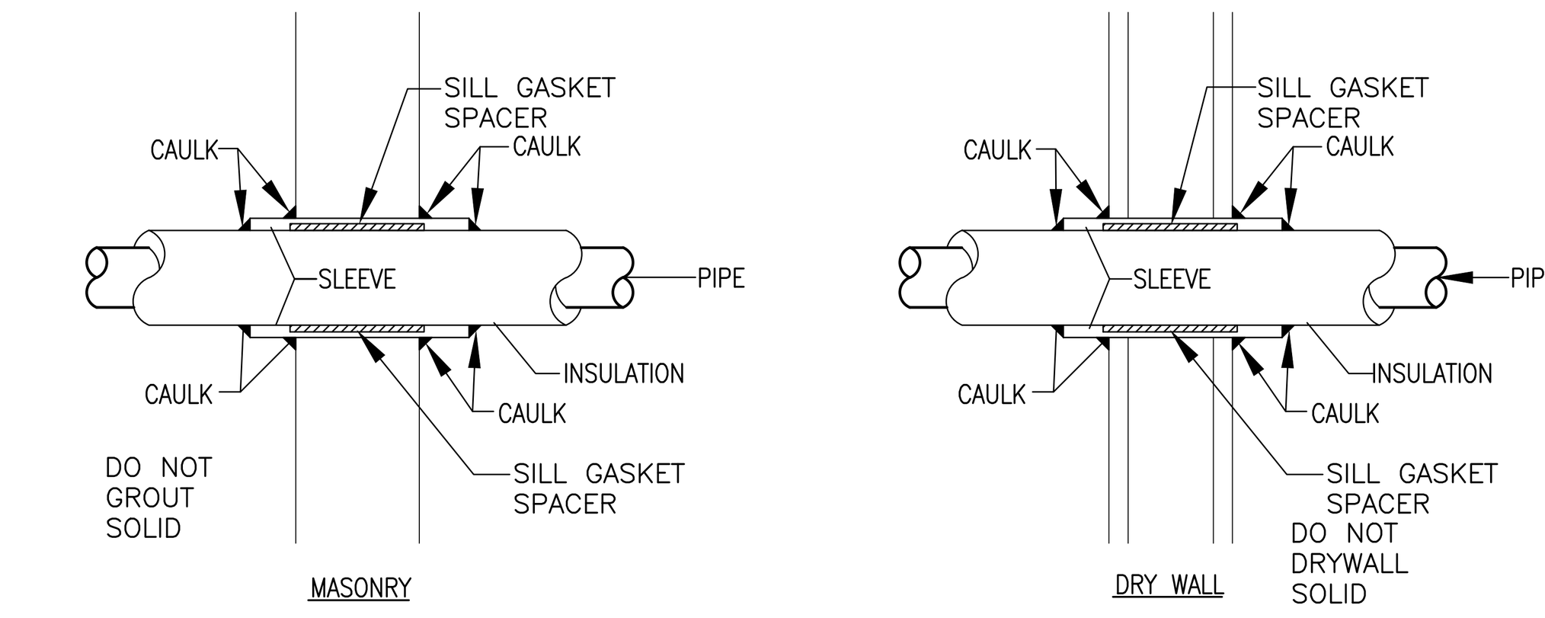
2 P-501 EW – EYE WASH DETAIL (WATER DOWNFED)
NTS



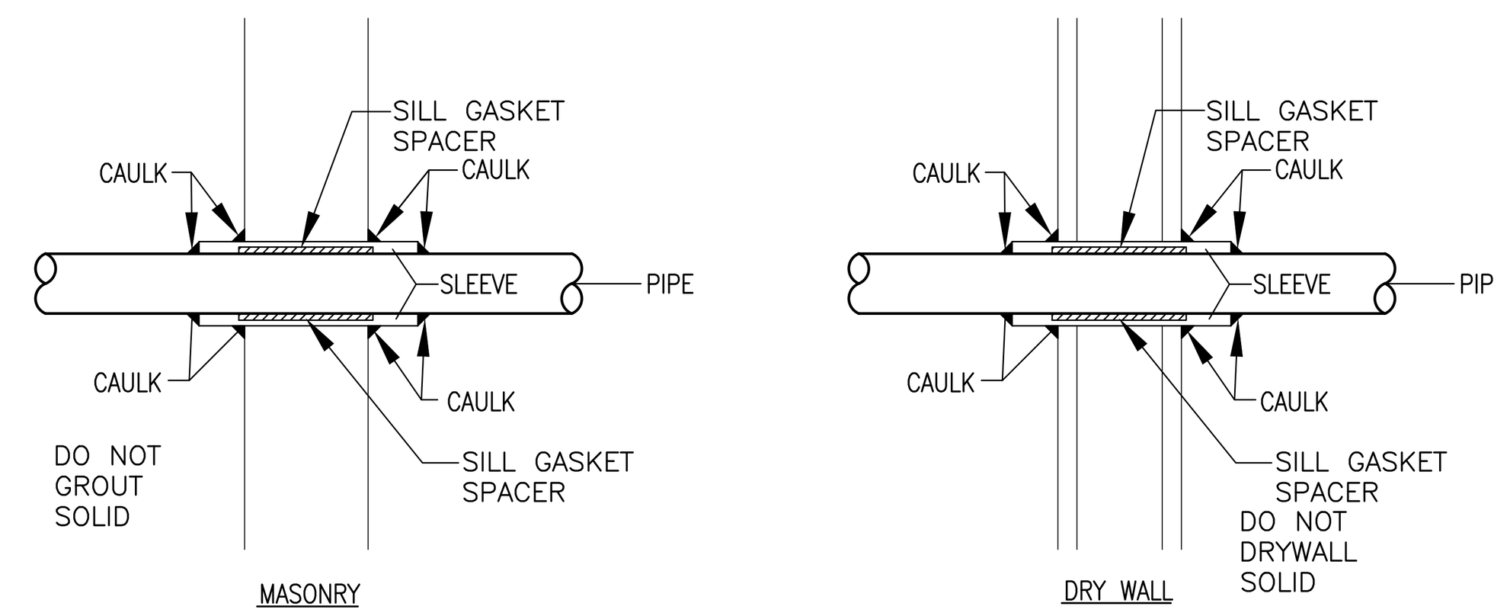
3 P-501 TRAP PRIMING UNITS
NTS



4 P-501 L-1 LAVATORY
NTS



5 P-501 INSULATED PIPE THRU UNRATED PARTITION
NTS



6 P-501 UNINSULATED PIPE THRU UNRATED PARTITION
NTS

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DUMAC

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CONSULTING ENGINEERS
752 BEDFORD HIGHWAY
HALIFAX, N.S.

KEY PLAN

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PROJECT TITLE

SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

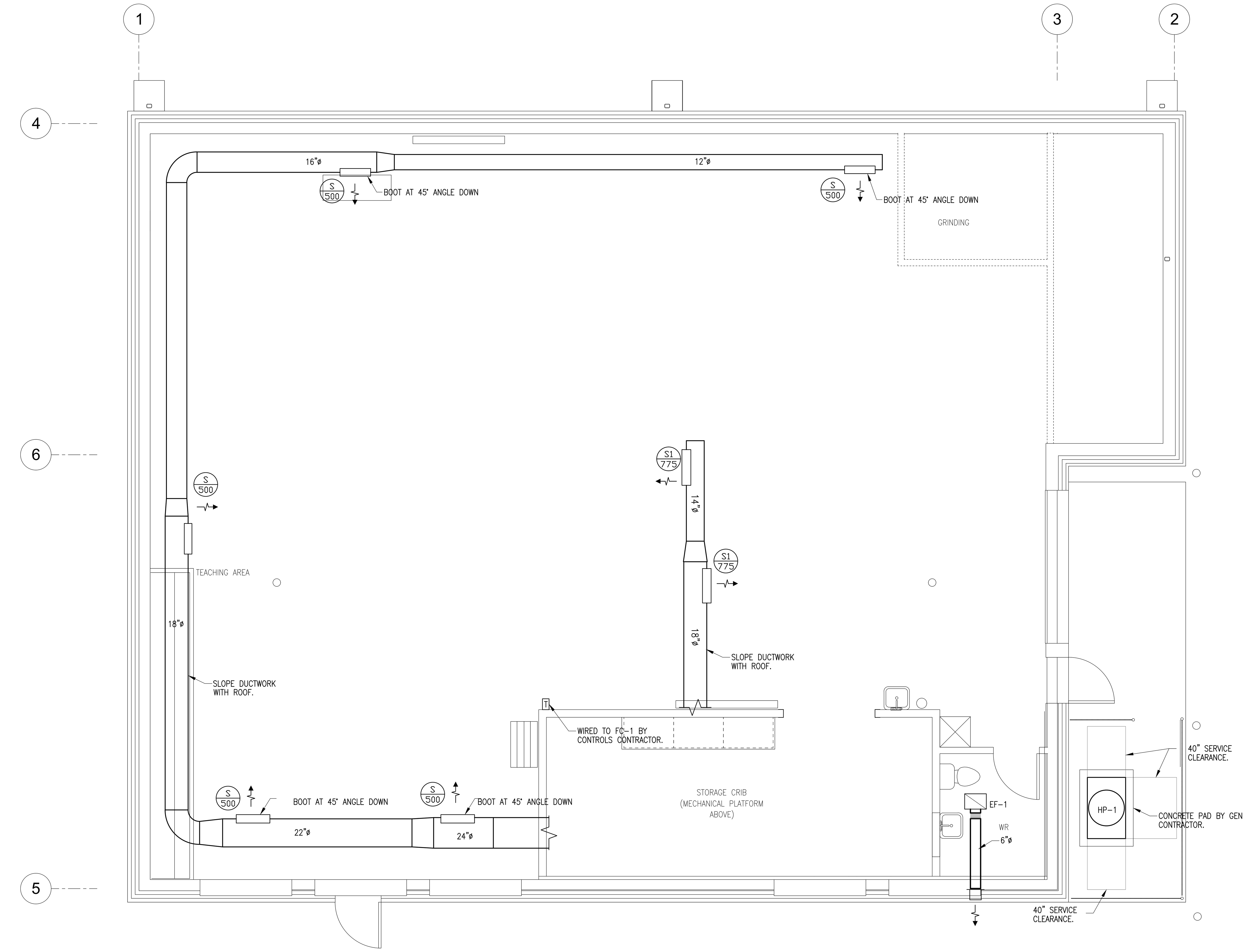
Project Number

SHEET TITLE

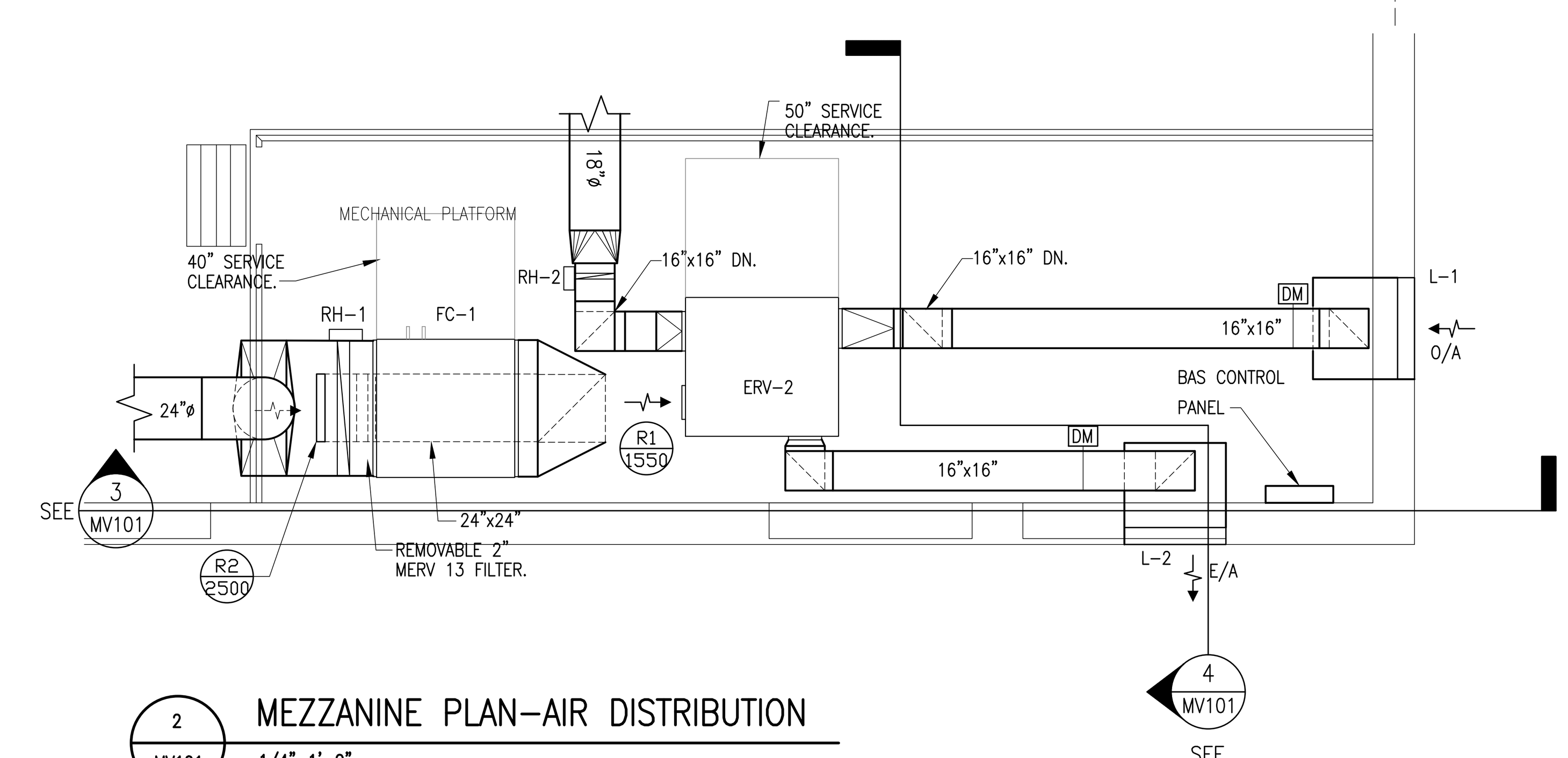
SCHEDULES AND DETAILS- PLUMBING

P-501

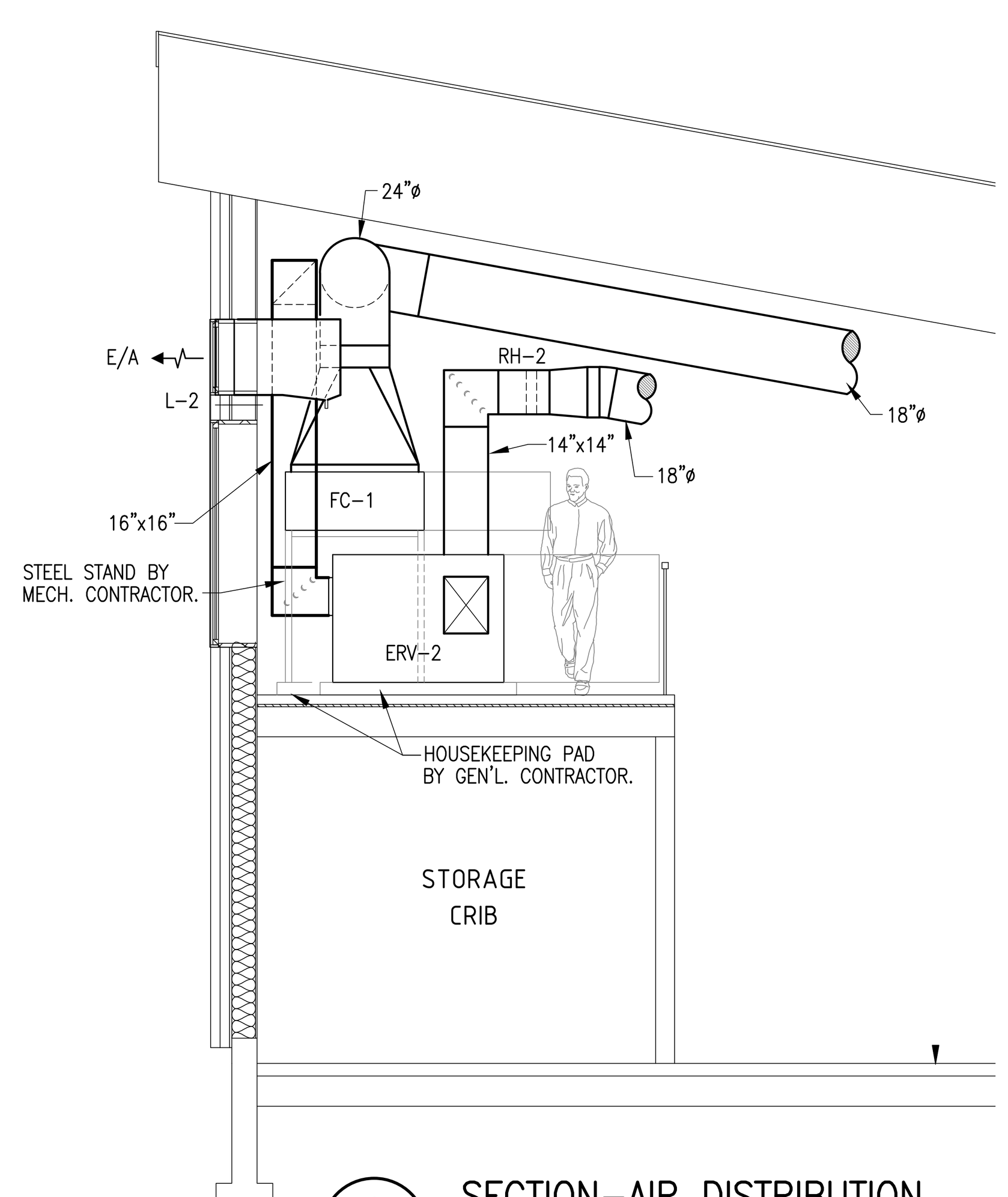
DUMAC #17-094



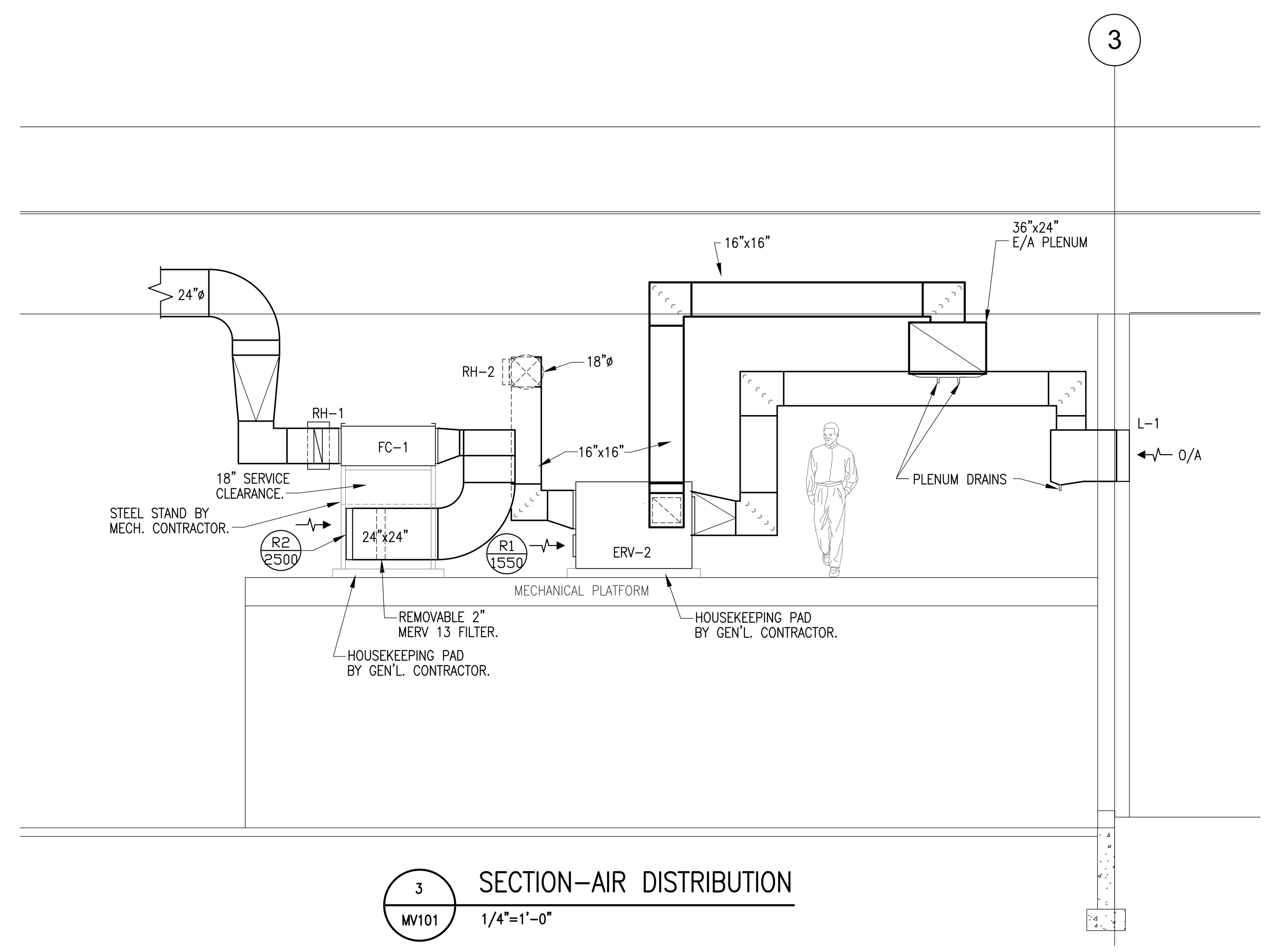
1 MV101 MAIN FLOOR PLAN-AIR DISTRIBUTION
1/4"=1'-0"



2 MV101 MEZZANINE PLAN-AIR DISTRIBUTION
1/4"=1'-0"



4 MV101 SECTION-AIR DISTRIBUTION
1/4"=1'-0"



3 MV101 SECTION-AIR DISTRIBUTION
1/4"=1'-0"

NOTES

1. REFER TO DWG. M-100 FOR MECHANICAL LEGEND.
2. REFER TO ARCHITECTURAL DRAWINGS FOR FIRE SEPARATIONS.
3. REFER TO ARCHITECTURAL REFLECTED CEILING PLAN FOR DRY WALL CEILINGS. WHERE POSSIBLE, LOCATE ITEMS REQUIRING SERVICE ACCESS ABOVE AN ACCESSIBLE CEILING.

DUMAC #17-094

SP DUMARESQ ARCHITECT LTD

DUMAC ENERGY LTD.
CONSULTING ENGINEERS
752 BEDFORD HIGHWAY
HALIFAX, N.S.

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PROJECT TITLE

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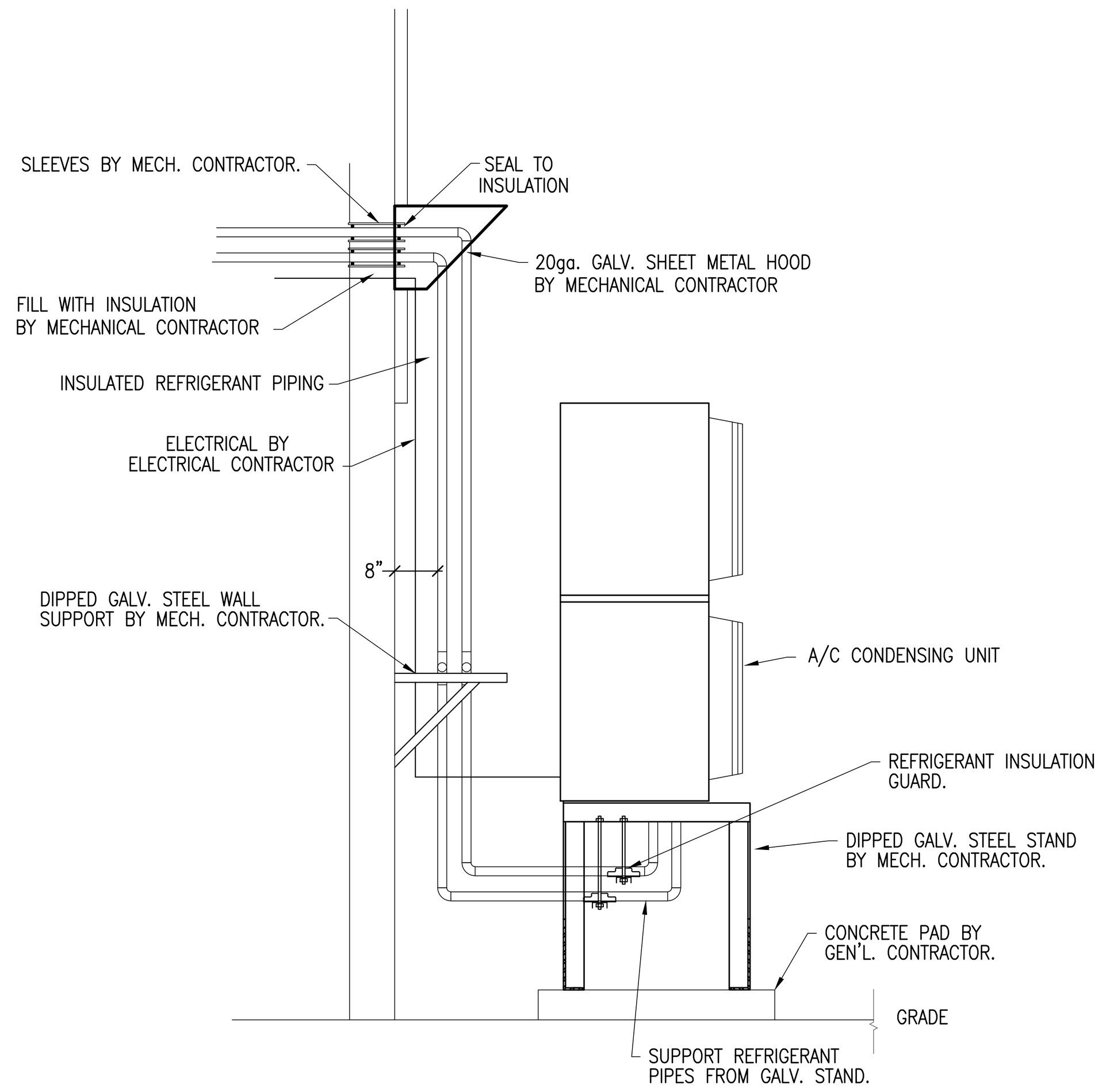
Project Number

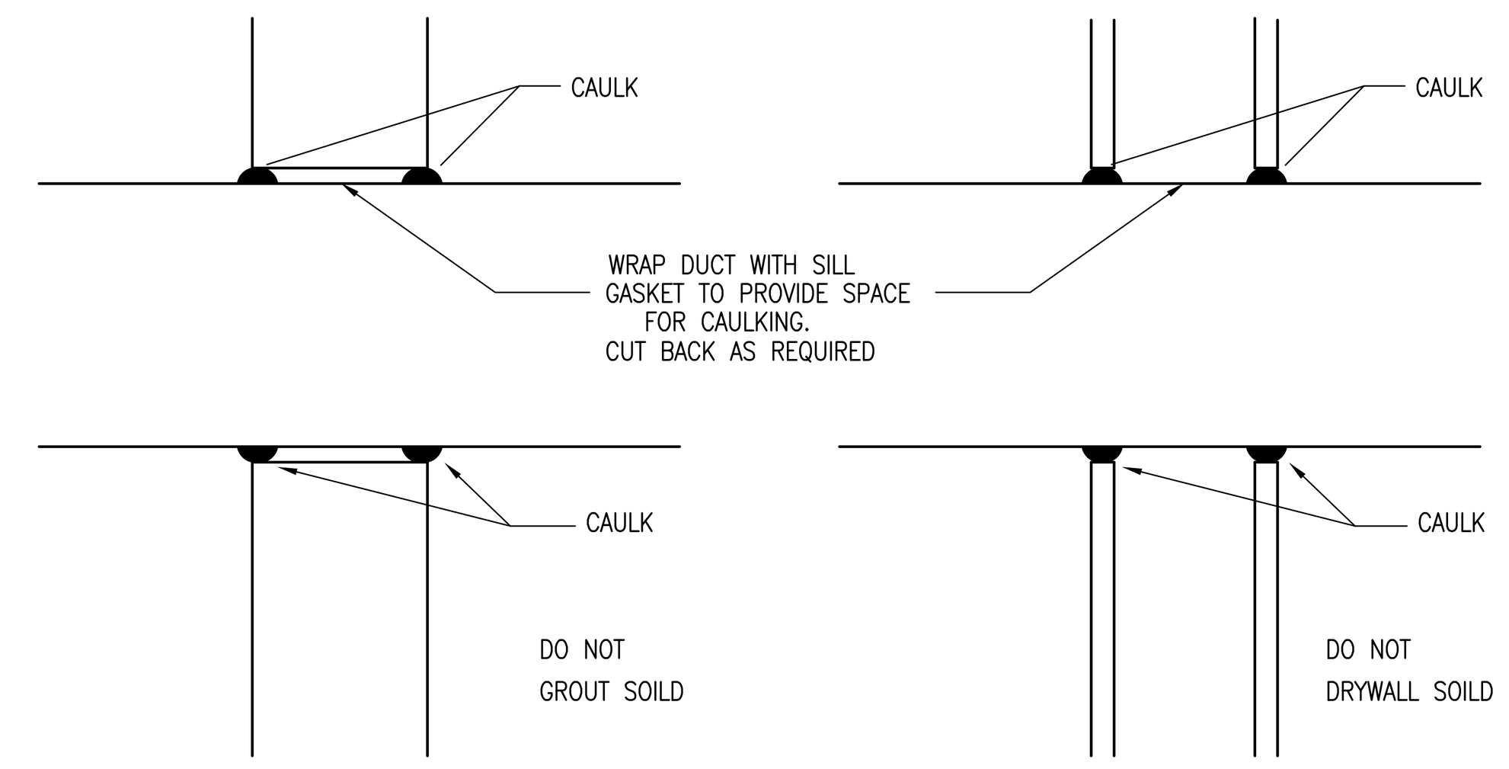
SHEET TITLE

MECHANICAL FLOOR PLAN-AIR DISTRIBUTION

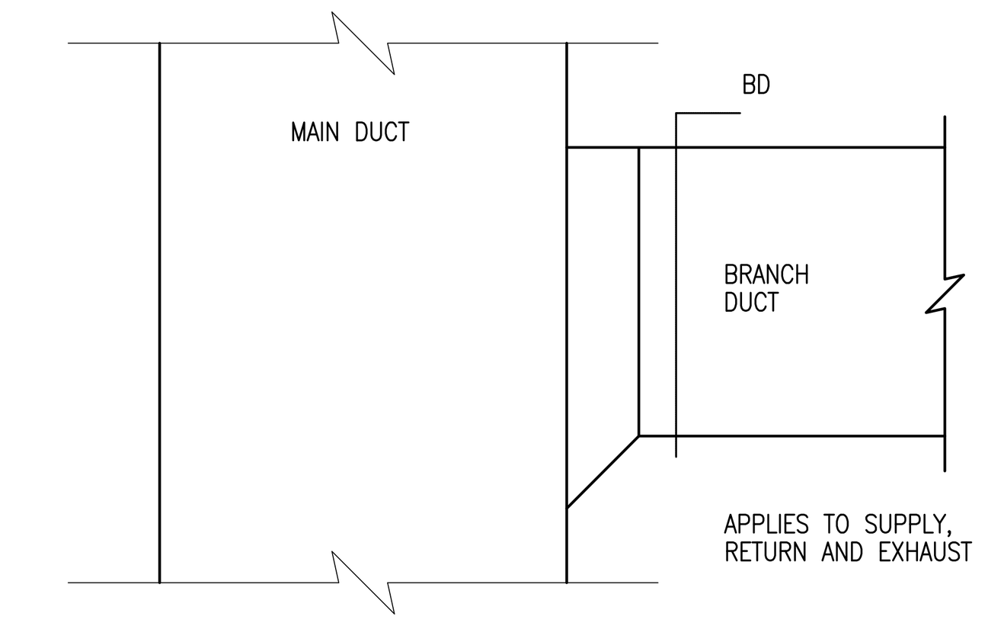
MV101



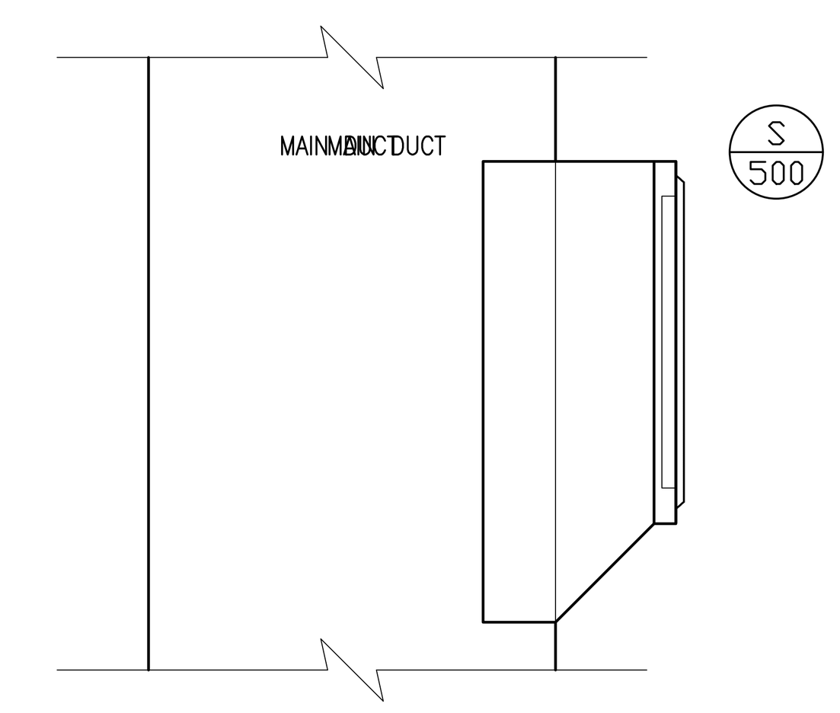
1 MV501 A/C CONDENSING UNIT DETAIL
NTS



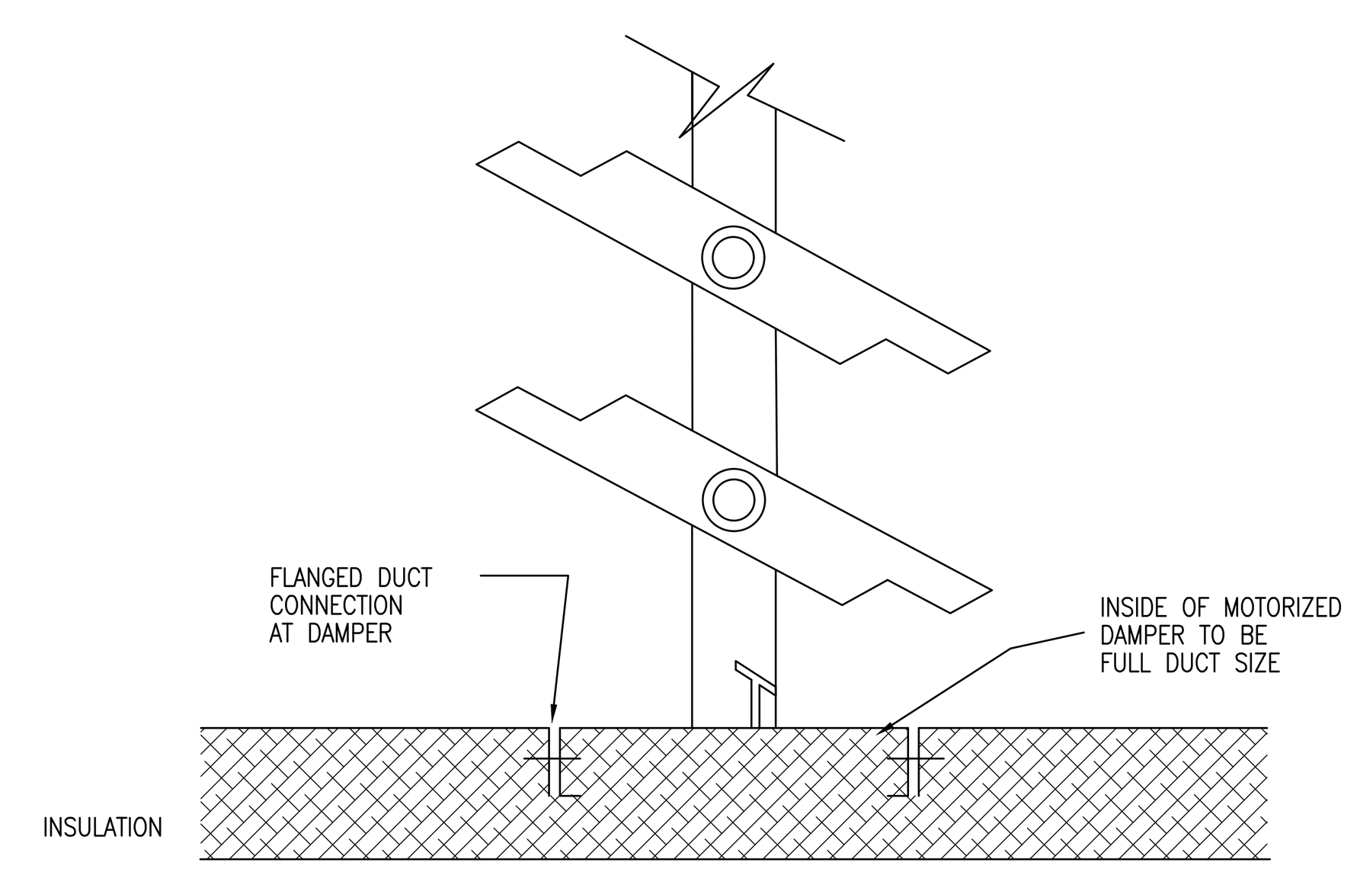
3 MV501 DUCT IN UNRATED WALL
N.T.S.



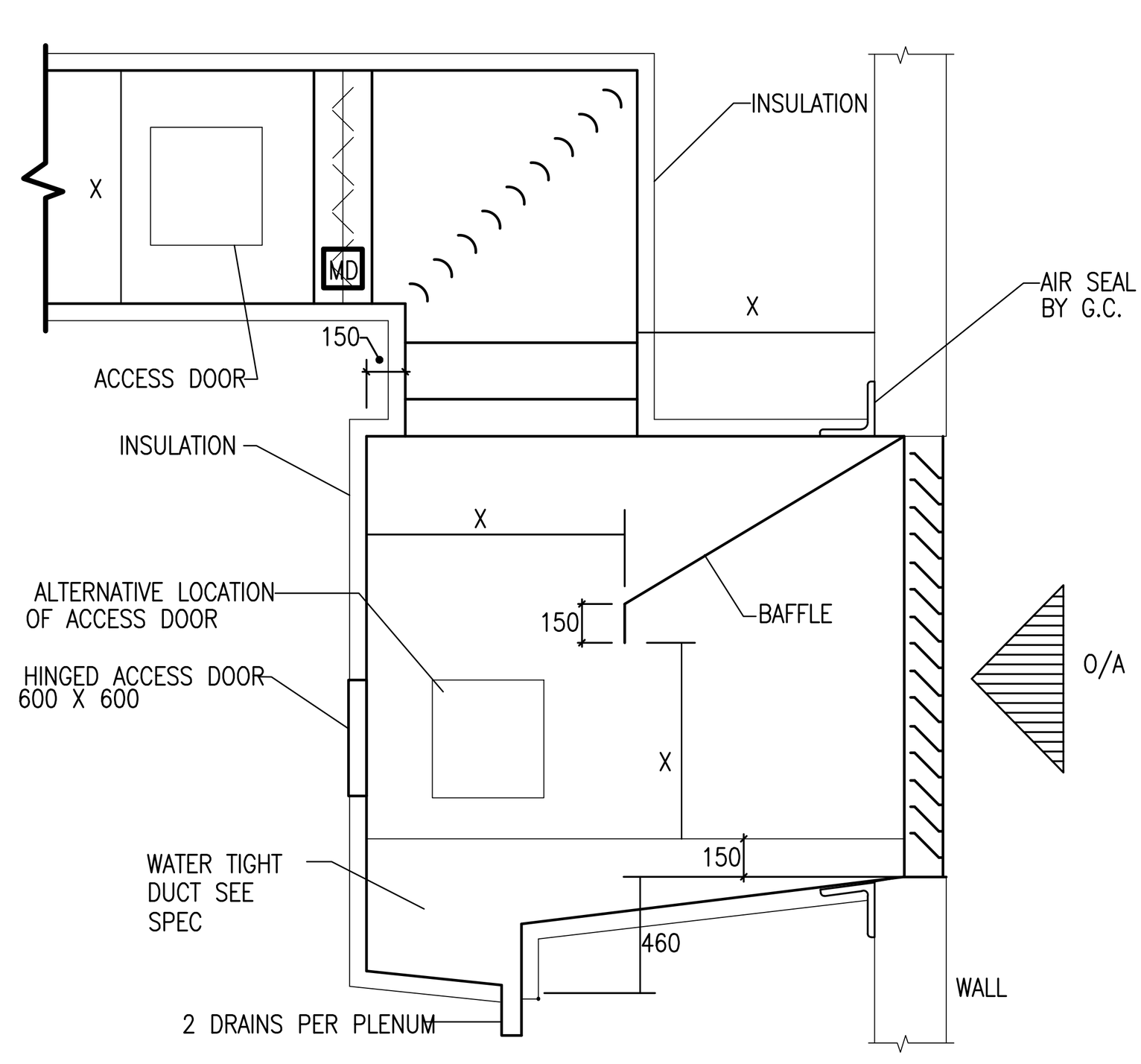
5 MV501 RETANGULAR BRANCH CONNECTION DETAIL
NTS



6 MV501 GRILLE BRANCH CONNECTION
NTS



4 MV501 MOTORIZED DAMPER SUPPLIED BY MECHANICAL CONTRACTOR
NTS DAMPER ACTUATORS BY CONTROLS CONTRACTOR



2 MV501 TYPICAL INTAKE LOUVER PLENUM DETAIL
NTS

DUMAC #17-094

SP DUMARESQ ARCHITECT LTD

DUMAC

DUMAC ENERGY LTD.
CONSULTING ENGINEERS
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M.G. DOYLE 3092 PROVINCE OF NOVA SCOTIA

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REVIEWED BY:	MGD
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SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

Project Number

SHEET TITLE

AIR DISTRIBUTION DETAILS

MV501

HEAT PUMP OUTDOOR VRF SCHEDULE

SYMBOL	SERVICE	STANDARD OF ACCEPTANCE		RATED COOLING CAPACITY (BTU/HR.) 80.6DB/70.0WB	HEATING CAPACITY (BTU/HR.) 1°F OAT	ELECTRICAL REQUIREMENTS			ACCESSORIES AND/OR REMARKS
		MANUFACTURER	MODEL			MCA	MOCP	VOLTAGE	
HP-1	FC-1	MITSUBISHI CITY MULTI	PUMY-P96TKMUA	96,000	108,000	34	57	208/3	WIND BAFFLES, SNOW HOOD, GOLD-FIN CORROSION PROTECTION COATING ON CONDENSER COIL, BASE HEATER

HEAT PUMP INDOOR SCHEDULE

SYMBOL	SERVES	STANDARD OF ACCEPTANCE		COOLING CAPACITY BTU/H @ ARI	HEATING CAPACITY BTU/H @ 1°F	CFM @ ESP @ HI-SPEED	VOLTAGE	ROOM TEMPERATURE WALL MOUNTED CONTROLLER	ACCESSORIES AND/OR REMARKS
		MANUFACTURER	MODEL						
FC-1	101	MITSUBISHI CITY MULTI	PEFY-P96NMHSU-E	7296,000	108,000	2500 @ 1"	208/1	PAC-YT53CRAU	EVAPORATOR UNIT, R410A EREFRIGERANT CONDENSATE PUMP LOCATED IN THE UNIT

FAN AND DAMPER SCHEDULE

CONTROL DAMPER MOTORS BY CONTROLS CONTRACTOR. CONTROL DAMPERS (FOR ROOF EF, SIZE DAMPERS TO MATCH FAN REC. ROOF OPENING) BY MECHANICAL CONTRACTOR (M.C.).

SYMBOL	SERVES	LOCATION	STANDARD OF ACCEPTANCE		AIRFLOW		DRIVE	RPM	BHP	MOTOR			CONTROL DAMPER	DAMPER MOTOR	DISC	SONES	ACCESSORIES AND/OR REMARKS	SYMBOL
			MANUFACTURER	MODEL#	CFM	SP(inwc)				WATTS	HP	VOLTAGE						
EF-1	WASHROOM 102		LOREN COOK	GC-222	75	0.25	DIRECT	1332		21		120/1/60	N	N	Y	1.2	VIBRATION ISOLATION, WALL CAP	EF-1

GRILLES AND DIFFUSERS SCHEDULE

SYMBOL	STANDARD OF ACCEPTANCE		AIRFLOW cfm	NECK SIZE	ACCESSORIES AND / OR REMARKS
	MANUFACTURER	MODEL			
S	PRICE	520	500	16"x8"	
S1	PRICE	520	750	22"x8"	
R1	PRICE	95	1550	24"x16"	
R2	PRICE	95	2500	24"x24"	
TG	PRICE	95	–	24"x24"	TWO WITH SHEET METAL COLLAR

ELECTRIC HEATING COIL SCHEDULE

SYMBOL	MANUFACTURER	CAPACITY	AIRFLOW CFM	STYLE	VOLTAGE	ACCESSORIES AND / OR REMARKS
RH-1	THERMOELEC	20 KW	2500	SCR	208/3	REFER TO MECHANICAL SPECIFICATION
RH-2	THERMOELEC	32 KW	1550	SCR	208/3	REFER TO MECHANICAL SPECIFICATION

LOUVER SCHEDULE

SYMBOL	STANDARD OF ACCEPTANCE		NECK SIZE	ACCESSORIES AND / OR REMARKS
	MANUFACTURER	MODEL		
L-1	RUSKIN	ELF6375D	36"x24"	
L-2	RUSKIN	ELF6375D	36"x24"	

HEAT RECOVERY UNIT SCHEDULE

CONTROL DAMPER MOTORS BY CONTROLS CONTRACTOR. CONTROL DAMPERS BY MECHANICAL CONTRACTOR (M.C.).

SYMBOL	LOCATION	STANDARD OF ACCEPTANCE		SUPPLY AIRFLOW CFM@ ESP "WG	RETURN AIRFLOW CFM@ ESP "WG	RPM	MOTOR HP	VOLTS	CONTROL DAMPER	DAMPER MOTOR	ACCESSORIES AND/OR REMARKS
		MANUFACTURER	MODEL								
ERV-2	MEZZ	LOREN COOK	ERV-2500	1550 @ 0.5	1550 @ 0.5	840 S / 932 E	2 @ 3/4	208/3	Y-(2)	Y-(2)	SINGLE POINT POWER CONNECTION, FAN STARTERS, VFD WHEEL CONTROL MERV 13 SUPPLY & EXHAUST FILTERS, DIRTY FILTER STATUS ALARM. DOUBLE WALL CONSTRUCTION, SEPARATE REMOTE CONTROL FOR SUPPLY FAN AND FOR EXHAUST FAN.

HEATING SCHEDULE

SYMBOL	STANDARD OF ACCEPTANCE			CAPACITY	FLOWRATE	EAT	EWT	LWT	AIRFLOW	MOTOR			ACCESSORIES &/OR REMARKS
	MANUFACTURER	MODEL	ARRANGEMENT	BTU/HR	GPM	°F	°F	°F	CFM	RPM	HP	VOLT	
CH-1	ENGA	CUH-3	11	23500	2.39	60	190	170	300	1050	1/25	120/1	SURFACE MOUNTED

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DATE	#	ISSUE
2017-12-18	1	ISSUED FOR TENDER

REGISTERED PROFESSIONAL ENGINEER
M.G. DOYLE
3092
PROVINCE OF NOVA SCOTIA

SCALE:	N.T.S.
DRAWN BY:	STAFF
REVIEWED BY:	MGD
DATE:	2017-12-18

PROJECT TITLE

SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

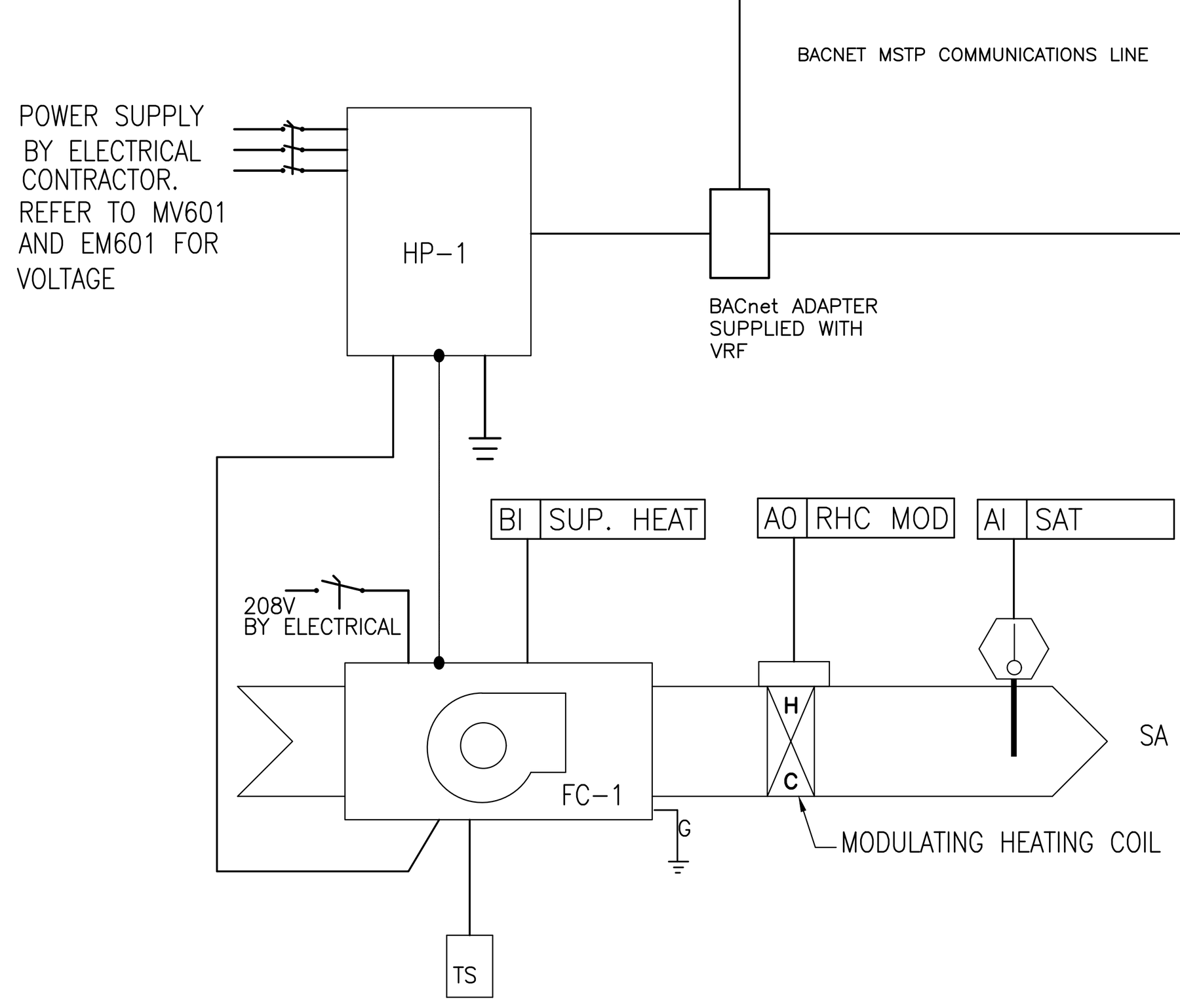
Project Number

SHEET TITLE

AIR DISTRIBUTION SCHEDULES

MV601

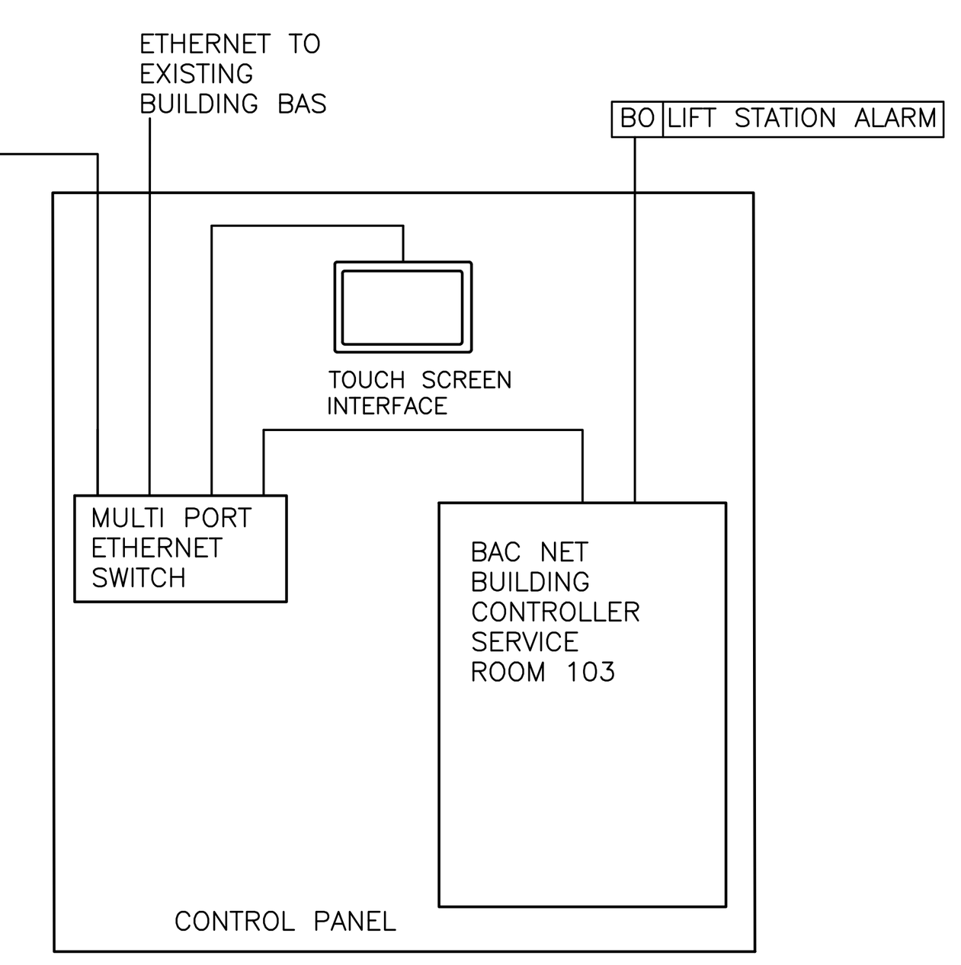
POINTS READ (MONITORING)		POINTS WRITTEN (OPERATION)	
POINT DESCRIPTION	TYPE	POINT DESCRIPTION	TYPE
FC-1 ON/OFF	BI (s)	FC-1 ON/OFF	BO (s)
MODE	BI (s)	MODE	BO (s)
FAN SPEED	BI (s)	FAN SPEED	BO (s)
SET TEMPERATURE	AI	SET TEMPERATURE	BO
FILTER	BI (s)	FILTER RESET	BI
PERMIT/PROHIBIT	BI (s)	PERMIR/PROHIBIT	BO (s)
ALARM	BI	FORCED OFF	BO (s)



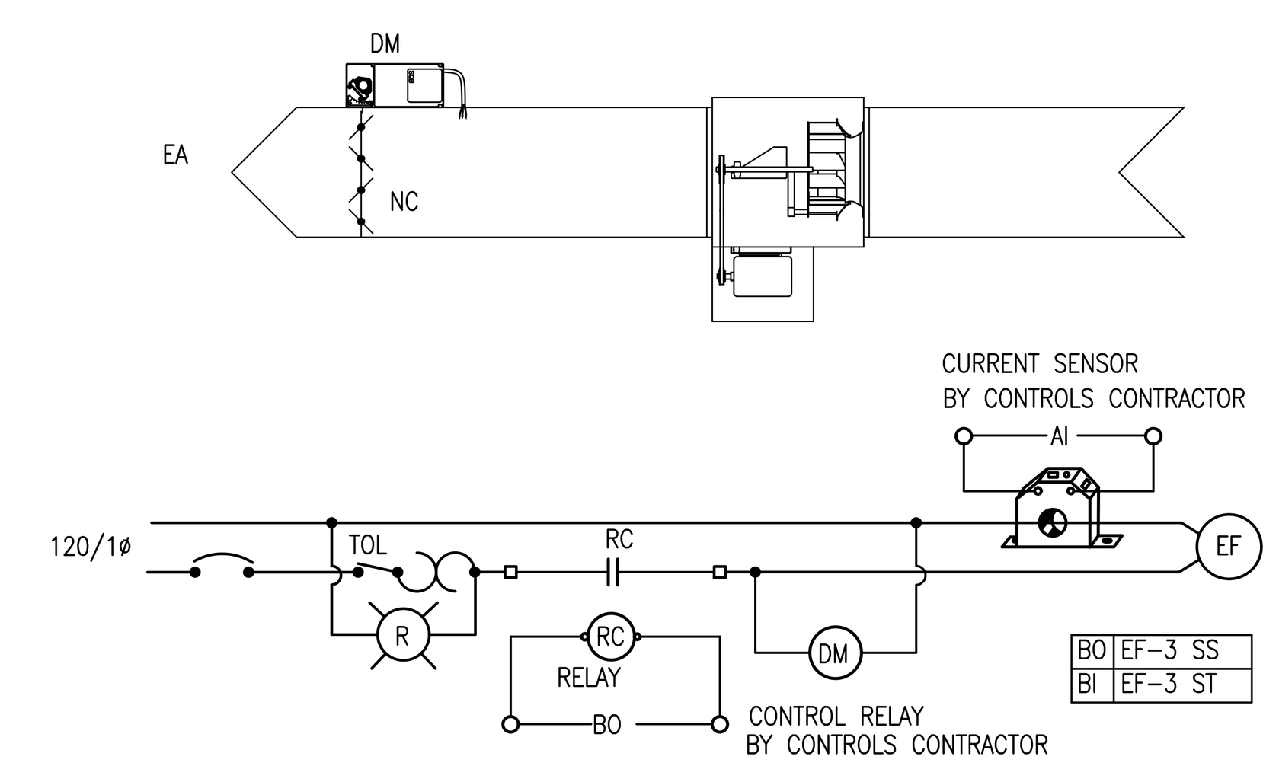
SEQUENCE OF OPERATION
WHEN HEAT PUMP TERMINAL CALLS FOR SUPPLEMENTAL HEAT, CONTACTS CLOSE AND ENERGIZE RHC AND MODULATES TO MAINTAIN 75°F. SETPOINT SHALL BE FIELD ADJUSTABLE.

1 MC601 HEAT PUMP CONTROL AND WIRING SCHEMATIC

WIRING DETAIL BASED ON STANDARD OF ACCEPTANCE "MITSUBISHI CITY MULTI" ALTERNATE MANUFACTURERS WILL DIFFER. IT IS THE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR TO COORDINATE ALL REQUIREMENTS OF AN ALTERNATE SELECTION.

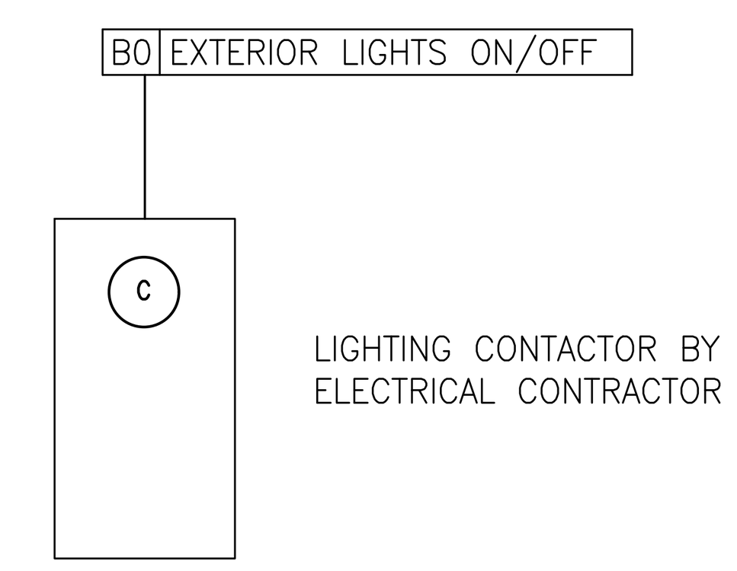


9 MC601 EXTENSION OF EXISTING BUILDING BAS

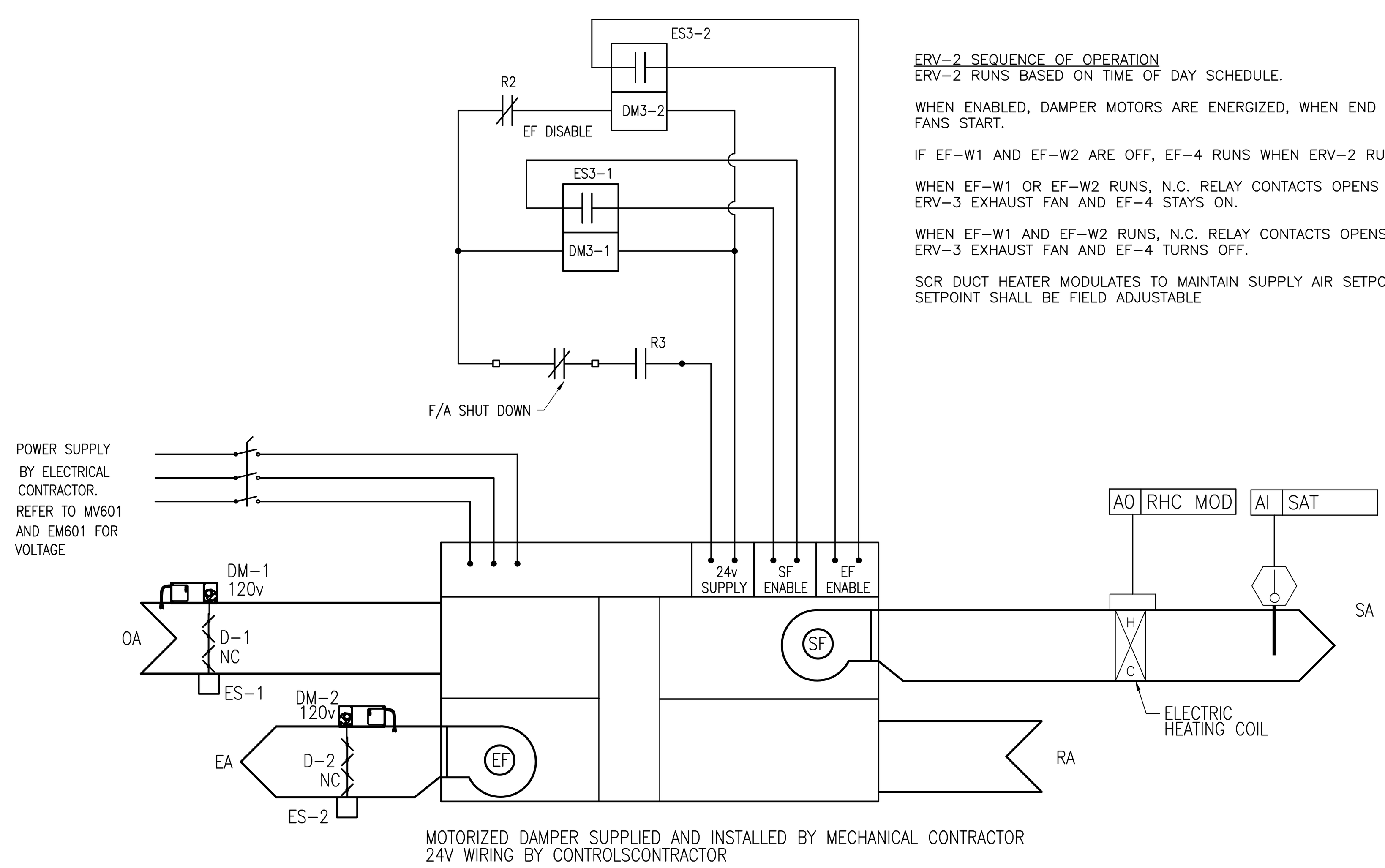


SEQUENCE OF OPERATION
EXHAUST FAN OPERATES ON TIME OF DAY SCHEDULE
CURRENT SENSOR INDICATES FAN ON
ALARM IF FAN CURRENT FALLS BELOW NORMAL

3 MC601 EF-3 WIRING & CONTROL



5 MC601 EXTERIOR LIGHTING CONTROL



ERV-2 SEQUENCE OF OPERATION
ERV-2 RUNS BASED ON TIME OF DAY SCHEDULE.

WHEN ENABLED, DAMPER MOTORS ARE ENERGIZED, WHEN END SWITCHES MAKE, FANS START.

IF EF-W1 AND EF-W2 ARE OFF, EF-4 RUNS WHEN ERV-2 RUNS.

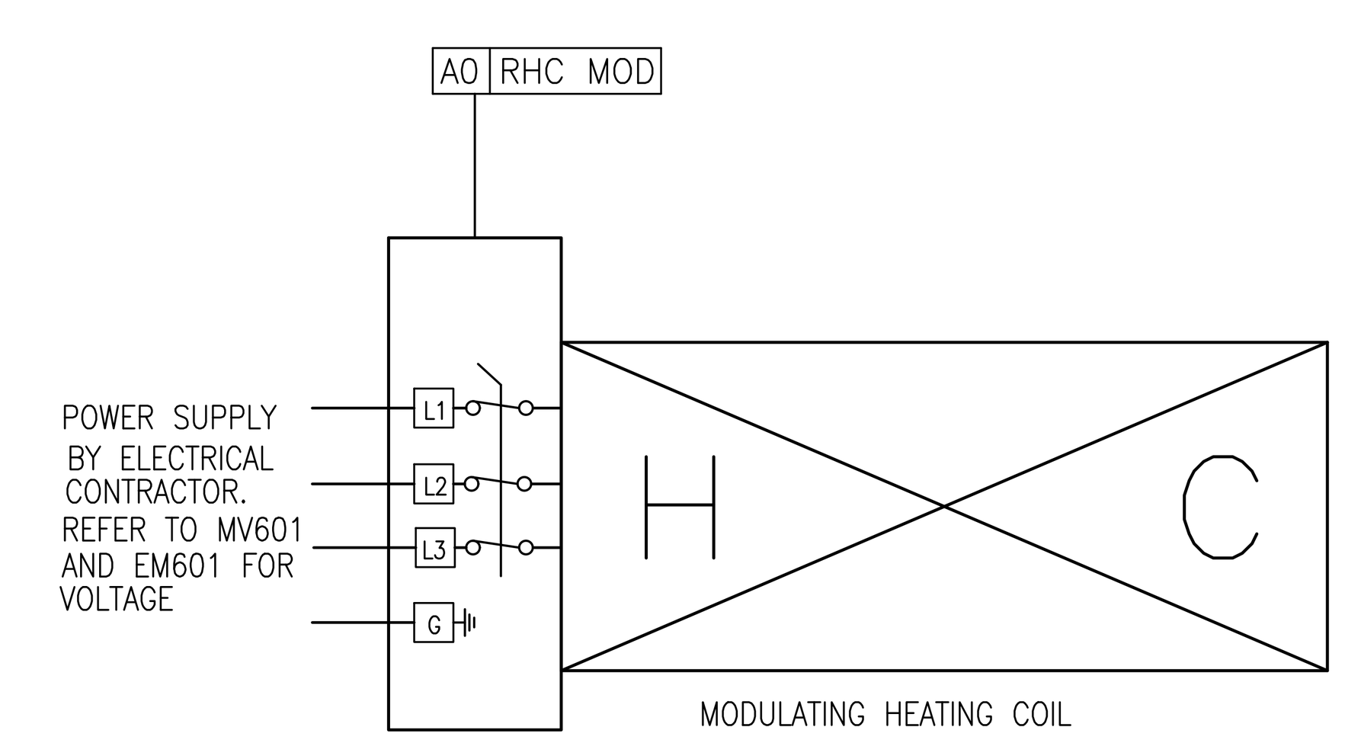
WHEN EF-W1 OR EF-W2 RUNS, N.C. RELAY CONTACTS OPENS AND DISABLES ERV-3 EXHAUST FAN AND EF-4 STAYS ON.

WHEN EF-W1 AND EF-W2 RUNS, N.C. RELAY CONTACTS OPENS AND DISABLES ERV-3 EXHAUST FAN AND EF-4 TURNS OFF.

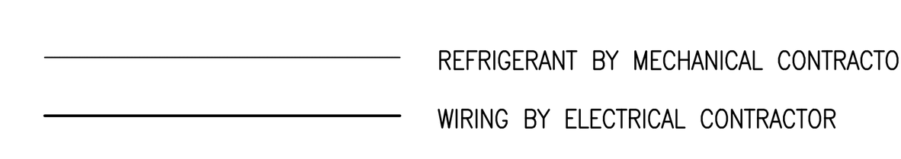
SCR DUCT HEATER MODULATES TO MAINTAIN SUPPLY AIR SETPOINT @ 68°F. SETPOINT SHALL BE FIELD ADJUSTABLE

MOTORIZED DAMPER SUPPLIED AND INSTALLED BY MECHANICAL CONTRACTOR
24V WIRING BY CONTROLSCONTRACTOR

2 MC601 WIRING SCHEMATIC FOR ERV-2



6 MC601 WIRING SCHEMATIC FOR HEATING COILS



NOTES

1. REFER TO DRAWING EM601, FOR MOTOR STARTER AND CONTROL LIST.
2. REFER TO DRAWING MV600'S FOR DAMPERS AND DAMPER MOTORS.
3. SEE DWG. M-001 FOR MECHANICAL LEGEND.
4. CURRENT SENSOR AND RELAY 'RC' PROVIDED BY ELECTRICAL CONTRACTOR, REFER TO ELECTRICAL SPECIFICATION, EXCEPT AS NOTED.
5. CONTROLS CONTRACTOR TO CONTROL RELAY 'RC'. PROVIDE ADAPTERS AS REQUIRED.
6. CONTROLS CONTRACTOR TO READ CURRENT SENSOR. PROVIDE ADAPTERS AS REQUIRED.
7. ALL DAMPER MOTORS ARE SUPPLIED, INSTALLED AND WIRED BY CONTROLS CONTRACTOR.

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KEY PLAN

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M.G. DOYLE 3092

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PROJECT TITLE
SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

Project Number

SHEET TITLE
CONTROLS

MC601

FIXTURE SCHEDULE

TYPE	STANDARD OF ACCEPTANCE MANUFACTURER CAT No.	DESCRIPTION	LAMP INFO	VOLTS	MOUNTING	REMARKS	ACCEPTABLE ALTERNATE MANUFACTURERS
1	PHILIPS DWAE-70L-835-4-UNV	4'-0" SURFACE MOUNTED LED VAPOURTIGHT FIXTURE	3500K 7000 LUMENS 65 WATTS	120V	CHAIN HANG		EATON, HUBBELL, LITHONIA
2	PHILIPS OWL440L835UNV	4' SURFACE LED WRAPAROUND FIXTURE	53 WATTS 3500K	120V	SURFACE		EATON, HUBBELL, LITHONIA
3	PHILIPS LP16T	EXTERIOR LED WALL FIXTURE	4000K 2500 40 WATTS	120V	WALL MOUNTED		EATON, HUBBELL, LITHONIA

HEATER SCHEDULE

TYPE	STANDARD OF ACCEPTANCE MANUFACTURER CAT No.	DESCRIPTION	WATTS	VOLTS	PHASE	REMARKS	ALTERNATE MANUFACTURERS
1	STELPRO 758 SERIES	38" BASEBOARD HEATER	750	208	1	C/W L.V. TRANSFORMER/RELAY KIT	DIMPLEX, OUELLET
2	STELPRO SHU0783C24	INDUSTRIAL UNIT HEATER	7500	208	3	C/W 24 VOLT CONTROL KIT AND WALL MOUNTING SUPPORT KIT	DIMPLEX, OUELLET
3	STELPRO SHU0383C24	INDUSTRIAL UNIT HEATER	3000	208	3	C/W 24 VOLT CONTROL KIT AND WALL MOUNTING SUPPORT KIT	DIMPLEX, OUELLET

LIGHTING LEGEND

- $ — 125V, 20amp, SINGLE POLE TOGGLE SWITCH MOUNTED 48"(1200mm) AFF
- $3 — 125V, 20amp, THREE WAY SWITCH MOUNTED 48"(1200mm) AFF
- OC — LINE VOLTAGE ON/OFF OCCUPANCY SENSOR-CEILING MOUNTED REFER TO DETAIL 1/E-103.
- '1' — LIGHTING FIXTURE. NUMBER INDICATES TYPE. REFER TO FIXTURE SCHEDULE.

POWER LEGEND

- 125V, 5-15R DUPLEX RECEPTACLE MOUNTED 18"(450mm) AFF UNLESS OTHER WISED INDICATED.
- 125V, 5-20R DUPLEX RECEPTACLE MOUNTED 18"(450mm) AFF
- 125V, 5-20R DUPLEX RECEPTACLE MOUNTED ABOVE COUNTER OR 42"AFF
- GF — 125V, 5-20R GFCI DUPLEX RECEPTACLE MOUNTED ABOVE COUNTER OR 42"AFF
- 125V, 5-20R GFCI DUPLEX RECEPTACLE MOUNTED ABOVE COUNTER
- 2 — INDICATES MECHANICAL EQUIPMENT NUMBER. REFER TO MOTOR STARTER AND CONTROL LIST.
- $TOL — MANUAL MOTOR STARTER C/W RED ON PILOT LIGHT
- NF — NON-FUSED DISCONNECT SWITCH
- NF WP — NON-FUSED WEATHERPROOF DISCONNECT SWITCH
- COMBINATION MAGNETIC STARTER
- T — THERMOSTAT OR TEMPERATURE SENSOR SUPPLIED, INSTALLED AND WIRED BY MECHANICAL CONTRACTOR. ELECTRICAL CONTRACTOR SHALL SUPPLY AND INSTALL DEVICE BOX C/W 21mmC AND PULL STRING TO NEAREST ACCESSIBLE CEILING SPACE.
- T/C — TIME CLOCK. SEE DETAIL 2/E-103
- PB — EMERGENCY STOP PUSHBUTTION. SEE RISER DIAGRAM 1/EP601.
- 1 — ELECTRIC HEATER. REFER TO HEATER SCHEDULE
- T G — LOW VOLTAGE THERMOSTAT. 'G' INDICATES GUARD HONEYWELL T86W
- L.V. — LOW VOLTAGE HEATING CONTROL WIRING
- DO — BARRIER FREE DOOR OPERATOR AND CONTROLS BY DIV. 08. ALL WIRING AND CONNECTIONS BY ELECTRICAL CONTRACTOR. REFER TO DETAIL 5/ES501.
- CP — SEWAGE LIFT STATION CONTROL PANEL SUPPLIED BY SITE SERVICES CONTRACTOR, INSTALLED AND WIRED BY ELECTRICAL CONTRACTOR. SEE DETAIL 1/EM601.

SYSTEMS LEGEND

- WG 72W — 120/12V EMERGENCY BATTERY UNIT WALL MOUNTED C/W 2x 5W LED HEADS WATTAGE AS INDICATED. DIRECT CONNECTION C/W WIREGUARD
- 2x 5W x12V LED EMERGENCY REMOTE HEADS - WALL MOUNTED
- D.C. — EMERGENCY LIGHTING D.C WIRING. RUN MINIMUM 2#12 RW90 Cu+#12B-1/2"C
- WG — WALL MOUNTED, SELF POWERED, PICTOGRAM EXIT FIXTURE-SINGLE FACED C/W WIREGUARD
- COMMUNICATIONS OUTLET MOUNTED 18"(450mm) AFF RUN 2x CAT 6 CABLES BACK TO COMMUNICATIONS RACK AND TERMINATE
- WIFI — WIFI DATA OUTLET CEILING MOUNTED. RUN 1x CAT 6 RATED CABLE BACK TO COMMUNICATIONS RACK AND TERMINATE
- 90"AFF — WALL MOUNTED DATA OUTLET FOR FUTURE PROJECTOR. RUN 1x CAT 6 RATED CABLE BACK TO COMMUNICATIONS RACK AND TERMINATE. VERIFY EXACT MOUNTING LOCATION WITH BUILDING I.T. REPRESENTATIVE PRIOR TO ROUGH-IN.
- G F — FIRE ALARM SYSTEM HORN/STROBE TO MATCH EXISTING. 'G' INDICATES GUARD. MOUNTED AT 7'-6" AFF. SEE DETAIL 1/ES501.
- G F — FIRE ALARM SYSTEM PULL STATION TO MATCH EXISTING. MONTED AT 48" AFF. 'G' INDICATES GUARD. SEE DETAIL 1/ES501.
- BPS — FIRE ALARM SYSTEM BOOSTER POWER SUPPLY SEE DETAIL 1/ES501.
- IM — FIRE ALARM SYSTEM ISOLATION MODULE SEE DETAIL 1/ES501.
- 90"AFF — MULTI-MEDIA OUTLET WALL MOUNTED 90"AFF. FOR FUTURE PROJECTOR. REFER TO DETAIL 4/E-103
- MULTI-MEDIA OUTLET WALL MOUNTED 18"AFF. FOR FUTURE PROJECTOR. REFER TO DETAIL 4/E-103
- AM — INTRUSION ADDRESSIBLE INTERFACE MODULE. SEE DETAIL 4/ES501.
- DC — INTRUSION ALARM DOOR CONTACT. SEE DETAIL 4/ES501.
- M — INTRUSION ALARM MOTION DETECTOR-CEILING MOUNTED SEE DETAIL 4/ES501.
- ODC — INTRUSION ALARM OVERHEAD DOOR CONTACT. SEE DETAIL 4/ES501.
- KP — INTRUSION ALARM KEY PAD MOUNTED AT 48" AFF. SEE DETAIL 4/ES501.
- CR — CARD READER SUPPLIED AND INSTALLED BY DIV. 08. WIRED BY ELECTRICAL CONTRACTOR. REFER TO DETAIL 5/ES501.
- ES — ELECTRIC DOOR STRIKE SUPPLIED AND INSTALLED BY DIV. 08. WIRED BY ELECTRICAL CONTRACTOR. REFER TO DETAIL 5/ES501.
- PS8 — ACCESS CONTROL SYSTEM POWER SUPPLIED AND INSTALLED BY DIV. 08. WIRED BY ELECTRICAL CONTRACTOR. REFER TO DETAIL 5/ES501.
- DCC — ACCESS CONTROL PANEL SUPPLIED AND INSTALLED BY DIV. 08. WIRED BY ELECTRICAL CONTRACTOR. SEE DETAIL 5/ES501.
- C1 WP — EXTERIOR WEATHERPROOF VIDEO SURVEILLANCE CAMERA REFER TO DETAIL 3/ES501.
- HS — TELEPHONE HAND SET BY OWNER SEE DETAIL 2/ES501.
- CS — PUBLIC ADDRESS SYSTEM CALL SWITCH MOUNTE 48"AFF. SEE DETAIL 2/ES501.
- P — PUBLIC ADDRESS SYSTEM HORN SEE DETAIL 2/ES501.

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KEY PLAN

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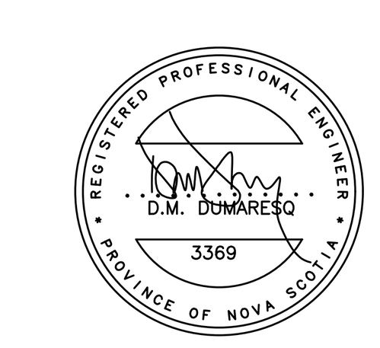

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DATE:	2017-12-18

PROJECT TITLE

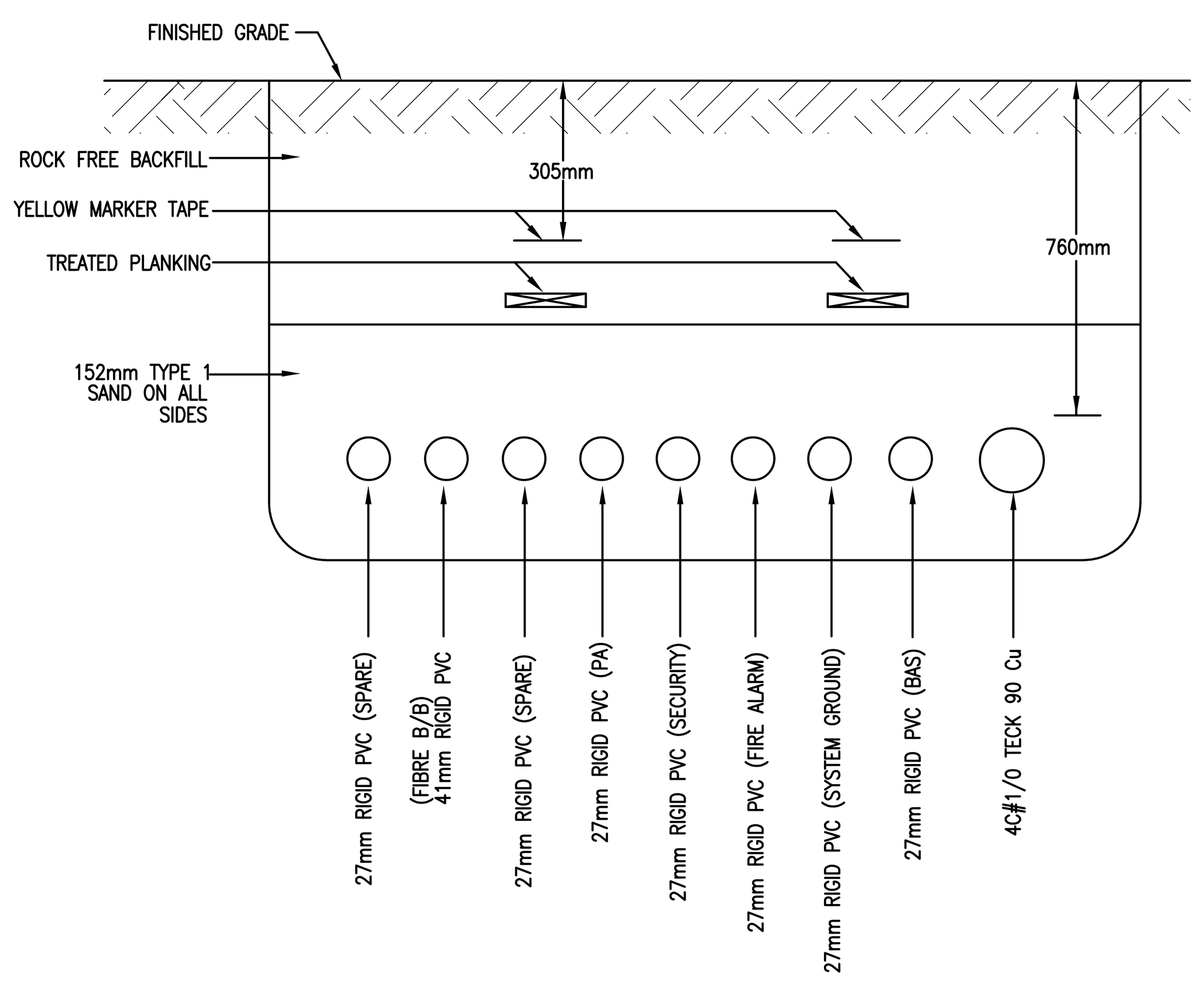
SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

Project Number

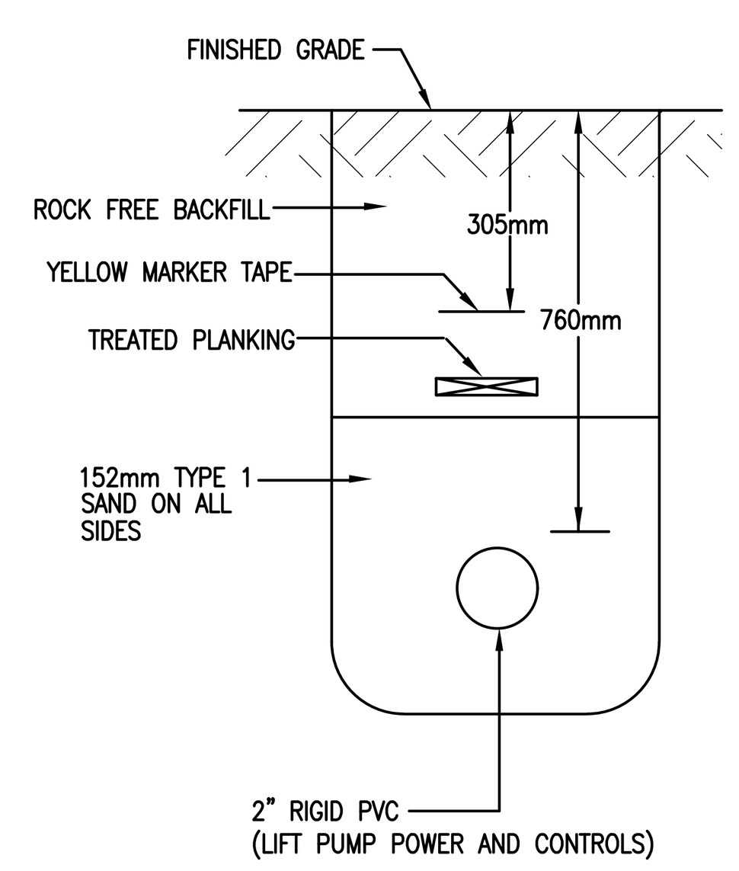
SHEET TITLE

ELECTRICAL LEGEND AND SCHEDULES

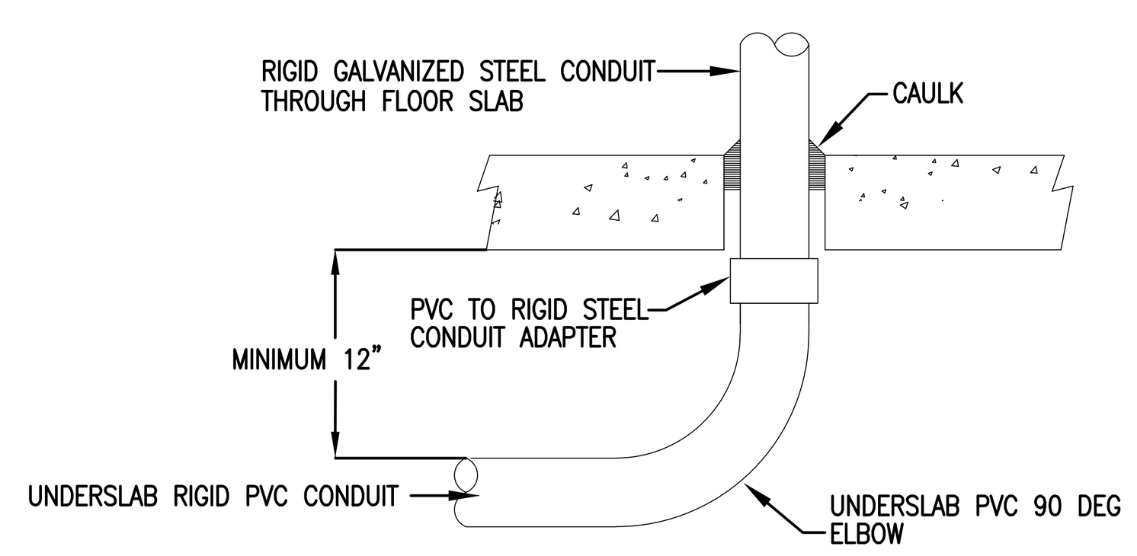
E-101



A / E-102 UNDERGROUND CONDUIT INSTALLATION SECTION 'A-A' N.T.S.



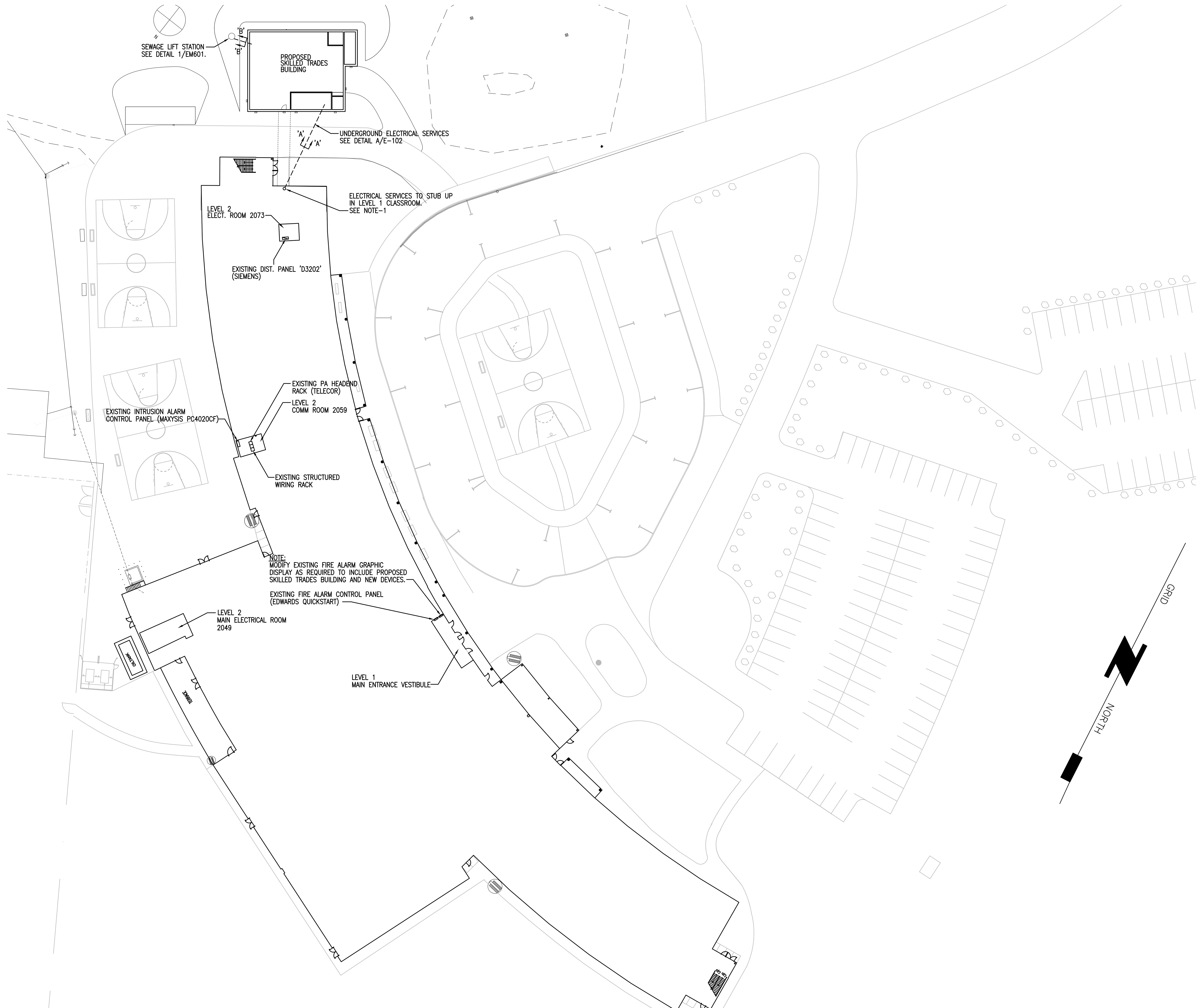
B / E-102 UNDERGROUND CONDUIT INSTALLATION SECTION 'B-B' N.T.S.



2 / E-102 TYPICAL CONDUIT PENETRATION THROUGH SLABS
N.T.S.

NOTES:

1. PROVIDE CARDBOARD SLEEVES DURING CONCRETE POURS. REMOVE CARDBOARD AND CAULK AROUND THE CONDUIT.
2. CONVERT ALL PVC CONDUITS TO RIGID GALVANIZED STEEL CONDUIT PRIOR TO PENETRATING FLOOR SLAB.



1 / E-102 ELECTRICAL SITE PLAN & KEY PLAN
SCALE 1"=30'-0"

NOTE-1:
UNDERGROUND SKILLED TRADES BUILDING ELECTRICAL SERVICES SHALL TURN UP IN LEVEL 1 CLASSROOM.
EXACT ROUTING THROUGH BUILDING SHALL BE VERIFIED ON SITE PRIOR TO CLOSE OF TENDER.
ELECTRICAL CONTRACTOR SHALL DISCONNECT, RELOCATE AND RECONNECT ANY EXISTING ELECTRICAL (ie: LIGHTS, BOXES, CONDUIT, WIRE, DEVICES, ETC) WHICH MAY CONFLICT WITH THE INSTALLATION OF NEW ELECTRICAL SERVICES

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KEY PLAN

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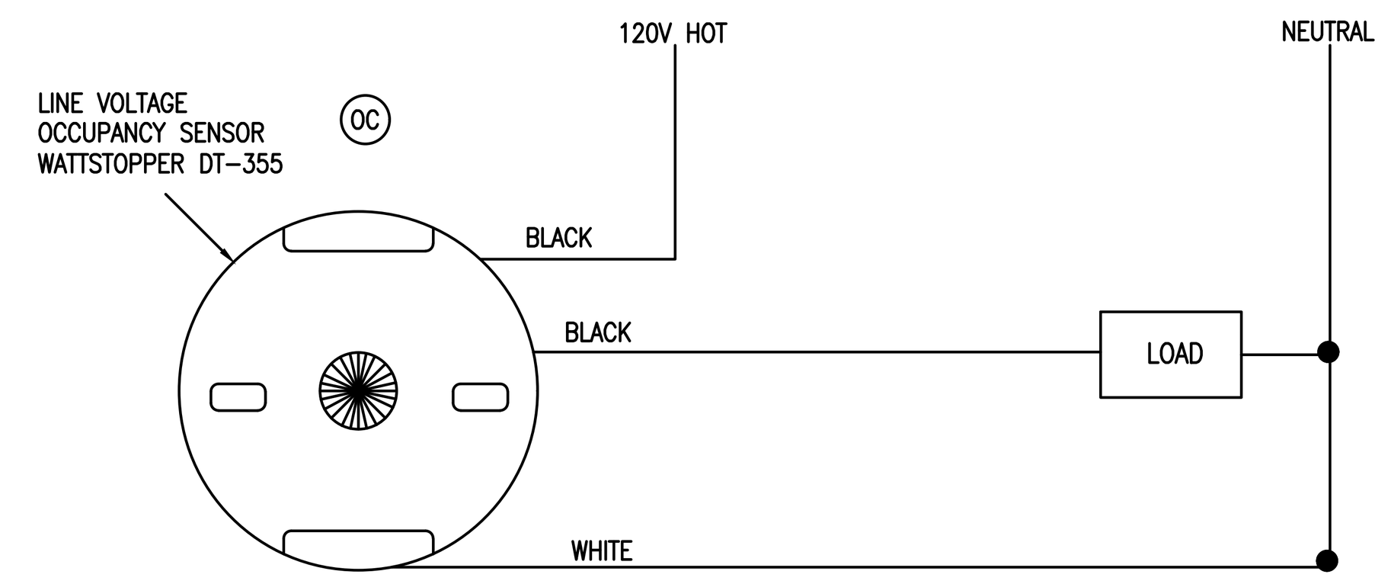
DATE:	2017-12-18

PROJECT TITLE
SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

Project Number

SHEET TITLE
ELECTRICAL SITE PLAN AND DETAILS

E-102

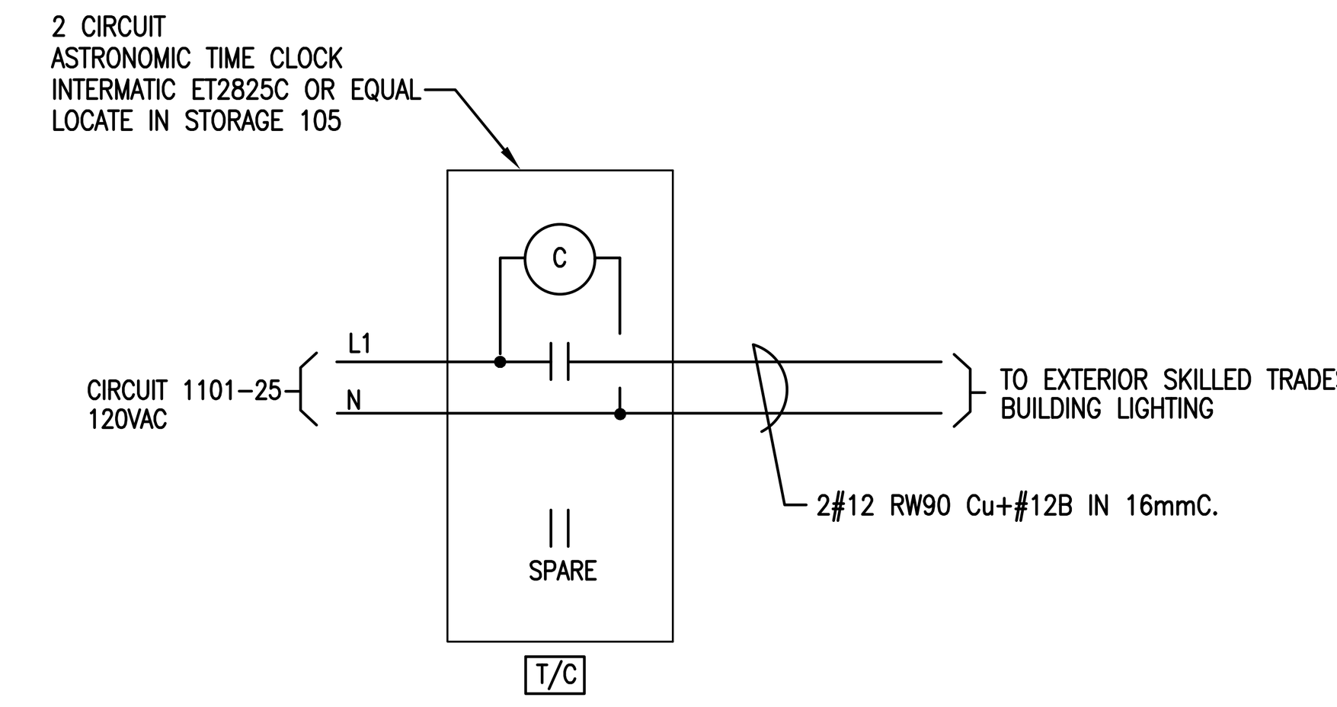


NOTES:

1. REFER TO LIGHTING FLOOR PLANS FOR QUANTITIES AND LOCATIONS OF DEVICES.
2. VERIFY ALL WIRING REQUIREMENTS WITH SYSTEM MANUFACTURER PRIOR TO ROUGH-INS.

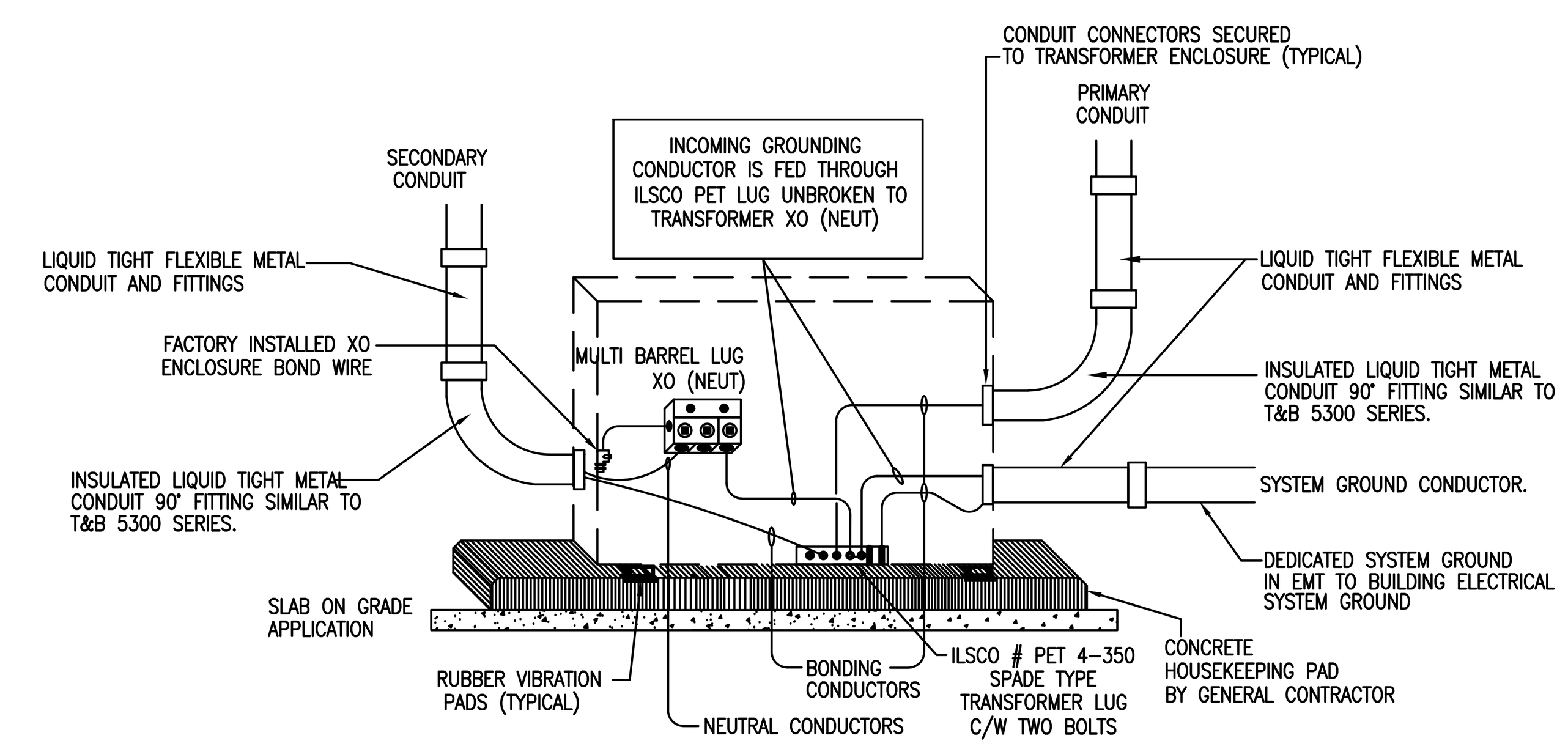
1 / E-103 — WIRING DETAIL – TYPICAL LINE VOLTAGE OCCUPANCY SENSOR INSTALLATION

N.T.S.



2 / E-103 — EXTERIOR LIGHTING CONTROL DETAIL

N.T.S.

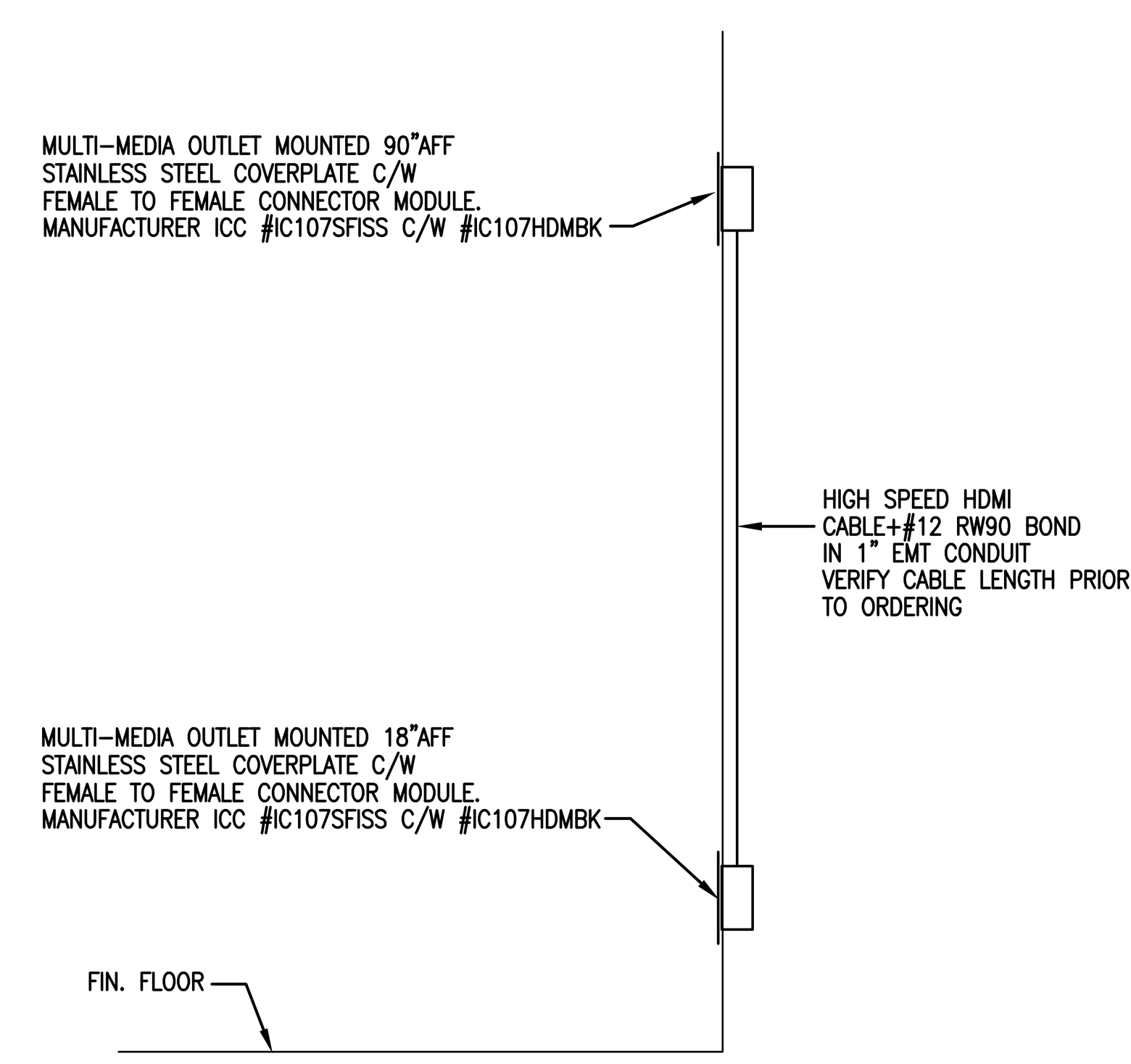


3 / E-103 — DRY TYPE TRANSFORMER INSTLLATION DETAIL

N.T.S.

NOTES:

1) MAIN GROUND CONDUCTOR FOR GROUNDIING TRANSFORMER XO POINT IS TO BE INSTALLED IN AN INDIVIDUAL MANNER BACK TO GROUND BAR IN MAIN ELECTRICAL ROOM 2049.
2) PROVIDE BONDING BUSHINGS FOR CONDUITS AND #6 BONDING CONDUCTORS (RW90 GREEN INSULATION) TO MULTI-BARRELL LUG.
3) PROVIDE A MINIMUM #3 RW90 GREEN INSULATION CONDUCTOR FROM PET LUG TO TRANSFORMER SHIELD GROUND TERMINAL TO MANUFACTURERS REQUIREMENTS.



4 / E-103 — MULTI-MEDIA OUTLET WIRING DETAIL

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KEY PLAN

GENERAL NOTES

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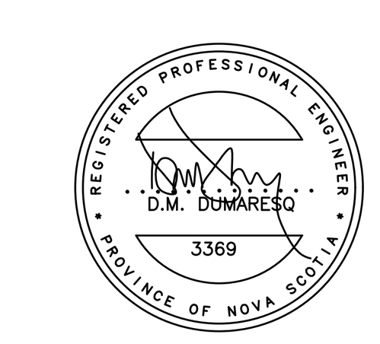


SCALE:	NTS"
DRAWN BY:	STAFF
REVIEWED BY:	DMD
DATE:	2017-12-18

PROJECT TITLE

SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

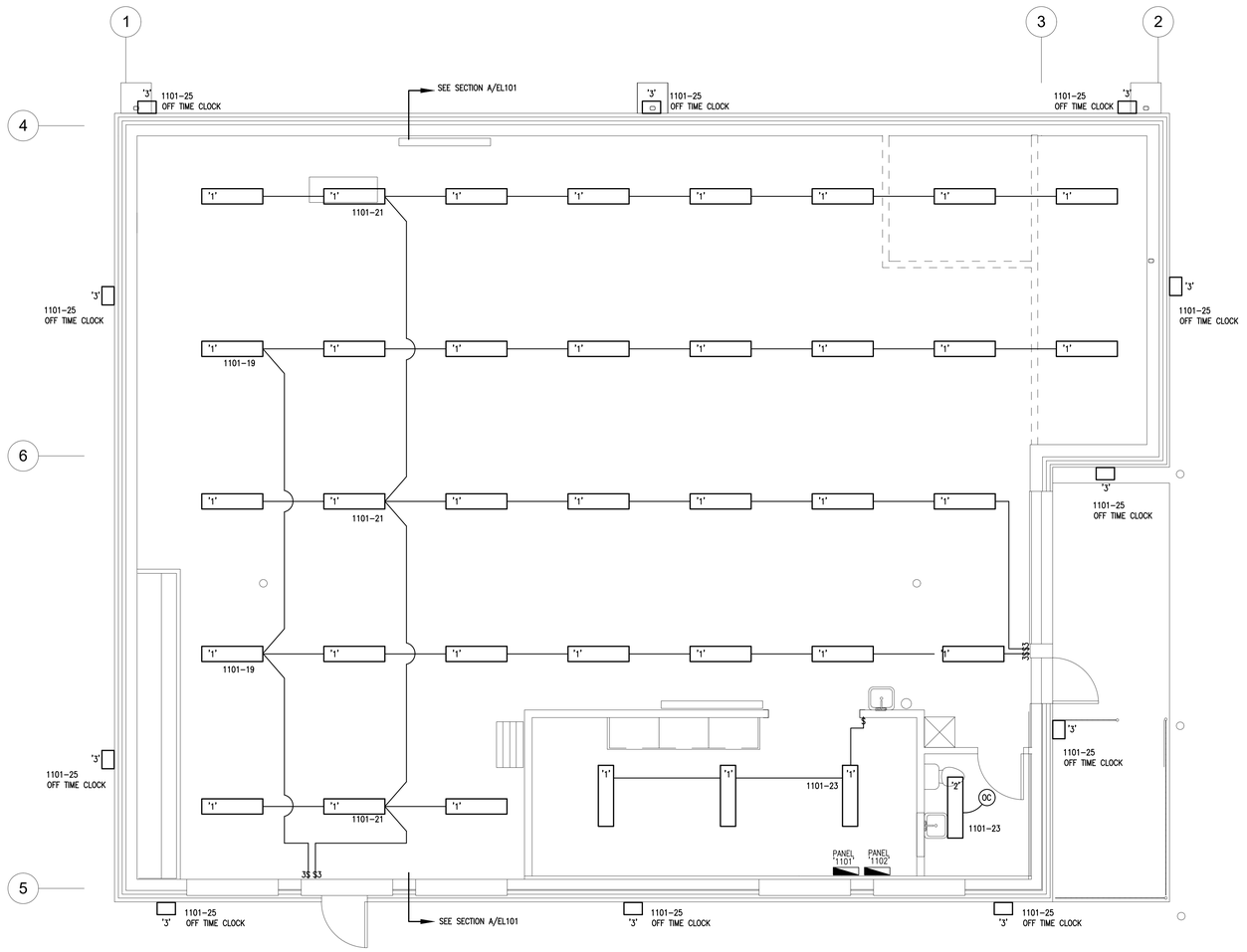
Project Number

SHEET TITLE

ELECTRICAL DETAILS

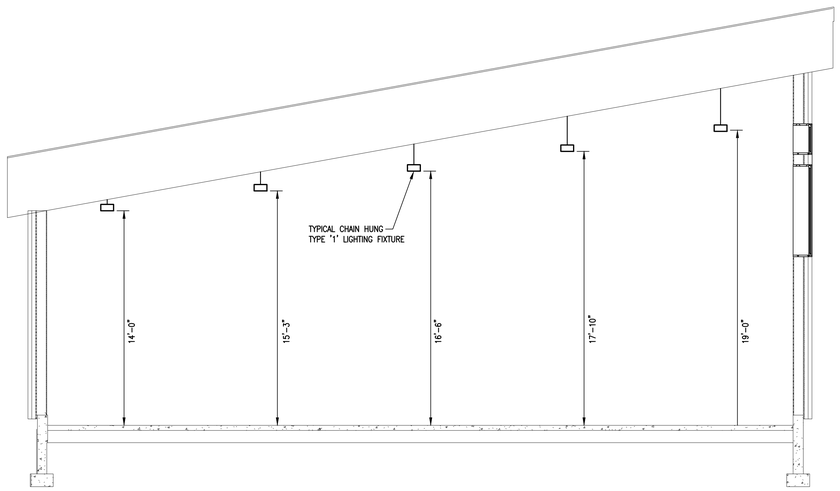
E-103

DUMAC #17-094



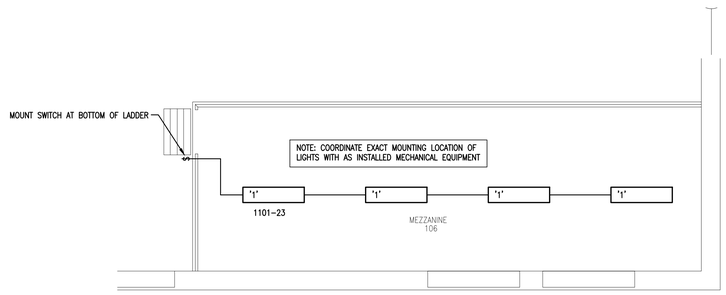
1 EL101 SKILLED TRADES BUILDING FLOOR PLAN – LIGHTING

SCALE 1/4"=1'-0"



A EL101 SECTION A–A – FIXTURE MOUNTING HEIGHTS

SCALE 1/4"=1'-0"



2 EL101 MEZZANINE 106 – LIGHTING

SCALE 1/4"=1'-0"

DUMAC #17-094

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REGISTERED PROFESSIONAL ENGINEER PROVINCE OF NOVA SCOTIA
S.M. DUMARESQ
3369

SCALE:	1/4" = 1'-0"
DRAWN BY:	STAFF
REVIEWED BY:	DMD
DATE:	2017-12-18

PROJECT TITLE

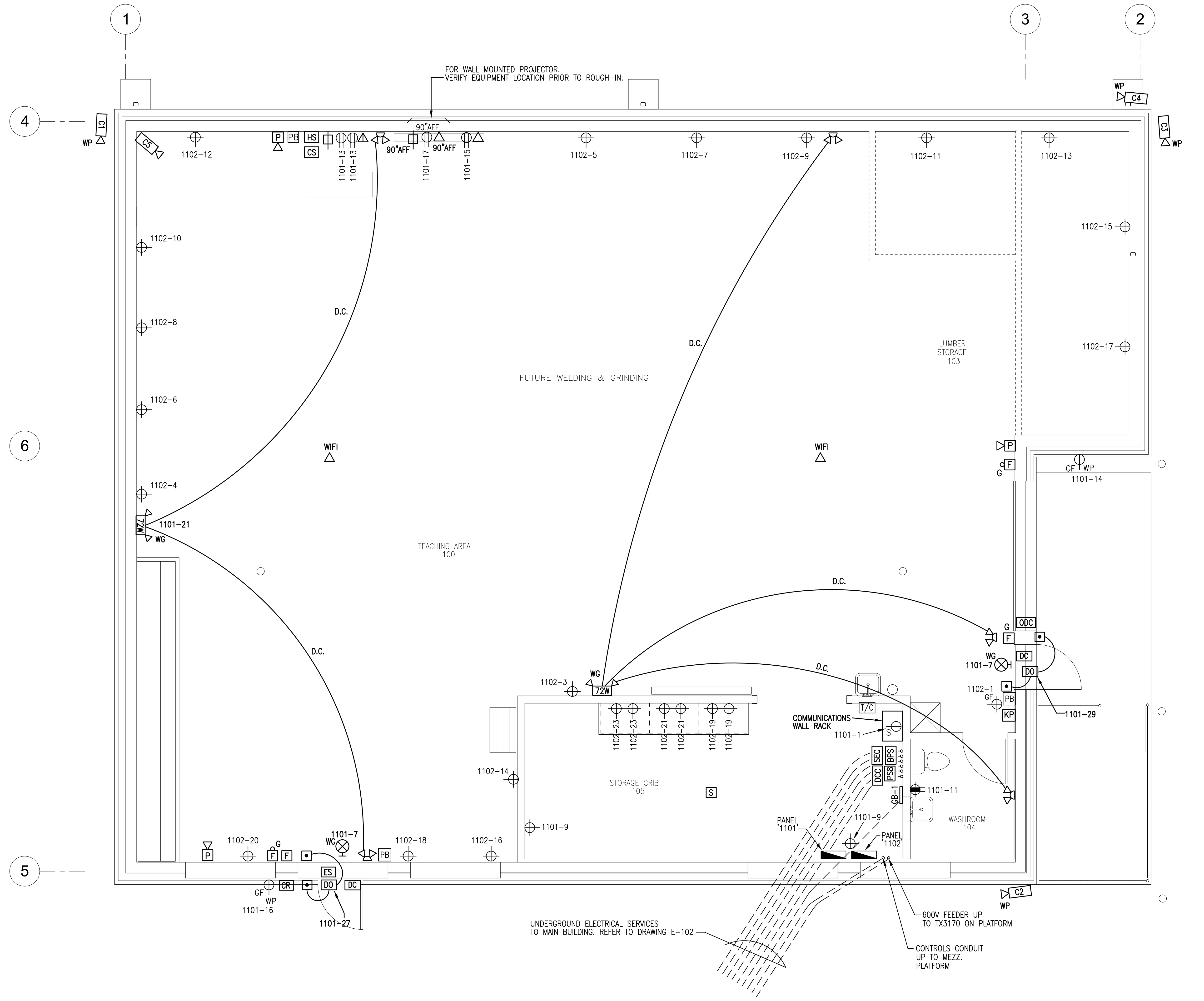
SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

Project Number

SHEET TITLE

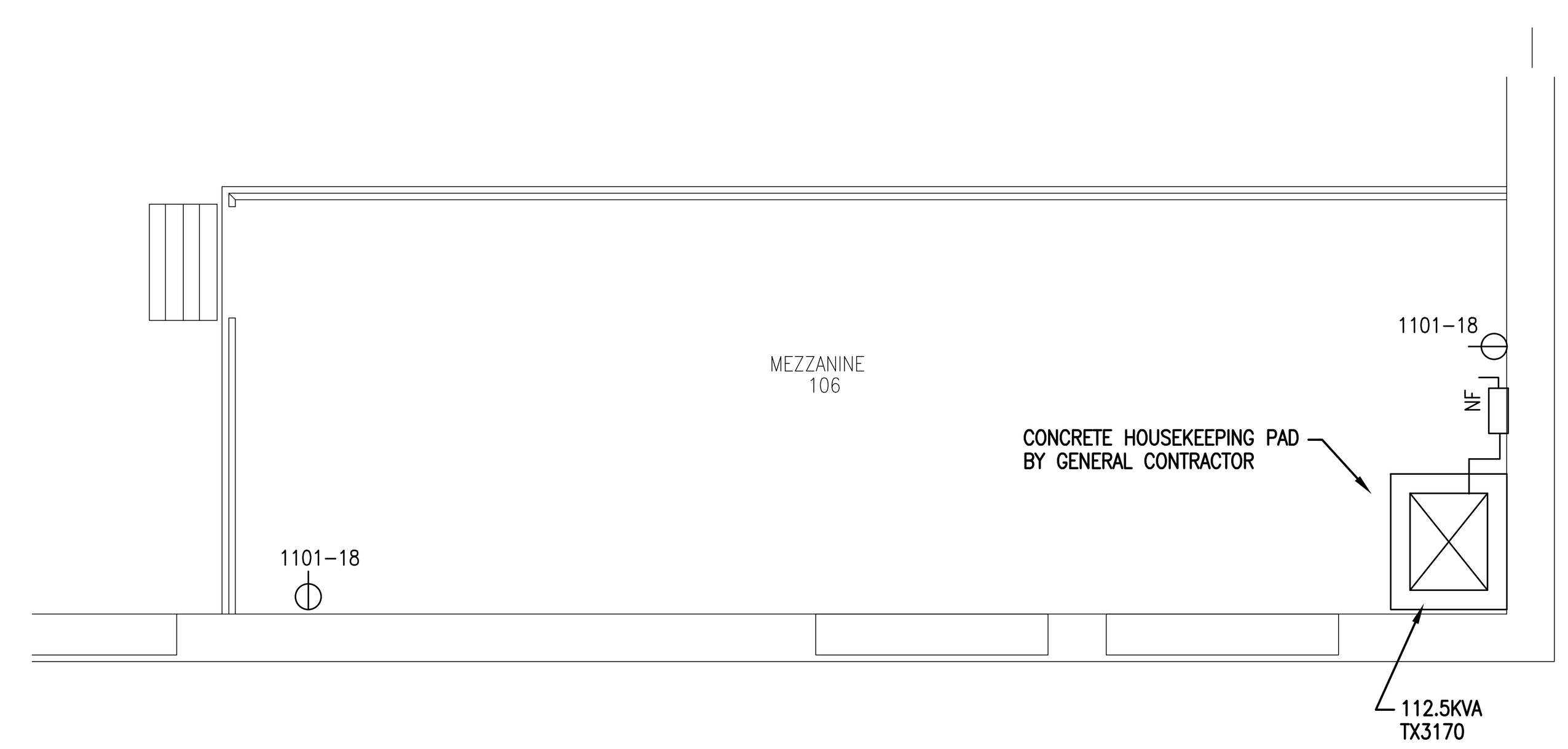
FLOOR PLANS LIGHTING

EL101



1 EP101 SKILLED TRADES BUILDING FLOOR PLAN – POWER AND SYSTEMS

SCALE 1/4"=1'-0"



2 EP101 MEZZANINE 106 – POWER AND SYSTEMS

SCALE 1/4"=1'-0"

DUMAC #17-094

SP DUMARESQ ARCHITECT LTD

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CONSULTING ENGINEERS
752 BEDFORD HIGHWAY
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PROJECT TITLE

SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

Project Number

SHEET TITLE

FLOOR PLANS POWER AND SYSTEMS

EP101

VOLTS 120/208 PANEL '1101' TYPE
PHASE 3 LOCATION STORAGE 105 MAINS 400 AMPS
WIRE 4 FED FROM TX3170 ENTER AT MTG. S

DESIGNATION	WATTS A	WATTS B	WATTS C	CIR. No.	BKR NO	A B C	BKR NO	CIR. No.	WATTS A	WATTS B	WATTS C	DESIGNATION
RECEPT-COMM RACK	500			1	20A		3P	2	5600			
SPARE				3	20A		200	4		4600		PANEL '1102' □
SPARE				5	20A		A	6			4600	
∗ EXIT LIGHTS	50			7	20A			8	–			
RECEPT-TOOL STORAGE		500		9	20A		15A	10		100		SHUNT TRIP POWER ∗
RECEPT-WASHROOM			500	11	15A		15A	12			100	SECURITY PANEL ∗
RECEPT-TEACHER DESK	500			13	15A		20A	14	500			RECEPT-EXTERIOR
RECEPT-TEACHER DESK		500		15	15A		20A	16		500		RECEPT-EXTERIOR
RECEPT-PROJECTOR			500	17	15A		20A	18			500	RECEPT-MECH PLATFORM
LIGHTING	900			19	20A		15A	20	100			DOOR POWER SUPPLY ∗
LIGHTING		800		21	20A		2P	22		375		BASEBOARD HEATER
LIGHTING			400	23	20A		15A	24			375	
EXTERIOR LIGHTING	300			25	20A		3P	26	2500			
DOOR OPERATOR		300		27	15A		30	28		2500		UNIT HEATER
DOOR OPERATOR			300	29	15A		A	30			2500	
				31			3P	32	1000			
				33			15	34		1000		UNIT HEATER
∗ FIRE ALARM BOOSTER POWER SUPPLY			100	35	15A		A	36			1000	
FC-1 EQ#2	800			37	2P		3P	38	500			
		800		39	15A		15	40		500		ERV-1 EQ#4
RH-1 EQ#3	6666		5000	41	3P		A	42			500	
				43	70		3P	44	10666			
		6666		45	A		125	46		10666		RH-2 EQ#5
DHW-M EQ#6	1125		6666	47	2P		A	48			10666	
				49	15A		2P	50	2700			
TRAP PRIMER EQ#7		100		51	15A		50A	52		2700		SEWAGE DUPLEX PUMPS EQ#9
EF-1 EQ#8			300	53	15A			54				
	4100			55	3P			56				
HP-1 EQ#1		4100		57	60			58				
			4100	59	A			60				
				61				62				
				63				64				
SPARE				65	20A		15A	66				SPARE
SPARE				67	20A		15A	68				SPARE
SPARE				69	20A		15A	70				SPARE
△ SPARE				71	20A		15A	72				SPARE △

ϕ'A' TOTAL 37357
ϕ'B' TOTAL 34807
ϕ'C' TOTAL 28000

1. DO NOT SHARE NEUTRALS ON LIGHTING CIRCUITS.
△ GROUND FAULT CIRCUIT INTERRUPTER BREAKER
∗ LOCKABLE BREAKER
□ SHUNT TRIP BREAKER

TOTAL LOAD 101 KW 280 AMP

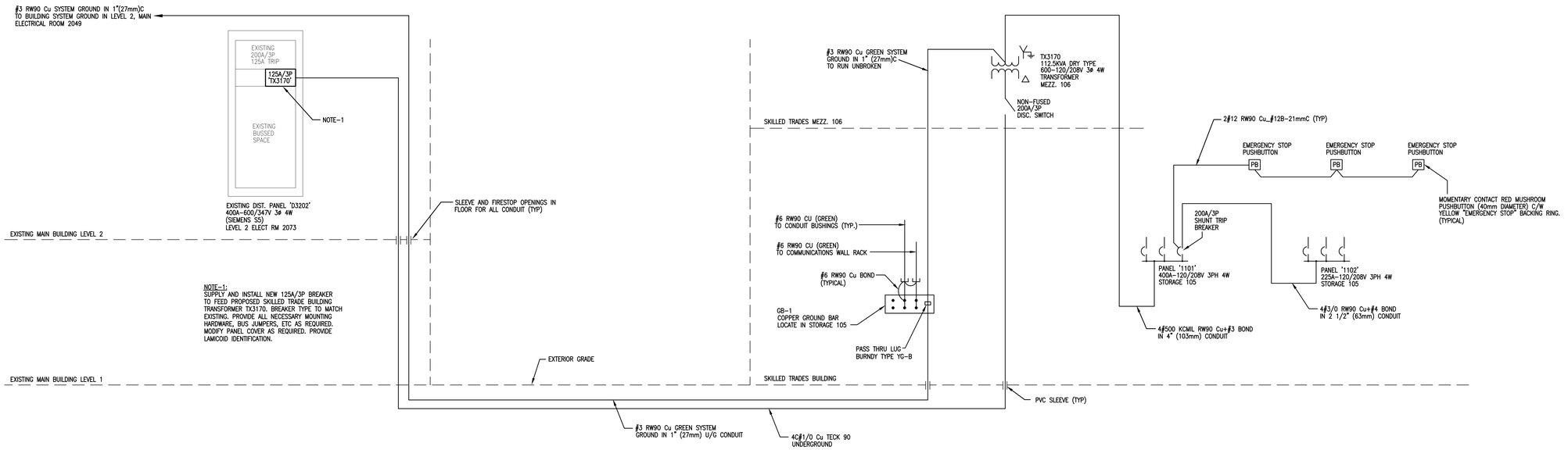
VOLTS 120/208 PANEL '1102' TYPE
PHASE 3 LOCATION STORAGE 105 MAINS 225 AMPS
WIRE 4 FED FROM '1101' ENTER AT MTG. S

DESIGNATION	WATTS A	WATTS B	WATTS C	CIR. No.	BKR NO	A B C	BKR NO	CIR. No.	WATTS A	WATTS B	WATTS C	DESIGNATION
RECEPT-WORKSHOP	600			1	20A		20A	2				SPARE
RECEPT-WORKSHOP		600		3	20A		20A	4		600		RECEPT-WORKSHOP
RECEPT-WORKSHOP			600	5	20A		20A	6			600	RECEPT-WORKSHOP
RECEPT-WORKSHOP	600			7	20A		20A	8	600			RECEPT-WORKSHOP
RECEPT-WORKSHOP		600		9	20A		20A	10		600		RECEPT-WORKSHOP
RECEPT-WORKSHOP			600	11	20A		20A	12			600	RECEPT-WORKSHOP
RECEPT-WORKSHOP	600			13	20A		20A	14	600			RECEPT-WORKSHOP
RECEPT-WORKSHOP		600		15	20A		20A	16		600		RECEPT-WORKSHOP
RECEPT-WORKSHOP			600	17	20A		20A	18			600	RECEPT-WORKSHOP
RECEPT-TOOL STOR. BENCH	600			19	20A		20A	20	600			RECEPT-WORKSHOP
RECEPT-TOOL STOR. BENCH		600		21	20A			22				
RECEPT-TOOL STOR. BENCH			600	23	20A			24				
SPARE				25	2P		2P	26				
				27	20A		30A	28				SPARE
SPARE				29	2P		2P	30				
				31	15A		30A	32				SPARE
				33				34				
SPARE				35	20A		15A	36				SPARE
SPARE				37	20A		15A	38				SPARE
SPARE				39	20A		15A	40				SPARE
△ SPARE				41	20A		15A	42				SPARE △

ϕ'A' TOTAL 5600
ϕ'B' TOTAL 4600
ϕ'C' TOTAL 4600

1. DO NOT SHARE NEUTRALS ON LIGHTING CIRCUITS.
△ GROUND FAULT CIRCUIT INTERRUPTER BREAKER
∗ LOCKABLE BREAKER

TOTAL LOAD 14.8 KW 41.1 AMP



1 EP601 PARTIAL POWER RISER DIAGRAM
N.T.S.

DUMAC #17-094

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REGISTERED PROFESSIONAL ENGINEER PROVINCE OF NOVA SCOTIA 3369

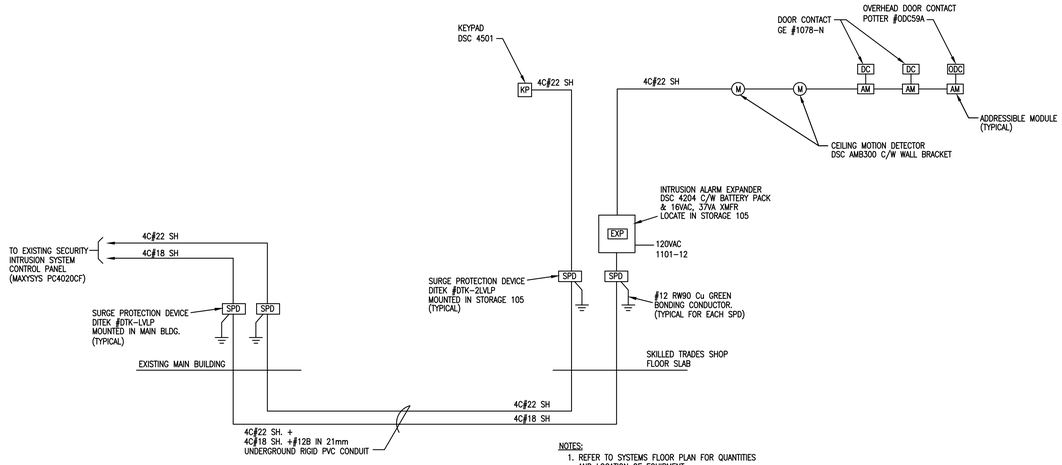
SCALE:	NTS*
DRAWN BY:	STAFF
REVIEWED BY:	DMD
DATE:	2017-12-18

PROJECT TITLE
SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

Project Number

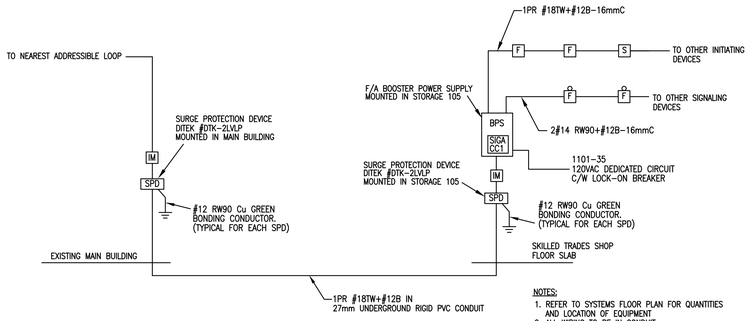
SHEET TITLE
PANEL SCHEDULES AND POWER RISER DIAGRAM

EP601



NOTES:
1. REFER TO SYSTEMS FLOOR PLAN FOR QUANTITIES AND LOCATION OF EQUIPMENT.
2. ALL WIRING TO BE IN CONDUIT.
3. VERIFY ALL REQUIREMENTS WITH MANUFACTURER PRIOR TO INSTALLATION.
4. PROVIDE ALL NECESSARY EXPANSION HARDWARE, PROGRAMMING, ETC TO MAKE A FULLY FUNCTIONING SYSTEM.
5. PROVIDE WRITTEN VERIFICATION REPORT.

4 / ES501 PARTIAL INTRUSION DETECTION SYSTEM RISER
NTS



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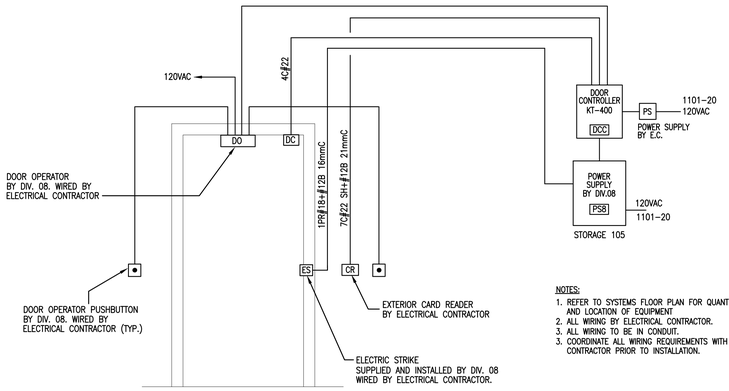
2. ALL WIRING TO BE IN CONDUIT.
3. VERIFY ALL REQUIREMENTS WITH MANUFACTURER PRIOR TO INSTALLATION.
4. PROVIDE ALL NECESSARY EXPANSION MODULES, PROGRAMMING, ETC TO MAKE A FULLY FUNCTIONING SYSTEM.
5. EXISTING FIRE ALARM CONTROL PANEL: EDWARDS QUICKSTART
6. PROVIDE WRITTEN FIRE ALARM VERIFICATION REPORT.

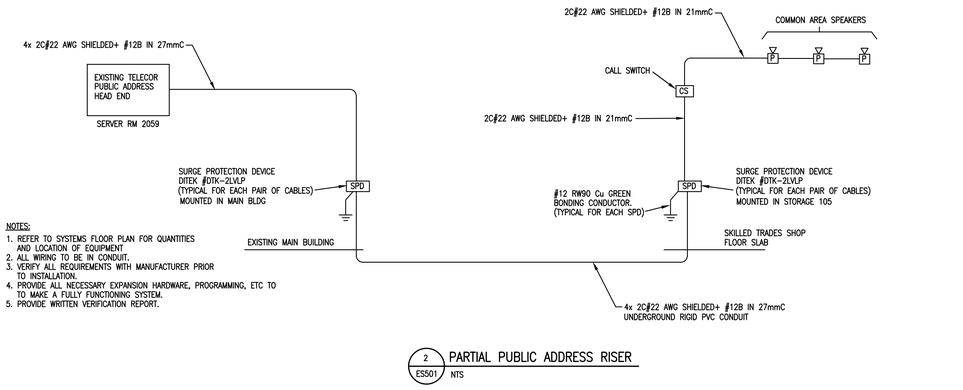
1 / ES501 PARTIAL FIRE ALARM ALARM RISER
NTS



DOOR ELEVATION

NOTES:
1. REFER TO SYSTEMS FLOOR PLAN FOR QUANTITIES AND LOCATION OF EQUIPMENT
2. ALL WIRING BY ELECTRICAL CONTRACTOR.
3. ALL WIRING TO BE IN CONDUIT.
3. COORDINATE ALL WIRING REQUIREMENTS WITH DOOR HARDWARE CONTRACTOR PRIOR TO INSTALLATION.

5 / ES501 ACCESS CONTROL WIRING DETAIL
NTS



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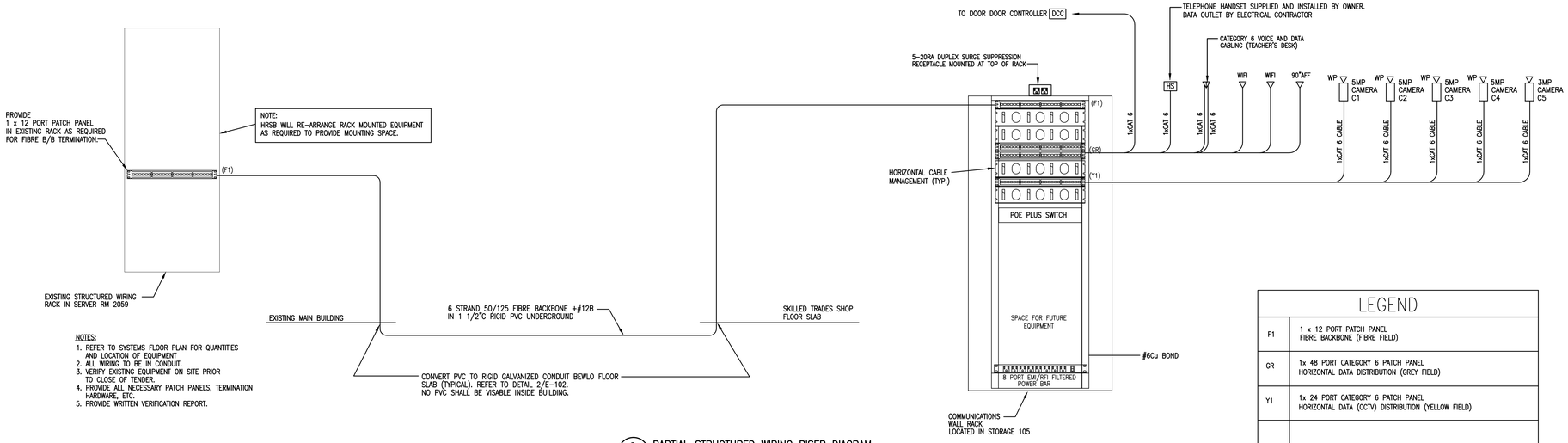
2. ALL WIRING TO BE IN CONDUIT.
3. VERIFY ALL REQUIREMENTS WITH MANUFACTURER PRIOR TO INSTALLATION.
4. PROVIDE ALL NECESSARY EXPANSION HARDWARE, PROGRAMMING, ETC TO MAKE A FULLY FUNCTIONING SYSTEM.
5. PROVIDE WRITTEN VERIFICATION REPORT.

2 / ES501 PARTIAL PUBLIC ADDRESS RISER
NTS



3 / ES501 PARTIAL STRUCTURED WIRING RISER DIAGRAM
NTS

NOTES:
1. REFER TO SYSTEMS FLOOR PLAN FOR QUANTITIES AND LOCATION OF EQUIPMENT
2. ALL WIRING TO BE IN CONDUIT.
3. VERIFY EXISTING EQUIPMENT ON SITE PRIOR TO CLOSE OF TENDER.
4. PROVIDE ALL NECESSARY PATCH PANELS, TERMINATION HARDWARE, ETC.
5. PROVIDE WRITTEN VERIFICATION REPORT.

LEGEND	
F1	1 x 12 PORT PATCH PANEL FIBRE BACKBONE (FIBRE FIELD)
GR	1x 48 PORT CATEGORY 6 PATCH PANEL HORIZONTAL DATA DISTRIBUTION (GREY FIELD)
Y1	1x 24 PORT CATEGORY 6 PATCH PANEL HORIZONTAL DATA (CCTV) DISTRIBUTION (YELLOW FIELD)

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REGISTERED PROFESSIONAL ENGINEER
D.M. DONAHESQ
3369
PROVINCE OF NOVA SCOTIA

SCALE:	NTS
DRAWN BY:	STAFF
REVIEWED BY:	DMD
DATE:	2017-12-18

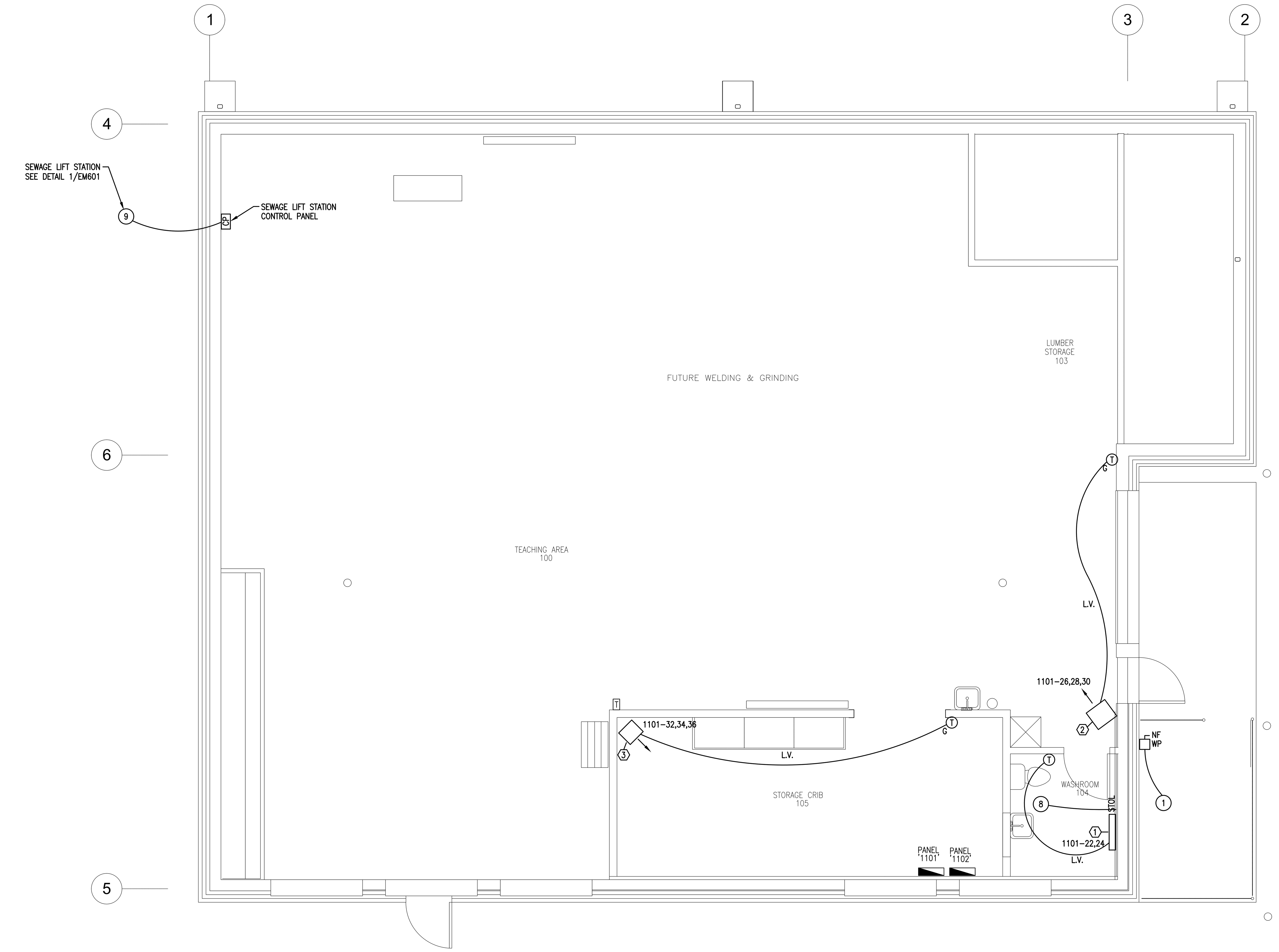
PROJECT TITLE
SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

Project Number

SHEET TITLE
SYSTEMS DETAILS

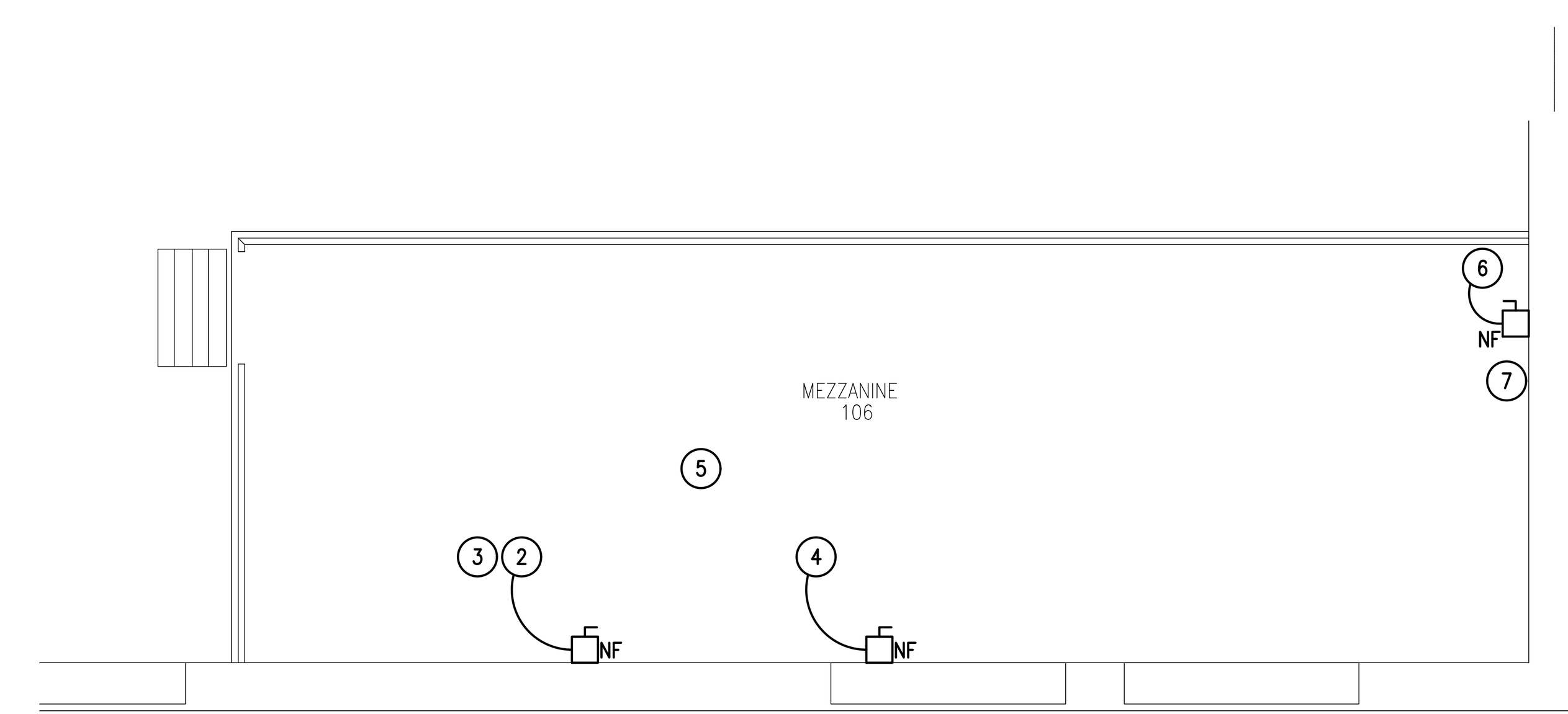
ES501

DUMAC #17-094



1 EM101 SKILLED TRADES BUILDING FLOOR PLAN – HEATING AND MECHANICAL EQUIPMENT CONNECTIONS

SCALE 1/4"=1'-0"



2 EM101 MEZZANINE 106 – HEATING AND MECHANICAL EQUIPMENT CONNECTIONS

SCALE 1/4"=1'-0"

DUMAC #17-094

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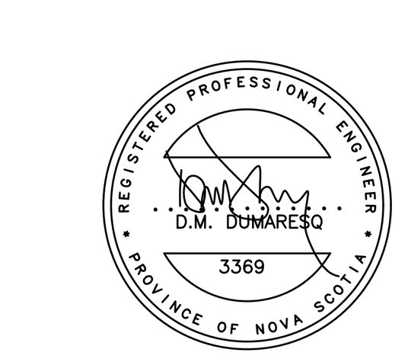

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PROJECT TITLE

SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

Project Number

SHEET TITLE

FLOOR PLANS
HEATING AND MECHANICAL EQUIPMENT CONNECTIONS

EM101

MOTOR STARTER AND CONTROL LIST

E–ELECTRICAL CONTRACTOR
M–MECHANICAL CONTRACTOR
U–USERS EQUIPMENT
X–PROVIDE
S–SITE SERVICES CONTRACTOR

1–WEATHERPROOF STOP–START STATION
2–ON–OFF
3–HAND–OFF–AUTO
4–PILOT LIGHT
5–CONTROL RELAY
6–VARIABLE FREQUENCY DRIVE
7–CO/NO2 DETECTOR
8–AQUASTAT
9–END SWITCH
10–CONTROL VALVE
11–SOLENOID
12–MOTORIZED DAMPER
13–FLOAT SWITCH
14–PRESSURE SWITCH
15–INTEGRAL SWITCH
16–AIRFLOW SWITCH
17–CONTROL TRANSFORMER
18–THERMOSTAT
19–INTEGRAL CONTROL PANEL
20–FIRE ALARM SHUTDOWN
21–CURRENT SENSOR
22–LOW FLOW SWITCH
23–HIGH LIMIT
24–LOW LIMIT
25–BUILDING AUTOMATION SYSTEM
26–REMOTE GAS SENSORS
27–INTERVAL TIMER
28–RECEPTACLE 5–15R
29–TOGGLE SWITCH UP
30–REMOTE PANEL

EQUIPMENT NO.	LOCATION	EQUIPMENT	SUPPLIED UNDER	INSTALLED UNDER	WIRED UNDER	EQUIPMENT RATING KW	EQUIPMENT RATING HP	VOLTAGE	PHASE	PANEL & CIRCUIT NO.
1	EXTERIOR	HEAT PUMP HP–1	M	M	E	7.5		208	3	1101–55,57,59
2	MEZZANINE 106	FAN COIL FC–1	M	M	E	0.82		208	1	1101–37,39
3	MEZZANINE 106	REHEAT COIL RH–1	M	M	E	20		208	3	1101–41,43,45
4	MEZZANINE 106	ERV–2	M	M	E		2@3/4	208	3	1101–38,40,42
5	MEZZANINE 106	REHEAT COIL RH–2	M	M	E	32		208	3	1101–44,46,48
6	MEZZANINE 106	DHW–M	M	M	E	2.25		208	1	1101–47,49
7	MEZZANINE 106	TRAP PRIMER	M	M	E			120	1	1101–51
8	WASHROOM 104	EF–1	M	M	E	0.02		120	1	1101–53
9	EXTERIOR	SEWAGE LIFT STATION DUPLEX PUMPS	S	S	E		2@2	208	1	1101–50,52
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										

STARTER

EQUIPMENT NO.	IN COVER: MANUAL	TOGGLE	PILOT LIGHT			MAGNETIC	COMBINATION	FUSE TYPE	CONTROL TRANS	AUXILIARY CONTACT	BREAKER TYPE	SIZE EEMAC	NON FUSED TYPE	NOTE	IN COVER: HAND–OFF–AUTO	AUTO–OFF	ON–OFF	ON LIGHT RED	SLOW LIGHT AMBER	SLOW/FAST OFF AUTO	CSA ENCLOSURE TYPE	LEGEND ABOVE	LEGEND ABOVE	SUPPLIED UNDER	INSTALLED UNDER	WIRED UNDER
1																										
2																										
3																										
4																										
5																										
6																										
7																										
8	X	X	X																					E	E	E
9																										

LOCATE AT MOTOR

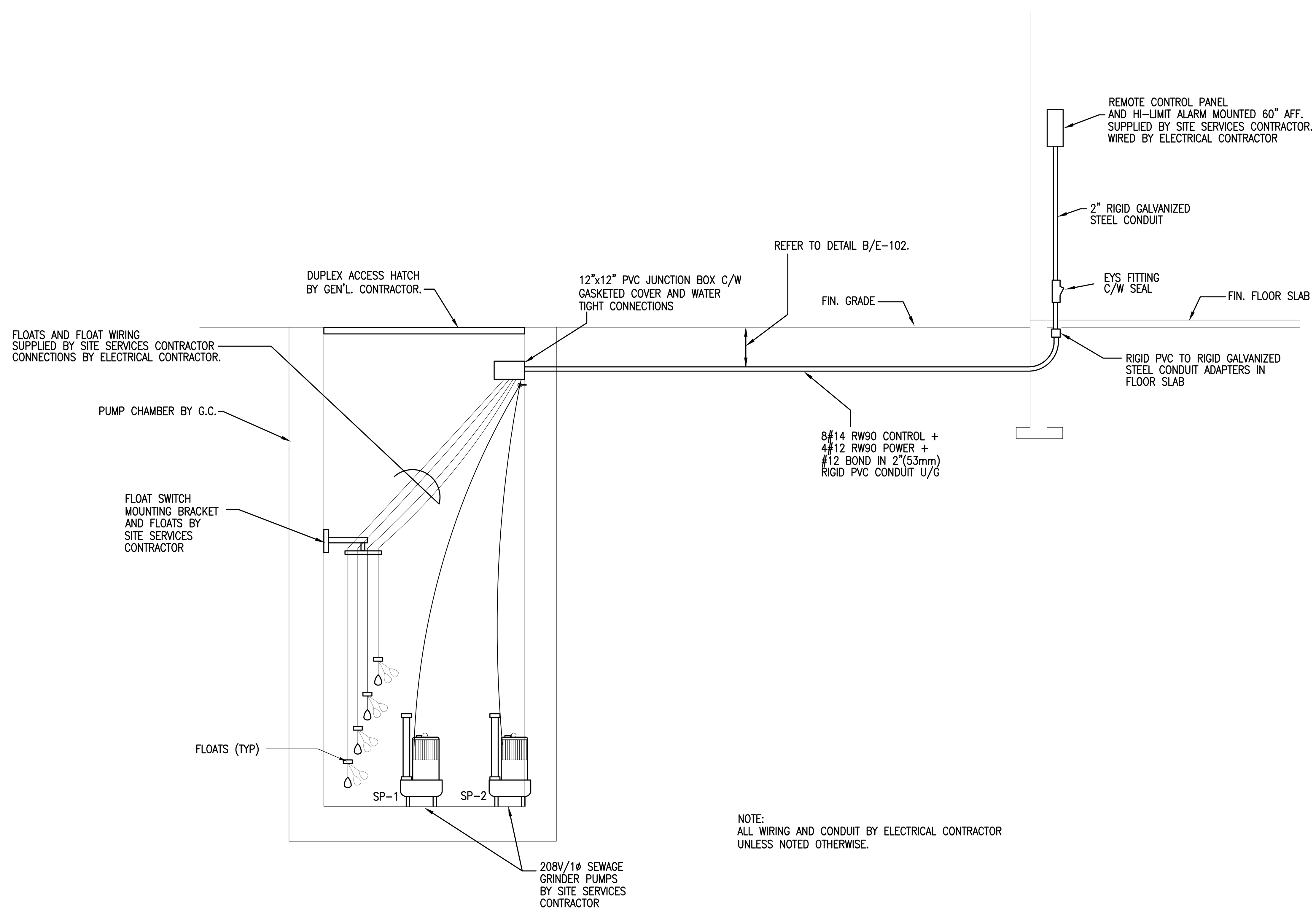
EQUIPMENT NO.	DISCONNECT SWITCH	VARIABLE FREQUENCY	TERMINAL BLOCK	LEGEND ABOVE	LEGEND ABOVE	LEGEND ABOVE	NOTE	SUPPLIED UNDER	INSTALLED UNDER	WIRED UNDER	DISCONNECT SWITCH	VARIABLE FREQUENCY	TERMINAL BLOCK	LEGEND ABOVE	LEGEND ABOVE	LEGEND ABOVE	NOTE	SUPPLIED UNDER	INSTALLED UNDER	WIRED UNDER
1	X																	E	E	E
2	X																	E	E	E
3	X																	M	M	E
4	X																	E	E	E
5	X																	M	M	E
6	X																	E	E	E
7																				
8	X																	M	M	E
9																				

REMOTE CONTROL

EQUIPMENT NO.	LEGEND ABOVE	LEGEND ABOVE	LEGEND ABOVE	LEGEND ABOVE	LEGEND ABOVE	LEGEND ABOVE	SUPPLIED UNDER	INSTALLED UNDER	WIRED UNDER	LEGEND ABOVE	LEGEND ABOVE	LEGEND ABOVE	LEGEND ABOVE	SUPPLIED UNDER	INSTALLED UNDER	WIRED UNDER	LINE DIAGRAM	INTERLOCK WITH EQUIP. NO.	INTERLOCK WITH EQUIP. NO.	INTERLOCK WITH EQUIP. NO.	INTERLOCK WIRED BY	FEEDER DETAILS RW90	EQUIPMENT NO.
1	25						M	M	M													3#6+#8B–27mmC	1
2	25						M	M	M													2#12+#12B–21mmC	2
3	25						M	M	M													3#4+#8B–35mmC	3
4	25	12	12	9	9		M	M	M													3#12+#12B–21mmC	4
5	25						M	M	M													3#1+#6B–41mmC	5
6																						2#12+#12B–16mmC	6
7																						2#12+#12B–16mmC	7
8	25						M	M	M													2#12+#12B–16mmC	8
9	30						S	S	E													3#10+#12B–21mmC	9

NOTES:

1. REFER TO WIRING DIAGRAMS ON MECHANICAL DRAWINGS
2. ALL STARTERS INCORPORATING NEUTRAL CONDUCTORS ARE TO BE SUPPLIED WITH NEUTRAL TERMINAL BLOCKS.
3. ROOF PENETRATIONS REQUIRED TO FEED ROOF MOUNTED EQUIPMENT ARE THE RESPONSIBILITY OF THE DIVISION 7. THE ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR IDENTIFYING THE LOCATION OF EACH ROOF TOP PENETRATION, INSTALLATION OF CONDUIT AND WIRE. DIVISION 7 IS RESPONSIBLE FOR MEMBRANE PENETRATION DETAILS TO ENSURE A WATER TIGHT SEAL IN CONFORMANCE WITH CRCA.
4. ALL 120 VAC DAMPER MOTORS ASSOCIATED WITH MECHANICAL EQUIPMENT ARE SUPPLIED, INSTALLED AND WIRED BY MECHANICAL CONTRACTOR.



NOTE:
ALL WIRING AND CONDUIT BY ELECTRICAL CONTRACTOR UNLESS NOTED OTHERWISE.

1 / EM601 WIRING DETAIL–SEWAGE LIFT PUMP
N.T.S. REFER TO DETAIL ON DRAWING C101

DUMAC #17-094

SP DUMARESQ ARCHITECT LTD
6389 COBURG ROAD, THIRD FLOOR, HALIFAX, N.S.

DUMAC ENERGY LTD.
CONSULTING ENGINEERS
752 BEDFORD HIGHWAY
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Email: DUMAC@DUMAC.NS.CA

KEY PLAN

GENERAL NOTES

THE CONTRACTOR SHALL VERIFY ALL LEVELS AND DIMENSIONS ON SITE AND REPORT ALL DISCREPANCIES TO THE ARCHITECT BEFORE BEGINNING WORK. DO NOT SCALE DRAWING. USE FIGURED DIMENSIONS ONLY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY CHANGES MADE TO THE DRAWINGS WITHOUT THE ARCHITECT'S APPROVAL. READ THIS DRAWING IN CONJUNCTION WITH CONTRACT DRAWINGS AND SPECIFICATIONS.

IF DIMENSION DOES NOT MEASURE 1" DRAWINGS IS NOTE PRINTED TO SCALE

DATE	#	ISSUE
2017–12–18	1	ISSUED FOR TENDER

REGISTERED PROFESSIONAL ENGINEER – D.M. DUMARESQ – 3369 – PROVINCE OF NOVA SCOTIA

SCALE:	NTS"
DRAWN BY:	STAFF
REVIEWED BY:	DMD
DATE:	2017-12-18

PROJECT TITLE
SIR JOHN A. MACDONALD SKILLED TRADES BUILDING

Project Number

SHEET TITLE
MOTOR STARTER AND CONTROL LIST

EM601