

Cover Page - Addendum No. 5

1. GENERAL

- 1.1 This Addendum shall form an integral part and shall be read in conjunction with Specifications and Drawings. This Addendum shall take precedence over all requirements to the aforementioned specifications with which it may prove to be at variance.
- 1.2 Receipt of this Addendum shall be acknowledged on the Bid Form. Failure to do so may subject the Proponent to disqualification.
- 1.3 This Addendum Contains:
 - .1 Cover Page – Addendum No.5 – 1 page;
 - .2 Civil Addendum C1 dated March 23, 2018 – 1 page;
 - .3 Architectural Addendum A3 dated March 23, 2018 – 9 pages including 1 specification page and 2 drawings;
 - .4 Structural Addendum S2 dated March 23, 2018 – 4 pages including 3 drawings;
 - .5 Mechanical Addendum M2 dated March 23, 2018 – 11 pages including 1 specification page, and 6 drawings;
 - .6 Electrical Addendum E-02 dated March 23, 2018 – 63 pages including 60 specification pages, and;
 - .7 Bidder's Questions & Responses dated March 23, 2018 – 2 pages.

END OF COVER PAGE

Civil Addendum C1

1. SPECIFICATIONS

1.1 Reference the following sections (sections not re-issued):

Section 31 15 53 Erosion and Sediment Control
Section 31 23 33 Excavating, Trenching, and Backfilling
Section 31 29 19 Geotextiles
Section 32 11 16 Granular Subbase
Section 32 11 23 Aggregate Base Course
Section 32 12 16 Asphalt Concrete Paving
Section 32 16 15 Concrete Walks, Curbs, and Gutters
Section 32 16 16 Exposed Aggregate Concrete Paving
Section 32 17 23 Pavement Markings
Section 32 98 00 Reinstatement
Section 33 31 13 Public Sanitary Utility Sewerage Piping
Section 33 39 00 Precast Manholes, Catch Basins, and Structures *Stonflex LTE System*

- .1 Except in instances where “*Owner’s Geotechnical Engineer*” is used, revise all instances of:

~~“Engineer”~~

to:

“*Consultant*”

- .2 Revise all instances of:

~~“*Owner’s Geotechnical Engineer*”~~

to:

“*Owner’s Inspection and Testing Consultant*”

2. DRAWINGS

2.1 Reference the following drawings (drawings not re-issued):

C-102 SITE PLAN DETAILS
C-104 CONSTRUCTION DETAILS AND NOTES

- .3 Except in instances where “*Owner’s Geotechnical Engineer*” is used, revise all instances of:

~~“Engineer”~~

to:

“*Consultant*”

- .4 Revise all instances of:

~~“*Owner’s Geotechnical Engineer*”~~

to:

“*Owner’s Inspection and Testing Consultant*”

END OF CIVIL ADDENDUM

Architectural Addendum A3

1. SPECIFICATIONS

1.1 Reference “Section 00 01 05 Document Responsibility and Project Directory”:

- .1 Revise 1.2.1 “Owner:” from:

~~“Municipality of East Hants
Box 230
Lloyd E. Matheson Centre
Suite 170, 15 Commerce Court
Elmsdale, NS
B2S 3K5”~~

To:

“The Municipality of the District of East Hants
Box 230
Lloyd E. Matheson Centre
Suite 170, 15 Commerce Court
Elmsdale, NS
B2S 3K5”

1.2 Reference Section 00 21 13 “Instructions to Bidders”:

- .1 Revise sentence 1.8.4 from:

“Addenda will be issued no later than 4:30 pm, local time, on the ~~27th~~ day of March, 2018, subject to paragraph 1.8.6 of Section 00 21 13.

To:

“Addenda will be issued no later than 4:30 pm, local time, on the 29th day of March, 2018, subject to paragraph 1.8.6 of Section 00 21 13.

- .2 Revise sentence 1.19.3.2.14.4 from:

“Discussion of ~~sub-trades~~ (pool tile, pool piping and equipment, concrete formwork contractor for concrete pool tanks).”

To:

“Discussion of responsibilities: (pool tile, pool piping and equipment, concrete formwork contractor for concrete pool tanks).”

1.3 Reference Section 00 41 13 “Stipulated Price Bid Form” (page included):

- .1 Specification page 1 titled “Stipulated Price Bid Form” dated March 23, 2018 to replace and supersede specification page 1 titled “Stipulated Price Bid Form” dated March 1, 2018. The changes include but are not limited to:

- .1 Revise “To (Owner)” name from ~~“The Municipality of East Hants”~~ to “The Municipality of the District of East Hants”.

1.4 Reference Section 01 45 00 “Quality Control”:

- .1 Reference item 1.8.2: delete the period after the words “testing company” and add the following words “appointed and paid for by the Owner.”

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1.5 Reference Section 01 50 00 "Temporary Facilities and Controls":

- .1 Item 2.1.1: After the words "application to 100%" delete the word "~~RH~~" and replace with the words "Relative Humidity (RH)".
- .2 Delete item 3.1.2.1.4: "~~Testing shall be conducted by independent inspection and testing company and in accordance with Section 01 45 00.~~"

1.6 Reference Section 03 30 00 "Cast-In-Place Concrete":

- .1 Revise item 2.1.17 from:

"~~Bonding Agent: Sikadur 32 Hi-Mod epoxy-based protective coating and bonding adhesive, as supplied by Sika Canada, or approved equivalent.~~"

To:

"Bonding Agent: Sikadur 32 Hi-Mod epoxy-based protective coating and bonding adhesive, as supplied by Sika Canada, or **Rezi-Weld 1000**, or approved equivalent."

.2 Revise item 2.1.18 from:

"~~Non-Shrink Grout: Minimum 30 MPa grout, as supplied by CPD Construction Products, or approved equivalent.~~"

To:

"Non-Shrink Grout: Minimum 30 MPa grout, as supplied by CPD Construction Products, or **GC-86, or V3-10K**, or approved equivalent."

1.7 Reference Section 07 21 00 "Thermal Insulation":

- .1 Delete item 3.4.7: "~~Install continuous woven wire restraint mechanically fastened to steel studs to hold insulation against exterior sheathing materials.~~"
- .2 Delete item 3.4.8: "~~Place insulation equal to that indicated for applicable assembly in jamb and header assemblies that will be inaccessible after their installation into wall.~~"

1.8 Reference Section 07 46 16 "Aluminum Panel Cladding System":

- .1 Add sentence 1.3.5: "Submit documents demonstrating cladding system meets the Effective Thermal Resistance Value as specified herein."
- .2 Add sentence 2.2.12: "Insulation thicknesses represent nominal values. Design system to achieve and Effective Thermal Resistance Value for the for the wall cladding system of RSI 4.4 (R 25)."

1.9 Reference Section 07 46 19 "Metal Cladding Systems":

- .1 Add sentence 1.3.5: "Submit documents demonstrating cladding system meets the Effective Thermal Resistance Value as specified herein."
- .2 Add sentence 2.2.9: "Insulation thicknesses represent nominal values. Design system to achieve and Effective Thermal Resistance Value for the for the wall cladding system of RSI 4.4 (R 25)."

1.10 Reference Section 08 71 00 "Door Hardware":

- .1 Add products to 2.2.1.5:
 - .1 Approved alternate: Butt hinges - Stanley FBB191

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- .2 Approved alternate: Continuous hinges: Stanley 661HD
- .2 Add product to 2.2.2.8:
 - .1 Approved alternate: Locksets - Best 40H Series
- .3 Add product to 2.2.3.6:
 - .1 Approved alternative: Best 7T Series
- .4 Add product to 2.2.6.3:
 - .1 Approved alternative: ABH 9010
 - .2 Approved alternative: ABH 1010/1020
- .5 Add product to 2.2.7.3:
 - .1 Approved alternative: Best 7T3 Series
- .6 Add product to 2.2.9.3:
 - .1 Approved alternative: Electric strikes - RCI F2164/2364
 - .2 Approved alternative: Power Supply – RCI 10 Series
 - .3 Approved alternative: Power transfer – Precision EPT
 - .4 Approved alternative: Cabinet lock – Best 1EE7E4
 - .5 Approved alternative: Key switch – RCI 960

1.11 Reference Section 08 71 13 “Automatic Door Operators”:

- .1 Revise item 2.2.1.1 from “~~Camden Door Controls ‘CM-75 Column Switch’~~” to “Camden Door Controls CM-75 Series Column Push Plate Switch Model CM-7536/4”.

1.12 Reference Section 09 31 01 “Tiling Schedule”:

- .1 Add products to 1.0.5 Tile Schedule:
 - .1 TL10 – Approved Alternate – Roca Tile (100mmx400mm) White Ice Bright
 - .2 TL11 – Approved Alternate – Roca Tile (100mmx400mm) White Ice Bright

1.13 Reference Section 09 51 23 “Acoustical Tile Ceiling Systems”:

- .1 Delete item 1.3.3.5:
 - ~~.5 “Submit engineered shop drawings for structural grid for ACT3, including the following:~~
 - ~~.1 Description of design criteria.~~
 - ~~.2 Stress and deflection analysis.~~
 - ~~.3 Selection of framing members, fittings and accessories.~~
 - ~~.4 Submit all pertinent manufacturer’s published data.~~
 - ~~.5 Submit coordination drawings indicating locations of concealed grounds, cutout plates and other required fabrications.~~
 - ~~.6 Show relation to adjoining construction, details of outside and inside corners and door openings.”~~

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1.13 Reference Section 10 21 13 “Solid Phenolic Partitions”:

- .1 Revise “Manufacturer” list 2.1.1 from:
 - .1 Bradley Corporation.
 - ~~.2 Prospec.~~
 - ~~.3 Substitutions: in accordance with Section 01 25 00.~~
- To:
 - .1 Bradley Corporation.
 - .2 Prospec.
 - .3 Metpar
 - .4 Decolam
 - .5 Substitutions: in accordance with Section 01 25 00.

1.14 Reference Section 10 22 27 “Operable Glass Partitions”:

- .1 Revise 2.1.1 “Acceptable Manufactures”:
 - .1 Add 2.1.1.4 “Moderco”.

1.15 Reference Section 12 24 13 “Roller Window Shades”:

- .1 Revise “Acceptable Manufacturers” list 2.1.2 from:
 - .1 Lutron Shading Solutions.
 - .2 Solarfective Products Ltd.
 - ~~.3 Substitutions: in accordance with Section 01 25 00.~~
- To:
 - .1 Lutron Shading Solutions.
 - .2 Solarfective Products Ltd
 - .3 Altex SunProject Commercial Window Blinds:
 - .1 Brackets to be Grade Brackets aluminum.
 - .2 Housing and associated accessories to be aluminum.
 - .4 Substitutions: in accordance with Section 01 25 00.
- .2 Reference 2.6.1 “RWS1, Sun control, 3% openness”:
 - .1 Add item 2.6.1.2: Altex Sunproject Tek Screen 9103, 9101, 9105 series by Phifer; with openness and colour later chosen by consultant from full colour range.
- .3 Reference 2.6.2 “RWS2, Room darkening”:
 - .1 Add item 2.6.2.2: Altex Sunproject Tek Screen 9103, 9101, 9105 series by Phifer; with openness and colour later chosen by consultant from full colour range.

1.16 Reference Section 13 11 13 “Swimming Pool Tanks and Decks”:

- .1 Reference item 2.1.3.7.2: delete the period after the word “equipment” and add the following words “, including all associated controls and control wiring for a fully functional system.”

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2. DRAWINGS

2.1 Reference drawing A010 “NOTES & TYPICAL DETAILS” (drawing not re-issued):

- .1 Revise “EXTERIOR WALL TYPES” W3, W3B, W3C, W4A, note:
“...~~140mm THERMALLY BROKEN FASTENING CLIPS~~...”
To:
“...152mm THERMALLY BROKEN SPACERS...”
- .2 Reference “INTERIOR MASONRY WALL TYPES” PM13 and PM14: Add words “90mm Height”
At the end of the descriptions.

2.2 Reference drawing A101 “FLOOR PLANS”:

- .1 Drawing A101 “FLOOR PLANS”, dated 2018-03-23 “Issued for Addendum No. 5” to replace and supersede drawing A101 “FLOOR PLANS”, dated 2018-03-01 “Issued for Tender”. Changes include but are not limited to:
 - .1 Note added at room “Vestibule 100”;
 - .2 Detail 8 / A111 reference at “Mechanical Room 116A” louver relocated;
 - .3 Hose bibs add in basement area, and;
 - .4 Note revised at filtration “Containment Curbs” in room “Pool Filtration 001”.

2.3 Reference drawing A330 “SECTION DETAILS - EXTERIOR”:

- .1 Revise Details 5, 6, 7, 8, 9, keynote:
“152mm HORZ. ~~THERMAL CLIP~~”
To:
“152mm HORIZ. THERMALLY BROKEN SPACERS”

2.4 Reference drawing A331 “SECTION DETAILS - EXTERIOR”:

- .1 Revise Details 1, 4, 7, 8, keynote:
“152mm HORZ. ~~THERMAL CLIP~~”
To:
“152mm HORIZ. THERMALLY BROKEN SPACERS”

2.5 Reference drawing A332 “SECTION DETAILS - EXTERIOR”:

- .1 Revise Details 1, 4, 7, keynote:
“152mm HORZ. ~~THERMAL CLIP~~”
To:
“152mm HORIZ. THERMALLY BROKEN SPACERS”

2.6 Reference drawing A333 “SECTION DETAILS - EXTERIOR”:

- .1 Revise Details 3, 5, keynote:

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"152mm HORZ. ~~THERMAL CLIP~~"

To:

"152mm HORZ. THERMALLY BROKEN SPACERS"

2.7 Reference drawing A334 "SECTION DETAILS - EXTERIOR":

- .1 Revise Detail 2, keynote:

"152mm HORZ. ~~THERMAL CLIP~~"

To:

"152mm HORZ. THERMALLY BROKEN SPACERS"

2.8 Reference drawing A461 "EXTERIOR BASEMENT STAIR PLAN & DETAILS":

- .1 Drawing A461 "EXTERIOR BASEMENT STAIR PLAN & DETAILS", dated 2018-03-23 "Issued for Addendum No. 5" to replace and supersede drawing A461 "EXTERIOR BASEMENT STAIR PLAN & DETAILS", dated 2018-03-01 "Issued for Tender". Changes include but are not limited to:

- .1 Clarification of dimensions
- .2 Extent of concrete retaining wall.

2.9 Reference the "Door Schedule" on drawing A700 "DOOR AND FRAME TYPES, DETAILS & SCHEDULE":

- .1 Revise Door No's. 101, 102, and 112: Change "Door Type" from "~~D1-EX~~" to "D2-EX".

END OF ARCHITECTURAL ADDENDUM

Stipulated Price Bid Form

Project/Contract: RFC50186 - East Hants Aquatic Centre

From (*Bidder*):

company name

street address or postal box number

city/town, province and postal code

contact name

phone number

email address

To (*Owner*): The Municipality of the District of East Hants
Box 230, Suite 170
15 Commerce Court
Elmsdale, Nova Scotia B2S 3K5

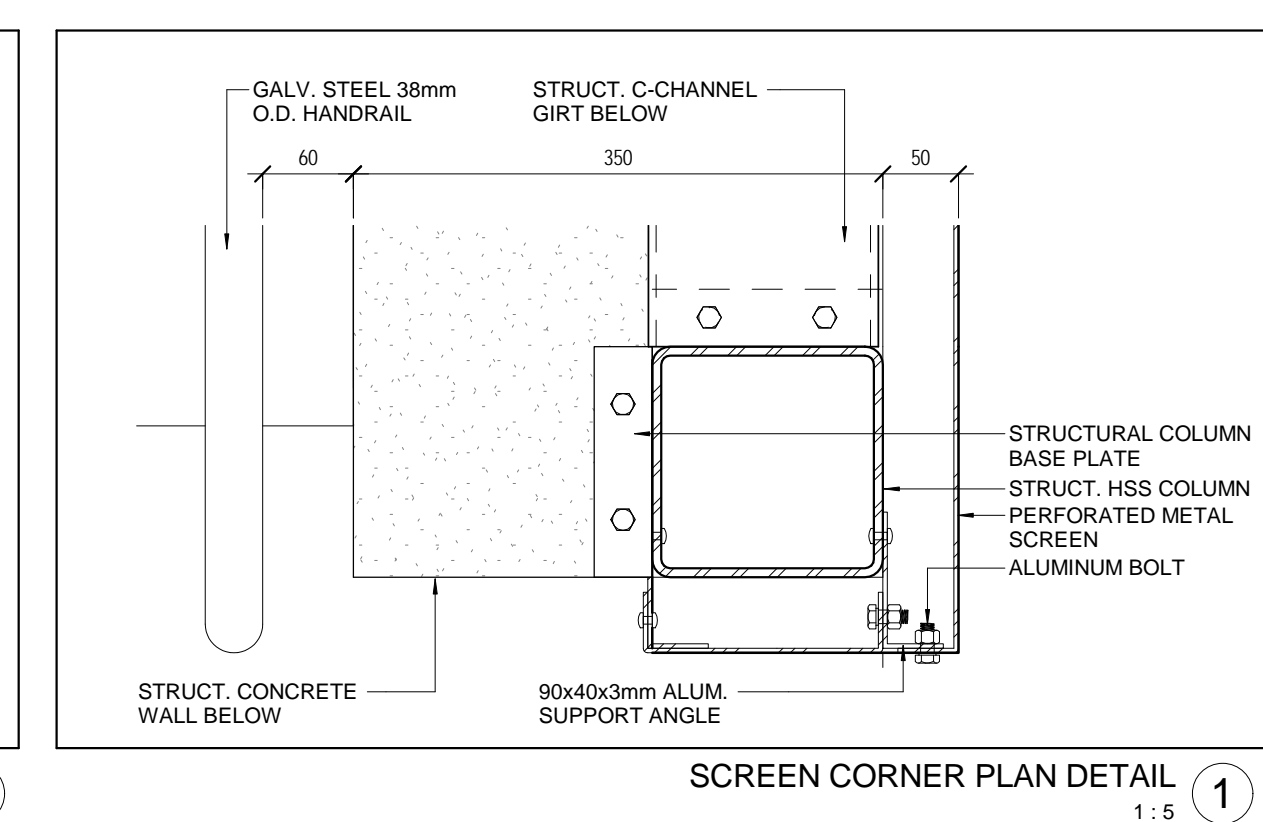
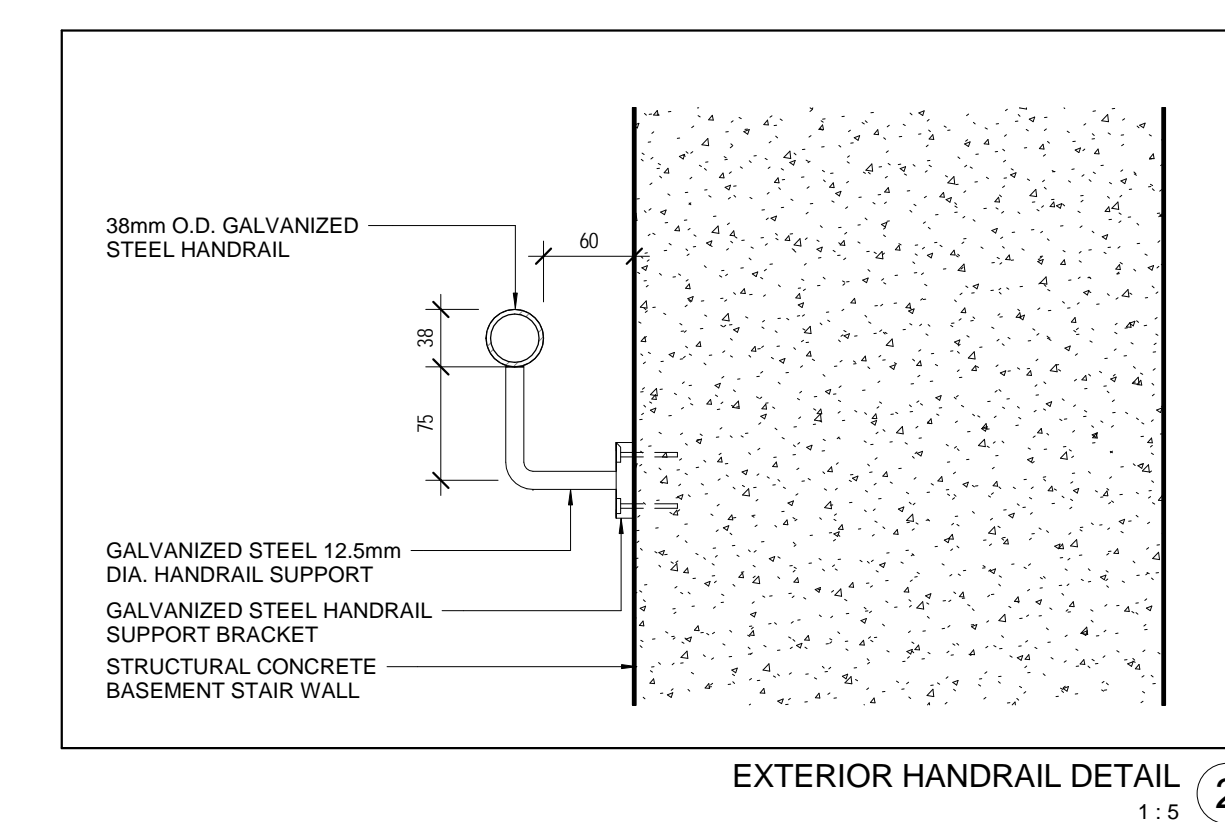
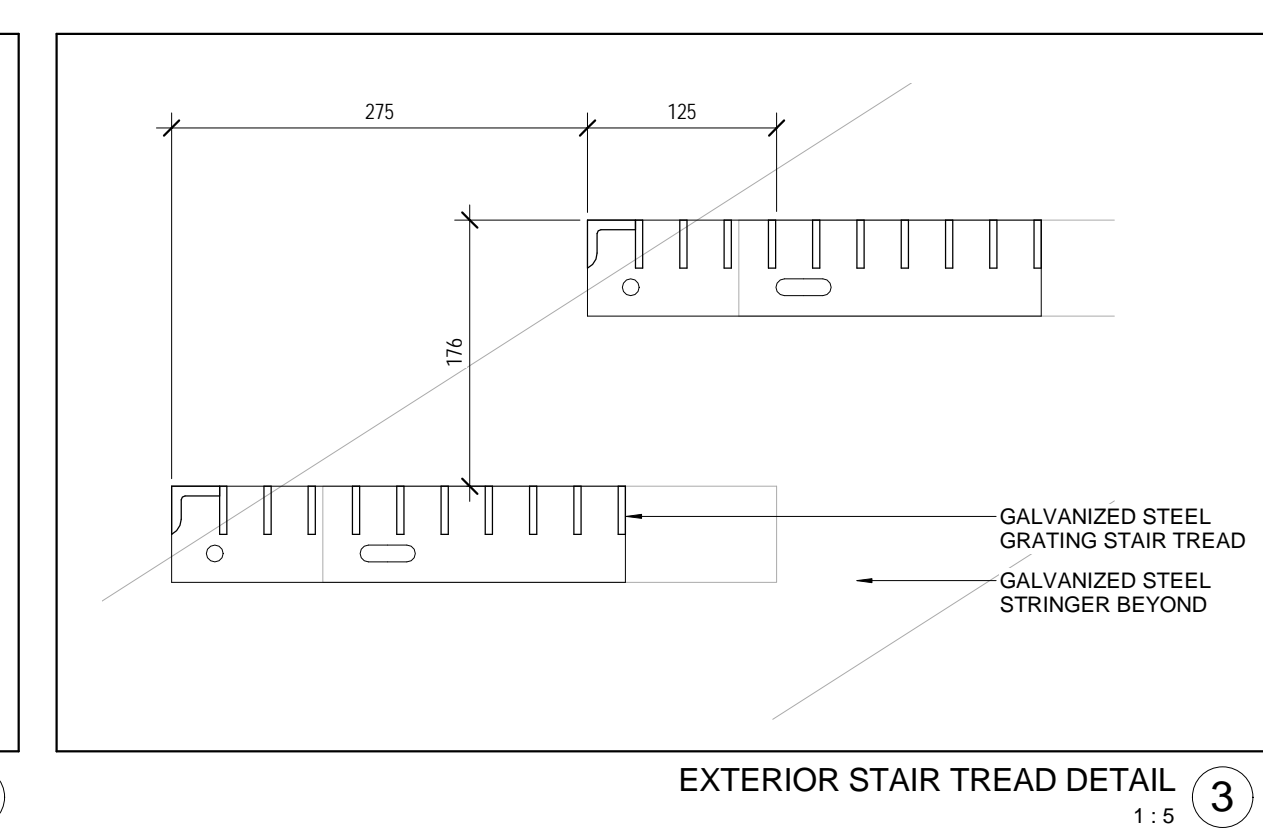
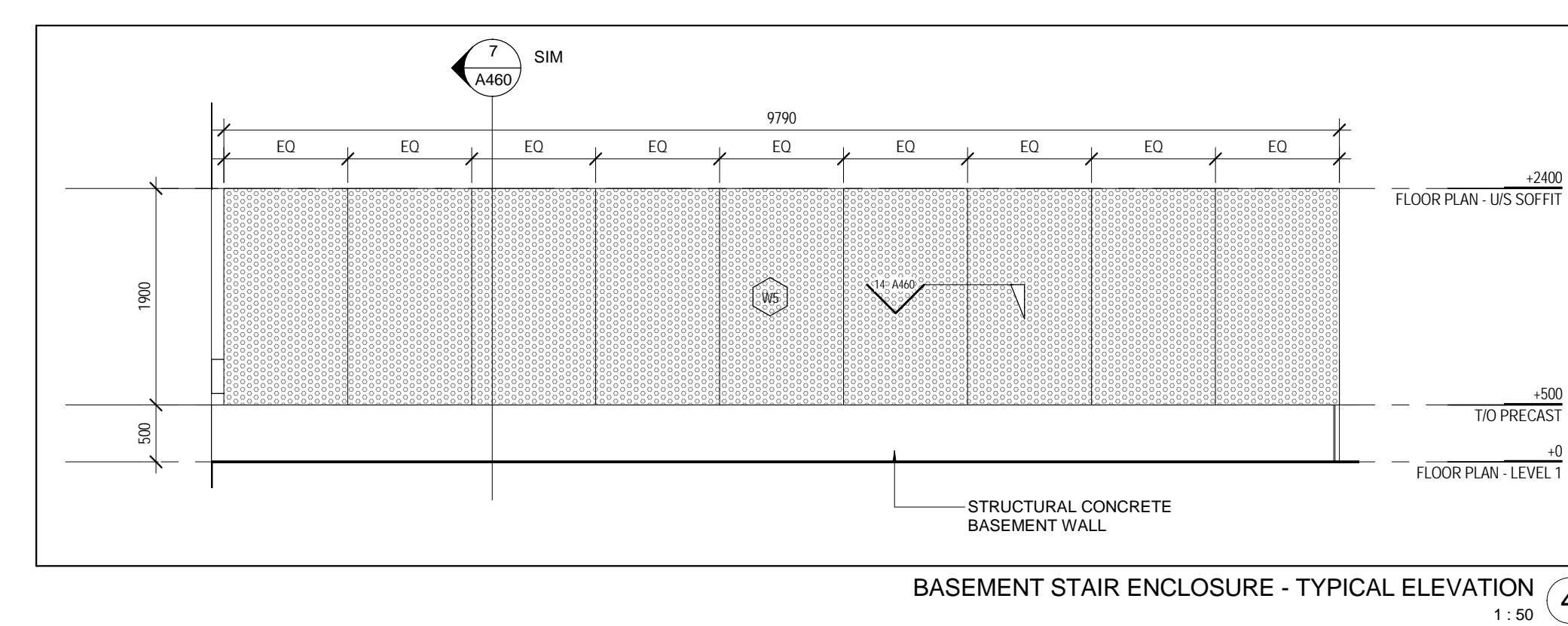
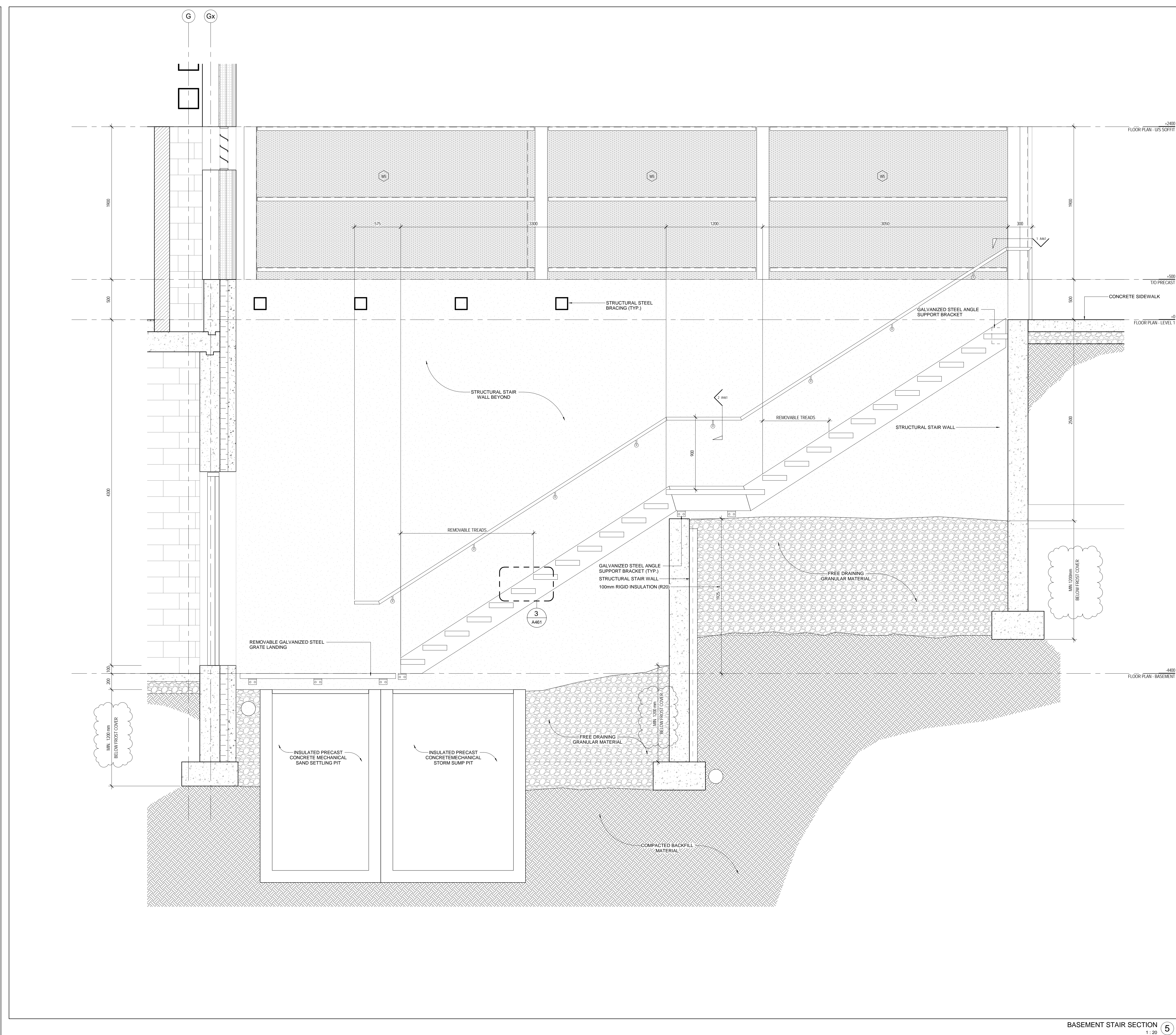
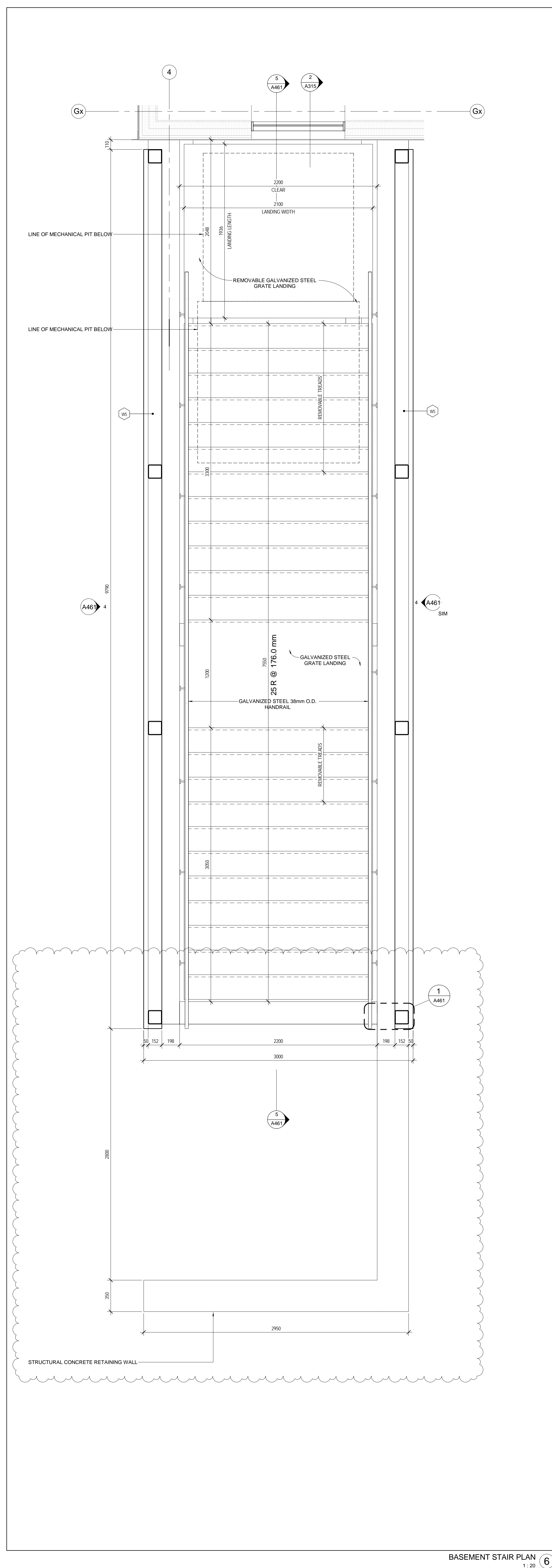
1.1 Bid Price

- .1 We, the undersigned, having examined the *Bid Documents* and addenda numbered _____ (inclusive), and having examined the *Place of the Work*, and examined conditions thereon that affect the *Work*, hereby accept and agree to enter into a *Contract* with the *Owner* to perform the *Work* required by the *Contract Documents* for the stipulated bid price of:

\$ _____ in Canadian dollars, excluding *Value Added Taxes*.
amount in figures

1.2 Declarations

- .1 We understand that the *Owner* will pay the *Value Added Taxes* payable with respect to the *Contract Price* and such is not included in the bid price.
- .2 We accept and agree to submit to the *Owner* required bonds and proofs of insurance specified in the conditions of the *Contract*, and as described in the *Bid Documents*, and to execute the *Contract* within 2 weeks from the date of notification of acceptance of this bid. We understand and agree that the submittal, by us, to the *Owner* of the required bonds and proofs of insurance, within 7 days after receipt of notification of conditional award, will be a condition of the final award of the *Contract* to us by the *Owner*, to the extent permitted by any other conditions contained in the notice of conditional acceptance.



Contractor must check and verify all dimensions on the job, and report any discrepancies to the Architect before proceeding with the work.


Do not scale this drawing.

[illegible]

MJMA

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CAMPBELL COMEAU ENGINEERING LTD.
STRUCTURAL ENGINEERS
 2719 GLADSTONE STREET, SUITE 110
 HALIFAX NS, B3K 4W6
 T: 902 429 5454 F: 902 444 3099

Smith + Andersen
MECHANICAL ENGINEERS
500-4211 Yonge Street
Toronto, Ontario, M2P 2A9
T: 416 487 8151 F: 416 487 9104

Smith + Andersen
ELECTRICAL ENGINEERS
1969 Upper Water Street, Suite 1905
Halifax, Nova Scotia, B3J 3R7
T: 902 440 0981 F: 416 487 9104

Strum Consulting
CIVIL ENGINEERS
Railside, 1355 Bedford Highway
Bedford, NS B4A 1C5
T: 902 835 5560 F: 902 835 5574



EAST HANTS
We live it!

Municipality of East Hants

Parks, Recreation and Culture
Lloyd E Matheson Centre
15 Commerce Court
Elmsdale, NS B2S 3K5
T: 902 883-7098

KEY PLAN

NORTH ARROW

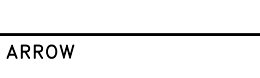


Diagram illustrating the key plan of the site, showing the North Arrow and the layout of the site, including the 'TOTAL' and 'PROJECT' areas.



PROJECT TITLE
East Hants Aquatic Centre

Commerce Court, Elmsdale, NS

DRAWING TITLE
EXTERIOR BASEMENT STAIR
PLAN & DETAILS

SCALE
As indicated

DATE
2018-03-01

PROJECT NUMBER
1609

DRAWING NUMBER

A461

Structural Addendum S2

1. SPECIFICATIONS

1.1 No revisions issued.

2. DRAWINGS

2.1 Reference drawing S101 “NOTES AND TYPICAL DETAILS”:

- .1 Drawing S101 “NOTES AND TYPICAL DETAILS”, dated 2018-03-23 “Issued for Addendum No. 5” to replace and supersede drawing S101 “NOTES AND TYPICAL DETAILS”, dated 2018-03-09 “Issued for Addendum No. 2”. Changes include but not limited to:
 - .1 Addition of typical detail for containments curb, addition of note for minimum reinforcing in CMU walls
 - .2 Addition of note for CMU wall lateral support angles to be galvanized

2.2 Reference drawing S102 “GROUND FLOOR PLAN”:

- .1 Drawing S102 “GROUND FLOOR PLAN”, dated 2018-03-23 “Issued for Addendum No. 5” to replace and supersede drawing S102 “GROUND FLOOR PLAN”, dated 2018-03-09 “Issued for Addendum No. 2”. Changes include but not limited to:
 - .1 Addition of Section 136 – clarification on slab on grade to foundation wall transition detail.

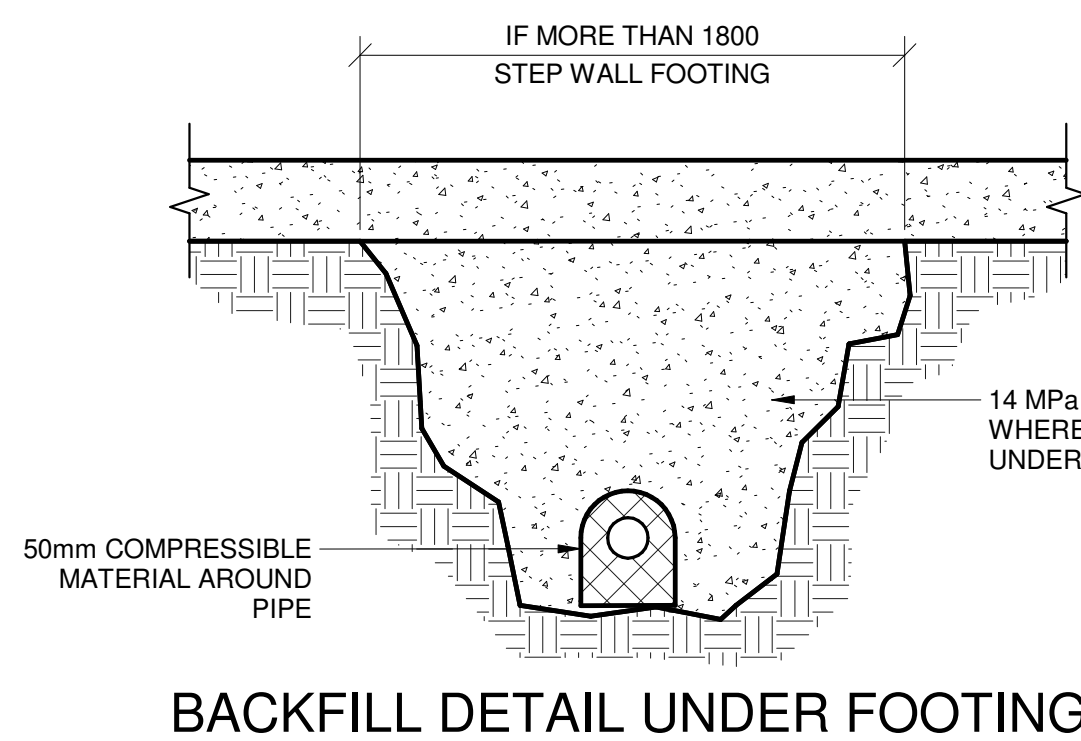
2.3 Reference drawing S103 “INTERMEDIATE AND ROOF FRAMING PLANS” (drawing not re-issued):

- .1 Reference Roof girders over the pool hall running east to west from gridline 3 to 7: The W1000x296 steel girder profile may be substituted for a W920x345 (x5 girders total).

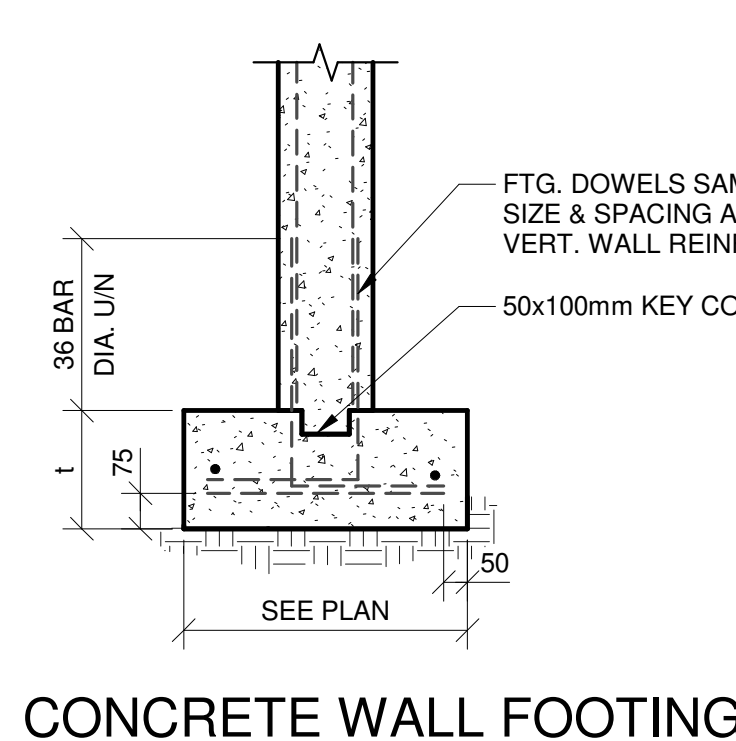
2.4 Reference drawing S200 “SECTIONS”:

- .1 Drawing S200 “SECTIONS”, dated 2018-03-23 “Issued for Addendum No. 5” to replace and supersede drawing S200 “SECTIONS”, dated 2018-03-09 “Issued for Addendum No. 2”. Changes include but not limited to:
 - .1 Addition of Section 136: Clarification on slab on grade to foundation wall transition detail.

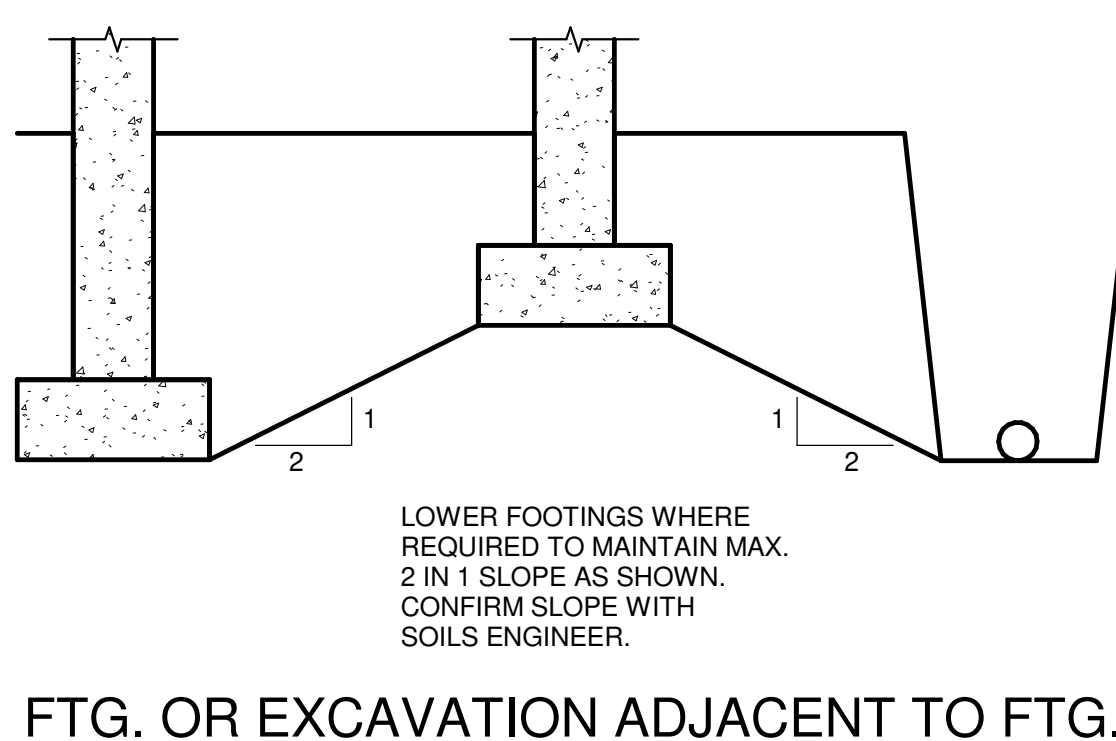
END OF STRUCTURAL ADDENDUM



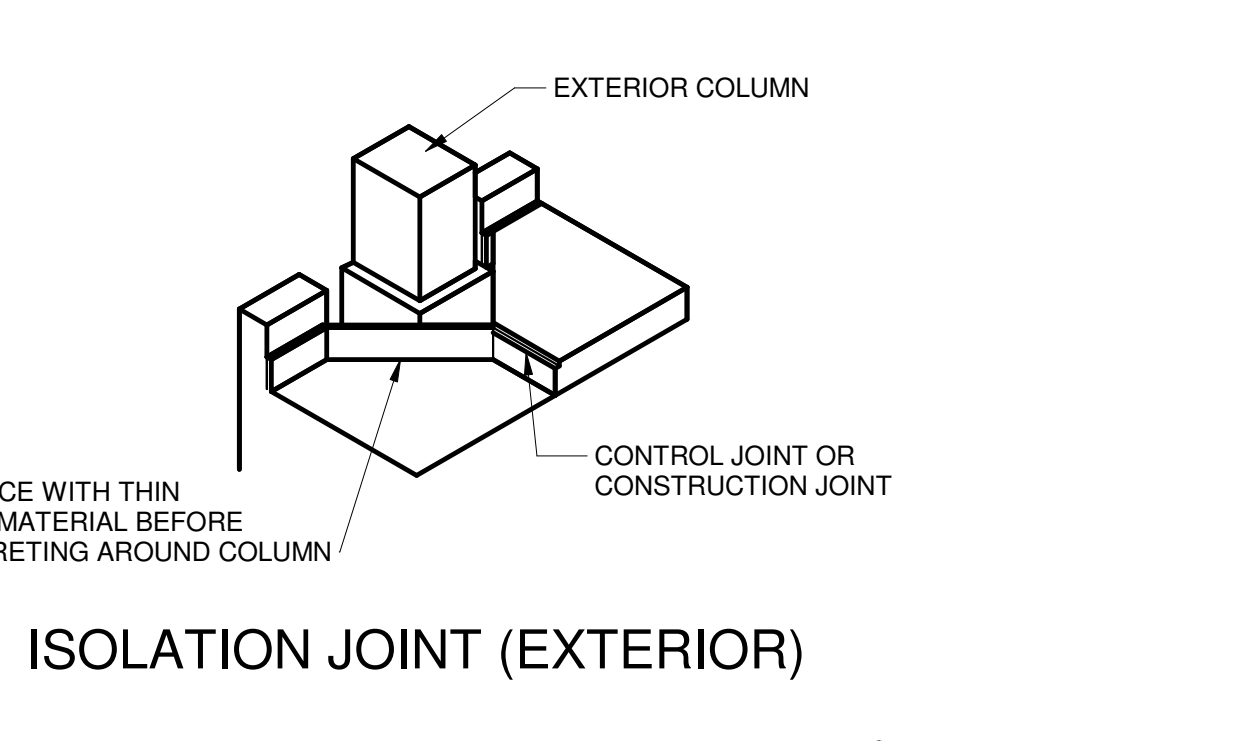
BACKFILL DETAIL UNDER FOOTING



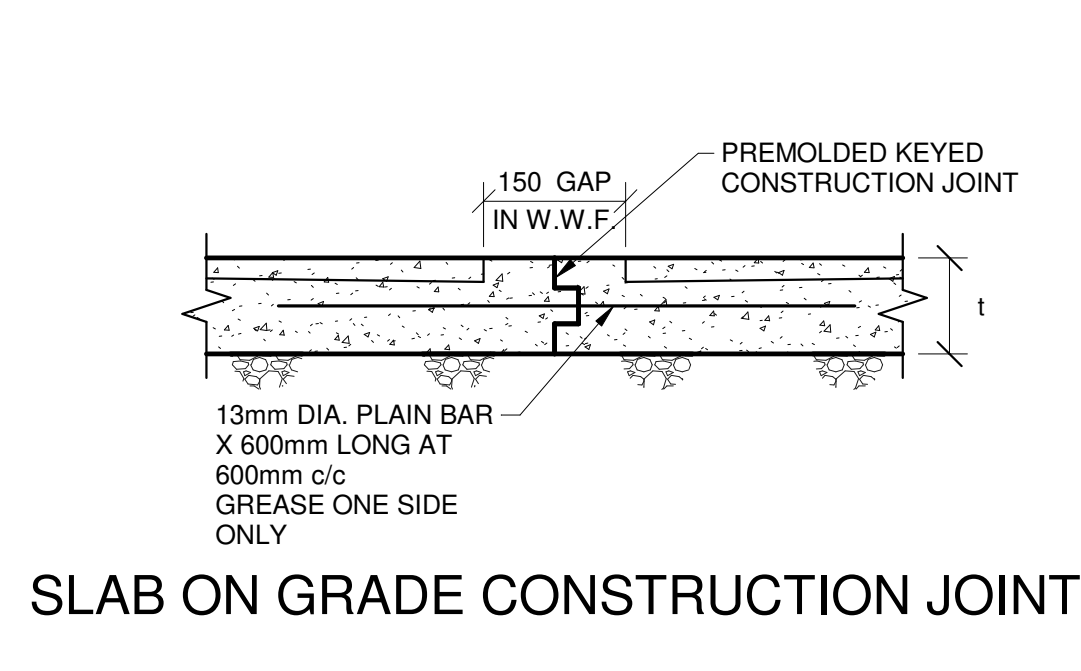
CONCRETE WALL FOOTING



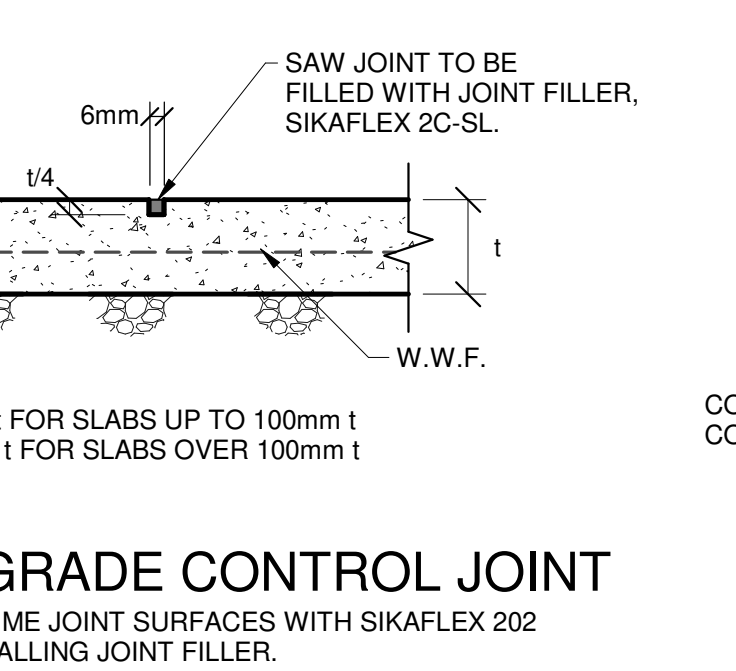
FTG. OR EXCAVATION ADJACENT TO FTG.



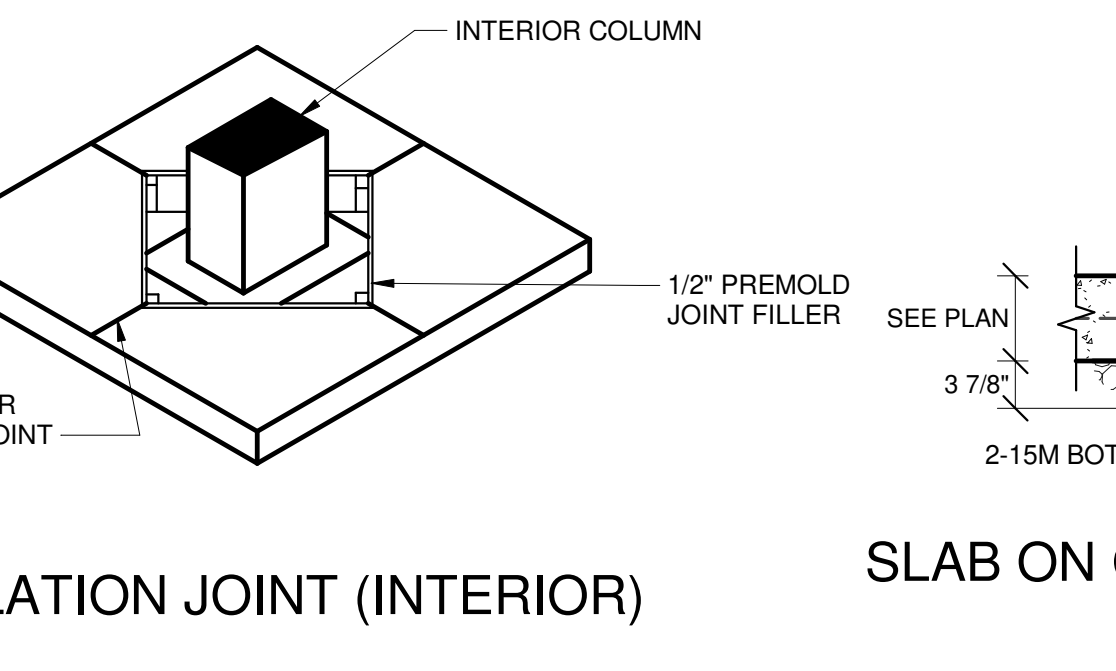
ISOLATION JOINT (EXTERIOR)



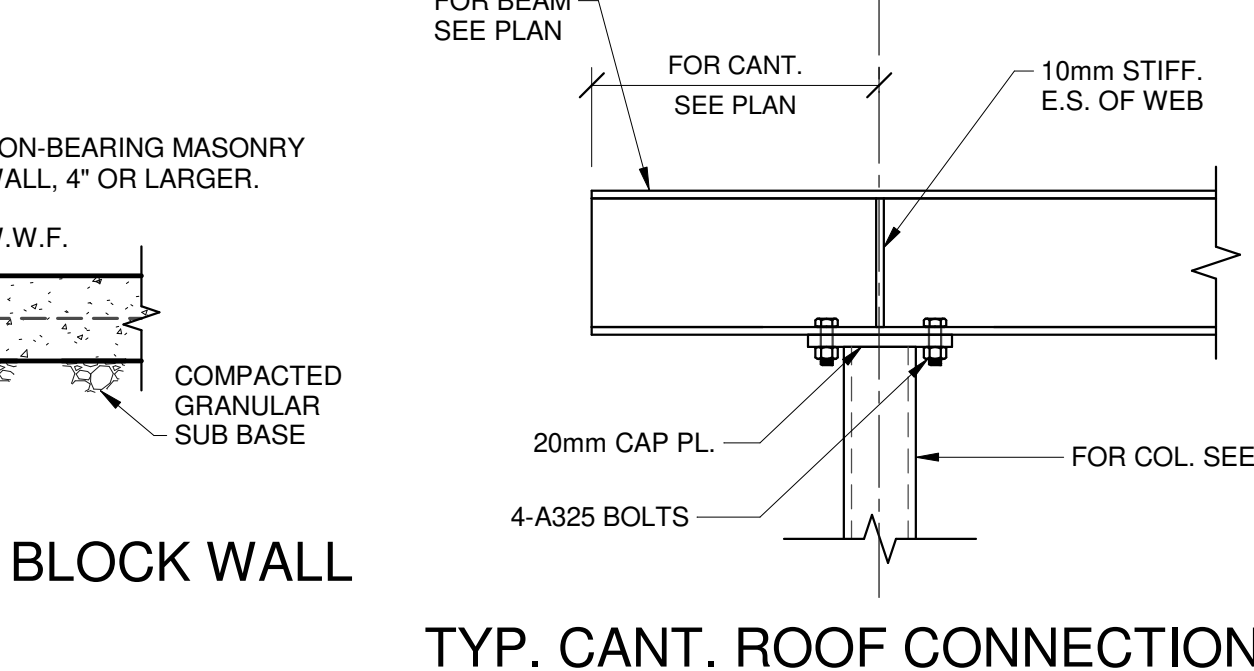
SLAB ON GRADE CONSTRUCTION JOINT



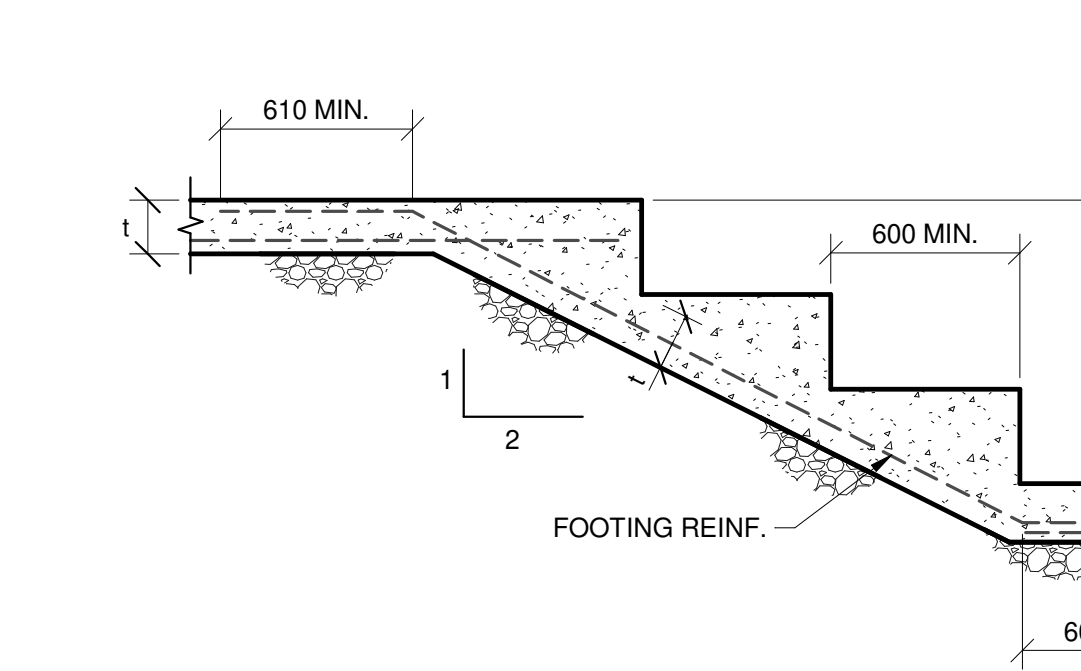
SLAB ON GRADE CONTROL JOINT



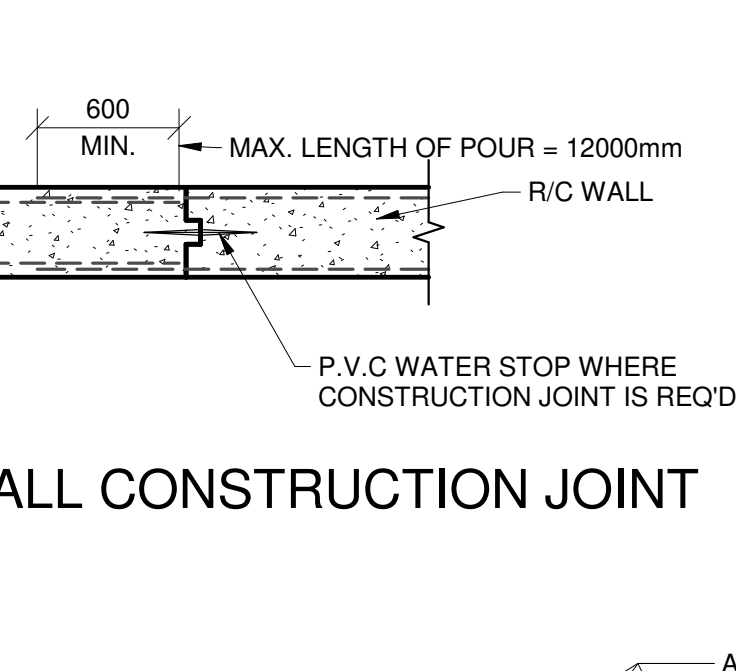
ISOLATION JOINT (INTERIOR)



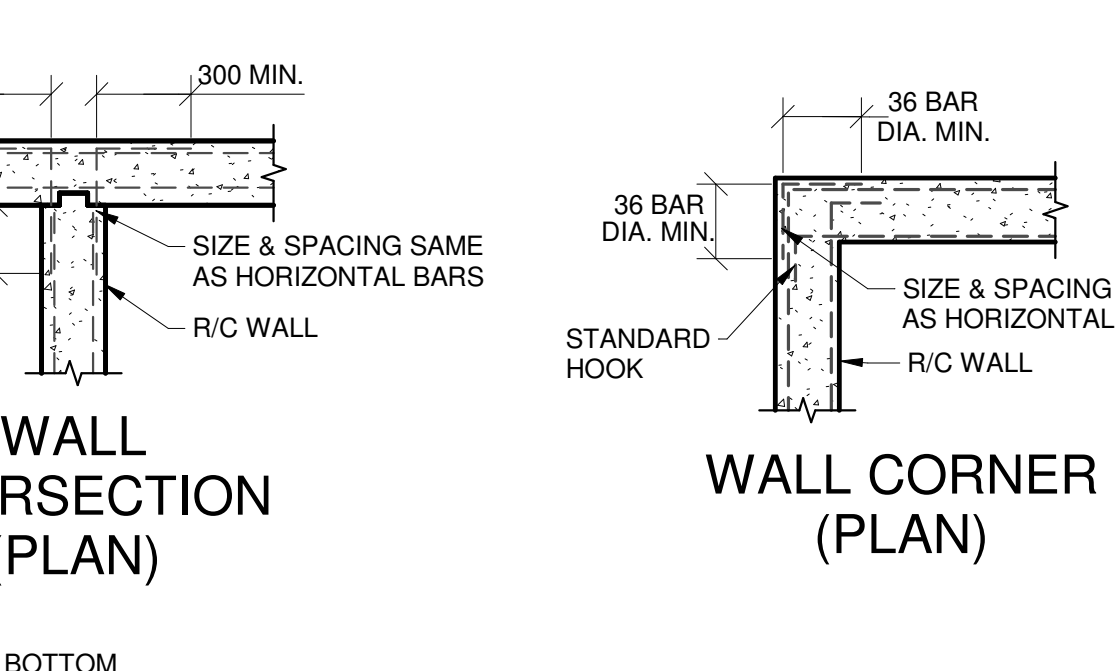
TYP. CANT. ROOF CONNECTION



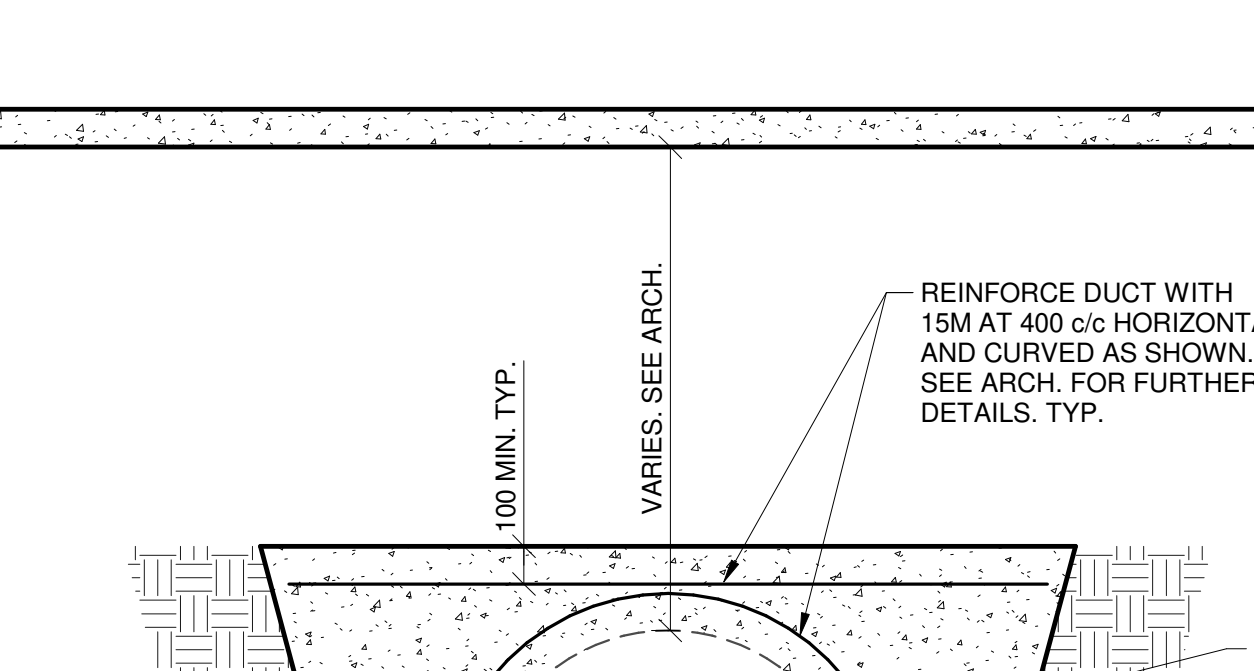
STEPPED FOOTING DETAIL



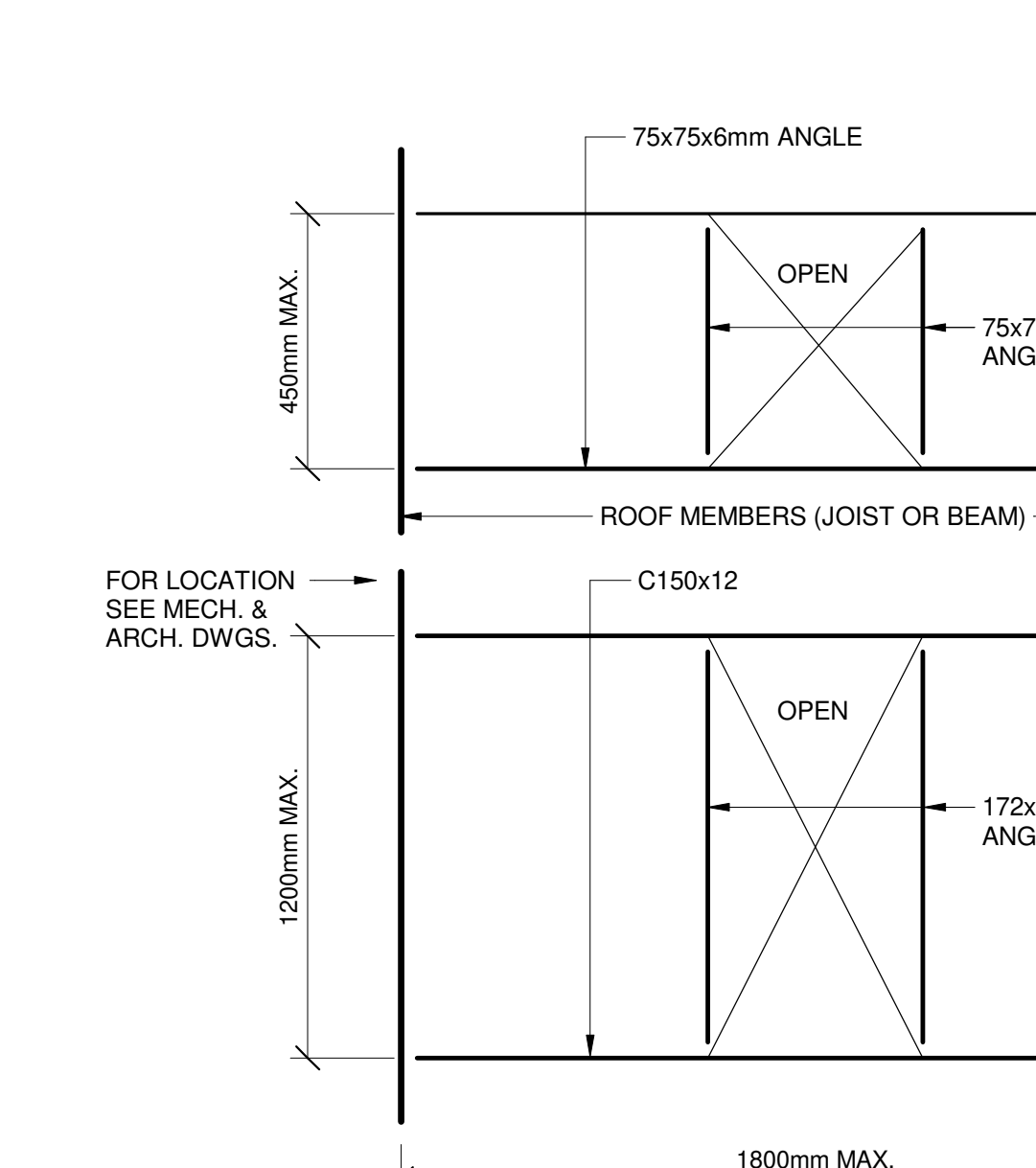
WALL CONSTRUCTION JOINT



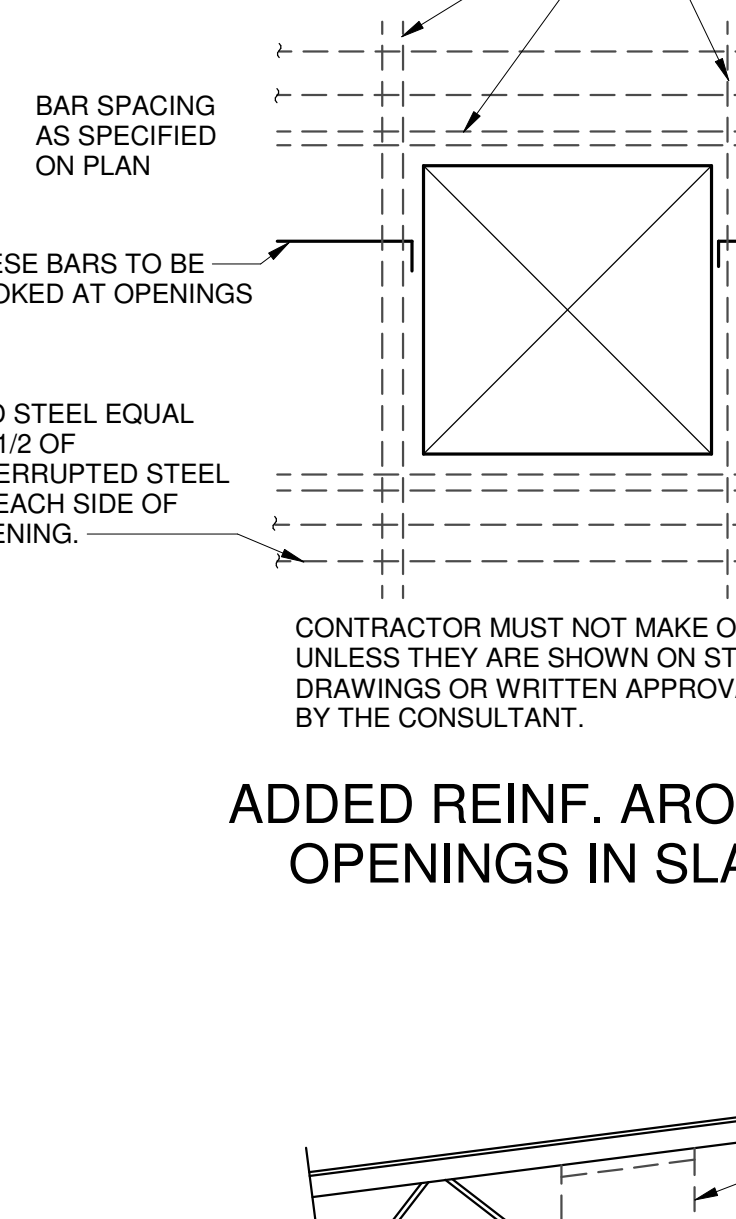
WALL INTERSECTION (PLAN)



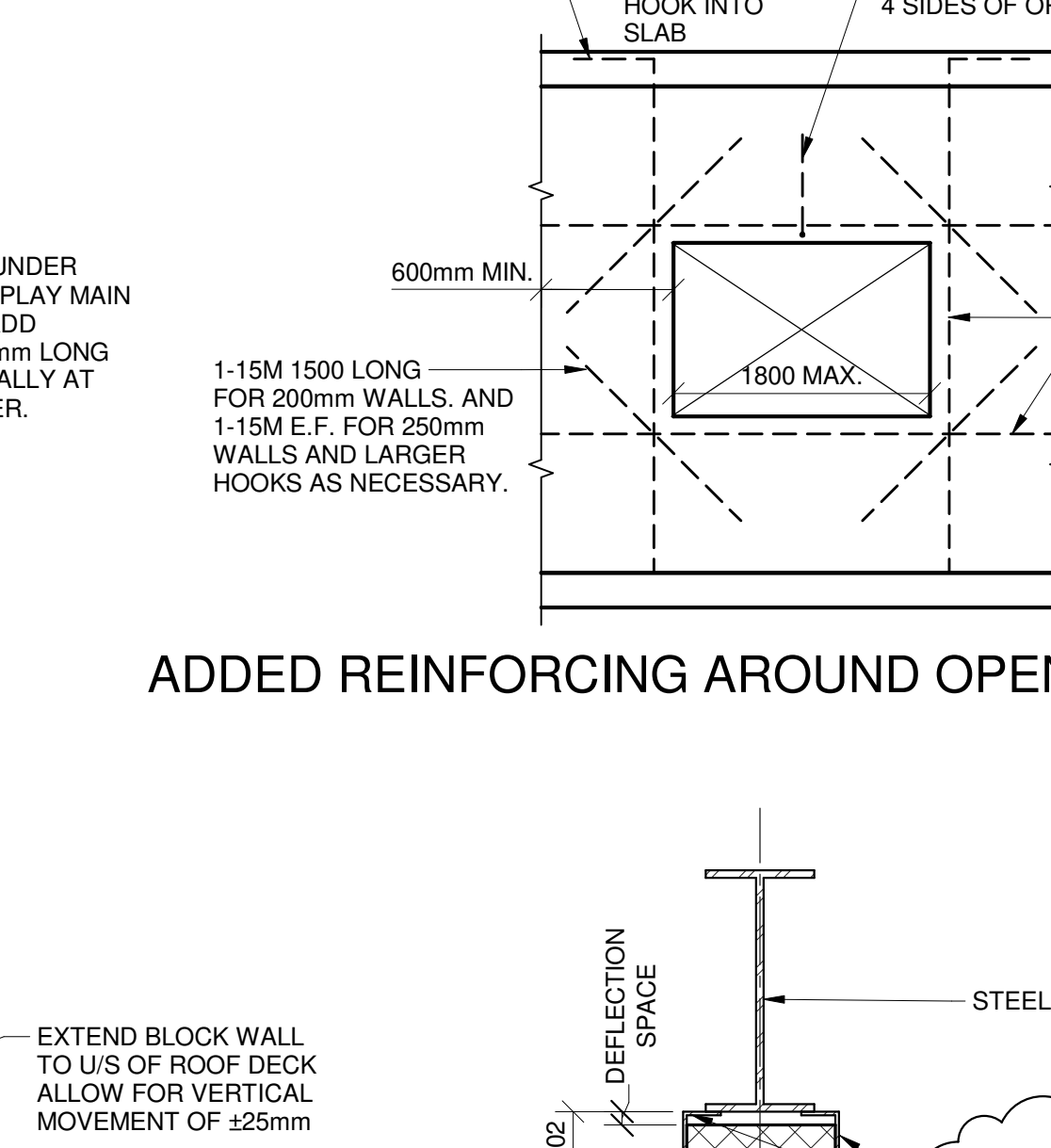
WALL CORNER (PLAN)



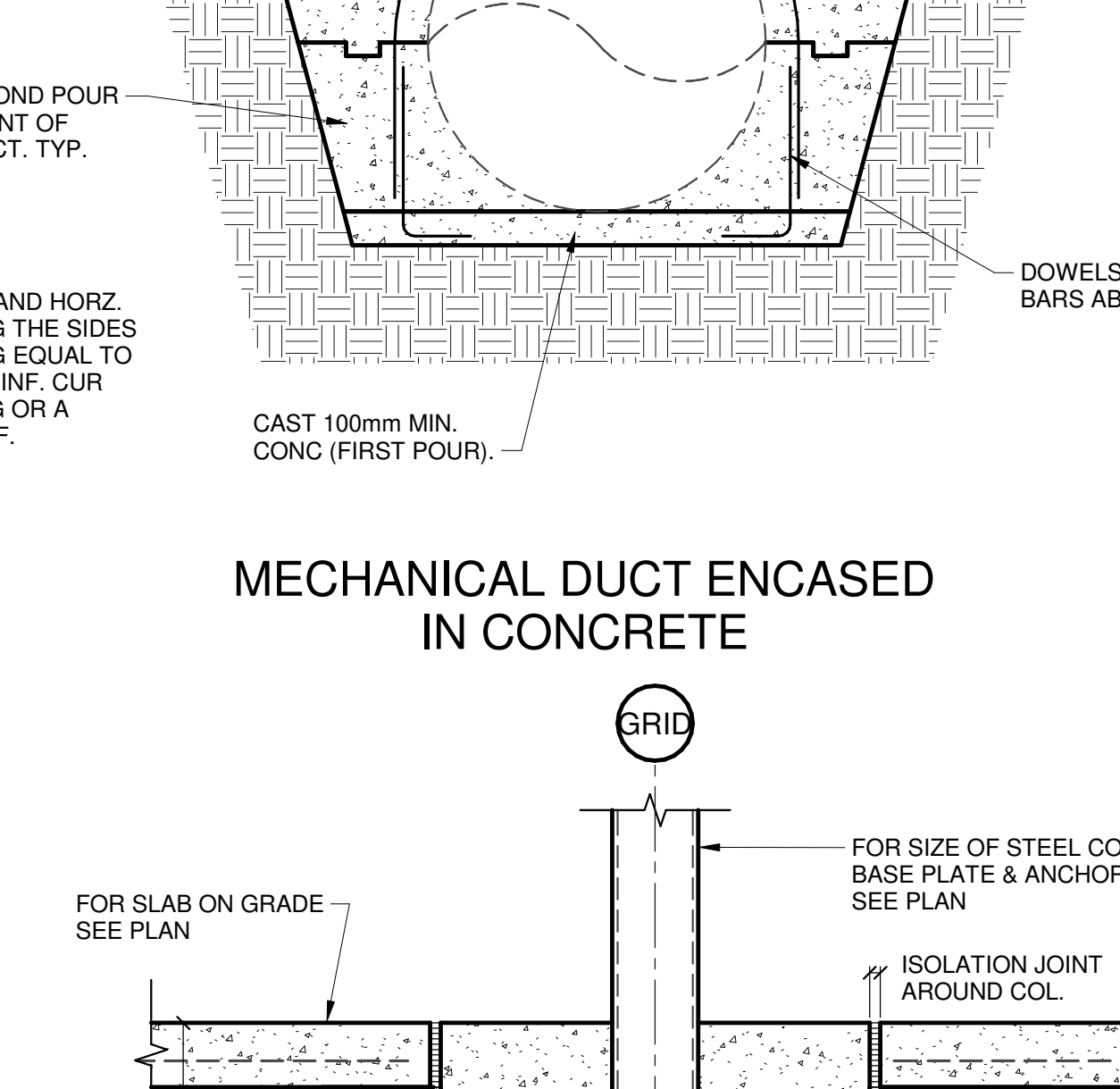
TYPICAL FRAMING AROUND ROOF OPENINGS



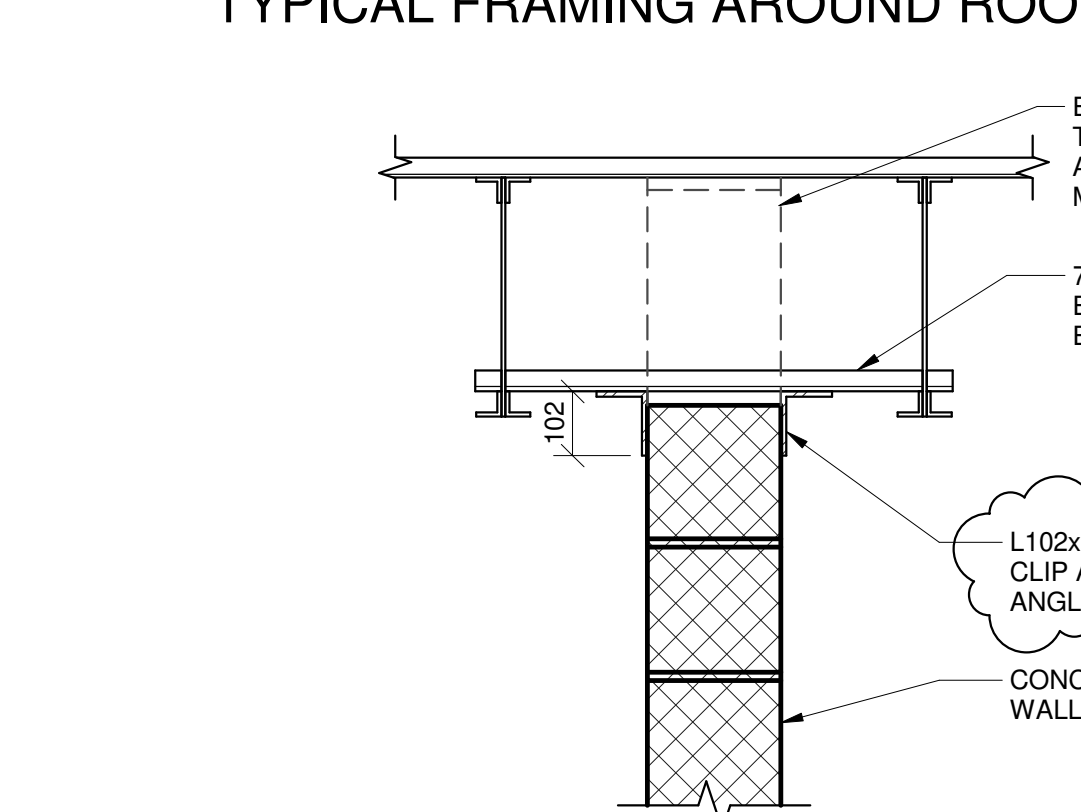
ADDED REINF. AROUND OPENINGS IN SLAB



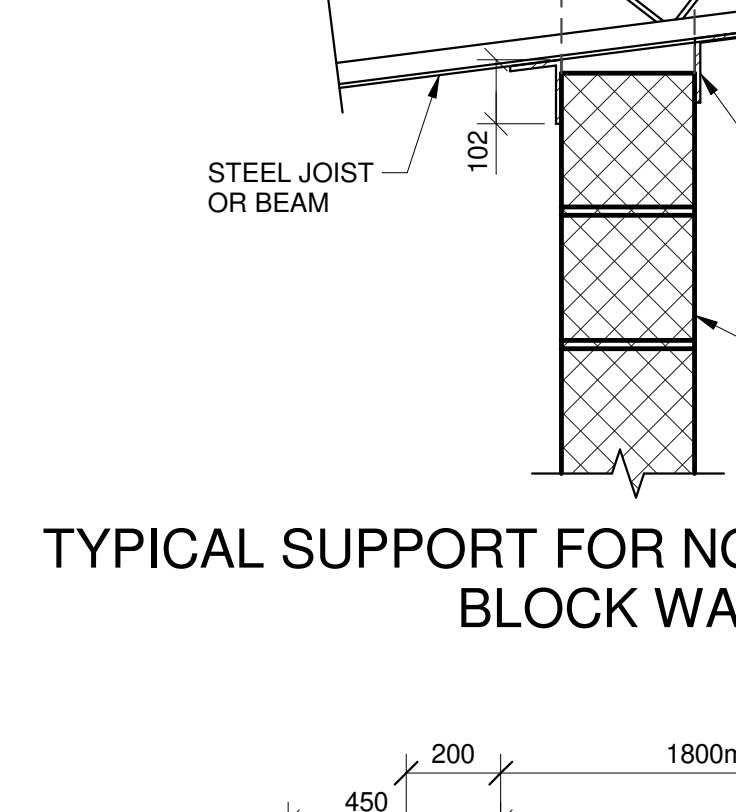
ADDED REINFORCING AROUND OPENINGS IN WALL



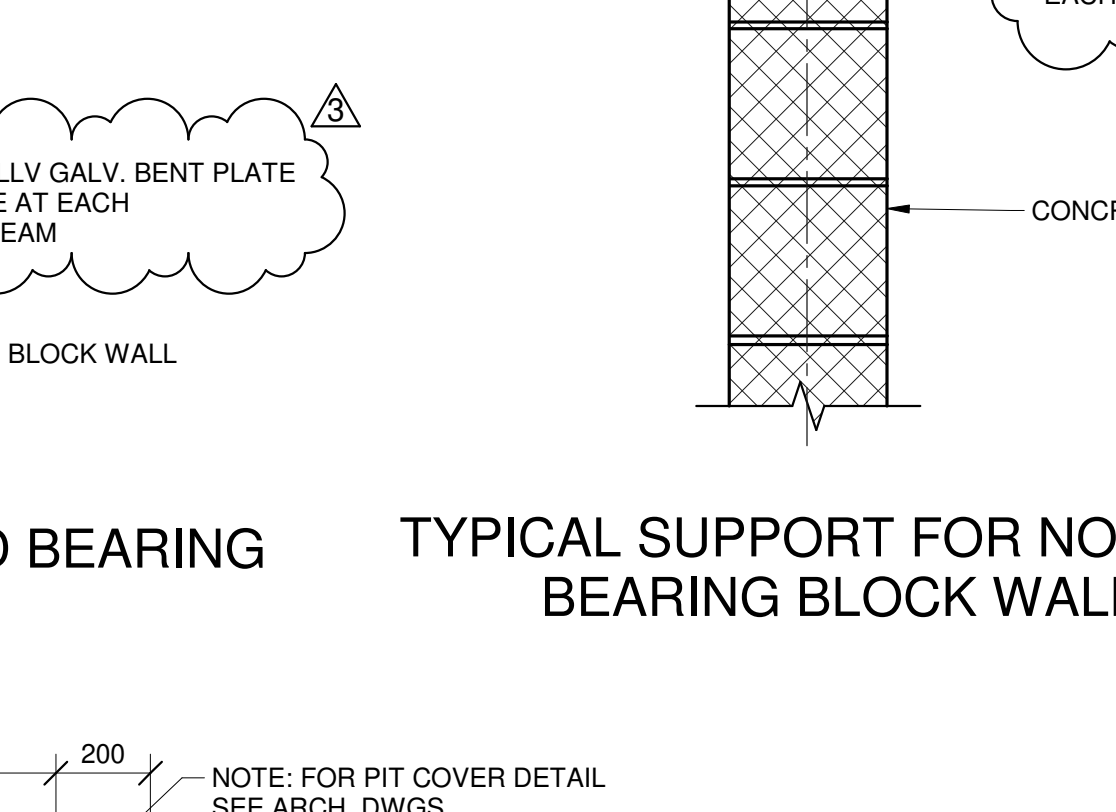
MECHANICAL DUCT ENCASED IN CONCRETE



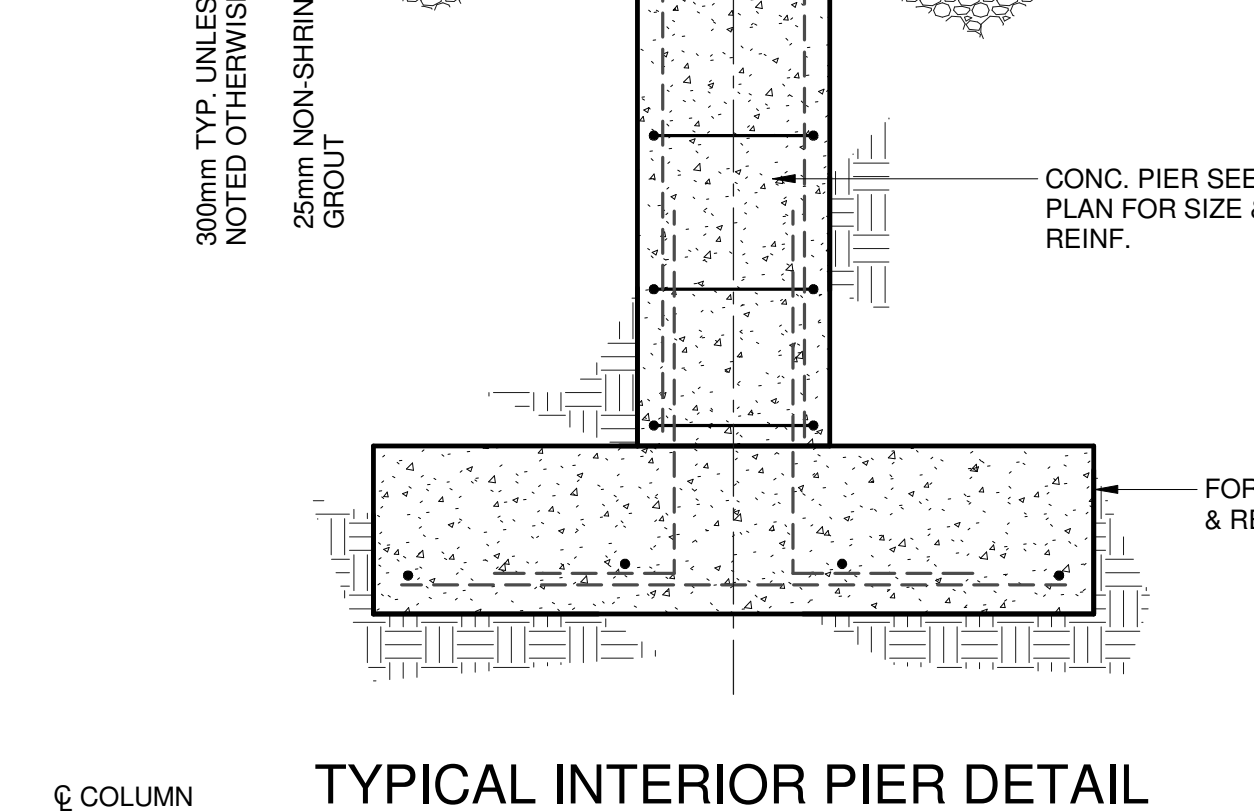
TYPICAL SUPPORT FOR NON LOAD BEARING BLOCK WALL



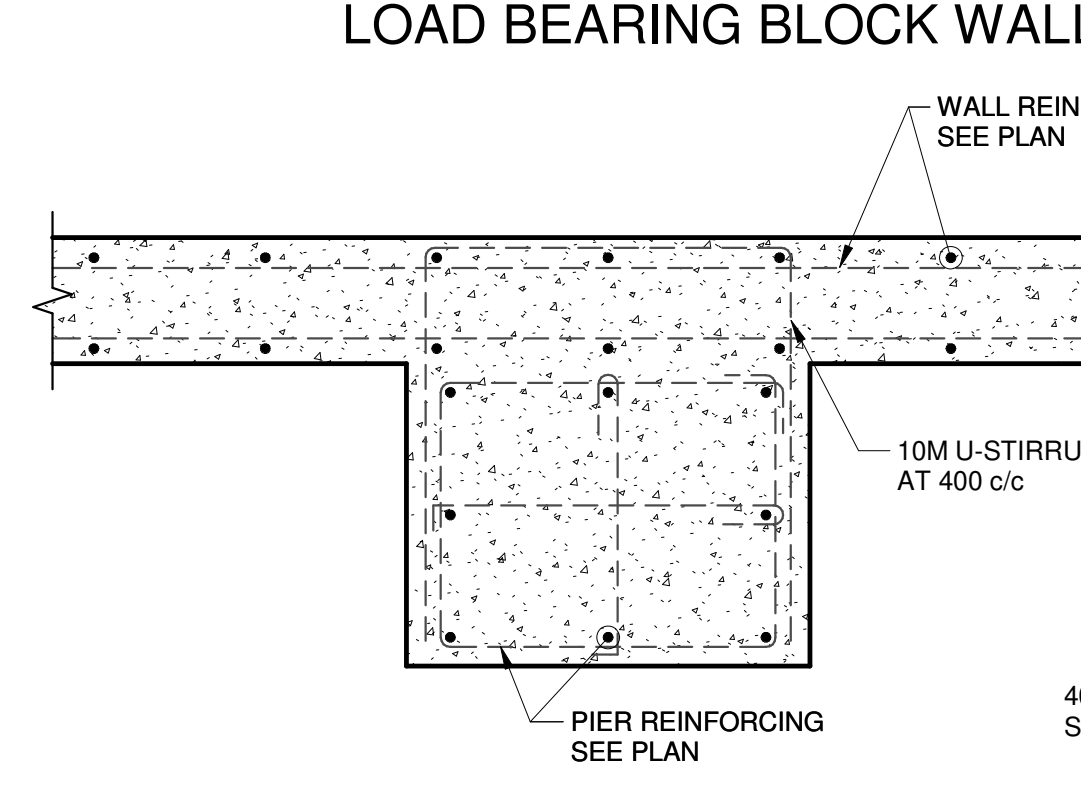
TYPICAL SUPPORT FOR NON LOAD BEARING BLOCK WALL



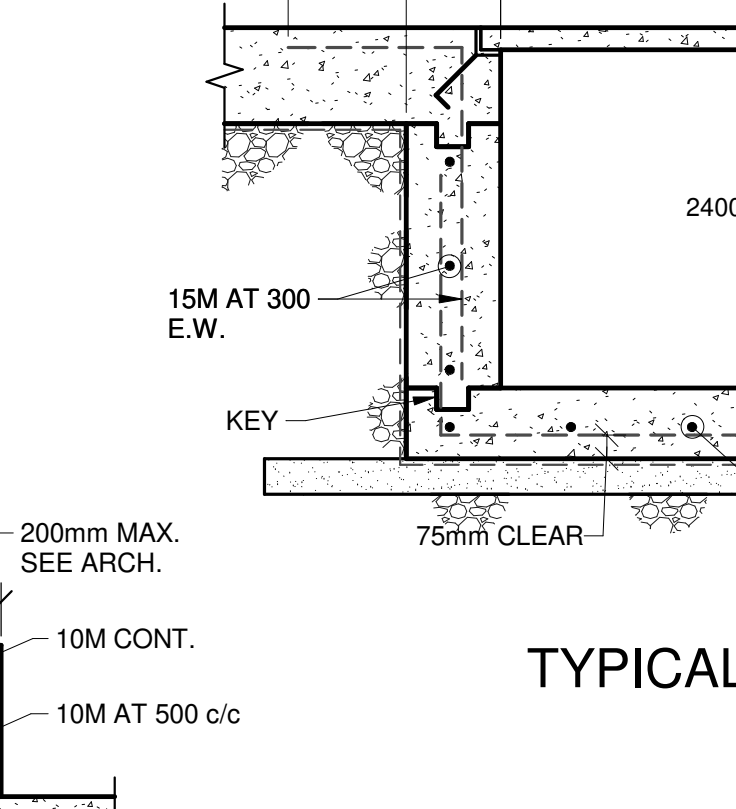
TYPICAL SUPPORT FOR NON LOAD BEARING BLOCK WALL



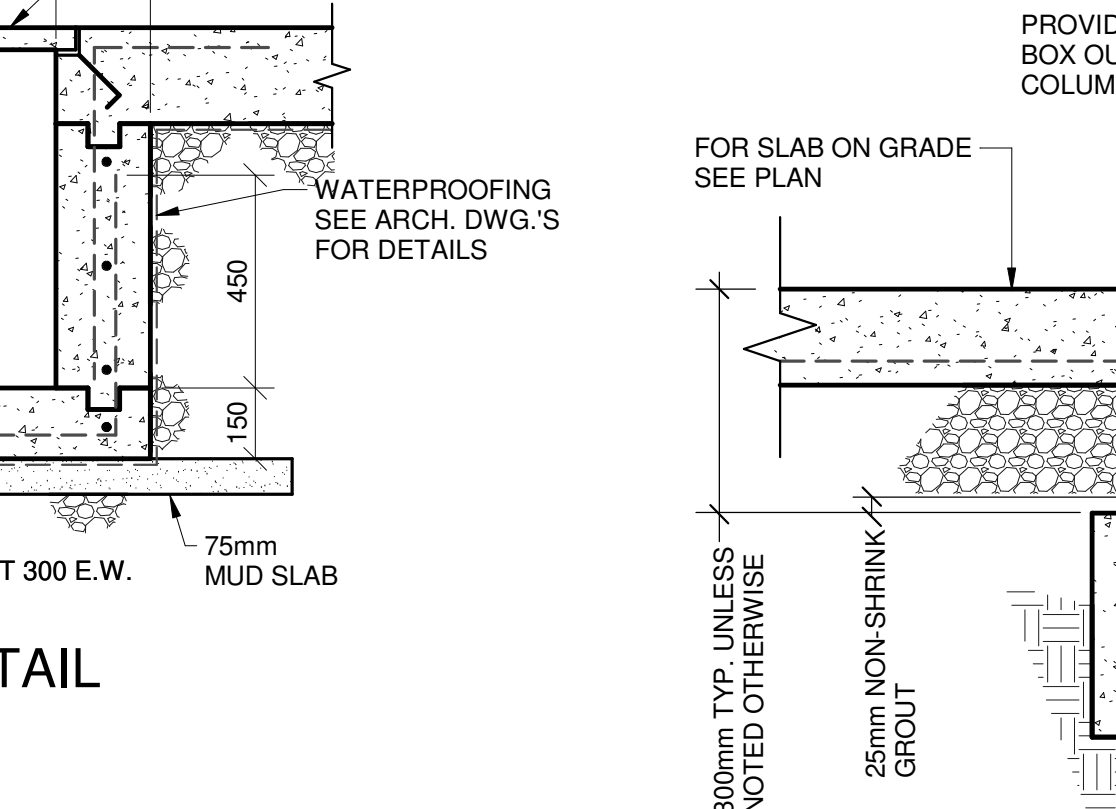
TYPICAL INTERIOR PIER DETAIL



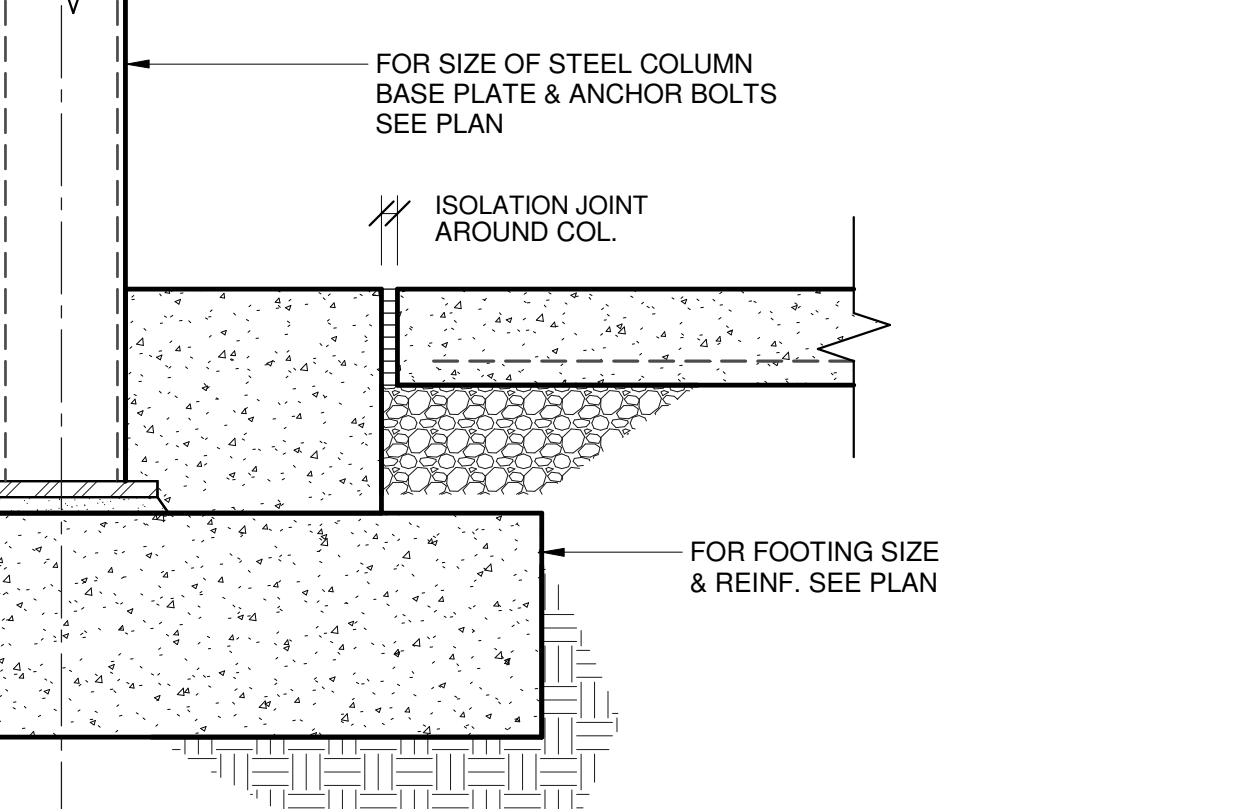
TYPICAL PIER/WALL DETAIL



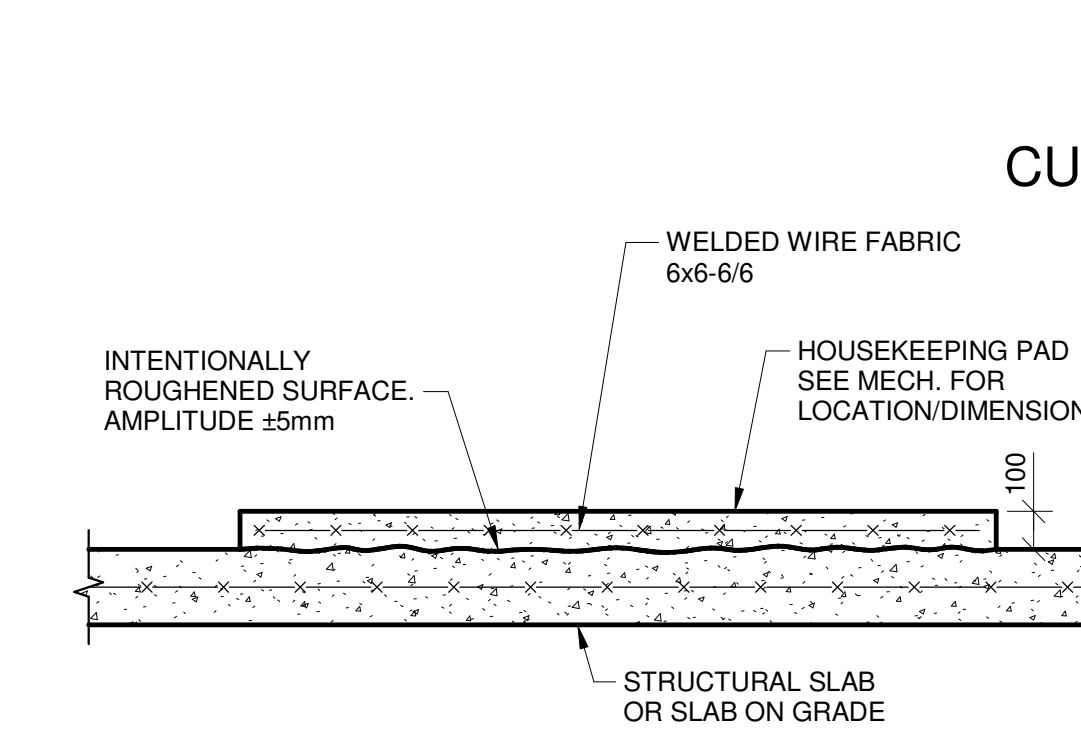
TYPICAL PIT DETAIL



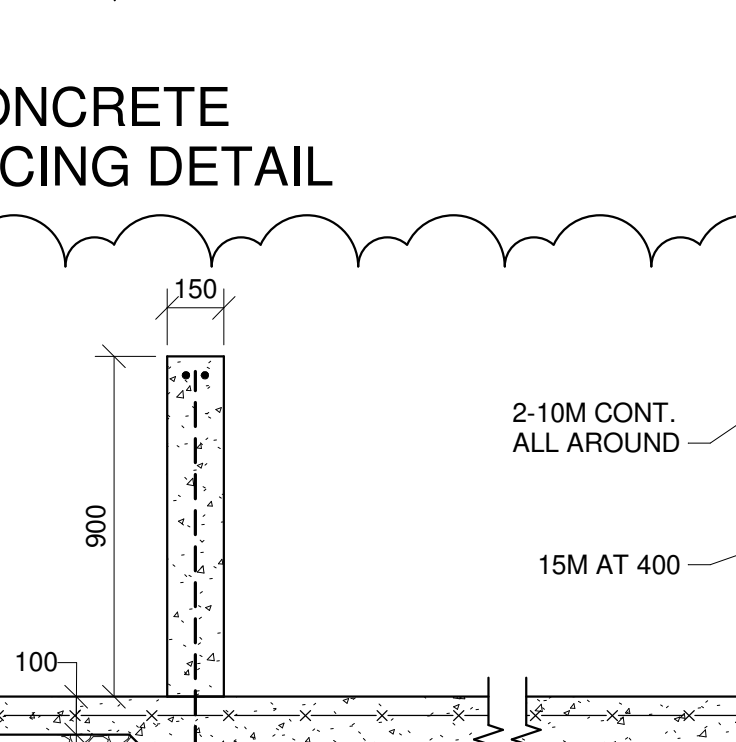
TYPICAL CONCRETE CURB REINFORCING DETAIL



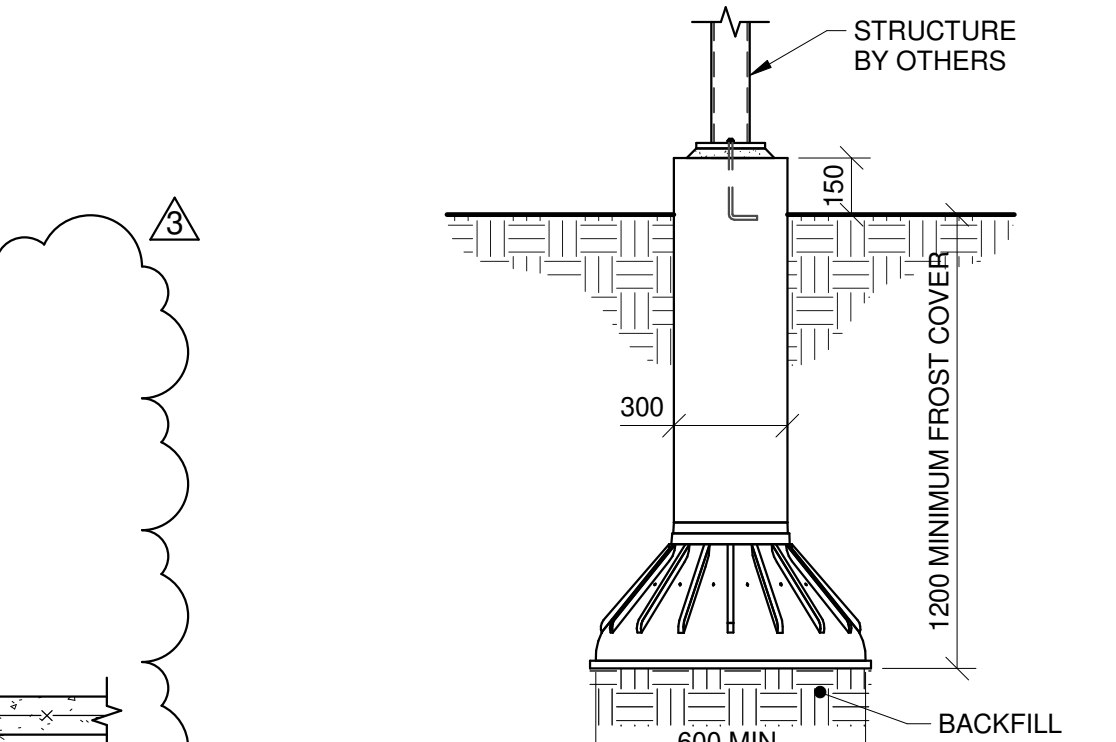
TYPICAL INTERIOR COLUMN DETAIL



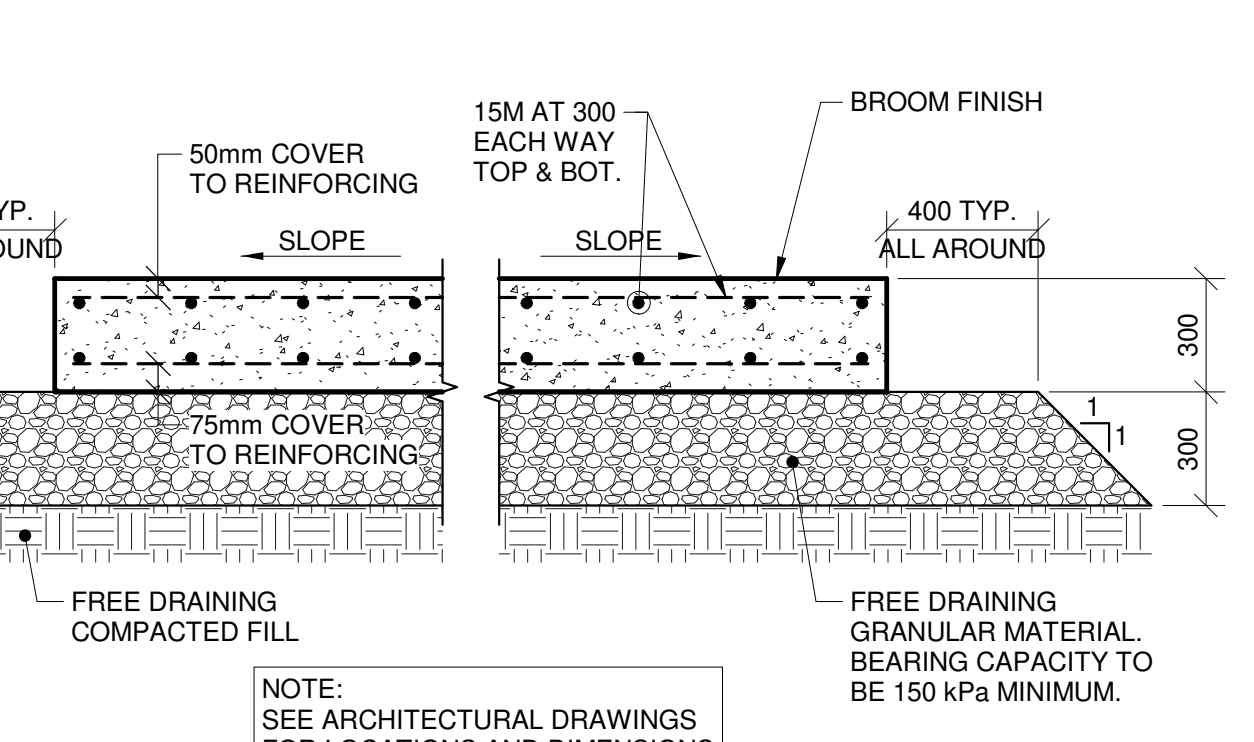
TYPICAL DETAIL - CONCRETE HOUSEKEEPING PAD



TYPICAL CONTAINMENT CURB DETAIL



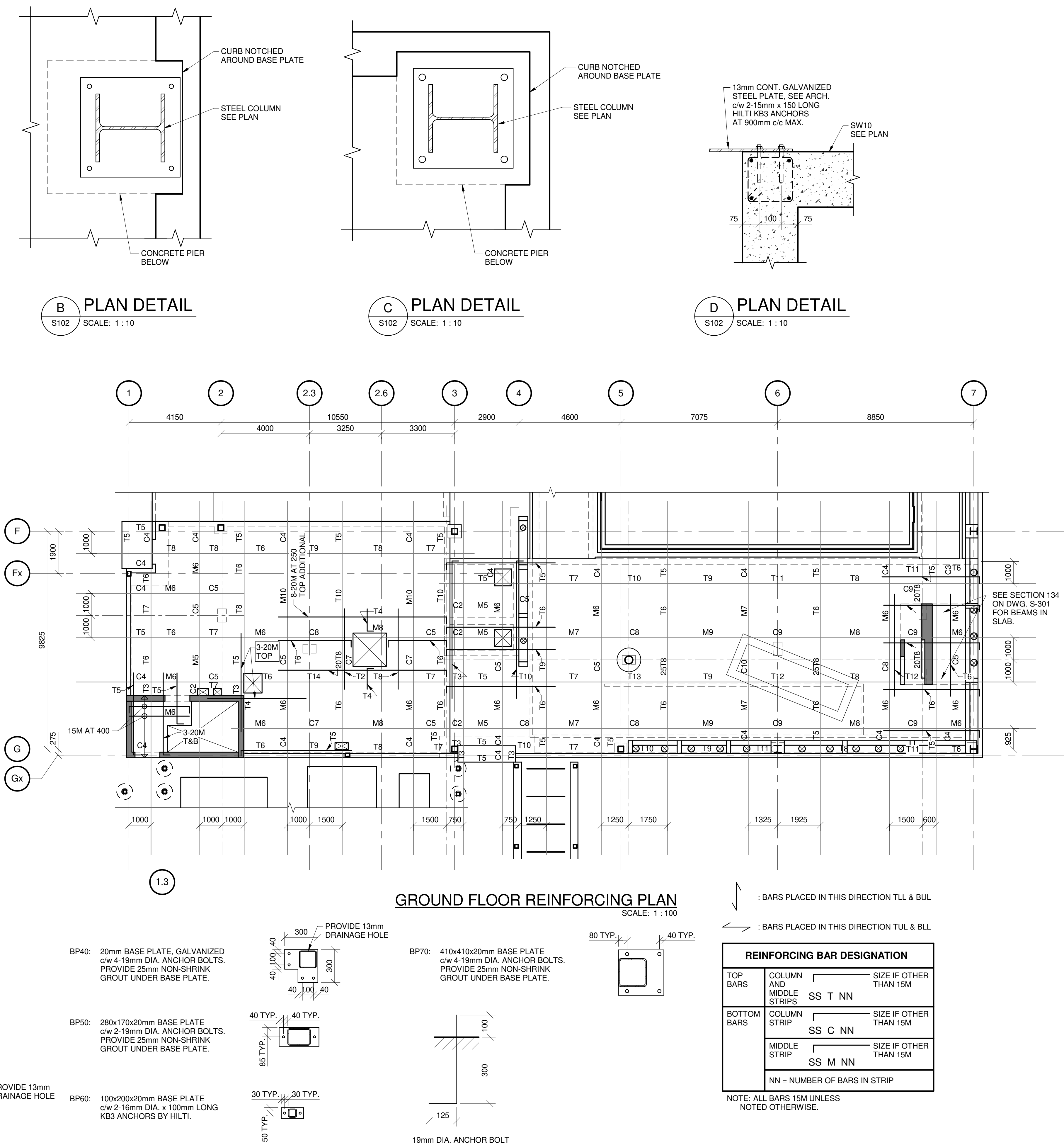
TYPICAL BIGFOOT FOOTING DETAIL



EXTERIOR CONCRETE PAD FOR EQUIPMENT

- GENERAL NOTES**
1. ALL WORK AND MATERIALS SHALL CONFORM TO THE REQUIREMENTS SET OUT IN THE 2010 NATIONAL BUILDING CODE OF CANADA.
 2. ALL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH THE NOVA SCOTIA OCCUPATIONAL HEALTH & SAFETY ACT.
 3. AUTOCAD DIGITAL FILES CAN BE DOWNLOADED FROM CAMPBELL COMEAU ENGINEERING LIMITED AND WILL BE PROVIDED AFTER OUR DATA USE AGREEMENT HAS BEEN COMPLETED. PLEASE NOTE A FEE OF \$230.00 WILL BE CHARGED FOR THIS SERVICE.
 4. ALL FOOTINGS TO BE PLACED ON UNDISTURBED SOIL OR STRUCTURAL BEDROCK. MINIMUM BEARING CAPACITY OF 150 KPa.
 5. ANY EXCAVATION IN PROXIMITY OF THE EXISTING FOOTINGS MUST BE APPROVED BY THE SOILS ENGINEER PRIOR TO COMMENCEMENT AND COMPLETED UNDER HIS CONTINUAL SUPERVISION.
 6. 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 POURING OF SLABS.
 7. BACKFILLING AGAINST WALLS ON ONE SIDE ONLY SHALL NOT BE STARTED UNTIL TEMPORARY BRACING OR FLOOR SLABS PROVIDING SUPPORT ARE IN PLACE AND SET.
 8. THE CONTRACTOR SHALL EXAMINE ALL DRAWINGS, CHECK ALL DIMENSIONS, AND REPORT ANY DISCREPANCIES BEFORE PROCEEDING WITH WORK.
 9. SOIL BEARING CAPACITY SHALL BE VERIFIED BY THE SOILS ENGINEER IN WRITING PRIOR TO POURING OF FOOTINGS.
 10. ALL DESIGN LOADS NOTED ON DRAWINGS ARE WORKING LOADS.
 11. 150mm PREMOULDED WATERSTOPS SHALL BE PLACED IN ALL EXPANSION, CONTRACTION AND CONSTRUCTION JOINTS AS SHOWN.
 12. ALL TRADES SHALL SUBMIT SHOP DRAWINGS STAMPED BY A PROFESSIONAL ENGINEER REGISTERED IN NOVA SCOTIA, PRIOR TO COMMENCEMENT OF FABRICATION.
 13. CONTRACTOR TO CONFIRM EXISTING STRUCTURE RELATED DIMENSIONS IN THE FIELD BEFORE PROCEEDING WITH THE WORK.

- FORMWORK NOTES**
1. DESIGN, CONSTRUCT AND REMOVE FORMWORK, FRAMING SUPPORTS AND BRACING TO CONFORM TO REQUIREMENTS SPECIFIED IN CSA-A23.1-14, AND CSA S289.1-1975, TO PROVIDE FINISHED POURED CONCRETE SURFACES WITHIN SPECIFIED TOLERANCES.
 2. ALLOWABLE TOLERANCES TO REQUIREMENTS OF CSA-A23.1-14, CHAMFER ALL EXTERNAL CORNERS EXPOSED TO VIEW.
 3. INSTALL ITEMS SUPPLIED BY OTHERS SUCH AS INSERTS, ANCHOR BOLTS, MISCELLANEOUS FRAMES, METAL FLASHING REGLETTS, HOLES, SLEEVES, LADDER RUNGS AND STEEL ANCHOR SLABS.
 4. DO NOT REMOVE FORMS OR SHORES, WITHOUT PRIOR APPROVAL OF THE ENGINEER.
 5. FORMS SHALL NOT BE REMOVED BEFORE THE CONCRETE HAS SET AND REACHED 70% OF ITS DESIGN STRENGTH.
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Halifax, Nova Scotia, B3J 3R7
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Strum Consulting
CIVIL ENGINEERS
Rattleside, 1355 Bedford Highway
Bedford, NS B4A 1C5
T: 902 835 5560 F: 902 835 5574



EAST HANTS
We live it!

Municipality of East Hants

Parks, Recreation and Culture
Lloyd E Matheson Centre
15 Commerce Court
Elmsdale, NS B2S 3K5
508-222-3333

KEYPLAN

NORTH ABBOT



PROJECT TITLE

EAST HANTS AQUATIC CENTRE

Commerce Court, Elmsdale, NS

DRAWING TITLE

GROUND FLOOR PLAN

SCALE

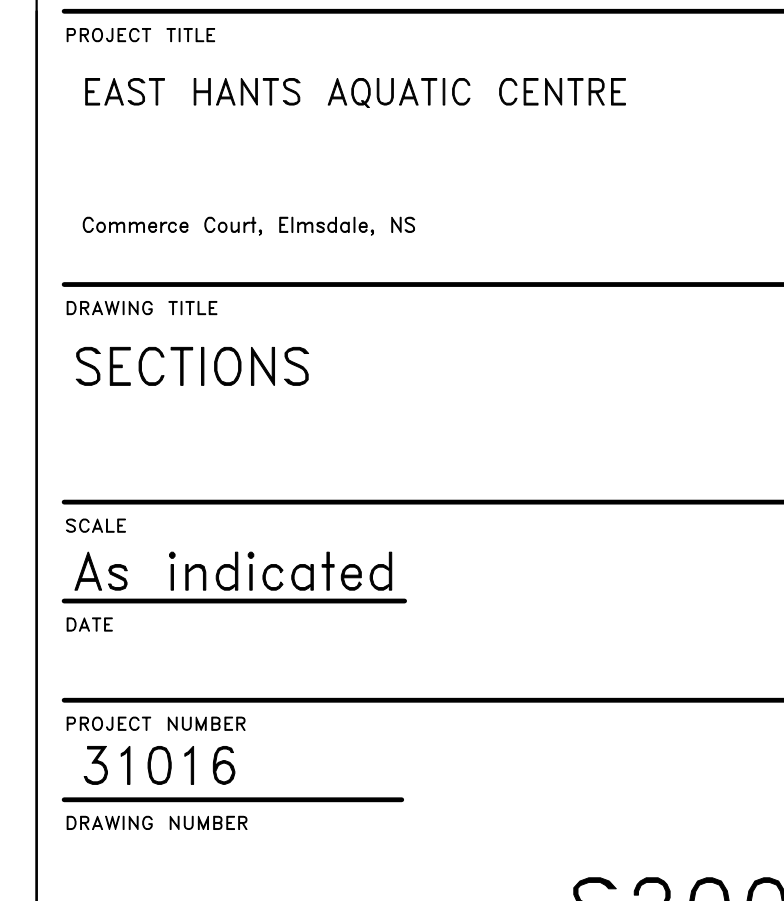
As indicated

PROJECT NUMBER

31016

DRAWING NUMBER

S102





Smith + Andersen

4211 Yonge Street Suite 500 Toronto Ontario M2P 2A9
416 487 8151 f 416 487 9104 smithandandersen.com

ADDENDUM

PROJECT NAME: East Hants Aquatic Centre

COMPANY: MJMA

ATTENTION: Andrew Filarski

PROJECT NO.: 17079.000.m.001

DATE: 2018-03-23

ADDENDUM NO.: M2

ISSUED BY: Syed Mateen

The following amendments are hereby made as part of the Contract Documents. The following revisions and/or additions shall be made to contract documents and the cost shall be included in the Tender Price.

1.0 SPECIFICATIONS

1.1 Section 21 05 00.00 General Instructions for Mechanical Sections (Not re-issued)

1.1.1 Item 2.2.6 shall be deleted.

1.1.2 Item 2.2.10 shall be deleted.

1.1.3 Item 3.1.7 shall be deleted.

1.2 Section 21 05 48.00 Vibration and Noise Control (Not re-issued)

1.2.1 Item 1.13 shall be deleted.

1.3 Section 21 42 00.00 Fixtures and Trim (Not re-issued)

1.3.1 Item 2.7.2 shall read as "Eyewash units shown as EW-1 shall be Guardian #G1778, right hand 90 deg. Swing-down, Wall Mounted polished chrome plated brass construction, eye/face wash, two (2) FS-Plus spray heads with fliptop dust cover and filter, furnished with in-line strainer to protect valve and spray heads from debris in water line, AutoFlow swing-down activation, 1/2" (13 mm) IPS plug-type valve with Teflon coated O-ring seals, Type 316 stainless steel valve housing (mount housing on wall using anchors or other mounting hardware) - Unit is third party certified by IAPMO to meet ANSI Z358.1-2014, the Uniform Plumbing Code cUPC and the National Plumbing Code of Canada. Eyewash/Facewash fixture should be installed 4 to 10 feet from the mixing valve. Provide shut-offs at emergency mixing valve.

- .1 For Emergency Thermostatic Mixing Valve, Lawler model # 911E/F lead-free brass and stainless steel design, vandal-resistant temperature adjustment, stainless steel sliding piston control device allow cold flow through both the fixed and variable bypass, 13 mm (1/2") N.P.T. Outlet, positive hot water shut-off, liquid-filled thermostatic motor control mechanism, 29 °C (84.2 °F) factory set temperature, standard 69.8 °F (21 °C) - 89.6 °F (32 °C) temperature range, 26

LPM (6.9 GPM) flow capacity at 30 psi (207 kPa) pressure drop across the valve, 7.57 LPM (2.0 GPM) min. Flow rate, 18 LPM (4.8 GPM) bypass flowrate at 30 psid. (See 911E/F) Provide shut-offs at emergency mixing valve. Lawler #911E/F, Emergency Thermostatic Mixing Valve for Eyewash or Eye/Face Wash.”

1.4 Section 22 42 49.00 Hydrants (Attached)

1.4.1 Specification section attached to include for interior domestic water wall hydrants.

1.5 Section 22 51 00.00 Swimming Pool and Whirlpool Equipment (Not re-issued)

1.5.1 Item 2.16.10 shall read as “The UV system shall be equal to Hanovia or Triogen.”

1.6 Section 23 25 13.00 Steam and Heating Water Treatment (Not re-issued)

1.6.1 Item 2.2.1 shall read as “Item 1.4 shall read as “For each heating system provide an adequately sized pot feeder for the entire system but not less than a 19 L (5 gallon) pot feeder. Pot feeder shall have a maximum working pressure of 300 psi at 200 deg F. Tank shell and heads shall be 11 gauge steel, and cap shall be cast iron with Buna N seal ring, equal to Ashland Drew PN 9233-04-0, or Neptune DBF-5HP or Axiom. Pot feeder assembly shall be complete with valved inlet and outlet, screen, drain and pot feeder.”

1.7 Section 23 09 00.00 Building Automation System (BAS) Open System (Not re-issued)

1.7.1 Item 1.14 shall read as “Item 1.4 shall read as “Approved Suppliers and Manufacturers

1. Approved Suppliers and Manufacturer Product Lines to Table 1. Manufacturer Product Line applies to Operator Software, Controller Resident Software, Building Controllers, Advanced Application Controllers and Specific Application Controllers.

Table 1: Approved Suppliers and Manufacturer Product Lines.			
Supplier	Manufacturer Product Line	Address/Location	Contact
Honeywell Limited	Honeywell Limited: Excel 5000 Open		
Johnson Controls Incorporated	Johnson Controls Incorporated: Extended System Architecture		
Siemens Building Technologies Limited	Siemens Building Technologies Limited: Apogee		
Advanced Energy Management (Alerton)		60 Dorey Avenue, Suite 103 Dartmouth, Nova Scotia B3B 0B1	Tel: 902-453-4498 Fax: 902-453-5970 e-Mail: inquiries@aemltd.com

Table 1: Approved Suppliers and Manufacturer Product Lines.			
Supplier	Manufacturer Product Line	Address/Location	Contact
Controls and Equipment (Delta Controls)		10 Thornhill Drive Unit 5 Dartmouth, NS B3B 1S1	Phone: 1-902-468-4885 Fax: 1-902-468-4886
Memco (Automated Logic)		1109 Champlain Street, Dieppe, NB	Tel: (506) 854-2496 Email: info@memcocontrols.com
Digicon (Reliable Controls)		201 Brownlow Avenue, Unit 11 Burnside Industrial Park, Dartmouth, Nova Scotia, B3B 1W2 Canada	

1.8 Section 23 74 13.00 Packaged Air Conditioning Units (Not re-issued)

1.8.1 Item 2.1.1 shall read as "Packaged air handling units shall be Carrier, Daikin, York or Engineered Air."

1.9 Section 23 81 26.01 Variable Refrigerant Volume AC System (Not re-issued)

1.9.1 Item 1.1.1 shall be deleted.

2.0 DRAWINGS

2.1 M201 – Pool Schematics (included herein)

2.1.1 Updated the pipe sizes. The revisions are bubbled for coordination purposes.

2.2 M202 – Pool Schematics and Details (included herein)

2.2.1 Updated the pipe sizes. The revisions are bubbled for coordination purposes.

2.3 M203 – Plumbing Schematics (included herein)

2.3.1 Added interior hose bibs. The revisions are bubbled for coordination purposes.

2.4 M301 – Level 1 Plumbing and Drainage (included herein)

2.4.1 Added interior hose bibs. The revisions are bubbled for coordination purposes.

2.5 M600 – Part Plans and Details (included herein)

2.5.1 Added interior hose bibs. The revisions are bubbled for coordination purposes.

2.6 M600A – Part Plans and Details (included herein)

2.6.1 Added interior hose bibs. The revisions are bubbled for coordination purposes.

3.0 CLARIFICATIONS

3.1.1 No further clarifications at this time.

END OF MECHANICAL ADDENDUM M2

17079.000.m.001 - Addendum M2.docx

Hydrants

1. General

1.1. WORK INCLUDED

- 1.1.1. Conform to Section 21 05 00.00 – GENERAL INSTRUCTIONS FOR MECHANICAL SECTIONS.

2. Products

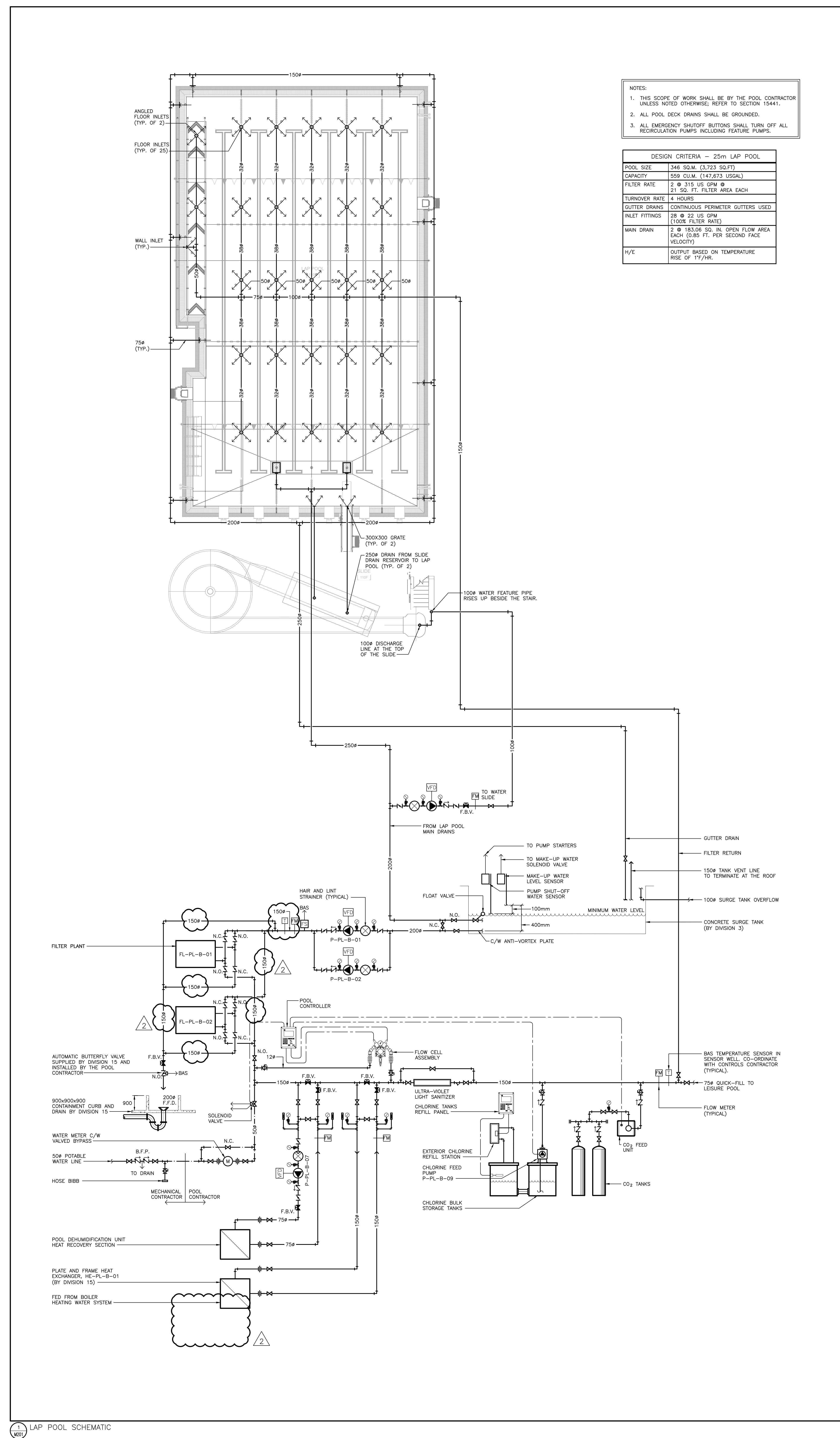
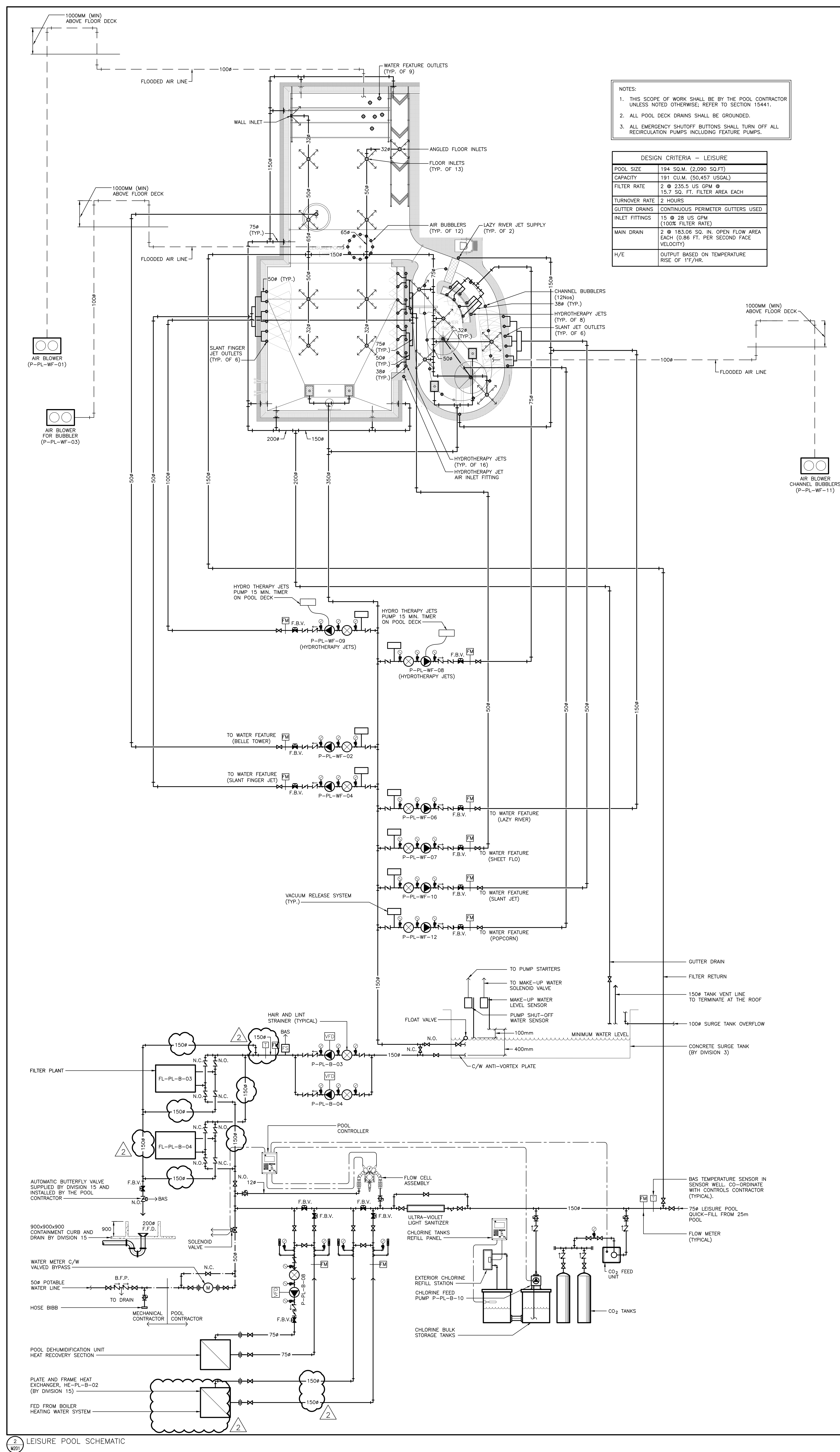
2.1. MATERIALS

- 2.1.1. Hydrants shall be J. R. Smith, Zurn, Mifab, or Watts, equal to the following series.
- 2.1.2. Wall hydrants for exterior applications shall be non-freeze, key operated with 19 mm (3/4 in.) hose connection, removable nylon or bronze seat, 19 mm (3/4 in.) ground joint union inlet, brass operating parts and nickel bronze access box with polished cover. Length of wall sleeve shall suit location. J.R. Smith 5509QTNB, Zurn Z-1300, Mifab MHY-20, Watts HY-725.
- 2.1.2.1. Cover shall be stainless steel where installed on curtainwall system.
- 2.1.3. Wall hydrants tagged as "HB-1" and for interior applications shall be key operated with 19 mm (3/4 in.) hose connection, removable nylon or bronze seat, 19 mm (3/4 in.) inlet, bronze operating parts with chrome plated face. Watts HY-430 or equal.
- 2.1.4. All hydrants shall be complete with vandal proof vacuum breaker, if backflow preventer is not provided.

3. Products

3.1. NOT USED

END OF SECTION

[illegible]

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NORTH ARROW	SEAL
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PROJECT TITLE
EAST HANTS AQUATIC CENTRE
COMMERCE COURT, ELMSDALE, N.S.

DRAWING TITLE
POOL SCHEMATICS

SCALE
N.T.S.

DATE
2018-03-01

PROJECT NUMBER
17079

DRAWING NUMBER

M201

5 POOL MAIN DRAIN
W202

2 LAP POOL WATER FEATURE CONTROL PANEL

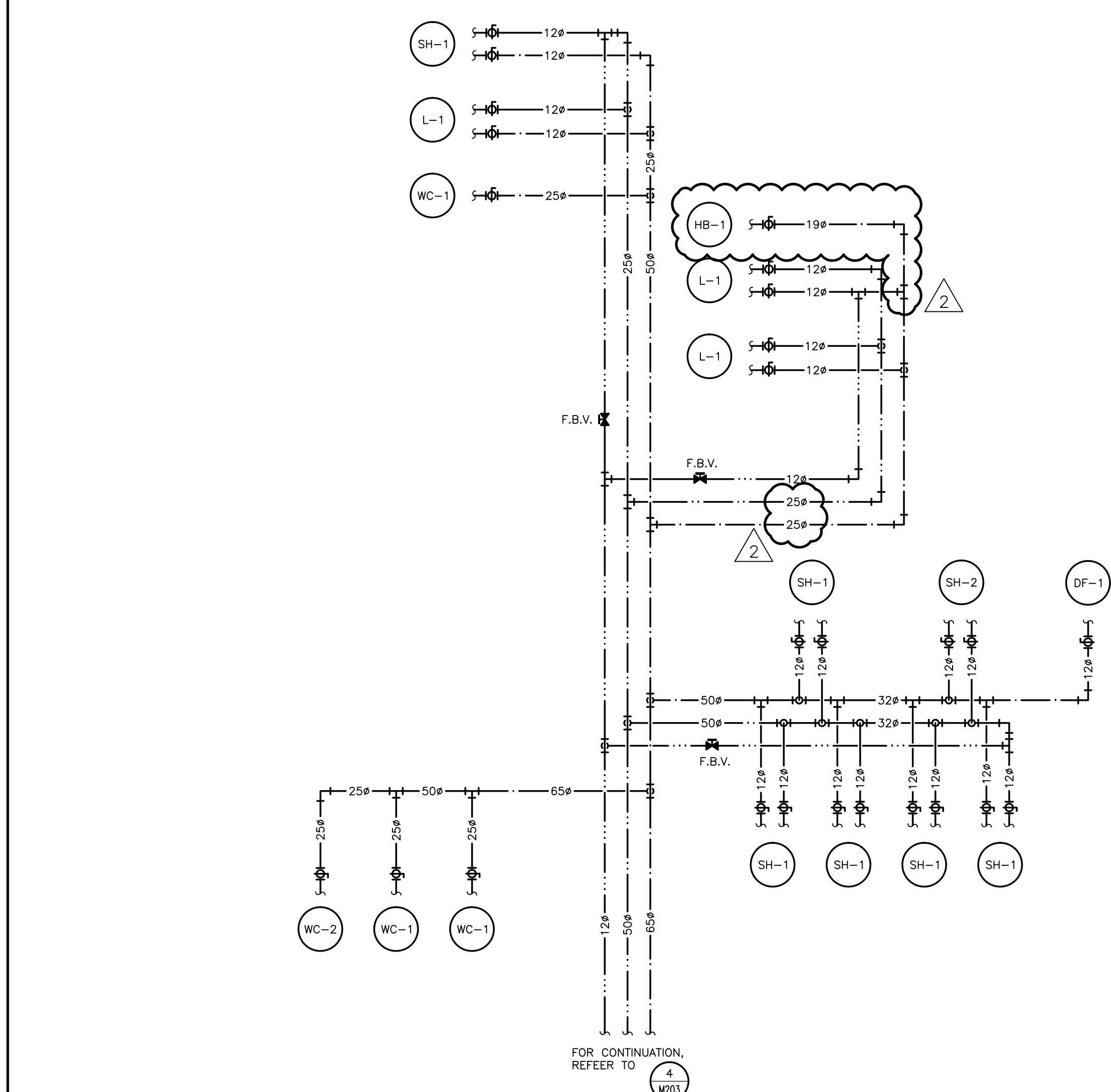
8 HOT TUB WATER FEATURE CONTROL PANEL

7 HYDROTHERAPY INSTALLATION

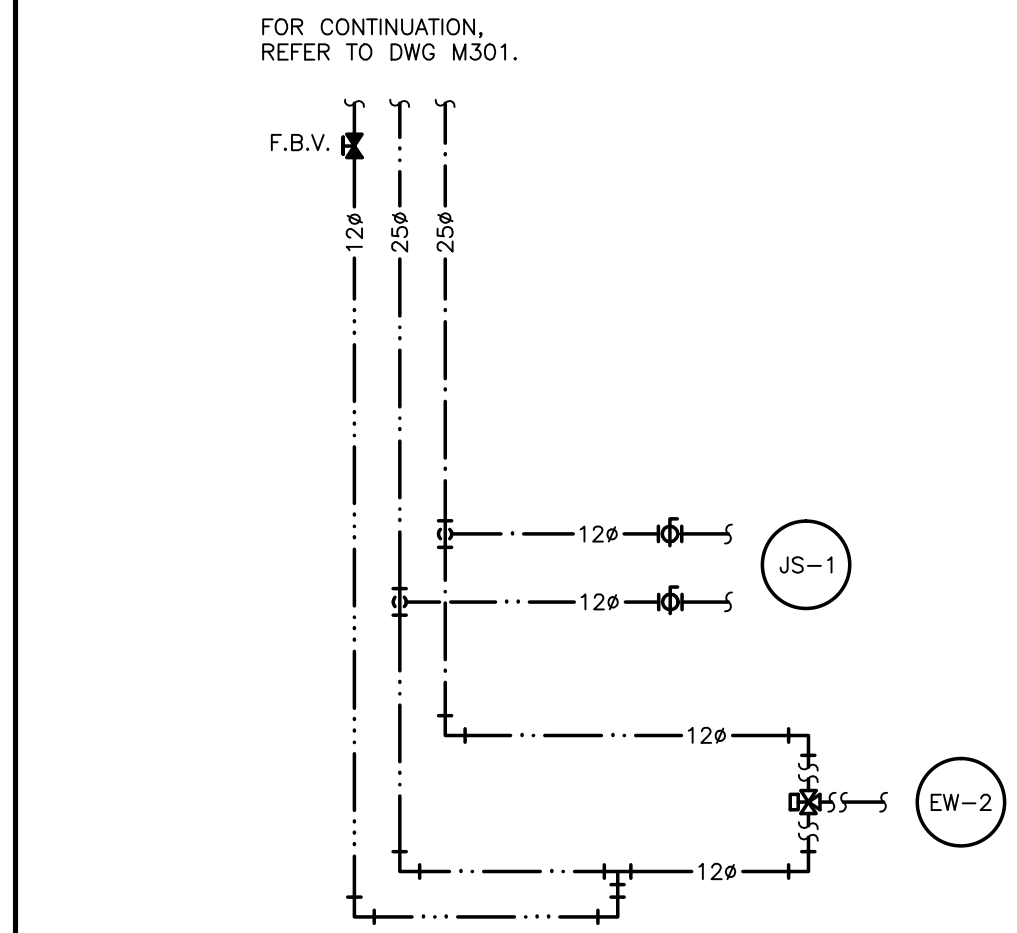
4 LEISURE POOL WATER FEATURE CONTROL PANEL

1 HOT TUB SCHEMATIC

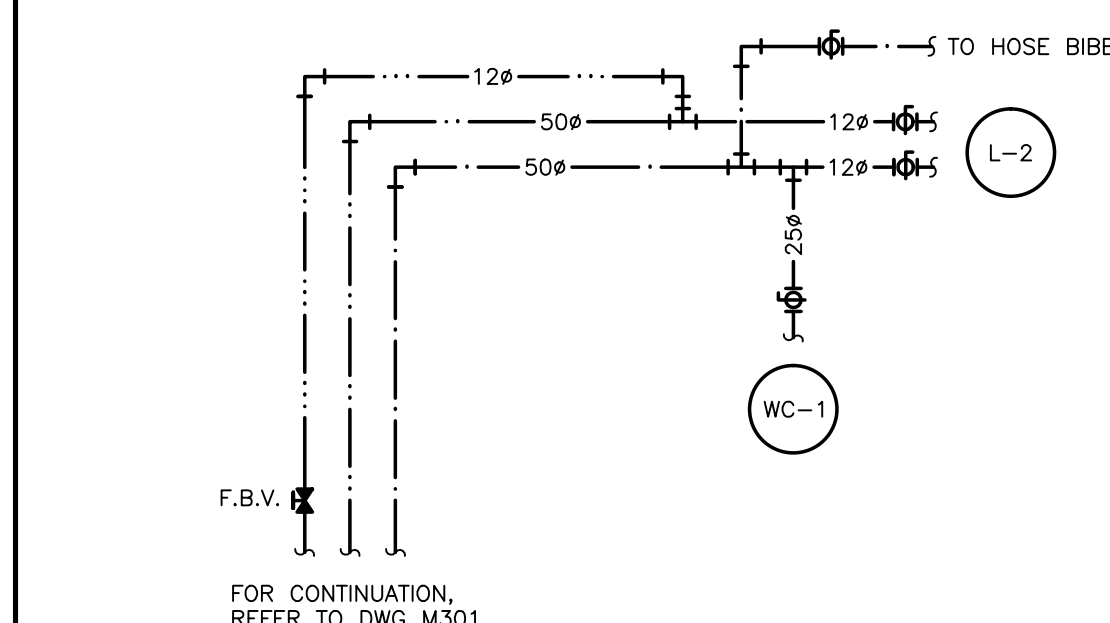
M202



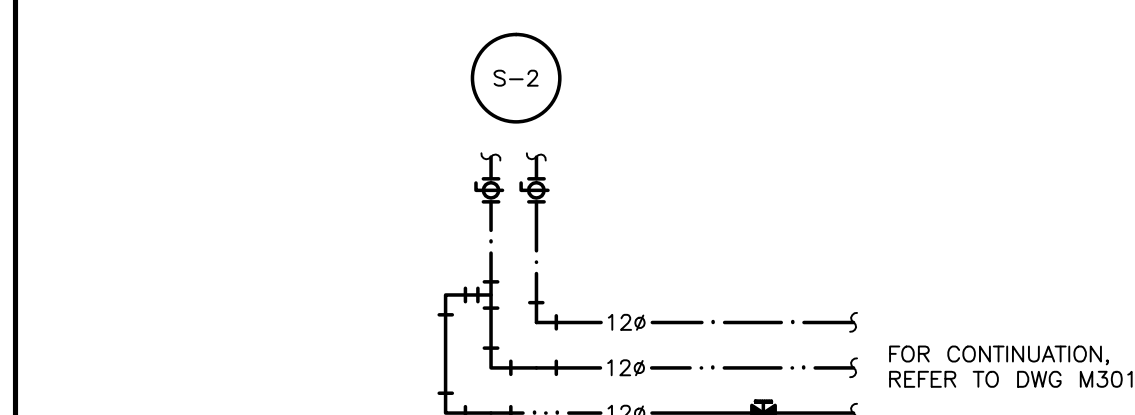
1 FEMALE WASHROOM
N.T.S.



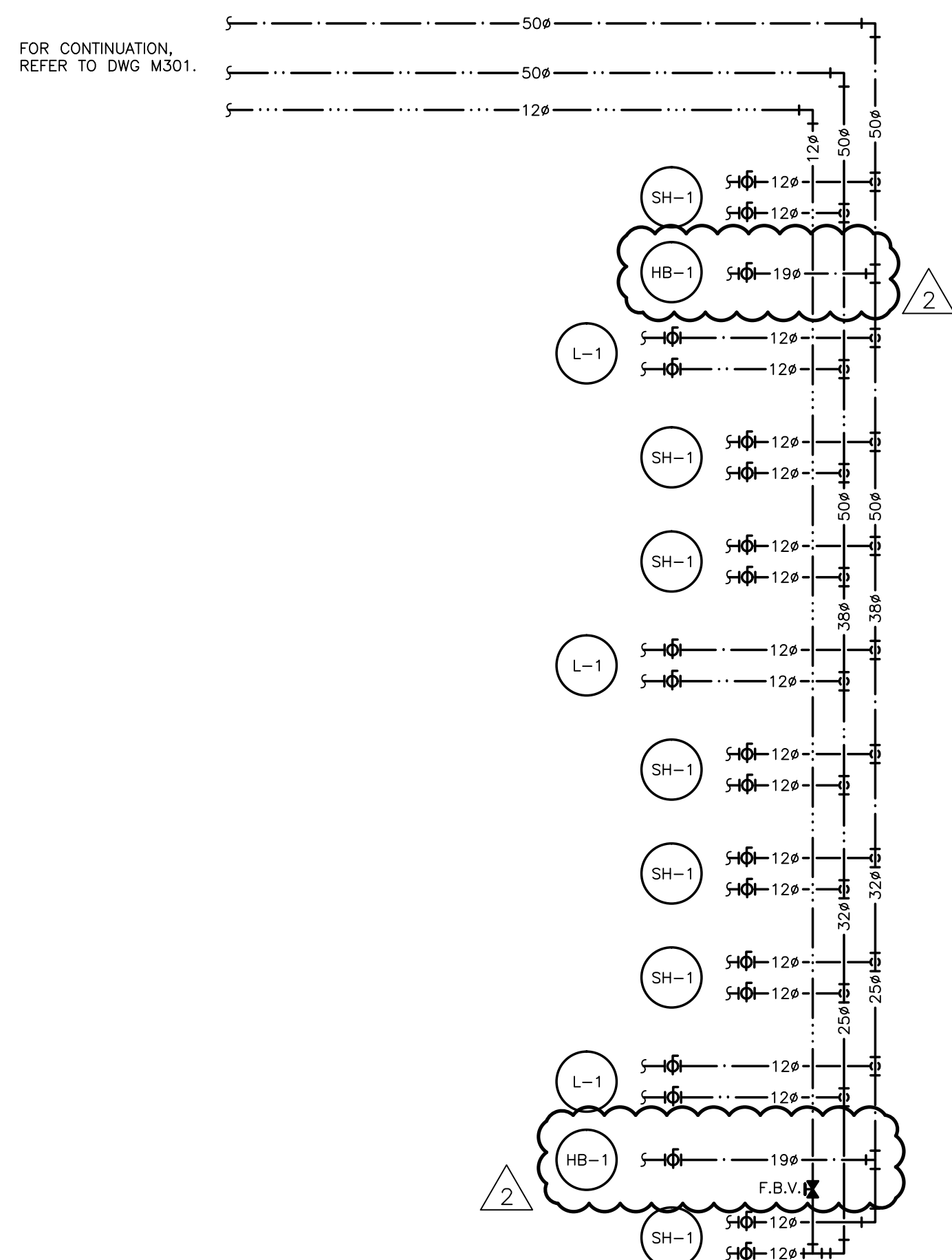
4 POOL STORAGE ROOM
N.T.S.



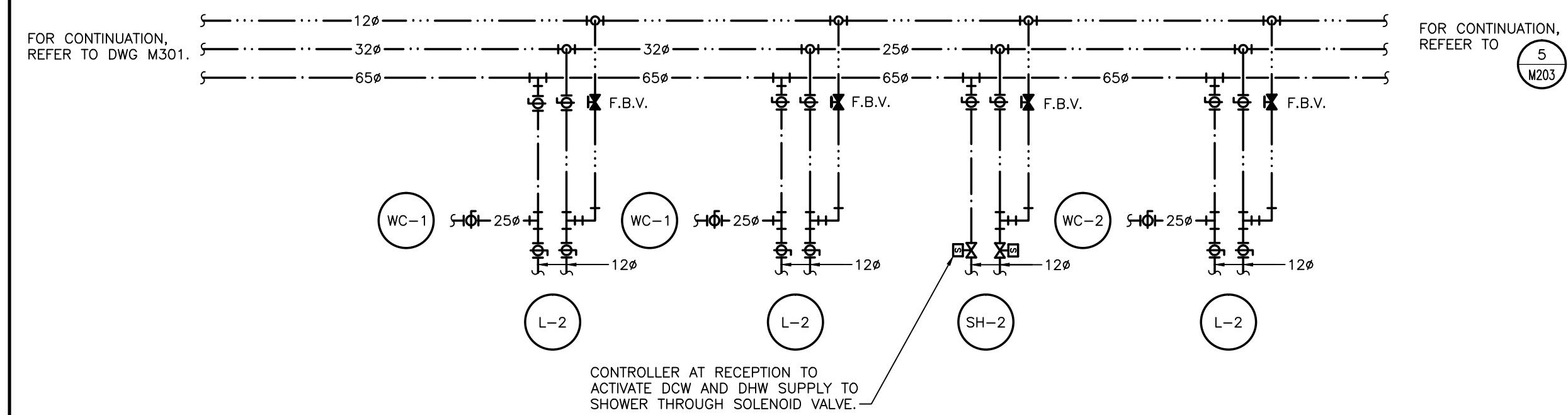
8 POOL WASHROOM
N.T.S.



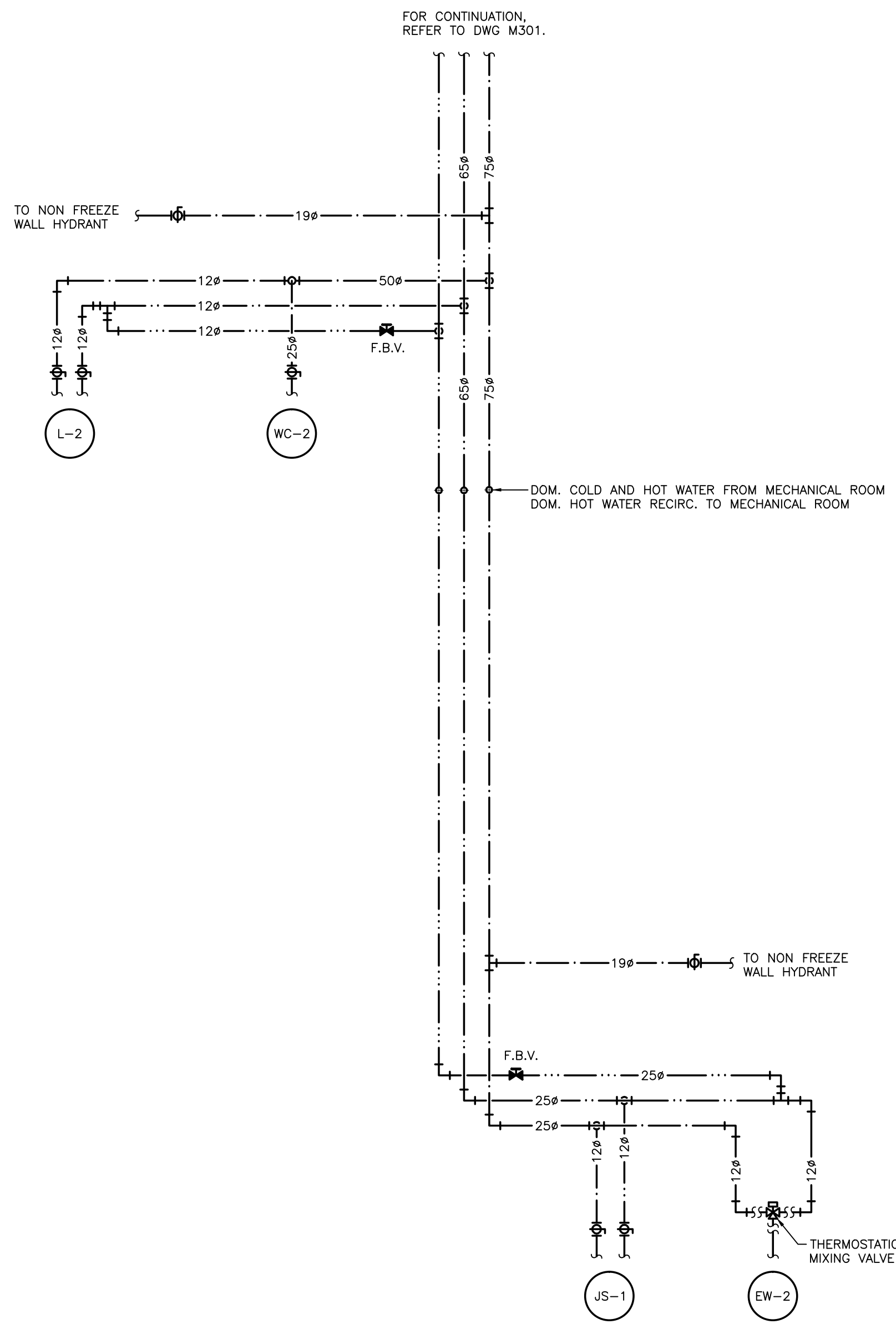
10 KITCHEN
N.T.S.



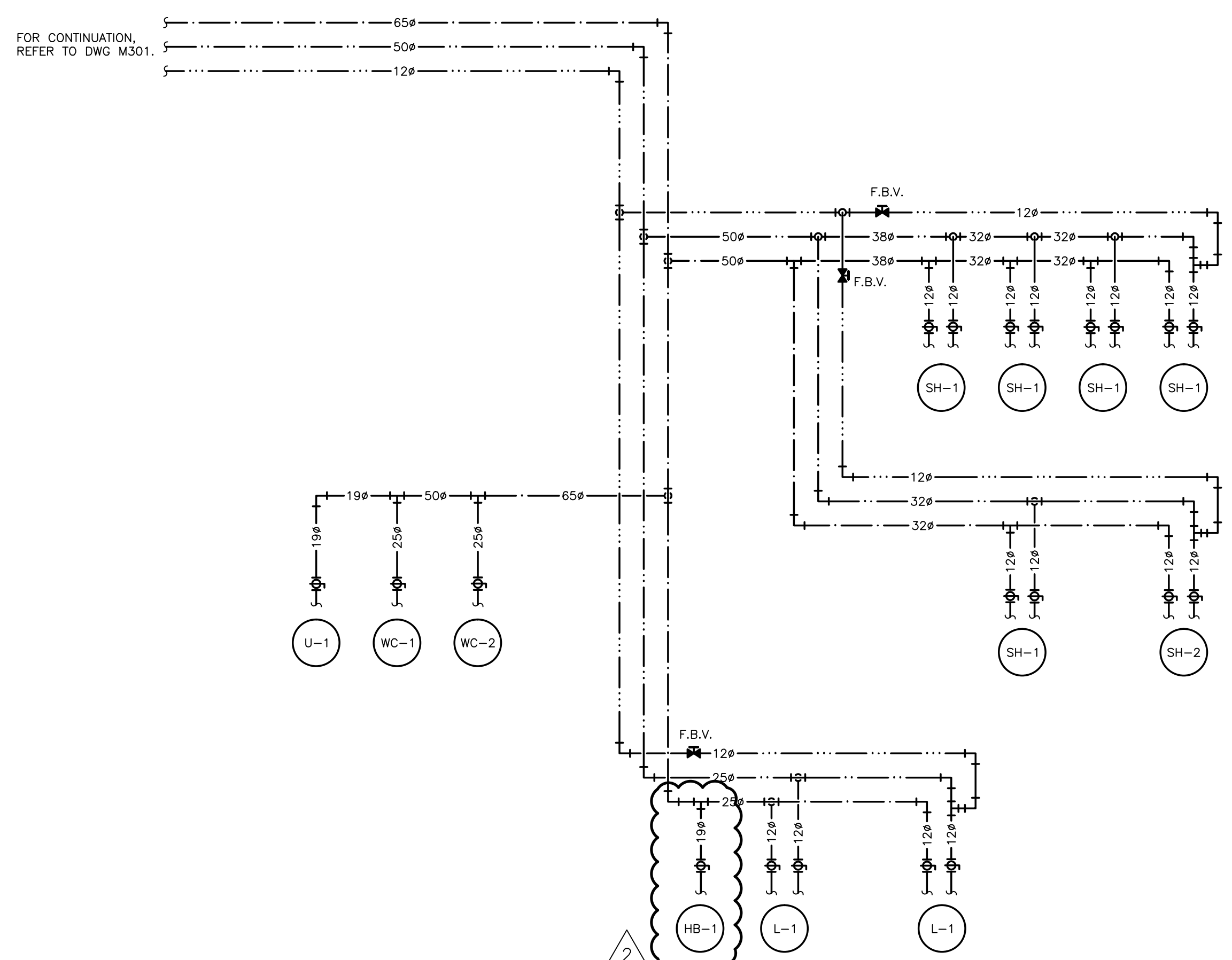
2 UNIVERSAL SHOWERS
N.T.S.



4 UNIVERSAL WASHROOMS
N.T.S.



3 MECHANICAL ROOM AND OUTDOOR WASHROOM
N.T.S.



5 MALE WASHROOM AND SHOWER
N.T.S.

Contractor must check and verify all dimensions on the job and report any discrepancies to the architect before proceeding with the work.
Do not scale this drawing.

REV	DESCRIPTION	DATE
1	Issued for Tender	2018-03-01
2	Issued for Addendum M2	2018-03-23

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PROJECT TITLE
EAST HANTS AQUATIC CENTRE
COMMERCE COURT, ELMISDALE, N.S.

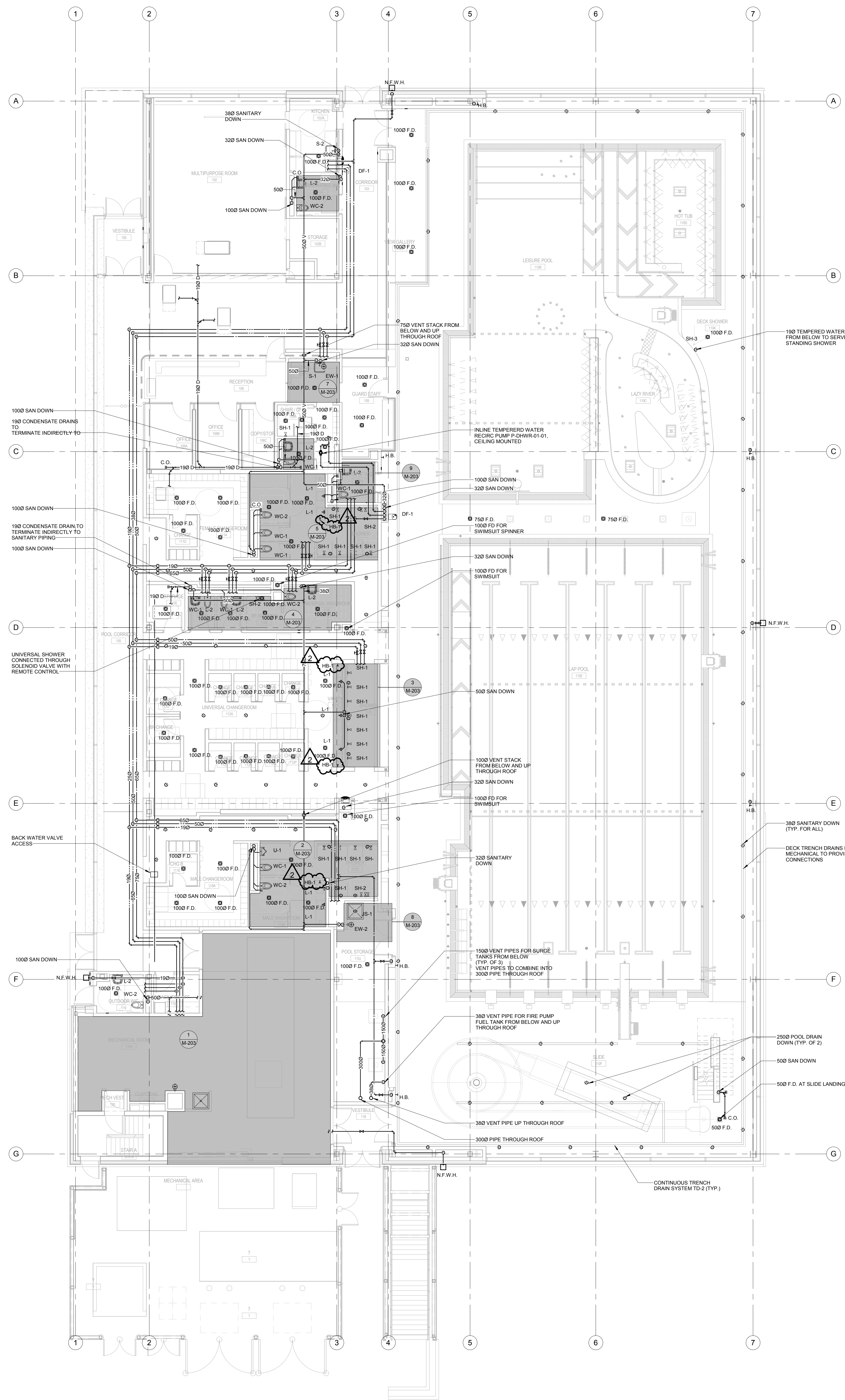
DRAWING TITLE
PLUMBING SCHEMATICS

SCALE
N.T.S.

DATE
2018-03-01

PROJECT NUMBER
17079

DRAWING NUMBER
M203



1. DO NOT SCALE DRAWINGS. THE LOCATIONS OF ALL ITEMS SHOWN ON THE DRAWINGS OR SPECIFIED THAT ARE NOT DEFINITELY FIXED BY DIMENSIONS ARE APPROXIMATE ONLY. THE EXACT LOCATIONS ARE NECESSARY TO OBTAIN THE BEST CONDITIONS AND ARE SUBJECT TO BE DETERMINED BY THE SITE CONDITIONS. REVIEW ALL REVISIONS WITH THE CONSULTANT.
2. FLOOR PLANS SHALL BE READ IN CONJUNCTION WITH SCHEMATICS. INFORMATION SHOWN ON FLOOR PLANS SHALL BE APPLIED TO THE SCHEMATICS AND VICE-VERSA TO PROVIDE A COMPLETE AND OPERATIONAL SYSTEM.

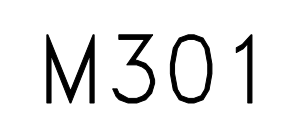
VERIFY THE STRUCTURAL INTEGRITY OF ALL TEMPORARY AND PERMANENT OPENINGS. ADDITIONAL FRAMING TO ENSURE STRUCTURAL INTEGRITY SHALL BE INCLUDED UNDER THIS CONTRACT.

1. ALL SANITARY DRAINAGE BELOW GRADE SHALL BE MINIMUM 100MM (4 IN.) UNLESS INDICATED OTHERWISE.
2. ALL FLOOR DRAINS SHALL BE COMPLETE WITH TRAPS AND TRAP PRIMERS.
3. ALL STORM DRAINAGE BELOW GRADE SHALL BE MINIMUM 100MM (4 IN.) UNLESS OTHERWISE INDICATED.
4. ALL DOMESTIC COLD WATER AND DOMESTIC HOT WATER PIPES SHALL BE MINIMUM 3/4 (19 MM) IN UNLESS INDICATED OTHERWISE.
5. ALL PIPING SHALL BE OVERHEAD, TIGHT TO UNDERSIDE OF THE STRUCTURE WITH SUFFICIENT ROOM FOR INSULATION UNLESS OTHERWISE INDICATED.
6. ALL STEEL DECK SHALL BE PROTECTED WITHIN STRUCTURE. STEEL SURFACE WHERE PRACTICAL AND IN EXPOSED OFFICE AREAS.
7. ALL STEEL DECK DRAINS TO BE GROUNDING.
8. PROVIDE TRAPS FOR ALL FLOORDRAINS, SINKS, LAVS ETC. AS PER BUILDING CODE REQUIREMENTS

1. ALL POOL DECK DRAINS SHALL BE GROUNDED.
2. ALL EMERGENCY SHUTOFF BUTTONS SHALL TURN OFF ALL RECIRCULATION PUMPS INCLUDING FEATURE PUMPS.

[illegible]

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ADDENDUM

PROJECT NAME: East Hants Aquatic Center

COMPANY: MJMA / TEAL

ATTENTION: Troy Wright / Will Snow

PROJECT NO.: 17079.000

DATE: 2018-03-23

ADDENDUM NO.: E-02

ISSUED BY: Tyler Hughes

The following amendments are hereby made as part of the Contract Documents. The following revisions and/or additions shall be made to contract documents and the cost shall be included in the Tender Price.

1.0 SPECIFICATIONS

1.1 Refer to Specification Section 26 27 13.00 – Electronic Metering (included herein):

1.1.1 The following items shall be removed from contract documents and replaced with “Not Used” to maintain document sequencing:

.1 [1.4.3], [2.5 inclusive], [2.6 inclusive], [2.7 inclusive]

1.2 Refer to Specification Section 26 52 01.01 – Unit Equipment for Emergency Lighting – Inverter (included herein):

1.2.1 Replace entire specification section with version attached.

1.3 The following specifications shall be added to the electrical contract documents (included herein):

- .1 27 05 28 – Pathways for Communications Systems
- .2 27 05 53 – Identification for Communications Systems
- .3 27 08 00 – Commissioning for Communications Systems
- .4 27 11 16 – Communications Cabinets, Racks, Frames and Enclosures
- .5 27 15 00.19 – Data Communications Horizontal Cabling
- .6 27 15 33 – Communications Coaxial Horizontal Cabling
- .7 27 16 19 – Communications Patch Cords and Cross Connect Wire

1.4 Refer to Specification Section 28 31 02 – Multiplex Fire Alarm System (included herein):

1.4.1 The following items shall be removed from contract documents and replaced with “Not Used” to maintain document sequencing:

- .1 [1.3.10.2], [1.3.10.11], [1.3.10.12], [1.7.1.5], [2.3.1.12], [2.4 inclusive], [2.8.4 inclusive], [2.12.1], [2.12.2], [2.16 inclusive], [2.20 inclusive]
- 1.4.2 Modify item 1.3.10.15 to read: "Monitoring dialer with cellular backup."
- 1.4.3 Modify item 2.3.1.3 to read: "Minimum capacity of 100 addressable monitoring and 100 addressable control/signal points. Points may be divided between 2 communication channels in distributed system, each channel operating independently of other. Faults on one communication channel not to affect operation of other channel."
- 1.4.4 Modify item 2.18 to read: "Dialer Module"
 - .1 2.18.1 to read: "Provide digital alarm dialer complete with cellular service backup. Dialer module shall annunciate alarm and supervisory state to a monitoring station."
- 1.4.5 Add the following to item 2.23.1: "Provide STI covers for manual stations in the natatorium."
- 1.4.6 Add the following acceptable manufacturers to item 2.25.1:
 - .1 Siemens
 - .2 Notifier

2.0 DRAWINGS

2.1 Refer to E300 – POWER AND SYSTEMS (not included):

- 2.1.1 Room 106C:
 - .1 Communications rack shall be wall mounted at high level on south side of west wall. Refer to architectural elevations for details. Ensure sufficient space is reserved for analog voice BIX panels and CATV distribution equipment on plywood backboard.
 - .2 Provide two dedicated circuit duplex receptacles for communications rack. Circuit to RP-GB.71 and .72.

3.0 SCHEDULES

3.1 Refer to LUMINAIRE SCHEDULE (not included)

- 3.1.1 The following are approved equivalent for the following fixture types:

TYPE L4: Philips Vaporlume LED: V3W 4 80L 835 UNV DIM

TYPE L9: Intense Lighting: ICL-LEDG2-L4-35-1-010-WW-24-I100

4.0 CLARIFICATION

- 4.1.1 **Tender Question:** "What size and quantity of conduit is required for the primary and secondary service entrance feeds? The SLD indicated (2) runs of 4#350 NUAL, but

does not indicate the conduit required. The Ductbank Section indicates (6) 4" conduit are required."

- .1 **Response:** The ductbank sections indicate the size and quantity of ducts.
- 4.1.2 **Tender Question:** "What size feed and conduit is required for Panel 'RP-GC'?"
- .1 **Response:** 'RP-GC' feeder shall have feeder tag C06.4.
- 4.1.3 **Tender Question:** "What size feeds and conduits are required for 'TX-BB'?"
- .1 **Response:** 'TX-BB' primary feeder shall be C04.3, secondary feeder C10.4. 'RP-BB' shall be rated 225A.
- 4.1.4 **Tender Question:** "What is ultimately required for the lighting control system? How are all the devices, panels and controllers interconnected?"
- .1 **Response:** The lighting control system shall be fully integrated with the BAS controls system. The precise interconnections shall be determined by the system manufacturer.
- 4.1.5 **Tender Question:** "Please define the lighting control devices required and their locations on the drawings. ... Changeroom zones are not included on drawing E202"
- .1 **Response:** The lighting control devices shall be distributed and located local to the associated lighting zone. Control devices to be installed in accessible ceiling space. Changeroom zones are indicated in detail 2/E202, top left corner: "ENCLOSED SPACE WITH OCCUPANCY SENSOR/CHANGE ROOMS WITH OCCUPANCY SENSOR".
- 4.1.6 **Tender Question:** "There are new light standards shown in the new parking lot on sheet E100 but there is no underground electrical conduit/trenching to feed these lights. Should there be underground lighting conduit installed to these locations?"
- .1 **Response:** Yes. The parking lot light standards and bollards shall be fed by direct buried underground conduit.
- 4.1.7 **Tender Question:** "I have been trying to locate the "Mechanical Equipment Schedule" (Similar to attached). We need the starters and voltage for all the pumps to get VFD's quoted. I may have over looked something but maybe you could point me in the right direction or possible we need to do an RFI. There is an attachment which Mike H will email to the team."
- .1 **Response:** All VFDs and duplex pump controls shall be by division 23. No loose starter schedule required for division 26.

END OF ELECTRICAL ADDENDUM

17079.001 - ADD E-02.docx

Electronic Metering

PART 1 - GENERAL

1.1 Work Included

- .1 Section 26 05 01.00 - GENERAL INSTRUCTIONS FOR ELECTRICAL SECTIONS.
- .2 Section 26 05 04.00 – SUBMITTALS/SHOP DRAWINGS.
- .3 Section 26 05 34.00 – CONDUITS, CONDUIT FASTENERS AND FITTINGS.
- .4 Section 26 05 21.00 – WIRE AND CABLE 1000V.

1.2 Standards

- .1 Except as noted by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the Canadian Electrical Manufacturer's Association, CSA and Measurement Canada.
- .2 The system shall be bench certified/approved by Measurement Canada for legal trade under the "Electricity and Gas Act" of Canada.
- .3 At the completion of installation, the system shall be field reviewed to verify compliance with Measurement Canada Specifications.

1.3 Shop Drawings And Product Data

- .1 Submit Shop Drawings and product data in accordance with Section 26 05 04.00 – SUBMITTALS/SHOP DRAWINGS.
- .2 Submit shop drawings and manufacturers data for the component items shown and specified under this section of the specification.
- .3 Do not supply any equipment to this project prior to shop drawing review by the Consultant.
- .4 Shop drawings will be stamped and signed by the contractor prior to submittal, allow a minimum of one week for review of the shop drawings submitted.
- .5 At the completion of the Project, As-Built Drawings will be submitted by the System Supplier/Manufacturer, who will prepare a complete manufacturer's manual including but not limited to all as-built wiring diagrams and all required Measurement Canada certifications and test results including equipment bench test and suite to breaker installation verification.

1.4 Description Of System

- .1 Work under this section is subject to the requirements of Section 26 05 01.00 - GENERAL INSTRUCTIONS FOR ELECTRICAL SECTIONS.
- .2 Provide computerized metering in accordance with the Contract Documents. The system to come complete with all parts necessary to operate this system.
- .3 Not Used.
- .4 The metering panels shall monitor a minimum of 12 three phase four wire customers or 18 two phase three wire loads.

Electronic Metering

- .5 The units to be mounted in a single CSA Type 2 sprinkler proof enclosure either located next to a panel or built into the raceway on the side of a panel.
- .6 Metering panels communicate over their own Local Area Network, which can either report direct to an onsite computer, or to remote computers using telephone or Ethernet/WAN/Internet communications.

PART 2 - PRODUCTS**2.1 General**

- .1 Provide a fully digital electrical measurement system for multi-tenant buildings incorporating complete metering, at several voltages and amperages. The system shall have four major components: a) the meter/communications modules, b) a set, per metered service, of current transformers or transducers sized to the load to provide the metering "node", c) potential transformers (if applicable) for line voltage measurement and d) communications interface to allow download of meter data to a remote computer for billing purposes. The metering panel must have its own local display for reading the meters connected to it.
- .2 Local area network communications shall interface with one of the following for remote data collection: Telephone (POTS connectivity), LAN Ethernet, WAN Ethernet, Internet, BACnet or other building automation connectivity, or future.

2.2 Meters

- .1 Installed near each tenant's main switch or circuit breakers. Meters to accurately measure electricity that each tenant used and stores the information in non-volatile, solid state memory. The metering panels shall be networked together to allow remote computerized access for remote meter reading and automated bill generation.
- .2 The meter shall be able to be used on poly-phase services. Wiring includes: connection of the meters to the line voltage, connection of the through-type current transformers/transducers installed at the circuit breakers, connection of network communications (wired or, if applicable, wireless communications devices).
- .3 Application Voltages:
The metering panel will accommodate all approved North American Distribution voltages up to 600 Volts. For higher voltages, potential transformers shall be used.
- .4 Operating Frequency: 50/60 Hz.
- .5 Power Factor Range: 0.5 to 1.0 lead/lag.
- .6 Power Supply Requirements: Self-powered.
- .7 Current Ranges: 100/200/400 Amps or 5/10 AMP interface (services over 400A or critical loads)
- .8 Accuracy: +/- 0.5% of 100% registration @ 1.0 pf, 1% to 100% load to meet: Measurement Canada.
- .9 Operating Temperature Range: -40 degrees to +55 degrees C.

Electronic Metering

- .10 Dimensions: Component specific. Multi-customer metering panels shall provide a more compact installation than a socket-type meter installation.
- .11 Meters and their elements must conform to the Measurement Canada "Standard Drawings for Electrical Metering Installations" to ensure accurate metering. All configurations shall come with current transformers/transducers required in the "Standard Drawings".

2.3 Current Transformers/Transducers

- .1 Provide all current transformers/transducers associated with the metering system.
- .2 Loads up to 400 amps shall have precision current transformers/transducers with an accuracy exceeding that specified in Measurement Canada approval.
- .3 Loads above 400 amps shall have Current Transformers rated ANSI Class 0.3 at a burden B0.1 connected to a precision Current Transformer compatible with the metering equipment.

2.4 Potential Transformers

- .1 The Potential transformers, if required, shall be mounted in a separate enclosure rated for the size and capacity necessary to feed the number of meters shown as per the drawings and rated by the manufacturer. Potential transformers must be Measurement Canada approved for revenue metering (independently or as part of system approval).
- .2 Potential transformers shall be factory assembled and come complete with electrical disconnects and fuses mounted in a separate enclosure.

2.5 Not Used.

2.6 Not Used.

2.7 Not Used.

2.8 Wiring

- .1 Provide all wiring in conduit as required to operate the entire system. Wiring to be provided as per manufacturer's instructions. All power wiring to be in conformance with the electrical code.

2.9 Manufacturers

- .1 The following are acceptable manufacturers:
 - .1 CARMA Industries Inc.
 - .2 Intellimeter Canada Inc.
 - .3 Schneider Electric

Electronic Metering

PART 3 - EXECUTION

3.1 Meter Installation

- .1 It is recommended that all metering equipment is installed in electrical closets or electrical rooms whenever possible.
- .2 Remove sub-panel/breaker-panel cover.
- .3 Wire bending space should be in compliance with Canadian Electrical Code Section 12. Verify that Current Transformers/Transducers, Power Taps, and wiring can be installed without crowding the subpanel.
- .4 Verify that the Current Transformers/Transducers can be installed with a minimum 1/2 inch clearance to uninsulated live parts in subpanel, and without bearing against dead metal parts.
- .5 Verify that power is 120V, 120/280V, 120/240V, 240/416V or 416V, 277/480V or 480V, 347/600V or 600V. Verify that neutral is available if applicable.
- .6 Provide a dedicated 15A, 120VAC circuit for each panel and equipment from the nearest available panel. Provide a new breaker in the respective panel.
- .7 Verify that the meter is the right size and voltage for the installation.
- .8 Secure metal conduit to sub-panel. Use insulating bushing. Reliable grounding is required. Locknuts must be tightened enough to pierce paint in cabinet.
- .9 Secure meter enclosure in or on wall, according to location, and connect conduit using locknut. Attach the enclosure to a wall stud using screws to provide equivalent support.
- .10 Install CT's and PT's per manufacturer's recommendations.
- .11 Interconnect all metering panels with wiring in conduit as per manufacturer's instructions. Provide connection of Metering Panels to remote accesses connection: telephone, Ethernet connection, etc.
- .12 Replace sub-panel/breaker-panel covers.
- .13 Contact Electrical Safety representatives for verification of compliance to governing electrical codes.
- .14 Contact Measurement Canada or accredited service provider for installation verification. Installation verification shall include a tenant-to-breaker check. Electrical subcontractor must be available for verification support.

3.2 Calibration And Maintenance Service

- .1 All meters shall be Measurement Canada bench verified, and manufacturer will provide all Inspection/Verification Certificates within as-built documentation in order to provide a complete operational system.
- .2 The manufacturer shall provide pricing for billing services, on a per meter price, for collection of tenant sub-metered energy for return to building management or local distribution company (LCD) to apply against facility energy costs.

Electronic Metering

- .3 The manufacturer shall detail remote connectivity requirements (telephone, High-Speed Internet, etc.). Building owner/property manager shall provide necessary remote connectivity to allow for remote billing services, if required.
- .4 Manufacturer will include all required Measurement Canada installation inspections in pricing. All appropriate equipment is to be labelled with the respective certification labels.
- .5 Manufacturer to register the system with Measurement Canada and work with the Owner to obtain all required information to do so.
- .6 After the specified Measurement Canada approval period (seal period typically 6 years), the manufacturer shall provide options for maintaining Measurement Canada Approval. This may include, but not limited to: Onsite Re-verification or removal of existing equipment and replacement with Measurement Canada verified equipment.
- .7 The manufacturer shall provide pricing to the Owner for system maintenance, repair and/or replacement service to the extent that covered by the warranty.

3.3 Warranty

- .1 All equipment shall be free from defect in materials and workmanship under normal use and service for the period of twenty four (24) months from the date of acceptance. .

END OF SECTION

Unit Equipment for Emergency Lighting

PART 1 - GENERAL**1.1 Work Included**

- .1 Section 26 05 01.00 – GENERAL INSTRUCTIONS FOR ELECTRICAL SECTIONS.
- .2 Section 26 05 04.00 – SUBMITTALS/SHOP DRAWINGS.
- .3 Section 26 05 21.00 – WIRE AND CABLES 1000V.
- .4 Section 26 05 34.00 – CONDUITS, CONDUIT FASTENERS AND FITTINGS.

1.2 References

- .1 CSA or cUL listed for Canadian application, UL and ETL listed to UL924 – AC inverter system for emergency power supply, latest edition.
- .2 CSA or cUL listed to C22.2-No.107.1-M91 – Standard for Commercial and Industrial Power Supply Equipment; ANSI C62-41; ANSI C62.45 (Cat. A&B), latest edition.
- .3 FCC Rules and Regulations 47 Part 15, Subpart J, Class A - Certified Compliance, latest edition.
- .4 Systems comply with CEC, OESC, OSHA and Life Safety Code, latest edition.
- .5 Installation shall comply with Building Materials Evaluation Committee (BMEC), latest edition.
- .6 Shall be certified by the Canadian Construction Materials Committee (CCMC), latest edition.
- .7 UL 1778 Standard for Uninterruptable Power Supply Equipment, latest edition.
- .8 ANSI C62.41-1980 Recommended Practice on Surge Voltages in Low Voltage Power Circuits, latest edition.
- .9 NEMA PE1 – Uninterruptible power supply, latest edition.
- .10 NFPA 111 – National Fire Protection Agency, latest edition.

1.3 Shop Drawings And Product Data

- .1 Submit Shop Drawings and product data in accordance with Section 26 05 04.00 – SUBMITTALS/SHOP DRAWINGS
- .2 Submit shop drawings for equipment and accessories specified in this Section. Include photometric data for all luminaires not named as approved in this specification.
- .3 Data to indicate system components, mounting method, source of power and special attachments.
- .4 Manufacturer/Contractor to ensure runtime capacity of battery unit is sized accordingly to meet the runtimes specified within this section and/or drawings/schedules.

1.4 QUALITY ASSURANCE

- .1 The Emergency Lighting Inverter (ELI) module shall be “burned-in” without failure for a minimum of 24 hours.

Unit Equipment for Emergency Lighting

- .2 A final test procedure for the product shall include a check of performance specifications before and after the twenty-four hour "burn-in".
- .3 An on-site test procedure shall include a check of controls, functions and indicators after installation of the equipment.

1.5 FIELD QUALITY CONTROL

- .1 Factory-trained field service personnel shall perform the following inspections and test procedures during the ELI start-up.
- .2 Visual inspection:
- .3 Mechanical inspection:
- .4 Electrical inspection:
- .5 Functional inspection:
- .6 After installation of equipment, a signed commissioning report describing on-site testing and functionality shall be sent to the factory to validate warranty.

1.6 Warranty

- .1 The warranty of the equipment shall be twelve (12) months after start-up or eighteen (18) months after shipment.
- .2 For batteries, the warranty period shall be extended to 120 months, with a no-charge replacement during the first 5 years and a pro-rated charge on the second 5 years.
- .3 The battery cell manufacturer's warranty shall be passed through to the end user.

PART 2 - PRODUCTS**2.1 System description**

- .1 Provide a complete Emergency Lighting Inverter (ELI) as specified herein to provide continuous, regulated ac power to various emergency lighting fixtures under normal and abnormal conditions, as well as loss of the utility ac power. This system shall incorporate conditioning and power filters on both the input and output sides of the ELI.
- .2 ELI Module Components: The ELI module consists of the following major components:
 - .1 Input ac filter
 - .2 Output ac filter
 - .3 Inverter
 - .4 Rectifier/Charger
 - .5 Dc to dc converter
 - .6 Microprocessor controlled logic and control panel with alarm indicators and digital metering display
 - .7 Communications interface:
 - .1 RS-232

Unit Equipment for Emergency Lighting

- .2 RS-485
- .3 8 port relay
- .8 Input power walk-in
- .9 External battery connection
- .10 External wraparound bypass switch
- .11 Battery Cabinet Component
 - .1 Sealed, maintenance free batteries
 - .2 Battery circuit breaker
- .12 Optional features:
 - .1 Remote terminal strip
- .3 Definitions
 - .1 ELI Module: The portion of the ELI system that contains the rectifier/charger, inverter, static bypass switch, manual bypass switch, controls, monitoring, isolation transformer and indicators.
 - .2 Rectifier/Charger: The portion of the ELI module, which converts the normal source AC input power to DC power for the inverter input and for charging the battery.
 - .3 Inverter: The portion of the ELI module that converts DC power from either the rectifier/charger or the battery, to regulated and filtered AC power, which is supplied to the critical load.
 - .4 Static Bypass Switch: The portion of the ELI module which automatically transfers the critical loads, without interruption, from the inverter output to the bypass AC power source in the event of an overload or degradation of the inverter's performance.
 - .5 Manual Bypass Switch: The portion of the ELI module, which is used to connect the utility AC power source to the critical loads while maintaining galvanic isolation.
 - .6 Battery: The battery system that provides DC power to the inverter input when the normal AC input power to the ELI module fails or in the event that the rectifier/charger should fail.
 - .7 Critical Loads: Those loads that require regulated continuous AC power and which are connected to the output of the ELI module.

2.2 system operation

- .1 Normal: the inverter shall supply ac power continuously to the critical loads via the bypass ac power source, provided that the bypass ac power source is within the specified frequency range. The rectifier circuit shall convert the normal ac input power to dc power for the inverter in conjunction with the charger to maintain the battery charge.

Unit Equipment for Emergency Lighting

- .2 Loss of normal ac input power: the battery shall supply dc power, via the dc to dc converter, to the inverter with a maximum delay of 500ms, whenever the normal ac input power source of the ELI module deviates from the specified tolerances or fails completely. The battery shall continue to supply power to the inverter for the specified protection time.
- .3 Return of normal ac input power source: the control circuit shall transfer the load back to the bypass ac power source when the normal ac input power source returns (with a maximum delay of 500ms). The rectifier shall then simultaneously supply the charger with dc power and recharge the battery. This shall be an automatic function and shall cause no disturbance to the critical load.

2.3 electrical characteristics

- .1 ELI Module Input
 - .1 Voltage and number of input wires: as shown on electrical single line diagram
 - .2 Voltage range: -20% to +15% without discharging the battery
 - .3 Input frequency: 45 to 65 Hz continuous
 - .4 Reserve frequency: 60Hz \pm 7% continuous
 - .5 Current walk-in: 20 seconds to full load rating
 - .6 Maximum input current: 150% of nominal full load current
 - .7 Power factor: 0.60 lagging at nominal input voltage, 30% THD at nominal conditions and at full ELI load.
 - .8 Current harmonics: <9% THD, with 12 pulse rectifier and input factor
 - .9 Input transient protection: ANSI C62.41.
- .2 ELI Module Output
 - .1 Voltage and number of output wires: as shown on electrical single line diagram
 - .2 Frequency: 60Hz
 - .3 Power rating: as shown on electrical single line diagram
 - .4 Battery back-up time: 90 minutes unless otherwise noted
 - .5 Voltage regulation: \pm 2% of nominal for any of the combined effects
 - .1 No load to full load
 - .2 Minimum to maximum output power factor
 - .3 Minimum to maximum ac input voltage
 - .4 Minimum to maximum dc input voltage
 - .5 0 to 40°C ambient temperature
 - .6 Dynamic regulation:
 - .1 \pm 3% from nominal for 100% step load
 - .2 \pm 2% from nominal for 50% step load

Unit Equipment for Emergency Lighting

- .3 Recovering to within 1% in less than one cycle
- .7 Voltage unbalance: $\pm 3\%$ of nominal for 100% unbalanced loads
- .8 Phase separation:
 - .1 $120^\circ \pm 1\%$ of nominal for 100% balanced loads
 - .2 $120^\circ \pm 2\%$ of nominal for 100% unbalanced loads
- .9 Voltage distortion
 - .1 $< 2\%$ THD at 100% loads (linear load)
 - .2 $< 3\%$ THD at 100% load (non-linear load)
- .10 Frequency stability: $60\text{Hz} \pm 0.01\%$ free running
- .11 Phase-lock window: $60\text{Hz}, \pm 4\%$
- .12 Overload capability:
 - .1 Inverter:
 - .1 $< 110\%$ continuous
 - .2 125% for 15 minutes
 - .3 150% for 10 seconds
 - .2 Static bypass:
 - .1 200% for 30 seconds
 - .2 400% for 1 second
- .13 Fault clearing capability:
 - .1 Static bypass: 1000% for $\frac{1}{2}$ cycle (non-repetitive)
- .14 Crest factor: 3:1 maximum
- .3 Battery
 - .1 Type: Sealed lead-acid (maintenance-free AGM)
 - .2 10 year life type battery
- .4 Inverter
 - .1 The inverter shall utilize fast-switching IGBT transistors, pulse width modulation (PWM) and phase vector synchronization (PVS). It shall consist of a switching bridge, dc input, output filter and control circuitry to provide precise ac voltage regulation, harmonic cancellation//conditioning and superior transient response.
 - .2 Control circuitry:
 - .1 The inverter shall be provided with a digital signal processor (DSP) control circuitry to provide constant ac voltage regulation and transient response as specified. The high-speed DSP controls shall sample the output continuously to provide precise voltage control.

Unit Equipment for Emergency Lighting

- .2 The high speed DSP control shall sample the inverter output and the ELI module output to determine the phase and amplitude of the output voltage. The results shall be used by the DSP to control the inverter output to ensure a clean output ac voltage sine wave when driving non-linear loads.
 - .3 The circuitry shall provide low voltage initial start-up of the inverter and ramp-up to full voltage.
 - .4 The control circuitry shall automatically synchronize and phase lock the inverter output to the bypass ac power source as long as the bypass source is within the synchronization range. If the bypass ac power source is not within these pre-set limits, then the control circuitry shall break synchronization and lock to an internal crystal oscillator.
 - .5 The control circuitry shall automatically send a signal to the static bypass switch to transfer to the bypass ac source and then turn off the inverter for any of the following conditions:
 - .1 Blown inverter fuse
 - .2 Over-temperature
 - .3 Overloads per specified limits
 - .4 High/low dc voltage
 - .5 Inverter over-voltage or under-voltage condition
 - .6 The control circuitry shall automatically turn off the inverter when the battery reaches the end of discharge. The ELI shall automatically restart and return to normal when input ac power returns.
 - .7 The control circuitry shall be capable of additional inverter features with future DSP control software releases.
- .5 Front Panel and User Interface
- .1 The ELI front panel shall include the following LED's and an active mimic diagram of the ELI operation:
 - .1 Eight warning LED's
 - .1 Rect. AC Fail
 - .2 Res AC Fail
 - .3 Fuse/Temp
 - .4 Overload
 - .5 High DC
 - .6 Bat Low
 - .7 Bat Low Shutdown
 - .8 Fault
 - .2 Twenty-four operation LED's
 - .1 Inv On

Unit Equipment for Emergency Lighting

- .2 Inv Static Switch
- .3 Short Circuit
- .4 Fuse/Temp Shutdown
- .5 Inv Fail Inverter Shutdown
- .6 Bypass On Inverter Shutdown
- .7 High DC Inverter Shutdown
- .8 Overload Inverter Shutdown
- .9 70% Load
- .10 110% Load
- .11 125% Load
- .12 150% Load
- .13 Res AC Fail
- .14 Res AC Freq. Fail
- .15 Bat Low
- .16 Bat Low Shutdown
- .17 Rect. AC Fail
- .18 Rotation Error
- .19 Rect. Shutdown
- .20 Rect. High DC
- .21 Boost Charge
- .22 Battery Test
- .23 Emergency Stop
- .24 Data Line
- .3 The front panel shall include the following buttons for system operation and control of the LCD display:
 - .1 System operation buttons:
 - .1 Inverter On
 - .2 Inverter Off
 - .3 Inverter Control
 - .2 LCD display control buttons:
 - .1 Up
 - .2 Down
 - .3 Enter

Unit Equipment for Emergency Lighting

- .2 The ELI shall include an audible alarm-warning device. This alarm shall sound whenever any abnormal condition occurs. Any subsequent alarm shall cause reactivation of the status indicator and audible alarm.
- .3 The following parameters shall be measured and displayed by an alphanumeric LCD display on the Front Panel. Each display shall have the nomenclature of the parameter indicated with the associated value. AC voltage and current values shall be measured in true RMS units.
 - .1 Main Menu Display
 - .1 ELI identification
 - .2 Serial number
 - .3 Maximum output rating
 - .4 Input and output voltage configuration
 - .5 Current date and time
 - .2 Select Menu Display
 - .1 Access to further menus
 - .3 Status Warning Menu Display
 - .1 Current status of ELI operation
 - .2 Warning codes
 - .3 Fault codes
 - .4 Real Time Data Menu Display
 - .1 Allow access to further menu options
 - .5 Historical Event Menu Display
 - .1 Recorded events, warnings or faults
 - .6 Parameter Setting Menu Display
 - .1 Allows control of basic features
 - .7 Rectifier Data Display:
 - .1 Input frequency.
 - .2 Rectifier AC voltage - phase to neutral.
 - .8 Reserve Data Display
 - .1 Reserve frequency.
 - .2 Reserve AC voltage - phase to neutral.
 - .9 Output Data Display
 - .1 Output frequency.
 - .2 Percent load per phase.
 - .3 Output voltage - phase to neutral.

Unit Equipment for Emergency Lighting

- .10 Other Data Display
 - .1 Internal temperature.
 - .2 Battery voltage.
 - .3 Battery current with flow direction.
- .4 ELI event history shall be available through the alphanumeric display. The event history shall store a minimum of 77 previous status and alarm events with the date and time of each occurrence on an EEPROM. Allowances for a second EEPROM shall be made to allow for the stored recorded events to be increased to 154.
- .6 Communication Interface
 - .1 The ELI shall be equipped with eight (8) Form A (Normally Open) relay alarm contacts for remote signalling:
 - .1 Common (programmable OR gate for any combination of contacts)
 - .2 Battery Low
 - .3 Back-up Mode
 - .4 Manual Bypass Mode
 - .5 Static Bypass Mode
 - .6 Fault Condition
 - .7 Overload Condition
 - .8 Inverter On
 - .2 The ELI shall be equipped with one Form A (Normally Open) summary alarm contact for remote fire alarm panel connection.
 - .3 An input opto-coupled contact shall be included for remote shutdown of the ELI.
 - .4 Remote alarm panel interface. Summary includes:
 - .1 Safety shutdown
 - .2 Low battery
 - .3 Bypass activated
 - .4 Output voltage not present
 - .5 Inverter stop activation
- .7 Communication Ports
 - .1 The ELI shall be equipped with:
 - .1 RS-232 port for SNMP (Ethernet Adapter)
 - .2 RS-485 port for computer communications
 - .3 RS-485 port for remote display panel
- .8 Construction

Unit Equipment for Emergency Lighting

- .1 Enclosure: The ELI electronics shall be housed in a sprinkler proof indoor enclosure. The enclosure shall be primed and painted inside and outside with manufacturer's standard paint. The enclosure shall be a freestanding floor mount design. Enclosure shall incorporate integrated drip shield.
- .2 Material and workmanship:
 - .1 Workmanship shall be first class in every respect.
 - .2 All material shall be new and of best industrial grade.
 - .3 Internal wiring conductors shall be combined into cables or bundles, and shall be tied securely together.
 - .4 All bundled wiring shall be identified by color codes or by wire numbers. Power cables shall be identified at each end.
- .9 Cooling
 - .1 The ELI shall be forced air-cooled. Ventilation shall be from the bottom to the top. The cooling shall be adequate for operation at altitudes up to 2,500 meters.
- .10 Audible Noise Reduction
 - .1 The ELI shall be designed and constructed such that the audible noise is reduced to a typical 38 to 40 decibels, measured on the A scale at 1 meter from the front of the cabinet.
- .11 Battery Cabinet
 - .1 The ELI shall be designed to operate with any common lead-acid or nickel-cadmium battery type. The installed battery type and rating shall be programmed into the ELI at the factory, and the ELI charger shall select the proper charging regimen based on the actual installed battery type. This will maximize the life of the battery. The ELI shall include a circuit breaker and battery test feature that will automatically test the battery every thirty (30) days. The user shall have the ability to manual test the battery as well.

2.4 acceptable manufacturers

- .1 Beghelli – Boreaus BKW,
- .2 Lumacell – IPS, or approved equal.

PART 3 - EXECUTION**3.1 Installation**

- .1 The equipment shall be installed in accordance with the manufacturer's recommendations as well as local and national electrical codes.
- .2 Install on flat floor only.
- .3 Tie-in general trouble and running alarms into fire alarm panel.
- .4 The inverter to be tested on site as defined in Section 26 08 01.00 – TECHNICAL SERVICES DIVISION START-UP SERVICE and herein. Contractor to oversee all testing and correct any deficiencies noted.

Unit Equipment for Emergency Lighting

3.2 test reports

- .1 Submit all test reports as part of the O&M manuals.

3.3 manufacturer's field service

- .1 Service personnel
 - .1 The ELI manufacturer shall employ a nationwide service organization, consisting of factory trained field service personnel dedicated to the start-up, maintenance, and repair of ELI and power equipment.
- .2 Maintenance contracts
 - .1 A full service maintenance contract for both the ELI system and battery system shall be available to the end user. Factory-trained service personnel shall perform all warranty and maintenance.

END OF SECTION

Pathways for Communications Systems

PART 1 - GENERAL**1.1 WORK INCLUDED**

- .1 Supply and install cabling as detailed in Contract Documents. The Cabling Contractor shall use pathways installed by the electrical contractor to distribute the cables throughout the facility. Where the cables leave the pathways and extend to the termination point they shall use cable support hangers as specified in this document.
- .2 The contractor shall not use any mechanical or electrical fittings to support the telecommunications cabling. All telecommunications cabling shall be independently supported.
- .3 The contractor shall independently support the cables above all ceiling tiles and in a manner where the cables do not interfere with the removal of the ceiling tiles. A minimum of 75 mm 3"(in) of clear vertical space above the ceiling tiles shall be maintained.
- .4 The project manager must approve all deviations from the contract documents and drawings in relation to cable routing, outlet and equipment locations.

1.2 INDOOR CABLE DISTRIBUTION

- .1 Utilise all indicated and available cable pathways such as conduits, Communications cable tray, ducts, surface raceways installed by the electrical contractor, and furniture system channels except where otherwise noted.
- .2 Inside buildings minimize any possibilities of interference by maintaining the following minimum clearances from electrical and heat sources when routing cables.

Item	Minimum Separation Distances		
	(<2kVA)	(2-5kVA)	(>5kVA)
Unshielded power lines or electrical equipment in proximity to open or non-metallic pathway.	127 mm (5"(in))	305 mm (12"(in))	610 mm (24"(in))
Unshielded power lines or electrical equipment in proximity to a grounded metal conduit pathway.	64 mm (2.5"(in))	152 mm (6"(in))	305 mm (12"(in))
Power lines enclosed in a grounded metal conduit (or equivalent shielding) in proximity to a grounded metal conduit pathway.	---	76 mm (3"(in))	152 mm (6"(in))
Motors	1.2 m (4'-0")		
Transformers	1.2 m (4'-0")		
Fluorescent Luminaires	300 mm (12")		
Pipes (gas, oil, water, etc.)	120 mm (5")		
HVAC (equipment, ducts, etc.)	150 mm (6")		

Pathways for Communications Systems

1.3 OUTDOOR CABLE DISTRIBUTION

- .1 Supply and install backbone cabling as detailed on drawings. The Cabling Contractor shall use the aerial support structures, duct bank, conduits, riser sleeves and Communications cable tray by the Electrical Contractor to distribute the cables throughout the campus. Otherwise, cables shall be direct buried as detailed on Drawings. Exercise caution when pulling cables in such pathways to avoid damage to any existing cables and follow manufacturer's maximum pull-force and minimum bend radii.
- .2 The Cabling Contractor shall not perform any work within nor climb into the power space on an aerial pole.

1.4 AERIAL SPANS

- .1 Span of Aerial Cables for Urban Streets shall be as per the table below (Reference ANSI/TIA/EIA 758). In no case shall span clearances be less than those indicated below.

Span Lengths	Urban Street Span Clearance
107 m (350 ft)	5.5 m (18.0 ft)
122 m (400 ft)	5.6 m (18.5 ft)
137 m (450 ft)	5.8 m (19.0 ft)
152 m (500 ft)	5.9 m (19.5 ft)
168 m (550 ft)	6.0 m (20.0 ft)
183 m (600 ft)	6.2 m (20.5 ft)

*The above clearances are based on 16°C with no wind and initial stringing sag.

- .2 Loading of Copper and/or Optical Fibre cabling onto a messenger strand shall not exceed 60% of the strand strength.

PART 2 - PRODUCTS

2.1 NON-Continuous CABLE SUPPORT

The Cabling Contractor shall supply and install cable support for the distribution of horizontal and backbone cables where conduit or cable tray has not been provided. Cable supports shall be manufactured by Erico, or Panduit, and sized as per manufacturer recommendations.

- .1 Non-continuous cable supports shall be utilized up to the maximum density of cables permitted, as specified by the manufacturer.
- .2 Panduit J-Pro or J-Mod cable supports shall be used where ceiling space rating dictates. J-Pro plenum part numbers are shown for reference below. Substitute equivalent J-Mod product codes for similar product when required.

Description	Panduit Part#
Wall Mount	JP2W-L20
Ceiling Mount	JP2CMB-L20
Drop Wire & Threaded Rod Clip	JP2DW-L20
Screw-On Beam Clamps	JP2SBC50-L20 or JP2SBC50RB-L20
Hammer On Beam Clamps	JP2HBC25RB-L20 or JP2HBC50RB-L20 or JP2HBC75RB-L20
Purlin Clips	JP2ZP-L20 or JP2CP-L20
Under Floor Pedestal Support Clamp	JP2UF100-L20

Pathways for Communications Systems

- .3 The size of J-hooks/support shall suit quantity of cables in runs used for distribution.
- .4 Include any other miscellaneous hardware (angled hanger bracket, hammer/screw on clamps) required to support horizontal and backbone cabling.

2.2 VELCRO TIE-WRAPS

- .1 It should be noted that only Velcro tie-wraps shall be acceptable. Under no circumstance shall plastic tie-wraps be used.

Panduit
HLS/HLM-15R0 (Black)

- .2 If plastic tie-wraps are used the Cabling Contractor shall be required to remove and replace all affected cables at their own expense.

2.3 SPIRAL WRAP

- .1 Size Spiral Wrap according to quantity of cables being fed into the system furniture. Spiral Wrap colour shall match system furniture manufacturer's power feed.
- .2 Panduit part number: T50F-CX.

2.4 INNERDUCT

- .1 For plenum rated spaces, supply and install plenum rated Innerduct. Carlon part numbers are listed below.
- .2 Acceptable manufacturer;

Size	Plenum	Riser
1"	Carlon Part# CF4X1C-XXX	Carlon Part# DF4X1C-XXX
2"	Carlon Part # CJ4X1C-XXX	Carlon Part # DJ4X1C-XXX

Where "XXX" refers to appropriate product length

- .3 Innerduct shall be sized appropriately to maintain the 40% fill ratio and allow for a proper bend radius of the cable(s) within.
- .4 Where Innerduct is installed for use with OM1 or OM2 multimode fibre, it shall be Orange. Where Innerduct is installed for use with OM3/OM4 multimode fibre, it shall be Aqua. Where Innerduct is installed for use with single mode fibre, it shall be Yellow. All Innerduct shall be installed with pre-lubricated pull tape.

PART 3 - EXECUTION

3.1 CABLE DISTRIBUTION

- .1 Exercise caution when pulling cables in pathways to avoid damage to any existing cables and follow manufacturer's maximum pull-force and minimum bend radii.
- .2 All cables and components shall be installed and terminated in accordance with applicable Codes, Standards and Regulations.

Pathways for Communications Systems

3.2 CABLE SUPPORT

- .1 Supply and install supports, hanger supports and any other miscellaneous hardware required to support telecommunications cabling where conduit/cable tray has not been provided. Any conduit and cable tray shall be provided by the electrical contractor as indicated on Division 16 drawings, unless otherwise noted. Cabling contractor is responsible for determining these requirements based on Communications &/or Electrical drawings.
- .2 Caddy hangers shall be installed at 4' intervals (maximum). Cables shall be run such that sag between supports does not exceed 4". Secure all cables to J-hooks/supports with Velcro tie-wraps. Cables shall be combed and dressed for all visible portions of the install. The above noted conditions will be strictly checked and the Cabling Contractor will be required to comb and redress any cables that are unsatisfactory at no additional cost.
- .3 The contractor shall run all cable support hangers & innerduct parallel to building lines.
- .4 Cable support hangers or hanger supports must not be drilled into post-tensioned beams under any circumstances.
- .5 The Contractor is responsible for coordinating the best time to install the supports with the Project Manager. After hours work may be required for this portion of the work.
- .6 Supports shall be sized to accommodate the number of cables in each run. Other hardware such as hammer on clamps, screw on clamps and angled hanger brackets to support the backbone and/or horizontal cabling shall be included.
- .7 In the Cable Support Hanger System, each individual run or pathway shall not contain more than fifty (50) UTP horizontal cables. Where these situations arise, provide an additional hanger pathway to divide the cable bundle.
- .8 The Cable Support Hanger System shall be completely and independently supported from the structural ceiling or walls (concrete slab/deck) and shall not be supported in any way by the suspended ceiling. Anchors for hangers must not be drilled into post tensioned beams under any circumstances. The Cabling Contractor shall not use Hilti Pneumatic hammers. All anchors must be drilled into slab.
- .9 The Cabling Contractor must minimize the disturbance or removal of 'fire spray' insulation during installation of cable supports.

3.3 VELCRO TIE-WRAPPS

- .1 Velcro tie-wraps shall be used to neatly dress cables; they shall be placed at a maximum of 4' intervals for horizontal distribution (centre points between cable supports).
- .2 Velcro tie-wraps shall also be used to dress horizontal cables into racks/cabinets. For each row of the patch panel. Maximum spacing of Velcro for horizontal cables into or along vertical cable managers shall be no more than 6", this includes cabling dropped from the ladder tray or ceiling above.

3.4 SPIRAL WRAP

- .1 Install Spiral Wrap from system furniture feed points to system furniture entry point. Spiral Wrap shall be butted so that no cables are exposed.

Pathways for Communications Systems

3.5 INNERDUCT

- .1 All Fibre Cables shall be installed in innerduct over their entire length inside the building to provide mechanical protection. Exceptions to this are for:
 - .1 Armoured Fibre cabling;
 - .2 Where a dedicated fibre conduit is installed that is 1.5" in diameter or less.

Under these situations, the fibre cabling may be installed without innerduct.

- .2 Minimise the number of separate innerducts installed by pulling multiple fibre cables through each innerduct.
- .3 Innerduct shall be CMR (FT4) or CMP (FT6) rated, as is appropriate for ceiling space classification and local code requirements. Innerduct shall be sized to suit installation requirements.
- .4 The innerduct shall be fastened to the backboard, rack or cabinet by utilizing cradle mounts and plastic permanent cable ties.

3.6 CABLE DISTRIBUTION

- .1 Ensure ANSI/EIA/TIA-568-B installation practices are followed for Indoor cable distribution and ANSI/EIA/TIA-758 installation practices are followed for Outdoor cable distribution.
- .2 Station personnel at each access point (i.e. Handhole, manhole, etc.) to observe and lubricate the cables being pulled. Submit tension pull calculation for installation of cables to Consultant.
- .3 Do not exceed the copper/fibre cables maximum tensile rating during installation. Monitor tension of the cable during installation. Use a dynamometer to record installation tension. Use a tension limiting device to prevent the exceeding of maximum pulling tension specifications during installation. The tension limit shall be set at or below the manufacturer's limit. The cable shall be taken up at intermediate pulling points with an intermediate take-up device as approved by the Consultant, to prevent over tension on the cable.
- .4 Minimum bend radius shall be as per manufacturer's recommendations.
- .5 Make cable pulls continuous and steady between pull points. Do not interrupt the pull unless necessitated by excessive tension on the cable.
- .6 Protect exposed cable ends from moisture ingress.
- .7 Cable passing through manholes to have sufficient slack for expansion/contraction and shall be mounted with clips to prevent sagging.

3.7 DUCT AND CONDUIT

- .1 Clean out each section of duct or conduit by pulling a steel wire brush and mandrel of the correct size through the duct or conduit before pulling cables. Bush, ream and remove any sharp projections on all conduits prior to installation of communications cables. When cleaning ducts, if obstructions are encountered which cannot be removed, advise the Consultant of the problems encountered.

Pathways for Communications Systems

- .2 Pull cables in bottom ducts/conduits first, leaving top ducts/conduits for future use. Apply manufacturer's recommended lubricant to cables to reduce friction between the cable and the duct. Cable grip shall be attached to the sheath and its strength members so that no direct force is applied to the conductors/fibres. The cable grip shall have a ball bearing swivel to prevent the cable from twisting during pulling.

END OF SECTION 27 05 28.00

Identification for Communications Systems

- .2 Install colour designation strips as follows:

Item	Color
C.O. Circuits	Orange
Common Equipment: PBX, LAN's, Muxes	Purple
First Level Backbone Cable	White
Second Level Backbone Cable	Gray
Horizontal Wiring	Blue
Auxiliary Circuits – Alarms, Security	Yellow
Future use and Key Systems	Red
Inter-building Campus Backbone	Brown

- .4 Fibre Backbone Labelling

- .1 The labelling for Fibre Backbone cabling shall be as follows:

Example:

XXX Strand To/From Address - YYth Floor, Room ZZZ

Where:

XXX = Pair count of cable(s)

YY = Floor Number

ZZZ = Room Number or Designation

Note: Each strand shall be identified individually at the Fibre Connector.

PART 2 - PRODUCTS

2.1 LABELLING

- .1 All adhesive cable labels shall meet the legibility, defacement, and adhesion requirements specified in ANSI/UL 969 (Ref. D-16). In addition the labels shall meet the general exposure requirements in ANSI/UL 969 for indoor use.
- .2 Cable Labels shall be of self-laminating vinyl construction with a white printing area and a clear tail that self laminates the printed area when wrapped around a cable. The clear area should be of sufficient length to wrap around the cable at least one and one-half times.
- .3 Panduit Part# LS8E or Equivalent
- .4 Easy-mark labeling software. Part# PROG-EMCD or Equivalent.

PART 3 - EXECUTION

3.1 LABELLING

- .1 All labels must be mechanically printed using a laser printer. Hand-written labels are not permitted.
- .2 Provide 25% additional labels to be left in each telecommunications room on site for future growth.

Identification for Communications Systems

3.2 LABEL LOCATIONS

- .1 Cable identification labels shall appear at the following locations with the numbers indicated on the cable schedule and drawings:
 - .1 102 mm 4”(in) from each end of the cable – after termination.
 - .2 Front of patch panels.
 - .3 Front of IDC termination blocks.
 - .4 Front of workstation/communications outlet faceplates.
 - .5 Each end of each Telecommunications Conduit.
- .2 Fibre Optic safety Labels shall appear at the following locations:
 - .1 Along the length of the conduit or innerduct at 3m 10’(ft) intervals.
 - .2 At all junction boxes
 - .3 At all pull boxes.
 - .4 On all fibre optic patch panels.

END OF SECTION 27 05 53.00

Commissioning for Communications Systems

PART 1 - GENERAL**1.1 WORK INCLUDED****.1 General Testing Requirements**

- .1 100% of the installed cabling links must be tested and must pass the requirements of the Standards as defined within this document. Any failing link must be diagnosed and corrected. The corrective action shall be followed with a new test to prove that the corrected link meets the performance requirements. The final and passing result of the tests for all links shall be provided in the test results documentation.
- .2 All deficiencies must be corrected before the Communications Consultant will provide a certificate to release the Holdback on the project.
- .3 Test patch cords to portable tester must be designed for testing by the manufacturer. Field assembled patch cords are not acceptable. Field testers must use the appropriate jack/tester adapter specified for use with the cabling jack(s) specified within this document.
- .4 The Cabling Contractor to produce a test report based on the cable schedules. The report should indicate for each cable, when it was tested successfully and the signature of the technician that performed the test, location, cable type, cable number and tester make and model. The entire report must be signed by an authorised person for the Cabling Contractor at the end of the project.

.2 Copper Cabling Test Requirements

- .1 Every cabling link in the installation shall be tested (as required by the Cabling specified) in accordance with the Telecommunications Industry Association (TIA) Standard ANSI/TIA/EIA-568.1-D.
- .2 The installed twisted-pair horizontal links shall be tested from the Telecom Room to the workstation against the "Permanent Link" performance limits Specification as defined in ANSI/TIA/EIA-568.1-D.
- .3 Trained technicians who have successfully attended an appropriate training program and have obtained a certificate, as proof thereof shall execute the tests. Appropriate training programs include installation certification programs provided by BICSI or the ACP (Association of Cabling Professionals) and Vendor supplied certifications for their product.
- .4 The test equipment shall comply with or exceed the accuracy requirements for enhanced level II and/or level III field testers (according to Cabling specified) as defined in TIA-568-B; Annex I: Section I.4. The tester including the appropriate interface adapter must meet the specified accuracy requirements. The accuracy requirements for the permanent link test configuration (baseline accuracy plus adapter contribution) are specified in Table I.4 of Annex I of TIA/EIA-568-B.2.

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- .5 The tester interface adapters must be of high quality and the cable shall not show any twisting or kinking resulting from coiling and storing of the tester interface adapters. In order to deliver optimum accuracy preference is given to a permanent link interface adapter for the tester that can be calibrated to extend the reference plane of the Return Loss measurement to the permanent link interface. The Cabling Contractor shall provide proof that the interface has been calibrated within the period recommended by the Vendor. To ensure that normal handling on the job does not cause measurable Return Loss change, the adapter cord cable shall not be of twisted-pair construction.
 - .6 The Pass or Fail condition for the link-under-test is determined by the results of the required individual tests. Any Fail or Fail* result yields a Fail for the link-under-test. In order to achieve an overall Pass condition, the results for each individual test parameter must Pass or Pass*.
 - .7 A Pass or Fail result for each parameter is determined by comparing the measured values with the specified test limits for that parameter. The test result of a parameter shall be marked with an asterisk (*) when the result is closer to the test limit than the accuracy of the field tester. The field tester manufacturer must provide documentation as an aid to interpret results marked with asterisks. (Reference TIA-568-B; Annex I: Section I.2.2).
- .3 Copper Cabling Performance Test Parameters
- .1 The test parameters for Cat 5e are defined in ANSI/TIA/EIA Standard 568-B.1; Section 11.2.4 as well as in Annex I; Section I.2.1 "Parameters to be reported". The test of each Cat 5e link shall contain all of the following parameters as detailed below. In order to pass the link test all measurements (at each frequency in the range from 1 MHz through 100 MHz) must meet or exceed the limit value determined in the above-mentioned Cat 5e Standard. In addition, the test parameters for Cat 6 are defined in TIA Cat 6 Standard, which refers to TIA/EIA-568-B.2. The test of each link shall contain all of the following parameters as detailed below. In order to pass the test all measurements (at each frequency in the range from 1 MHz through 250 MHz) must meet or exceed the limit value determined in the above-mentioned Standard.
- Testing of all 4 pairs of the horizontal cable (as specified in this document) shall include but not be limited to the following:
- .1 Wire Map including; end to end continuity, open and shorts, pair polarity
 - .2 Cable length
 - .3 Attenuation
 - .4 NEXT/FEXT
 - .5 ACR
 - .6 Return Loss
 - .7 ELFEXT, PSELFEXT
 - .8 Propagation Delay, Delay skew
 - .9 PSNEXT, PSACR

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- .2 Permanent link testing of all horizontal & backbone cables is to be completed in accordance with the follow test criteria:
 - .1 Wire Map including; end to end continuity, open and shorts, pair polarity
 - .2 Cable length
 - .3 Basic Link
- .3 The nominal velocity of propagation (NVP) must be set specific to each cable manufacturer before testing. The portable tester shall be within the calibration period recommended by the manufacturer in order to achieve the manufacturer-specified measurement accuracy. Refer to manufacturer's test procedure.
- .4 Optical Fibre Cabling Test Requirements
 - .1 Every optical fibre cabling link in the installation shall be tested in accordance with the field test Specifications defined by the Telecommunications Industry Association (TIA) Standard ANSI/TIA/EIA- 568-C (or by the appropriate network application Standard(s) whichever is more demanding).
 - .2 ANSI/TIA/EIA-568-B, defines the passive cabling network to include cable, connectors, and splices (if present), between two optical fibre patch panels (connecting hardware). A typical horizontal link segment is from the telecommunications outlet/connector to the horizontal cross-connect. This TIA document describes three typical backbone link segments: (1) main cross-connect to intermediate cross-connect, (2) main cross-connect to horizontal cross-connect, or (3) intermediate cross-connect to horizontal cross-connect. The test shall include the representative connector performance at the connecting hardware associated with the mating of patch cords. The test does not, however, include the performance of the connector at the interface with the test equipment.
 - .3 Trained technicians who have successfully attended an appropriate training program and have obtained a certificate, as proof thereof shall execute the tests. These certificates may have been issued by any of the following organisations or an equivalent organisation:
 - .1 The manufacturer of the optical fibre cable and/or the optical fibre connectors
 - .2 The manufacturer of the test equipment used for the field certification
 - .3 Training organisations authorised by BICSI (Building Industry Consulting Services International) or by the ACP (Association of Cabling Professionals™).
 - .4 Vendor supplied certifications for their product.

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- .4 Field test instruments for multimode fibre cabling shall meet the requirements of ANSI/TIA/EIA-526-14A. The light source shall meet the launch requirements of ANSI/EIA/TIA-455-50B; Method A. This launch condition can be achieved either within the field test equipment or by use of an external mandrel wrap (as described in clause 11 of ANSI/TIA/EIA-568-B.1) with a Category 1 light source. Field test instruments for singlemode fibre cabling shall meet the requirements of ANSI/EIA/TIA-526-7.
- .5 The optical fibre launch cables and adapters must be of high quality and the cables shall not show excessive wear resulting from repetitive coiling and storing of the tester interface adapters.
- .6 The Pass or Fail condition for the link-under-test is determined by the results of the required individual tests as detailed below.
- .7 A Pass or Fail result for each parameter is determined by comparing the measured values with the specified test limits for that parameter.
- .5 Optical Fibre Cabling Performance Test Parameters
 - .1 ANSI/TIA/EIA Standard 568-C3 prescribes that the single performance parameter for field testing of optical fibre links is link attenuation when installing components compliant with this Standard.
 - .2 The link attenuation shall be calculated by the following formulas specified in ANSI/TIA/EIA 568-B.
 - .3 Link attenuation does not include any active devices or passive devices other than cable, connectors, and splices, i.e. link attenuation does not include such devices as optical bypass switches, couplers, repeaters, or optical amplifiers.
 - .4 The above link attenuation test limits are based on the use of the One Reference Jumper Method specified by ANSI/TIA/EIA-526-14A, Method B and ANSI/TIA/EIA-526-7, Method A.1. The user shall follow the procedures established by these Standards or application notes to accurately conduct performance testing.
 - .5 The Horizontal Link (multimode): acceptable link attenuation for a multimode horizontal optical fibre Cabling Solution is based on the maximum 90 m (295 ft) distance. The horizontal optical fibre cabling link segments need to be tested at only one (1) wavelength. Because of the short length of cabling [90 m (295 ft) or less], attenuation deltas due to wavelength are insignificant. The horizontal link should be tested at 850 nm or 1300 nm in one direction in accordance with ANSI/EIA/TIA-526-14A, Method B, and One Reference Jumper. The horizontal link may be tested using a fixed upper limit for attenuation of 2.0 dB. This value is based on the loss of two (2) connector pairs, one (1) pair at the telecommunications outlet/connector and one (1) pair at the horizontal cross-connect, plus 90 m (295 ft) of optical fibre cable.
 - .6 The Backbone Link (multimode) shall be tested in one direction at both operating wavelengths to account for attenuation deltas associated with wavelength.

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- .7 Multimode Backbone Links shall be tested at 850 nm and 1300 nm in accordance with ANSI/EIA/TIA-526-14A. Because backbone length and the potential number of splices vary depending upon site conditions, the link attenuation equation shall be used to determine limit (acceptance) values.
- .8 Singlemode Backbone Links shall be tested at 1310 nm and 1550 nm in accordance with ANSI/TIA/EIA-526-7, Method A.1, and One Reference Jumper. All singlemode links shall be certified with test tools using laser light sources at 1310 nm and 1550 nm (See Note below).

Notes:

- .1 Link attenuation has been based upon the use of a light source categorised by a Coupled Power Ratio (CPR) of Category 2, Underfilled, per Annex B of ANSI/EIA/TIA-526-14A. The use of a light source categorised as Category 1, Overfilled, may provide results higher than the 2.0 dB limit. A field test tool based on LED (light emitting diode) light sources is a Category 1 device and typically yields high attenuation results.
- .2 Links destined to be used with network applications that use laser light sources (underfilled launch conditions) shall be tested with test equipment based on laser light sources. This rule should be followed for Cabling Solutions to support Gigabit Ethernet. Gigabit Ethernet only specifies laser light sources.
- .3 For Gigabit Ethernet compliant certification (IEEE STD 802.3z application), use test equipment which uses a VCSEL (Vertical cavity surface emitting laser) at 850 nm (compliant with 1000BASE-SX) and a FP laser at 1310 nm (compliant with 1000BASE-LX).
- .9 Each optical fibre link terminated with an optical adapter system which does not impose a transmission direction because the adapters are not or cannot be ganged should be tested and documented in both directions since the direction of the signal transmission cannot be predicted at the time of installation.
- .10 Test each strand of fibre with an Optical Time Domain Reflectometer for length and attenuation. Performance test must be below the total return loss budget for the cable connectors/balun. Provide comprehensive optical time domain reflectometry (OTDR) testing for all fibre runs. Include a hard copy chart recording with the test documentation.
- .6 Copper and Optical Fibre Cabling Test Result Documentation
 - .1 The following test result documentation requirements shall be applied to the Copper Cabling and Optical Fibre Cabling as appropriate.
 - .2 The test result information for each link shall be recorded in the memory of the field tester upon completion of the test.
 - .3 A paper copy of the test results shall be provided that lists all the links that have been tested with the following summary information:
 - .1 The identification of the link in accordance with the naming convention defined in the overall system documentation

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- .2 The overall Pass/Fail evaluation of the link-under-test including the Attenuation worst case margin (margin is defined as the difference between the measured value and the test limit value).
 - .3 The overall Pass/Fail evaluation of the link-under-test including the NEXT Headroom (overall worst case) number
 - .4 The date and time the test results were saved in the memory of the tester
- .4 General Information shall be provided in the electronic data base containing the test result information for each link:
 - .1 The identification of the Client site as specified by the end-user
 - .2 The overall Pass/Fail evaluation of the link-under-test
 - .3 The name of the Standard selected to execute the stored test results
 - .4 The cable type and the value of the 'index of refraction' used for length calculations
 - .5 The date and time the test results were saved in the memory of the tester
 - .6 The brand name, model and serial number of the tester
 - .7 The revision of the tester software and the revision of the test Standards database in the tester
- .5 The detailed test results data to be provided in the electronic database for each tested Copper Cable must contain the following information
 - .1 The identification of the link in accordance with the naming convention defined in the overall system documentation
 - .2 The cable type and the value of NVP used for length calculations
 - .3 The identification of the tester interface
 - .4 The test results information must contain information on each of the required test parameters that are listed in this document.
- .6 The detailed test result data to be provided in the electronic database for each tested Optical Fibre Cable must contain the following information:
 - .1 The identification of the link/fibre in accordance with the naming convention defined in the overall system documentation
 - .2 The insertion loss (attenuation) measured at each wavelength, the test limit calculated for the corresponding wavelength and the margin (difference between the measured attenuation and the test limit value).
 - .3 The link length shall be reported for each optical fibre for which the test limit was calculated based on the formulas in this document.
- .7 Coaxial Cable Testing
 - .1 All horizontal CATV Coaxial cables shall be swept tested to industry standards using a Time Domain Reflectometer (TDR).

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- .2 All horizontal CATV Coaxial cables shall be sweep tested after installation for opens, shorts, and kinks. Damaged cables shall be replaced by installing a new cable. Indicate on the floor plans the actual length of each cable section as installed.
- .3 The Cabling Contractor shall provide soft and hard copy of cable test result for each CATV cable. Cable test results shall identify cable numbers and associated test results.
- .8 Warranty and Certification Requirements
 - .1 The Cabling Contractor is required to provide a minimum of a 2-year unconditional parts and labour Warranty for all equipment & labour provisioned under this contract, from the date of substantial completion, for each communications cabling system.
 - .2 The Cabling Contractor is required to arrange for a minimum of 25-year Manufacturer's Warranty and System Performance Guarantee, from the date of substantial completion, for each communications cabling system.
 - .3 Response time for Warranty items shall be 24 hours. The Cabling Contractor may be required to repair deficient Cabling Solution components outside regular working hours. Bidders shall include a statement of Warranty terms and conditions with their Bid Response.
 - .4 Provide a manufacturer Warranty that the Structured Cabling Solution is installed and fully operating in accordance with this and the manufacturer specifications. A framed certificate will be acceptable.
 - .5 Upon request and at no additional cost to the Client the Cabling Contractor must provide a manufacturer's technical representative to conduct an on-site visit to ensure complete technical compliance.
 - .6 All documentation including the certificate must be in English and French, and shall be submitted to the Communications Consultant for signed acceptance prior to their production.

PART 2 - PRODUCTS**2.1 ACCEPTABLE COPPER TESTERS**

- .1 Acceptable portable UTP test manufacturers include: HP/Agilent, OMNIScanner and Fluke DSP-4000.

2.2 ACCEPTABLE FIBRE TESTERS

- .1 Acceptable portable fibre test manufacturers include EXFO, Fluke OptiFiber® Pro OTDR and Fotec.
- .2 Provide 850nm and 1300nm \pm 20nm wavelength LED light sources.
- .3 Spectral width of sources shall be \pm 50nm for 850nm wavelengths and \pm 140nm for 1300nm wavelengths.
- .4 Provide 1300nm and 1500nm \pm 20nm wavelength Laser light sources.

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- .5 Output stability ± 0.40 dB from 0 to 50oC. Long term stability shall be ± 0.10 dB at 25oC.

2.3 Warranty & Certification

- .1 Provide to client, one system certification per project..

PART 3 - EXECUTION**3.1 WARRANTY AND CERTIFICATION REQUIREMENTS**

- .1 The Cabling Contractor shall forward the Structured Cabling Solution certification request form(s) to the proper authority and ensure that a Plaque is issued to the Client along with the Structured Cabling Solution user manual. The Cabling Contractor will provide a certification number within two weeks of award of this project
- .2 The Cabling Contractor will provide letter(s) of Certification within two weeks of substantial completion of the project to the Communications Consultant. This document will include the following: verification of the performance of the installed system, identification of the installation by location and project number and a copy of the Warranty.
- .3 Upon award of contract, the Cabling Contractor shall forward copies of the Structured Cabling Solution certification request for Certification form complete with certification number(s) for the project to Smith + Andersen's office within 7 days of the award of contract. Provide a copy of the form with Specification submission.

END OF SECTION 27 08 00.00

Communications Cabinets, Racks, Frames and Enclosures

PART 1 - GENERAL**1.1 WORK INCLUDED****.1 Equipment Locations**

- .1 Devices, racks, cabinets, brackets and backboards may be relocated, prior to installation, from the location shown on the Contract Drawings, to a maximum distance of 3.05m (10'-0') without adjustment to the Contract price.

.2 Plywood Backboards

- .3 Use plywood backboards for mounting of Voice fields, Data fields, wall mount racks, wall mount brackets, wall mount cabinets, swing-out racks, termination of horizontal and backbone cables, or for any other use as specified in the scope of work and/or on drawings including but not limited to for use by others. Refer to detail drawings for location of backboards. The Cabling Contractor shall install all new backboards, unless otherwise noted.

.4 Communication Racks and Cabinets

- .1 All wall mount brackets, racks, cabinets and components shall be supplied and installed by the Cabling Contractor as indicated in this document and on the Contract drawings.
- .2 All racks, cabinets, wall mount brackets and components provided shall be from the same manufacturer and identical style shall be used throughout the project, unless specifically noted in this section.
- .3 All racks, cabinets, wall mount brackets and components shall meet or exceed requirements as defined by ANSI/EIA-310-D-1992, Cabinets, Racks, Panels and Associated Equipment.
- .4 All racks, cabinets, wall mount brackets and components required for this project will be reflected on Telecommunications Room Layout & Rack Elevation Detail drawings (If required).
- .5 At a minimum, provide one (1) new 2U horizontal cable management panel for each new patch panel installed, when no rack elevation drawing is provided. Quantities shown on rack elevation drawing(s) shall supersede this requirement.
- .6 In all cases wall mount brackets, racks, cabinets and components shall be powder-coated black.
- .7 Approved manufacturers:
 - 1. Hammond Manufacturing
 - 2. D.L. Custom
 - 3. Electron Metal
 - 4. Panduit
 - 5. Belden
 - 6. R.F. Mote
 - 7. Middle Atlantic

PART 2 - PRODUCTS

2.1 wall MOUNT COMMUNICATIONS CABINET

- .1 Wall mounted 482 mm (19") double swing out cabinet to accommodate a minimum 28 standard EIA vertical rack positions shall be used.
- .2 Fully welded, fabricated from a minimum of 16GA. (0.060") steel.
- .3 The shall have the following product features:
 - .1 Lexan front door.
 - .2 Solid side panels
 - .3 10-32 tapped mounting angle style
 - .4 Hinged cabinet body.
 - .5 Minimum of one (1) 75 C.F.M or greater cooling fan.
 - .6 Vertical cable management panels with hinged doors with nonmagnetic closing mechanisms
 - .7 One (1) dual bolt ground lug
- .4 Utilize proper fasteners for the vertical cable managers, power bars and all accessories as per the manufacturer's recommendations.

2.2 COMMUNICATIONS RACK & cabinet COMPONENTS

- .1 20A, Shielded Cord Vertical Power Bar
 - .1 Fabricated from 18 GA (0.048") steel & mountable into 19" EIA cabinet frames or network racks.
 - .2 Each power bar shall have 12 NEMA 5-20 output receptacles and come with a minimum of 3m 10'(ft) cord and NEMA L5-20 input plug.
 - .3 Shielded Cord features a 300V capacity, 100% coverage aluminum foil - polyester tape shield, 7x28 AWG tinned copper drain wire (20 AWG), and a durable PVC outer coating.
 - .4 The power bar(s) shall be UL/ULC listed and must meet UL/ULC 1363 and 1449 requirements.
 - .5 Features breaker protection with reset button, three-stage surge protection, fused and non-switched with Illuminated power switch showing power "ON".
 - .6 Each rack/cabinet shall be equipped with a minimum of one power bar unless otherwise noted.

Communications Cabinets, Racks, Frames and Enclosures

2.3 PLYWOOD BACKBOARDS

- .1 The Cabling Contractor shall supply, install and layout the Plywood Backboard(s) as required, unless otherwise noted. Backboards shall be constructed of 4' x 8' (3/4") plywood sheet(s) as noted on drawings, one side good. The plywood sheets shall be placed vertically (unless otherwise noted), and shall be painted with 2 coats of white fire retardant non-conductive paint.
- .2 Offset Backboards
- .3 Backboards shall be constructed to suit construction specifications prescribed in included detail drawing(s). All cables shall be fed from behind the Backboard to the IDC mounts, unless otherwise noted. Install offset backboards where required as shown on drawings.
- .4 Flush Backboards
- .5 Backboards shall be used for wall mounted racks, wall mounted cabinets, wall mount brackets, telephone equipment, service provider equipment, lightning protection, horizontal cables, riser cables, IDC punch down blocks, and/or any other use as identified in the scope of work for this project, including for use by others. Install flush backboards where required as shown on drawings.

PART 3 - EXECUTION**3.1 COMMUNICATIONS wall mount brackets, RACKS, CABINETS AND COMPONENTS**

- .1 Properly secure the racks on top of the finished floor and wall within the Telecommunications Room. Ground all racks and cabinets in accordance with the parameters within this specification document.
- .2 Refer to detail drawings for location(s) of communications wall mount brackets, racks and cabinets.
- .3 All communications rack and cabinet components shall be provided by the Cabling Contractor as per the detail drawings. The Cabling Contractor shall provide (including levelling and ganging) all Racks, Cabinets and their components for a complete functioning system.
- .4 Vertical Power bars are to be mounted on the rear right side of the rack with the cord end located at the top of the rack. Horizontal power bars shall be mounted as shown on rack elevation drawings.
- .5 All wall mounted equipment (i.e. rotating rack & wall mount cabinet) shall be secured to 3/4" G1S CANPLY Exterior Grade plywood (4' x 8' sheet). Plywood shall be provided by the cabling contractor unless noted otherwise.

END OF SECTION 27 11 16.00

Data Communications Horizontal Cabling

PART 1 - GENERAL**1.1 WORK INCLUDED**

- .1 Supply and install cabling as detailed in Contract Documents. The Cabling Contractor shall use pathways (by Electrical Contractor) to distribute the cables throughout the facility. Where the cables leave the pathways and extend to the termination point they shall use J-hooks/cable support specified in this document.
- .2 Ensure that all cable lengths are sufficient to allow for slack, vertical runs, wastage, connectorization and future moves.
- .3 The Contractor shall ensure ANSI/EIA/TIA-568-C.2 installation practices are followed. Install horizontal cables in accordance with manufacturer's specifications ensuring that proper installation techniques are adhered to.
- .4 The Contractor shall terminate all pairs of cable at each cable end.
- .5 Inform the Consultant immediately of any horizontal cable runs exceeding 90 m 295'(ft). Minimum horizontal cable run (if required) shall not be less than that specified in manufacturer's specifications.
- .6 The Consultant shall determine the quality of workmanship during installation. Cables that have not been properly installed will be reinstalled by the cabling contractor at no additional expense to the contract.

1.2 CABLE ROUTING

- .1 Make any necessary changes or additions to routing of cables, pathways to accommodate structural, mechanical, electrical and architectural conditions. Where pathways or cables are shown diagrammatically run them parallel to building columns. If it is necessary to run cables otherwise to accommodate acceptable cable lengths, written permission must be obtained from the Consultant prior to installation.
- .2 Any deviation from the cable routing, outlet and equipment locations shown on drawings must be approved by the Consultant and documented on as-built drawings.

PART 2 - PRODUCTS**2.1 4-Pair HORIZONTAL COPPER CABLE**

- .1 Four pair, twisted pair cable consisting of #22-26 AWG solid conductors, formed into four individually twisted pairs and enclosed in an appropriately rated thermoplastic jacket as required by local codes. All individual conductors to be insulated with fluorinated ethylene propylene (FEP).
- .2 All cabling must be CSA certified and stamped accordingly
- .3 Cable to withstand a bend radius of 25.4 mm (1") at a temperature of -20°C ± 1°C without jacket or insulation cracking.
- .4 All cables shall have an outer jacket colour as identified below:

Data Communications Horizontal Cabling

Cable Designation	Colour
Data	Blue

PART 3 - EXECUTION**3.1 GENERAL CONDITIONS**

- .1 When terminating copper cables remove only enough cable jacket to perform termination, untwist pairs a maximum of 13 mm (1/2") for Category 5 to 6a cables and 25 mm (1") for Category 3 cables. Any specific manufacturer's installation guidelines shall supersede the above.
- .2 The cabling contractor shall not splice any cables for any reason, unless prior consent is given by the Consultant.

3.2 HORIZONTAL CABLE DISTRIBUTION

- .1 Provide a minimum of 3.05 m (10'-0") of slack at both ends of each cable to permit future cable relocation. Neatly coil slack in ladder tray. If ladder tray is not available ceiling space and cable supports may also be used to coil slack. For completely enclosed zone conduit distribution systems, provide 3.05 m (10'-0") of slack at the telecommunications room end only.
- .2 Follow proper installation and termination practices for Category 3, 5, 5e, 6, 6A and Optical Fibre cables. Do not kink or exceed the cable minimum bend radius or maintain a minimum of four (4) times cable diameter as bend radii if the manufacturer specifies no bend radius. For Optical Fibre cables maintain a minimum of ten (10) times the cable diameter or 30 mm (1.2") whichever is larger for a bend radius.
- .3 All horizontal cables shall be bundled on the Telecommunications Racks using Panduit Velcro straps. Separate Voice, Data and fibre cables into separate distinct bundles for identification purposes where applicable.
- .4 Bundles shall be tie-wrapped in telecommunications rooms, at a maximum of 203 mm 8"(in) separation and shall contain no more than fifty (50) cables to eliminate any excessive stress on the cable jackets.
- .5 When bundling cables, comply with manufacturer's recommended bundling practices for installation. Ensure that excess pressure is not placed on the cable at any point that may result in the compression or deformation of the cable jacket and internal pair/conductor geometry.
- .6 All exposed cabling at the workstation between wall/floor-input point locations and systems furniture is to be wrapped with black split loom tubing, size and length as required to suit.
- .7 Cabling Contractor will be required to route/install telecommunications cabling in systems furniture, lab casework furniture & mill work as denoted on floor plans.
- .8 Avoid scraping, denting or otherwise damaging cables before, during or after installation. The cabling contractor shall make every effort to protect all exposed cabling from other trades during construction phase until cables can be placed in final pathway. The Cabling Contractor without any additional compensation shall replace damaged cables.

Data Communications Horizontal Cabling

- .9 Provide data cables to each outlet indicated on the drawings. The Cabling Contractor shall refer to the legends on the drawing to determine the number of cables to each outlet location.
- .10 Terminate test and label each cable in accordance to the parameters stated in this specification document.
- .11 Ground all cables and components to manufacturer's specifications and standard practices.

END OF SECTION 27 15 00.19

Communications Coaxial Horizontal Cabling

PART 1 - GENERAL**1.1 WORK INCLUDED**

- .1 Supply and install cabling as detailed in Contract Documents. The Cabling Contractor shall use pathways provided by the electrical contractor to distribute the cables throughout the facility. Where the cables leave the pathways and extend to the termination point they shall use J-hooks/cable support specified in this document.
- .2 Avoid scraping, denting, or otherwise damaging cables, before, during or after installation. The Cabling Contractor without any additional compensation shall replace damaged cables.
- .3 Ensure that all cable lengths are sufficient to allow for slack, vertical runs, wastage and connectorization.
- .4 Cable lengths within boxes shall be adequate to permit installation and removal of device for inspection without damage to cable or connections (minimum of 6").
- .5 Cable bends shall not be greater than that recommended by the manufacturer of the cable.

1.2 CABLE ROUTING

- .1 Make any necessary changes or additions to routing of cables, pathways to accommodate structural, mechanical, electrical and architectural conditions. Where pathways or cables are shown diagrammatically run them parallel to building columns. If it is necessary to run cables otherwise to accommodate acceptable cable lengths, written permission must be obtained from the Communications Engineer's Representative prior to installation.
- .2 Any deviation from the cable routing, outlet and equipment locations shown on drawings must be approved by the Communications Engineer's Representative and documented on as-built drawings.

PART 2 - PRODUCTS**2.1 HORIZONTAL CATV COPPER CABLE**

- .1 All horizontal CATV cabling shall be CommScope F-6 Series (CommScope Part # 4100903/10) coaxial cable or Belden equivalent.

2.2 catv cable CONNECTORS

- .1 All CATV cable connectors shall be Snap-N-Seal "F" Connectors.
- .2 The Snap-N-Seal "F" Connectors shall have the following minimum performance parameters:
 - .1 Permanently stamped part number and color-coded sleeves for easy identification before and after installation.
 - .2 Quad sealed system prevents moisture from migrating into the connection.
 - .3 360° radial compression provides superior RF integrity (-95dB typical, 60% bonded foil cable).

Communications Coaxial Horizontal Cabling

- .4 1/4"x 1/4" cable preparation
- .5 Connector to cable retention 40 lbs minimum
- .6 Minimum return loss performance of -30dB to 1GHz.
- .7 Manufactured of high quality 360 brass, cadmium plated with yellow chromate coating for maximum corrosion resistance. Plastic and O-ring providing a reliable environmentally sealed connector.

2.3 WORKSTATION OUTLETS

- .1 Wall Faceplate
- .2 All wall outlets shall utilise 2-port modular style flush-mounted faceplate adapters. Each outlet shall be equipped with the appropriate "F" Female/Female bulhead modules.
- .3 Coordinate colour of face plates with architect/interior designer.
- .4 Approved manufacturers are as follows:

Thomas and Betts
CommScope

- .5 Decora Adapters
- .6 Communications boxes that are ganged with the electrical boxes, wall, floor or raceway outlets shall utilise 2-port Decora style adapters/inserts. Each outlet shall be equipped with the appropriate "F" Female/Female bulhead modules.
- .7 Coordinate colour of Decora style adapters/inserts with architect/interior designer.
- .8 Approved manufacturers are as follows:

Thomas and Betts
CommScope

2.4 BLANK INSERTS

- .1 All unused communications ports must be installed with Blank Inserts. Blank inserts shall match faceplates.
- .2 All CATV cable drops shall be terminated on Snap-N-Seal "F" connectors within their respective Telecom Room. The cabling contractor shall coordinate with the CATV service provider, the exact termination locations and amount of slack to be left on each cable.

PART 3 - EXECUTION**3.1 GENERAL CONDITIONS**

- .1 When terminating coaxial cables, use only manufacturer recommended coaxial cable stripping tool to remove only enough cable jacket to perform termination.
- .2 Utilize only manufacturer recommended compression style tool to perform installation of Snap-N-Seal "F" connectors.

Communications Coaxial Horizontal Cabling

3.2 HORIZONTAL coaxial CABLE DISTRIBUTION

- .1 Provide coaxial cables to each outlet indicated on the drawings. The Cabling Contractor shall refer to the legends on the drawing to determine the number of cables to each outlet location.
- .2 Neatly bundle and tie-wrap all cables using Velcro tie-wraps.
- .3 Follow proper installation and termination practices for coaxial cables. Do not kink or exceed the cable minimum bend radius or maintain a minimum of four (4) times cable diameter as bend radii if the manufacturer specifies no bend radius.
- .4 When bundling coaxial cables, comply with manufacturer's recommended bundling practices for installation. Ensure that excess pressure is not placed on the cable at any point that may result in the compression or deformation of the cable jacket and cable geometry.
- .5 Each end of each coaxial cable shall be terminated with one Type F connector.
- .6 Cabling contractor to verify location of coaxial backbone cable within termination room. Provide adequate cable slack for termination and to reach backbone cable tap box.

END OF SECTION 27 15 33.00

Communications Patch Cords and Cross Connect Wire

PART 1 - GENERAL**1.1 WORK INCLUDED**

- .1 Conform to Section 27 00 05.10 – GENERAL INSTRUCTIONS FOR COMMUNICATIONS SECTIONS.
- .2 Avoid scraping, denting, or otherwise damaging cables, before, during or after installation. The Cabling Contractor without any additional compensation shall replace damaged cables.

1.2 OPTICAL FIBRE PATCH CORDS

- .1 Multimode Optical Fibre Patch Cords shall be made of 50/125 or 62.5/125 micron fibre with a maximum attenuation of 3.5 dB/km @ 850 nm and 1.25 dB/km @ 1300 nm. Type of fibre Patch Cords shall be consistent with type of fibre backbone.
- .2 The Multimode Optical Fibre Patch Cord connector shall be multimode PC polish-type with ceramic ferrule with a typical insertion loss of 0.3 dB (guaranteed 0.5 dB) and a reflectance of –20 dB.
- .3 Single mode Optical Fibre Patch Cords shall have a maximum attenuation of 0.8 dB/km @ 1310 nm and 0.5 dB/km @ 1550 nm.
- .4 The Single mode Optical Fibre Patch Cord connector shall be either SPC or UPC polish-type with ceramic ferrule with a typical insertion loss of 0.15 dB (guaranteed 0.5 dB) and a reflectance of –40 dB for SPC and –55 dB for UPC.
- .5 The Optical Fibre Cord assembly shall be ST, SC, Duplex SC, FC, LC or MT-RJ construction (confirm connector type with East Hants).

1.3 Copper PATCH CORDS

- .1 All Data Patch Cords shall be connected in the Telecom Room to the Client supplied active equipment using 8 position 4 pair T568A/B : T568A/B Patch Cords.
- .2 The Patch Cords shall be CMR (FT4) rated and stamped accordingly and shall be consistent with the grade and manufacturer of the Data Cable that is being Warranted.

1.4 CROSS CONNECT WIRE

- .1 The Multipair cable IDC Termination Connectors shall have the same AWG sizing as the multipair conductors that it is connecting.

PART 2 - PRODUCTS**2.1 OPTICAL FIBRE PATCH CORDS**

- .1 All Optical fibre Backbone cable strands shall be connected to the Client supplied active equipment using Fibre Patch Cords. The Fibre Patch Cords shall be CMR rated FT4 and stamped accordingly. Fibre Patch Cords shall be consistent with the grade and manufacturer of the Fibre cable that is being warranted.

Communications Patch Cords and Cross Connect Wire

- .2 The Cabling Contractor is required to supply and install Fibre Patch Cords for complete connectivity of Fibre Cables. The Client reserves the right to switch the Fibre Patch Cords to a different configuration at no extra cost, 10 business days prior to delivery.

2.2 DATA PATCH CORDS and pigtail assemblies

- .1 All Data Patch Cords shall be connected in the Telecom Room to the Client supplied active equipment using 8 position 4 pair patch cords.
- .2 The Patch Cords shall be CMR (FT4) rated and stamped accordingly and shall be consistent with the grade and manufacturer of the Data Cable that is being Warranted.
- .3 Patch cords to have stranded copper conductors (where system dictates) and designed to provide a mated-connection performance that exceeds the requirements per ANSI/TIA/EIA-568-B.
- .4 Patch cords and pigtail assemblies to be factory assembled and not site prepared, complete with snagless boot.
- .5 Patch Cord / Pigtail requirements:

Designation	Termination	Colour	Length	Location
Data	RJ45/RJ45	TBA	3' (ft) 0.91m	Telecom. Room
Data	RJ45/RJ45	TBA	10' (ft) 3m	Workstation
Data	RJ45/Open	TBA	Cabinet to Backboard length	

2.3 CROSS-CONNECT WIRE

- .1 For the multipair copper backbone cabling system, the Cabling Contractor shall supply and install Cross-Connect wire. All Cross-Connect Wire supplied and installed must maintain the Structured Cabling Solution.
- .2 Cross-connects shall be made with wire of equal gauge and Category to that of the highest Category cable, which it is being connected to.
- .3 Assume all pairs of backbone are to be cross-connected at both ends.

PART 3 - EXECUTION**3.1 OPTICAL FIBRE PATCH CORDS**

- .1 Assume all strands of optical fibre cable(s) shall be patched.

3.2 UTP COPPER PATCH CORDS

- .1 At Telecommunications Room end, provide one (1) 3' (ft) 0.91m patch cord for each data cable installed. Cabling Contractor shall be responsible for patching all data cabling. A patching schedule shall be provided to the Cabling Contractor prior to installation. Patch Cords supplied and installed must maintain the Channel Solution.
- .2 At workstation end, provide one (1) 10' (ft) 3m patch cord for each data cable installed. Patch Cords supplied and installed must maintain the Channel Solution.

Communications Patch Cords and Cross Connect Wire

3.3 CROSS-CONNECT WIRE

- .1 Assume all pairs of backbone are cross-connected at both ends.

END OF SECTION 27 16 19.00

Multiplex Fire Alarm System

PART 1 - GENERAL

1.1 Work Included

- .1 Section 26 05 01.00 – GENERAL INSTRUCTIONS FOR ELECTRICAL SECTIONS.
- .2 Section 26 05 04.00 – SUBMITTALS/SHOP DRAWINGS.
- .3 Section 26 05 34.00 - CONDUITS, CONDUIT FASTENERS AND FITTINGS.
- .4 Section 26 08 01.00 - TECHNICAL SERVICES DIVISION STARTUP SERVICE.

1.2 References

- .1 CAN/ULC-S524, Installation of Fire Alarm Systems, latest edition.
- .2 CAN/ULC-S536, Inspection and Testing of Fire Alarm Systems, latest edition.
- .3 CAN/ULC-S537, Verification of Fire Alarm Systems, latest edition.
- .4 CAN/ULC-S1001, Integrated Systems Testing of Fire Protection and Life Safety Systems, latest edition.
- .5 CAN/ULC-S553, Standard For Installation of Smoke Alarms, latest edition.

1.3 System Description

- .1 All equipment and components shall be new, and the manufacturer's current model.
- .2 Spare modules will be provided for future tenant tie ins. Panels will be tied into emergency standby generators, fire pumps, security panels, and auxiliary and ancillary devices.
- .3 Elevator shafts will have a weather proof heat detector located in the pit along with an ionisation smoke detector located at the top of the shaft.
- .4 Emergency power feed from generator(s) or inverter(s) shall have two supervisory zones each, monitoring Generator Running and Generator General Trouble.
- .5 Fully supervised, microprocessor-based, fire alarm system, utilizing digital techniques for data control and digital, and multiplexing techniques for data transmission.
- .6 System to carry out fire alarm and protection functions; including receiving alarm signals; initiating general and two-stage alarm; supervising components and wiring; actuating annunciators and auxiliary functions; initiating trouble signals and signalling to monitoring agency.
- .7 Zoned, non-coded single stage or two stage, as indicated.
- .8 Modular in design to allow for future expansion.
- .9 Operation of system shall not require personnel with special computer skills.
- .10 System to include:
 - .1 Central Control Unit in separate enclosure with power supply, stand-by batteries, central processor with microprocessor and logic interface, main system memory, input-output interfaces for alarm receiving, annunciation/display, and program control/signalling.

Multiplex Fire Alarm System

- .2 Not Used.
- .3 Power supplies.
- .4 Initiating/input circuits.
- .5 Indication/output circuits.
- .6 Auxiliary circuits.
- .7 Wiring.
- .8 Manual and automatic initiating devices.
- .9 Audible and visual signalling devices.
- .10 End-of-line resistors.
- .11 Not Used.
- .12 Not Used.
- .13 Historic event recorder.
- .14 Isolation modules.
- .15 Monitoring dialer with cellular backup
- .16 Programmed features.

1.4 Requirements Of Regulatory Agencies

- .1 System components shall be listed by ULC/CSA and comply with applicable provisions of the National Building Code, the Local/Provincial Building Code, and meet requirements of local authority having jurisdiction.

1.5 Shop Drawings And Product Data

- .1 Submit Shop Drawings and product data in accordance with Section 26 05 04.00 – SUBMITTALS/SHOP DRAWINGS.
- .2 Include:
 - .1 Detail assembly and internal wiring diagrams for control units and auxiliary cabinets.
 - .2 Overall system riser wiring diagram identifying control equipment, initiating zones, signaling circuits; and 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.
 - .5 Step-by-step operating sequence, cross referenced to logic flow diagram.

1.6 Operation And Maintenance Data

- .1 Provide operation and maintenance data for fire alarm system for incorporation into the O&M manual.

Multiplex Fire Alarm System

.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.
- .4 List of recommended spare parts for system.
- .5 Detailed sequence of operation or operational matrix.
- .6 Full fire alarm verification inspection report.
- .7 CD/DVD or USB stick, containing electronic version of fire alarm passive graphic both in PDF and CAD, as part of O&M manual.

1.7 Maintenance Materials**.1 Include:**

- .1 Spare glass rods for manual pull stations, if applicable.
- .2 Key for fire alarm panel, remote annunciator, and pull stations.
- .3 Specialty tool for resetting sprinkler supervisory, if applicable.
- .4 Spare fuses for control circuits.
- .5 Not Used.

1.8 Maintenance

- .1 Provide one year's free maintenance with two inspections by manufacturer during warranty period. Inspection tests to conform to CAN/ULC-S536. Submit inspection report to Owner.

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.

1.10 Commissioning

- .1 Testing and commissioning of the integration of all life safety and fire protection systems shall be required. The testing of the integrated systems shall include, but not limited to the following systems:
 - .1 Fire Alarm
 - .2 Mass Notification
 - .3 Elevators
 - .4 Emergency Generators and/or Inverters
 - .5 Audio/Visual

Multiplex Fire Alarm System

- .6 Lighting Control
- .7 Notification (i.e. "Fire Do Not Enter" signage, etc.)
- .8 Sprinkler
- .9 Standpipe
- .10 Fire Pumps
- .11 Water Supplies and/or Control Valves
- .12 Freeze Protection
- .13 Fixed Fire Suppression
- .14 Cooking Equipment Fire Suppression
- .15 Hold-Open Devices
- .16 Electromagnetic Locks
- .17 Smoke Control
- .18 Hazardous Protection Monitoring
- .19 Smoke Alarms

PART 2 - PRODUCT**2.1 Materials**

- .1 Equipment and devices: ULC listed, labelled and supplied by single manufacturer.
- .2 Power supply: to CAN/ULC-S524.
- .3 Audible signal devices: to ULC-S525.
- .4 Visual signal devices: to CAN/ULC-S526.
- .5 Control unit: to CAN/ULC-S527.
- .6 Manual pull stations: to CAN/ULC-S528.
- .7 Thermal detectors: to CAN/ULC-S530.
- .8 Smoke detectors: to CAN/ULC-S529.
- .9 Smoke alarms: to CAN/ULC-S531.

2.2 System Operation: 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 and data gathering panel/transponder.
 - .2 Indicate zone of alarm at central control unit and remote annunciator.
 - .3 Cause audible signalling devices to sound continuously throughout building and at central control unit.
 - .4 Transmit signal to fire department via dialler.

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- .5 Cause air conditioning and ventilation fans to shut down or to function to provide required control of smoke movement.
- .6 Cause fire doors and smoke control doors, if normally held open, to close automatically.
- .7 Cause elevators to return to floor of egress, or to alternate floor, as required.
- .2 Acknowledging alarm: indicated at central control unit.
- .3 Actuation of supervisory devices to:
 - .1 Cause electronic latch to lock-in supervisory state at central control unit and data gathering panel/transponder.
 - .2 Indicate respective supervisory zone at central control unit and at remote annunciator.
 - .3 Cause audible signal at central control unit to sound.
 - .4 Activate common supervisory sequence.
- .4 Resetting of alarm or supervisory device shall not return system indications/functions back to normal until control unit has been reset.
- .5 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.
- .6 Trouble on system: suppressed during course of alarm.
- .7 Trouble condition on any circuit in system not to initiate alarm conditions.

2.3 Control Panel

- .1 Central control unit (CCU):
 - .1 Suitable for Data Communication Link style C (DCL-C) unless otherwise noted on the drawings: to CAN/ULC-S524.
 - .2 Features specified are minimum requirements for microprocessor-based system with digital data control and digital multiplexing techniques for data transmission.
 - .3 Minimum capacity of 100 addressable monitoring and 100 addressable control/signal points. Points may be divided between 2 communication channels in distributed system, each channel operating independently of other. Faults on one communication channel not to affect operation of other channel.
 - .4 System to provide for priority reporting levels, with fire alarm points assigned highest priority, supervisory and monitoring lower priority, and third priority for troubles. Possible to assign control priorities to control points in system to guarantee operation or allow emergency override as required.
 - .5 Integral power supply, battery charger and standby batteries.

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- .6 Basic life safety software: retained in non-volatile Erasable Programmable Read-Only-Memory (EPROM). Extra memory chips: easily field-installed. Random-Access-Memory (RAM) chips in panel to facilitate password-protected field editing of simple software functions (e.g. zone labels, priorities) and changing of system operation software.
- .7 Circuitry to continuously monitor communications and data processing cycles of microprocessor. Upon failure, audible and visual trouble indication to activate.
- .8 Communication between CCU and remote DGP's/TPR's to be supervised, DCLA. Should communications fail between CCU and remote units, audible and visual trouble to be indicated at CCU. Data communication to be binary DC, baseband, time-division multiplex, half-duplex. Each data channel: capable of communicating up to distance of 3,000 m.
 - .1 Communication between nodes in networked system to be supervised, DCLA. Should communications fail between any 2 nodes, other nodes on loop to continue to communicate with each other and programmed functions on communicating nodes to continue operating.
- .9 Support up to 4 RS-232-C I/O ports. CCU output: parallel ASCII with adjustable baud rates to allow interface of any commercially available printer, terminal or PC.
- .10 Equipped with software routines to provide Event-Initiated-Programs (EIP); change in status of one or more monitor points, may be programmed to operate any or all of system's control points.
- .11 Software and hardware to maintain time of day, day of week, day of month, month and year.
- .12 Not Used.
- .13 Printer to record activities on system controlled by EIA RS-232-C link from within CCU.
- .14 Software to operate variable sensitivity addressable smoke detectors and annunciate their status and sensitivity settings at control panel.

2.4 Not Used.**2.5 Power Supplies**

- .1 120V, 60 Hz as primary source of power for system. The circuit shall be labelled at the main power distribution panel as FIRE ALARM. The fire alarm disconnect must be locked, a locked electrical room or panel door does not constitute the lock for the disconnect.
- .2 Voltage regulated, current limited distributed system power.
- .3 Primary power failure or power loss (less than 102 V) will activate common trouble sequence.
- .4 Interface with battery charger and battery to provide uninterruptible transfer of power to standby source during primary power failure or loss.

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- .5 Abnormal operating conditions such as a fault in battery charging circuit, short or open in the battery leads, shall activate a common trouble sequence and standby power trouble indicator.
- .6 Standby batteries: 5 year NiCad sealed, maintenance free.
- .7 Continuous supervision of wiring for external initiating and alarm circuits are to be maintained for 24hrs with capability of maintaining alarm activation for a minimum of 2 hrs, immediately following 24 hrs of supervision.

2.6 Initiating/Input Circuits

- .1 Receiving circuits for alarm initiating devices such as manual pull stations, smoke detectors, heat detectors and water flow switches, wired in DCL-C, as per CAN/ULC-S524, configuration to central control unit or DGP's/transponders.
- .2 Alarm receiving circuits (active and spare) are to be compatible with smoke detectors and open contact devices.
- .3 Actuation of alarm initiating device is to cause system to operate as specified in "System Operation".
- .4 Receiving circuits for supervisory devices are to be wired in DCL-A configuration to central control unit or DGP's/transponders.
- .5 Actuation of supervisory initiating device is to cause the system to operate as specified in "System Operation".
- .6 Sprinkler devices such as pressure switches and flow switches are to have the tamper switch wired after the switch and before the EOL, to create a trouble condition while still allowing the device to electrically initiate its respective zone.
- .7 Low room temperature devices are to be provided in sprinkler rooms whenever a dry sprinkler system is provided.

2.7 Alarm Output Circuits

- .1 Alarm output circuits are to be connected to signals, wired in class B configuration to the central control unit or DGP's/transponders.
- .2 The signal circuits' operation is to be capable of sounding bells, horns as required. Each signal circuit: rated at 2 A, 24 VDC; fuse-protected from overloading/overcurrent.
- .3 Manual alarm silence, automatic alarm silence and alarm silence inhibit is to be provided by system's common control.
- .4 Separate circuits shall be provided for audible signal devices on each floor area.
- .5 Audible signal devices within dwelling units or suites of residential occupancy shall be wired on separate signal circuits from those not within suites of residential occupancy or dwelling units.

2.8 Auxiliary Circuits

- .1 Auxiliary contacts for control functions.
- .2 Actual status indication (positive feedback) from controlled device.

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- .3 Alarm or supervisory trouble on system to cause operation of programmed auxiliary output circuits.
- .4 Not Used.
- .5 Upon resetting system, auxiliary contacts are to return to normal or to operate as pre-programmed.
- .6 Fans: stagger-started upon system reset; timing circuit to separate starting of each fan or set of fans connected to auxiliary contact on system. Timing circuit: controlled by CCU.
- .7 Auxiliary circuits: rated at 2 A, 24 V dc or 120 V ac, fuse-protected.

2.9 Wiring

- .1 All fire alarm system wiring must be new.
- .2 Twisted copper conductors: 300 V CSA FAS minimum 105°C with FT4 rating and in mechanical protection i.e. EMT or flex as specified under Section 26 05 34.00 - CONDUITS, CONDUIT FASTENERS AND FITTINGS.
- .3 To initiating circuits: 18 AWG minimum, and in accordance with manufacturer's requirements.
- .4 To signal circuits: 16 AWG minimum, and in accordance with manufacturer's requirements.
- .5 To control circuits: 14 AWG minimum, and in accordance with manufacturer's requirements.
- .6 All initiating circuits are to be wired in a DCL-C (i.e. Class A) configuration.
- .7 All output circuits are to be wired in a Class B configuration, unless otherwise shown on the drawings.
- .8 All wiring between junction boxes and water flow switch, pressure switch, or supervisory switches will be in liquid tight flexible conduit.

2.10 Manual Alarm Stations

- .1 Addressable manual pull station.
 - .1 Pull lever, break glass rod, semi-flush wall mounted type, single stage, or 2 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 two pole for direct disconnect of magnetic locking devices local to the devices.

2.11 Automatic Alarm Initiating Devices

- .1 Addressable thermal fire detectors, combination fixed temperature and rate of rise, non-restorable fixed temperature element, self-restoring rate of rise, fixed temperature 57 deg. C., rate of rise 8.3 deg. C. per minute:
 - .1 Electronics to communicate detector's status to addressable module/transponder.

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- .2 Detector address to be programmed on site.
- .2 Smoke detector: ionization and photo electric:
 - .1 Twistlock plug-in type with fixed base.
 - .2 Wire-in base assembly with integral red alarm LED.
 - .3 Auxiliary output contact.
- .3 Duct type smoke detectors: photo-electric with sampling tubes:
 - .1 Twistlock plug-in type with fixed base.
 - .2 Wire-in base assembly with integral red alarm LED.
 - .3 Auxiliary output contact.
 - .4 Properly sized air sampling tubes.
- .4 Beam type detectors: long range and short range:
 - .1 Complete with transmitter and receiver.
 - .2 Short range operating distance of 9-30 meters.
 - .3 Long range operating distance of 30-100 meters.
 - .4 Operating temperatures shall be of -5 to 55 deg. C.
 - .5 The beam detector shall feature alignment LEDs on both the receiver and the transmitter and automatic gain control.
 - .6 Beam detector calibrated test filters, if applicable.
- .5 Addressable variable-sensitivity smoke detectors:
 - .1 Ionization and photo-electric type.
 - .2 Electronics to communicate detector's status to addressable module/transponder.
 - .3 Detector address to be set on detector head in field.
 - .4 Sensitivity settings: 3 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 2 levels of detector contamination automatically with trouble condition at control panel.
 - .6 Auxiliary output contact.
- .6 Water flow switches: lever and pressure type:
 - .1 Shall have a mechanical alarm transmitted delay adjustable from 0-60 seconds. Initial settings shall be 30-45 seconds. Times will be recorded and submitted to Consultant.
 - .2 The tamper switch located within the water flow switch shall be wired as per manufacturer's recommendations such that if the housing is open a latching trouble will be initiated.
- .7 Sprinkler and standpipe valve supervisory switches:

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- .1 The tamper switch located within the supervisory switch shall be wired as per manufacturer's recommendations such that if the housing is open a latching trouble will be initiated.
- .8 Smoke alarms: ionization and photo electric.
 - .1 Twistlock plug-in type with fixed base.
 - .2 Wire-in base assembly with integral red and green LEDs for alarm/normal status.
 - .3 Silence button to silence nuisance alarms.
 - .4 Test button to verify circuitry and alarm operation.
 - .5 Electrical Rating: 120VAC, 60Hz and Battery Backup
 - .1 Battery capacity to provide power for minimum 7 days in normal condition, followed by 4 minutes of alarm.
 - .6 Visual strobe light with the following performance requirements:
 - .1 The flash rate shall not exceed two flashes per second (2 Hz) nor be less than one flash every second (1 Hz) throughout the listed voltage range of the appliance.
 - .2 Maximum pulse duration shall of 0.2 seconds with a maximum duty cycle of 40 percent, where the pulse duration is defined as the time interval between initial and final points of 10 percent of maximum signal.
 - .3 Shall be clear or nominal white and shall be minimum 175 cd but not exceed 1000 cd (effective intensity).
 - .4 The strobe light shall be synchronized where multiple smoke alarm strobe lights are installed within the same area and/or viewpoint.
- .9 Combination Smoke/Carbon Monoxide alarms:
 - .1 Smoke Detection: ionization.
 - .2 Twistlock plug-in type with fixed base.
 - .3 Wire-in base assembly with integral red and green LEDs for alarm/normal status.
 - .4 Silence button to silence nuisance alarms.
 - .5 Test button to verify circuitry and alarm operation.
 - .6 Electrical Rating: 120VAC, 60Hz and Battery Backup
 - .1 Battery capacity to provide power for minimum 7 days in normal condition, followed by 4 minutes of alarm.

2.12 Audible Signal Devices

- .1 Not Used.
- .2 Not Used.
- .3 Horns: 24 V dc, indoor horn type with compression driver, surface mounted.
 - .1 Corrosion, vibration and vermin resistant.

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- .2 Taps: multiple, adjustable with maximum tap output sound level of 100db at 3m.
- .3 Frequency response: 400 to 4000 Hz.
- .4 Weatherproof Horns: 24 V dc, for use primarily in mechanical equipment areas, both indoor and outdoor. Horn type with compression driver, surface mounted.
 - .1 Corrosion, vibration and vermin resistant.
 - .2 Frequency response: 400 to 4000 Hz.
 - .3 Complete with weatherproof box as recommended by manufacturer.
 - .4 High output 40mA @ 24Vdc, Low output 20mA @24Vdc.

2.13 Visual Alarm Signal Devices

- .1 Strobe type: white flashing light, wall mount or ceiling mounted as per drawings.
 - .1 Synchronized at one flash per second.
 - .2 Flash tube enclosure in clear LEXAN.
 - .3 "FIRE" installed red letters.
 - .4 Operating on 20-24 V dc.
 - .5 Field adjustable for 15cd or 75cd unless specified otherwise.

2.14 End-Of-Line Devices

- .1 End-of-line devices to control supervisory current in alarm circuits and signalling circuits, sized to ensure correct supervisory current for each circuit. Open, short or ground fault in any circuit will alter supervisory current in that circuit, producing audible and visible alarm at main control panel and remotely as indicated.

2.15 Remote Annunciators

- .1 LED type, with designation cards to indicate zones.
- .2 Display:
 - .1 Alarms for alarm initiating circuits.
 - .2 Common supervisory alarm for supervisory initiating circuits.
 - .3 Common system trouble.
- .3 Trouble buzzer:
 - .1 Acknowledging trouble at main panel to silence trouble buzzers in system.
- .4 Supervised, with LED test button.
- .5 Minimum wiring configuration with main panel.

2.16 Not Used.

2.17 Isolation Module

- .1 Provide isolation modules in accordance with CAN-ULC-S524.

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- .1 Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an DCL-C branch. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the DCL segment branch.
- .2 If a wire-to-wire short occurs, the isolator module shall automatically disconnect the DCL-C segment. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.
- .3 The isolation module will provide a single LED that flashes to indicate the isolation module is operating and illuminate steadily to indicate that a short circuit condition has been detected and isolated.

2.18 Dialer Module

- .1 Provide digital alarm dialer complete with cellular service backup. Dialer module shall annunciate alarm and supervisory state to a monitoring station.

2.19 Programmed Features:

- .1 By-pass feature for signalling devices:
 - .1 Bypassing of audible devices shall be provided through the programmable keys. The use of the feature is intended for personnel with programming access.
- .2 Evacuation feature.
 - .1 Evacuation key will be programmed and accessible for any personnel working on the fire alarm panel.

2.20 Not Used.**2.21 Ancillary Devices**

- .1 Remote relay unit to initiate fan shutdown, magnetic door locks and door hold open devices.

2.22 STI Steel Web Stoppers, Detector Covers.

- .1 Provide STI 9600 series detector cover for areas where sporting events or similar activities avail.

2.23 STI Stopper 2 & Weather Proof Stopper 2, Covers For Manual Stations.

- .1 Provide STI Stopper 2 1100 series manual station covers for all vandal resistant locations identified on the electrical and architectural drawings. Provide STI covers for manual stations in the natatorium.
- .2 Provide Weather Proof Stopper 2 1200 (flush mount) or 3100 (surface mount) series manual station covers for all weather proof locations and outdoor applications identified on the electrical and architectural drawings.

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2.24 Relay Base, For Fire Detectors.

- .1 Provide power along with the relay base detector such that the device that is being controlled with the normally open or normally closed relay base may operate or function. Power requirements and relay condition to be determined on site.

2.25 Manufacturers

- .1 The following are acceptable manufacturers:
 - .1 Chubb Edwards.
 - .2 Simplex.
 - .3 Mircom
 - .4 Siemens
 - .5 Notifier

PART 3 - EXECUTION**3.1 Installation**

- .1 Install systems in accordance with CAN/ULC-S524.
- .2 Install central control unit and connect to ac power supply.
- .3 Install manual alarm stations and connect to alarm circuit wiring.
- .4 Locate and install detectors and connect to alarm circuit wiring. Do not mount detectors within 1 m of air outlets. Maintain at least 600 mm radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts. Installation of duct type detectors will be complete with sampling tubes.
- .5 Connect alarm circuits to main control panel.
- .6 Install bells, horns and visual signal devices and connect to signalling circuits.
- .7 Connect signalling circuits to main control panel.
- .8 Install end-of-line devices.
- .9 Install remote annunciator panels and connect to annunciator circuit wiring.
- .10 Install door releasing devices.
- .11 Install remote relay units to control fan shut down.
- .12 Sprinkler system: wire alarm and supervisory switches and connect to control panel.
 - .1 Sprinkler devices should be wired such that opening of a device will cause a trouble on an alarming device or a supervisory on a supervising device.
 - .2 Where mechanical/sprinkler contractor makes revisions to the base design, electrical contractor shall coordinate any revisions to fire protection system directly with the mechanical/sprinkler contractor at no cost to the owner and update as-built drawings accordingly.
- .13 Room detection system (where applicable):

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- .1 Install detectors. Make necessary connections between room detection panel and main fire alarm panel.
- .2 Locate and install audible signals and visual alarms.
- .3 Locate and install detectors under raised floor. Fasten to steel brackets approximately 300 mm above sub-floor level to clear cables and conduits.
- .14 Connect fire suppression systems to control panel.
- .15 Splices are not permitted.
- .16 Provide necessary raceways, cable and wiring to make interconnections to terminal boxes, annunciator equipment and CCU, as required by equipment manufacturer.
- .17 Ensure that wiring is free of opens, shorts or grounds, before system testing and handing over.
- .18 Identify circuits and other related wiring at central control unit, annunciators, and terminal boxes.
- .19 Install smoke and smoke/CO alarm in accordance with CAN/ULC-S553.
 - .1 Where more than one smoke (or smoke/CO) alarm is installed within a dwelling unit, interconnect the wiring such that actuation of one smoke (or smoke/CO) alarm will cause all the smoke (or smoke/CO) alarms within the dwelling unit to sound.

3.2 Field Quality Control and commissioning

- .1 Perform tests and verification in accordance with Section 26 08 01.00 - TECHNICAL SERVICES DIVISION STARTUP SERVICE.
- .2 The installing contractor is responsible for hiring and coordinating with the manufacturer to perform the following:
 - .1 Testing of system to CAN/ULC-S536 prior to performing verification.
 - .2 Partial verification inspection to CAN/ULC-S537 and reports as required for partial occupancy.
 - .3 Complete an entire building test to CAN/ULC-S536 and provide detailed report. Provide a full verification inspection and test report at the end of the project. Cumulative partial verification reports do not constitute a full verification.
 - .4 Perform complete commissioning of the integration of all life safety and fire protection systems as a whole to ensure the proper operation and inter-relationship between the systems.
 - .1 Testing and commissioning of the integrated systems must be done as a complete installed assembly; individual component testing or partially installed assembly testing is not acceptable.
 - .2 Follow the testing methodology for verifying and documentation of operation as outlined in CAN/ULC-S1001.

Multiplex Fire Alarm System

- .3 Provide an Integrated Systems Testing Report as recommended in Appendix B of CAN/ULC-S1001. Include report with fire alarm test and verification reports.
- .3 All fire alarm test and verification reports are to be submitted with a covering letter from the manufacturer clearly stating that there are no deficiencies with the installation prior to releasing the respective area for occupancy.

END OF SECTION

Bidders's Questions & Responses

1. BIDDER'S QUESTIONS & RESPONSES

1.1 Architectural

.1 Question:

"The Tender package requires scope of the Pool Contractor be performed by qualified contractor as noted in # 00 21 13.1.19.3.2.14 (Bid evaluation meeting). This clause makes reference to section 13 11 13. However, it should be clearly stated what the owner defines to be included in the Pool Contractor scope. There are several aspects associated with the pool which should be read as being under the pool contractor scope....

...The limit of scope under the Pool Contractors responsibility must be defined for the Mechanical Contractor and the Electrical Contractor to understand their limit of scope. For example, drawing M201 shows this limit of scope for the Potable Water Lines in details 1 and 2. It does not show the scope limit for the Heating Water system. Specification 13 11 13.2.1.3.7 also assigns electrical design, supply and installation to the Pool Contractor. Please confirm the above interpretation and provide limit of scope for the associated mechanical / electrical systems."

Response:

The intent of Specifications Section 13 11 13 is to identify the requirement for a single experienced pool Subcontractor to take responsibility for the installation of the swimming pools and associated systems. See paragraph 1.5. – Quality Assurance.

The general scope of work is identified in paragraph 2.1 – Performance/Design Requirements.

The precise limits of scope between trades are not defined by the Consultant as these may vary from one Contractor to the next based on their relationship to and communications with the Subcontractors. Please refer to Section 01 10 00, paragraph 1.2.

Note revisions to Section 00 21 13, 1.19.3.2.14.4 and Section 13 11 13, 2.1.7.2 contained in the Addendum.

.2 Question:

"Is bonding required for sub contractors? "

Response:

Bonding requirements are identified in Section 00 21 13, paragraph 1.9. This paragraph lists the requirement for the Bidder to submit a Bid Bond and an Agreement to Bond as a part of their bid. This Section does not include any additional requirements from the Subcontractors.

Subcontractors should discuss any additional bonding with the Bidders to whom they are bidding.

.3 Question:

"Request for Alternate, lifeguard chairs and starting platforms, Aquam.

Vendor has written: "I was wondering if supplying pool equipment in 316L stainless steel with powder coat finish only would be an accepted alternative. I know section 13 11 47 specifies that any ferrous pool equipment must have a primer, + powder coat + clear coat finish, but this is something only Spectrum supplies and I truly believe that it is not necessary. In our many years

Bidders's Questions & Responses

of experience, Stainless 304 grade + Powder coat finish is enough to prevent corrosion completely. "

Response:

The specifications will not be revised. Rather than downgrade the basis of design products from 316L to 304 stainless steel, the listed acceptable alternate manufacturers are required to provide their products in the specified materials.

.4 Question:

"In the insulation spec note 3.4.7 walls for a woven wire for holding the insulation into the stud cavity tight to the exterior sheathing board, are alternative options acceptable for the locations where the sheathing isn't applied on both sides of the wall?"

Response:

Condition described in 3.4.7, in which batt insulation is installed between steel studs and held against exterior sheathing, does not occur in this project.

Section 07 21 00, sentences 3.4.7 and 3.4.8 will be deleted by Addendum.

.5 Question:

"On drawing A 700 Door & Frame Types please confirm what is required for aluminum doors D 1-AL and D2-AL "Two-Side Aluminum Plate Door"? Do these doors have glass or an aluminum panel?"

Response:

Per A700 Door Types, D1-AL and D2-AL are two-sided Aluminum Plate. No glass panels for these types.

.6 Question:

"Please provide top of footing elevations for the foundations."

Response:

Contractor to provide price based on information provided, including but not limited to:

- .1 Geotechnical Reports
- .2 Minimum frost depth
- .3 Civil grading plan and spot elevations
- .4 Finish floor elevations
- .5 Structural foundation plans, sections, and details
- .6 Architectural floor plans, sections, and details
- .7 Architectural drawing A461 "EXTERIOR BASEMENT STAIR PLAN & DETAILS" revised to clarify dimensions associated with the basement stair well and wall heights.

END OF BIDDER'S QUESTIONS & RESPONSES