Daycare Expansion at Saint-Marguerite-Bourgeoys

60 Clench Ave., Brantford, ON N3T 1B8

TENDER DRAWINGS, FEB. 10, 2025

MZE PROJECT No. 21-42

CONSULTANTS

ARCHITECT
MACDONALD ZUBEREC ENSSLEN ARCHITECTS INC.
39 QUEEN STREET, SUITE 403
ST. CATHARINES, ONTARIO, L2R 5G6
905.685.8467
905.685.6852 (F)

STRUCTURAL ENGINEER
LEE YUNG & ASSOCIATES, INC.
382 GUELPH LINE
BURLINGTON, ONTARIO, L7R 3L4
905.333.3383
905.333.5206 (F)

MECHANICAL/ELECTRICAL ENGINEER
HARP ENGINEERING & DESIGN INC.
140 WELLAND AVENUE, UNIT 9
ST. CATHARINES, ONTARIO, L2R 2N6
905.684.3838
905.684.0578 (F)

SITE SERVICES ENGINEER
KERRY T. HOWE
98 CHURCH STREET, P.O. BOX 460
ST. CATHARINES, ONTARIO, L2R 6V9
905.688.6885
905.687.7207 (F)

ABBREVIATIONS

A.B	ANCHOR BOLT	LAM.	LAMINATED
A.F.F.	ABOVE FINISH FLOOR	LAV.	LAVATORY
A.P.	ACOUSTIC PANEL (CEILING)	LG.	LONG
ALT.	ALTERNATIVE	LTD. PT.	LIMITED PAINTING
ADJ.	ADJUSTABLE	LIN.	LINOLEUM
A/C	AIR CONDITIONING		
ALUM.	ALUMINUM		
A/V.B.	AIR VAPOR BARRIER	M.C.C.	METAL CHANNEL CEILING
		MECH.	MECHANICAL
BLK	BLOCK	M.H.	MANHOLE
B.H.	BORE HOLE	MTD.	MOUNTED
BOTT.	BOTTOM		
BLKHD.	BULKHEAD	N.R.	NAPKIN RECEPTACLE
BRK.	BRICK	NOM.	NOMINAL
		N.I.C.	NOT IN CONTRACT
CAB.	CABINET	N.T.S.	NOT TO SCALE
CARP.	CARPET	O.C.	ON CENTRE
C.B.	CARPET BASE	OPEN'G	OPENING
C.I.	CAST IRON	O.W.S.J.	OPEN WEB STEEL JOIST
C.B.	CATCH BASIN	O.D.	OUTSIDE DIAMETER
CLG.	CEILING	O/H	OVERHEAD
C.M.T.	CERAMIC MOSAIC TILE	0.S.	OPERATOR SWITCH
C.T.	CERAMIC TILE	0.P.	OPERATOR PADDLE
CHKBK	CHALKBOARD		
COL.	COLUMN	PT.	PAINT
CONC.	CONCRETE	PART'N	PARTITION
CONC. BLK.	CONCRETE BLOCK	PL.	PLASTER
CMU.	CONCRETE MASONRY UNIT	PL.C.	PLASTIC COATING
CONT.	CONTINUOUS	P.L.F.	PLASTIC LAMINATED FACED
C.J.	CONTROL JOINT	PLYWD	PLYWOOD
C.G.	CORNER GUARD	PORC. T.	PORCELAIN TILE
CONST.	CONSTRUCTION	P.C.	PRE CAST CONCRETE
CUP'B	CUPBOARD	PREFAB.	PREFABRICATED
		P.F.	PRE FINISHED
DIA.	DIAMETER	P.F.G.W.B.	PRE FINISHED GYPSUM WALL BOARD
DN.	DOWN	P.T.	PRESSURE TREATED
DWG.	DRAWING		
D.F.	DRINKING FOUNTAIN	Q.T.	QUARRY TILE
DEMO.	DEMOLITION		
		RES.	RESILIENT
ELEC.	ELECTRICAL	REQ'D	REQUIRED
E.H.D.	ELECTRIC HAND DRYER	REINF.	REINFORCING
ELEV.	ELEVATION	R.W.L.	RAINWATER LEADER
EQ.	EQUAL	R.C.	REINFORCED CONCRETE
EXT.	EXTERIOR	RM.	ROOM
EXIST./EX.	EXISTING	R.O.	ROUGH OPENING
E.M.D.	EXPOSED METAL DECK	R.B.	RUBBER BASE
E.C.D.	EXPOSED CONCRETE DECK	RFT'D	REFLECTED
ENCL.	ENCLOSED	R.T.	RUBBER TILE
		R.T.U.	ROOF TOP UNIT
FIN.	FINISH	SAN.	SANITARY
F.E.	FIRE EXTINGUISHER	S.N.R.	SANITARY NAPKIN RECEPTACLE
F.E.C.	FIRE EXTINGUISHER CABINET	S.D.	SOAP DISPENSER
F.H.C.	FIRE HOSE CABINET	S.F.	STEPPED FOOTING
F.H.	FIRE HYDRANT	S.S	STAINLESS STEEL
F.R.	FIRE RATED	STL.	STEEL
FR.	FRAME	STM.	STORM
F.R.R.	FIRE RESISTANT RATING	S.M.	SURFACE MOUNTED
FLR	FLOOR	S.O.F.	SPRAYED-ON FIREPROOFING
F.D.	FLOOR DRAIN	SK	SINK
FLUOR.	FLUORESCENT	STRUCT'L	STRUCTURAL
FTG.	FOOTING	SPEC.	SPECIFICATION
FDN.	FOUNDATION	SCH.	SCHEDULE
F.S.	FLOOR SOCKET	STOR.	STORAGE
		TERR.	TERRAZZO
G.W.P.G.	GEORGIAN WIRE POLISHED	T.T.H.	TOILET TISSUE HOLDER
GL.	GLASS	TYP.	TYPICAL
G.T.	GLAZED TILE	T/O	TOP OF UNDERSIDE
G.B.	GRAB BAR	U/S	URINAL
G.W.B.	GYPSUM WALLBOARD	URIN.	UNDERWRITERS LABORATORY OF CANADA
G.C.	GLAZED COATING	U.L.C.	
G.F.R.C.	GLASS FIBER REINFORCED CONCRETE		
		V.B.	VAPOR BARRIER
H.M.	HOLLOW METAL	V.S.	VINYL SHEET
HR.	HOUR	V.W.F.	VINYL WALL FABRIC (FIELD APPLIED)
H.I.G.W.B.	HIGH IMPACT GYPSUM WALLBOARD	V.C.T.	VINYL COMPOSITE TILE
		V.I.F.	VERIFY IN FIELD
I.D.	INSIDE DIAMETER		
INT.	INTERIOR	W.C.	WATER CLOSET
INST.	INSTALL/INSTALLATION	W.T.	WEEPING TILE
		W.W.F.	WELDED WIRE FABRIC
JAN.	JANITOR	WD.	WOOD
		W.R.	WATER RESISTANT

PROJECT INFORMATION

CLIENT ADDRESS:
CSC MonAvenir, 110 Drewry Avenue, North York, ON M2M 1C8

PROJECT ADDRESS:
60 CLENCH AVE., BRANTFORD, ON, N3T 1B9

ITEM	ONTARIO BUILDING CODE MATRIX PARTS 3 & 9	OBC REFERENCE	
1	PROJECT DESCRIPTION ☐ NEW BUILDING ☒ ADDITION ☐ CHANGE OF USE ☐ ALTERATION	☒ PART 3	☐ PART 9
2	MAJOR OCCUPANCY(S): GROUP A, DIVISION 2	3.1.2.1.(1)	9.10.2
3	BUILDING AREA (m²): EXISTING: 1,798 NEW: 127.3	1.1.3.2	1.1.3.2
4	GROSS AREA (m²): EXISTING: N/A NEW: 127.3	1.1.3.2	1.1.3.2
5	No. OF STOREYS: ABOVE GRADE: EXIST'G - 2, NEW - 1, BELOW GRADE: 0	3.2.1.1. & 1.1.3.2	2.1.1.3
6	HEIGHT OF BUILDING (m): 4.5		2.1.1.3
7	NUMBER OF STREETS/ACCESS ROUTES: 2 STREETS	3.2.2.10 & 3.2.5.5	
8	BUILDING CLASSIFICATION: GROUP A, DIV. 2, UP TO 2 STOREYS, - 3.2.2.25	3.2.2.20-.83	9.10.4
9	SPRINKLER SYSTEM PROPOSED ☐ ENTIRE BUILDING ☐ BASEMENT ONLY ☐ IN LIEU OF ROOF RATING ☒ NOT REQUIRED	3.2.2.20-.83 3.2.1.5 3.2.2.17	9.10.4
10	STANDPIPE REQUIRED ☐ YES ☒ NO	3.2.9	
11	FIRE ALARM REQUIRED ☒ YES ☐ NO	3.2.4	9.10.7.2
12	WATER SERVICE/SUPPLY IS ADEQUATE ☒ YES ☐ NO		
13	HIGH BUILDING ☐ YES ☒ NO	3.2.6	
14	PERMITTED CONSTRUCTION: ☒ COMBUSTABLE ☒ NON-COMBUSTABLE ACTUAL CONSTRUCTION: ☐ COMBUSTABLE ☒ NON-COMBUSTABLE	3.2.2.20-.83	9.10.6
15	MEZZANINE(S) AREA (m²): N/A	3.2.1.1.(3)-(8)	9.10.4.1
16	OCCUPANT LOAD BASED ON: ☐ SF/PERSON ☒ DESIGN OF BUILDING EXISTING BUILDING: LOAD: 458 NEW ADDITION: LOAD: 27	3.1.1.16	9.9.1.3
17	BARRIER-FREE DESIGN: ☒ YES ☐ NO (EXPLAIN)	3.8	9.5.2
18	HAZARDOUS SUBSTANCES: ☐ YES ☒ NO	3.2.1.2.(1)&3.3.1.19(1)	9.10.1.3
19	REQUIRED FIRE RESISTANCE RATING (FRR)	3.2.2.20-.83&3.2.1.4	9.10.8 9.10.9
20	SPATIAL SEPARATION - CONSTRUCTION OF EXTERIOR WALLS: NO NEW EXT. WALLS	3.2.3	9.10.14
21	OTHER		

Item 19 – Required Fire Resistance Rating (FRR):

HORIZONTAL ASSEMBLIES FRR (HOURS)	LISTED DESIGN NO. OR DESCRIPTION (SG-2)
BASEMENT: N/A HOURS: N/A	N/A
FLOORS: 3/4 HR IF COMB. CONST.	NON-COMB. CONST.
ROOF: 3/4 HR IF COMB. CONST.	NON-COMB. CONST.
SUPPORTING MEMBERS FRR (HOURS)	**LISTED DESIGN NO. OR DESCRIPTION (SG-2)**
BASEMENT: HOURS: N/A	N/A
FLOORS: 3/4 HR IF COMB. CONST.	NON-COMB. CONST.
ROOF: 3/4 HR IF COMB. CONST.	NON-COMB. CONST.

Item 20 – Spatial Separation:

WALL	AREA OF EBF (m²)	LD (m)	L/H OR H/L	PERMITED MAX % OF OPENINGS	PROPOSED % OF OPENINGS	FRR (HRS)	LISTED DESIGN OR DESCRIPTION	COMB CONST	COMB. CONST. NONC. CLADDING	NON-COMB. CONSTR.
NORTH	16.3	3.0	3:1	26%	26%	0	-	OK	-	-
SOUTH	78	11.0	3:1-10:1	100%	<100%	0	-	OK	-	-
EAST	76	8.0	3:1-10:1	100%	<100%	0	-	OK	-	-
WEST	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

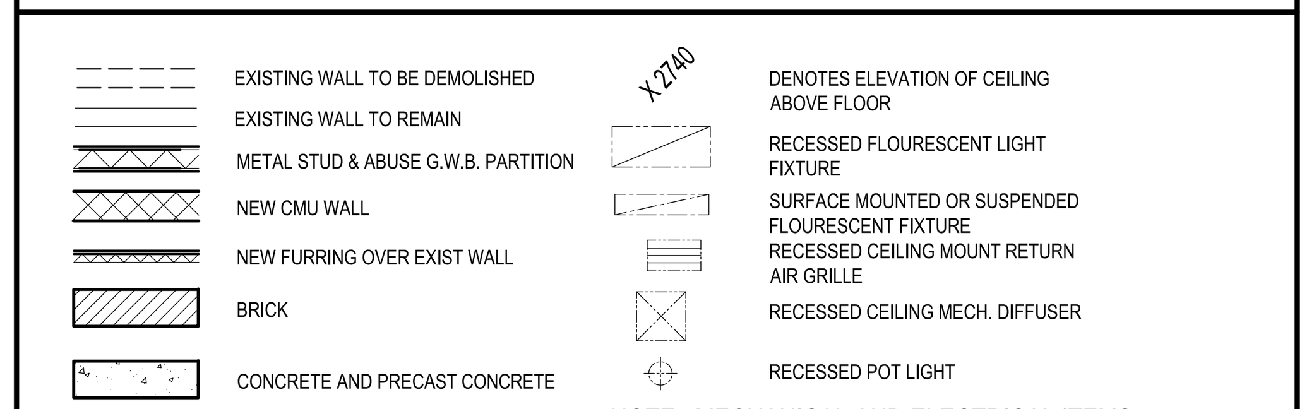
ASSEMBLIES

APPLICATION	DESIGNATION	F.R.R.	S.T.C.	REFERENCE
MASONRY AND CONCRETE WALLS:				
140mm (6" NOM) LEIGHTWEIGHT CONCRETE BLOCK		1 HR.		O.B.C. SB-2 SECTION 2.1, TABLE 2.1.1.
190mm (8" NOM) LEIGHTWEIGHT CONCRETE BLOCK	W1	1 HR.		O.B.C. SB-2 SECTION 2.1, TABLE 2.1.1.
77mm (3 1/8") CAST CONCRETE		45min.		O.B.C. SB-2 SECTION 2.1, TABLE 2.1.1.
100mm (4") (MIN.) CAST CONCRETE WALL		1 HR.		O.B.C. SB-2 SECTION 2.1, TABLE 2.1.1.
REINFORCED OR PRESTRESSED CONCRETE FLOOR AND ROOF SLABS:				
64mm (2 1/2") CAST CONC. IN 38mm (1 1/2") MTL DECK ON SUPPORTING STRUCTURE		-		
77mm (3 1/8") CAST CONC. IN 38mm (1 1/2") MTL DECK ON SUPPORTING STRUCTURE		45min.		O.B.C. SB-2 SECTION 2.2, TABLE 2.2.1.A..
90mm (3 5/8") CAST CONCRETE SLAB IN 38mm (1 1/2") MTL DECK ON SUPPORTING STRUCTURE		1 HR.		O.B.C. SB-2 SECTION 2.2, TABLE 2.2.1.A.
112mm (4 1/2") CAST CONCRETE SLAB IN 38mm (1 1/2") MTL DECK ON SUPPORTING STRUCTURE		1 1/2 HR		O.B.C. SB-2 SECTION 2.2, TABLE 2.2.1.A.
130mm (5 1/8") CAST CONCRETE SLAB IN 38mm (1 1/2") MTL DECK ON SUPPORTING STRUCTURE		2 HR.		O.B.C. SB-2 SECTION 2.2, TABLE 2.2.1.A..
200mm (7 7/8") PRECAST CONCRETE SLAB IN 38mm (1 1/2") MTL DECK ON SUPPORTING STRUCTURE		1 HR.		O.B.C. SB-2 SECTION 2.2, TABLE 2.2.1.A..
WOOD FRAMED WALLS:				
16mm G.W.B. BOTH SIDES WOOD STUDS @ 400mm O.C.		-		
16mm F.R. G.W.B. BOTH SIDES WOOD STUDS @ 400mm O.C.		1 HR.	32	O.B.C. SB-2 SECTION 2.3, TABLES 2.3.4.A. & 2.3.4.C. SB-3 WALL TYPE W1d ULC W301
2 LAYERS 16mm F.R. G.W.B. ON RES. CHANNELS @ 600mm O.C. 89mm STUDS @ 400mm O.C. W/ ABSORPTIVE MAT'L - 16mm F.R. G.W.B.		1 HR.	51	O.B.C. SB-3 WALL TYPE W4a ULC W301
2 LAYERS 16mm F.R. G.W.B. BOTH SIDES 89mm STUDS W/ ABSORPTIVE MAT'L AND RES. CHANNELS @ 600mm O.C. 1 SIDE		1.5 HR.	58	O.B.C. SB-2 TABLE 2.3.4.A. + 2.3.4.C.
		1.5 HR.	58	O.B.C. SB-3 WALL TYPE W6b (LOADBEARING)
		2 HR.	58	O.B.C. SB-3 WALL TYPE W6b (NON-LOADBEARING)
METAL STUD FRAMED WALLS:				
16mm G.W.B. BOTH SIDES MTL. STUDS @ 400mm O.C.		-		
16mm F.R. G.W.B. BOTH SIDES MTL. STUDS @ 600mm O.C.		1 HR.		ULC W415, W424, W453
16mm F.R. G.W.B. BOTH SIDES MTL. STUDS @ 400mm O.C.		3/4 HR.	38	SB-3 WALL TYPE S4d (NON-LOADBEARING)
16mm F.R. G.W.B. BOTH SIDES MTL. STUDS @ 400mm O.C. W/ ABSORTIVE MAT'L		1 HR. 3/4 HR.	47	ULC W415, W424, W453 SB-3 WALL TYPE S4a (NON-LOADBEARING)
16mm F.R. G.W.B., 92mm MTL. STUDS W/ ABSORTIVE MAT'L 2 LAYERS 16mm G.W.B. (NON-LOADBEARING)		1 HR.	52	O.B.C. SB-3 WALL TYPE S5b - STUDS @ 400mm O.C.
		1 HR.	54	ULC W453 - STUDS @ 600mm O.C.
16mm F.R. G.W.B., 92mm MTL. STUDS @ 400mm O.C. W/ ABSORTIVE MAT'L 16mm F.R. G.W.B. ON RES. CHANNELS @ 600mm O.C.		1 HR.	49	O.B.C. SB-3 WALL TYPE S12a (NON-LOADBEARING) ULC W453
16mm F.R. G.W.B., 92mm MTL. STUDS @ 400mm O.C. W/ ABSORPTIVE MAT'L, 2 LAYERS 16mm F.R. G.W.B. ON RES. CHANNELS @ 600mm O.C.		1 HR.	54	O.B.C. SB-3 WALL TYPE S13a ULC W453
2 LAYERS 16mm F.R. G.W.B. BOTH SIDES, 92mm MTL. STUDS @ 400mm O.C. W/ ABSORPTIVE MAT'L, RES. CHANNELS @ 600mm O.C. 1 SIDE		1 1/2 HR.	61	O.B.C. SB-3 WALL TYPE S14a SB-2 SECTION 2.3, TABLES 2.3.4.A. & 2.3.4.C.
F.R.R. FOR G.W.B. CEILING MEMBRANES:				
16mm F.R. G.W.B. W/ 75mm MIN. MINERAL WOOL BATTS		30 min.		O.B.C. SB-2 SECTION 2.3, TABLE 2.3.12.
2 LAYERS 13mm F.R. G.W.B.		45 min.		O.B.C. SB-2 SECTION 2.3, TABLE 2.3.12.
2 LAYERS 16mm F.R. G.W.B.		1 HR.		O.B.C. SB-2 SECTION 2.3, TABLE 2.3.12.

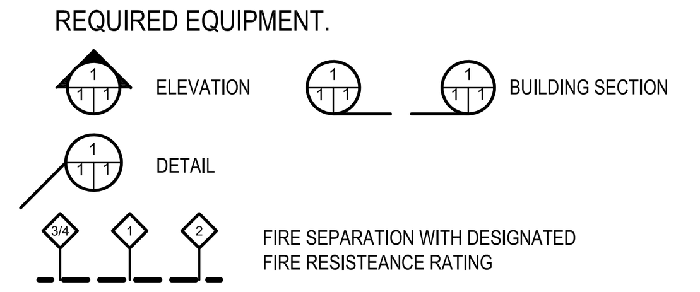
NOTES

- APPLICATIONS WITHOUT A DESIGNATION DO NOT APPEAR IN THIS CONTRACT.
- SEE ALSO PLANS AND SECTIONS FOR APPLICATION LOCATIONS.

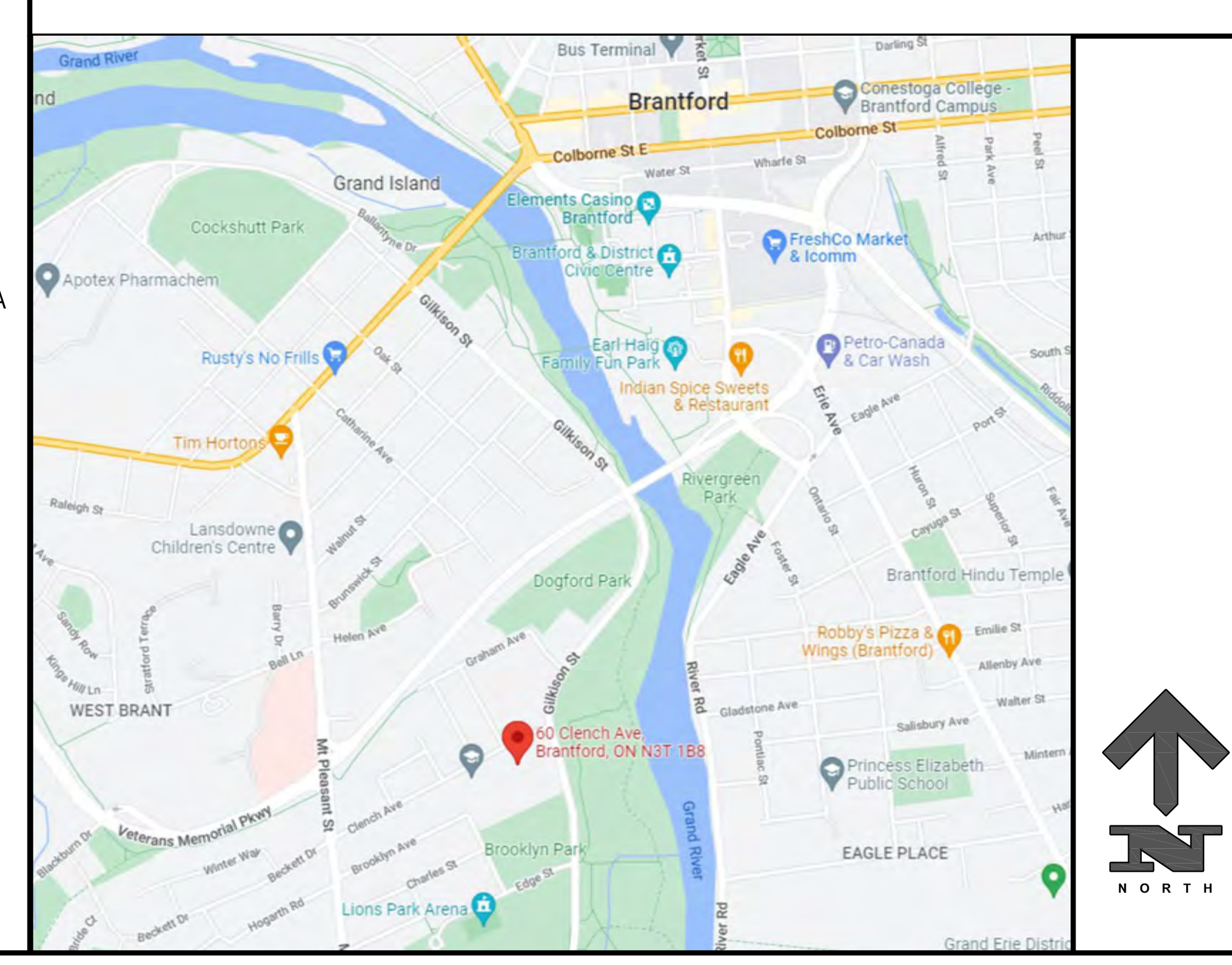
SYMBOLS



NOTE: MECHANICAL AND ELECTRICAL ITEMS SHOWN ON REFLECTED CEILING PLANS FOR LAYOUT ONLY. SEE MECH. AND ELECT'L DRAWINGS FOR REQUIRED EQUIPMENT.



VICINITY MAP



DRAWING LIST

TS1.1 TITLE SHEET (THIS PAGE)

SITE SERVICES
- C0.0 GENERAL NOTES, KEY PLAN & DETAILS
- C0.1 TYPICAL DETAILS
- C1.1 GRADING, SERVICING, SEDIMENT AND EROSION CONTROL PLAN
- C2.1 PRE-DEVELOPMENT DRAINAGE
- C2.2 POST DEVELOPMENT DRAINAGE

LANDSCAPE DRAWINGS
- TPP1 TREE PRESERVATION PLAN
- TPP2 TREE PRESERVATION DATA

ARCHITECTURAL DRAWINGS
- A1.1 SITE & ENLARGED PLANS, DATA
- A2.1 KEY & FLOOR PLANS, DETAILS
- A2.2 PLANS, DETAILS, INT. ELEVATIONS
- A3.1 BUILDING ELEVATIONS & SECTIONS
- A3.2 WALL SECTIONS, DETAILS

STRUCTURAL DRAWINGS
- S0.1 GENERAL NOTES
- S1.1 FOUNDATION PLAN
- S1.2 SLAB ON GRADE PLAN
- S2.1 LOW ROOF FRAMING PLAN
- S2.2 HIGH ROOF FRAMING PLAN
- S3.1 SECTIONS
- S4.1 TYPICAL DETAILS

MECHANICAL DRAWINGS
- M0.1 GENERAL NOTES
- M0.2 MECHANICAL SPECIFICATION
- M0.3 MECHANICAL SPECIFICATIONS
- M0.4 MECHANICAL SPECIFICATIONS
- M1.1 PROPOSED PLUMBING/SAN/FP PLAN
- M1.2 PROPOSED STORM PLAN
- M2.1 PROPOSED HVAC PLAN
- M2.2 PROPOSED ROOF PLAN
- M3.1 DETAILS AND SCHEDULES

ELECTRICAL DRAWINGS
- E0.1 GENERAL NOTES & LEGENDS
- E0.2 ELECTRICAL SPECIFICATIONS
- E1.1 ELECTRICAL SITE PLAN
- E1.2 GROUND FLOOR LIGHTING, FIRE ALARM, POWER & COMMUNICATIONS PLAN
- E1.3 2ND FLOOR & ROOF LIGHTING, POWER, FIRE ALARM PLAN & PANEL SCHEDULE
- E2.1 ELECTRICAL DETAILS
- ED1.1 LIGHTING & FIRE ALARM DEMO PLAN

GENERAL NOTES

1. EXISTING ELEVATIONS AND UNDERGROUND SERVICES AND/OR UTILITY INFORMATION IS DERIVED FROM EXISTING DRAWINGS AND/OR INFORMATION PROVIDED AND HAVE NOT BEEN LOCATED BY THE UTILITY COMPANIES AND ARE NOT GUARANTEED. MANTECON PARTNERS INC. ASSUMES NO RESPONSIBILITY AS TO THE ACCURACY, CORRECTNESS AND COMPLETENESS OF THE UNDERGROUND SERVICE AND/OR UTILITY INFORMATION SHOWN ON THIS PLAN. ALL EXISTING UTILITIES SHOWN ON THE DRAWINGS ARE FOR REFERENCE PURPOSES ONLY.
2. THE CONTRACTOR SHALL CHECK EXISTING SERVICES AND VERIFY EXACT LOCATION AND INVERTS BEFORE PROCEEDING WITH WORK. THE CONTRACTOR SHALL SATISFY THEMSELVES AS TO THE ACTUAL LOCATION AND DEPTH OF ANY UTILITIES AND/OR SERVICES WITHIN THE WORK AREA AND SHALL BE LIABLE FOR ALL OR ANY DAMAGE. FOR ANY DISCREPANCY. THE CONTRACTOR SHALL CONTACT THE UTILITY COMPANIES FOR UTILITY STAKEOUT. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY DISCREPANCIES A MINIMUM 48 HOURS PRIOR TO THE COMMENCEMENT OF ANY WORK.
3. IF REQUESTED BY THE CITY, AND/OR ENGINEER, THE CONTRACTOR TO EXPOSE EXISTING SERVICES TO VERIFY EXACT LOCATION, PRIOR TO STARTING CONSTRUCTION.
4. CONSTRUCTION OF SEWERS, AND RELATED APPURTENANCES SHALL BE UNDERTAKEN IN ACCORDANCE WITH THE CITY OF BRANTFORD AND THE LATEST EDITIONS OF THE ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD).
5. RELOCATION OF EXISTING SERVICES AND/OR UTILITIES SHALL BE CONSTRUCTED AS SHOWN ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER.
6. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS FOR CONSTRUCTION.
7. ALL EXCAVATIONS THAT ARE TO BE BACKFILLED WITH SELECT NATIVE MATERIAL, APPROVED BY THE ENGINEER, SHALL BE COMPACTED TO 95% SPD.
8. THE CONTRACTOR IS RESPONSIBLE FOR INSTALLING AND MAINTAINING ALL EROSION CONTROL MEASURES AS SHOWN ON THE DRAWINGS AS A MINIMUM AND AS DIRECTED BY THE ENGINEER AND/OR CITY INSPECTOR.
9. ALL WORK REQUIRED, INCLUDING ANY DEMOLITION, SHALL BE CARRIED OUT IN A MANNER THAT WILL PREVENT OR MINIMIZE DAMAGE TO THE EXISTING SITE OR STRUCTURES TO THE BEST OF THE CONTRACTORS ABILITIES. ANY DAMAGE SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE.
10. CONTRACTOR IS RESPONSIBLE FOR RESTORATION OF ALL DAMAGED AND/OR DISTURBED PROPERTY WITHIN THE SITE LIMITS OR WITHIN THE LIMIT OF THE MUNICIPAL RIGHT-OF-WAY TO THE CITY OF BRANTFORD STANDARD REQUIREMENTS.
11. ALL PAVEMENT AREAS WHICH ARE DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER. ALL GRASSED AREAS DISTURBED SHALL BE RESTORED WITH SOD ON MINIMUM 100mm OF TOPSOIL.
12. ALL WORK AND MATERIALS SHALL BE IN COMPLIANCE WITH ONTARIO PROVINCIAL STANDARDS AND SPECIFICATIONS, CURRENT PROVINCIAL BUILDING CODE, AS WELL AS ALL APPLICABLE HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS.
13. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING ALL WORK ON SITE WITH OTHER CONTRACTORS TO PREVENT CONFLICTS.
14. POSITIVE DRAINAGE SHALL BE PROVIDED THROUGHOUT THE SITE AT ALL TIMES DURING CONSTRUCTION ACTIVITIES.
15. THE CONTRACTOR IS RESPONSIBLE FOR ALL REMOVALS AND SHALL ENSURE THEIR LEGAL OFFSITE DISPOSAL.
16. THE GENERAL NOTES MUST BE READ IN CONJUNCTION WITH THE DESIGN DRAWINGS AND SPECIFICATIONS OF ENGINEERING. THIS INCLUDES DRAWING SPECIFICATIONS AND SKETCHES. SHOULD THERE BE CONTRADICTORY INFORMATION BETWEEN DRAWINGS, SKETCHES AND SPECIFICATIONS, THE ONE WHICH IS MOST STRINGENT REQUIREMENT TAKES PRESIDENCE.
17. THE CONTRACTOR IS TO FAMILIARIZE THEMSELVES WITH THE CITY OF BRANTFORD STANDARD DETAILS, AS APPLICABLE. TYPICAL STANDARD DETAILS SHALL BE USED WHERE SPECIFIC DRAWING DETAILS ARE NOT CALLED OUT.
18. THE GENERAL CONTRACTOR MUST REVIEW ALL DIMENSIONS PRIOR TO THE COMMENCEMENT OF ALL WORK AND MUST REPORT ALL DISCREPANCIES TO THE ENGINEER/LANDSCAPE ARCHITECT, AS APPROPRIATE.
19. PROVIDE POSITIVE DRAINAGE AT ALL TIMES THROUGHOUT CONSTRUCTION AND PLACEMENT OF PAVEMENT. PROVIDE TEMPORARY SWALES/DRAINAGE WHERE NECESSARY.
20. THE FOLLOWING ITEMS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW PRIOR TO FABRICATION. SUBMIT FOUR COPIES UNLESS NOTED OTHERWISE.

ITEMS	REQUIRED SUBMITTAL?	ENGINEER'S STAMP REQUIRED?	NOTES
CONCRETE MIX DESIGNS	YES		
ASPHALT MIX DESIGNS	YES		
AGGREGATE GRADATION	YES		

CONCRETE AND REINFORCING

1. CONCRETE MATERIALS AND METHODS OF CONCRETE CONSTRUCTION, TESTING AND STANDARD PRACTICES FOR CONCRETE SHALL BE IN ACCORDANCE WITH CSA STANDARD A23.1/A23.2 (LATEST EDITION).
2. CONCRETE DESIGN SHALL BE IN THE DESIGN OF CONCRETE STRUCTURES CSA STANDARD A23.3 (LATEST EDITION).
3. SUPPLY AND PLACE CONCRETE IN ACCORDANCE TO TABLE 1:

TABLE 1

LOCATION	MINIMUM COMPRESSIVE STRENGTH (f'c) AT 28 DAYS MPa (PSI)	SLUMP mm (in)	EXPOSURE CLASS	AIR CONTENT (%)
SIDEWALK/CURBS PAVING SLABS, EXTERIOR CONCRETE	32 (4643)	40 ± 20 (1.5 ± 0.75)	C - 1	5 - 8

4. PAVEMENT SHALL BE:

PAVEMENT COMPONENT	THICKNESS (mm)
CONCRETE PAVERS	N/A
CONCRETE SLAB	200
GRANULAR "A" BASE	150
GRANULAR "B" SUBBASE	200 (OR AS PER GRADING)

5. GRANULAR BASE LAYERS SHALL BE COMPACTED TO MINIMUM 100% STANDARD PROCTOR DENSITY.
6. THE COMPRESSIVE STRENGTH OF THE CONCRETE IS BASED ON THE FOLLOWING CONDITIONS:
   a. TYPE GU NORMAL PORTLAND CEMENT UNLESS OTHERWISE NOTED OR APPROVED.
   b. MAXIMUM SIZE OF AGGREGATE 20mm (3/4") WASHED IRREGULAR CUT CLEAR STONE, EXCEPT FOR CONCRETE TOPPING WHICH SHALL HAVE MAXIMUM SIZE OF AGGREGATE 10mm (3/8") WASHED IRREGULAR CUT CLEAR STONE.
   c. SLUMP SHOWN ON THE TABLE IS SLUMP WITHOUT SLUMP AID ADMIXTURE. WHERE THE USE OF AN ADMIXTURE IS REFERRED TO INCREASE THE SLUMP, THE SUPERPLASTICIZED CONCRETE SLUMP MUST REMAIN BELOW THE POINT AT WHICH SEGREGATION WILL OCCUR.

SITE GRADING

1. NATIVE BACKFILL MATERIAL NOT UNDER INFLUENCE OF PAVEMENTS SHALL BE COMPACTED TO 95% STANDARD PROCTOR DENSITY. GRANULAR BACKFILL MATERIAL SHALL BE PLACED IN LAYERS NOT EXCEEDING 150mm IN DEPTH AND COMPACTED TO 100% SPMDD.
2. PAVEMENT SHALL BE AS NOTED BELOW PER GEOTECHNICAL REPORT NO. SM 124433-G DATED MARCH 19, 2012 AND PREPARED BY SOIL-MAT ENGINEERS & CONSULTANTS LTD.:

PAVEMENT COMPONENT	THICKNESS (mm)
LIGHT DUTY ASPHALT (PARKING AREAS)	
ASPHALT SURFACE COURSE - HL-3	65
ASPHALT BASE COURSE - HL-4	-
GRANULAR "A" BASE (100% CRUSHED)	150
GRANULAR "B" SUB-BASE (OPSS TYPE II)	200
LIGHT DUTY ASPHALT (PLAYING AREA)	
ASPHALT SURFACE COURSE - HL-3	40
ASPHALT BASE COURSE - HL-4	-
GRANULAR "A" BASE (100% CRUSHED)	300
GRANULAR "B" SUB-BASE (OPSS TYPE II)	200
HEAVY DUTY (TRUCK ROUTE)	
ASPHALT SURFACE COURSE - HL-3	40
BINDER COURSE (OPSS HL-8)	65
GRANULAR "A" BASE (100% CRUSHED)	150
GRANULAR "B" SUB-BASE (OPSS TYPE II)	350

3. SUBMIT ASPHALT MIX DESIGN AND TRIAL MIX TEST RESULTS TO CONSULTANT FOR APPROVAL.
4. PROOF ROLLING OF SUBGRADE SHALL BE INSPECTED BY THE GEOTECHNICAL CONSULTANT.
5. PLACE GRANULAR BASE TO COMPACTED THICKNESS AS INDICATED. DO NOT PLACE FROZEN MATERIAL.
6. PROOF ROLLING OF AGGREGATE BASE PRIOR TO PLACEMENT OF ASPHALT SHALL BE INSPECTED BY THE GEOTECHNICAL CONSULTANT.
7. ASPHALT MATERIALS SHALL BE ROLLED AND COMPACTED TO A MINIMUM OF 97% MRD.
8. NO PAVING WILL BE ALLOWED DURING RAIN OR ON WET SUBGRADE AFTER RAIN.
9. PROVIDE POSITIVE DRAINAGE FOR ALL NEW PAVEMENT CONSTRUCTED.

TESTING AND INSPECTION

1. THE FOLLOWING ITEMS REQUIRE TESTING OR INSPECTION BY A CERTIFIED INDEPENDENT TESTING OR INSPECTION AGENCY PAID BY OWNER. THE AGENCY SHALL SEND COPIES OF ALL TESTING AND INSPECTION REPORTS TO THE ENGINEER FOR REVIEW.

ITEMS	REQUIRED?	COMMENTS
SOIL COMPACTION	YES	BY GEOTECHNICAL ENGINEER
AGGREGATE DENSITY	YES	BY GEOTECHNICAL ENGINEER
CONCRETE COMPRESSIVE TESTS	YES	MINIMUM 2 SETS PER $50m^3$
CONCRETE SLUMP AND AIR TESTS	YES	BY GEOTECHNICAL ENGINEER
ASPHALT DENSITY	YES	BY GEOTECHNICAL ENGINEER

COMPACTION REQUIREMENTS

A. ALL BEDDING AND BACKFILL MATERIAL, ROAD SUB-GRADES AND GENERALLY ALL MATERIAL USED FOR LOT GRADING AND FILL SECTIONS, ETC., SHALL BE COMPACTED TO MIN. 95% SPD (UNLESS OTHERWISE RECOMMENDED BY THE GEOTECHNICAL ENGINEER). ALL MATERIAL SHALL BE PLACED IN LAYERS NOT EXCEEDING 300mm LIFTS.

B. ALL GRANULAR ROAD BASE MATERIALS SHALL BE COMPACTED TO 100% SPD WITH EXISTING SUBGRADE UNDER PAVEMENTS COMPACTED TO 98% SPD.

C. FOR ALL SEWERS AND WATERMAINS IN FILL SECTIONS, THE COMPACTION SHALL BE CERTIFIED BY A GEOTECHNICAL ENGINEER PRIOR TO LAYING OF PIPE.

SILTATION AND EROSION CONTROL NOTES

A. SILTATION CONTROL BARRIERS SHALL BE PLACED AS DETAILED.

B. ALL SILTATION CONTROL MEASURES SHALL BE CLEANED AND MAINTAINED AFTER EACH RAINFALL AND ALSO WEEKLY AS DIRECTED AND TO THE SATISFACTION OF THE CITY OF BRANTFORD

C. ADDITIONAL SILT CONTROL LOCATIONS MAY BE REQUIRED AS DETERMINED BY THE CITY OF BRANTFORD.

D. ALL SILT FENCING TO BE INSTALLED PRIOR TO COMMENCEMENT OF ANY AREA GRADING, EXCAVATING, OR DEMOLITION.

E. PROTECT ALL DISTURBED AND EXPOSED AREAS AS A RESULT OF CONSTRUCTION. STORM WATER MEASURES DURING CONSTRUCTION TO BE UTILIZED TO ENSURE SUITABLE DRAINAGE WHILE MINIMIZING EROSION. STOCKPILES ARE TO BE SEEDED OR COVERED WITH VEGETATIVE GROWTH FOR THE DURATION OF CONSTRUCTION.

F. PROTECT ALL MANHOLES, AND PIPE ENDS (EXISTING AND NEW) FROM SEDIMENT INTRUSION WITH GEOTEXTILE CLOTH (TERRAFIX 270R). ALL CATCHBASINS TO HAVE SILTSACK AS PER THE ATTACHED DETAILS.

G. PREVENT WIND-BLOWN DUST TO THE BEST OF THE CONTRACTORS ABILITY. KEEP SOIL DAMP DURING DRY WHETHER OR BY OTHER MEANS NECESSARY TO COMPLETE THE WORK.

H. EROSION CONTROL STRUCTURES TO BE MONITORED REGULARLY BY CONTRACTOR AND ANY DAMAGE REPAIRED IMMEDIATELY. SEDIMENTS TO BE REMOVED WHEN ACCUMULATIONS REACH A MAXIMUM OF ONE THIRD (1/3) THE HEIGHT OF THE SILT FENCE.

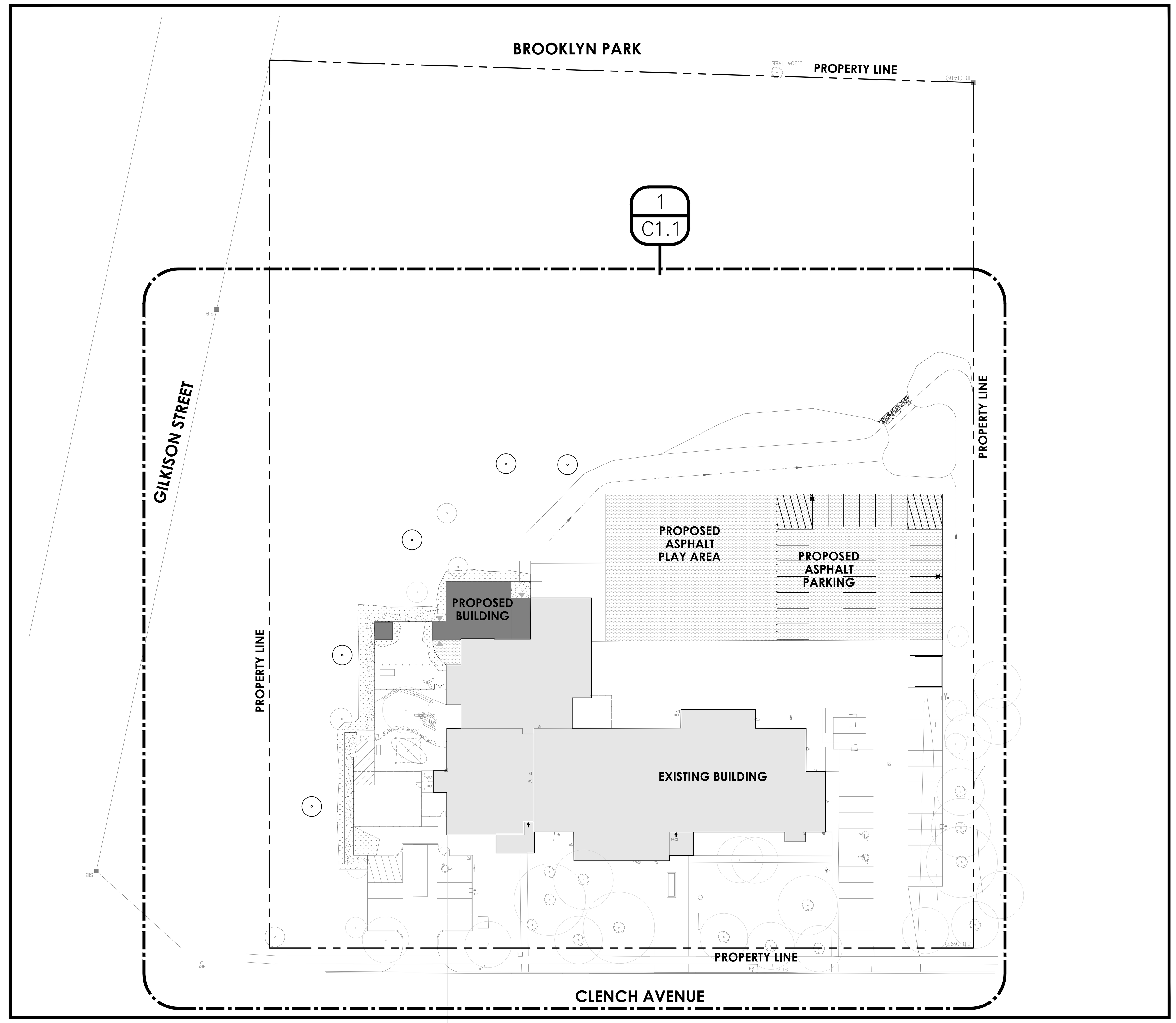
I. ALL EROSION CONTROL STRUCTURES TO REMAIN IN PLACE UNTIL ALL DISTURBED GROUND SURFACES HAVE BEEN RE-STABILIZED EITHER BY PAVING OR RESTORATION OF VEGETATIVE GROUND COVER.

J. THE CONTRACTOR IS RESPONSIBLE FOR REMOVING SEDIMENTS FROM THE MUNICIPAL ROADWAY AND SIDEWALKS AT THE END OF EACH WORK DAY.

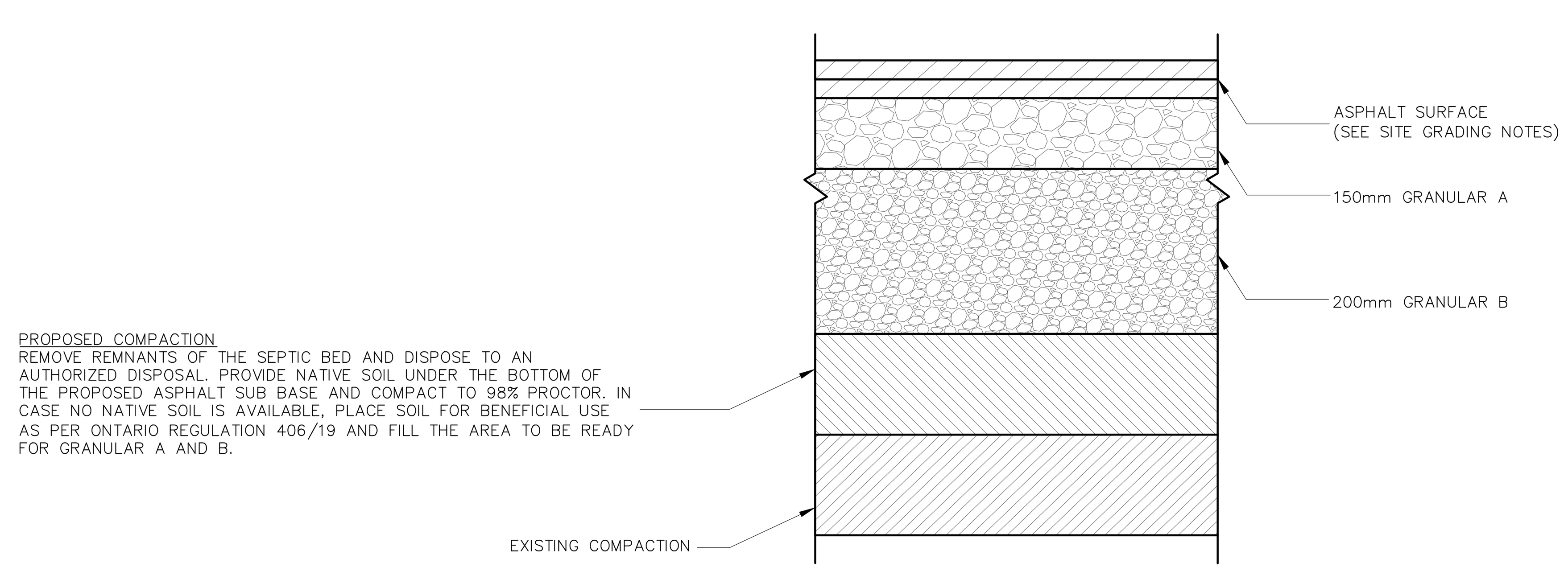
K. MUD MATS OF 50mm - 75mm CLEAR STONE WITH MINMUM DEPTH OF 450mm, (20 METRES LONG, 10 METRES WIDE (OR TO SUIT), 450mm DEEP) SHALL BE PROVIDED AT SITE CONSTRUCTION ENTRANCES. CONTRACTOR TO ENSURE ALL VEHICLES LEAVE THE SITE VIA THE MUD MAT AND THAT THE MAT IS MAINTAINED IN A MANNER TO MAXIMIZE ITS EFFECTIVENESS AT ALL TIMES.

DRAWING NOTES

1. ALL WORKS INVOLVED IN THE CONSTRUCTION, RELOCATION AND REPAIR OF MUNICIPAL SERVICES FOR THE PROPOSED DEVELOPMENT SHALL BE TO THE SATISFACTION OF THE CITY OF BRANTFORD.
2. RIGHT-OF-WAY ACTIVITY PERMITS ARE REQUIRED FOR ANY WORK IN THE CITY'S RIGHT-OF-WAY BY ANY CONTRACTOR.
3. PRIVATE OWNER/DEVELOPER IS RESPONSIBLE FOR ALL SERVICING, UTILITIES AND COSTS.
4. REMOVE CURB AND POUR NEW CURB FOR ANY NEW DRIVEWAYS OR DRIVEWAYS TO BE ABANDONED.
5. STORM WATER DRAINAGE MUST NOT HAVE A NEGATIVE IMPACT ON ADJACENT PROPERTIES.
6. DRIVEWAY SLOPES MUST BE 8% MAXIMUM, AND SIDEWALK CROSS FALL 2% TO 4% MAXIMUM.
7. A 5.0 m DRIVEWAY VISIBILITY TRIANGLE ON EITHER SIDE OF THE DRIVEWAYS PROJECTED FROM WHERE THE PROPERTY LINES MEETS THE DRIVEWAY IS REQUIRED WHERE NO PLANT MATERIAL/STRUCTURE GREATER THAN 0.6m IS TO BE PLANTED WITHIN THIS AREA.
8. NO PERSON SHALL CAUSE OR PERMIT ALTERATION OF A SITE IN THE MUNICIPALITY, WITHOUT HAVING FIRST OBTAINED A SITE ALTERATION PERMIT IN ACCORDANCE WITH BY-LAW 28-2011.

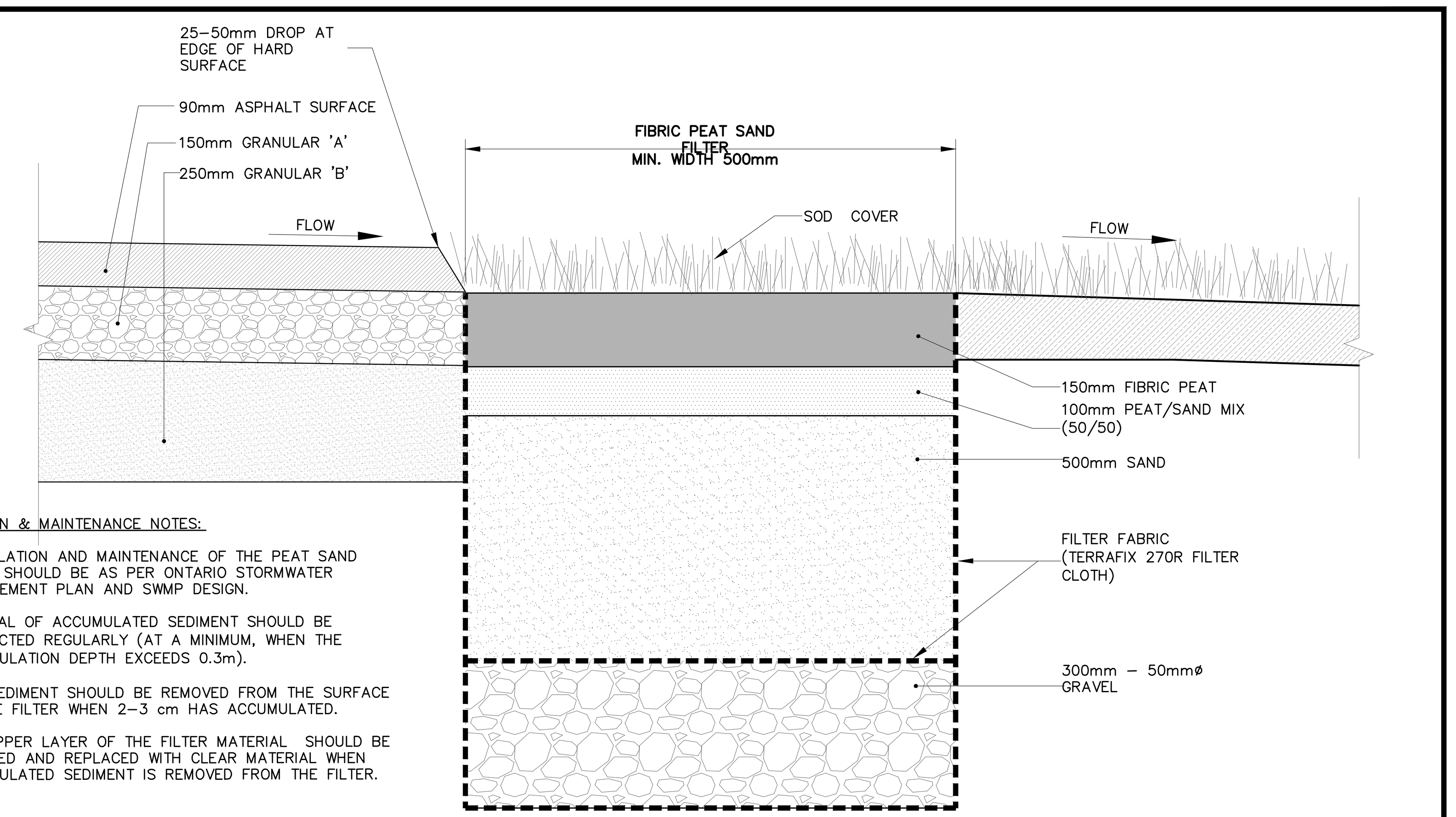


1 C0.0 KEY PLAN
1:500



PROPOSED COMPACTION
REMOVE REMNANTS OF THE SEPTIC BED AND DISPOSE TO AN AUTHORIZED DISPOSAL. PROVIDE NATIVE SOIL UNDER THE BOTTOM OF THE PROPOSED ASPHALT SUB BASE AND COMPACT TO 98% PROCTOR. IN CASE NO NATIVE SOIL IS AVAILABLE, PLACE SOIL FOR BENEFICIAL USE AS PER ONTARIO REGULATION 406/19 AND FILL THE AREA TO BE READY FOR GRANULAR A AND B.

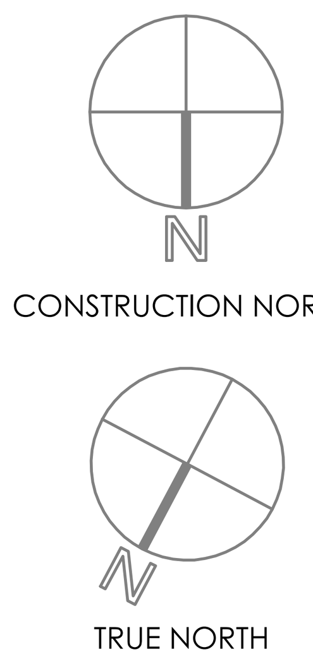
3 C0.0 TYPICAL ASPHALT SECTION DETAIL
N.T.S.



INSTALLATION & MAINTENANCE NOTES:

1. INSTALLATION AND MAINTENANCE OF THE PEAT SAND FILTER SHOULD BE AS PER ONTARIO STORMWATER MANAGEMENT PLAN AND SWMP DESIGN.
2. REMOVAL OF ACCUMULATED SEDIMENT SHOULD BE CONDUCTED REGULARLY (AT A MINIMUM, WHEN THE ACCUMULATION DEPTH EXCEEDS 0.3m).
3. SILT/SEDIMENT SHOULD BE REMOVED FROM THE SURFACE OF THE FILTER WHEN 2–3 cm HAS ACCUMULATED.
4. THE UPPER LAYER OF THE FILTER MATERIAL SHOULD BE REMOVED AND REPLACED WITH CLEAR MATERIAL WHEN ACCUMULATED SEDIMENT IS REMOVED FROM THE FILTER.

2 C0.0 FIBRIC PEAT SAND FILTER CROSS SECTION DETAIL
N.T.S.



REVIEW ALL DRAWINGS AND VERIFY ALL DIMENSIONS AT THE SITE. DO NOT SCALE THE DRAWINGS. REPORT ALL DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH ANY CONSTRUCTION OR SHOP FABRICATION. ALL DRAWINGS, SPECIFICATIONS AND RELATED DOCUMENTS ARE THE COPYRIGHT PROPERTY OF "MANTECON PARTNERS" AND MUST BE RETURNED UPON REQUEST. REPRODUCTION OF DRAWINGS, SPECIFICATIONS AND RELATED DOCUMENTS IN PART OR WHOLE IS FORBIDDEN WITHOUT THE ENGINEER'S WRITTEN PERMISSION.

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STRUCTURAL MECHANICAL ELECTRICAL CIVIL ENGINEERS
15 Foundry Street, Dundas, ON, L9H 2V6
Phone: (905)648-0373
www.manteconpartners.com

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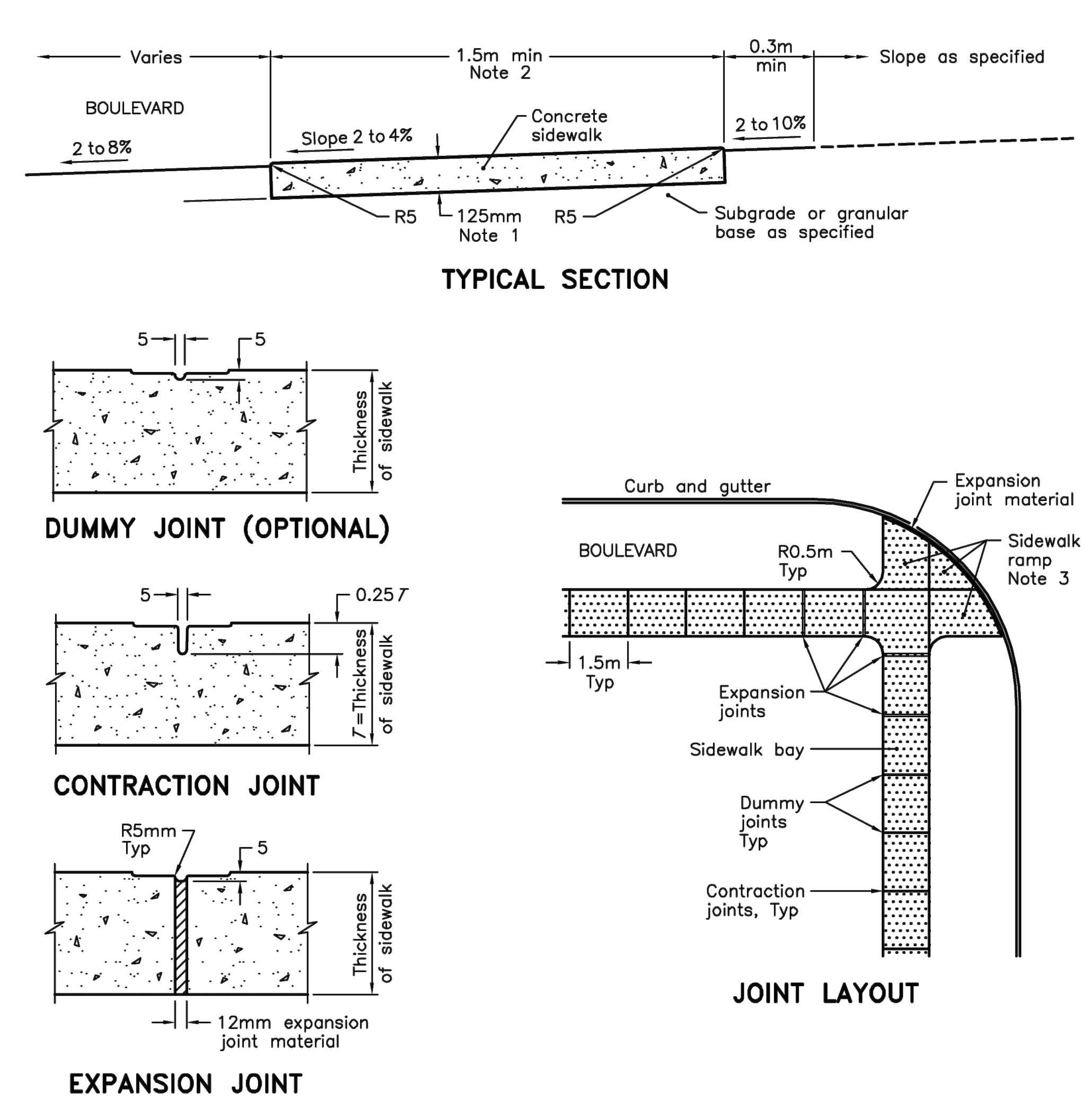
4	Issued For Owner Review	2022-07-08

MPI Project No: 21-153
Scale: As Shown
Drawn by: A.A.
Plot Date: FEB. 11, 2022
Issue Date:

PRESCHOOL DAY CARE ADDITION
Ecole elementaire catholique Saint-Marguerite-Bourgeoys
60 Clench Avenue, Brantford, Ontario N3T 1B9
GENERAL NOTES, KEY PLAN & DETAILS

C0.0

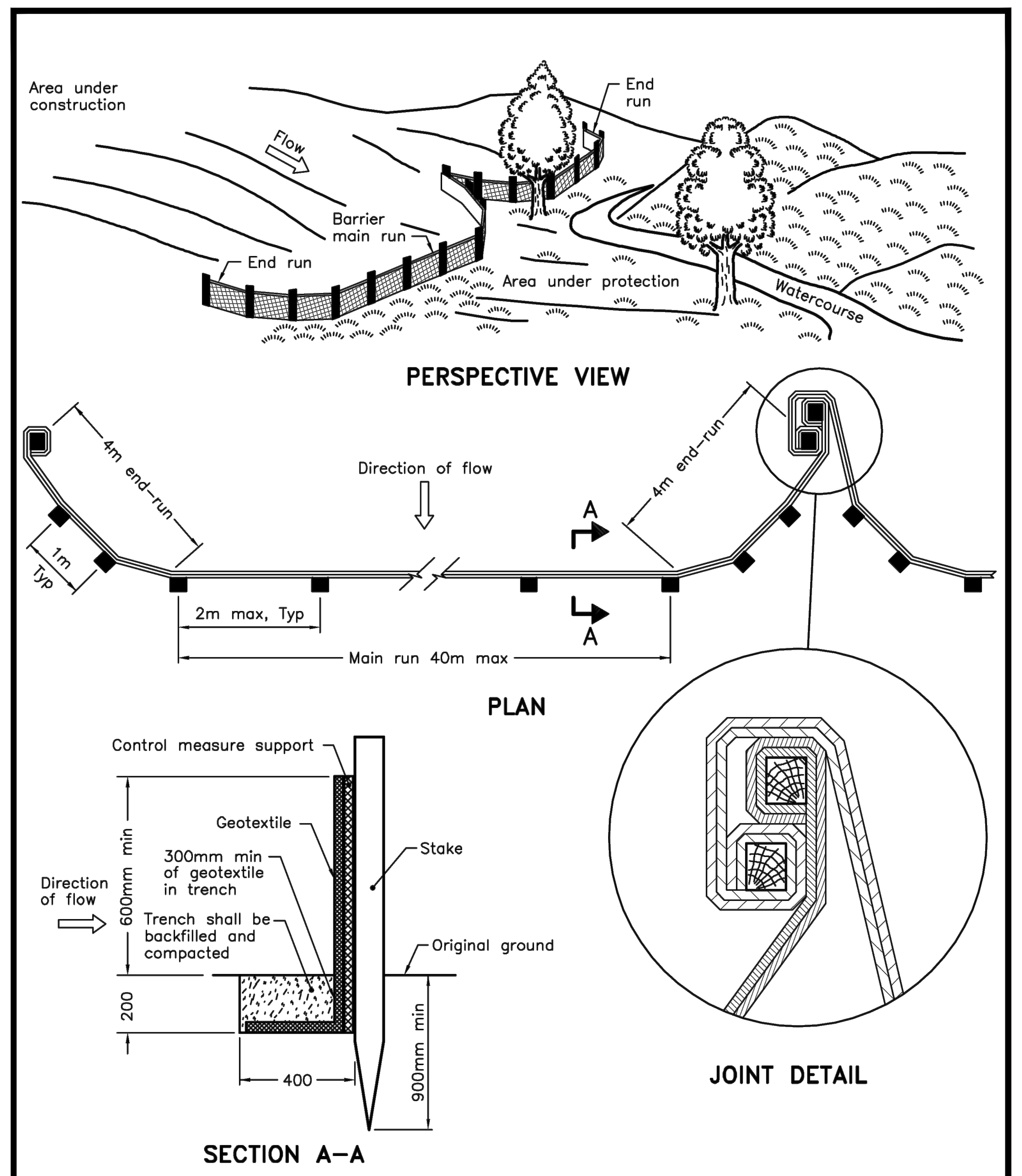


NOTES:

1. Sidewalk thickness at residential driveways and adjacent to curb shall be 150mm. At commercial and industrial driveways, the thickness shall be 200mm.
2. Sidewalk width shall be wider when specified.
3. This OPSD shall be read in conjunction with OPSD 310.030, 310.031, 310.032, 310.033 and 310.039.

A All dimensions are in millimetres unless otherwise shown.

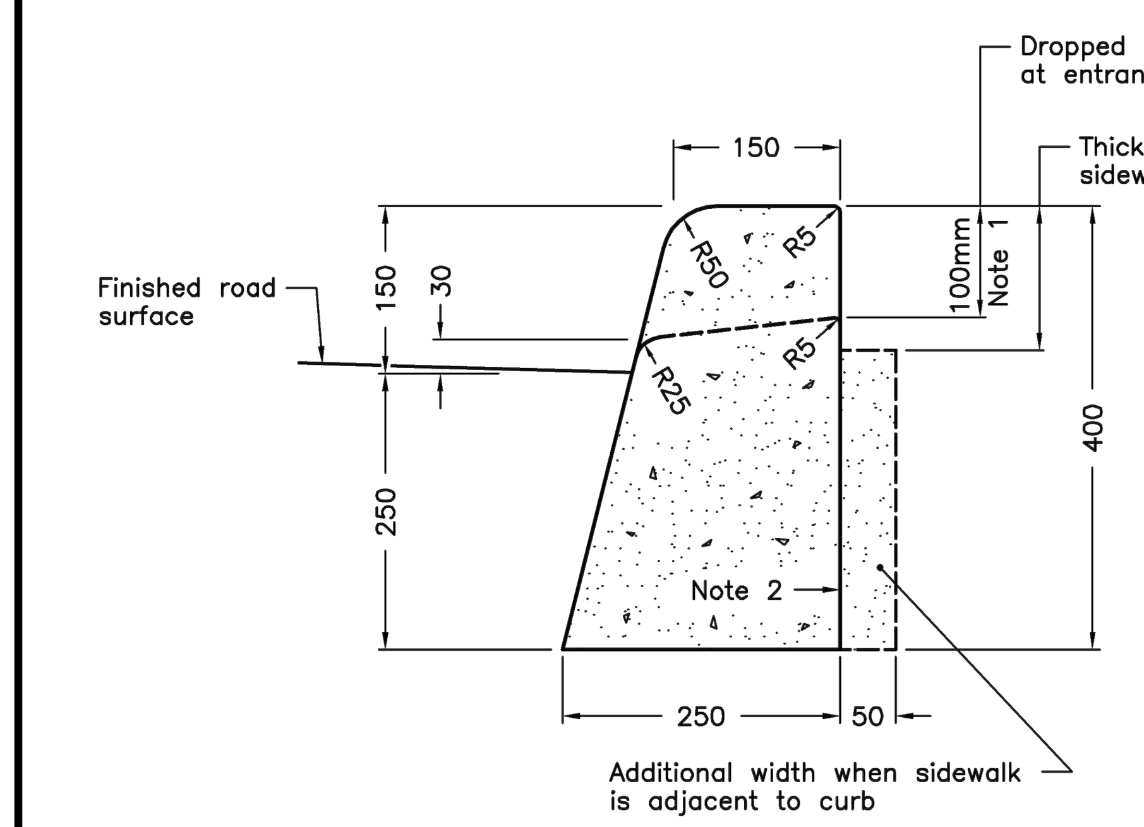
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 2
CONCRETE SIDEWALK	OPSD 310.010	



NOTE:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 2
HEAVY-DUTY SILT FENCE BARRIER	OPSD 219.130	



NOTES:

1. When sidewalk is continuously adjacent, the dropped curb at entrances shall be reduced to 75mm.
2. For slipforming procedure a 5% batter is acceptable.

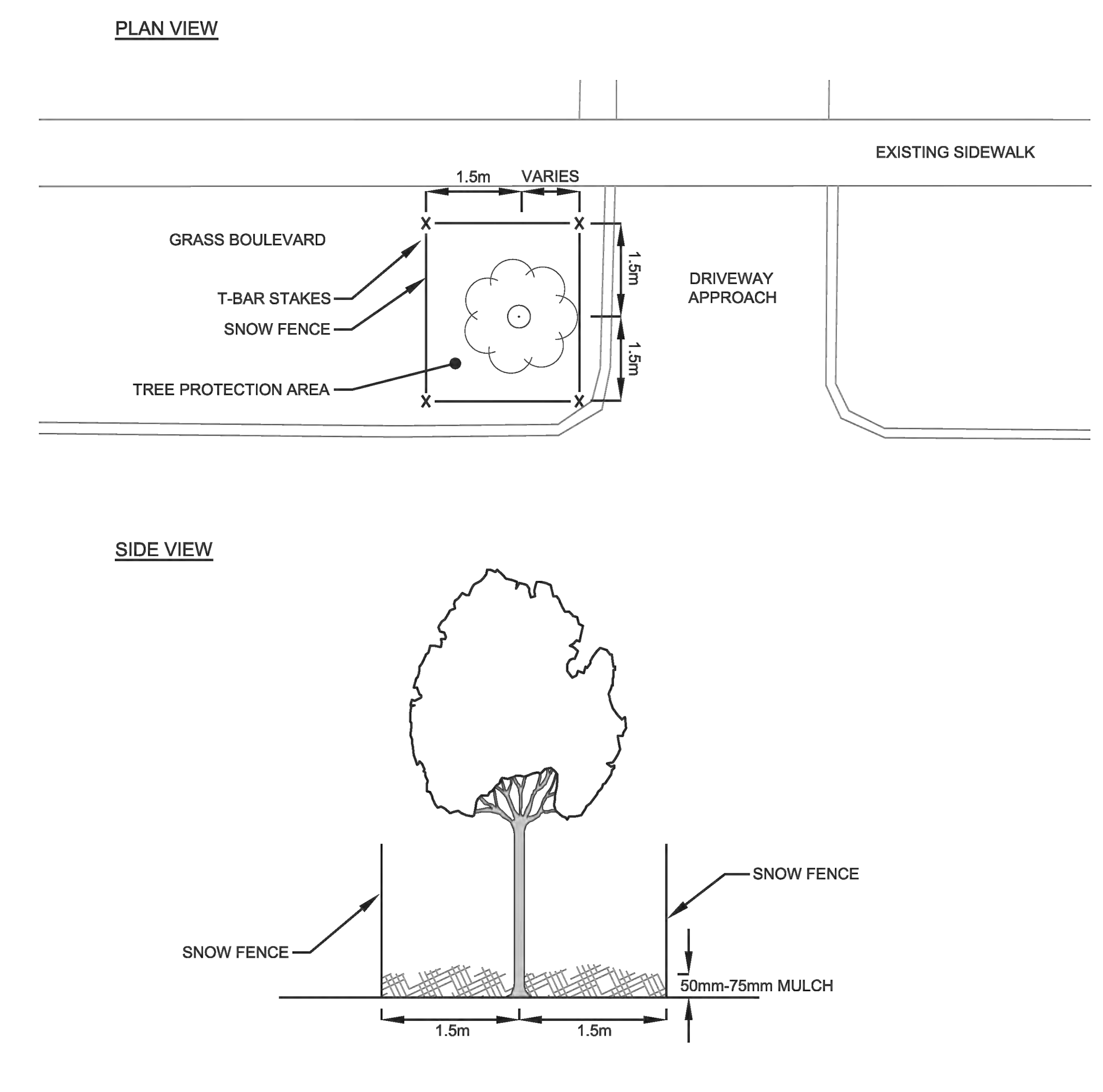
A Treatment at entrances shall be according to OPSD 351.010.

B Outlet treatment shall be according to the OPSD 610 Series.

C The transition from one curb type to another shall be a minimum length of 3.0m, except in conjunction with guide rail where it shall be according to the OPSD 900 Series.

D All dimensions are in millimetres unless otherwise shown.

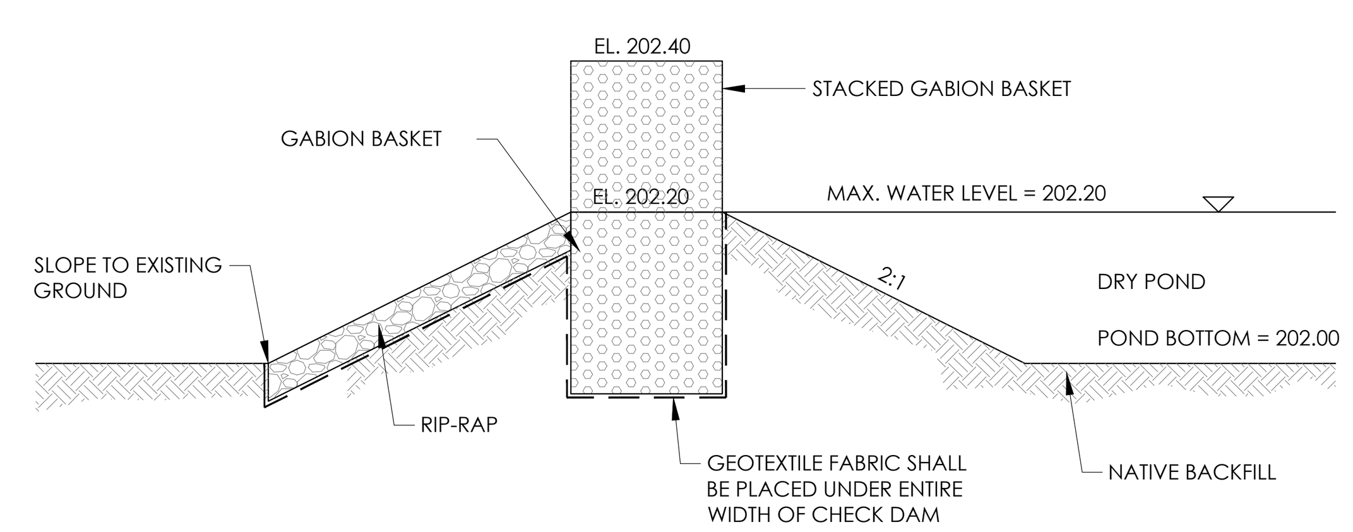
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev 2
CONCRETE BARRIER CURB	OPSD 600.110	



NOTES:

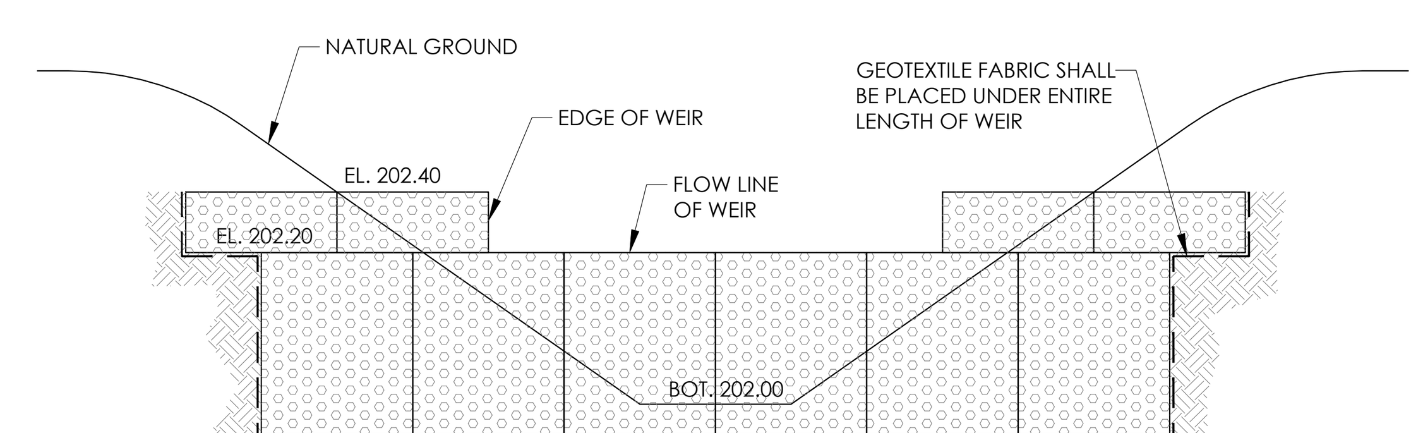
1. SNOW FENCE TO EXTEND 1.5m AROUND THE TREE (DESIRABLE DISTANCE) OR MODIFY TO SUIT SITE CONDITIONS
2. SNOW FENCE WITH T-STAKES MUST BE MAINTAINED DURING CONSTRUCTION
3. TREE PROTECTION MUST NOT INTERFERE WITH PRIVATE WALKWAY AND DRIVEWAY ACCESS
4. PROVIDE ACCESS TO FIRE HYDRANT

BRANTFORD	TREE PROTECTION DETAIL TP-101	ENGINEERING SERVICES DEPARTMENT
		SEPT. 2015 / N.T.S.
		DETAIL / DRAWN BY: L.J.W.



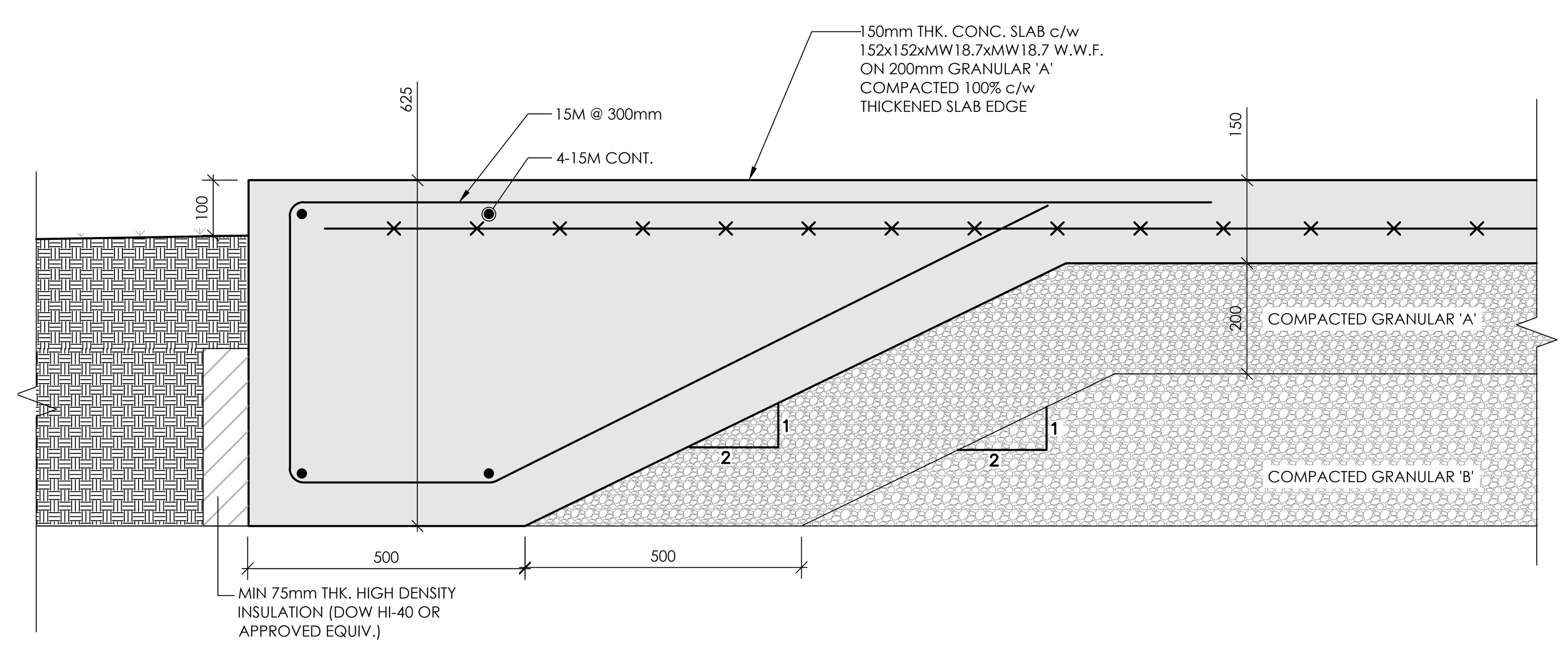
A / C0.1 GABION BASKET SECTION A-A

SCALE: N.T.S.



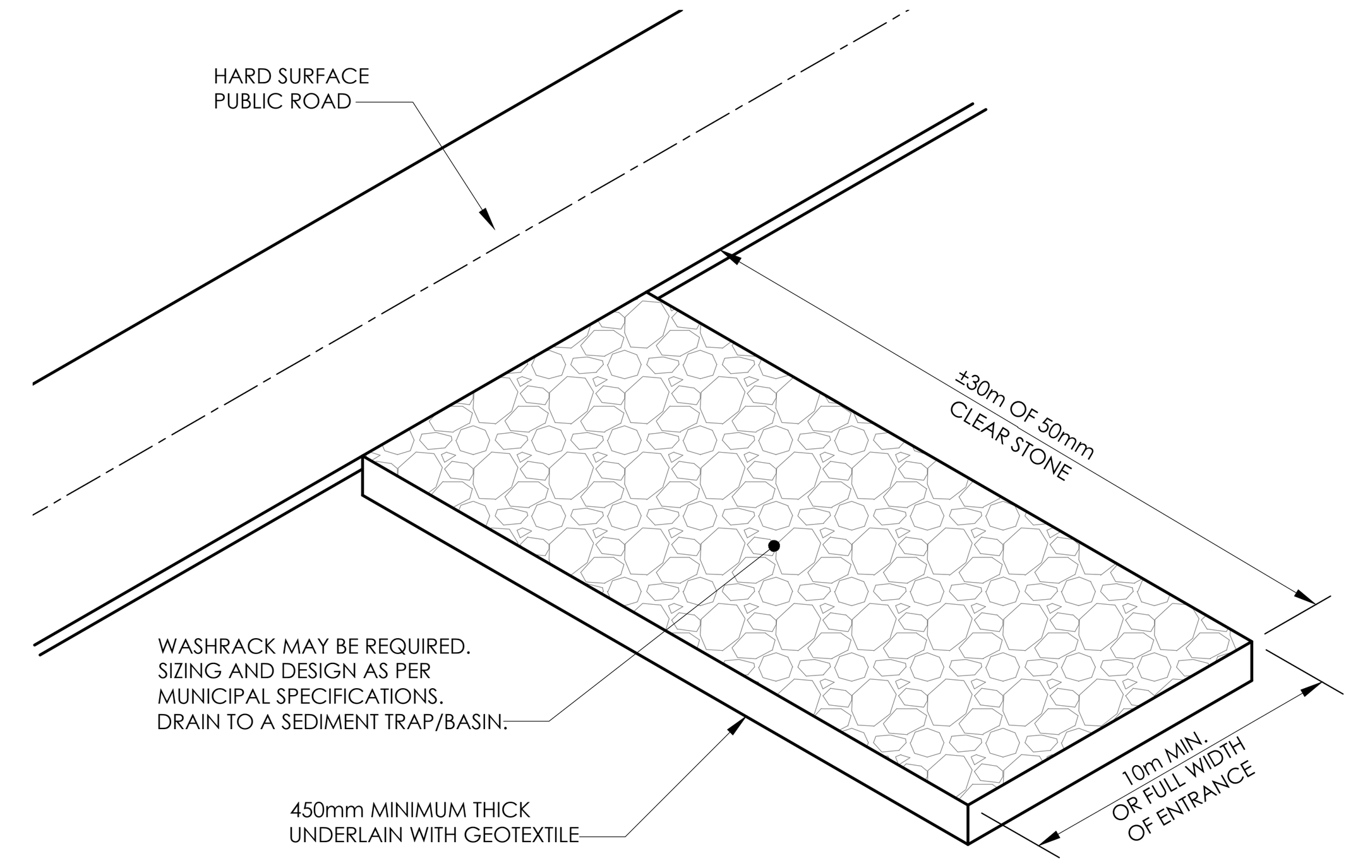
B / C0.1 GABION BASKET SECTION B-B

SCALE: N.T.S.



ENCLOSURE CONCRETE PAD SECTION DETAIL

SCALE: N.T.S.

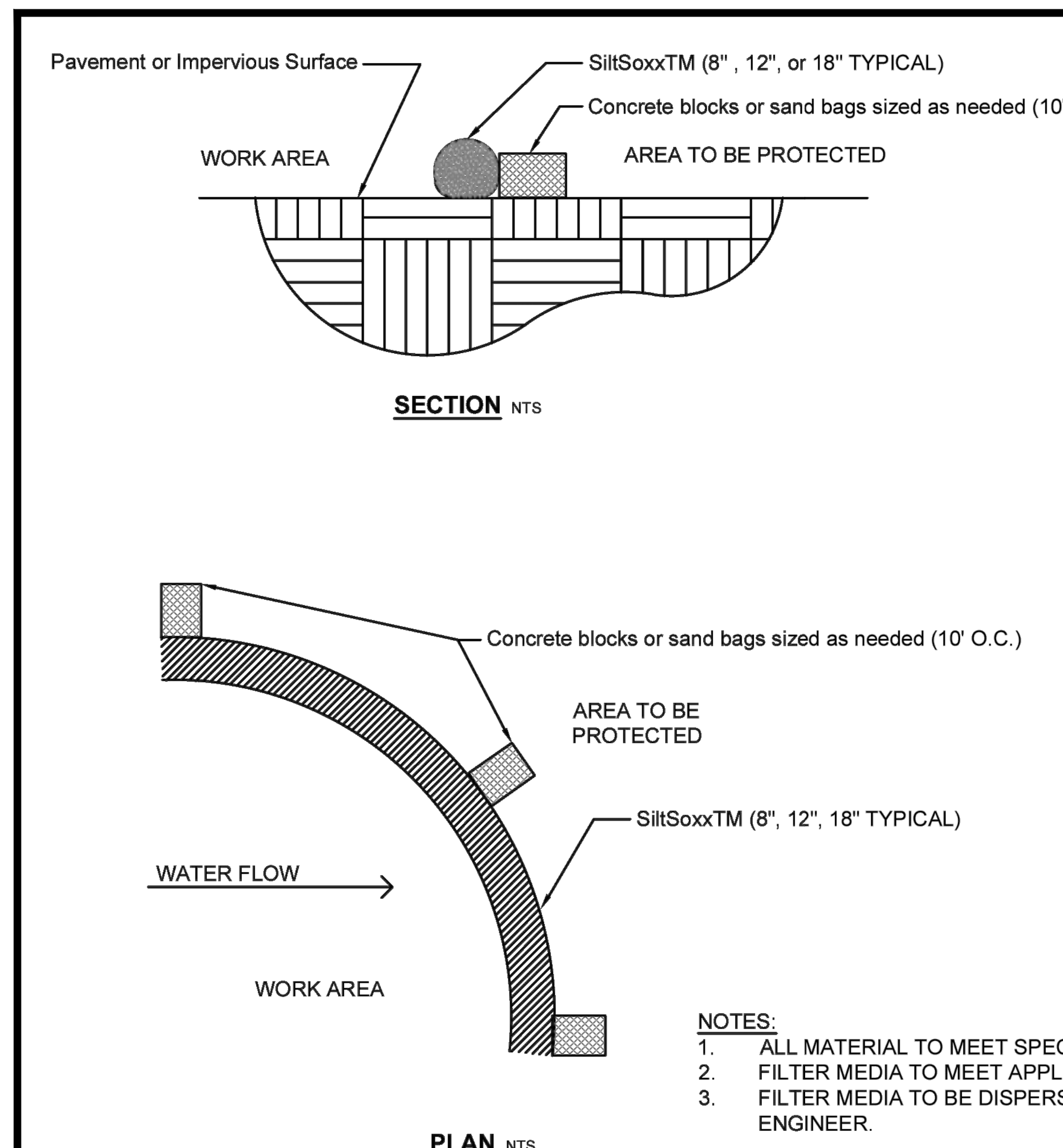


NOTES

1. DIMENSIONS HAVE BEEN MODIFIED TO SUIT SITE CONDITIONS
2. ALL EROSION AND SILTATION CONTROL DEVICES SHOULD BE AS PER LOCAL AUTHORITY HAVING JURISDICTION.

TEMPORARY MUD MAD DETAIL

SCALE: N.T.S.

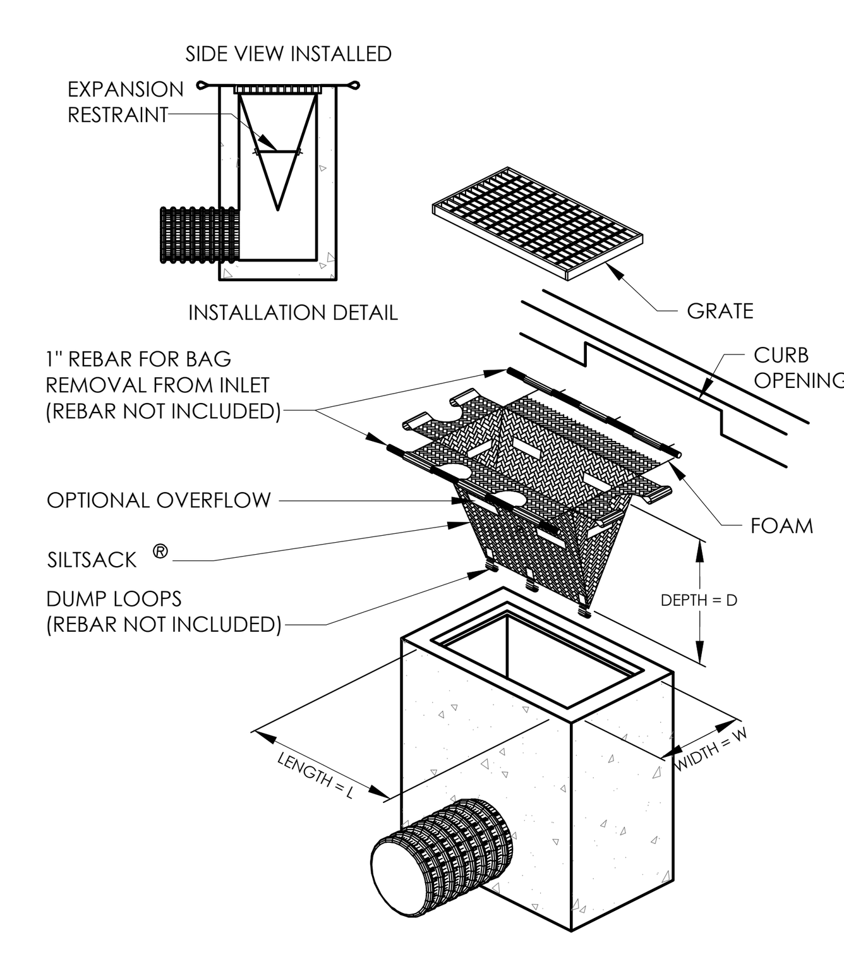


NOTES:

1. ALL MATERIAL TO MEET SPECIFICATIONS.
2. FILTER MEDIA TO MEET APPLICATION REQUIREMENTS.
3. FILTER MEDIA TO BE DISPERSED ON SITE, AS DETERMINED BY ENGINEER.

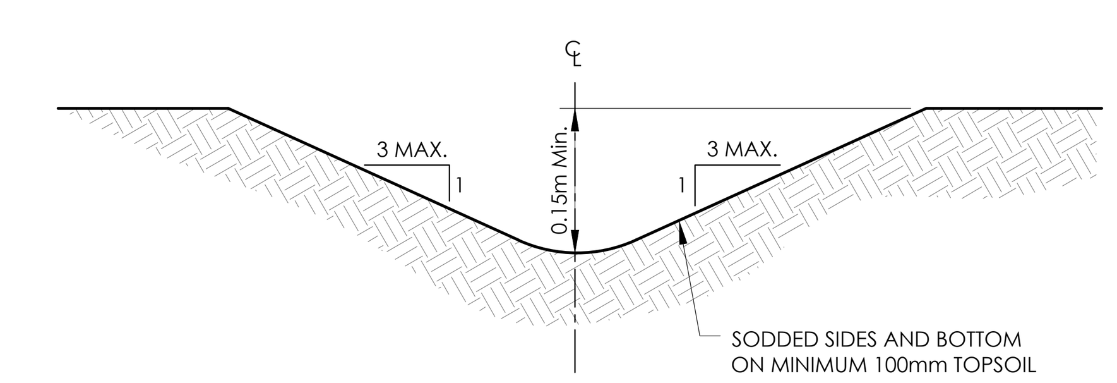
SiltSoxxTM for Sediment Control on Pavement

NTS



TYPICAL CB SILT TRAP DETAIL

SCALE: N.T.S.



TYPICAL SWALE DETAIL

SCALE: N.T.S.

CONSTRUCTION NORTH

TRUE NORTH

REVIEW ALL DRAWINGS AND VERIFY ALL DIMENSIONS AT THE SITE. DO NOT SCALE THE DRAWINGS. REPORT ALL DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH ANY CONSTRUCTION OR SHOP FABRICATION. ALL RELATED DOCUMENTS ARE THE COPYRIGHT PROPERTY OF "MANTECON PARTNERS" AND MUST BE RETURNED UPON REQUEST. REPRODUCTION OF DRAWINGS, SPECIFICATIONS AND RELATED DOCUMENTS IN PART OR WHOLE IS FORBIDDEN WITHOUT THE ENGINEER'S WRITTEN PERMISSION.

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MPI Project No: 21-153

Scale: As Shown

Drawn by: A.A.

Plot Date: FEB. 11, 2022

Issue Date:

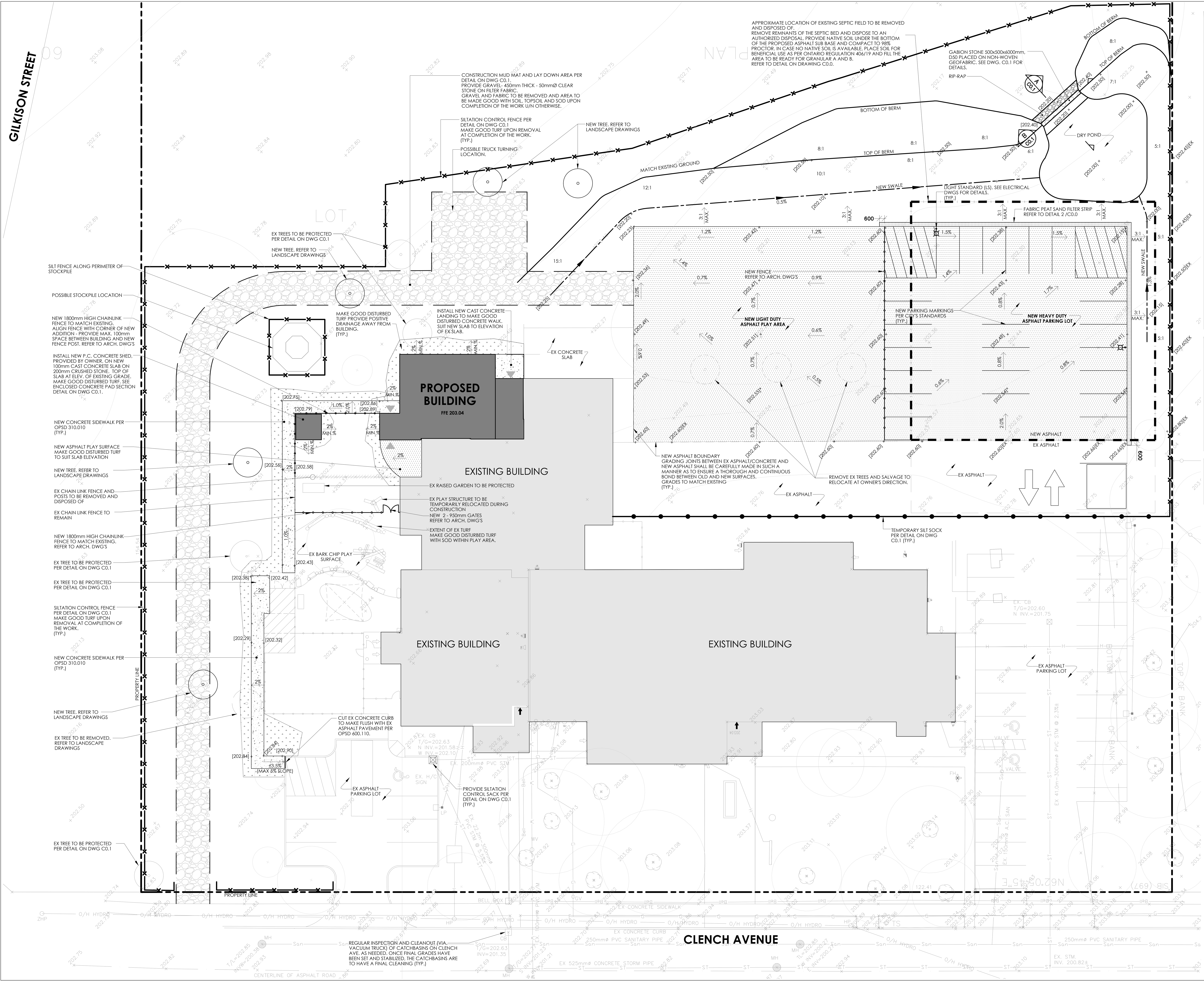
PRESCHOOL DAY CARE ADDITION

Ecole elementaire catholique Saint-Marguerite-Bourgeoys

60 Clench Avenue, Brantford, Ontario N3T 1B9

TYPICAL DETAILS

C0.1



GILKISON STREET
CLENCH AVENUE
PROPOSED BUILDING
FFE 203.04
EXISTING BUILDING
EXISTING BUILDING
EXISTING BUILDING
NEW LIGHT DUTY ASPHALT PLAY AREA
NEW HEAVY DUTY ASPHALT PARKING LOT
DRY POND
APPROXIMATE LOCATION OF EXISTING SEPTIC FIELD TO BE REMOVED AND DISPOSED OF. REMOVE REMNANTS OF THE SEPTIC BED AND DISPOSE TO AN AUTHORIZED DISPOSAL. PROVIDE NATIVE SOIL UNDER THE BOTTOM OF THE PROPOSED ASPHALT SUB BASE AND COMPACT TO 98% PROCTOR. IN CASE NO NATIVE SOIL IS AVAILABLE, PLACE SOIL FOR BENEFICIAL USE AS PER ONTARIO REGULATION 406/19 AND FILL THE AREA TO BE READY FOR GRANULAR A AND B. REFER TO DETAIL ON DRAWING C0.0.
GABION STONE 500x500x6000mm, D50 PLACED ON NON-WOVEN GEOFABRIC. SEE DWG. C0.1 FOR DETAILS.
RIP-RAP
CONSTRUCTION MUD MAT AND LAY DOWN AREA PER DETAIL ON DWG C0.1. PROVIDE GRAVEL- 450mm THICK - 50mmØ CLEAR STONE ON FILTER FABRIC. GRAVEL AND FABRIC TO BE REMOVED AND AREA TO BE MADE GOOD WITH SOIL, TOPSOIL AND SOD UPON COMPLETION OF THE WORK U/N OTHERWISE.
SILTATION CONTROL FENCE PER DETAIL ON DWG C0.1 MAKE GOOD TURF UPON REMOVAL AT COMPLETION OF THE WORK. (TYP.)
POSSIBLE TRUCK TURNING LOCATION.
NEW TREE, REFER TO LANDSCAPE DRAWINGS
MATCH EXISTING GROUND
BOTTOM OF BERM
TOP OF BERM
NEW SWALE
LIGHT STANDARD (LS). SEE ELECTRICAL DWGS FOR DETAILS. (TYP.)
FABRIC PEAT SAND FILTER STRIP REFER TO DETAIL 2 /C0.0
EX TREES TO BE PROTECTED PER DETAIL ON DWG C0.1
NEW TREE. REFER TO LANDSCAPE DRAWINGS
SILT FENCE ALONG PERIMETER OF STOCKPILE
POSSIBLE STOCKPILE LOCATION
NEW 1800mm HIGH CHAINLINK FENCE TO MATCH EXISTING. ALIGN FENCE WITH CORNER OF NEW ADDITION - PROVIDE MAX. 100mm SPACE BETWEEN BUILDING AND NEW FENCE POST. REFER TO ARCH. DWG'S
INSTALL NEW P.C. CONCRETE SHED, PROVIDED BY OWNER, ON NEW 100mm CAST CONCRETE SLAB ON 200mm CRUSHED STONE. TOP OF SLAB AT ELEV. OF EXISTING GRADE. MAKE GOOD DISTURBED TURF. SEE ENCLOSED CONCRETE PAD SECTION DETAIL ON DWG C0.1.
MAKE GOOD DISTURBED TURF PROVIDE POSITIVE DRAINAGE AWAY FROM BUILDING. (TYP.)
INSTALL NEW CAST CONCRETE LANDING TO MAKE GOOD DISTURBED CONCRETE WALK. SUIT NEW SLAB TO ELEVATION OF EX SLAB.
EX CONCRETE SLAB
NEW FENCE REFER TO ARCH. DWG'S
NEW PARKING MARKINGS PER CITY'S STANDARDS (TYP.)
NEW CONCRETE SIDEWALK PER OPSD 310.010 (TYP.)
NEW ASPHALT PLAY SURFACE MAKE GOOD DISTURBED TURF TO SUIT SLAB ELEVATION
NEW TREE. REFER TO LANDSCAPE DRAWINGS
EX CHAIN LINK FENCE AND POSTS TO BE REMOVED AND DISPOSED OF
EX CHAIN LINK FENCE TO REMAIN
NEW 1800mm HIGH CHAINLINK FENCE TO MATCH EXISTING. REFER TO ARCH. DWG'S
EX TREE TO BE PROTECTED PER DETAIL ON DWG C0.1
EX TREE TO BE PROTECTED PER DETAIL ON DWG C0.1
SILTATION CONTROL FENCE PER DETAIL ON DWG C0.1 MAKE GOOD TURF UPON REMOVAL AT COMPLETION OF THE WORK. (TYP.)
NEW CONCRETE SIDEWALK PER OPSD 310.010 (TYP.)
NEW TREE. REFER TO LANDSCAPE DRAWINGS
EX TREE TO BE REMOVED. REFER TO LANDSCAPE DRAWINGS
EX TREE TO BE PROTECTED PER DETAIL ON DWG C0.1
PROPERTY LINE
EX RAISED GARDEN TO BE PROTECTED
EX PLAY STRUCTURE TO BE TEMPORARILY RELOCATED DURING CONSTRUCTION
NEW 2 - 950mm GATES REFER TO ARCH. DWG'S
EXTENT OF EX TURF MAKE GOOD DISTURBED TURF WITH SOD WITHIN PLAY AREA.
EX BARK CHIP PLAY SURFACE
NEW ASPHALT BOUNDARY GRADING JOINTS BETWEEN EX ASPHALT/CONCRETE AND NEW ASPHALT SHALL BE CAREFULLY MADE IN SUCH A MANNER AS TO ENSURE A THOROUGH AND CONTINUOUS BOND BETWEEN OLD AND NEW SURFACES. GRADES TO MATCH EXISTING (TYP.)
REMOVE EX TREES AND SALVAGE TO RELOCATE AT OWNER'S DIRECTION.
EX ASPHALT
NEW ASPHALT
TEMPORARY SILT SOCK PER DETAIL ON DWG C0.1 (TYP.)
EX ASPHALT PARKING LOT
CUT EX CONCRETE CURB TO MAKE FLUSH WITH EX ASPHALT PAVEMENT PER OPSD 600.110.
PROVIDE SILTATION CONTROL SACK PER DETAIL ON DWG C0.1 (TYP.)
EX ASPHALT PARKING LOT
REGULAR INSPECTION AND CLEANOUT (VIA. VACUUM TRUCK) OF CATCHBASINS ON CLENCH AVE. AS NEEDED. ONCE FINAL GRADES HAVE BEEN SET AND STABILIZED, THE CATCHBASINS ARE TO HAVE A FINAL CLEANING (TYP.)
EX CONCRETE SIDEWALK
EX CONCRETE CURB
250mmø PVC SANITARY PIPE
EX 525mmø CONCRETE STORM PIPE
CENTERLINE OF ASPHALT ROAD
(MAX 5% SLOPE)

LEGEND

THIS LEGEND OF SYMBOLS REPRESENTS MANTECON PARTNERS INC. STANDARD/GENERIC LEGEND. ALL SYMBOLS MAY NOT APPEAR ON DRAWINGS.

REFER	DESCRIPTION
	PROPERTY LINE
	EXISTING BUILDING
	PROPOSED BUILDING
	PROPOSED ASPHALT
	PROPOSED CONCRETE
	PROPOSED GRASS
+XXX.XX	EXISTING ELEVATION
+[XXX.XX]	PROPOSED ELEVATION
	EXISTING ITEMS TO BE DEMOLISHED OR REMOVED
San	EXISTING SANITARY SERVICE
Stm	EXISTING STORM SERVICE
O/H HYDRO	EXISTING OVERHEAD HYDRO SERVICE
H	EXISTING UNDERGROUND HYDRO SERVICE
G	EXISTING GAS SERVICE
B	EXISTING BELL SERVICE
	PROPOSED SILT FENCE
	PROPOSED SILTATION CONTROL SACK
	PROPOSED CONSTRUCTION MUD MAT
	PROPOSED SILT SOCK
	PROPOSED CHAIN LINK FENCE
	PROPOSED GABION STONE
	PROPOSED RIP-RAP
	PROPOSED SWALE

METRIC: DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

SITE PLAN

PLAN OF TOPOGRAPHICAL SURVEY OF PART OF LOTS 5, 6 AND 7 REGISTERED PLAN 60 SOUTH OF CLENCH AVENUE CITY OF BRANTFORD

INFORMATION ON THIS SITE PLAN TAKEN FROM SURVEY / TOPOGRAPHY PREPARED BY:

MACAULAY, WHITE & MUIR LTD. ONTARIO LAND SURVEYORS-CANADA LAND SURVEYORS 440 HARDY ROAD, UNIT 2, BRANTFORD, ON, N3T 5L8 T:519-752-0040 F:519-752-0087

THE SURVEY WAS COMPLETED ON MAY 24, 2007

BENCHMARK

T.B.M. No. 1 ELEVATION = 203.36

TOP NUT OF FIRE HYDRANT IN FRONT OF MUNICIPAL #42 DELAMERE STREET.

CONSTRUCTION NORTH

TRUE NORTH

REVIEW ALL DRAWINGS AND VERIFY ALL DIMENSIONS AT THE SITE. DO NOT SCALE THE DRAWINGS. REPORT ALL DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH FABRICATION, CONSTRUCTION OR SHOP APPLICATION. ALL DRAWINGS, SPECIFICATIONS, AND RELATED DOCUMENTS ARE THE COPYRIGHT PROPERTY OF MANTECON PARTNERS AND MUST BE RETURNED UPON REQUEST. REPRODUCTION OF DRAWINGS, SPECIFICATIONS AND RELATED DOCUMENTS IN PART OR WHOLE IS FORBIDDEN WITHOUT THE ENGINEER'S WRITTEN PERMISSION.

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15 Foundry Street, Dundas, ON, L9H 2V6
Phone: (905)648-0373
www.manteconpartners.com

No.	Revisions:	Date:
11	Issued For Tender	2025-02-10
10	Re-Issued For SPA	2023-08-02
9	Re-Issued For SPA	2023-06-30
8	Re-Issued For SPA	2023-03-23
7	Issued For Permit	2023-01-20
6	Issued For SPA	2022-09-23
5	Issued For Owner Review	2022-09-02

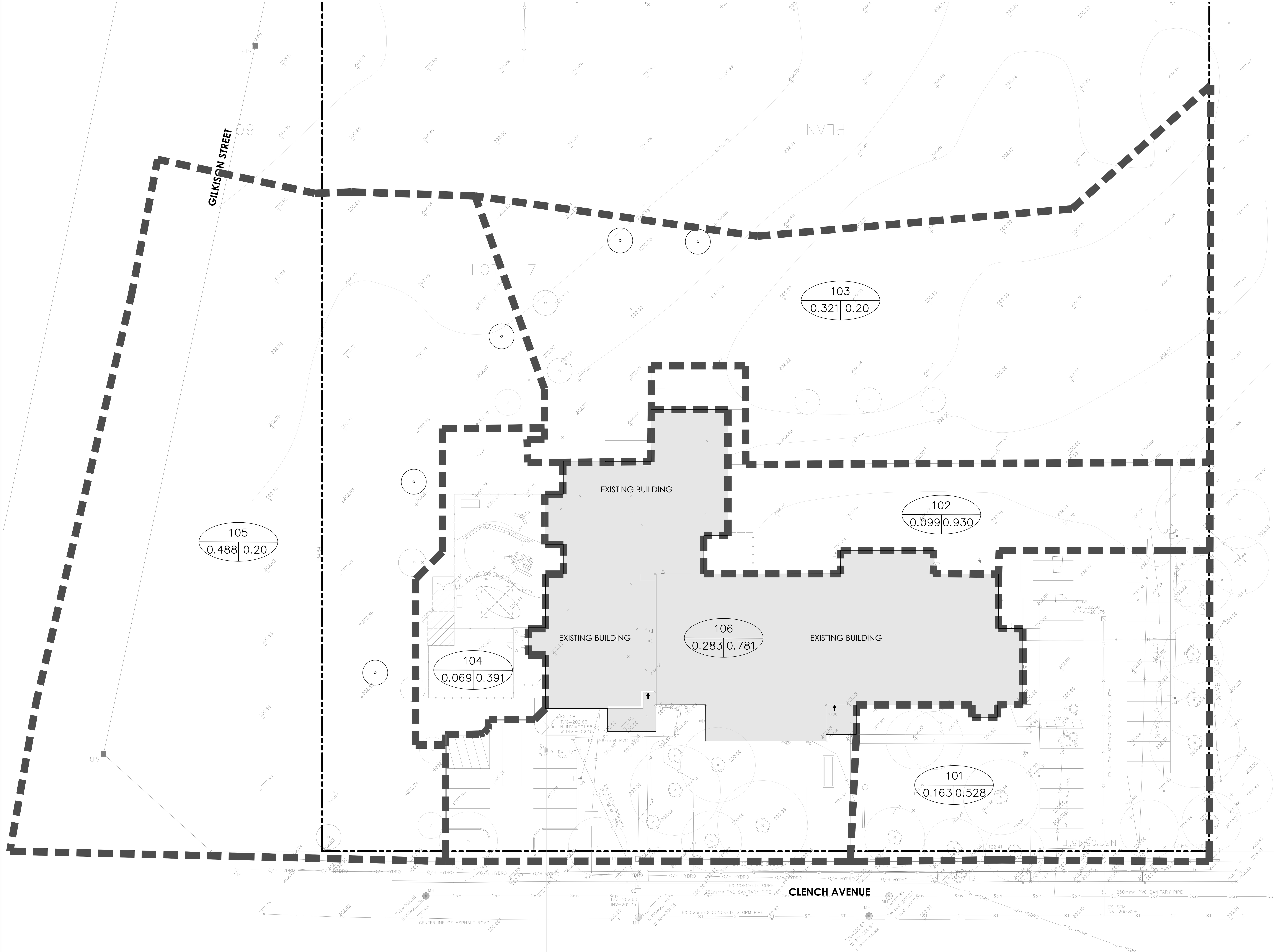
MPI Project No:	21-153
Scale:	1:200
Drawn by:	A.A.
Plot Date:	FEB. 11, 2022
Issue Date:	

PRESCHOOL DAY CARE ADDITION
Ecole elementaire catholique Saint-Marguerite-Bourgeoys

60 Clench Avenue, Brantford, Ontario N3T 1B9

SITE GRADING /SERVICING /SEDIMENT & EROSION CONTROL PLAN

C1.1



1 / C2.1 PRE–DEVELOPMENT DRAINAGE AREA PLAN
1:250

LEGEND - DRAINAGE AREA

THIS LEGEND OF SYMBOLS REPRESENTS MANTECON PARTNERS INC. STANDARD/GENERIC LEGEND. ALL SYMBOLS MAY NOT APPEAR ON DRAWINGS.

REFER	DESCRIPTION
	PROPERTY LINE
	EXISTING BUILDING
	PROPOSED BUILDING
	PROPOSED ASPHALT
	PROPOSED CONCRETE
	PROPOSED GRASS
H	EXISTING HYDRO SERVICE
SIB	EXISTING STANDARD IRON BAR
CB	EXISTING CATCHBASIN
MH	EXISTING MANHOLE
	DRAINAGE AREA BOUNDARY
+XXX.XX	EXISTING ELEVATION

DRAINAGE AREA IDENTIFIER NUMBER — 205
AREA (IN HECTARES) — 0.141
RUNOFF COEFFICIENT — 0.488

METRIC: DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

CONSTRUCTION NORTH

TRUE NORTH

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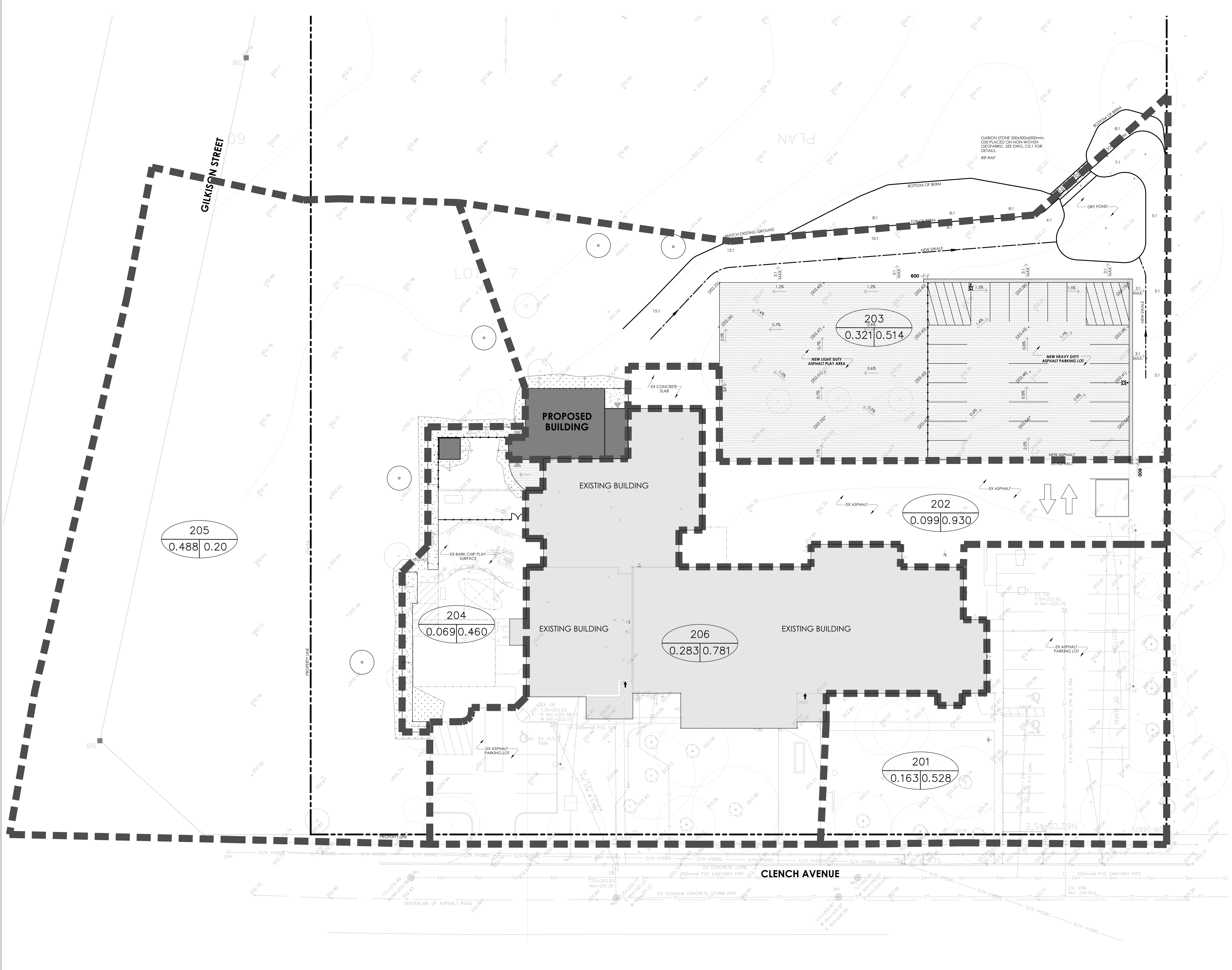
3	Issued For SPA	2022-09-23
2	Issued For Owner Review	2022-09-02
1	Issued For Owner Review	2022-07-08

MPI Project No: 21-153
Scale: As Shown
Drawn by: A.A.
Plot Date: FEB. 11, 2022
Issue Date:

PRESCHOOL DAY CARE ADDITION
Ecole elementaire catholique Saint-Marguerite-Bourgeoys
60 Clench Avenue, Brantford, Ontario N3T 1B9
PRE-DEVELOPMENT DRAINAGE AREA PLAN

C2.1



1 / C2.2 POST DEVELOPMENT DRAINAGE AREA PLAN
1:250

LEGEND - DRAINAGE AREA

THIS LEGEND OF SYMBOLS REPRESENTS MANTECON PARTNERS INC. STANDARD/GENERIC LEGEND. ALL SYMBOLS MAY NOT APPEAR ON DRAWINGS.

REFER	DESCRIPTION
(long dash line)	PROPERTY LINE
(light grey fill)	EXISTING BUILDING
(dark grey fill)	PROPOSED BUILDING
(dotted fill)	PROPOSED ASPHALT
(speckled fill)	PROPOSED CONCRETE
(grass symbol fill)	PROPOSED GRASS
—— H ——	EXISTING HYDRO SERVICE
■ SIB	EXISTING STANDARD IRON BAR
□ CB	EXISTING CATCHBASIN
MH	EXISTING MANHOLE
(thick dashes)	DRAINAGE AREA BOUNDARY
+XXX.XX	EXISTING ELEVATION

DRAINAGE AREA IDENTIFIER NUMBER — 205
AREA (IN HECTARES) — 0.141
RUNOFF COEFFICIENT — 0.488

METRIC: DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

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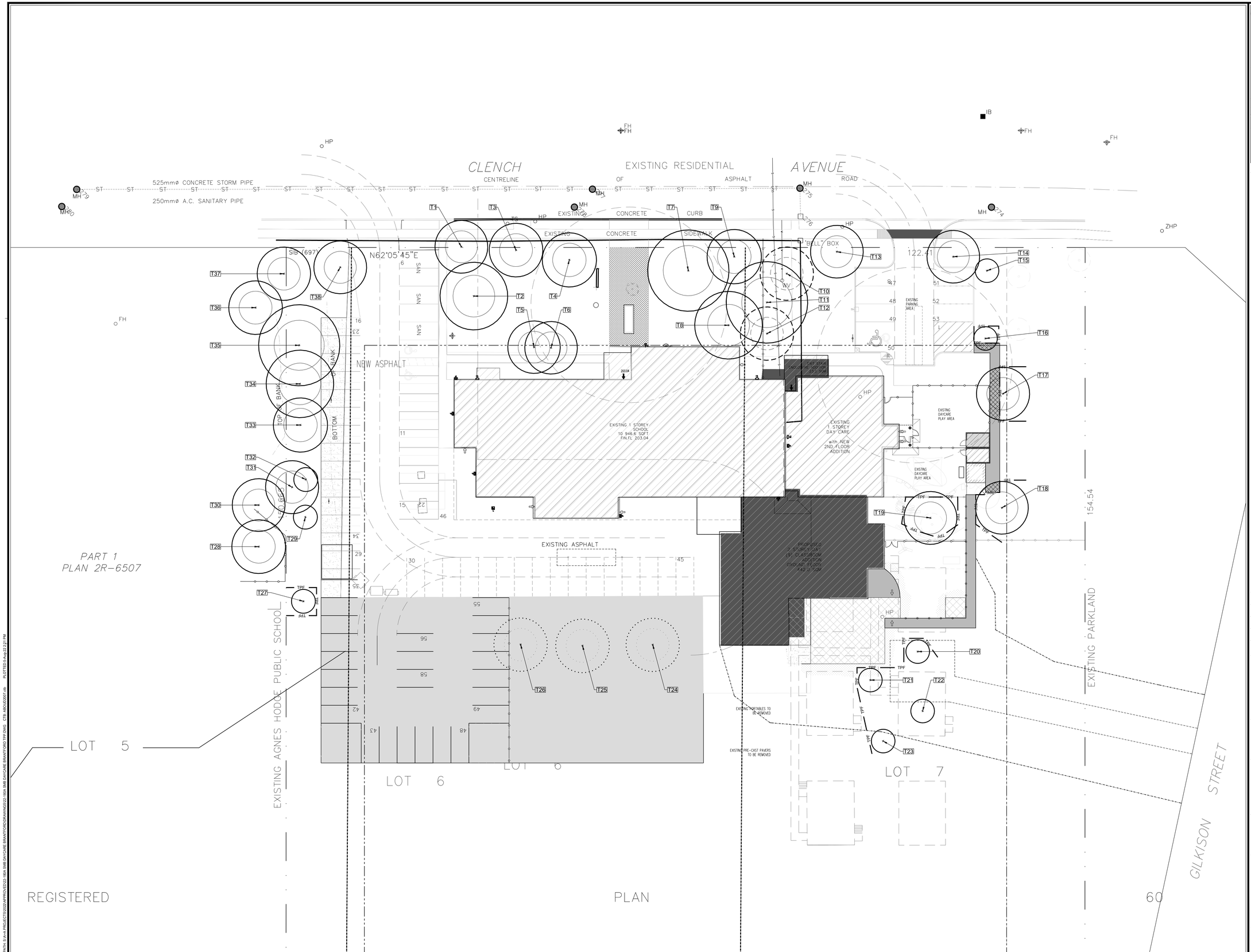
Issue Date:

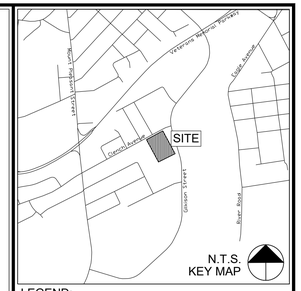
PRESCHOOL DAY CARE ADDITION
Ecole elementaire catholique Saint-Marguerite-Bourgeoys

60 Clench Avenue, Brantford, Ontario N3T 1B9

POST DEVELOPMENT DRAINAGE AREA PLAN

C2.2





LEGEND:

- EXISTING TREE (T1) — ID NUMBER / OUTER CIRCLE DENOTES APPROX. CRITICAL ROOT ZONE (CRZ). INNER CIRCLE DENOTES MINIMUM TREE PROTECTION ZONE (MTPZ).
- PRESERVE TREE — TREE HAS MODERATE TO HIGH BIOLOGICAL HEALTH AND/OR STRUCTURAL CONDITION AND CAN BE INCORPORATED INTO THE PROPOSED DEVELOPMENT
- REMOVE TREE — TREE HAS LOW BIOLOGICAL HEALTH AND/OR STRUCTURAL CONDITION
- REMOVE TREE — TREE IS IN CONFLICT WITH PROPOSED DEVELOPMENT
- TPF — TREE PROTECTION FENCE
- ROOT SENSITIVE EXCAVATION AND GRADING WITHIN TREE PROTECTION ZONES

INFORMATION SOURCES

1. Site Plan and Survey received from Macdonald Zuberec Ensslen Architects Inc. July 15, 2022 T:519.821.2763.
2. Tree inventory and analysis conducted by Aboud & Associates Inc. July 22, 2022 T:519.822.6839.

No.	Description	By	Date
0	ISSUED FOR REVIEW	JD	05 AUG-22

REVISIONS: All previous issues of this drawing are superceded

ABOUD & ASSOCIATES INC.
Consulting Arborists • Ecologists • Landscape Architects
3-5 Edinburgh Rd S , Guelph , Ontario , N1H 5N8 . 519.822.6839 . www.aboudtng.com

Title:

TREE PRESERVATION PLAN

Project:

60 CLENCH AVENUE
CITY OF BRANTFORD

Date: AUGUST 2022	Designer: JGL
Project: AA22-180A	Drawn: JGL
Scale: 1:250	Checked: JD

Drawing No:

TPP1

Tree No.	Tree Species	DBH (cm) 1, 2	Minimum Tree Protection Zone (m) (from outer trunk of tree) 3	Critical Root Zone (m) (from outer trunk of tree) 3	Crown Reserve est. (m)	Biological Health (Low, Moderate, High)	Structural Condition (Low, Moderate, High)	Overall Condition (Dead, Poor, Fair, Good, Excellent)	Ownership: Private, Offsite, Municipal, Shared	Rec. Action - Condition: Preserve, Remove	Rec. Action - Development: Preserve, Remove	Final Recommendation: Preserve, Remove	Observations/ Tree Preservation Notes
1	Acer platanoides Norway Maple	16	2.4	4	6	M	M(H)	Fair	S	P	P	P	Dyeback, chlorosis
2	Acer platanoides Norway Maple	46	3	5	14	M	M(H)	Fair	P	P	P	P	Trunk without bark (20%), decay in large branch at 3m high moderate , decay in Crown moderate
3	Tilia cordata Little-Leaf Linden	29	2.4	4	6	M	M(H)	Fair	P	P	P	P	Deadwood in Crown minor moderate
4	Gleditsia triacanthos Honeylocust	38	2.4	4	16	M(H)	M(H)	Good	P	P	P	P	
5	Juniperus sp. Juniper	11	2.4	4	2	M	M(H)	Fair	P	P	P	P	Poor pruning
6	Juniperus sp. Juniper	12[11,5]	2.4	4	2	M	M(H)	Fair	P	P	P	P	Codominant stems from base
7	Picea glauca White Spruce	57	3.6	6	10	M	M(H)	Fair	P	P	P	P	Lack of vigour, slime flux, exposed roots, girdling roots, deadwood in Crown moderate, poor pruning
8	Acer platanoides Norway Maple	46	3	5	14	M	M	Fair	P	P	P	P	Girdling roots, decay minor in previous pruning scars, deadwood in Crown minor
9	Tilia cordata Little-Leaf Linden	40	2.4	4	8	M	M(H)	Fair	P	P	P	P	Raised soil level, garden plants around possible decay around base of trunk, deadwood in Crown minor
10	Dead tree	25	2.4	4	8	-	-	-	P	R	P	RC	
11	Juglans nigra Black Walnut	60	3.6	6	16	M	M(H)	Good	P	P	P	P	
12	Malus sp. Apple species	25	2.4	4	8	M(L)	M(L)	Poor	P	R	P	RC	Decay severe at base of trunk, two 15cm branches dead
13	Quercus rubra Red Oak	15	2.4	4	8	M(H)	M(H)	Good	P	P	P	P	
14	Quercus rubra Red Oak	14	2.4	4	6	M(H)	M(H)	Good	P	P	P	P	
15	Quercus rubra Red Oak	5	1.8	1.8	2	M(H)	M(H)	Good	P	P	P	P	
16	Quercus rubra Red Oak	5	1.8	1.8	3	M(H)	M(H)	Good	P	P	P	P	
17	Quercus rubra Red Oak	22	2.4	4	12	M(H)	M(H)	Good	P	P	P	P	
18	Quercus rubra Red Oak	15	2.4	4	8	M(H)	M(H)	Good	P	P	P	P	
19	Quercus rubra Red Oak	18	2.4	4	10	M(H)	M(H)	Good	P	P	P	P	
20	Acer platanoides Norway Maple	5	1.8	1.8	2	M	M(H)	Fair	P	P	P	P	Chlorosis moderate
21	Acer platanoides Norway Maple	5	1.8	1.8	2	M	M(H)	Fair	P	P	P	P	Chlorosis moderate
22	Acer platanoides Norway Maple	5	1.8	1.8	1	M	M(H)	Fair	P	P	P	P	Chlorosis moderate
23	Acer platanoides Norway Maple	5	1.8	1.8	2	M	M(H)	Fair	P	P	P	P	Chlorosis moderate
24	Acer x Freemanii Freeman Maple	25	2.4	4	10	M(H)	M(H)	Fair	P	P	R	RD	Exposed roots
25	Acer x Freemanii Freeman Maple	30	2.4	4	12	M	M	Fair	P	P	R	RD	Girdling roots
26	Acer x Freemanii Freeman Maple	26	2.4	4	12	M	M	Fair	P	P	R	RD	Girdling roots
27	Quercus rubra Red Oak	9	1.8	1.8	5	M(H)	M(H)	Good	P	P	P	P	
28	Acer x Freemanii Freeman Maple	31	2.4	4	14	M	M	Fair	O	P	P	P	Neighbour's tree, girdling roots
29	Picea glauca White Spruce	10	1.8	1.8	3	M(H)	M(H)	Good	P	P	P	P	
30	Picea pungens Colorado Spruce	16	2.4	4	8	M	M	Fair	O	P	P	P	Neighbour's tree
31	Malus baccata Siberian Crab-Apple	20[14,10, 10]	2.4	4	4	M(L)	M	Fair	P	P	P	P	Deadwood in Crown moderate, codominant stems from base, 14 cm branch 40 % bark off with decay
32	Tilia cordata Little-Leaf Linden	10	1.8	1.8	4	M(H)	M(H)	Fair	P	P	P	P	Partially suppressed on one side
33	Acer saccharum ssp. saccharum Sugar Maple	38	2.4	4	16	M	M	Fair	P	P	P	P	
34	Tilia cordata Little-Leaf Linden	44	3	5	12	M(H)	M(H)	Fair	P	P	P	P	Girdling roots
35	Acer platanoides Norway Maple	55	3.6	6	16	M(H)	M	Fair	P	P	P	P	Girdling roots, decay in some previous pruning scars minor, deadwood in Crown minor
36	Acer platanoides Norway Maple	29	2.4	4	12	M	M	Fair	O	P	P	P	Neighbour's tree
37	Picea pungens Colorado Spruce	25	2.4	4	10	M	M(H)	Fair	O	P	P	P	Lean minor
38	Robinia pseudoacacia Black Locust	16[10,8,7, 6,3]	2.4	4	6	M	M(H)	Good	P	P	P	P	Multiple stems

	Ownership	Condition	Development	Final
Ownership				
Private (On Site) Trees	33			
Private (Off Site) Trees	4			
Municipal Trees	0			
Shared Trees	1			
Subtotal	**38**			
Recommendation Based on Condition				
Preserve Tree Based on Health & Structure		36		
Remove Tree Based on Health & Structure		2		
Subtotal		**38**		
Recommendation Based on Development				
Preserve/Transplant Tree Based on Development Impacts			35	
Remove Tree Based on Development Impacts			3	
Subtotal			**38**	
Final Recommendation				
Final Recommendation: Preserve (P)				33
Final Recommendation: Remove due to Condition (RC)				2
Final Recommendation: Remove due to Development (RD)				3
Final Recommendation: Remove due to Condition and Development (RCD)				0
Total				**38**

1. DBH (Diameter at breast height): Measurement of tree stem diameter at 1.4 meters above ground.

2. [ ] Denotes DBH's of Each Stem of Tree with Multiple Stems

3. Tree Protection Zones, Taken from Specifications for Trees (SS12A) City of Burlington. February, 2013.

Removal of trees owned by others (e.g. private off-site, municipal or shared/boundary trees) require approval from the owner.

GENERAL TREE NOTES

1. All arboricultural work performed on trees such as pruning of branches and roots shall be conducted by an ISA Certified Arborist.
2. Prune and mitigate limbs and roots damaged by construction work in accordance with ANSI A300 (Part 1) - 2008 Pruning and the Best Management Practices companion publication (revised 2008).
3. Tree Protection Fence to be erected prior to the commencement of any construction or grading, and maintained throughout the duration of the work.
4. Tree Protection Zone is delimited by Tree Protection Fence shown on the drawings.
5. No construction or activities including the following to occur within Tree Protection Zone: equipment parking or access, storage of supplies, topsoil or fill, and refueling.
6. Tree removals (if required) will be undertaken in compliance with the Migratory Birds Convention Act. Efforts will be made to remove vegetation outside the General Nesting period (April 1 - Aug 31) for regions C1 and C2 of Ontario. In the event vegetation must be removed within the General Nesting Period, a qualified avian biologist is to review the site prior to removal to ensure compliance with the Migratory Birds Convention Act.
7. Any soils and vegetation within tree protection zone damaged by the Contractor shall be restored to the satisfaction of the Municipality by the Contractor at no additional cost to the Owner.

CONSTRUCTION WITHIN MINIMUM TREE PROTECTION ZONE

1. An ISA Certified Arborist must be present on site during construction activities within MTPZ to confirm and/or modify mitigation measures for trees to be preserved.
2. Use trenchless methods (e.g. horizontal directional drilling) to install underground services (e.g. sanitary sewers and water lines) within Minimum Tree Protection Zones.

EXISTING UNDERGROUND SERVICES WITHIN TREE PROTECTION ZONES

1. Existing sanitary/storm sewers and watermains to be discontinued within tree protection zones will be filled (as needed) and abandoned.
2. Excavation and access for construction/removal of underground services will be conducted outside of tree protection zones.

FINISH GRADING WITHIN TREE PROTECTION ZONES

Where finish grading of cuts and fills, and including swales occurs within tree protection zones, the following steps are required.

Grade Cut:

1. Excavate by hand or Air-spade technology to a maximum depth of 100mm.
2. Roots encountered are to be assessed by the Project Arborist to determine the extent of roots to be pruned. Based on findings, other treatments may be required (e.g. crown reduction, tree removal), and which may require approval from the City.
3. Based on root findings, local, minor adjustments to grading within the tree protection zone may be required based on field consultation between the Project Arborist and Project Engineer.
4. No access by heavy equipment into tree protection zone is permitted. Fine grading to be carried out using light equipment and/or by hand.

Grade Fill:

5. Add topsoil to meet grade requirements to a maximum of 150mm.
6. No topsoil to be added onto trunk base or above-ground section of trunk base flare.
7. Maintain positive drainage away from trunk base.
8. Based on local conditions (e.g. surface drainage), local, minor adjustments to grading within the tree protection zone may be required based on field consultation between the Project Arborist and Project Engineer.

TREES OWNED BY OTHERS

1. Trees owned by others require permission (i.e. written consent) from the land owner(s) prior to activities that may damage or destroy trees. Trees owned by others are Offsite Trees and Shared Trees:
   a. Offsite Trees - Trees on property adjacent to the subject property;
   b. Shared (Boundary) Trees - Trees whose trunk including the basal trunk flare growing on the boundary between the subject property and adjoining property (from *Ontario Forestry Act*).

The Provincial Forestry Act, R.S.O. 1990 (Section 10):

10. (2) Every tree whose trunk is growing on the boundary between adjoining lands is the common property of the owners of the adjoining lands. 1990, c. 18 Sched. I, s. 21.
(3) Every person who injures or destroys a tree growing on the boundary between adjoining lands without the consent of the land owners is guilty of an offence under this Act. 1998, c. 18, Sched. I, s. 21.

ROOT SENSITIVE EXCAVATION

A preliminary excavation at the limit of work is recommended to determine the potential magnitude of the impacts posed by the planned work. For excavation in turf or permeable surfaces, the final excavation limit should be marked in the field and arborist supervised excavation shall be performed using air-spade, dry-vac truck, hydro-vac truck or hand tools. For excavation of existing impermeable surfaces, the impermeable top layer may be broken up by machine to allow access to the permeable base layers. The permeable base layers may need to be excavated further to expose existing roots, in which case this excavation shall be performed using air-spade, dry-vac truck, hydro-vac truck or hand tools. All root sensitive excavation must be performed under the supervision of a qualified arborist. All roots exposed must be documented by the supervising arborist. Every effort should be made to preserve as many exposed roots as possible. Roots approved for pruning should be cleanly cut with a sharp, non-vibrating tool such as a handsaw, secateurs, chainsaw at face of trench such that no further disturbance of the roots are to be expected once mechanical excavation begins. All root pruning is to be performed by the arborist only, as per guidelines below.

1. When root sensitive excavation is performed in regards to the installation of a deep site feature such as a foundation, roots of less than 5cm diameter can be cut sharply, if necessary, unless an abundance of smaller roots are involved. If roots of 5cm diameter or greater or an abundance of smaller roots are exposed in the excavation areas inside or just outside the Tree Protection Zone (TPZ) of bylaw trees they should be preserved.

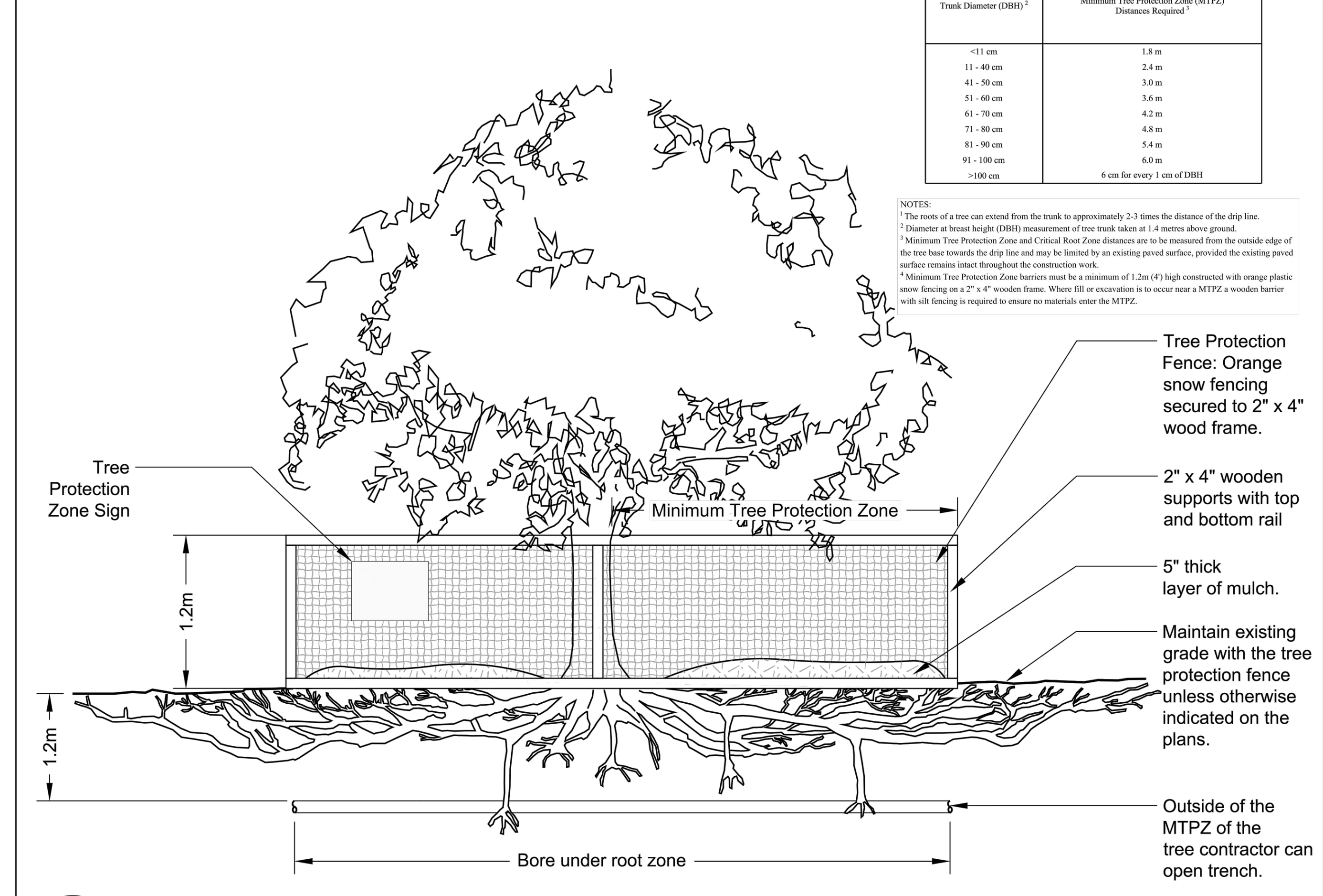
2. When root sensitive excavation is performed in regards to the installation of site features such as post holes, all roots exposed of under 5cm diameter may be cleanly cut at face of hole such that no further disturbance of the roots are to be expected once mechanical excavation begins for the lower portion of the holes (below hand dug area). If roots of 5cm diameter or greater are uncovered they should be preserved, the post holes filled in with viable soil and the hole moved at least 0.5 metre away to avoid significant roots.

3. When root sensitive excavation is performed in regards to the installation of site features such as driveways, walkways, curbs, etc. roots of less than 5cm diameter can be cut sharply, if necessary, unless an abundance of smaller roots are involved. If roots of 5cm diameter or greater or an abundance of smaller roots are exposed in the excavation areas inside or just outside the TPZ of bylaw trees they should be preserved

4. When root sensitive excavation is performed in regards to the installation of utilities such as water lines or sewers, every effort should be made to preserve as many exposed roots as possible by installing the utilities underneath the roots without root pruning. If roots of 5cm diameter or greater are uncovered they should be preserved.

Trunk Diameter (DBH) [2]	Minimum Tree Protection Zone (MTPZ) Distances Required [3]
<11 cm	1.8 m
11 - 40 cm	2.4 m
41 - 50 cm	3.0 m
51 - 60 cm	3.6 m
61 - 70 cm	4.2 m
71 - 80 cm	4.8 m
81 - 90 cm	5.4 m
91 - 100 cm	6.0 m
>100 cm	6 cm for every 1 cm of DBH

NOTES:
[1] The roots of a tree can extend from the trunk to approximately 2-3 times the distance of the drip line.
[2] Diameter at breast height (DBH) measurement of tree trunk taken at 1.4 metres above ground.
[3] Minimum Tree Protection Zone and Critical Root Zone distances are to be measured from the outside edge of the tree base towards the drip line and may be limited by an existing paved surface, provided the existing paved surface remains intact throughout the construction work.
[4] Minimum Tree Protection Zone barriers must be a minimum of 1.2m (4') high constructed with orange plastic snow fencing on a 2" x 4" wooden frame. Where fill or excavation is to occur near a MTPZ a wooden barrier with silt fencing is required to ensure no materials enter the MTPZ.



TP-1 TREE PROTECTION DETAIL

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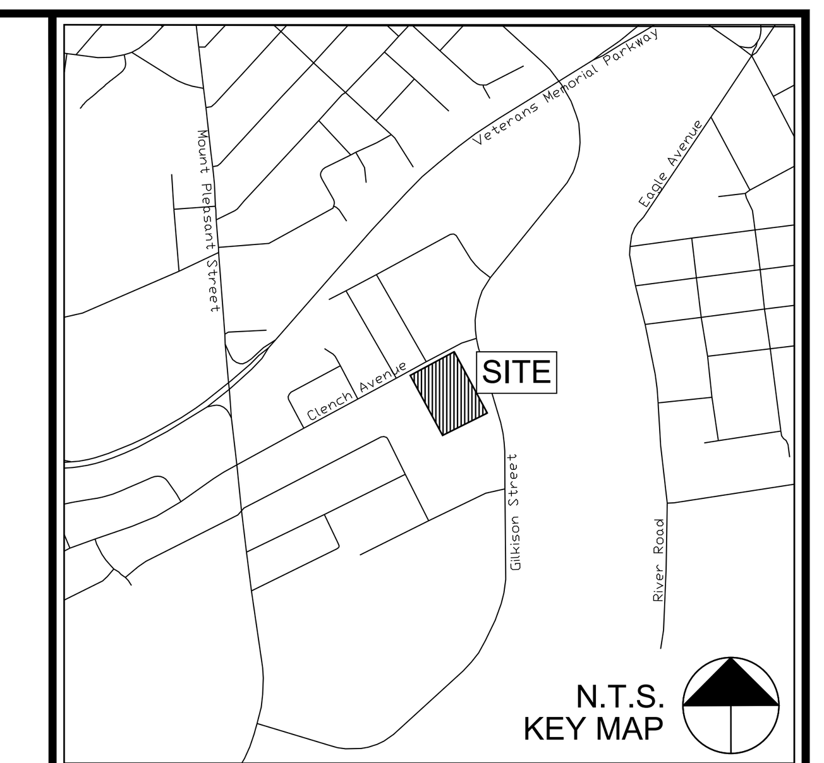


N.T.S.
KEY MAP

No.	Description	By	Date
0	ISSUED FOR REVIEW	JD	05 AUG-22

REVISIONS: All previous issues of this drawing are superceded

ABOUD & ASSOCIATES INC.
Consulting Arborists • Ecologists • Landscape Architects
3-5 Edinburgh Rd S . Guelph . Ontario . N1H 5N8 . 519.822.6839 . www.aboudtng.com

Title:

TREE PRESERVATION DATA

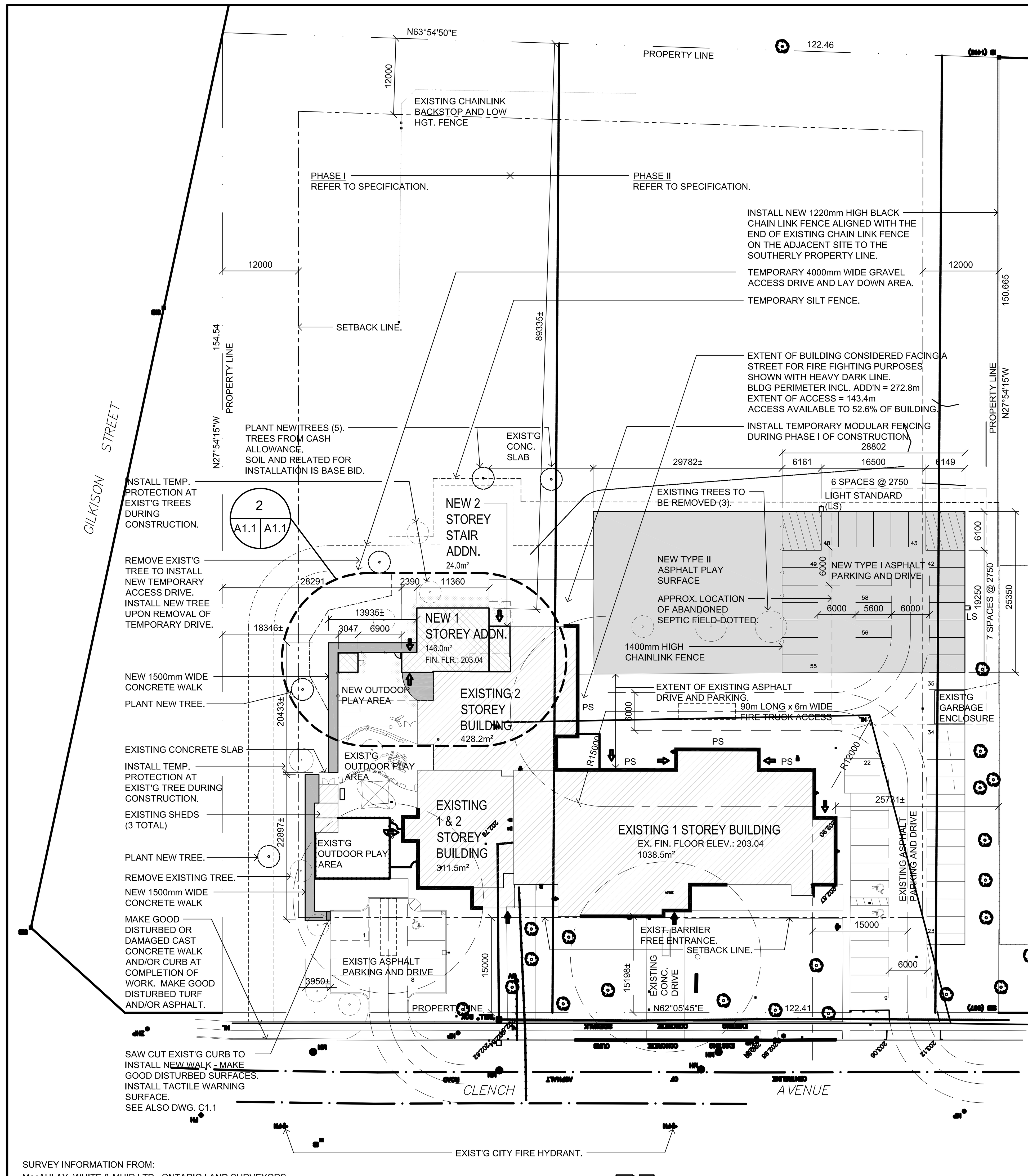
Project:

60 CLENCH AVENUE
CITY OF BRANTFORD

Date: AUGUST 2022 | Designer: JGL
Project: AA22-180A | Drawn: JGL
Scale: N/A | Checked: JD

Drawing No:

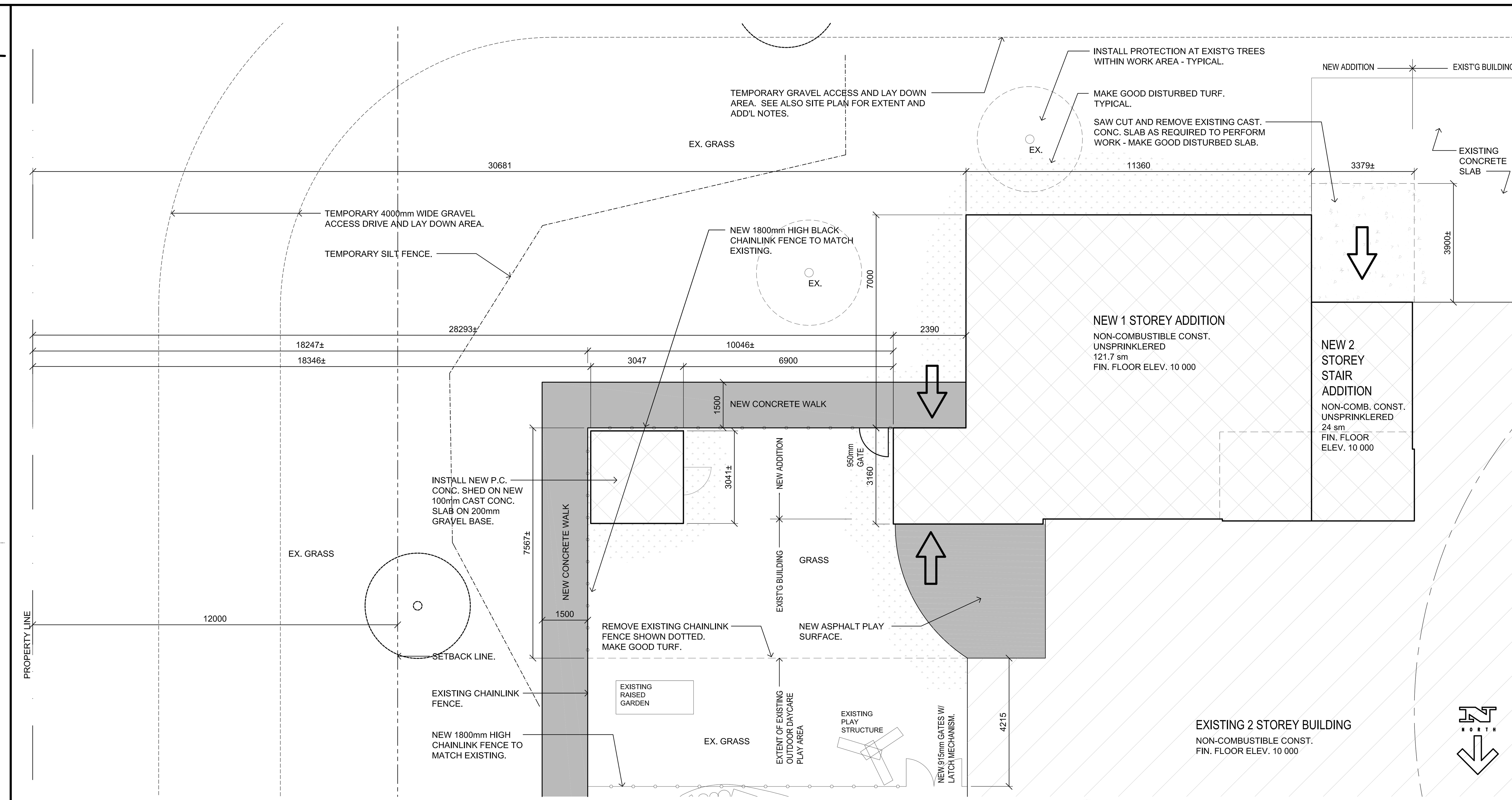
TPP2



SURVEY INFORMATION FROM:
MacAULAY, WHITE & MUIR LTD. ONTARIO LAND SURVEYORS - CANADA LANDS SURVEYORS 440 HARDY ROAD, UNIT 2, BRANTFORD, ONTARIO, N3T 5L8 TELEPHONE 519-752-0040
FAX 519-752-0087
FILE: 07-074
DATE: MAY 24, 2007
BENCH MARK:
TOP NUT OF FIRE HYDRANT IN FRONT OF MUNICIPAL #42 DELAMERE STREET.

1 A1.1 SITE PLAN
SCALE 1:500

LEGEND
PS WALL MTD. FIRE ROUTE SIGN
FH FIRE HYDRANT
MAIN ENTRANCE
SECONDARY ENTRANCE

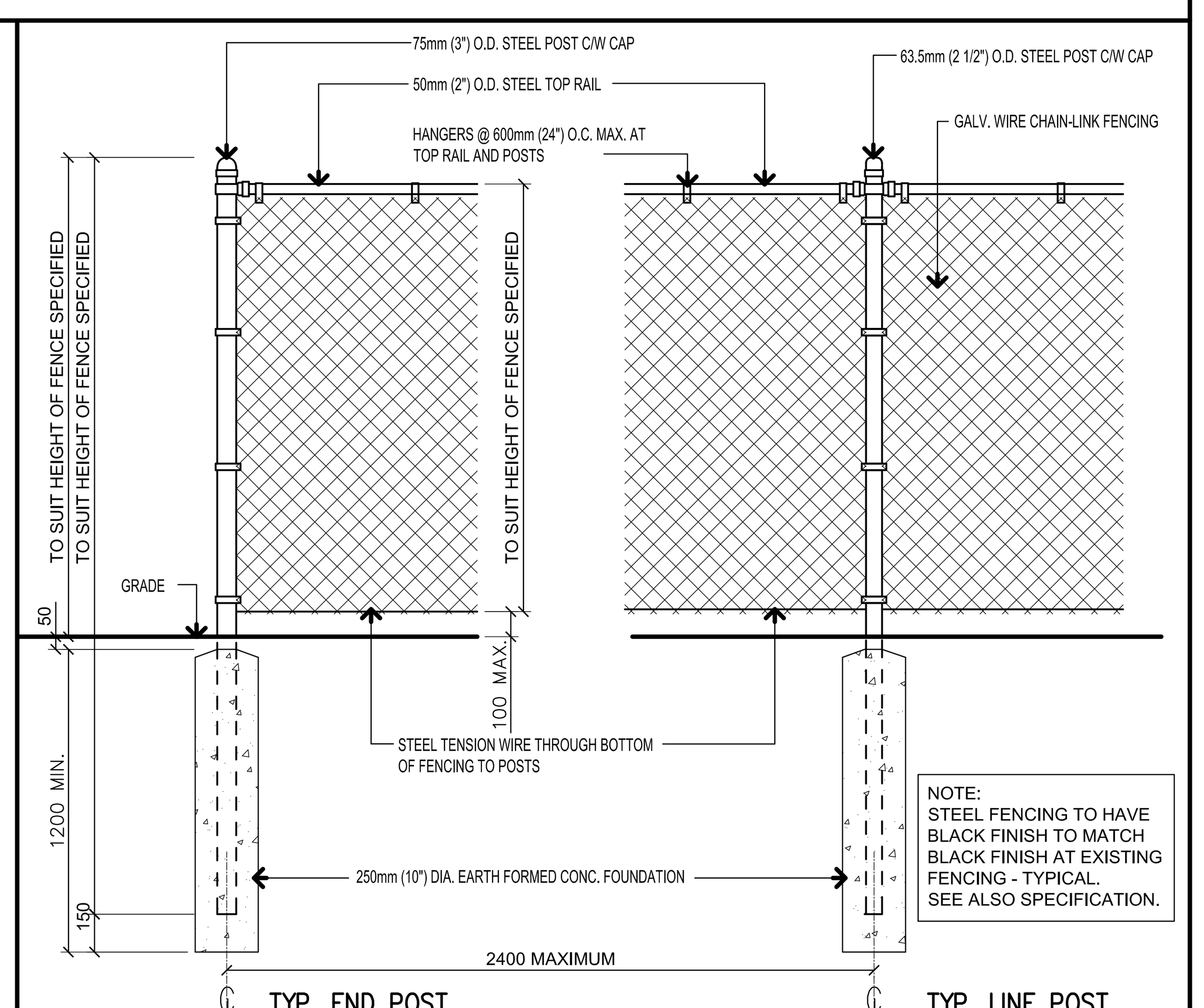


2 A1.1 PARTIAL ENLARGED SITE PLAN
SCALE 1:100

SITE DATA:

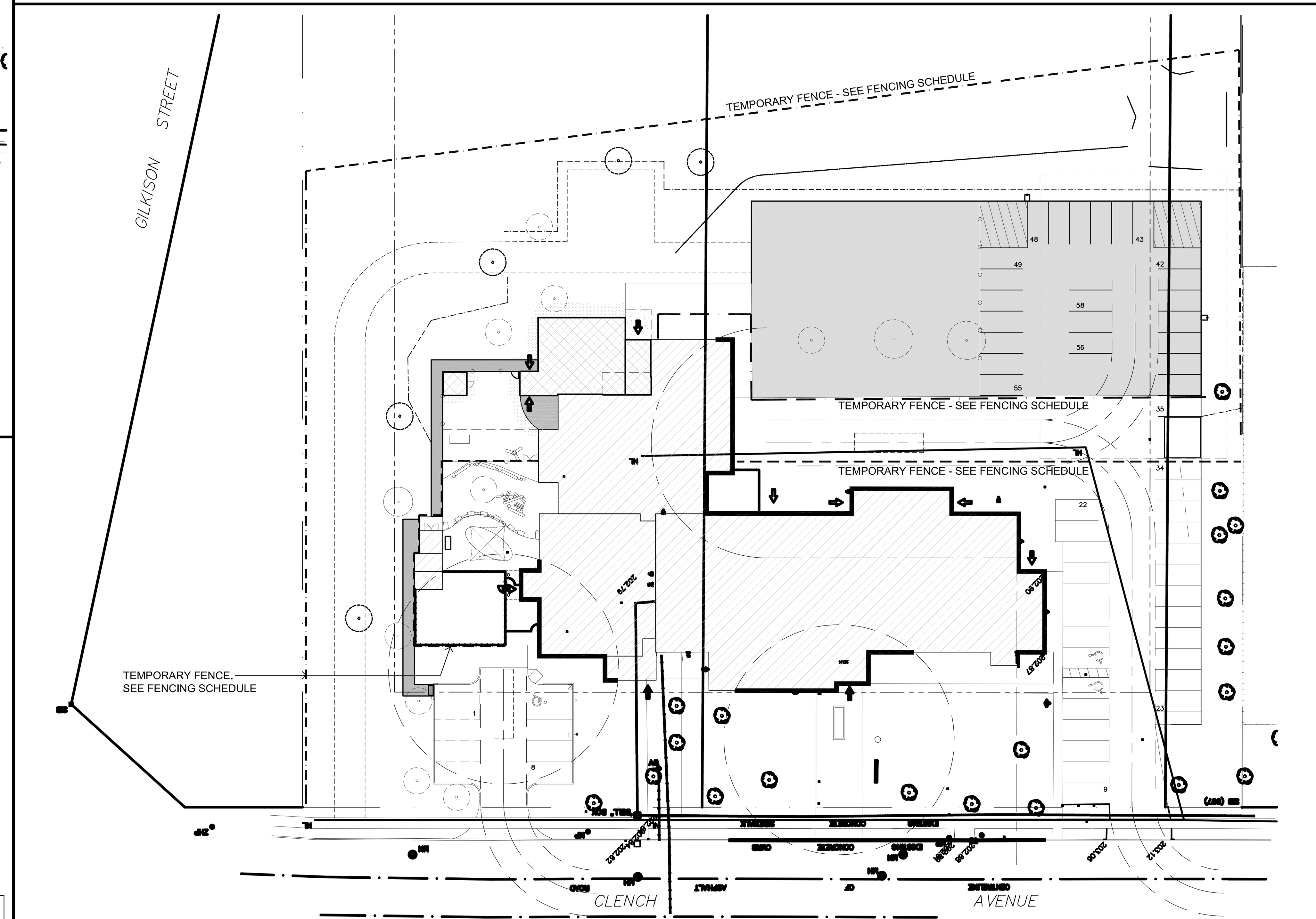
	ZONING BY-LAW	REQUIRED	PROPOSED
	CURRENT OFFICIAL PLAN: RESIDENTIAL, CURRENT ZONING: I3-5 – INSTITUTIONAL MAJOR		
A	MIN. LOT AREA	53,820 sft, 5000.2 sm	18,686 sm – UNCHANGED
B	MIN. LOT FRONTAGE	65.6 ft, 20 m	401.6 ft APPROX. (122.41 m) – UNCHANGED
C	MIN. FRONT YARD DEPTH	49.2 ft , 15.0 m	49.9 ft APPROX. (15.2 m) – UNCHANGED
D	MIN. REAR YARD DEPTH	39.4 ft , 12.0 m	ADDITION = 89.3 m
E	MIN. INTERIOR SIDE YARD DEPTH (WEST)	39.4 ft , 12.0 m	84.3 ft APPROX. (25.7 m) – UNCHANGED
F	MIN. INTERIOR SIDE YARD DEPTH (EAST)	39.4 ft , 12.0 m	EXISTING BLDG. = 28.3m NEW ADDN = 28.3m NEW STORAGE SHED = 18.3m
G	MAX. LOT COVERAGE	40%	EXISTING BLDG = 1797.51m2 (9.6%) PROPOSED ADDITIONS = 146 m2 (0.8%) EXISTING SHEDS = 27 m2 (0.1%) PROPOSED SHEDS = 9 m2 (0.05%) TOTAL: = 1980.0 m2 (10.6%)
H	MAX. BUILDING HEIGHT	49.2 ft , 15.0 m	4.5 sm – ADDITION
I	MIN. LANDSCAPED OPEN SPACE	15%	12,983.5 m2 (69.48%)
	PARKING REQUIREMENTS IN ACCORDANCE WITH SECTION 6.18		
J	MIN. NUMBER OF PARKING SPACES	ELEMENTARY SCHOOL 3.0 SPACES PLUS 1.0 SPACE/TEACHING STATION *OR* 1 SPACE PER 4 PERSONS OF GYM CAPACITY *WHICHEVER IS GREATER* 10 EXISTING TEACHING SPACES = 12 SPACES (5 PORTABLES + 5 INDOOR CLASSROOMS) *OR* 200 PEOPLE IN GYM = 50 SPACES *PLUS* EXIST'G DAYCARE 1 SPACE/ 28 SQM OF GROSS FLOOR AREA OF PLAYROOM SPACE 89 SQM PLAYROOM = 3.2 SPACES (4 SPACES) PROPOSED DAYCARE ADDITION 1 SPACE/ 28 SQM OF GROSS FLOOR AREA OF PLAYROOM SPACE 70 SQM PLAYROOM = 2.5 SPACES (3 SPACES) TOTAL = 57 SPACES	EXISTING: 29 SPACES (DURING SCHOOL HOURS) PLUS 26 SPACES (AFTER SCHOOL HOURS) = 55 SPACES PROPOSED: 58 SPACES TOTAL (DURING SCHOOL HRS)
K	MIN. SIZE OF PARKING SPACES	STANDARD 2.75 m X 5.6 m ACCESSIBLE 4.6 m X 5.6 m	STANDARD 2.75m X 5.6 m ACCESSIBLE 4.6 m X 5.6 m (EXISTING)
L	MIN. SIZE OF AISLE	19.68 ft , (6.0m)	19.68 ft APPROX. (6.0 m)
M	ASPHALT AREA		EXIST'G ASPHALT PARKING = 1852.8 m2 NEW ASPHALT PARKING = 730.4 m2 EXIST'G ASPHALT PLAY SURFACE = 131.3 m2 NEW ASPHALT PLAY SURFACE = 758.7 m2 TOTAL ASPHALT = 3473.2 m2 (18.59%)
N	CONCRETE SIDEWALK AREA		EXIST'G CONCRETE SIDEWALK = 71.0 m2 EXIST'G TURF STONE = 87.9 m2 NEW CONCRETE WALKS = 90.4 m2 TOTAL SIDEWALKS = 249.3 m2 (1.33%)

COMMENTS: PROPOSED WORK CONSISTS OF:
1. DEMOLITION OF AN EXISTING STAIR TO INSTALL A NEW STAIR IN THE SAME LOCATION, IN A DIFFERENT ORIENTATION, TO PROVIDE PROPER EXIT FROM THE EXISTING BUILDING WHILE ALLOWING ACCESS TO THE NEW ADDITION.
2. ADDITION OF A NEW SINGLE STOREY DAYCARE CLASSROOM AND ASSOCIATED OUTDOOR PLAY AREA.
3. EXPANSION OF EXISTING ASPHALT PARKING TO PROVIDE A TOTAL OF 58 PARKING SPACES THAT ARE AVAILABLE DURING SCHOOL HOURS – AN INCREASE OF 29 SPACES DURING SCHOOL HOURS.
4. EXPANSION OF FIRE TRUCK ACCESS: PERIMETER OF BUILDING INCL. ADDITION: 272,826m; LENGTH OF ACCESS WITHIN 15m: 161,153m; % OF BUILDING WITHIN 15m ACCESS: 59%



NOTE:
STEEL FENCING TO HAVE BLACK FINISH TO MATCH BLACK FINISH AT EXISTING FENCING - TYPICAL.
SEE ALSO SPECIFICATION.

3 A1.1 TYPICAL CHAIN LINK FENCE DETAIL
SCALE 1:25



FENCING SCHEDULE
- JUNE 1, 2025: INSTALL 6FT HIGH FENCE AT PERIMETER OF THE PROJECT.
- JUNE 1, 2025: INSTALL 8FT HIGH TEMP. CONSTRUCTION FENCE WITH BLACK PRIVACY FABRIC TO SEPARATE SCHOOL PLAY AREA. RELOCATE FENCING JUNE 30, 2025.
- JUNE 1, 2025: INSTALL 8FT HIGH TEMP. CONSTRUCTION FENCE WITH BLACK PRIVACY FABRIC AROUND DAYCARE PLAY AREA, FENCE TO REMAIN UNTIL THE END OF THE PROJECT.
- JUNE 30, 2025: RELOCATE TEMP. CONSTRUCTION FENCE AT SCHOOL PLAY AREA AS REQ'D FOR CONTRACTOR ACCESS.

NOTES:
NOTE: FENCING TO SATISFY CITY GUIDELINES AND SAFETY AUTHORITY REQUIREMENTS.
FENCE LOCATION SHOWN ARE APPROXIMATE. COORDINATE LOCATIONS ON SITE WITH EXISTING CONDITIONS AND THE OWNER.
TEMPORARILY ADJUST FENCING AS REQUIRED TO PERFORM WORK.

1 A1.1 TEMPORARY FENCING PLAN
SCALE 1:500

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96 Church St. / St.Catharines / Ontario / L2R 3C8 / 905.685.8467
info@mzearchitects.com / www.mzearchitects.com

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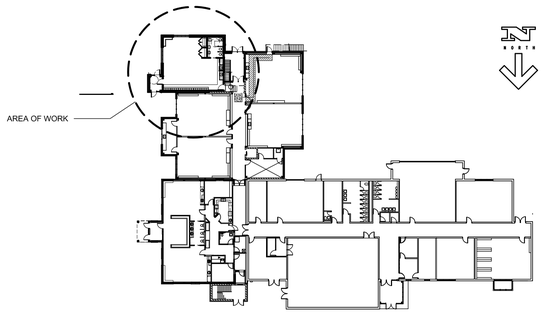
Scale: As Shown
Drawn by: MZE
Plot Date: APR. 4, 2022
Issue Date:

PRESCHOOL DAY CARE ADDITION
Ecole elementaire catholique Saint-Marguerite-Bourgeoys
60 Clench Avenue, Brantford, Ontario N3T 1B9

SITE PLAN, ENLARGED SITE PLAN, SITE LOCATION PLAN, DETAILS

A1.1



1 A2.1 | A2.1 KEY PLAN
SCALE 1:500

GENERAL NOTES:

- DIMENSIONS ARE APPROXIMATE TO FACE OF EXISTING WALLS.
- DIMENSIONS ARE TO FACE OF STUDS OR MASONRY AT NEW WALLS.
- SITE VERIFY ALL DIMENSIONS.
- MAKE GOOD EXISTING SURFACES AND FINISHES DISTURBED AT LOCATIONS OF ITEMS MODIFIED AND/OR REMOVED. CLOSE EXISTING OPENINGS WITH MATERIALS TO MATCH EXISTING.
- CONTRACTOR TO MAINTAIN EXIT PATHS DURING CONSTRUCTION.
- INSTALL HOARDING AS REQUIRED.
- CORRIDOR 126A: SECURE OR REMOVE EXISTING H.M. DOOR AND FRAME AT THE SOUTH END OF THE CORRIDOR TO THE EXTERIOR. INSTALL PLYWOOD TO CLOSE THE WALL OPENING.
- DOORS OPERATED BY POWER DOOR OPERATOR ARE INDICATED BY A DOTTED DOOR SWING.

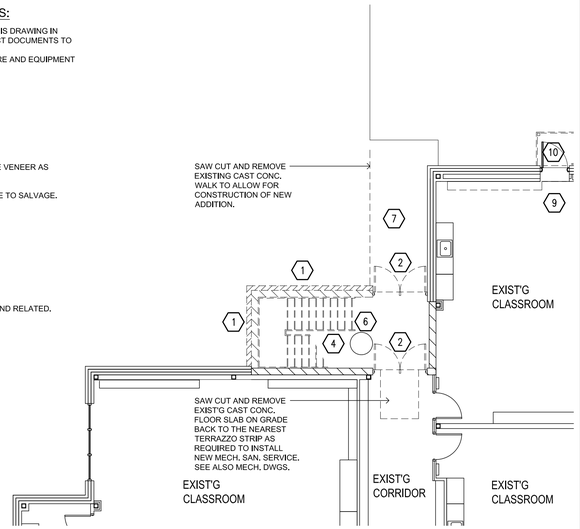
GENERAL DEMOLITION NOTES:

- DEMOLITION CONTRACTOR TO REVIEW THIS DRAWING IN CONJUNCTION WITH ALL OTHER CONTRACT DOCUMENTS TO DETERMINE EXTENT OF DEMOLITION.
- OWNER TO REMOVE ALL LOOSE FURNITURE AND EQUIPMENT U/N OTHERWISE.
-

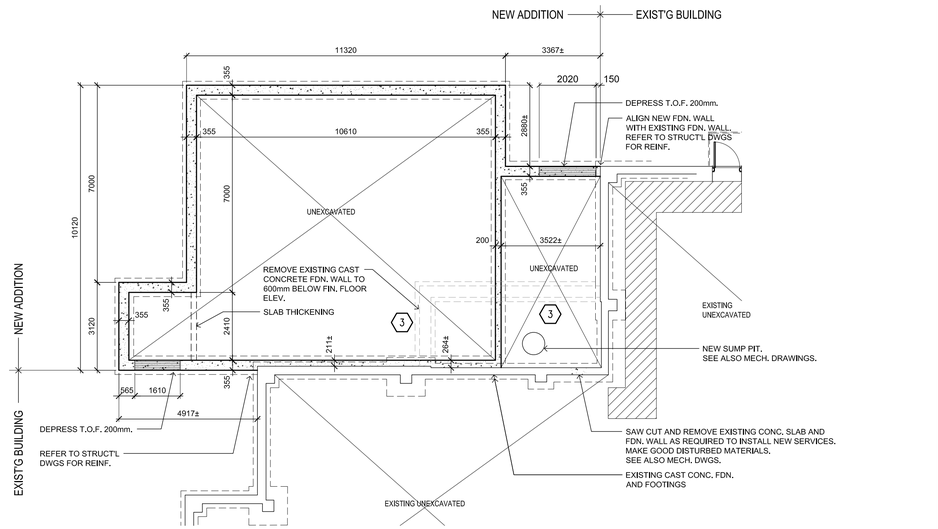
DEMOLITION NOTES:

REMOVE THE FOLLOWING:

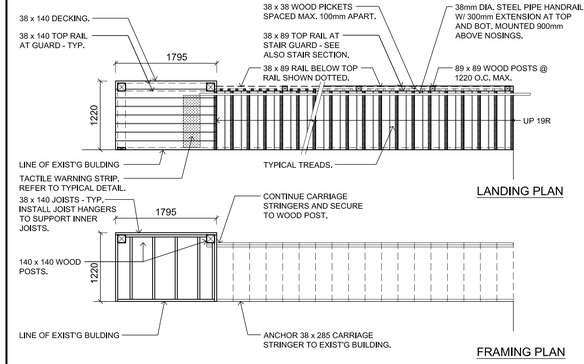
1. EXTERIOR MASONRY WALL (SALVAGE VENEER AS REQUIRED - REFER TO DRAWINGS.
2. DOOR AND FRAME - HOLD HARDWARE TO SALVAGE.
3. CONCRETE FOUNDATION WALL TO 600mm BELOW FIN. FLOOR
4. CAST CONCRETE SLAB ON GRADE
5. METAL DECK ROOF CONSTRUCTION
6. STEEL STAIR, HANDRAILS, GUARDS AND RELATED.
7. CAST CONCRETE WALK
8. SUSPENDED CONCRETE SLAB
9. MILLWORK
10. EXISTING EXTERIOR WALL CONST.



2 A2.1 | A2.1 PARTIAL GROUND FLOOR DEMOLITION PLAN
SCALE 1:100

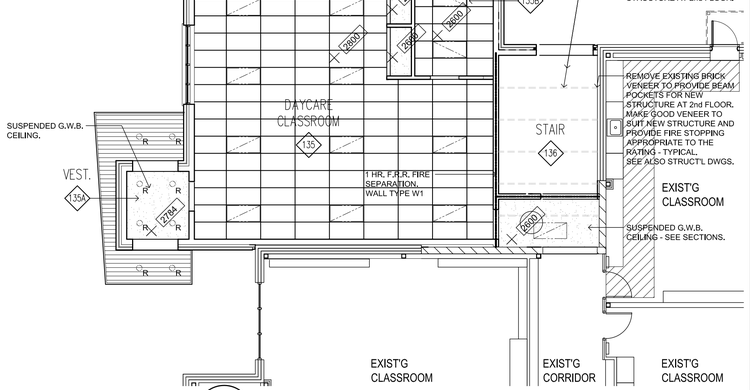


3 A2.1 | A2.1 PARTIAL FOUNDATION PLAN
SCALE 1:100

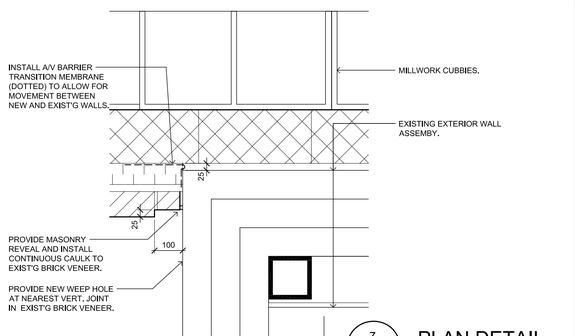


NOTES:
ALL WOOD TO BE PRESSURE TREATED.
ALL FASTENERS TO BE GALVANIZED.
INSTALL BLACK ADHESIVE NON-SLIP NOSING AT EACH TREAD & LANDING.
INSTALL SURFACE MOUNTED TACTILE WARNING AT LANDING.
ANCHOR LEDGER AND STRINGER AT WALL OF EXIST'G BUILDING THROUGH MASONRY VENEER TO EXISTING STRUCTURE.

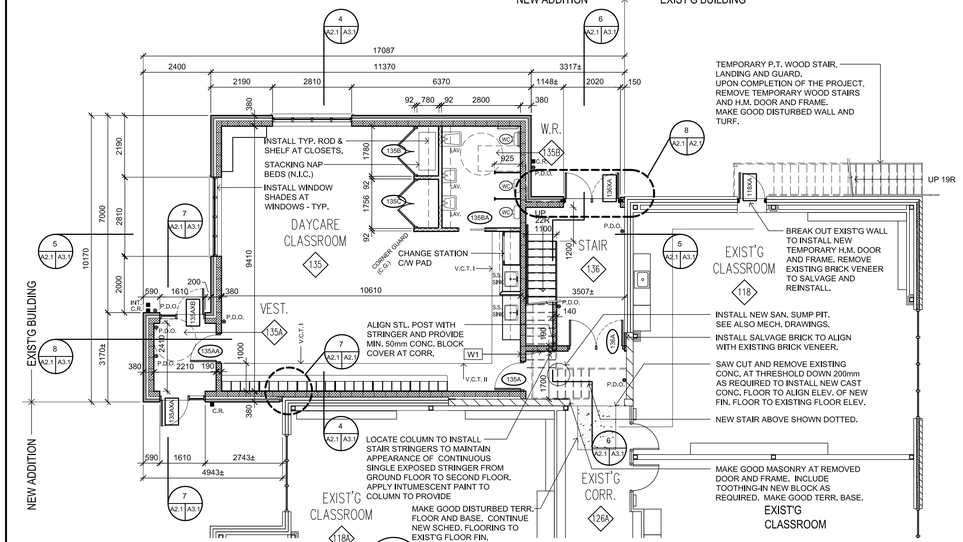
9 A2.1 | A2.1 TEMP. EXT. WOOD STAIR CONSTRUCTION
SCALE 1:50



5 A2.1 | A2.1 PARTIAL GROUND FLOOR REFL. CEILING PLAN
SCALE 1:100



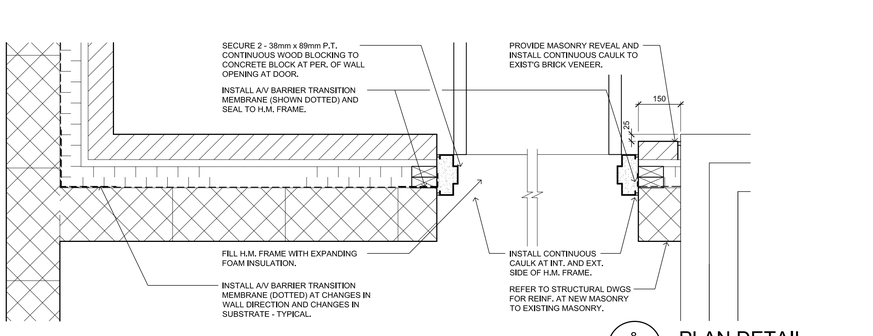
7 A2.1 | A2.1 PLAN DETAIL
SCALE 1:10



LEGEND

P.D.O. POWER DOOR OPERATOR
INT. INTERCOM
C.R. CARD READER

6 A2.1 | A2.1 PARTIAL GROUND FLOOR PLAN
SCALE 1:100



8 A2.1 | A2.1 PLAN DETAIL
SCALE 1:10

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info@mzearchitects.com / www.mzearchitects.com

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PRESCHOOL DAY CARE ADDITION
Ecole elementaire catholique
Saint-Marguerite-Bourgeoys
60 Clench Avenue, Brantford, Ontario N3T 1B9

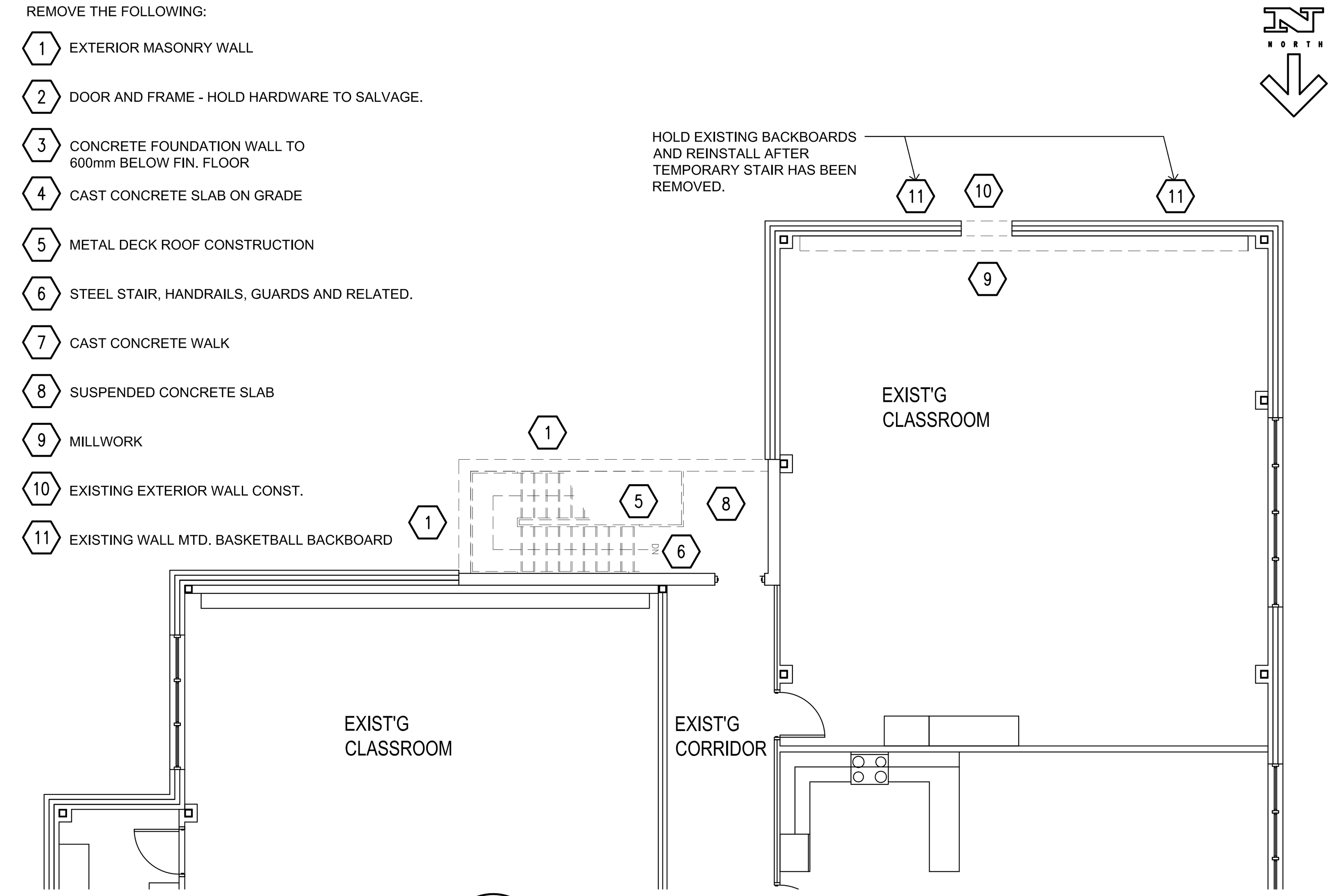
KEY PLAN, FOUNDATION PLAN, GROUND FLOOR & REFL. CLG. PLANS, DETAILS

A2.1

DEMOLITION NOTES:

REMOVE THE FOLLOWING:

1. EXTERIOR MASONRY WALL
2. DOOR AND FRAME - HOLD HARDWARE TO SALVAGE.
3. CONCRETE FOUNDATION WALL TO 600mm BELOW FIN. FLOOR
4. CAST CONCRETE SLAB ON GRADE
5. METAL DECK ROOF CONSTRUCTION
6. STEEL STAIR, HANDRAILS, GUARDS AND RELATED.
7. CAST CONCRETE WALK
8. SUSPENDED CONCRETE SLAB
9. MILLWORK
10. EXISTING EXTERIOR WALL CONST.
11. EXISTING WALL MTD. BASKETBALL BACKBOARD

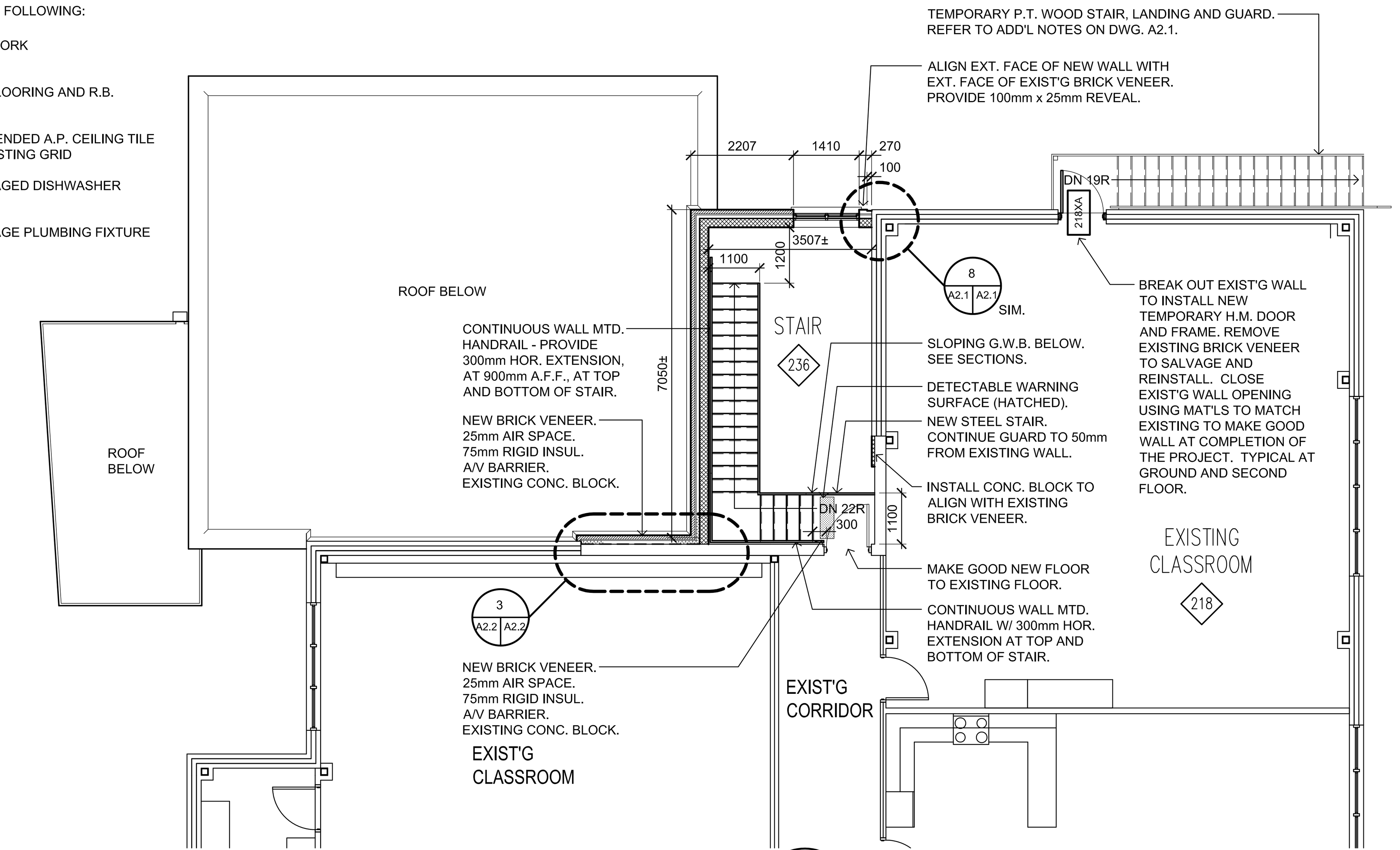


1 A2.2 A2.2 PARTIAL SECOND FLOOR DEMOLITION PLAN
SCALE 1:100

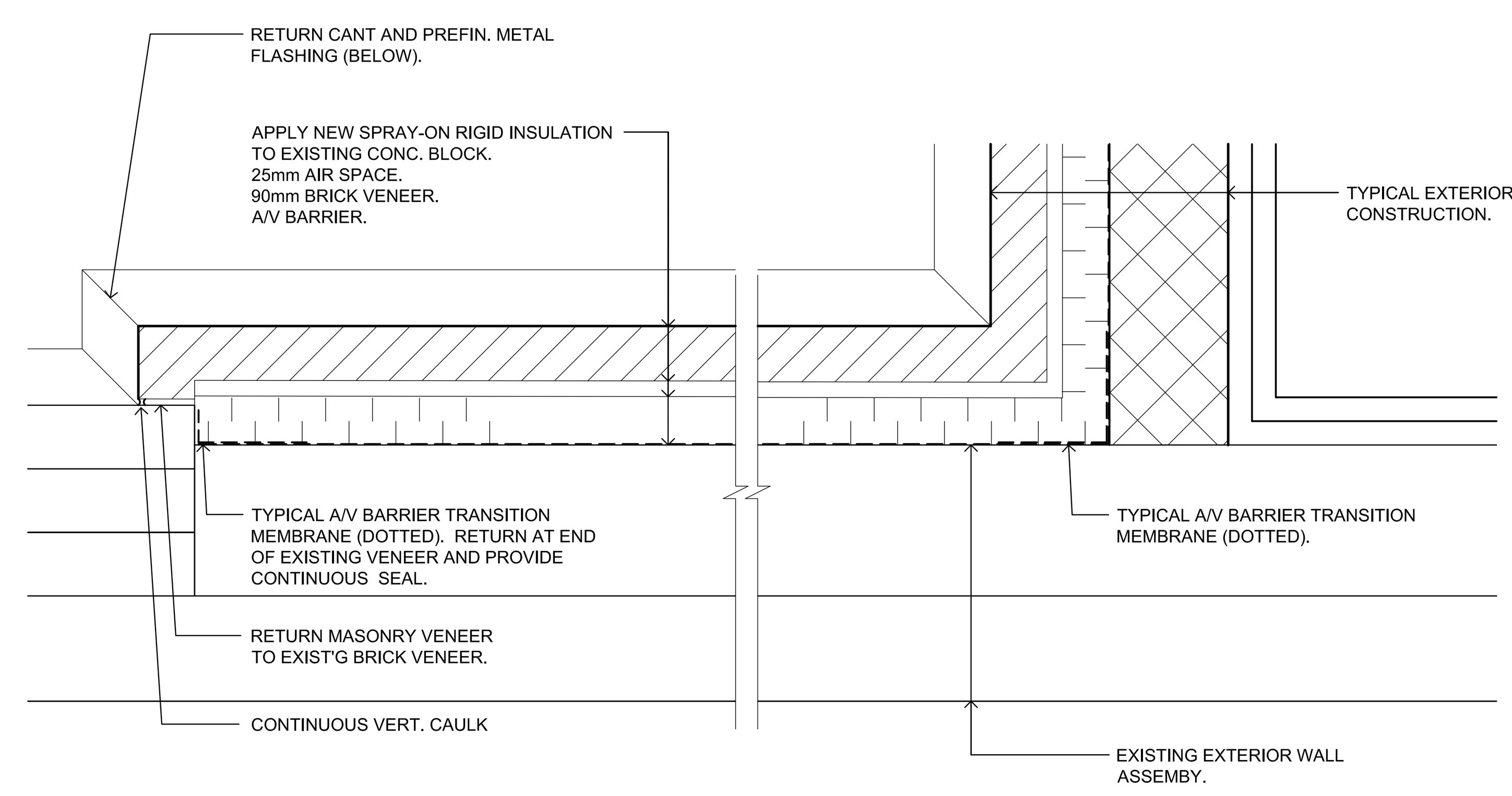
CONSTRUCTION NOTES:

INSTALL THE FOLLOWING:

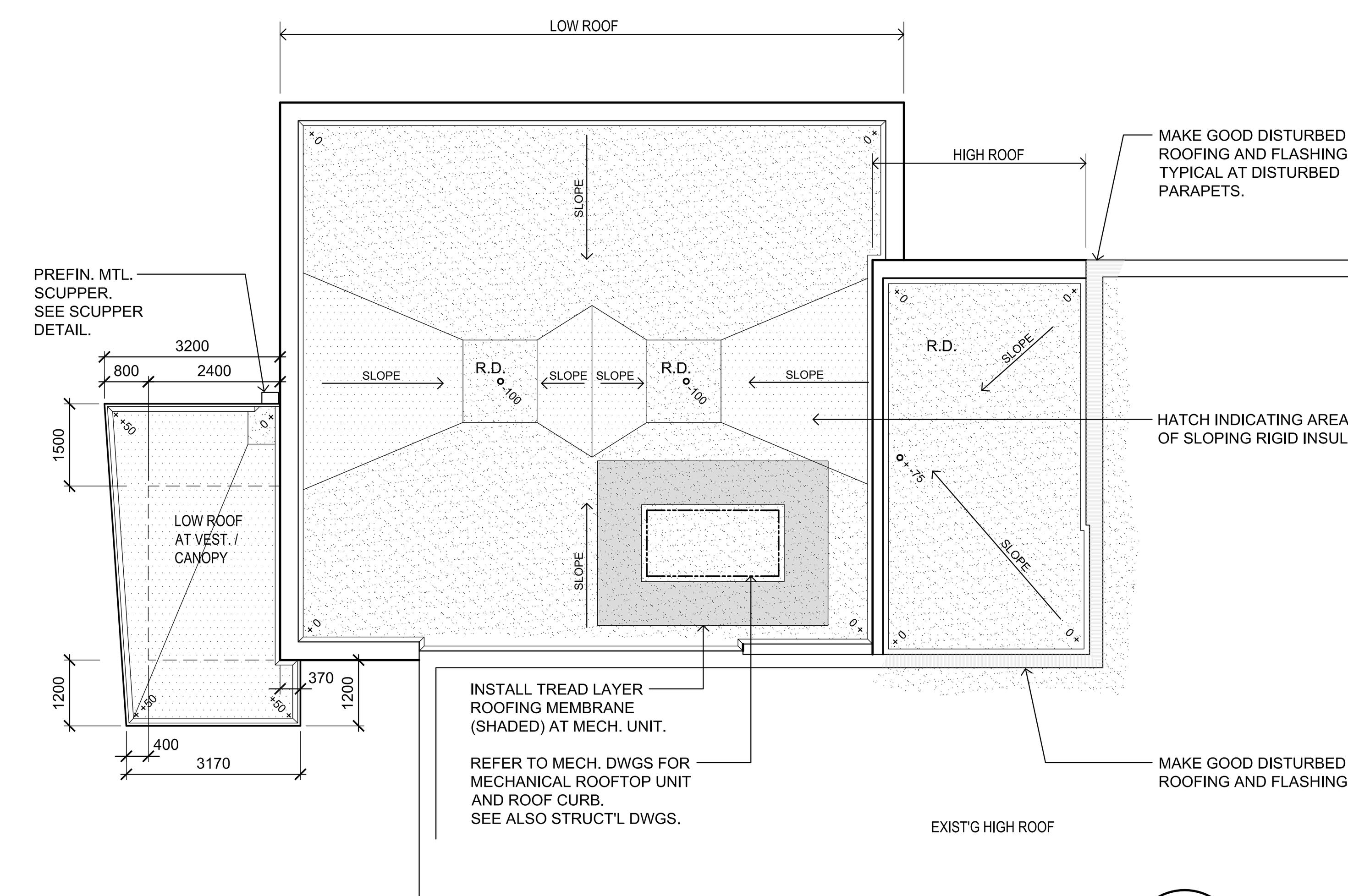
1. MILLWORK
2. LVT FLOORING AND R.B.
3. SUSPENDED A.P. CEILING TILE IN EXISTING GRID
4. SALVAGED DISHWASHER
5. SALVAGE PLUMBING FIXTURE



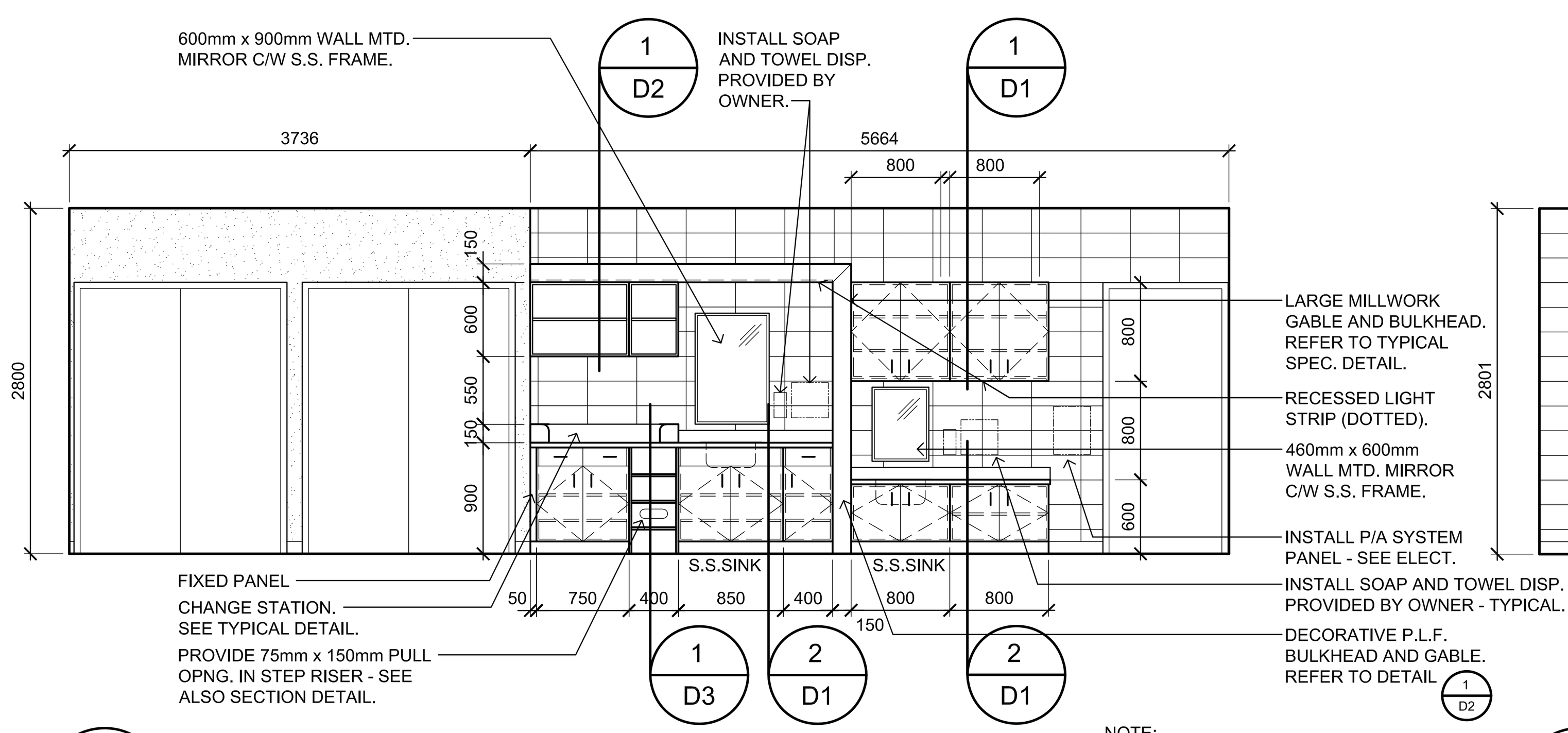
2 A2.2 A2.2 PARTIAL SECOND FLOOR PLAN
SCALE 1:100



3 A2.2 A2.2 PLAN DETAIL
SCALE 1:10

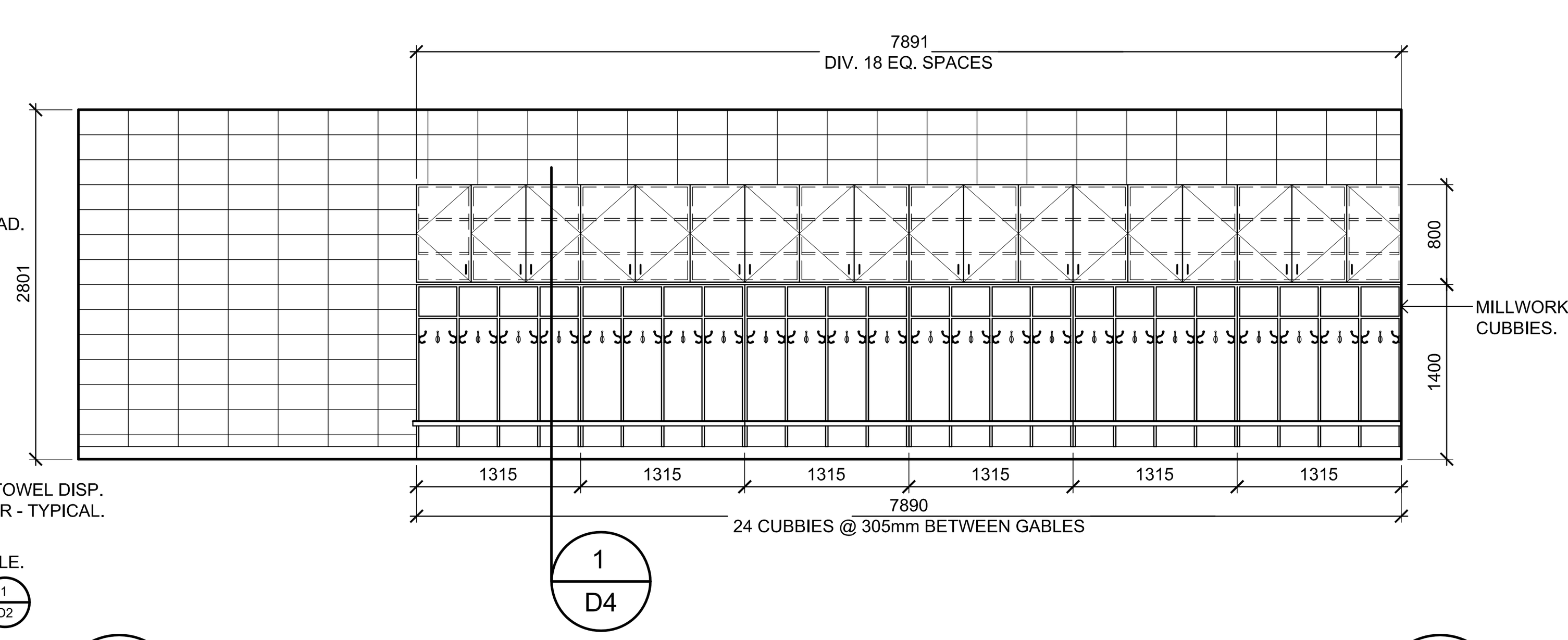


4 A2.1 A2.1 PARTIAL ROOF PLAN
SCALE 1:100



NOTE: PROVIDE CHILDPROOF LATCHES AT BASE CABINETS AND LOCKABLE HARDWARE AT ALL CUPBOARD DOORS AND DRAWERS.

2 A2.2 A2.2 WEST WALL RM. 135
SCALE 1:50



2 A2.2 A2.2 NORTH WALL RM. 135
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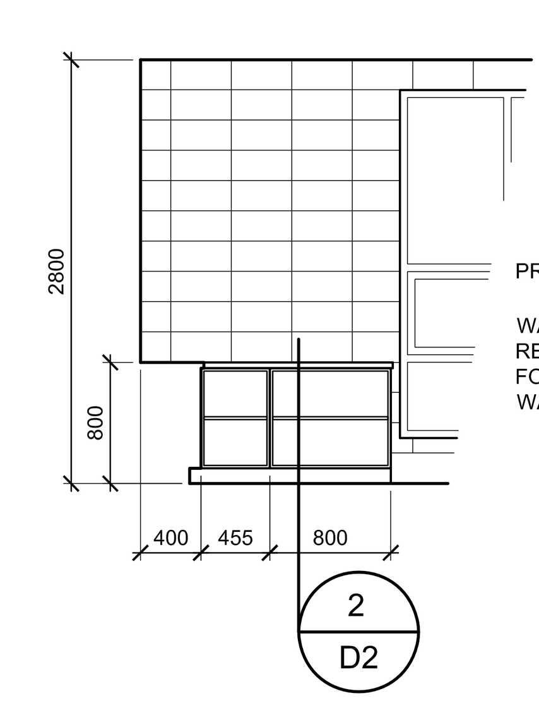
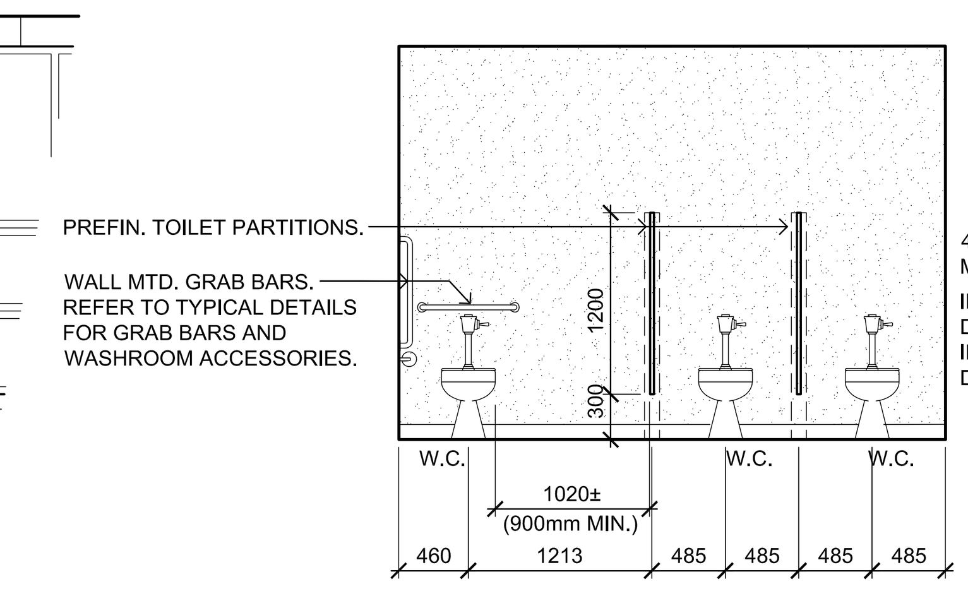
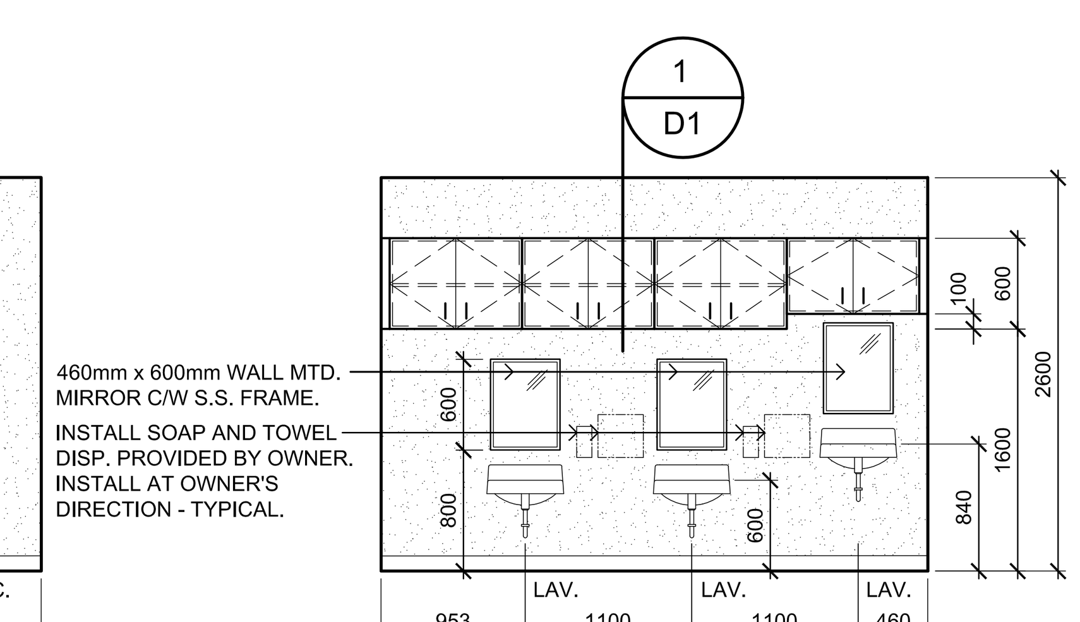


2 A2.2 A2.2 PART'L SOUTH WALL RM. 135
SCALE 1:50
PARTIAL EAST WALL SIMILAR - HANDED.



2 A2.2 A2.2 WEST WALL RM. 135B
SCALE 1:50



2 A2.2 A2.2 EAST WALL RM. 135B
SCALE 1:50

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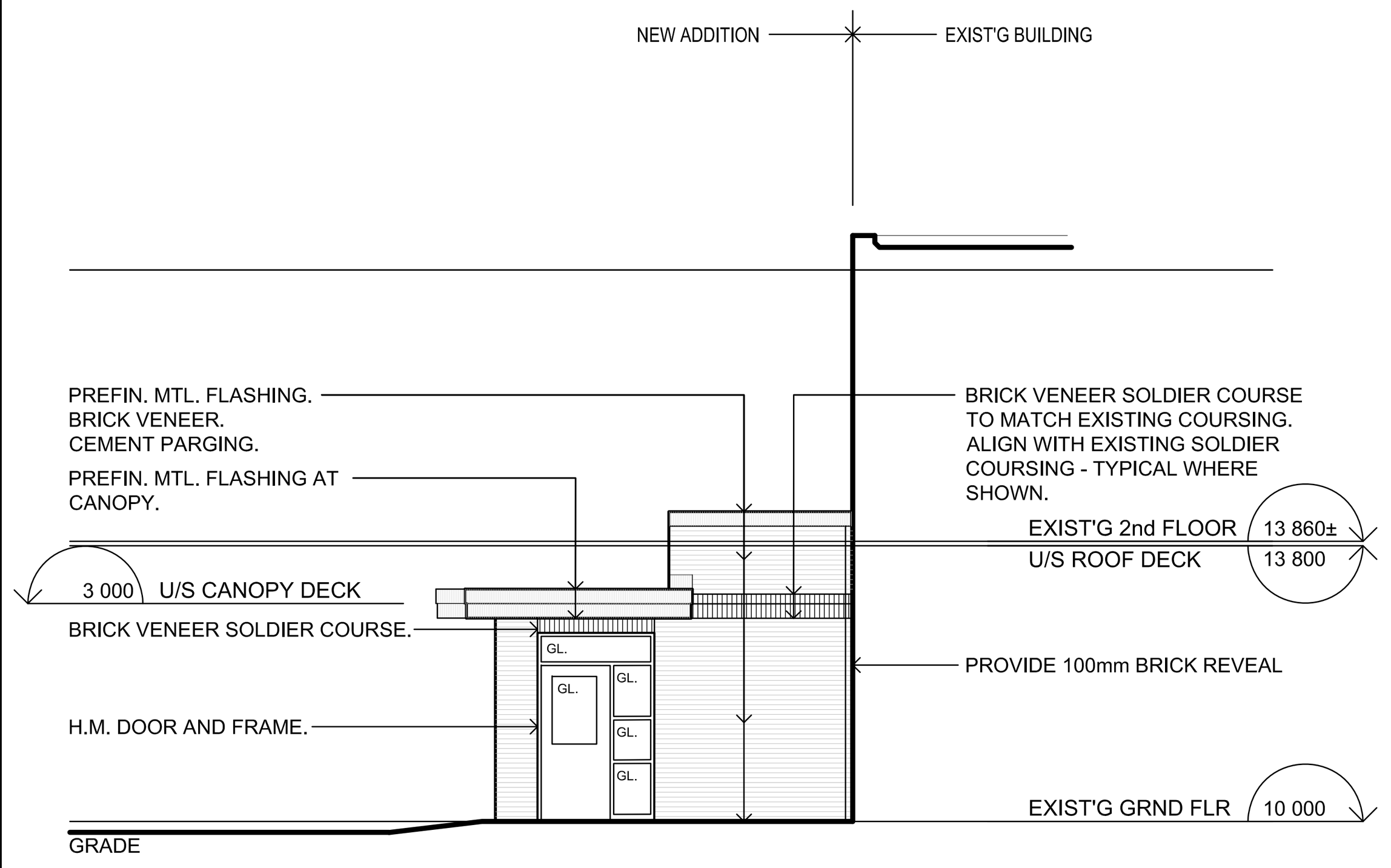
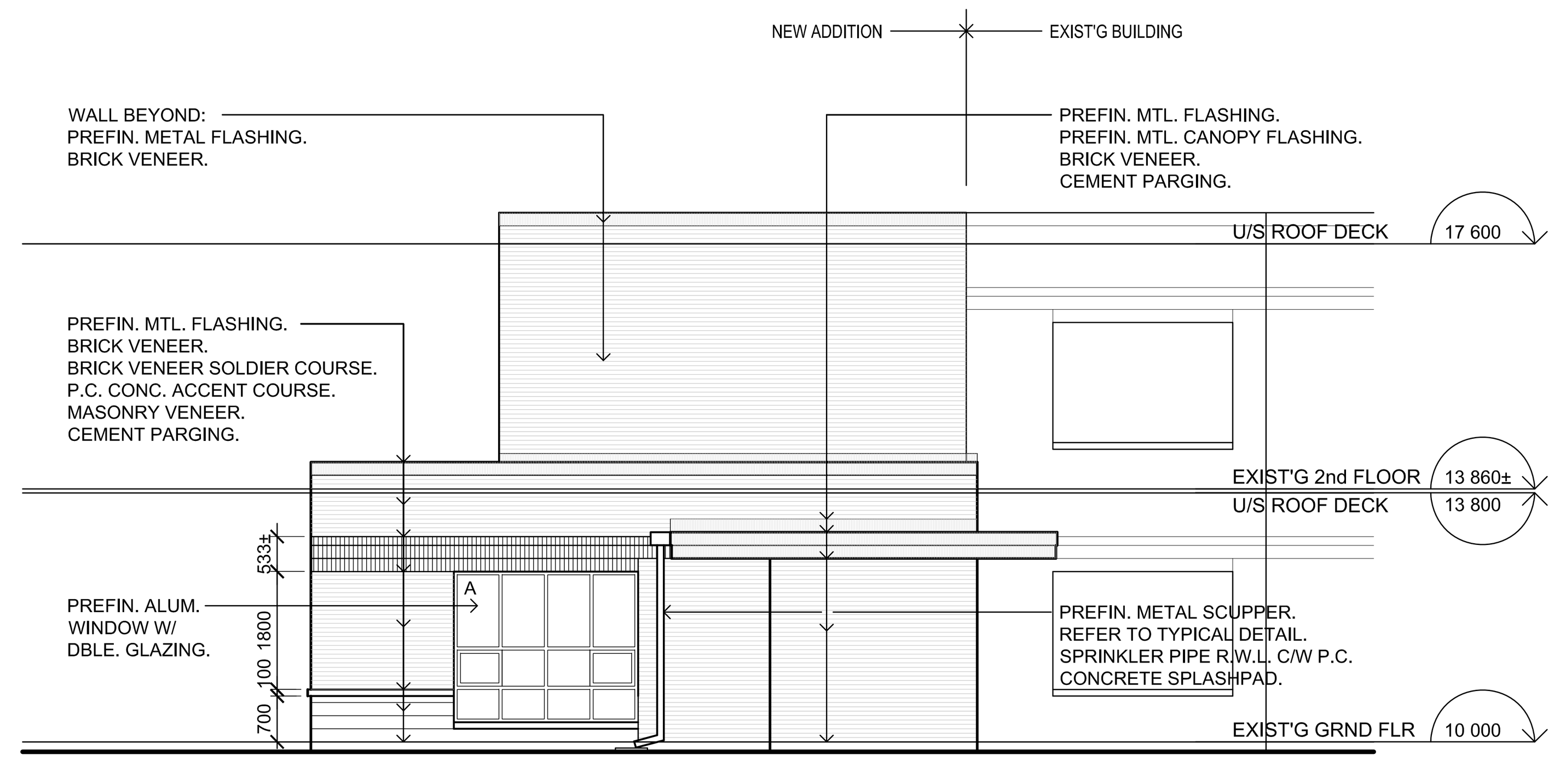
60 Clench Avenue, Brantford, Ontario N3T 1B9

SECOND FLOOR DEMO AND FLOOR PLANS, ROOF PLAN, INT. ELEV., DETAILS

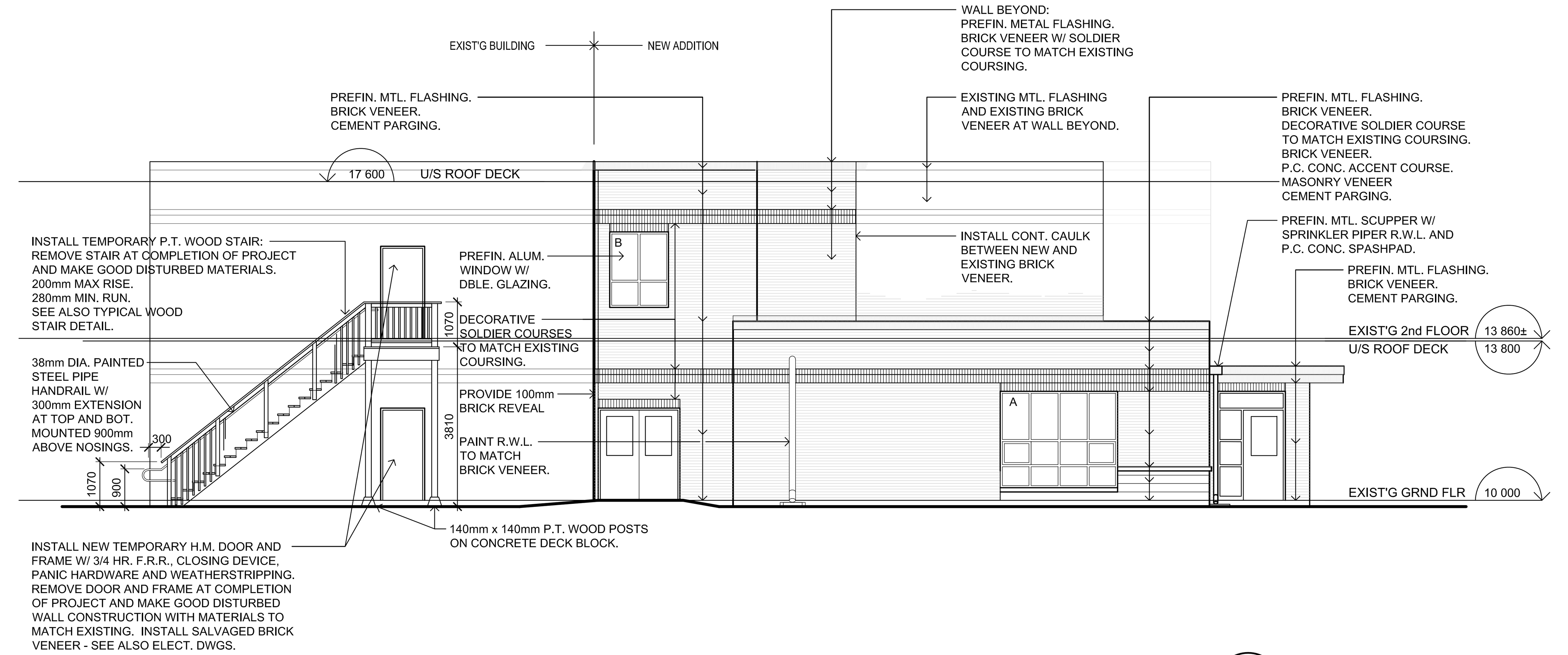
A2.2



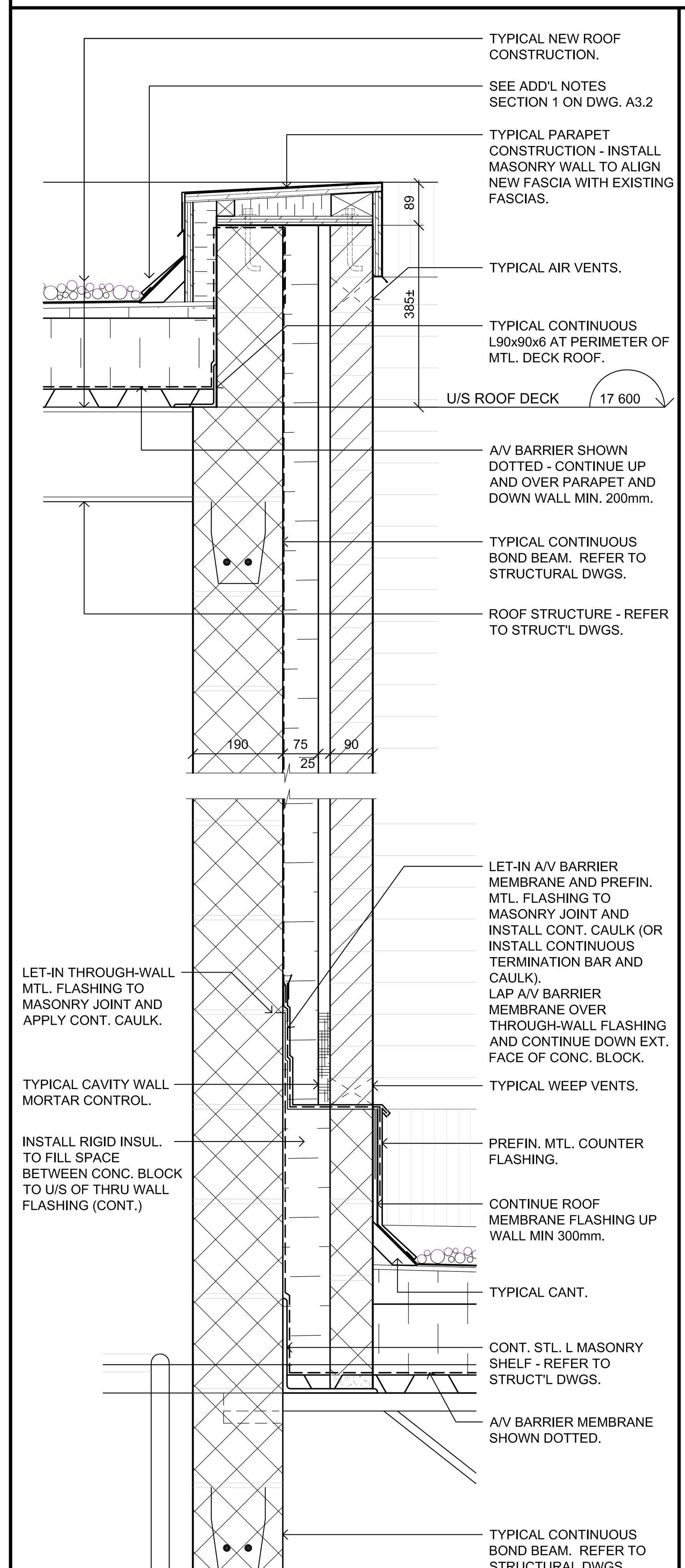
1 A3.1 A3.1 NORTH ELEVATION
SCALE 1:100



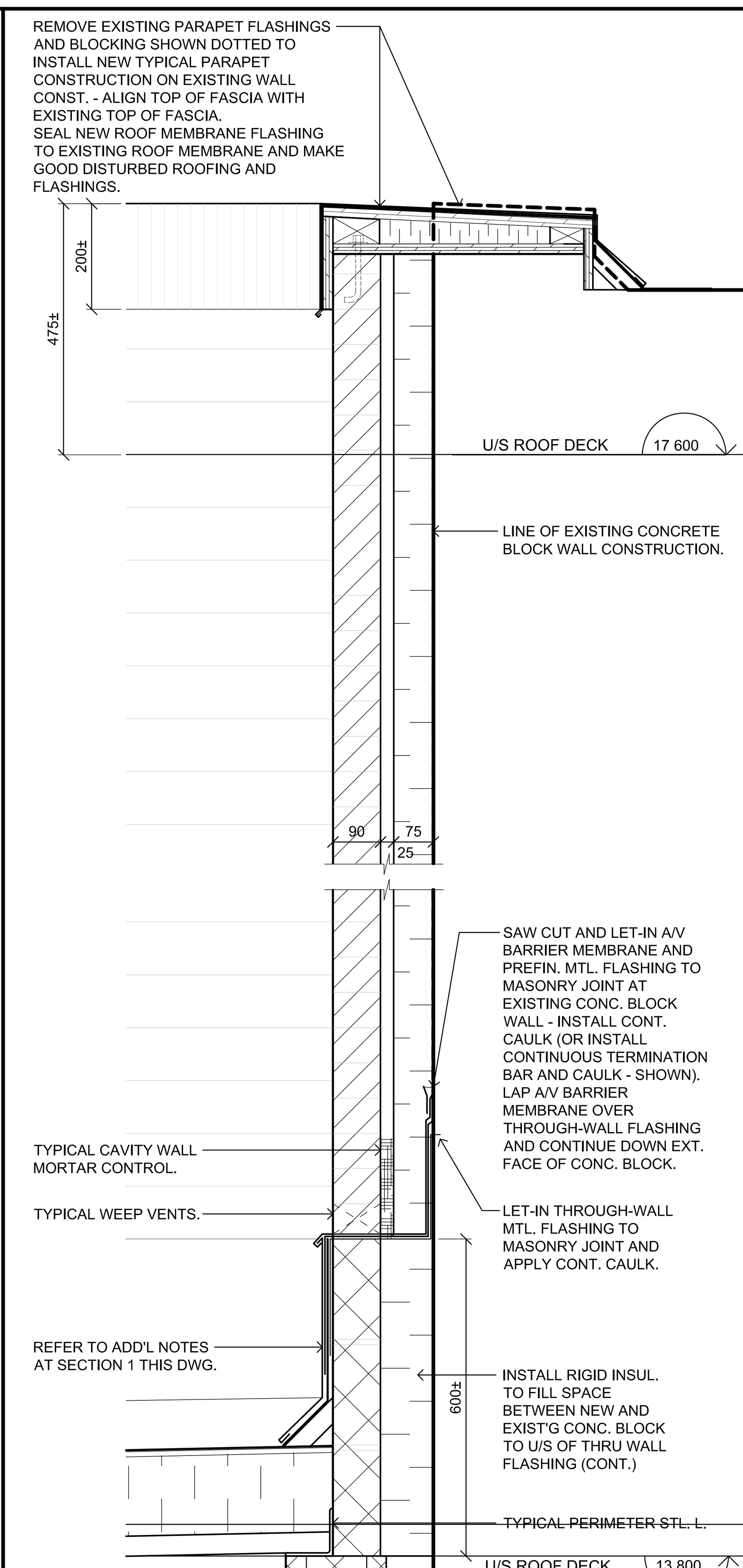
2 A3.1 A3.1 EAST ELEVATION
SCALE 1:100



3 A3.1 A3.1 SOUTH ELEVATION
SCALE 1:100



9 A3.1 A3.1 WALL SECTION
SCALE 1:10



10 A3.1 A3.1 NORTH ELEVATION
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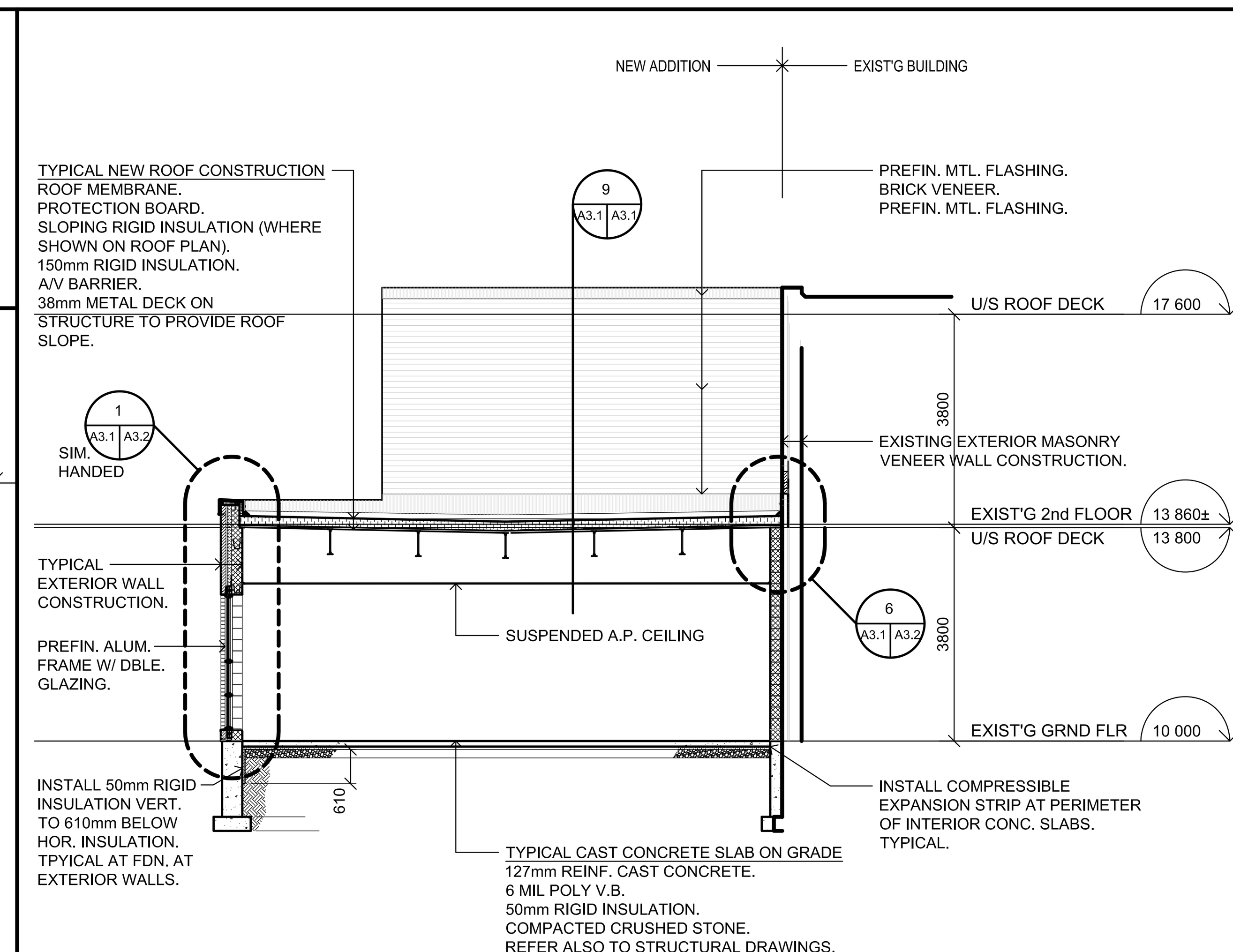
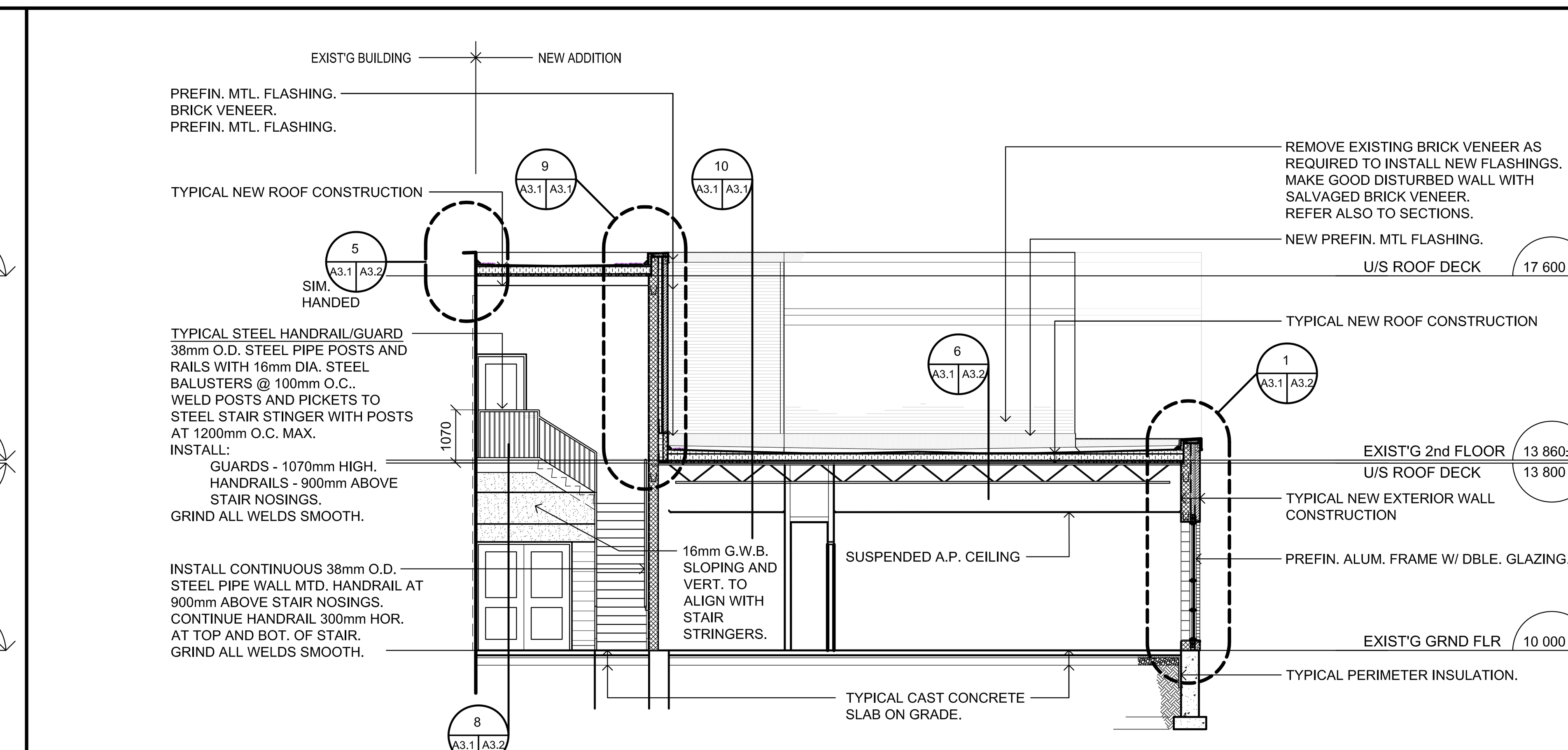


4 A2.1 A3.1 BUILDING SECTION
SCALE 1:100



5 A2.1 A3.1 BUILDING SECTION
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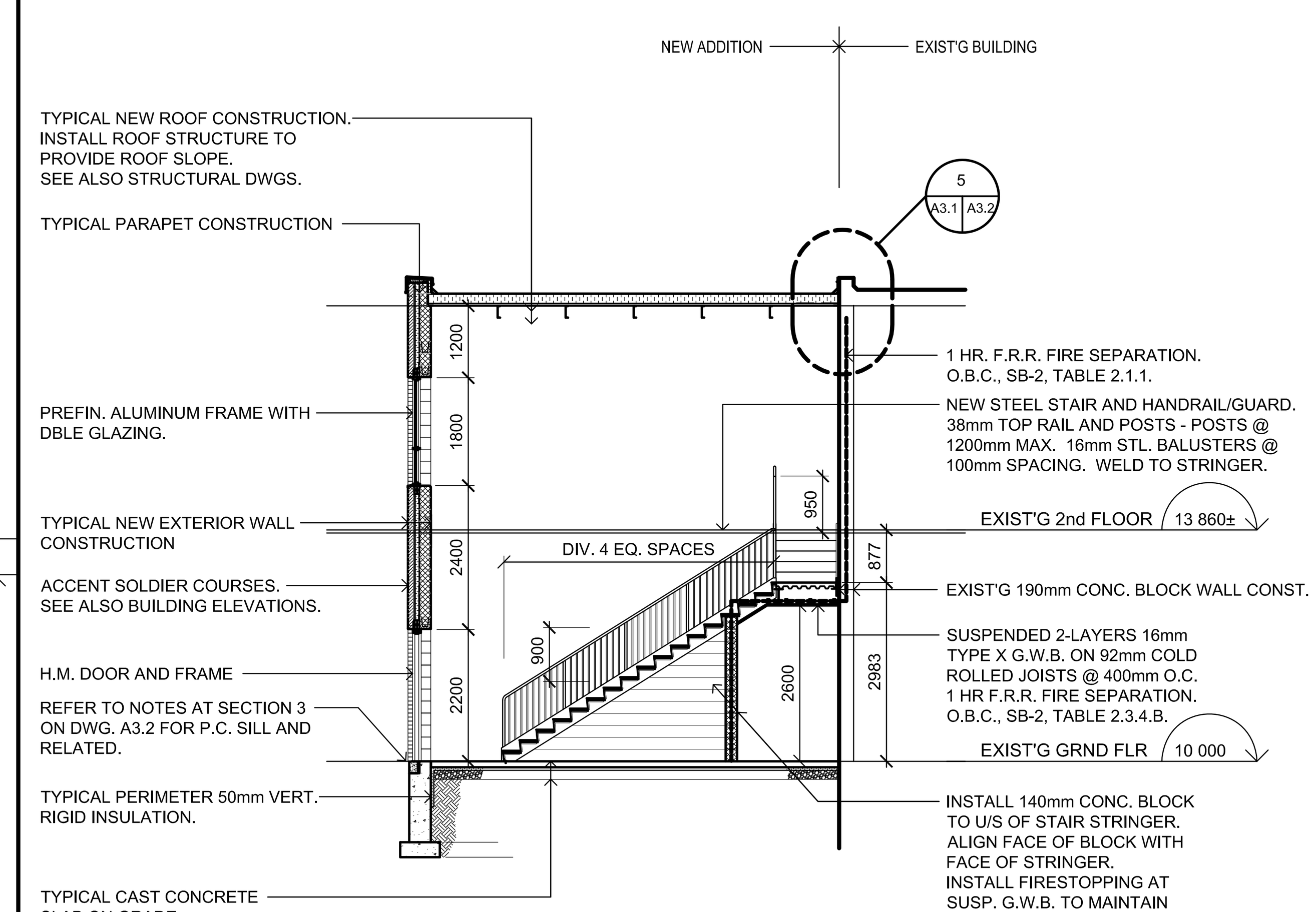
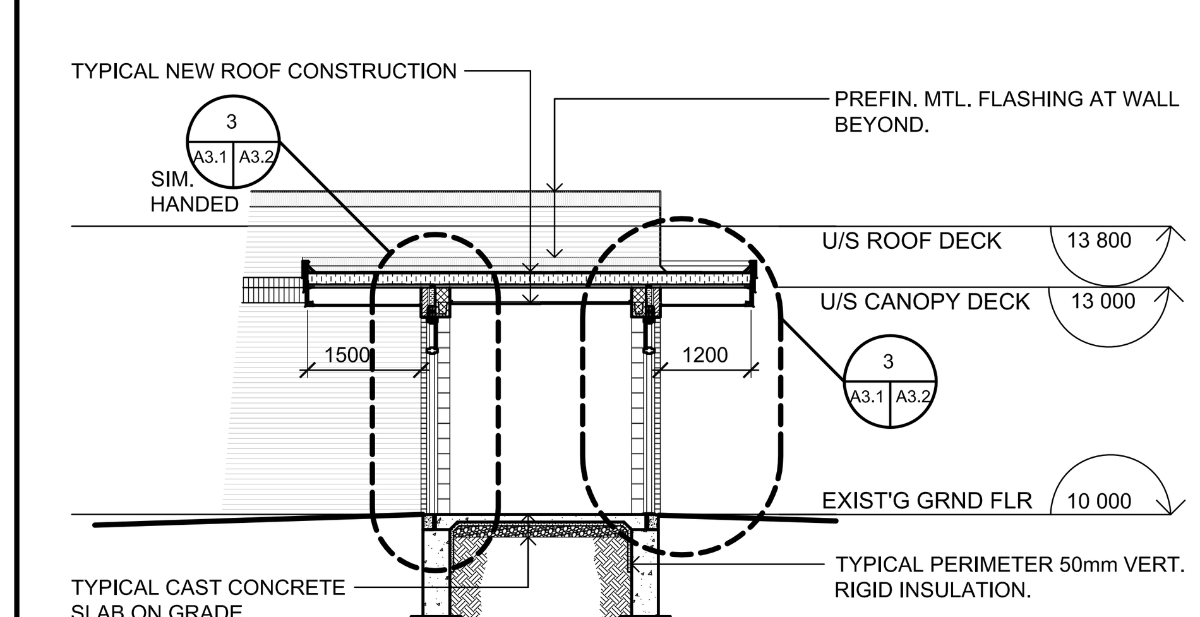


6 A2.1 A3.1 PARTIAL BUILDING SECTION
SCALE 1:100



7 A2.1 A3.1 PARTIAL BUILDING SECTION
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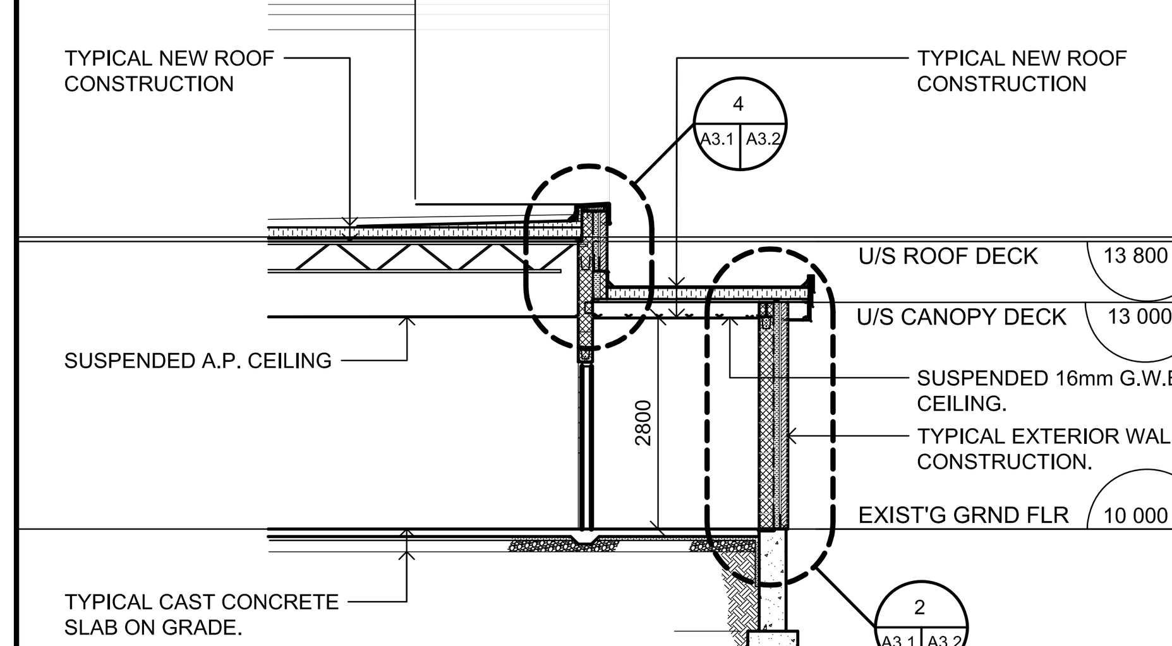

8 A2.1 A3.1 PARTIAL BUILDING SECTION
SCALE 1:100

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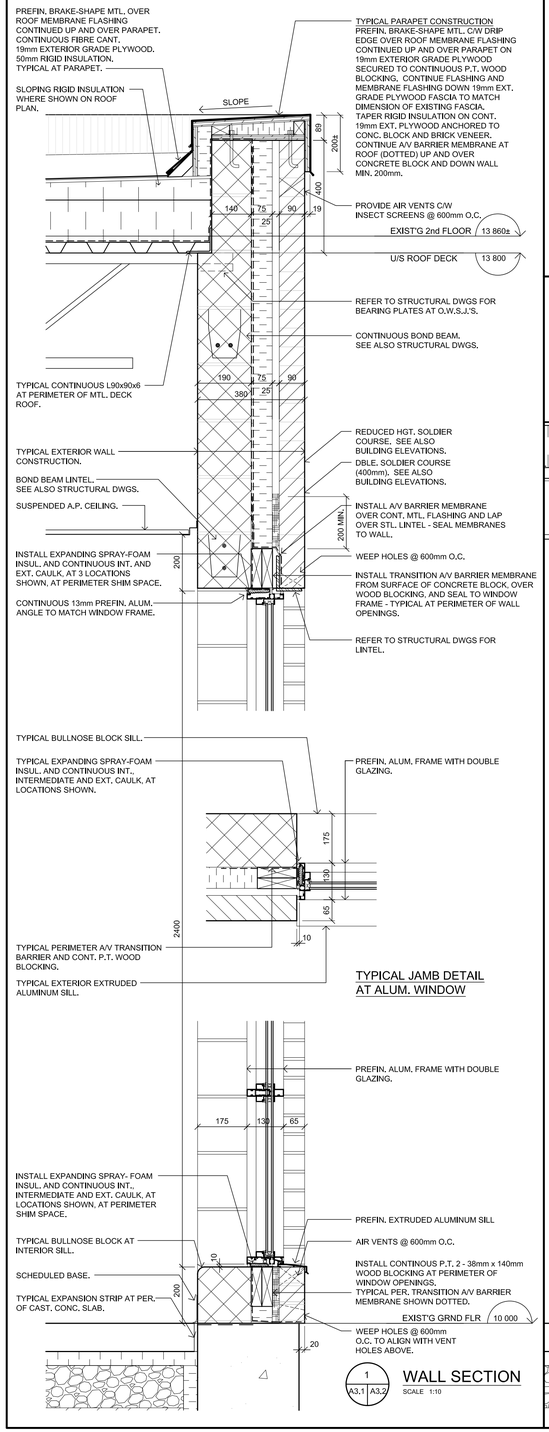
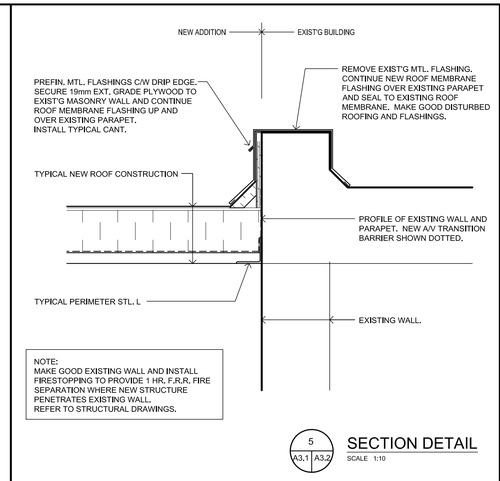
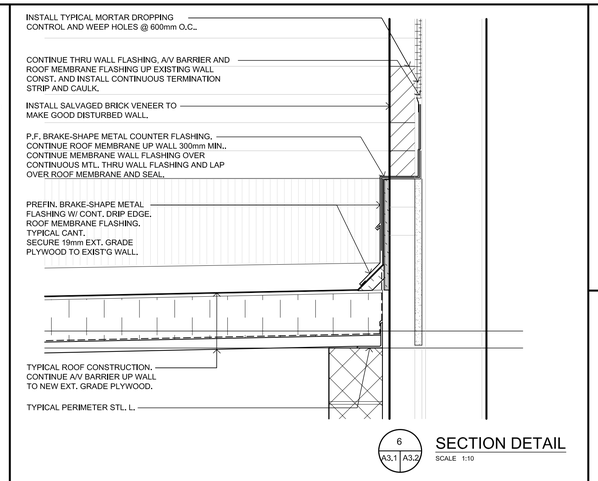
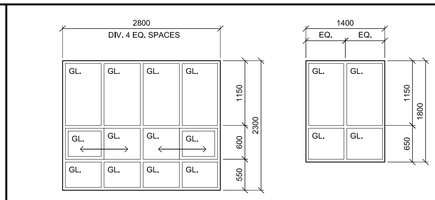
BUILDING ELEVATIONS AND SECTIONS, WALL SECTIONS

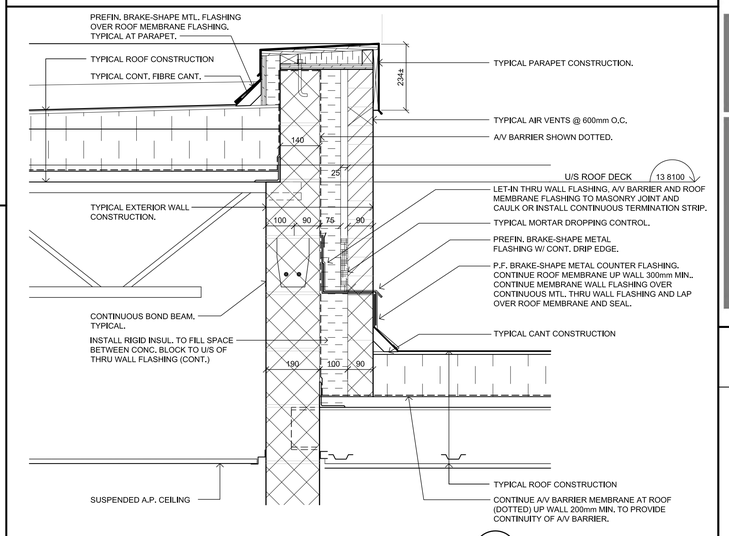
A3.1

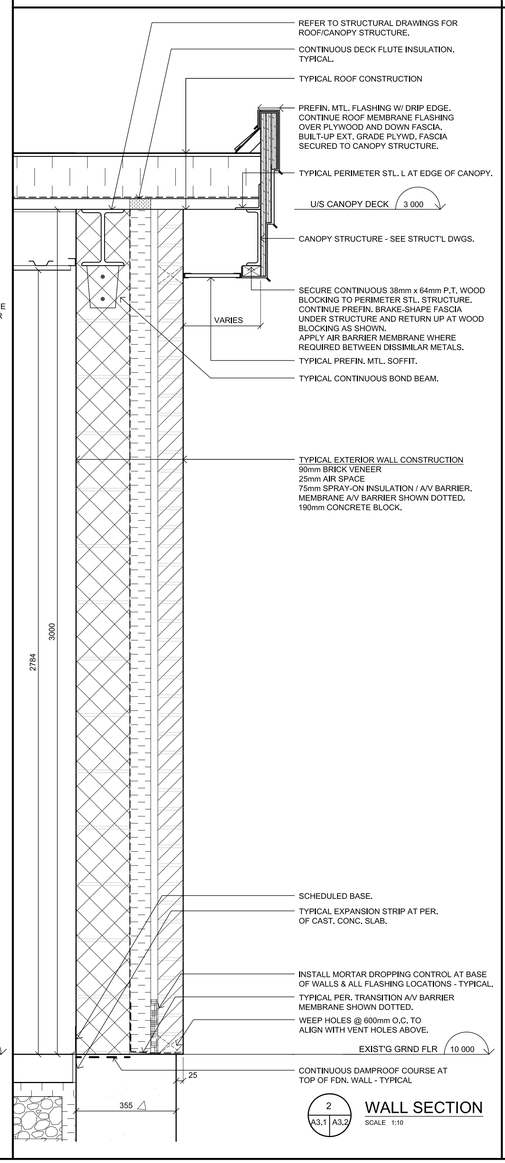


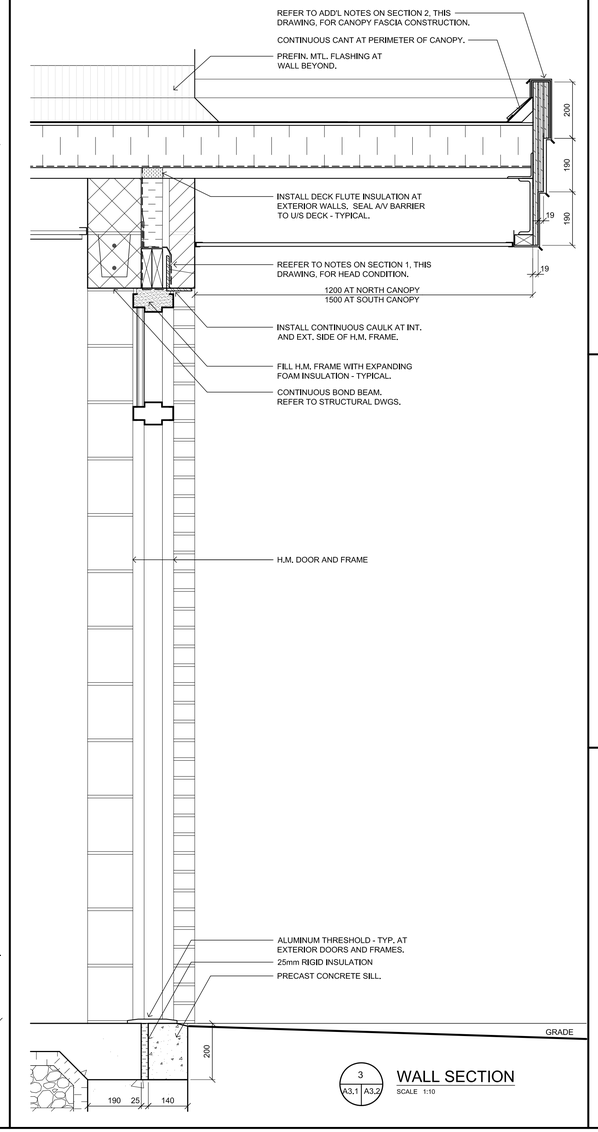


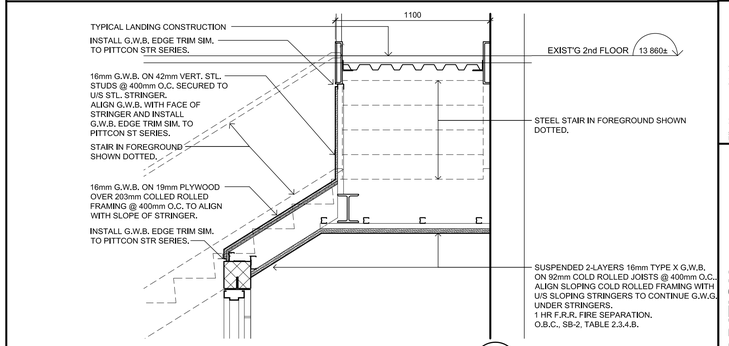


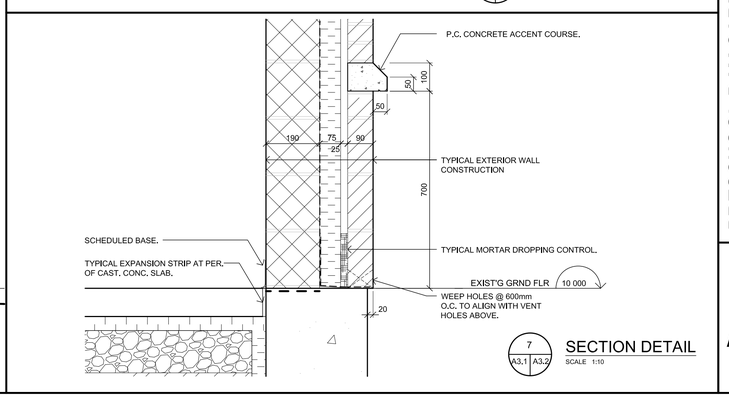












architecture design inc
96 Church St. / St.Catharines /Ontario / L2R 3C8 / 905.685.8467
info@mzearchitects.com / www.mzearchitects.com

No.	Revisions:	Date:
	Issued for Tender	Feb. 10/25
	Issued for Permit	Jan. 20/23
	Issued for Site Plan Control	Sept. 15/22

File No.:	21-42
Scale:	As Shown
Drawn by:	MZE
Plot Date:	APR. 4, 2022
Issue Date:	

PRESCHOOL DAY CARE ADDITION
Ecole elementaire catholique
Saint-Marguerite-Bourgeoys
60 Clench Avenue, Brantford, Ontario N3T 1B9

WALL SECTIONS, DETAILS, WINDOW SCHEDULE

A3.2

STRUCTURAL DRAWING LIST

GENERAL NOTES

1. THE GENERAL NOTES MUST BE READ IN CONJUNCTION WITH THE DESIGN DRAWINGS AND SPECIFICATIONS OF ENGINEERING AND ARCHITECTURAL DISCIPLINES WHICH FORM PART OF THIS CONTRACT. THIS INCLUDES DRAWING SPECIFICATIONS AND SKETCHES. SHOULD THERE BE CONTRADICTORY INFORMATION BETWEEN DRAWINGS, SKETCHES AND SPECIFICATIONS,THE ONE WHICH IS MOST STRINGENT TAKES PRECEDENCE.
2. REFER TO ARCHITECTURAL, MECHANICAL AND ELECTRICAL DRAWINGS FOR LOCATION AND SIZE OF OPENINGS, TRENCHES, PITS, EQUIPMENT, SLEEVES, DEPRESSIONS, GROOVES AND CHAMFERS NOT INDICATED ON STRUCTURAL DRAWINGS.
3. UNLESS SPECIFICALLY NOTED OTHERWISE ON THE DRAWINGS, NO PROVISION HAS BEEN MADE IN THE DESIGN FOR CONDITIONS OCCURRING DURING CONSTRUCTION. THE CONTRACTOR IS TO PROVIDE ALL NECESSARY BRACING AND SHORING REQUIRED FOR STRESSES AND INSTABILITY OCCURRING FROM ANY CAUSE DURING CONSTRUCTION.THE CONTRACTOR SHALL ACCEPT FULL RESPONSIBILITY FOR ALL SUCH MEASURES. IT SHALL ALSO BE THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE ALL NECESSARY BRACING, SHORING, SHEET PILING OR OTHER TEMPORARY SUPPORTS TO SAFEGUARD ALL EXISTING OR ADJACENT STRUCTURES AFFECTED BY THE WORK.
4. ALL CONNECTIONS CONNECTED TO EXISTING STRUCTURE ARE TO BE SITE VERIFIED.
5. REVIEW OF SHOP DRAWINGS BY STRUCTURAL CONSULTANT IS ONLY TO ASSESS THAT SUBMITTED SHOP DRAWINGS REFLECT THE INTENT OF THE STRUCTURAL DESIGN.
6. REVIEW BY THE STRUCTURAL CONSULTANT SHALL NOT RELIEVE THE CONTRACTOR OF THE RESPONSIBILITY FORSEEN THAT THE WORK IS COMPLETE, ACCURATE AND IN CONFORMITY WITH THE STRUCTURAL DRAWINGS AND SPECIFICATIONS.
7. TYPICAL DETAILS SHALL BE USED WHERE SPECIFIC DETAILS ARE NOT SHOWN ON THE DRAWINGS.
8. ALL WORK REQUIRED, INCLUDING ANY DEMOLITION, SHALL BE CARRIED OUT IN A MANNER THAT WILL NOT DAMAGE THE EXISTING SITE OR STRUCTURE. ANY DAMAGE SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE.
9. ALL DESIGN, DETAILING, CONSTRUCTION, EXCAVATION AND SHORING, MUST CONFORM TO THE PRESENT ONTARIO BUILDING CODE, OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS LATEST EDITION. ALL ASSOCIATED COST WITH THE DESIGN, SUPPLY AND INSTALLATION OF TEMPORARY SHORING IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR. GENERAL CONTRACTOR TO PROVIDE STAMPED, ENGINEERED SHORING DRAWINGS.
10. THE GENERAL CONTRACTOR IS RESPONSIBLE TO COORDINATE WORK OF ALL SUBCONTRACTORS.
11. THE GENERAL CONTRACTOR MUST REVIEW ALL DIMENSIONS PRIOR TO THE COMMENCEMENT OF ALL WORK AND MUST REPORT ALL DISCREPANCIES TO THE ENGINEER/ARCHITECT.
12. STRUCTURAL DRAWINGS SHALL BE READ IN CONJUNCTION WITH THE ARCHITECTURAL, CIVIL, MECHANICAL AND ELECTRICAL DRAWINGS.
13. PROVIDE STAMPED STRUCTURAL SHOP DRAWINGS AS NOTED IN THE FOLLOWING TABLE.

ITEMS	REQ'D SUBMITTAL?	ENGINEER'S STAMP REQ'D?	NOTES
REBAR SHOP DWGS.	YES	NO	
CONC. MIX DESIGNS	YES	NO	
PRECAST CONC. STAIRS	NO	NO	
PRECAST CONC. SLAB	NO	NO	
STRUCT. STEEL SHOP DWGS.	YES	YES	
STEEL JOISTS DWGS.	NO	NO	
STEEL JOISTS CALC.	NO	NO	
STEEL DECK SHOP DWGS.	YES	NO	
STUD WALL SHOP DWGS.	NO	NO	

14. PROJECTS WHICH INCLUDE ANY DEMOLITION AND OR RENOVATION WORK, THE GENERAL CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL DIMENSIONS AND EXISTING CONSTRUCTION. SHOULD A DISCREPANCY ON EITHER BE FOUND,REPORT FINDINGS TO ENGINEER/ARCHITECT.
15. ALL DETAILS SHOWN ARE SPECIFIC TO THE PROJECT.WHERE A LOCATION IS NOT SPECIFIED FOR A DETAIL, DETAILS IN THE DRAWINGS INCLUDING TYPICAL DETAILS WHICH CLOSELY RESEMBLES THE WORK, WILL APPLY.
16. ALL CODES AND REGULATIONS QUOTED ARE TO BE THE LATEST EDITION.

SOILS AND FOUNDATIONS

1. ALL THE SPREAD FOOTINGS AND STRIP FOOTINGS TO BE CONSTRUCTED ON UNDISTURBED NATIVE SOIL OR ENGINEERED FILL CAPABLE OF RESISTING 200 KPa (4000 PSF). THE GEOTECHNICAL CONSULTANT TO CONFIRM THE SOIL BEARING RESISTANCE BEFORE CONSTRUCTION.
2. THE GEOTECHNICAL REPORT IS A GUIDE ONLY (REPORT #SM 124433-G COMPLETED BY SOIL-MAT ENGINEERS & CONSULTANTS LTD. IN 2012. MANTECON PARTNERS INC. IS NOT RESPONSIBLE FOR ITS CONTENT, RECOMMENDATIONS, CORRECTNESS AND OMISSIONS.THE GENERAL CONTRACTOR SHOULD FAMILIARIZE HIMSELF WITH THE REPORT AND THE SITE.
3. FOR THE DURATION OF THE EXCAVATION, THE GEOTECHNICAL AND STRUCTURAL ENGINEERS MUST BE MADE AWARE OF ALL SOIL CONDITIONS FOUND WHICH ARE DIFFERENT THAN REPORTED IN THE GEOTECHNICAL REPORT.
4. FOUNDING ELEVATION, BACKFILL AND COMPACTION MUST BE APPROVED BY THE GEOTECHNICAL ENGINEER.
5. ALL FOOTINGS MUST BE FOUNDED AT THE ELEVATIONS SHOWN ON THE CONTRACT DOCUMENTS, UNLESS POORER SOIL CONDITIONS ARE ENCOUNTERED, WHERE THE GEOTECHNICAL ENGINEER WILL DETERMINE FOUNDING ELEVATIONS.
6. ALL EXTERIOR FOOTINGS AND FOOTINGS EXPOSED TO FREEZING MUST BE FOUNDED TO A MINIMUM FROST PROTECTION DEPTH OF 1.2M (4') BELOW FINISHED GRADE. REFER TO GRADING PLAN FOR FINISH EXTERIOR GRADE ELEVATIONS.
7. ALL SPREAD FOOTINGS, CONTINOUS FOOTINGS AND DEEP FOUNDATIONS, WHICH INCLUDES BUT IS NOT LIMITED TO CAISSONS AND PILES, MUST BE CONSTRUCTED CONCENTRIC TO THE COLUMN AND/OR WALL WHICH THEY ARE SUPPORTING UNLESS OTHERWISE NOTED.
8. ALL EXCAVATIONS MUST BE CARRIED OUT IN CONFORMANCE TO THE GEOTECHNICAL REPORT AND OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS, LATEST EDITION GUIDELINES.
9. DO NOT EXCEED A MAXIMUM RISE TO RUN OF 7 TO 10 SLOPE BETWEEN ADJACENT FOOTINGS UNLESS DIRECTED IN WRITING BY THE GEOTECHNICAL ENGINEER.
10. BACKFILL MATERIAL AND COMPACTION SHOULD BE IN CONFORMANCE WITH GEOTECHNICAL REPORT.
11. PRIOR TO BACKFILLING, CONCRETE FLOOR OR STRUCTURAL STEEL FLOOR AND SLAB ON GRADE MUST BE IN PLACE TO PREVENT WALLS FROM COLLAPSE. THE CONCRETE MUST HAVE ACHIEVED A STRENGTH OF MINIMUM 75% OF ITS DESIGN STRENGTH.
12. IN WALLS WHERE THE CONTRACT DOCUMENTS CALL FOR WATER STOPS AT THE INTERFACE OF THE TOP OF FOOTING AND THE UNDERSIDE OF THE WALL, THE GENERAL CONTRACTOR MUST PROVIDE THE STRUCTURAL ENGINEER SKETCHES OF THE PROPOSED INSTALLATION FOR REVIEW. SIMILAR DIRECTION MUST BE FOLLOWED FOR WALL CONSTRUCTION JOINTS.

CONCRETE AND REINFORCING

1. CONCRETE MATERIALS AND METHODS OF CONCRETE CONSTRUCTION, TESTING AND STANDARD PRACTICES FOR CONCRETE SHALL BE IN ACCORDANCE WITH CSA STANDARD A23.1/A23.2 (LATEST EDITION).
2. CONCRETE DESIGN SHALL BE IN ACCORDANCE WITH THE DESIGN OF CONCRETE STRUCTURES CSA STANDARD A23.3 (LATEST EDITION).
3. SUPPLY AND PLACE CONCRETE IN ACCORDANCE TO TABLE 1

TABLE 1

	LOCATION	MIN. COMPRESSIVE STRENGTH (f'c) AT 28 DAYS MPa (PSI)	SLUMP mm (in)	EXPOSURE CLASS	AIR CONTENT (%)
FTGS	FND. WALL FOOTINGS	25 (3500)	80 ± 30 (3 ± 1)	N	0
WALLS	FND. WALLS,SHEAR WALLS, ABOVE GRADE WALLS RETAINING WALLS	35 (5000)	80 ± 30 (3 ± 1)	C-1	5-8
SLABS	INTERIOR SLAB ON GRADE, AND CONC. SLAB ON DECK	25 (3500)	80 ± 30 (3 ± 1)	N	0
OTHER	SIDEWALK/CURBS PAVING SLABS, EXTERIOR CONC. AND TOPPING	32 (4650)	40 ± 20 ($1\frac{1}{2} \pm \frac{3}{4}$)	C-2	5-8
	HOUSEKEEPING PADS	25 (3500)	80 ± 30 (3 ± 1)	N	0
	NON-SHRINKABLE GROUT	30	AS PER MANUF. RECOMEN.	N	0
	LEAN MIX CONCRETE	8 (1000)	80 ± 30 (3 ± 1)	N	0

4. THE COMPRESSIVE STRENGTH OF THE CONCRETE IS BASED ON THE FOLLOWING CONDITIONS:

a) TYPE GU NORMAL PORTLAND CEMENT UNLESS OTHERWISE NOTED OR APPROVED
b) MAXIMUM SIZE OF AGGREGATE 20mm (3/4") WASHED IRREGULAR CUT CLEAR STONE
c) SLUMP SHOWN ON THE TABLE IS SLUMP WITHOUT SLUMP AID ADMIXTURE. WHERE THE USE OF AN ADMIXTURE IS PREFERRED TO INCREASE THE SLUMP, THE SUPERPLASTICIZED CONCRETE SLUMP MUST REMAIN BELOW THE POINT AT WHICH SEGREGATION WILL OCCUR

5. REINFORCEMENT SHALL CONFORM TO CSA G30.3,G30.5 AND G30.18 (LATEST EDITION) YIELD STRENGTH FOR CONCRETE AND MASONRY REINFORCEMENT, fy=400MPa YIELD STRENGTH FOR WELDED WIRE FABRIC fy=360MPa
6. WHEN COLUMNS AND WALLS ARE POURED INTEGRALLY USE THE HIGHER STRENGTH CONCRETE OF THE ELEMENT WHICH SPECIFIED IN TABLE 1.
7. MINIMUM CONCRETE COVER FOR REINFORCING, WHERE NOT SHOWN ON DESIGN DRAWINGS SHALL BE AS FOLLOWS:

a) ALL STEEL NOT CAST IN FORMS PERMANENTLY AGAINST EARTH OR ROCK AND IN A NON-CORROSIVE ENVIRONMENT, COVER SHALL BE 75mm (3").
b) ALL STEEL CAST IN FORMS SHALL FOLLOW TABLE 2 OR AS NOTED ON DRAWINGS.

TABLE 2

STRUCTURAL ELEMENT	COVER mm (in)	STRUCTURAL ELEMENT	COVER mm (in)
CONCRETE POURED IN FORMS BUT EXPOSED TO WEATHER OR EARTH		CONCRETE NOT EXPOSED TO WEATHER OR EARTH	
-BARS LARGER THAN 15M	50 (2")	-SLABS AND WALLS	25 (1")
-BARS 15M AND SMALLER	38 ($1\frac{1}{2}$")	-BEAMS AND GIRDERS	38 ($1\frac{1}{2}$")
		-COLUMNS MAIN STEEL	50 (2")
FTGS. & OTHER ELEMENTS POURED AGAINST EARTH	75 (3")		

8. THE GENERAL CONTRACTOR MUST COORDINATE THE INSTALLATION OF MECHANICAL AND ELECTRICAL OPENINGS AND SLEEVES.THEY MUST FOLLOW THE GUIDE LINES BELOW:

a) NO SLEEVES SHALL BE PLACED VERTICALLY OR HORIZONTALLY THROUGH BEAMS UNLESS APPROVED BY THE STRUCTURAL ENGINEER.
b) NO OPENINGS SHALL BE MADE IN FLAT SLABS OR TWO WAY SLAB COLUMN STRIPS EXCEPT AS SHOWN ON THE DRAWINGS OR APPROVED BY THE STRUCTURAL ENGINEER.
c) WHERE A CORE DRILL OR AN OPENING IS REQUIRED IN HARDENED CONCRETE THE GENERAL CONTRACTOR MUST SEEK THE APPROVAL OF THE STRUCTURAL ENGINEER.
d) ELECTRICAL CONDUITS SHALL NOT PASS THROUGH COLUMNS AND ARE NOT TO RUN HORIZONTALLY IN WALLS.
e) CONDUITS WITHIN SLABS MUST NOT HAVE A (OUTER) DIAMETER GREATER THAN ONE-QUARTER OF THE SLAB THICKNESS. SPACING BETWEEN CONDUITS MUST BE AT LEAST 3 TIMES THE OUTER DIAMETER (CLEAR SPACING). CONDUITS MUST BE PLACED WITHIN MIDDLE THIRD OF SLAB. CONDUITS SHALL BE LAID SUCH THAT ONLY SINGLE CROSS OVERS OCCUR WITHIN MAXIMUM 500mm OF ONE ANOTHER. ALL CONDUITS WITHIN SLAB ARE SUBJECT TO APPROVAL BY STRUCTURAL CONSULTANT.

9. REFER TO DESIGN DRAWINGS FOR TYPICAL DETAILS OF CONTROL JOINTS, EXPANSION JOINTS AND CONSTRUCTION JOINTS. UNLESS OTHERWISE NOTED ON THE DESIGN DRAWINGS, THE FOLLOWING MAXIMUM DISTANCE BETWEEN JOINTS MUST BE FOLLOWED:

a) CONTROL JOINTS IN WALLS 6m (20') MAXIMUM
b) MAXIMUM POUR LENGTH FOR SLAB ON GRADE IS 30m (100').
c) ALL SAWCUTS MUST BE MADE WITHIN 24 HRS. FR0M PLACING OF CONCRETE. THE DEPTH OF THE SAWCUT MUST BE 1/3 THE DEPTH OF THE SLAB.

TOPPING

10. THE CONTRACTOR SHALL PROVIDE A SUITABLE TOP FINISH TO ACCEPT DIRECT APPLICATION OF FINISHED FLOORING/ROOFING AS PER ROOM FINISH SCHEDULE

TESTING AND INSPECTION

1. THE FOLLOWING ITEMS REQUIRE TESTING OR INSPECTION BY A CERTIFIED INDEPENDENT TESTING OR INSPECTION AGENCY UNLESS NOTED OTHERWISE. THE AGENCY SHALL SEND COPIES OF ALL STRUCTURAL TESTING AND INSPECTION REPORTS TO THE ENGINEER FOR REVIEW.

ITEMS	REQ'D?	COMMENTS
SOIL BEARING CAPACITY	YES	BY SOILS ENGINEER
SOIL COMPACTION	YES	BY SOILS ENGINEER
REINF. STEEL PLACEMENT	YES	INSPECT FINAL PLACEMENT
CONC. COMPRESSIVE TESTS	YES	MIN. 2 SETS PER X m^3
CONC. SLUMP	YES	
WELDED CONNECTIONS	YES	INSPECT ALL FIELD WELDS
MORTAR CUBES	NO	
GROUT CUBES	NO	

* CONCRETE POURS IN WINTER MONTHS TO HAVE MIN. 2 SETS LAB CURED AND 2 SETS FIELD CURED.

UNIT MASONRY

1. MASONRY DESIGN AND CONSTRUCTION SHALL CONFORM TO
C.S.A. S304.1: MASONRY DESIGN FOR BUILDINGS
C.S.A. A371: MASONRY CONSTRUCTION FOR BUILDINGS
C.S.A. A165: CSA STANDARDS FOR CONCRETE MASONRY UNITS
C.S.A. A179: MORTAR AND GROUT FOR UNIT MASONRY
(LATEST EDITION)
2. ALL CONCRETE BLOCK SHALL HAVE A NET COMPRESSIVE STRENGTH OF 15 MPa (2200 PSI).
3. MASONRY WALLS SHALL HAVE TYPE S MORTAR.
4. GROUT SHALL BE IN ACCORDANCE WITH THE ABOVE NOTED STANDARDS.
5. PROVIDE THREE COURSES OF FULLY GROUTED MASONRY UNDER BEARING PLATES FOR STEEL BEAMS, UNLESS OTHERWISE NOTED.
6. PROVIDE LATERAL RESTRAINT AT THE TOP OF ALL NON-LOAD BEARING PARTITIONS. REFER TO TYPICAL DETAILS.
7. PROVIDE CONTROL JOINTS EVERY 7m AND AT ALL DISCONTINUITIES AND OPENINGS AND AS SHOWN ON THE ARCHITECTURAL DRAWINGS.
8. PROVIDE AND INSTALL HORIZONTAL REINFORCING IN ALL MASONRY WALLS. UNLESS INDICATED OTHERWISE ON DRAWINGS, PROVIDE 4.8mm GALVANIZED LADDER TYPE HORIZONTAL REINFORCING AT EVERY SECOND MORTAR JOINT IN MASONRY WALLS.
9. PROVIDE AND CONSTRUCT A SINGLE COURSE BOND BEAM AT THE TOP OF ALL NON BEARING WALLS. REINFORCE BOND BEAM WITH 2-10M CONTINUOUS. AT LOAD BEARING WALLS BOND BEAMS ARE 400mm DEEP WITH 2-15M CONTINUOUS.
10. PROVIDE 1-15M EVERY FOURTH CELL, VERTICAL REINFORCEMENT, IN ALL LOAD BEARING AND NON-LOAD BEARING WALLS AND SHEAR WALLS UNLESS GREATER REINFORCEMENT IS INDICATED ON THE DRAWINGS.
11. PROVIDE ADDITIONAL REINFORCING TO MATCH WALL REINFORCING AT ALL CORNERS, OPENINGS AND BENEATH ALL BEARING PLATES AND LINTELS.
12. PROVIDE AND INSTALL LINTELS OVER ALL OPENINGS IN ACCORDANCE WITH THE TYPICAL LINTEL SCHEDULE OR AS SHOWN ON THE DRAWING.

STRUCTURAL STEEL

1. STRUCTURAL STEEL DESIGN,FABRICATION AND ERECTION SHALL CONFORM TO THE LATEST EDITION OF:
C.S.A. S16.1: LIMIT STATES DESIGN OF STEEL STRUCTURES,
C.S.A. G40-20: GENERAL REQUIREMENTS FOR ROLLED OR WELDED STRUCTURAL QUALITY STEELS
C.S.A. G40-21: STRUCTURAL QUALITY STEELS
C.S.A. W59: WELDED STEEL CONSTRUCTION
C.S.A. S136: COLD FORMED STEEL STRUCTURAL MEMBERS
2. STRUCTURAL STEEL SHALL CONFORM TO G40.21 GRADE 350W FOR W SHAPES AND GRADE 300W FOR PLATES, ANGLES AND CHANNELS. SQUARE/RECTANGULAR HSS (HOLLOW STRUCT. SECTIONS) SHALL BE GRADE 350W, CLASS C. ROUND HSS SHALL BE ASTM A500 GRADE C.
3. UNLESS NOTED ON DRAWINGS, ALL BOLTS SHALL CONFORM TO A325 HIGH STRENGTH BOLTS IN BEARING M20 DIAMETER MINIMUM.
4. THE DESIGN OF BEAM SHEAR CONNECTIONS SHALL BE THE GREATER OF 50% OF THE BEAM SHEAR OR THE BEAM REACTION CALCULATED USING THE DESIGN LOADS SHOWN ON THE DRAWINGS, OR THE DESIGN SHEAR SHOWN. USE A MINIMUM OF TWO BOLTS.
5. WELDED CONNECTIONS SHALL BE UNDERTAKEN ONLY BY CERTIFIED WELDERS APPROVED BY C.W.B. TO THE REQUIREMENTS OF W47.1 DIVISION 1 AND 2. WELDING SHOULD BE DONE IN ACCORDANCE WITH W59. USE WELDING ELECTRODES WITH LOW HYDROGEN E480XX (E70XX) OR APPROVED EQUAL.
6. SHOULD THE FABRICATOR ELECT TO USE AN ALTERNATE ELECTRODE, THE ALTERNATE ELECTRODE SHALL MEET THE INTENT OF THE CONNECTION DESIGN AND MUST BE CERTIFIED BY A LICENSED WELDING ENGINEER IN THE PROVINCE OF ONTARIO.THE COST OF THE CERTIFICATION MUST BE BOURN BY THE CONTRACTOR.
7. WHEN WELDING TO EXISTING STEEL OR FIELD WELDING NEW STEEL, THE LOCATION OF THE WELD MUST BE FREE OF PAINT AND PRIMER.
8. CONNECTIONS FOR BRACING MEMBERS MUST BE DESIGNED FOR THE FULL TENSILE STRENGTH OF THE MEMBER, UNLESS LOADS ARE OTHERWISE INDICATED ON THE DRAWINGS.
9. ALL EXTERIOR EXPOSED STEEL INCLUDING MISCELLANEOUS EMBEDDED PLATES SUPPORTING SHELF ANGLES AND SHELF ANGLES SHALL BE HOT DIPPED GALVANIZED.

DESIGN LOADS

GRAVITY LOADS

1. DEAD LOADS

ROOFING = 0.4kPa
M/E/CEILING = 0.3kPa
SELF WEIGHT = 0.2kPa
TOTAL 0.9kPa

2. SNOW LOADS HAVE BEEN DETERMINED IN ACCORDANCE WITH THE O.B.C. USING THE FOLLOWING CRITERIA:

Ss =1.3 Sr =0.4 Is = 1.15 (HIGH IMPORTANCE)

REFER TO PLANS FOR SNOW PILE UP CONDITIONS.

LATERAL LOADS

1. WIND LOADS HAVE BEEN DETERMINED IN ACCORDANCE WITH THE 0.B.C USING THE FOLLOWING CRITERIA:

q10 = 0.33kPa q50 = 0.42kPa Iw = 1.15 (HIGH IMPORTANCE)

2. SEISMIC LOADS HAVE BEEN DETERMINED IN ACCORDANCE WITH THE O.B.C. USING THE FOLLOWING CRITERIA:

Sa (0.2) = 0.155 Sa (0.5) = 0.089 Sa (1.0) = 0.049
Sa (2.0) = 0.024 PGA = 0.097 SITE CLASS 'C' Rd = 1.5 Ro = 1.3 Ie = 1.3 (HIGH IMPORTANCE)
SFRS = CONVENTIONAL MASONRY (SHEAR WALL)

STEEL DECK

1. STEEL DECK SHALL CONFORM TO S136 GRADE 230 WITH DEPTHS AND THICKNESSES AS INDICATED ON DRAWINGS.
2. DECK SHALL BE CONTINUOUS OVER A MINIMUM OF THREE SPANS WHERE POSSIBLE.
3. STEEL DECK FOR COMPOSITE SLABS SHALL BE COMPOSITE TYPE DECK.
4. UNLESS INDICATED OTHERWISE ON THE DRAWINGS FASTEN DECK TO SUPPORTS AS FOLLOWS:
a) 20mm DIA WELDS EVERY 2ND FLUTE AND EVERY 600mm (24") ALONG SIDES, OR,
b) HILTI ENP2K OR ENKK NAILS EVERY FLUTE AND EVERY 600mm (24") ALONG THE SIDES.
c) WHEN USING SHEAR STUDS WELD EVERY THIRD FLUTE.
5. UNLESS INDICATED OTHERWISE ON THE DRAWINGS BUTTON PUNCH SIDE LAPS EVERY 600mm (24").
6. ALL EDGES OF DECK SHALL BE SUPPORTED WITH PERIMETER ANGLES WITH VERTICAL AND HORIZONTAL LEGS EQUAL TO THE DECK DEPTH, UNLESS OTHERWISE NOTED.
7. REINFORCE OPENINGS ACCORDING TO THE FOLLOWING TABLE:

OPENING SIZE (MAX. DIMENSION)	REINFORCING
LESS THAN 150mm (6")	NO REINFORCING REQUIRED
150-300 mm (6"-12")	L51x51x6 (L2x2x1/4) WELDED TO U/S DECK (PERPENDICULAR TO SPAN) EXTENDING 450mm BEYOND OPENING ON EACH SIDE
300-450mm (12"-18")	L75x75x6 (L3x3x1/4) WELDED TO U/S DECK ALL AROUND OPENING AND EXTENDING 450mm (18") BEYOND OPENING ON EACH SIDE (PERPENDICULAR TO SPAN)

OPENINGS LARGER THAN 450mm (18") OR OPENINGS CARRYING LOADS GREATER THAN 1.0 kN SHALL BE REINFORCED ACCORDING TO THE TYPICAL ROOF TOP SUPPORT DETAIL

8. DECK SHALL OVERLAP A MINIMUM OF 50mm (2") AT ALL END JOISTS AND HAVE A MINIMUM BEARING LENGTH OF 50mm (2") ON ALL STRUCTURAL STEEL.
9. DECK WELDS SHALL BE TOUCHED UP WITH APPROVED PAINT BY THE DECK ERECTOR.
10. METAL DECK SHALL BE GALVANIZED STRUCTURAL STEEL SHEET FABRICATED AND ERECTED IN ACCORDANCE WITH CSSBI 10M-96 AND CAN3-S136.
11. PROTECT ROOF AND FLOOR DECK FROM DAMAGE DURING SHIPPING STORAGE AND ERECTION. CONTRACTOR SHALL REPLACE ANY PUNCTURED, DENTED OR WELD PERFORATED DECK.
12. STEEL DECK WORK SHALL INCLUDE THE SUPPLY AND INSTALLATION OF ALL SHEET STEEL ANGLES, COVER PLATES, CLOSURES, STIFFENERS AND ANY OTHER ACCESSORIES REQUIRED.

STEEL LINTELS FOR NON-LOAD BEARING MASONRY WALLS AND BRICK VENEER

MASONRY TYPE	MAXIMUM MASONRY OPENING	MATERIAL	DETAIL
90 BRICK/ 90 BLOCK	UP TO 1530	1-L89x89x6.4	L
	1530 TO 1830	1-L102x89x7.9	L
	1830 TO 2135	1-L127x89x7.9	L
	2135 TO 2440	1-L152x89x9.5	L
140 BLOCK	UP TO 1830	2-L's 89x64x7.9	⊥ 64 LEGS HORZ.
	1830 TO 2135	2-L's 89x64x9.5	⊥ 64 LEGS HORZ.
	2135 TO 3050	W200x21	I
190 BLOCK	UP TO 1830	2-L's 89x89x7.9	⊥
	1830 TO 2440	2-L's 127x89x7.9	⊥ 89 LEGS HORZ.
	2440 TO 3050	W200x21 + 175x6 PLATE	I
240 BLOCK	UP TO 1530	2-L's 102x102x6.4	⊥
	1530 TO 2440	2L's 152x102x7.9	⊥
	2440 TO 3050	W200x21 + 225x6 PLATE	I
290 BLOCK	UP TO 2440	W200x21 + 275x6 PLATE	I
	2440 TO 3050	W200x27 + 275x6 PLATE	I

NOTES

1. READ THIS SCHEDULE IN CONJUNCTION WITH THE ARCHITECTURAL,MECHANICAL AND ELECTRICAL DRAWINGS
2. PROVIDE A SUITABLE LINTEL FOR ALL OPENINGS IN MASONRY WALLS (MECH./ELECT.)
3. PROVIDE 200mm MIN. BEARING EACH END ON 2 COURSES OF FILLED OR SOLID MASONRY UNLESS NOTED OTHERWISE
4. PROVIDE STEEL PACKING PLATES TO ENSURE EVEN BEARING
5. CONNECT ALL LINTELS TO STEEL WHERE LESS THAN 300mm OF MASONRY REMAINS BETWEEN ROUGH OPENING AND FACE OF STEEL
6. ALL DOUBLE ANGLE LINTELS TO BE WELDED BACK TO BACK,TOP AND BOTTOM WITH 6mmx50mm LONG WELD @ 450mm O.C.
7. ALL EXTERIOR ANGLES SHALL BE HOT-DIPPED GALVANIZED,INCLUDING ANY CONNECTION MATERIAL TO BACK-UP STRUCTURAL STEEL
8. LINTELS IN CURVED WALLS TO BE ROLLED TO REQUIRED RADIUS
9. ALL STEEL TO BE CSA G40.21-300W OR BETTER,SHOP PRIMED AND TOUCHED UP IN THE FIELD AFTER ERECTION
10. CONCRETE BLOCK UNITS ARE TO BE HOLLOW AND UNFILLED EXCEPT FOR FIRST COURSE ABOVE LINTEL WHICH SHALL BE FILLED SOLID UNLESS NOTED OTHERWISE

LINTELS FOR MASONRY WALLS CONCRETE BLOCK LINTELS

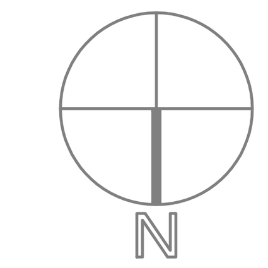
MASONRY TYPE	MAXIMUN OPENING WIDTH	LINTEL DEPTH	REINFORCEMENT	DETAIL
140 (5 1/2") BLOCK 190 (7 1/2") BLOCK 240 (9 1/2") BLOCK	UP TO 1220 (48")	200 (8")	2-15M	
140 (5 1/2") BLOCK 190 (7 1/2") BLOCK 240 (9 1/2") BLOCK	1220 (48") TO 2740 (108")	400 (16")	2-15M	
140 (5 1/2") BLOCK 190 (7 1/2") BLOCK 240 (9 1/2") BLOCK	2740 (108") TO 3660 (144")	610 (24")	2-15M	

NOTES

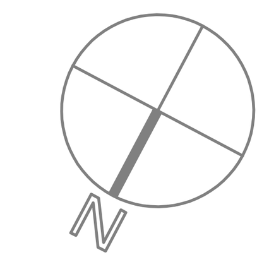
1. READ THIS SCHEDULE IN CONJUNCTION WITH THE ARCHITECTURAL,MECHANICAL AND ELECTRICAL DRAWINGS
2. PROVIDE A SUITABLE LINTEL FOR ALL OPENINGS IN MASONRY WALLS (MECH./ELECT.)
3. CONTROL JOINTS NOT TO BE LOCATED THROUGH LINTELS
4. DO NOT PASS DUCTS THROUGH REINFORCED MASONRY LINTELS
5. PROVIDE 300mm MIN. BEARING LENGTH EACH SIDE OF OPENING UNLESS NOTED OTHERWISE
6. CONCRETE STRENGTH fc' = 20 MPa WITH 10mm MAX. AGGREGATE AND 3"±1" SLUMP
7. REINFORCING STEEL GRADE fy = 400 MPa

STRUCTURAL ABBREVIATIONS

A.B.	ANCHOR BOLT	L.L.H.	LONG LEG HORIZONTAL
ALT.	ALTERNATE	L.L.V.	LONG LEG VERTICAL
ALUM.	ALUMINUM	LP.	LOW POINT
ANCH'S.	ANCHORS	LG.	LONG
APPROX.	APPROXIMATELY	L.S.H.	LONG SIDE HORIZONTAL
ARCH.	ARCHITECTURAL	L.S.V.	LONG SIDE VERTICA
B	BOTTOM	L.L.B.B.	LONG LEG BACK TO BACK
BP	BEARING PLATE	M.C.	MOMENT CONNECTION
B/F	BOTTOM FACE	MAX.	MAXIMUM
B/FTG.	BOTTOM OF FOOTING	MECH.	MECHANICAL
B.A.	BASE PLATE	MET'L.	METAL
BLK.	BLOCK	MIN.	MINIMUM
BM.	BEAM	MISC.	MISCELLANEOUS
BTM.	BOTTOM	m	METER
BRG.	BEARING	mm	MILLIMETRE
BT.PL.	BENT PLATE	MPa	MEGAPASCAL
B.L.L	BOTTOM LOWER LEVEL	N.I.C.	NOT IN CONTRACT
B.U.L.	BOTTOM UPPER LEVEL	N.T.S.	NOT TO SCALE
C/W	COMPLETE WITH	No.	NUMBER
C/C	CENTRE TO CENTRE	NS/FS	NEAR SIDE/FAR SIDE
C.J.	CONTROL JOINT	O.A.E.	OR APPROVED EQUAL
BT.	CENTRE LINE	O.C.	ON CENTRE
CLG.	CEILING	O.C.B.	ON CENTRE BOTTOM
COL.	COLUMN	O.D.	OUTSIDE DIAMETER
CONC.	CONCRETE	O.H.	OVER HEAD
CONN.	CONNECTION	OWSJ	OPEN WEB STEEL JOIST
CONST.	CONSTRUCTION	OPG.	OPENING
CONT.	CONTINUOUS	O.S.F.V.	OUTSIDE FACE VERTICAL
DEMO.	DEMOLITION	PART'N.	PARTITION
DET'L.	DETAIL	PL.	PLATE
DIA.	DIAMETER	R.C.	REINFORCED CONCRETE
DIM.	DIMENSION	R.D.	ROOF DRAIN
DO	DIDO	R.O.	ROUGH OPENING
DP.	DEEP	REF.	REFERENCE
DWG.	DRAWING	REINF.	REINFORCED
DWL.	DOWEL	REQ'D	REQUIRED
E.F.	EACH FACE	SECT.	SECTION
E.F.H.	EACH FACE HORIZ.	S.D.F.	STEP DOWN FOOTING
E.J.	EXPANSION JOINT	S.L.H.	SHORT LEG HORIZONTAL
ELEC.	ELECTRICAL	S.L.V.	HORT LEG VERTICAL
E.S.	EACH SIDE	S.L.B.B.	SHORT LEG BACK TO BACK
E.W.	EACH WAY	S.O.G	SLAB ON GRADE
EA.	EACH.	S.P.D.D.	STANDARD PROCTOR DRY DENSITY
ELEV.	ELEVATION	S.S.	STAINLESS STEEL
EQ.	EQUAL	STL.	STEEL
EXIST.	EXISTING	STIFF	STIFFENER
F.F.	FACE TO FACE	STRUCT.	STRUCTURAL
FIN.	FINISHED	T	TOP
FL.	FLOOR	T/C	TOP OF CONCRETE
FDN.	FOUNDATION	T/F	TOP OF FOOTING
FTG.	FOOTING	T/O	TOP OF
GA.	GAUGE	T/S	TOP OF STEEL
GALV.	GALVANIZED	T/WALL	TOP OF WALL
GRD.	GRADE	T.L.L.	TOP LOWER LEVEL
HORIZ.	HORIZONTAL	TYP.	TYPICAL
H.D.	HEAVY DUTY	U/G	UNDERGROUND
H.D.G.	HOT DIPPED GALVANIZED	U.N.O.	UNLESS OTHERWISE NOTED
H.E.F.	HORIZONTAL EACH FACE	U/S	UNDERSIDE
H.P.	HIGH POINT	VERT.	VERTICAL
HSS	HOLLOW STRUCT. SECTION	V.E.F	VERTICAL EACH FACE
HT.	HEIGHT	V.I.F.	VERTICAL INSIDE FACE
I.D.	INSIDE DIAMETER	V.O.F.	VERTICAL OUTSIDE FACE
INV. ELEV.	INVERT ELEVATION	V.S.C.	VERTICAL SLOTTED CONNECTION
I.S..V.	INSIDE FACE VERTICAL	W.P.	WORKING POINT
kN.	KILONEWTON	W.W.M.	WELDED WIRE MESH
kN/m	KILONEWTON METERS	@	SPACED AT
kPa	KILOPASCAL		
L	ANGLE		



CONSTRUCTION NORTH



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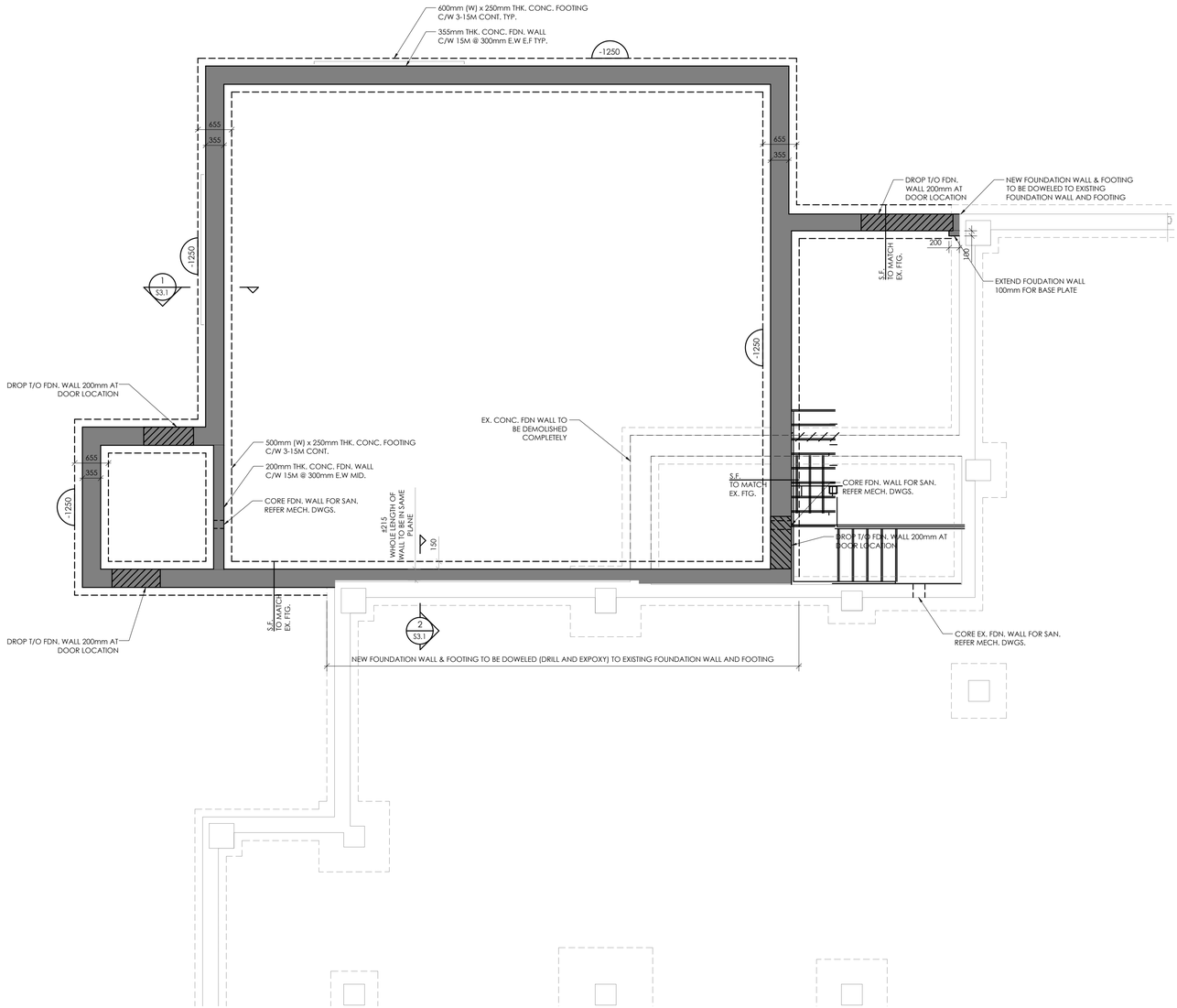
Issue Date:

PRESCHOOL DAY CARE ADDITION
Ecole elementaire catholique Saint-Marguerite-Bourgeoys
60 Clench Avenue, Brantford, Ontario N3T 1B9

GENERAL NOTES

S0.1



FOUNDATION NOTES

1. TOP OF CONCRETE FOOTING ELEVATIONS NOTED ON PLAN AS SUCH (-XXX)
2. UNDERSIDE OF ALL FOOTINGS AT EXTERIOR OF BUILDING SHALL BE A MINIMUM OF 1200mm BELOW FINISHED GRADE ELEVATION UNLESS NOTED OTHERWISE.
3. FOOTINGS HAVE BEEN DESIGNED FOR AN ALLOWABLE SAFE BEARING PRESSURE ON UNDISTURBED NATIVE SOIL OR ENGINEERED FILL. SEE SPECIFICATION AND SOILS REPORT FOR ADDITIONAL INFORMATION. IN THE EVENT OF POORER BEARING CAPACITY AT ELEVATIONS SHOWN, CONTACT ENGINEER FOR REDESIGN OF FOUNDATIONS AS REQUIRED.
4. ALL FOOTINGS SHALL BE CENTERED UNDER WALLS UNLESS NOTED.
5. SUBGRADE SOIL SHALL BE PROOF-ROLLED PRIOR TO PLACING GRANULAR BASE COURSE.
6. SEE ARCHITECTURAL DRAWINGS FOR ALL DIMENSIONS, WALL THICKNESS FLOOR SLOPES AND FLOOR FINISHES NOT SHOWN.
7. FOUNDATION CONTRACTOR TO CO-ORDINATE WITH ALL TRADES THE LOCATION OF ALL PIPE SLEEVES PASSING THROUGH FOUNDATION WALLS. PIPING IS NOT TO RUN THROUGH OR BELOW FOOTINGS. FOOTINGS TO BE STEPPED DOWN TO SUIT. FOR LOCATION AND DEPTH OF EXISTING AND NEW UNDERGROUND SERVICES NOT SHOWN, REFER TO CIVIL, ARCHITECTURAL, MECHANICAL AND ELECTRICAL DRAWINGS.
8. DROP PIERS DOWN AS INDICATED ON DRAWINGS AND EXTEND CONCRETE FLOOR SLAB OVER.
9. DEPRESS TOP OF FOUNDATION WALL 200mm TO ALL EXTERIOR AND INTERIOR DOOR OPENINGS. AT EXTERIOR OPENINGS, HOOK TOP BARS DOWN 800mm EACH SIDE OF OPENING. PROVIDE MATCHING HORIZONTAL BARS BELOW DOOR OPENING. EXTEND BARS 800mm BEYOND EDGE OF DOOR OPENING,EACH SIDE. PROVIDE SLAB ON GRADE CONTROL JOINT AT ALL INTERIOR DOORS.
10. ELEVATION FOR TOP OF FOUNDATION WALL SHALL BE EQUAL TO TOP OF ADJACENT FINISHED FLOOR, UNLESS NOTED OTHERWISE.

1 FOUNDATION PLAN
S1.1 1:50

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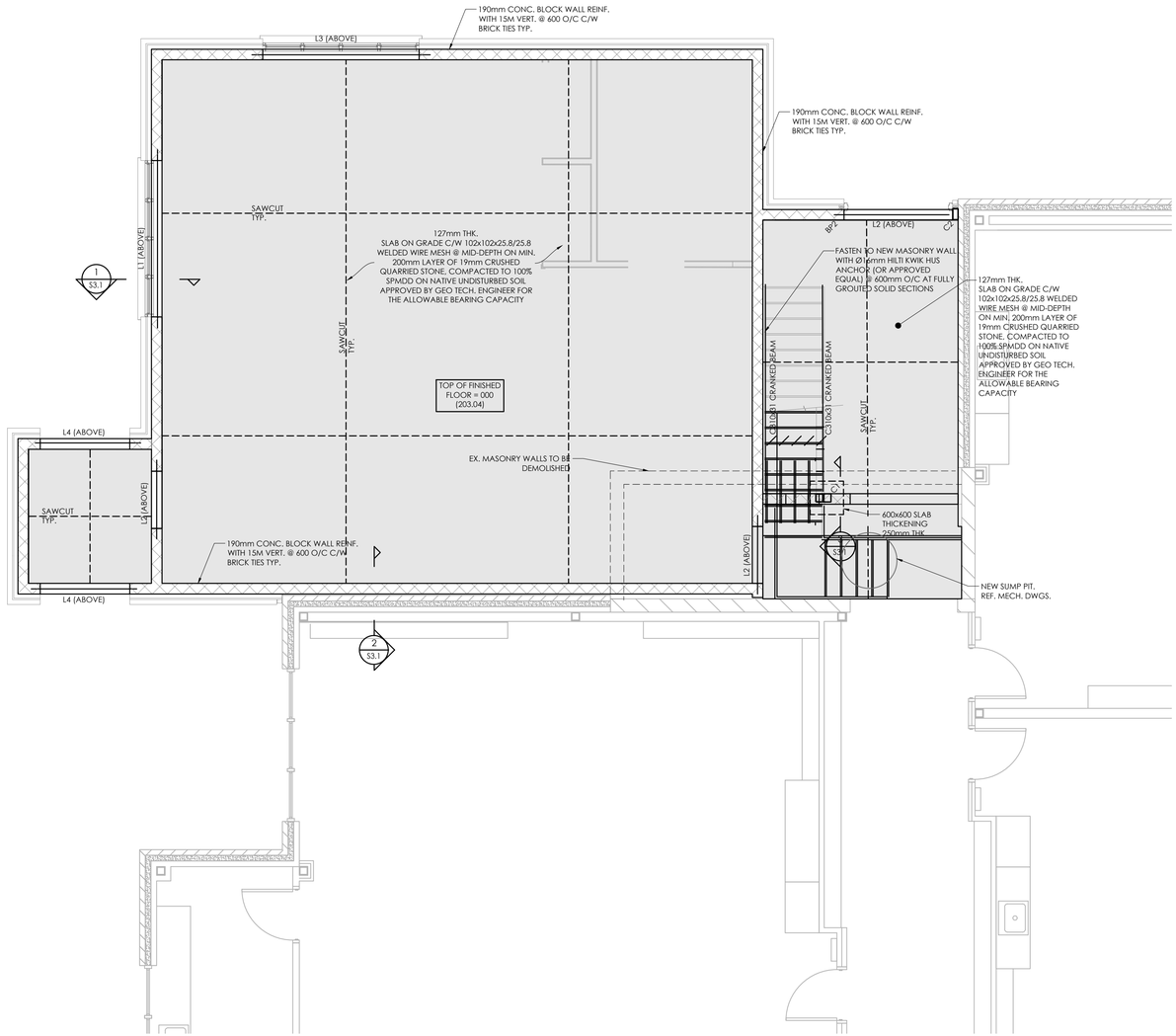
FOUNDATION PLAN

S1.1



SLAB ON GRADE NOTES

1. TOP OF FINISHED CONCRETE SLAB ON GRADE ELEVATION AS NOTED ON PLAN.
2. SLAB ON GRADE TO BE FOUNDED ON MIN. 200mm LAYER OF 19mm CRUSHED QUARRIED STONE, COMPACTED TO 100% SPMDD ON NATIVE UNDISTURBED SOIL APPROVED BY GEO TECH. ENGINEER FOR THE ALLOWABLE BEARING CAPACITY.
3. SAWCUTS @ MAX. 4000mm O.C., SEE PLAN FOR SAWCUT/CONTROL JOINTS LOCATIONS. CO-ORDINATE LOCATION OF FLOOR CONTROL JOINTS AND/OR CONSTRUCTION JOINTS WITH ARCHITECTURAL FLOOR FINISHES.
4. SEE ARCHITECTURAL DRAWINGS FOR ALL DIMENSIONS, WALL THICKNESS FLOOR SLOPES AND FLOOR FINISHES NOT SHOWN.
5. SEE MECHANICAL AND ELECTRICAL DRAWINGS FOR LOCATION AND SIZE OF ALL PITS, INSERTS, DRAINS AND HOUSEKEEPING PADS.
6. ALL ISOLATION JOINTS AROUND COLUMNS AND FLOOR DRAINS ARE TO BE FORMED NOT SAWCUT.
7. PROVIDE SLAB THICKENING/ISOLATED FOOTING BELOW ALL INTERIOR CONCRETE BLOCK PARTITION WALLS UNLESS NOTED OTHERWISE.
8. DEPRESS AND MAINTAIN SPECIFIED SLAB ON GRADE THICKNESS AT MAT SINKAGES AND OTHER FLOOR DEPRESSIONS. SEE ARCHITECTURAL DRAWINGS FOR EXACT LOCATIONS.
9. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ARCHITECTURAL, MECHANICAL AND ELECTRICAL DRAWINGS FOR ALL FLOOR AND WALL PENETRATIONS.
10. REFER TO DRAWING S000 FOR DOOR/MECH. OPENING LINTELS IN NON-LOAD BEARING CONC. BLOCK WALLS.

STEEL COLUMN SCHEDULE

MARK	SIZE	BASEPLATE	NOTES
C1	HSS 152x152x6.4	350x165x16 C/W 2-Ø16mm ANCHORS	U/S OF BASEPLATE TO BE +25mm FROM SLAB TO ACCOUNT FOR GROUT
C2	HSS 203x102x6.4	350x110x16 C/W 2-Ø16mm ANCHORS	FIRST PL. DIM. PARALLEL WITH LONG DIM. OF HSS T.O.S. TO BE AT LINTEL (L2).

LINTEL SCHEDULE

MARK	SIZE	DETAIL	NOTES
L1	W200x27 C/W WOOD BLOCKING FASTENED TO STEEL		MIN. 200mm BEARING E/S ON BLOCK WALL. FULLY 2 GROUT COURSES BELOW LINTEL. BP2 EACH SIDE
L2	W200x19 C/W CONT. 180x10mm BOT. PLATE		MIN. 200mm BEARING E/S ON BLOCK WALL. FULLY 2 GROUT COURSES BELOW LINTEL. BP2 EACH SIDE
L3	3 COURSE BOND BEAM C/W 1-15M		MIN. 200mm BEARING E/S ON BLOCK WALL. FULLY 2 GROUT COURSES BELOW LINTEL
L4	1 COURSE BOND BEAM C/W 1-15M		MIN. 200mm BEARING E/S ON BLOCK WALL. FULLY 2 GROUT COURSES BELOW LINTEL

FOR ALL NON-LOAD BEARING WALL LINTELS, REFER TO GENERAL NOTES

1 S1.2 SLAB ON GRADE PLAN 1:50

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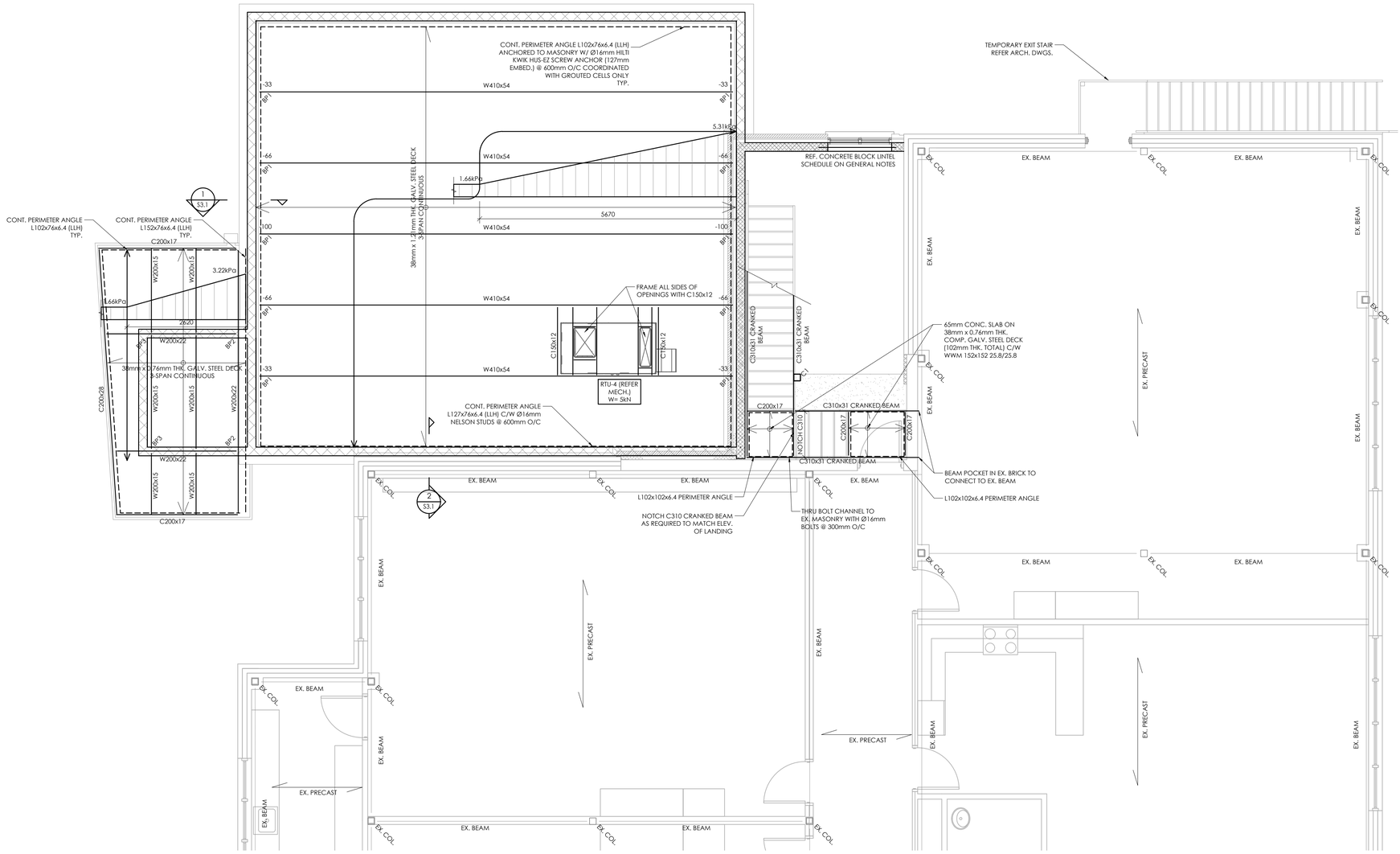
SLAB ON GRADE PLAN

S1.2



1 LOW ROOF FRAMING PLAN
S2.1 1:50

STEEL COLUMN SCHEDULE

MARK	SIZE	BASEPLATE	NOTES
C1	HSS 152x152x6.4	350x165x16 C/W 2-Ø16mm ANCHORS	U/S OF BASEPLATE TO BE +25mm FROM SLAB TO ACCOUNT FOR GROUT
C2	HSS 203x102x6.4	350x110x16 C/W 2-Ø16mm ANCHORS	FIRST PL. DIM. PARALLEL WITH LONG DIM. OF HSS T.O.S. TO BE AT LINTEL (L2).

BEARING PLATE SCHEDULE

MARK	SIZE	NOTES
BP1	200x16x150	C/W 2- Ø20mm x 127mm LONG NELSON STUDS
BP2	150x12x200	C/W 2- Ø20mm x 127mm LONG NELSON STUDS
BP3		C/W 3- Ø20mm x 127mm LONG NELSON STUDS

NOTE: LAST DIMENSION PARALLEL TO BEAM WEB

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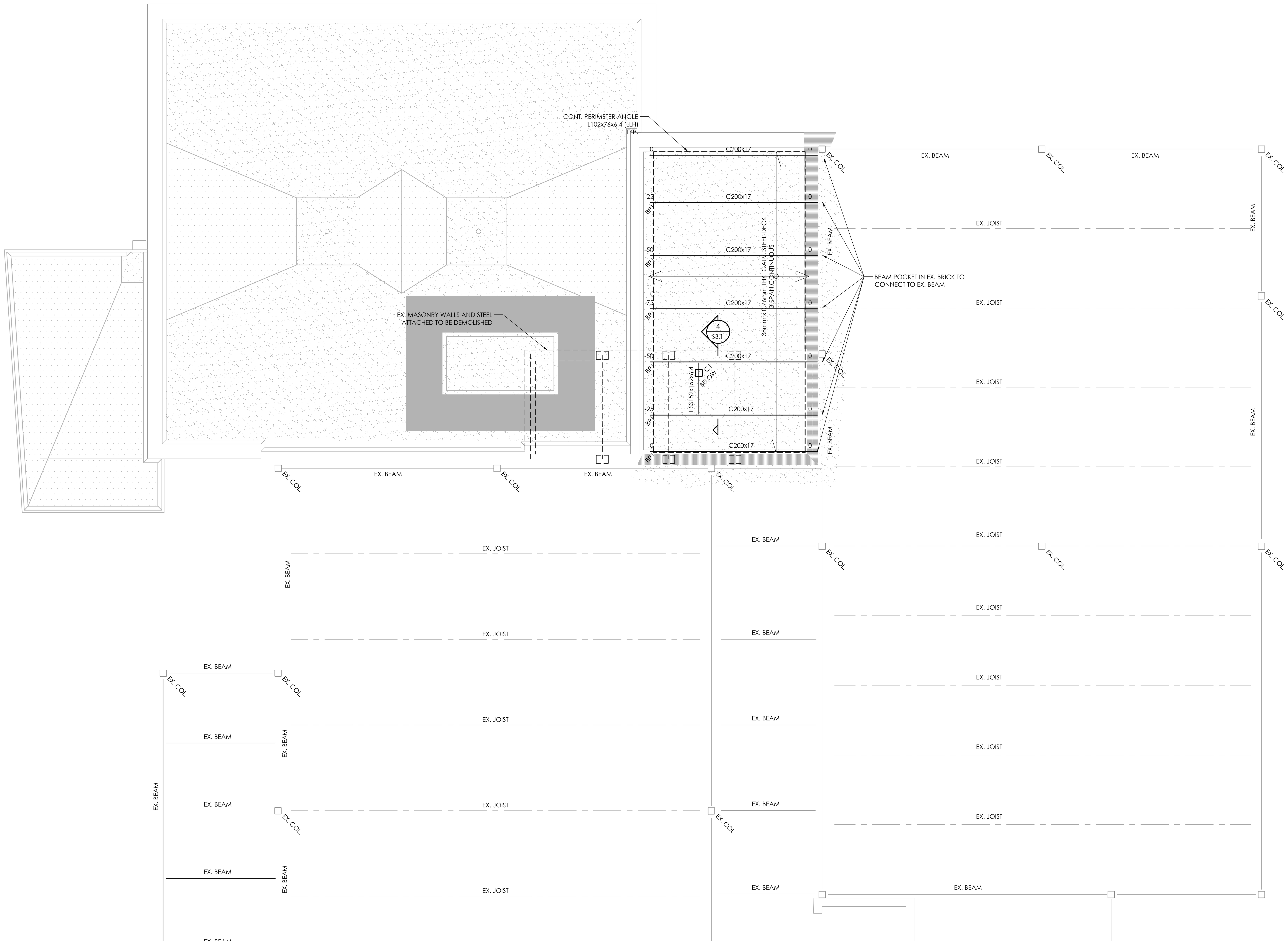
LOW ROOF FRAMING PLAN

S2.1

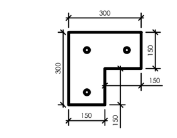


HIGH ROOF FRAMING PLAN
1/S2.2 1:50

STEEL COLUMN SCHEDULE

MARK	SIZE	BASEPLATE	NOTES
C1	HSS 152x152x6.4	350x165x16 C/W 2-Ø16mm ANCHORS	U/S OF BASEPLATE TO BE +25mm FROM SLAB TO ACCOUNT FOR GROUT
C2	HSS 203x102x6.4	350x110x16 C/W 2-Ø16mm ANCHORS	FIRST PL. DIM. PARALLEL WITH LONG DIM. OF HSS T.O.S. TO BE AT LINTEL (L2).

BEARING PLATE SCHEDULE

MARK	SIZE	NOTES
BP1	200x16x150	C/W 2- Ø20mm x 127mm LONG NELSON STUDS
BP2	150x12x200	C/W 2- Ø20mm x 127mm LONG NELSON STUDS
BP3		C/W 3- Ø20mm x 127mm LONG NELSON STUDS

NOTE: LAST DIMENSION PARALLEL TO BEAM WEB

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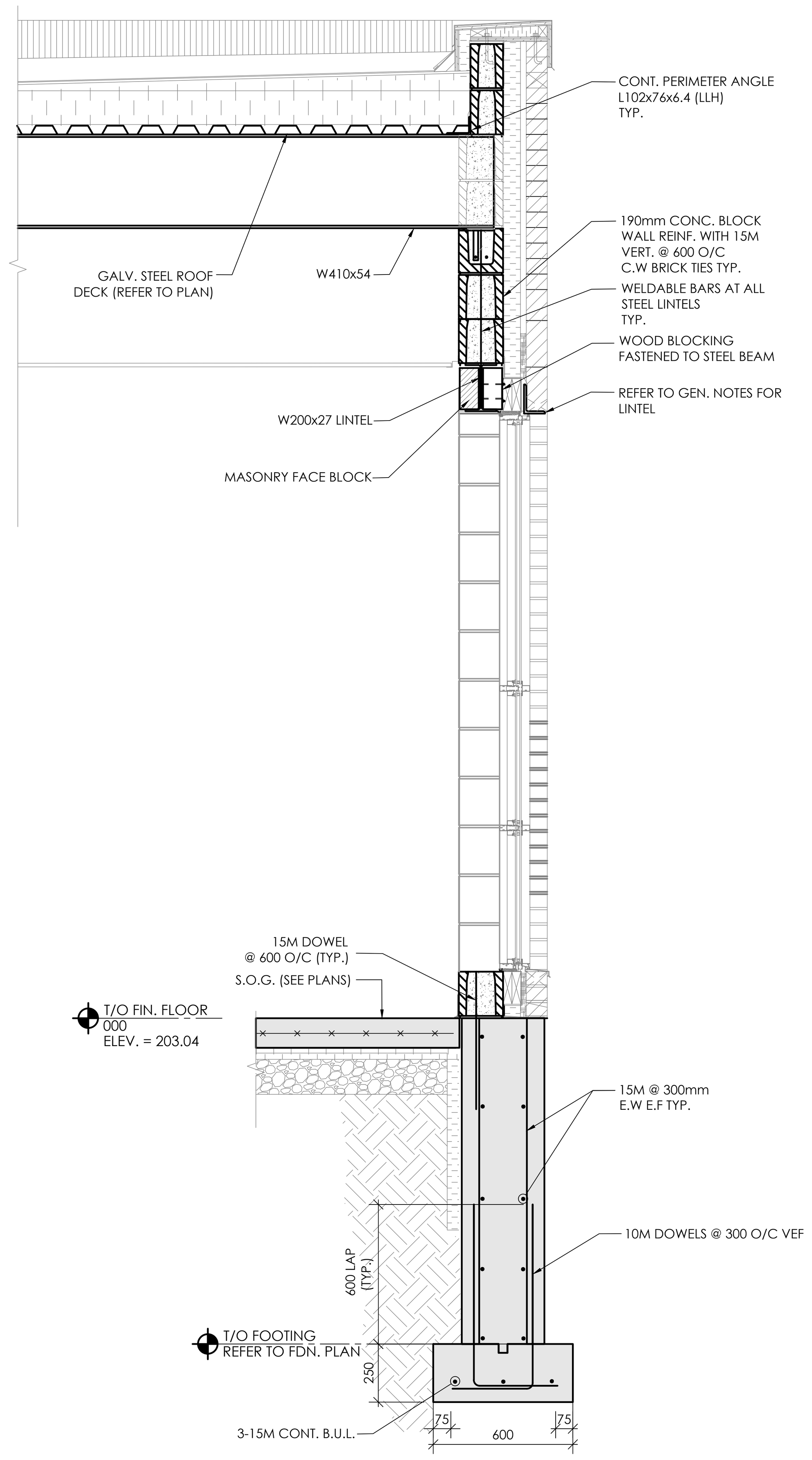
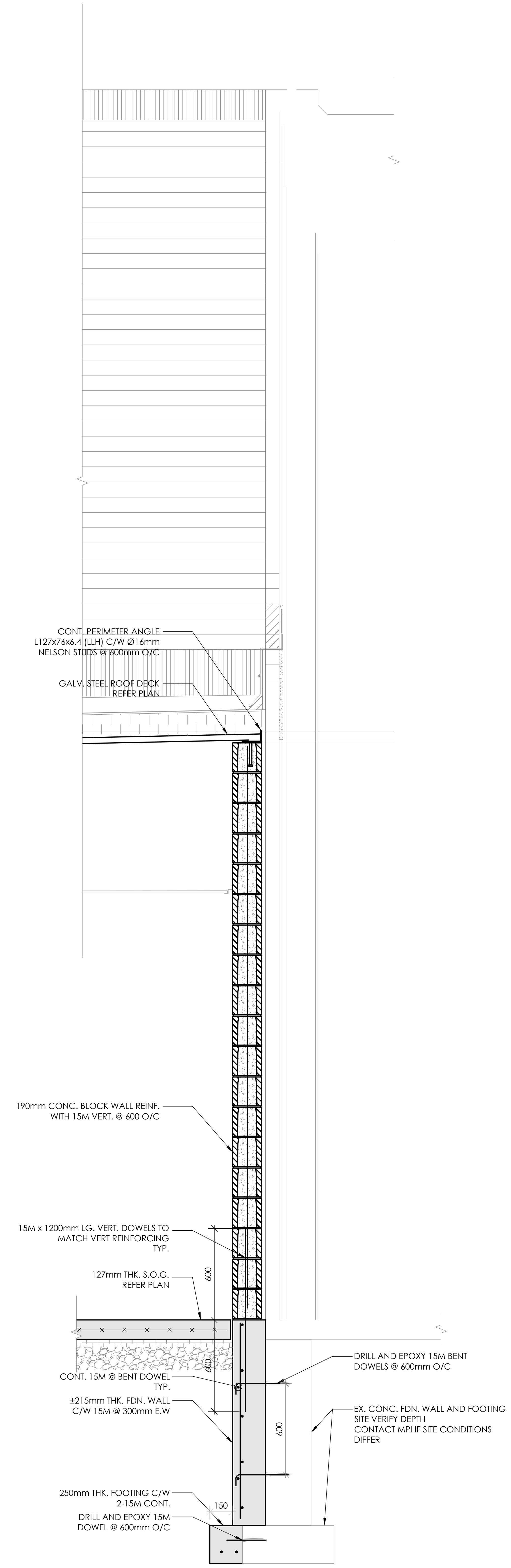
HIGH ROOF FRAMING PLAN

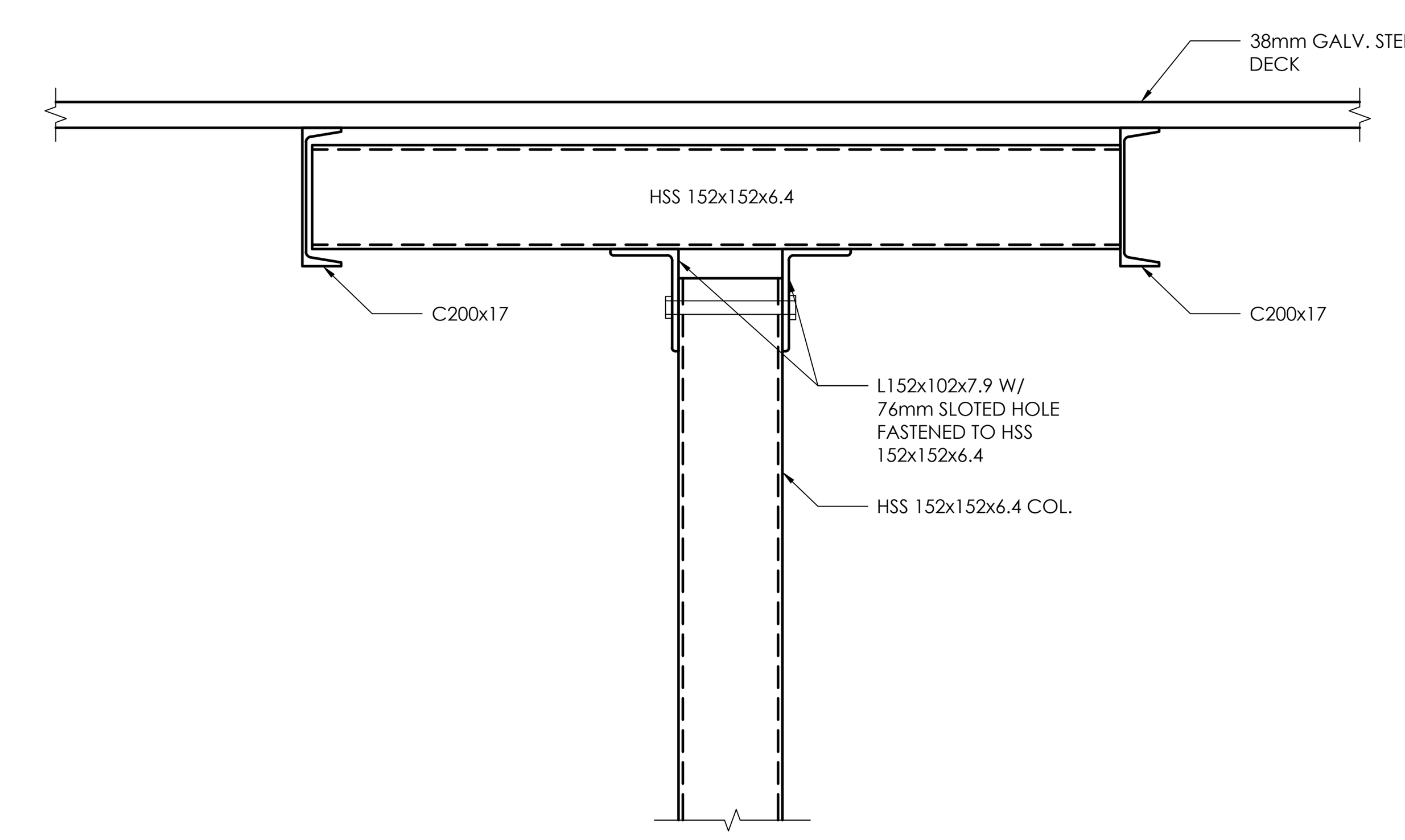
S2.2



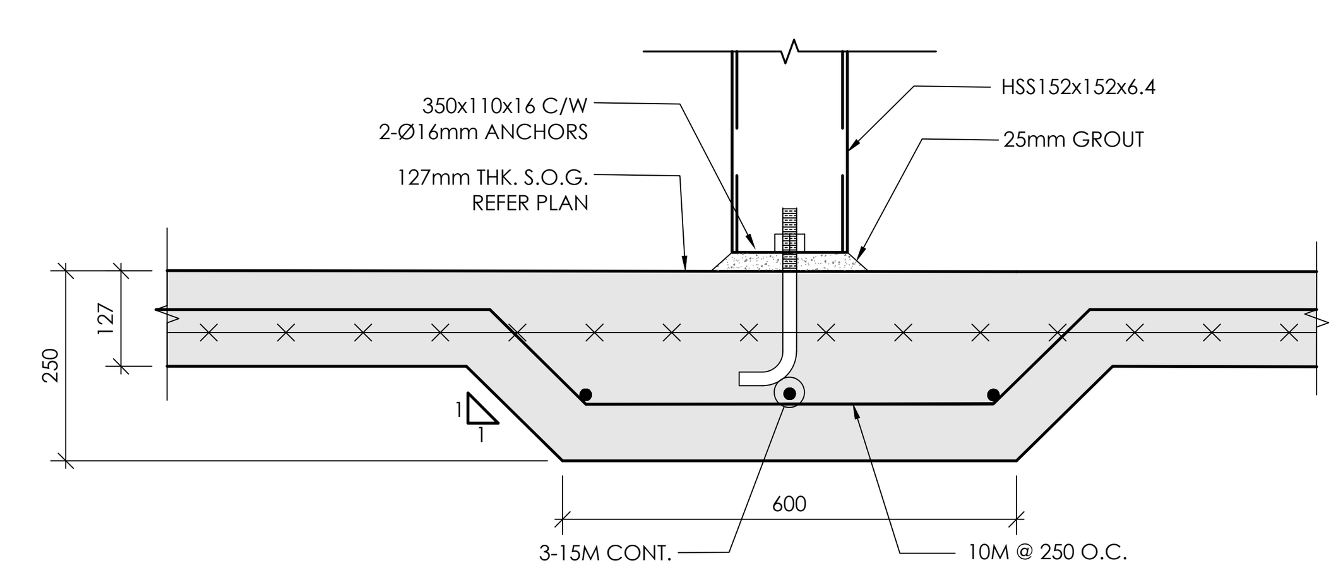
1 S3.1 WALL SECTION 1:20



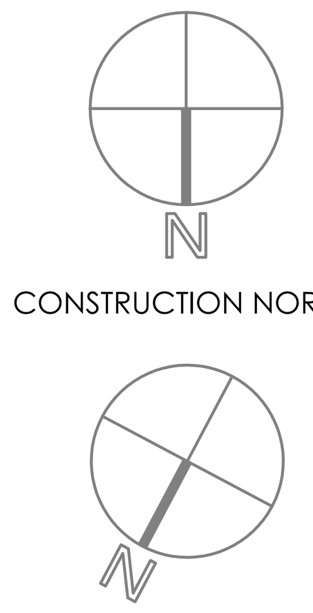
2 S3.1 WALL SECTION 1:20



4 S3.1 COLUMN LATERAL SUPPORT 1:10



3 S3.1 COLUMN SLAB THICKENING 1:10



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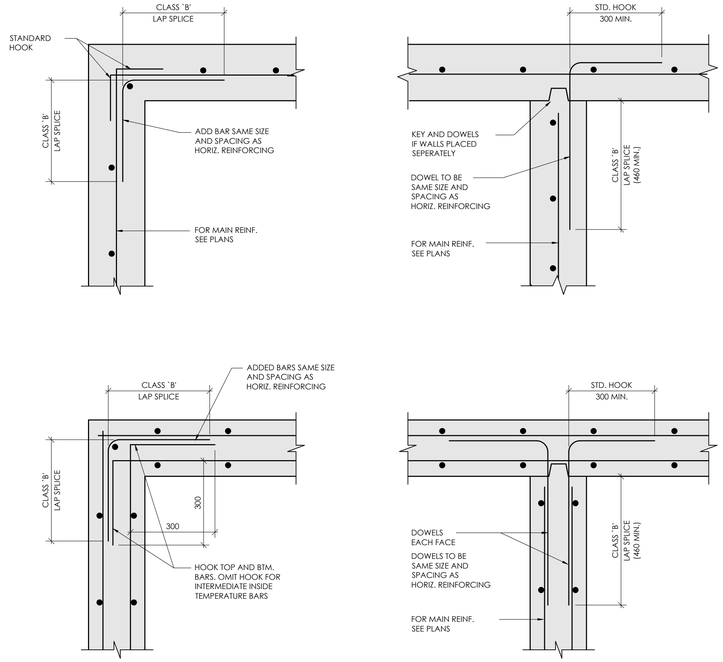
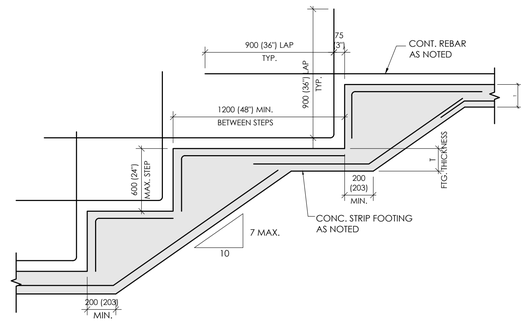
SECTIONS

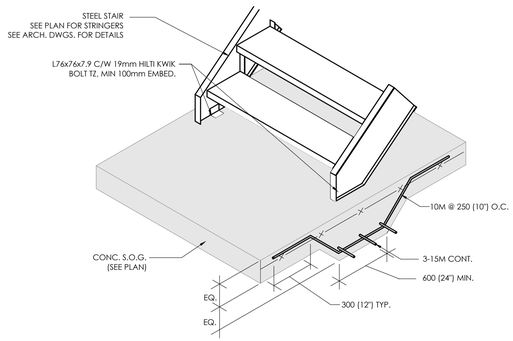
S3.1



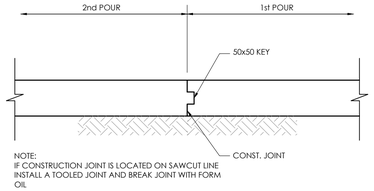
1 S4.1 TYP. HORIZ. CORNER REINFORCING FOR WALLS
1:10



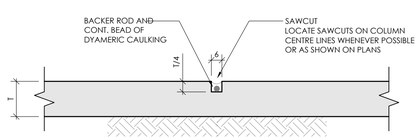
2 S4.1 TYP. STEPPED FOOTING
1:20



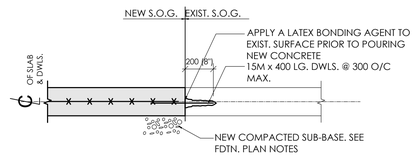
2 S4.1 TYP. FOUNDATION - SLAB THICKENING AT STAIRS
1:20



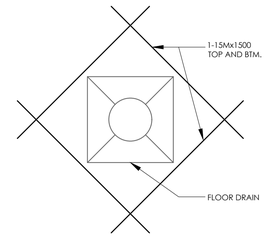
4 S4.1 TYP. CONSTRUCTION JOINT IN S.O.G
1:10



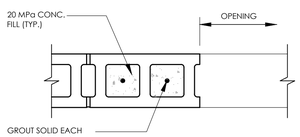
5 S4.1 TYP. SAWCUT CONTROL JOINT IN S.O.G
1:10



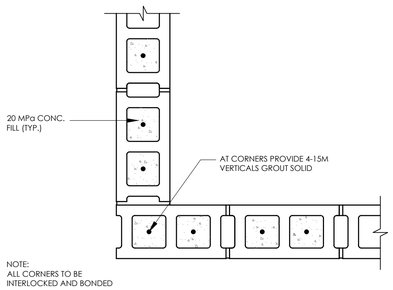
6 S4.1 NEW SLAB TO EXISTING SLAB DETAIL
1:20



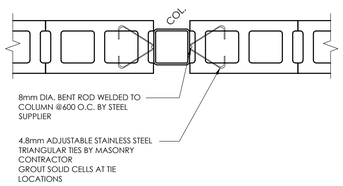
7 S4.1 TYP. FLOOR DRAIN
1:10



8 S4.1 TYP. BLOCKWALL CORNERS
1:10



9 S4.1 TYP. BLOCKWALL AT OPENINGS
1:10



10 S4.1 TYP. COLUMN STRAPPING DETAIL
1:10

NOTES

1. ⍑ DENOTES 19mmØ PUDDLE WELDS

2. PROVIDE WELDS SHOWN AT ENDS OF ALL SHEETS AND AT ALL INTERMEDIATE SUPPORTS

3. CLINCH SIDE LAPS @ 400mm O.C. MAX.

4. PERIMETER WELDS @ 450mm O.C.

11 S4.1 TYP. DECK WELDING
1:5

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No.	Revisions:	Date:
1	Issued For Permit	2023-01-20
2	Issued For Tender	2025-02-10

MPI Project No: 21-153
Scale: As Shown
Drawn by: AB
Plot Date: SEPT. 21, 2022
Issue Date:

PRESCHOOL DAY CARE ADDITION
Ecole elementaire catholique
Saint-Marguerite-Bourgeoys
60 Clench Avenue, Brantford, Ontario N3T 1B9

TYPICAL DETAILS

S4.1

MECHANICAL DRAWING LIST

M0.1	GENERAL NOTES, DRAWING LIST & LEGENDS
M0.2	SPECIFICATIONS
M0.3	SPECIFICATIONS
M0.4	SPECIFICATIONS
M0.5	SPECIFICATIONS
M0.6	SPECIFICATIONS
M1.1	GROUND FLOOR PROPOSED PLUMBING, SANITARY, & FIRE PROTECTION PLAN
M1.2	GROUND FLOOR PROPOSED STORM PLAN
M2.1	GROUND FLOOR PROPOSED HVAC PLAN
M2.2	ROOF LEVEL PROPOSED PLAN
M3.1	MECHANICAL DETAILS
M3.2	MECHANICAL DETAILS
M3.3	MECHANICAL DETAILS AND SCHEDULES
M3.4	SCHEDULES

GENERAL NOTES

1. REFER TO SITE AND OWNER INSTRUCTIONS FOR PHASING AND STAGING.
2. THE CONTRACTOR SHALL CO-ORDINATE WITH THE STRUCTURAL TO PROVIDE OPENINGS AND SLEEVES THROUGH STRUCTURAL ELEMENTS WHERE REQUIRED.
3. PENETRATIONS OF CONCRETE SHALL BE SAW-CUT OR CORE BORED-IMPACT HAMMERS ARE NOT ALLOWED, SEAL ALL DUCTWORK & SLEEVES TO PREVENT LEAKAGE THRU FLOOR.
4. DO NOT SCALE DRAWINGS FOR INSTALLATION PURPOSES. OBTAIN ALL DIMENSIONS FROM ARCHITECTURAL PLANS, MANUFACTURER'S SHOP DRAWINGS, AND ON SITE INSPECTIONS.
5. MECHANICAL, DIV. 2-14 AND ELECTRICAL TRADES SHALL WORK IN CONJUNCTION WITH ONE ANOTHER SO AS TO AVOID INTERFERENCE'S BETWEEN PIPING, DUCTWORK, CONDUIT, LIGHTING FIXTURES, ETC.
6. WORK SHALL BE CO-ORDINATED THROUGH THE GENERAL CONTRACTOR PRIOR TO INSTALLATION OF ANY EQUIPMENT, DUCTWORK AND CONTROLS. CO-ORDINATE WITH ARCHITECTURAL ELEVATIONS FOR ARCHITECTURAL, MECHANICAL, AND ELECTRICAL SPACE ALLOCATIONS.
7. PROPERLY SUPPORT CEILING MOUNTED EQUIPMENT AND ANY OTHER EQUIPMENT INDEPENDENT OF CEILING SUPPORT SYSTEM. REFER TO ARCHITECTURAL DETAILS AND CO-ORDINATE WITH STRUCTURAL TRADE.
8. REFER TO ARCHITECTURAL FOR OWNER SUPPLIED EQUIPMENT. CONFIRM ALL MECHANICAL REQUIREMENTS AND PROVIDE TO SUIT.
9. REVIEW ARCHITECTURAL, ELECTRICAL, AND STRUCTURAL DRAWINGS AND PROVIDE ON SITE INSPECTIONS TO DETERMINE FULL EXTENT OF PROJECT PRIOR TO SUBMITTING BID.
10. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING ALL MECHANICAL SERVICES TO THE OCCUPIED AREA THROUGHOUT THE PHASING OF THE WORK. PROVIDE CONSTRUCTION VALVES, TEMPORARY DUCTWORK AND PIPING AS REQUIRED TO LIMIT THE SHUT DOWN OF SERVICES TO ONE TIME.
11. EXISTING MECHANICAL SERVICES SHOWN ON THESE DRAWINGS WERE TAKEN FROM THE ORIGINAL CONTRACT DRAWINGS AS LISTED BELOW. THE CONTRACTOR SHALL VERIFY EXACT SIZE AND LOCATION OF ALL EXISTING SERVICES ON SITE AND SHALL REMOVE ALL REDUNDANT SERVICES IN THE AREAS OF CONSTRUCTION.
12. ALL DRAWINGS ARE INTEGRATED WITH THE SPECIFICATIONS WHICH ACCOMPANY THEM. NEITHER IS TO BE USED ALONE. ANY ITEM OR SUBJECT OMITTED FROM ONE BUT IMPLIED IN THE OTHER IS FULLY AND PROPERLY REQUIRED. WHEREVER DIFFERENCE OCCURS, THE MOST ONEROUS CONDITION GOVERNS.
13. PENETRATIONS OF EITHER FIRE OR SMOKE BARRIER RESISTANT WALLS SHALL BE SLEEVED & SEALED AGAINST THE PASSAGE OF FLAME OR SMOKE W/SUITABLE NON-COMBUSTIBLE MATERIALS EQUAL TO THE CONSTRUCTION TO BE PENETRATED.
14. AVOID ANY DIRECT CONTACT BETWEEN ANY PIPING, DUCTING AND ELECTRICAL CONDUIT SYSTEMS. TO PREVENT SOUND TRANSMISSION.
15. IF ANY AREAS ARE AFFECTED BY THE NEW SCOPE OF WORK, CONTRACTOR TO CARRY COSTS FOR THE REMOVAL AND INSTALLATION OF THE EXISTING CEILING TILES. REFER TO ARCHITECTURAL NEW REFLECTED CEILING PLAN FOR SCOPE OF NEW CEILING.
16. INSTALLATION SHALL BE COMPLETE AND FULLY FUNCTIONAL. PROVIDE ALL LABOR, MATERIALS, TOOLS, SERVICES, EQUIPMENT, ETC. AS REQUIRED.
17. PROVIDE ACCESS FOR SERVICING EQUIPMENT AS INDICATED, AS REQUIRED BY CODE AND AS RECOMMENDED BY THE MANUFACTURER.
18. PROVIDE ACCESS DOORS AS NECESSARY FOR ACCESS TO VALVES, DAMPERS, AND OTHER COMPONENTS REQUIRING MONITORING, INSPECTION, AND MAINTENANCE.
19. INSTALL EQUIPMENT, DUCTS, AND PIPES PARALLEL TO OR PERPENDICULAR TO BUILDING LINES. PROVIDE SPACE, UNIONS AND FLANGES FOR DISASSEMBLY, SERVICING AND REMOVAL OF EQUIPMENT.
20. THE CONTRACTOR SHALL, WITH APPROVAL OF THE OWNER AND AT NO ADDITIONAL CONTRACT COST, REMOVE, REARRANGE AND/OR RELOCATE ANY OBSTRUCTIONS WHICH INTERFERE WITH INSTALLATION OF NEW WORK.
21. ALL SHUTDOWN OF ANY PORTION OF EXISTING BUILDING SYSTEMS SHALL BE PERFORMED WITH THE OWNER'S CONSENT. THE CONTRACTOR SHALL COORDINATE WITH THE OWNER FOR TIME AND DURATION OF SERVICE INTERRUPTIONS. INCLUDE COST OF PREMIUM TIME IN THE CONTRACT PRICE FOR WORK PERFORMED DURING NIGHTS, WEEK-ENDS OR OTHER TIME OUTSIDE NORMAL WORKING HOURS AS NECESSARY TO MAINTAIN MECHANICAL SERVICES IN OPERATION.
22. WHEN A CONFLICT OCCURS BETWEEN INSTALLATION DETAILS, DIAGRAMS, ETC. INDICATED IN THE CONTRACT DOCUMENTS AND MANUFACTURER'S INSTALLATION INSTRUCTIONS, THE MANUFACTURER'S INSTRUCTIONS SHALL GOVERN AND SHALL BE FOLLOWED.
23. ALL INSTALLATIONS SHALL BE IN ACCORDANCE WITH CODES, APPLICABLE STANDARDS, BULLETINS ETC., AND REQUIREMENTS OF ALL INSPECTION AUTHORITIES FOR THE CITY OF BRANTFORD.
24. DUE TO INCONSISTENT RECORD OF EXISTING SERVICES NOT ALL SERVICES MAY BE SHOWN, OR IF SHOWN MAY NOT BE ACCURATE. IT IS CONTRACTORS RESPONSIBILITY TO FIELD CONFIRM ALL SERVICES.
25. CONTRACTOR IS TO VERIFY CONNECTION POINTS TO EXISTING SERVICES ON SITE.
26. CHECK AND VERIFY LOCATION OF ALL PIPES, DUCTS AND EQUIPMENT WITH ALL OTHER TRADES TO PREVENT INTERFERENCE. REMOVAL OR RELOCATION OF ANY SUCH WORK INTERFERING WITH WORK OF OTHER TRADES IS THE RESPONSIBILITY OF THE MECHANICAL TRADE CONCERNED UNLESS OTHERWISE APPROVED IN WRITING.
27. PROVIDE ACCESS DOOR FOR ALL VALVES LOCATED ABOVE DRY WALL CEILING.
28. IN ALL INSTANCES THE NEED FOR ACCESS DOOR IN GWB CEILINGS SHOULD BE AVOIDED IF POSSIBLE. WHERE INSTALLATION OF COMPONENTS WHICH REQUIRE ACCESS CANNOT BE AVOIDED, SUBMIT (DIMENSIONED) LAYOUT ON ARCHITECTURAL REFLECTED CEILING PLANS TO CONSULTANTS FOR APPROVAL PRIOR TO INSTALLATION OF COMPONENT.
29. BEFORE CUTTING ANY HOLES THROUGH THE EXISTING SLAB REFER TO STRUCTURAL DRAWINGS FOR GENERAL REQUIREMENTS.
30. PROVIDE SIGN IDENTIFYING LOCATION OF ALL VALVES INSTALLED IN CEILING SPACE.

GENERAL DEMOLITION NOTES

1. CONTRACTOR IS TO ENSURE THAT ALL EXISTING PIPING SERVING EXITING AREAS REMAIN IN SERVICE UNTIL THESE AREAS ARE RECONNECTED TO NEW SERVICES. ONLY THEN OBSOLETE PIPING IS TO BE REMOVED AS SHOWN.
2. ALL DISTURBED SURFACES AFTER PIPE REMOVAL OR REROUTING TO BE FILLED-IN WITH APPROPRIATE MATERIAL TO MAINTAIN FIRE SEPARATION AND PATCHED TO MATCH EXISTING OR NEW.
3. CONTRACTOR IS TO ENSURE THAT ALL EXISTING REMOVED FIXTURES AND EQUIPMENT REMAIN THE PROPERTY OF THE OWNER AND ALL EFFORTS SHOULD BE MADE TO REUSE THESE IN THE TEMPORARY RELOCATION PROJECT.
4. AFTER PIPE/DUCT REMOVAL ALL EXISTING OPENINGS IN FIRE SEPARATION ARE TO BE FILLED-IN TO MAINTAIN INTEGRITY OF THAT FIRE SEPARATION.

PLUMBING NOTES

1. CONTRACTOR IS TO CLEAR EXISTING DUCTWORK WHEN INSTALLING NEW PIPING. CLEARANCES TO BE VERIFIED ON SITE.
2. PROVIDE A CLEANOUT AT THE BOTTOM OF EVERY SOIL AND WASTE STACK THAT CONNECTS TO A HORIZONTAL DRAINAGE PIPE.
3. PROVIDE A CLEANOUT FROM EACH PLUMBING FIXTURE WHERE REQUIRED BY ONTARIO BUILDING CODE, PART 7 - PLUMBING.
4. ALL PLUMBING FIXTURES INCLUDING FLOOR DRAINS (HUB, FUNNEL FLOOR DRAINS) TO BE TRAPPED AND VENTED AS REQUIRED BY ONTARIO BUILDING CODE, PART 7 - PLUMBING.
5. FOR MOUNTING HEIGHT OF ALL PLUMBING FIXTURES REFER TO ARCHITECTURAL DRAWINGS.
6. PROVIDE ACCESS DOOR FOR ALL CLEANOUTS LOCATED ABOVE DRY WALL CEILING.
7. CONTRACTOR IS TO REMOVE ALL OBSOLETE PIPING WHEREVER POSSIBLE.
8. CONTRACTOR IS TO ENSURE THAT ALL EXISTING PIPING SERVING EXISTING AREAS REMAIN IN SERVICE UNTIL THESE AREAS ARE RECONNECTED TO NEW SERVICES. ONLY THEN OBSOLETE PIPING IS TO BE REMOVED AS SHOWN.
9. RECONNECT VENTS FROM EXISTING EQUIPMENT AND PLUMBING FIXTURES WHICH ARE TO REMAIN TO NEW VENTS AS REQUIRED.
10. WHENEVER COLD AND HOT WATER DISTRIBUTION TO LAVATORIES IS TO RUN UNDER COUNTER, PIPING DISTRIBUTION IS TO BE INSTALLED AS TIGHT TO UNDER SIDE OF THE COUNTER AS POSSIBLE.
11. ALL WATER, SANITARY, SEWER AND VENT COPPER PIPING WITH SOLDER JOINTS SHALL BE LEAD FREE. DO NOT INSTALL WATER LINES IN OUTSIDE WALL WHERE THEY MAY FREEZE, UNLESS BOTH THE WALL AND THE PIPES ARE PROPERLY INSULATED.
12. INSTALL SHUT-OFF VALVES AT EACH PLUMBING FIXTURE.
13. DEMOLITION AND REMOVAL OF PLUMBING AND DRAINAGE PIPING SHALL BE TAKEN BACK TO THE NEAREST WORKING MAIN AND BE CAPPED AS CLOSE TO THE WORKING MAIN AS POSSIBLE TO AVOID DEAD LEG LENGTHS OF PIPING. REFER TO CSA CODE Z317. SPECIAL REQUIREMENTS FOR PLUMBING INSTALLATIONS IN HEALTH CARE FACILITIES 6.4.1.3

FIRE PROTECTION NOTES

1. SPRINKLER CONTRACTOR IS RESPONSIBLE FOR DESIGN OF SPRINKLER SYSTEM IN STRICT ACCORDANCE WITH THE ONTARIO BUILDING CODE, ALL APPLICABLE NFPA STANDARDS, THE REQUIREMENTS OF THE OWNER'S INSURANCE UNDERWRITERS ENGINEERING AUTHORITY (O.I.U.E.A.) AND AUTHORITIES HAVING JURISDICTION.
2. THE CONTRACTOR SHALL COORDINATE THE INSTALLATION WITH THE WORK OF OTHER TRADES. PROVIDE HORIZONTAL AND/OR VERTICAL OFFSETS AS REQUIRED TO SUIT THIS COORDINATION.
3. PROVIDE ADDITIONAL SPRINKLER HEADS AS REQUIRED TO SUIT OBSTRUCTIONS GREATER THAN 1200mm (48") [I.E.: DUCTWORK, BULKHEADS, ETC.].
4. CONTRACTOR SHALL PAY ALL FEES, CHARGES AND COSTS REQUIRED FOR REVIEWS, INSPECTIONS, TESTS OR COMMENTS IN REGARDS TO THIS PROJECT.
5. THE SPRINKLER LAYOUT SHOWN ON THESE DRAWINGS SERVE AS A GENERAL SCOPE OF WORK. THE SPRINKLER CONTRACTOR SHALL MAKE ALL MODIFICATIONS TO THE DESIGN TO COMPLY WITH AUTHORITIES REQUIREMENTS AND TO THE ARCHITECT'S APPROVAL. SPRINKLER HEADS MAY BE ADDED OR DELETED TO PROVIDE ADEQUATE COVERAGE AS DETERMINED BY THE SPRINKLER CONTRACTOR AT NO EXTRA OR CREDIT TO THE CONTRACT, PROVIDED ALL APPROVALS ARE MET IN FULL COORDINATION MECHANICAL, ELECTRICAL, STRUCTURAL AND ARCHITECTURAL ELEMENTS OF THE BUILDINGS.
6. FOR FINAL COORDINATION OF SPRINKLER LAYOUT REFER TO ARCHITECTURAL REFLECTED CEILING PLAN.
7. SPRINKLER CONTRACTOR IS TO SUBMIT LAYOUT OF SPRINKLER HEAD LOCATIONS TO ARCHITECT AND CONSULTANTS FOR REVIEW.
8. IN "T" BAR CEILING LOCATE SPRINKLERS CENTERED LENGTHWISE WITH TILE, AT LEAST 6" FROM "T".
9. PROVIDE WIRE GUARDS ON ALL SPRINKLERS IN MECHANICAL AND ELECTRICAL ROOMS.

LEGEND - FIRE PROTECTION

THIS LEGEND OF SYMBOLS REPRESENTS MANTECON PARTNERS INC. STANDARD/GENERIC LEGEND. ALL SYMBOLS MAY NOT APPEAR ON DRAWINGS.

REFER	DESCRIPTION
E	EXISTING PIPING
F	STANDPIPE PIPING
SP	SPRINKLER PIPING
DF	DRY STANDPIPE PIPING
DSP	DRY SPRINKLER PIPING
F-FDC	STANDPIPE FIRE DEPARTMENT CONNECTION PIPING
SP-FDC	SPRINKLER FIRE DEPARTMENT CONNECTION PIPING
ESV	ELECTRICALLY SUPERVISED VALVE
D/T	DRAIN/TEST VALVE
FS	FLOW SWITCH
FH	FIRE HYDRANT
	FIRE DEPARTMENT PUMPER CONNECTION
FHC	FIRE HOSE CABINET - SURFACE MOUNTED
FHC	FIRE HOSE CABINET - SEMI RECESSED
SCC	SPRINKLER CONTROL CABINET
FEX	FIRE EXTINGUISHER - SURFACE MOUNTED
FEC	FIRE EXTINGUISHER - CABINET
SFEC	SECURE FIRE EXTINGUISHER CABINET
	SPRINKLER HEAD - PENDENT
	SPRINKLER HEAD - UPRIGHT
	SPRINKLER HEAD - PENDENT c/w WIRE GUARD
	SPRINKLER HEAD - UPRIGHT c/w WIRE GUARD
	SPRINKLER HEAD - SIDEWALL
	SPRINKLER HEAD - SIDEWALL c/w WIRE GUARD
	SPRINKLER HEAD - PENDENT SIDEWALL
HT	SPRINKLER HEAD - HIGH TEMPERATURE PENDENT
HT	SPRINKLER HEAD - HIGH TEMPERATURE UPRIGHT
D	SPRINKLER HEAD - DRY PENDENT

DRAWING NOTES

(1) ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE NATIONAL BUILDING CODE, NFPA STANDARDS NO,'s 10, 13, & 14 AND TO THE LOCAL AUTHORITIES REQUIREMENTS.

(2) THE CONTRACTOR SHALL COORDINATE THE INSTALLATION WITH THE WORK OF OTHER TRADES. PROVIDE HORIZONTAL AND/OR VERTICAL OFFSETS AS REQUIRED TO SUIT THIS COORDINATION.

(3) PROVIDE ADDITIONAL SPRINKLER HEADS AS REQUIRED TO SUIT OBSTRUCTIONS GREATER THAN 1200mm (48") [I.E.: DUCTWORK, BULKHEADS, ETC.].

GENERAL SITE SERVICE NOTES

1. CONTRACTOR IS TO VERIFY LOCATIONS OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION.
2. ALL EXISTING UTILITIES AND SERVICES ARE TO BE MAINTAINED AND SUPPORTED BY THE CONTRACTOR TO THE SATISFACTION OF THE OWNER OF THE UTILITY.

HVAC NOTES

1. REFER TO ARCHITECTURAL REFLECTED CEILING PLAN FOR CO-ORDINATION OF GRILLES, DIFFUSERS AND OTHER ELEMENTS.
2. CONTRACTORS SHALL COORDINATE ALL CEILING FINISHES WITH OWNER AND MATCH EXISTING. CONTRACTOR SHALL REVIEW MECHANICAL DRAWINGS, ARCHITECTURAL REFLECTED CEILING PLANS AND ARCHITECTURAL ROOM FINISH SCHEDULES AS SOON AS CONTRACT DOCUMENTS ARE SIGNED. ADVISE CONSULTANT OF ANY CONFLICTS BETWEEN CEILING TYPE AND DIFFUSER/GRILLE TYPE.
3. THE CONTRACTOR SHALL VERIFY ALL CEILING FINISHES WITH ARCHITECTURAL DRAWINGS. CONTRACTOR AND DIFFUSER/GRILLE SUPPLIER ARE RESPONSIBLE TO PROVIDE ALL PLASTER AND FINISHING FRAMES, MOUNTING HARDWARE, AND ACCESSORIES TO SUIT ARCHITECTURAL CEILING TYPES. MECHANICAL CONTRACTOR SHALL CO-ORDINATE AND PROVIDE DETAILS OF MOUNTING REQUIREMENTS OF DIFFUSERS AND GRILLES IN DRYWALL CEILINGS TO DRYWALL TRADE AND ENSURE EDGES OF OPENINGS ARE FRAMED BY DRYWALL TRADE TO SUPPORT DIFFUSERS AND GRILLES PROPERLY. DIFFUSERS AND GRILLES MUST NOT BE SUPPORTED SOLELY BY HANGER WIRES.
4. CONTRACTOR TO CARRY FOR ADDITIONAL DUCTS AND DUCT FITTING REQUIRED TO CLEAR THE INTERFERENCES IN THE CEILING SPACE.
5. ALL NEW DUCTWORK TO BE CLEANED.
6. ALL DUCTWORK FITTINGS SHALL BE RIGID GALVANIZED IRON.
7. CONTRACTOR TO TAKE ALL MEASUREMENTS NECESSARY TO DETERMINE CURRENT SYSTEMS PERFORMANCE IN AREAS THAT WILL CONTINUE TO BE SERVED BY EXISTING AIR HANDLING EQUIPMENT AND SHALL REPORT ALL MEASUREMENTS MADE PRIOR TO START OF DEMOLITION.
8. ON COMPLETION OF DUCT ALTERATIONS, AIR BALANCE TECHNICIAN SHALL REBALANCE ALL EXISTING SYSTEMS TO DELIVER PRE-CONSTRUCTION FLOWS.
9. WHERE MODIFICATIONS HAVE BEEN DONE TO THE HEATING WATER CIRCUITS CONTRACTOR MUST REBALANCE THE AFFECTED PARTS.

LEGEND - HVAC - AIR DISTRIBUTION

THIS LEGEND OF SYMBOLS REPRESENTS MANTECON PARTNERS INC. STANDARD/GENERIC LEGEND. ALL SYMBOLS MAY NOT APPEAR ON DRAWINGS.

REFER	DESCRIPTION
	POSITIVE PRESSURE (SUPPLY) DUCT UP
	POSITIVE PRESSURE (SUPPLY) DUCT UP
	NEGATIVE PRESSURE (RETURN) DUCT UP
	POSITIVE PRESSURE (SUPPLY) DUCT DOWN
	POSITIVE PRESSURE (SUPPLY) DUCT DOWN
	NEGATIVE PRESSURE (RETURN) DUCT DOWN
	EXISTING DUCTWORK TO BE REMOVED
	EXISTING DUCTWORK TO REMAIN
	NEW DUCTWORK
	FLEXIBLE DUCTWORK APPROVAL REQ. FOR USE (5'-0" MAX)
	DOUBLE WALL INSULATED DUCTWORK
	DUCT IN FIREPROOF ENCLOSURE
	CROSSHATCHING ON DUCTWORK INDICATES 1"(25mm) DUCT LINING AS SPECIFIED.
	DUCTWORK WITH INSULATION
	SUPPLY AIR DIFFUSER (SQUARE)
	SUPPLY AIR DIFFUSER (LAMINAR FLOW)
	SHADING INDICATES DIFFUSER TO HAVE A BLANK OFF PANEL
	LINEAR OR SLOT DIFFUSER WITH PLENUM
	SUPPLY AIR DIFFUSER (ROUND)
	SIDEWALL GRILLE
	RETURN/EXHAUST GRILLE
	FULL RADIUS DUCT CONNECTION
	TAP-IN DUCT CONNECTION
	ROUND DUCT CONNECTION
	TURNING VANES
FD	FIRE DAMPER
EXFD	EXISTING FIRE DAMPER
RFD	REMOVE FIRE DAMPER
FD/SD	FIRE DAMPER/SMOKE DAMPER
CFD	CEILING FIRE DAMPER
MD	MOTORIZED DAMPER
EXMD	EXISTING MOTORIZED DAMPER
VD	VOLUME DAMPER
BD	BALANCING DAMPER
OBBD	OPPOSED BLADE BALANCING DAMPER
OED	OPEN ENDED DUCT
ERC	EXISTING ELECTRIC REHEAT COIL
N.I.C.	NOT IN CONTRACT
T	THERMOSTAT
T RAT	REVERSE ACTING THERMOSTAT
	THERMOSTAT c/w TAMPERPROOF COVER
H	HUMIDISTAT
S	SPEED CONTROLLER
O/U	OCCUPIED/UNOCCUPIED SWITCH
UC	U/C UNDERCUT
CAP	CAP
	HOT WATER CEILING PANEL RADIATION
	HOT WATER PANEL RADIATION
	HOT WATER REHEAT COIL
	OPENNING ABOVE CEILING
	CROSS TALK SILENCER
	SILENCER
EXS CFM	INDICATES EXISTING SUPPLY AIR OUTLET
EXR CFM	INDICATES EXISTING RETURN AIR OUTLET
EXV CFM	INDICATES EXISTING VAV BOX
S CFM	INDICATES NEW SUPPLY AIR OULET
R CFM	INDICATES NEW RETURN AIR OULET
REB CFM	INDICATES EXISTING SUPPLY/RETURN AIR OUTLET TO BE RE-BALANCED TO AIR FLOW INDICATED
V CFM	INDICATES NEW VAV BOX

DIFFUSER / GRILLE
- TYPE
- SIZE (IN)
- AIR FLOW (CFM)

LEGEND - PLUMBING

THIS LEGEND OF SYMBOLS REPRESENTS MANTECON PARTNERS INC. STANDARD/GENERIC LEGEND. ALL SYMBOLS MAY NOT APPEAR ON DRAWINGS.

REFER	DESCRIPTION
E	EXISTING PIPING
A	ABANDONED PIPING
	DOMESTIC COLD WATER PIPING
	DOMESTIC HOT WATER PIPING
	DOMESTIC HOT WATER RECIRC. PIPING
ROS	REVERSE OSMOSIS SUPPLY PIPING
ROR	REVERSE OSMOSIS RETURN PIPING
S	COLD SOFT WATER PIPING
V	VENT PIPING
	SANITARY PIPING ABOVE FLOOR
	SANITARY PIPING BELOW GRADE OR FLOOR
S	STORM PIPING ABOVE FLOOR
S	STORM PIPING BELOW GRADE OR FLOOR
AW	ACID WASTE PIPING
AV	ACID VENT PIPING
CS	COMBINED SEWER PIPING
C	CONDENSATE PIPING
PC	PUMPED CONDENSATE PIPING
PD	PUMPED DISCHARGE PIPING
T	TEMPERED WATER PIPING
FM	FORCEMAIN PIPING
G	GAS PIPING
CA	COMPRESSED AIR PIPING
NP	NON PORTABLE PIPING FOR IRRIGATION SYSTEM
GW	GRAY WATER PIPING
	PIPING TO BE REMOVED
	HEAT TRACED PIPING
E	CONNECTION OF NEW AND EXISTING PIPING
	CAPPED PIPE
FD	FLOOR DRAIN
FFD	FUNNEL FLOOR DRAIN
HD	HUB DRAIN
AD	AREA DRAIN
FS	FLOOR SINK DRAIN
RD	ROOF DRAIN
RD	ROOF DRAIN ABOVE
CD	CANOPY DRAIN
BD	BALCONY DRAIN
	ELEVATOR PIT DRAIN c/w BACK WATER VALVE
CO	CLEANOUT IN FLOOR
CO	CLEANOUT IN LINE OR STACK
M	WATER METER
M	GAS METER
NFWH	NON-FREEZE WALL HYDRANT c/w VACUUM BREAKER
HB	HOSE BIBB c/w VACUUM BREAKER
	ISOLATION VALVE
	THROTTLING VALVE
	CHECK VALVE
	RESILIENT CHECK VALVE
	CHECK VALVE c/w BALL DRIP VALVE
	STRAINER
	GAS VALVE
RPBP	REDUCED PRESSURE BACKFLOW PREVENTER
DCAP	DUAL CHECK W/ ATOMSPHERIC PORT BACKFLOW PREVENTER
PVB	VACUUM BREAKER - PRESSURE TYPE
PRV	PRESSURE REDUCING VALVE (WATER)
VTR	VENT THROUGH ROOF
	3-WAY VALVE
	TEMPERATURE & PRESSURE RELIEF VALVE
	CONTROL VALVE
	UNION
PG	PRESSURE GAUGE
T	THERMOMETER
	PUMP
	PIPE DOWN
	PIPE UP
	PIPE UP & DOWN
	PIPE TEE
E	DENOTES EXISTING

CONSTRUCTION NORTH

TRUE NORTH

MANTECON PARTNERS
STRUCTURAL MECHANICAL ELECTRICAL CIVIL ENGINEERS
15 Foundry Street, Dundas, ON, L9H 2V6
Phone: (905)648-0373
www.manteconpartners.com

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MPI Project No: 21-153
Scale: As Shown
Drawn by: MZE
Plot Date: FEB. 11, 2022
Issue Date:

PRESCHOOL DAY CARE ADDITION
Ecole elementaire catholique Saint-Marguerite-Bourgeoys
60 Clench Avenue, Brantford, Ontario N3T 1B9

GENERAL NOTES

M0.1

MECHANICAL SPECIFICATIONS - GENERAL 21-153

ABBREVIATED SPECIFICATION DESCRIBES SOME EQUIPMENT AND MATERIALS TO BE INCLUDED IN THE WORK. ONLY FIRST-CLASS WORKMANSHIP, MATERIALS AND PRACTICES WILL BE ACCEPTED. THE STANDARDS TO BE MET ARE FULLY DESCRIBED IN THE MASTER SPECIFICATIONS OF MANTECON PARTNERS INC. AND ARE AVAILABLE FOR REFERENCE AT THEIR MAIN OFFICE.

1. GENERAL REQUIREMENTS

1.1. READ AND CONFORM TO:

1.1.1. THE CONTRACT CCDC 2, STIPULATED PRICE CONTRACT AS AMENDED.

1.1.2. DIVISION 1 REQUIREMENTS AND DOCUMENTS REFERRED TO THEREIN.

1.2. THE SPECIFICATIONS ARE INTEGRAL WITH THE DRAWINGS WHICH ACCOMPANY THEM. DO NOT USE EITHER ALONE. ANY ITEM OR SUBJECT OMITTED FROM ONE BUT IMPLIED IN THE OTHER IS FULLY AND PROPERLY REQUIRED.

1.3. WHEREVER DIFFERENCES OCCUR IN THE TENDER DOCUMENTS, THE MOST ONEROUS CONDITION GOVERNS. BASE THE BID ON THE COSTLIEST ARRANGEMENT.

1.4. PROVIDE A 50% PERFORMANCE BOND AND A 50% LABOUR AND MATERIALS PAYMENT BOND. IN ADDITION, ENSURE SUB-CONTRACTORS EMPLOYED TO UNDERTAKE ANY PART OF THE WORK THAT IS $50,000.00 OR GREATER IN CONTRACT VALUE PROVIDE A 50% PERFORMANCE BOND AND A 50% LABOUR AND MATERIALS BOND TO THE PARTY THEY ARE IN CONTRACT WITH.

1.5. CONFORM TO THE LATEST EDITION OF ONTARIO BUILDING CODE (CSA STANDARDS), ONTARIO FIRE CODE, LOCAL & DISTRICT BYLAWS, REGULATIONS, & PUBLISHED ENGINEERING STANDARDS.

1.6. NOTIFY CONSULTANT UPON DISCOVERY OF CONDITIONS WHICH ADVERSELY AFFECT WORK OF THIS DIVISION. NO ALLOWANCE WILL BE MADE AFTER LETTING OF CONTRACT FOR ANY EXPENSES INCURRED THROUGH FAILURE TO DO SO.

1.7. APPLY FOR & OBTAIN PERMITS INCLUDING BUILDING PERMITS, & TSSA APPLICATIONS, LICENSES, OR CERTIFICATES NECESSARY FOR THE PERFORMANCE OF THE WORK. COORDINATE WORK WITH BUILDING OFFICIALS & AUTHORITIES HAVING JURISDICTION. MAKE MODIFICATIONS REQUIRED BY AUTHORITIES.

1.8. ENSURE TRADESMEN EMPLOYED ON THE PROJECT SHALL HOLD VALID TRADE CERTIFICATES/LICENSES AND HAVE A COPY AVAILABLE FOR REVIEW BY THE CONSULTANT AND/OR OWNER WHEN REQUESTED.

1.9. EXTRAS: PROVIDE DETAILED BREAKDOWNS INCLUDING MATERIALS QUOTATIONS FROM SUPPLIERS, HOURS OF WORK AND HOURLY LABOUR RATES. QUOTATIONS FROM SOFTWARE SUCH AS ALLPRISER WILL NOT BE ACCEPTED.

1.10. THE DIVISION OF WORK AMONG SUBCONTRACTORS IS NOT THE CONSULTANT'S RESPONSIBILITY AND THE CONSULTANT ASSUMES NO RESPONSIBILITY TO ACT AS AN ARBITER AND/OR TO ESTABLISH SUBCONTRACT LIMITS BETWEEN ANY PORTIONS OR SECTIONS OF THE WORK.

2. SCOPE OF WORK

2.1. PROVIDE PRODUCTS AND METHODS MENTIONED OR SHOWN IN THE CONTRACT DOCUMENTS COMPLETE WITH INCIDENTALS NECESSARY FOR A COMPLETE OPERATING INSTALLATION. PROVIDE TOOLS, EQUIPMENT AND SERVICES REQUIRED TO DO THE WORK.

2.2. EXAMINE EXISTING SITE CONDITIONS WHICH MAY AFFECT WORK OF THIS DIVISION. EXAMINE CONTRACT DOCUMENTS IN CONJUNCTION WITH SITE EXAMINATION TO ENSURE THAT WORK OF THIS DIVISION MAY BE SATISFACTORILY COMPLETED.

2.3. INCLUDE DISCONNECTION AND REMOVAL OF VARIOUS MECHANICAL EQUIPMENT IN AREAS TO BE TURNED OVER TO THE OWNER.

2.4. INCLUDE DISCONNECTION AND MAKING SAFE OF VARIOUS MECHANICAL SYSTEMS AND EQUIPMENT IN AREAS TO BE DEMOLISHED AND/OR RENOVATED.

2.5. ISOLATE AND DRAIN (OR PIPE FREEZE IF DRAINING IS NOT FEASIBLE) SYSTEMS AS REQUIRED TO EFFECT DEMOLITION, RENOVATIONS, MODIFICATIONS AND/OR REPAIRS. DISCONNECT, CAP AND MAKE SAFE MECHANICAL SERVICES TO THE BUILDING INCLUDING, BUT NOT LIMITED TO; SANITARY SEWER(S), STORM SEWER(S), WATER SERVICE, NATURAL GAS SERVICE, STEAM SERVICE, CONDENSATE RETURN, WATER SUPPLY TO STANDPIPE AND SPRINKLER SYSTEMS, FIRE SUPPRESSION SYSTEMS HOT WATER HEATING SYSTEMS, STEAM AND CONDENSATE SYSTEMS.

2.6. ON COMPLETION OF RENOVATIONS, MODIFICATIONS AND/OR REPAIRS, TEST ENTIRE SYSTEM AS IF NEW. REPORT REPAIRS OR REPLACEMENTS REQUIRED OF EXISTING EQUIPMENT, PIPING, FITTINGS OR DEVICES THAT ARE NOT INCLUDED IN CONTRACT TO CONSULTANT AND OWNER FOR INSTRUCTION. FLUSH, CLEAN AND REFILL RENOVATED SYSTEMS AS SPECIFIED FOR NEW.

2.7. INCLUDE EXCAVATION & BACKFILL NECESSARY FOR INSTALLATION OF UNDERGROUND WORK. EXCAVATE WITH SUITABLE MACHINERY OR BY HAND AS NECESSARY.

2.8. INCLUDE CUTTING AND PATCHING OF NEW OR EXISTING WORK.

2.9. INCLUDE IDENTIFICATION OF EQUIPMENT, PIPING, DUCTWORK, VALVES AND CONTROLLERS AS PER DRAWING DETAIL. APPLY EXISTING SYSTEMS TO NEW WORK. CONFORM TO CSA B149, NFPA 13, NFPA 14, AND CAN/CGSB 24.3 FOR PIPING SYSTEMS. SUBMIT IDENTIFICATION DETAILS TO CONSULTANT FOR APPROVAL.

2.10. PERFORM START-UP AND COMMISSION EQUIPMENT AND SYSTEMS INSTALLED AND/OR MODIFIED UNDER THIS CONTRACT. COMPLETE COMMISSIONING WORK TO THE SATISFACTION OF THE CONSULTANT PRIOR TO ACCEPTANCE OF THE WORK OR ANY PART THEREOF.

2.11. TAKE SUCH MEASURES AND INCLUDE IN BID PRICE FOR THE PROPER PROTECTION OF THE EXISTING BUILDING AND ITS FINISHES DURING ALTERATIONS AND CONSTRUCTION OF THE NEW ADDITION. COORDINATE THIS PROTECTIVE WORK WITH OTHER TRADES.

2.12. VERIFY THE CORRECT OPERATION OF EACH EQUIPMENT ITEM PROVIDED AND/OR ALTERED AND EACH SYSTEM IN TOTAL AND OBTAIN THE OWNER'S APPROVAL PRIOR TO STARTING AND/OR RETURNING TO OPERATION.

2.13. CONTRACT DOCUMENTS DRAWINGS FOR HVAC, PLUMBING AND FIRE PROTECTION WORK ARE DIAGRAMMATIC AND INTENDED TO CONVEY SCOPE AND GENERAL ARRANGEMENT ONLY.

2.14. INSTALL MECHANICAL EQUIPMENT AND APPURTENANCES TO MANUFACTURERS' RECOMMENDATIONS, CONTRACT DOCUMENTS, AND APPLICABLE CODES AND REGULATIONS.

2.15. PROVIDE VIBRATION ISOLATION FOR MECHANICAL EQUIPMENT TO PREVENT TRANSMISSION OF VIBRATION TO BUILDING STRUCTURE.

2.16. LOCATION OF EXISTING UNDERGROUND UTILITIES IS SHOWN IN AN APPROXIMATE WAY. DETERMINE EXACT LOCATIONS OF EXISTING UTILITIES BEFORE COMMENCING WORK. REPAIR DAMAGES CAUSED BY FAILURE TO EXACTLY LOCATE AND PRESERVE UNDERGROUND UTILITIES.

2.17. MAINTAIN MINIMUM 6'-8" CLEARANCE TO THE UNDERSIDE OF DUCTS, PIPES, CONDUITS AND SUSPENDED EQUIPMENT THROUGHOUT ACCESS ROUTES IN MECHANICAL ROOMS.

2.18. COMPLETE TESTING BEFORE INSULATION OF PIPING OR EQUIPMENT IS APPLIED.

2.19. LOCATE TEMPERATURE, PRESSURE AND FLOW MEASURING DEVICES IN ACCESSIBLE LOCATIONS WITH STRAIGHT SECTIONS OF PIPE/DUCT UP-AND-DOWNSTREAM AS RECOMMENDED BY MANUFACTURER TO MAINTAIN GOOD ACCURACY.

2.20. ENSURE TESTING, ADJUSTING AND BALANCING AGENCY IS A MEMBER OF AABC OR NEBB IN GOOD STANDING. PREFORM TAB TO AABC STANDARDS.

2.21. WHERE TWO OR MORE ITEMS OF THE SAME TYPE ARE REQUIRED, PROVIDE THE PRODUCT OF ONE MANUFACTURER.

2.22. CONFORM TO ASTM 315 AND ACI 318 FOR CONCRETE REINFORCEMENT, DETAILING AND PLACEMENT. CONFORM TO ASTM A94 FOR CONCRETE. CONFORM TO ACI 318 PART ENTITLED “CONSTRUCTION REQUIREMENTS”. PROVIDE 3000 PSI 28 DAY COMPRESSIVE STRENGTH. ENSURE BETWEEN 3 AND 7 PERCENT AIR CONTENT IN BY VOLUME. ENSURE SLUMP IS BETWEEN 3” & 4”. CURE CONCRETE FOR SEVEN DAYS AFTER PLACEMENT.

2.23. SIZE AND LOCATE CONCRETE HOUSEKEEPING PADS. PROVIDE MINIMUM 6” THICKNESS PADS THAT EXTEND MINIMUM 6” BEYOND THE EQUIPMENT ON EACH SIDE UNLESS OTHERWISE INDICATED.

2.24. LOCATIONS OF ITEMS SHOWN ON DRAWINGS IS APPROXIMATE UNLESS DIMENSIONED. DO NOT SCALE DRAWINGS. DETERMINE EXACT LOCATIONS IN ACCORDANCE WITH SITE LOCATIONS. OBTAIN CONSULTANT APPROVAL FOR LOCATIONS BEFORE INSTALLING.

2.25. PROVIDE MISCELLANEOUS STEEL FOR PIPING, DUCTWORK AND EQUIPMENT.

2.26. SUPPORT EQUIPMENT, PIPING AND DUCTWORK TO PROVIDE A VIBRATION-FREE INSTALLATION.

2.27. DO NOT SUPPORT MECHANICAL PRODUCTS FROM A METAL DECK.

2.28. PROVIDE FIRE STOPPING IN FIRE SEPARATION PENETRATIONS FROM DUCTWORK, PIPING, CONDUITS, ETC.

2.29. PROVIDE MOTORS REQUIRED FOR EQUIPMENT SUPPLIED BY THIS DIVISION.

2.30. PROVIDE VARIABLE FREQUENCY DRIVES FOR MOTORS AND EQUIPMENT SUPPLIED BY THIS DIVISION.

2.31. PROVIDE INTERNAL WIRING, RELAYS, CONTACTORS, SWITCHES, TRANSFORMERS, MOTOR STARTERS, AND CONTROLS NECESSARY FOR THE INTENDED OPERATION, FURNISHED WITH TERMINALS AND EXTERNAL CONTROLS SUITABLE FOR CONNECTION TO POWER SOURCE AT A SINGLE EASILY ACCESSED LOCATION FOR ITEMS THAT ARE SUPPLIED WITH MOTORS AND/OR ELECTRICAL OR ELECTRONIC COMPONENTS UNDER THIS DIVISION.

2.32. ADJUST THE LOCATION OF MATERIALS AND/OR EQUIPMENT AS DIRECTED WITHOUT ADJUSTMENT TO CONTRACT PRICE, PROVIDED THAT THE CHANGES ARE REQUESTED BEFORE INSTALLATION AND DO NOT AFFECT MATERIAL QUANTITY. NOTE THAT OUTLETS AND/OR EQUIPMENT MAY BE RELOCATED UP TO 10 FEET (3 M) IN ANY DIRECTION WITHOUT A CHANGE TO THE CONTRACT PRICE.

3. SUBMITTALS

3.1. SHOP DRAWINGS: PREPARE AND SUBMIT TWO (2) COPIES OF SHOP DRAWINGS OF EQUIPMENT ITEMS TO THE CONSULTANT FOR REVIEW. THE CONSULTANT WILL RETURN ONE COPY, MARKED WITH COMMENTS AND REVIEW STAMP AS DEEMED APPROPRIATE.

3.2. CLEARLY INDICATE MANUFACTURER'S AND SUPPLIER'S NAMES, MODEL NUMBERS, DETAILS OF CONSTRUCTION, ACCURATE DIMENSIONS, CAPACITIES AND PERFORMANCE. PRIOR TO SUBMISSION CHECK AND CERTIFY AS CORRECT, SHOP DRAWINGS AND DATA SHEETS. DO NOT ORDER EQUIPMENT UNTIL A COPY OF THE SHOP DRAWINGS, REVIEWED BY CONSULTANT, HAS BEEN RETURNED.

3.3. THE CONSULTANT WILL NOT REVIEW SHOP DRAWINGS THAT FAIL TO BEAR THE CONTRACTOR'S STAMP OF APPROVAL OR CERTIFICATION.

3.4. AS-BUILT RECORDS: BEFORE FINAL PAYMENT, SUBMIT TWO SETS OF AS-BUILTS DRAWINGS IN AUTOCAD FORMAT SHOWING ALL CHANGES & CONCEALED SERVICES DIMENSIONED. AUTOCAD FILES SHALL BE PROVIDED TO THE CONTRACTOR BY MANTECON PARTNERS INC AT A FEE OF $300.00 PLUS $25.00 PER SHEET UPON REQUEST.

3.5. REQUESTS FOR SHUT-DOWN: OBTAIN PERMISSION FOR SYSTEMS SHUT-DOWN AND/OR SERVICE INTERRUPTION FROM THE OWNER PRIOR TO DISRUPTION OF ANY SYSTEM OR SERVICE IN USE BY THE OWNER. EMPLOY THE OWNER'S STANDARD FORM OF REQUEST WHERE AVAILABLE.

3.6. REQUESTS FOR START-UP: OBTAIN PERMISSION FROM THE OWNER TO START-UP OR TO RETURN TO SERVICE ANY ITEM OF EQUIPMENT, SYSTEM OR SERVICE INSTALLED NEW OR PREVIOUSLY SHUT DOWN.

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3.7. WARRANTY: PROVIDE WRITTEN GUARANTEE FOR ALL NEW EQUIPMENT & WORKMANSHIP FOR ONE (1) YEAR FROM DATE OF SUBSTANTIAL COMPLETION. FIVE (5) YEARS FOR COMPRESSOR & HEAT EXCHANGER. DEFECTIVE PARTS REPAIRED OR REPLACED WITHOUT CHARGE.

4. DESIGN FOR SEISMIC RESTRAINT

4.1. WHERE REQUIRED BY CODE, PROVIDE ENGINEERED SEISMIC RESTRAINTS FOR EQUIPMENT, PIPING AND DUCTWORK.

4.2. PROVIDE CALCULATIONS FOR SEISMIC RESTRAINT SELECTIONS CERTIFIED BY A P.ENG (ONTARIO). SUBMIT DETAILED SHOP DRAWINGS INCLUDING DIMENSIONS, MATERIALS, ATTACHEMENT AND ANCHORAGE REQUIREMENTS AS WELL AS LOCATIONS OF RESTRAINTS ON THE BUILDING PLAN.

4.3. SEISMIC DESIGN CRITERIA:

4.3.1. IMPORTANCE FACTOR - 1.3

4.3.2. USE S(0.2) VALUE I.E. 200 MILLISECONDS

4.3.3. ADDRESS: 60 CLENCH AVENUE, BRANTFORD ONTARIO.

4.4. PROVIDE SEISMIC RESTRAINTS FOR OPERATIONAL AND FUNCTIONAL COMPONENTS OF BUILDING SERVICES TO OBC REQUIREMENTS.

4.5. CONFORM TO THE RELEVANT REQUIREMENTS OF ASHRAE, NFPA, AND SMACNA.

5. COMMON WORK RESULTS

5.1. ELECTRIC MOTORS

5.1.1. PROVIDE MOTORS FOR MECHANICAL EQUIPMENT AS SPECIFIED.

5.1.2. MOTORS UNDER 1/2 HP: SPEED AS INDICATED, CONTINUOUS DUTY, BUILT-IN OVERLOAD PROTECTION, RESILIENT MOUNT, SINGLE PHASE, 120 V, UNLESS OTHERWISE SPECIFIED OR INDICATED. PROVIDE CONTINUOUSLY RATED SQUIRREL CAGE INDUCTION TYPE WITH CAPACITOR START, EEMAC `N' STARTING CHARACTERISTICS AND A MINIMUM OF CLASS `A' INSULATION.

5.1.3. MOTORS 1/2 HP AND LARGER: EEMAC CLASS B, SQUIRREL CAGE INDUCTION, SPEED AS INDICATED, CONTINUOUS DUTY, DRIP PROOF, BALL BEARING, MAXIMUM TEMPERATURE RISE 40 DEGREES C, 3 PHASE, VOLTAGE AS INDICATED. PROVIDE CONTINUOUSLY RATED SQUIRREL CAGE INDUCTION TYPE WITH EEMAC `B' STARTING CHARACTERISTICS AND A MINIMUM OF CLASS `B' INSULATION.

5.1.4. DO NOT PROVIDE MOTORS WITH CLASS F OR H INSULATION FOR TENV ENCLOSURE RATINGS. DO NOT PROVIDE CLASS H INSULATION MOTORS FOR ALL OTHER ENCLOSURE RATINGS.

5.1.5. IF PROVIDING A MOTOR WITH AN INSULATION CLASS THAT INCREASES THE TEMPERATURE RATING OF THE WIRING, BEAR THE ASSOCIATED COST FOR THE ELECTRICAL CHANGES AT NO ADDITIONAL COST TO THE PROJECT.

5.2. NAMEPLATES

5.2.1. PROVIDE LAMINATED PLASTIC PLATES WITH BLACK FACE AND WHITE CENTRE OF MINIMUM SIZE 3-1/2" X 1-1/2" X 3/32" (90 X 40 X 2 MM) NOMINAL THICKNESS, ENGRAVED WITH 1/4" (6 MM) HIGH LETTERING. USE 1" (25 MM) LETTERING FOR MAJOR EQUIPMENT.

5.2.2. FASTEN NAMEPLATES SECURELY IN CONSPICUOUS PLACE. WHERE NAMEPLATES CANNOT BE MOUNTED ON COOL SURFACE, PROVIDE STANDOFFS.

5.2.3. IDENTIFY EQUIPMENT TYPE AND NUMBER AND SERVICE OF AREAS OR ZONE OF BUILDING SERVED.

5.2.4. FOR EACH ITEM OF EQUIPMENT WHICH MAY BE STARTED AUTOMATICALLY OR REMOTELY, ADD A RED LAMACOID PLATE, 2-1/2" X 9" (65 X 230 MM), READING: "WARNING. THIS EQUIPMENT IS AUTOMATICALLY CONTROLLED AND MAY START AT ANY TIME."

5.3. PRESSURE GAUGES

5.3.1. APPROVED MANUFACTURER: TRERICE MODEL 600C OR EQUAL BY WEISS, WINTER, MORRISSON, OR TAYLOR.

5.3.2. GAUGE: 4-1/2" (115MM) DIAMETER BLACK CAST ALUMINUM, PHOSPHOR BRONZE BOURDON TUBE, ROTARY BRASS MOVEMENT, BRASS SOCKET, WITH FRONT RECALIBRATION ADJUSTMENT, BLACK SCALE ON WHITE BACKGROUND, MID-SCALE ACCURACY: 1%, SCALE: PSI AND KPA

5.3.3. GAUGE COCK: TEE OR LEVER HANDLE, BRASS FOR MAXIMUM 150 PSI (1034 KPA0.

5.3.4. NEEDLE VALVE: BRASS, 1/4" (6 MM) NPT FOR MINIMUM 150 PSI (1034 KPA).

5.3.5. PULSATION DAMPER: PRESSURE SNUBBER, BRASS WITH 1/4" (6 MM) CONNECTIONS.

5.3.6. SYPHON: STEEL, SCHEDULE 40, 1/4" (6 MM) ANGLE OR STRAIGHT PATTERN.

5.4. STEM TYPE THERMOMETERS

5.4.1. APPROVED MANUFACTURER: TRERICE MODEL BX91403-1/2 OR WEISS MODEL 9VS3-1/2, OR EQUAL BY WINTER, MORRISON, TAYLOR.

5.4.2. THERMOMETER: 9" (230MM) SCALE, RED APPEARING THERMAL FLUID WITH BLACK FIGURES ON WHITE SCALE, CALIBRATED IN BOTH DEGREES F AND DEGREES C, ACCURACY TO ASTM E77 OF 2%, CLEAR GLASS LENS FRONT TUBE, CAST ALUMINUM CASE WITH ENAMEL FINISH, CAST ALUMINUM ADJUSTABLE JOINT WITH POSITIVE LOCKING DEVICE, 3/4" (20MM) NPT BRASS STEM.

5.4.3. INCLUDE SEPARABLE WELL WITH THERMOMETERS.

5.4.4. SOCKET: BRASS SEPARABLE SOCKETS FOR THERMOMETER STEMS WITH OR WITHOUT EXTENSIONS AS REQUIRED, AND WITH CAP AND CHAIN.

5.4.5. FLANGE: 3" (75 MM) OUTSIDE DIAMETER REVERSIBLE FLANGE, DESIGNED TO FASTEN TO SHEET METAL AIR DUCTS, WITH BRASS PERFORATED STEM

5.5. SLEEVES: MINIMUM SCHEDULE 20 GALVANIZED STEEL OR CAST IRON.

5.6. FLASHINGS AND COUNTER FLASHINGS: THALER OR EQUIVALENT MECHANICAL/ELECTRICAL FLASHINGS AS RECOMMENDED FOR SPECIFIC PURPOSE. STAINLESS STEEL FLASHING SLEEVE, INTEGRAL DECK FLANGE AND EPDM SEAL.

5.7. PENETRATION SEALS

5.7.1. APPROVED MANUFACTURER: LINK-SEAL OR EQUAL

5.7.2. MODULAR MECHANICAL TYPE, CONSISTING OF INTERLOCKING SYNTHETIC RUBBER LINKS SHAPED TO CONTINUOUSLY FILL THE ANNULAR SPACE BETWEEN THE PIPE AND WALL OPENING. LINKS SHALL BE LOOSELY ASSEMBLED WITH BOLTS TO FORM A CONTINUOUS RUBBER BELT AROUND THE PIPE WITH A PRESSURE PLATE UNDER EACH BOLT HEAD AND NUT.

5.8. ACCESS DOORS

5.8.1. MANUFACTURERS: ACUDOR ACORN, CEB, MIFAB, CENDRES CONTOUR

5.8.2. STANDARD UNIVERSAL FLUSH - MATERIAL: UPT TO 16" X 16" (400X400) 16 GAUGE MOUNTING FRAME, OVER 16" X 16" (400X400) 14 GAUGE DOOR, 16 GAUGE MOUNTING FRAME. HINGE: CONTINUOUS, CONCEALED. LATCH: STAINLESS STEEL SCREWDRIVER OPERATED CAM LATCH FINISH: STEEL: 5-STAGE IRON PHOSPHATE PREPARATION WITH PRIME COAT OF WHITE, ALKYD BAKING ENAMEL OR STAINLESS-STEEL TYPE 304, NO. 4 SATIN POLISH.

5.8.3. RECESSED - MATERIAL: STEEL OR STAINLESS STEEL, 22 GAUGE DOOR, 22 GAUGE MOUNTING FRAME. DOOR -RECESSED 5/8". HINGE: CONTINUOUS, CONCEALED. LATCH: STAINLESS STEEL SCREWDRIVER OPERATED CAM LATCH. FINISH: SATIN COAT STEEL

5.8.4. FIRE RATED - ULC LABELLED. REFER TO ARCHITECTURAL DRAWINGS FOR RATINGS OF FIRE SEPARATIONS AND ASSEMBLIES. MINIMUM 12 GAUGE. HINGE: CONTINUOUS, CONCEALED. LATCH: STAINLESS STEEL SCREWDRIVER OPERATED CAM LATCH FINISH: STEEL: 5-STAGE IRON PHOSPHATE PREPARATION WITH PRIME COAT OF WHITE, ALKYD BAKING ENAMEL OR STAINLESS-STEEL TYPE 304, NO. 4 SATIN POLISH.

5.9. PIPE HANGERS AND SUPPORTS

5.9.1. APPROVED MANUFACTURERS: ANVIL, MYAT, HUN

5.9.2. PLUMBING PIPING - DRAIN, WASTE, AND VENT:

5.9.2.1. CONFORM TO ASME B31.9.

5.9.2.2. HANGERS FOR PIPE SIZES 1/2" TO 1-1/2" (15 TO 40 MM): MALLEABLE IRON, ADJUSTABLE SWIVEL, SPLIT RING.

5.9.2.3. HANGERS FOR PIPE SIZES 2" (50 MM) AND OVER: CARBON STEEL, ADJUSTABLE, CLEVIS.

5.9.2.4. MULTIPLE OR TRAPEZE HANGERS: STEEL CHANNELS WITH WELDED SPACERS AND HANGER RODS.

5.9.2.5. WALL SUPPORT FOR PIPE SIZES TO 3-1/4" (80 MM): CAST IRON HOOK.

5.9.2.6. WALL SUPPORT FOR PIPE SIZES 4" (100 MM) AND OVER: WELDED STEEL BRACKET AND WROUGHT STEEL CLAMP.

5.9.2.7. VERTICAL SUPPORT: STEEL RISER CLAMP.

5.9.2.8. FLOOR SUPPORT: CAST IRON ADJUSTABLE PIPE SADDLE, LOCK NUT, NIPPLE, FLOOR FLANGE, AND CONCRETE PIER OR STEEL SUPPORT.

5.9.2.9. COPPER PIPE SUPPORT: CARBON STEEL RING, ADJUSTABLE, COPPER PLATED.

5.9.3. PLUMBING PIPING - WATER:

5.9.3.1. CONFORM TO ASME B31.9.

5.9.3.2. HANGERS FOR PIPE SIZES 1/2" TO 1-1/2" (15 TO 40 MM): MALLEABLE IRON, ADJUSTABLE SWIVEL, SPLIT RING.

5.9.3.3. HANGERS FOR COLD PIPE SIZES 2" (50 MM) AND OVER: CARBON STEEL, ADJUSTABLE, CLEVIS.

5.9.3.4. HANGERS FOR HOT PIPE SIZES 2" TO 4" (50 TO 100 MM): CARBON STEEL, ADJUSTABLE, CLEVIS.

5.9.3.5. HANGERS FOR HOT PIPE SIZES 6" (150 MM) AND OVER: ADJUSTABLE STEEL YOKE, CAST IRON PIPE ROLL, DOUBLE HANGER.

5.9.3.6. MULTIPLE OR TRAPEZE HANGERS: STEEL CHANNELS WITH WELDED SUPPORTS OR SPACERS AND HANGER RODS.

5.9.3.7. MULTIPLE OR TRAPEZE HANGERS FOR HOT PIPE SIZES 6" (150 MM) AND OVER: STEEL CHANNELS WITH WELDED SUPPORTS OR SPACERS AND HANGER RODS, CAST IRON ROLL.

5.9.3.8. WALL SUPPORT FOR PIPE SIZES TO 3-1/4" (80 MM): CAST IRON HOOK.

5.9.3.9. WALL SUPPORT FOR PIPE SIZES 4" (100 MM) AND OVER: WELDED STEEL BRACKET AND WROUGHT STEEL CLAMP.

5.9.3.10. WALL SUPPORT FOR HOT PIPE SIZES 6" (150 MM) AND OVER: WELDED STEEL BRACKET AND WROUGHT STEEL CLAMP WITH ADJUSTABLE STEEL YOKE AND CAST IRON PIPE ROLL.

5.9.3.11. VERTICAL SUPPORT: STEEL RISER CLAMP.

5.9.3.12. FLOOR SUPPORT FOR COLD PIPE: CAST IRON ADJUSTABLE PIPE SADDLE, LOCK NUT, NIPPLE, FLOOR FLANGE, AND CONCRETE PIER OR STEEL SUPPORT.

5.9.3.13. FLOOR SUPPORT FOR HOT PIPE SIZES TO 4" (100 MM): CAST IRON ADJUSTABLE PIPE SADDLE,

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LOCKNUT, NIPPLE, FLOOR FLANGE, AND CONCRETE PIER OR STEEL SUPPORT.

5.9.3.14. FLOOR SUPPORT FOR HOT PIPE SIZES 6" (150 MM) AND OVER: ADJUSTABLE CAST IRON PIPE ROLL AND STAND, STEEL SCREWS, AND CONCRETE PIER OR STEEL SUPPORT.

5.9.3.15. COPPER PIPE SUPPORT: CARBON STEEL RING, ADJUSTABLE, COPPER PLATED.

5.9.4. FUEL GAS PIPING

5.9.4.1. CONFORM TO NFPA 31.

5.9.4.2. HANGERS FOR PIPE SIZES 1" - 1-1/2" (15 TO 40 MM): MALLEABLE IRON, ADJUSTABLE SWIVEL, SPLIT RING.

5.9.4.3. HANGERS FOR PIPE SIZES 2" (50 MM) AND OVER: CARBON STEEL, ADJUSTABLE, CLEVIS.

5.9.4.4. MULTIPLE OR TRAPEZE HANGERS: STEEL CHANNELS WITH WELDED SPACERS AND HANGER RODS.

5.9.4.5. WALL SUPPORT FOR PIPE SIZES TO 3-1/4" (80 MM): CAST IRON HOOK.

5.9.4.6. VERTICAL SUPPORT: STEEL RISER CLAMP.

5.9.4.7. FLOOR SUPPORT: CAST IRON ADJUSTABLE PIPE SADDLE, LOCK NUT, NIPPLE, FLOOR FLANGE, AND CONCRETE PIER OR STEEL SUPPORT.

5.9.4.8. ROOF SUPPORT: REFER TO SECTION 15140 AND CSA B149.1

5.9.4.9. COPPER PIPE SUPPORT: CARBON STEEL RING, ADJUSTABLE, COPPER PLATED.

5.9.5. ACCESSORIES

5.9.5.1. HANGER RODS: GALVANIZED, CARBON STEEL CONTINUOUS THREADED.

5.9.5.2. INSERTS: MALLEABLE IRON CASE OF GALVANIZED STEEL SHELL AND EXPANDER PLUG FOR THREADED CONNECTION WITH LATERAL ADJUSTMENT, TOP SLOT FOR REINFORCING RODS, LUGS FOR ATTACHING TO FORMS; SIZE INSERTS TO SUIT THREADED HANGER ROD

5.10. EQUIPMENT ROOF CURBS

5.10.1. FABRICATION: WELDED 0.05" (1.2 MM) GALVANIZED STEEL SHELL AND BASE, MITRED 3" (75 MM) CANT, VARIABLE STEP TO MATCH ROOF INSULATION, FACTORY INSTALLED WOOD NAILER.

5.11. ROOFTOP PIPE/DUCT SUPPORTS

5.11.1. ACCEPTABLE MANUFACTURERS: PORTABLE PIPE HANGERS, INC, UNISTRUT

5.11.2. PROVIDE PRE-ENGINEERED PIPE/DUCT SUPPORT SYSTEM.

5.11.3. BASES: WEATHER RESISTANT AND UV RADIATION RESISTANT WITH SEISMIC ATTACHMENTS

5.11.4. FRAMING: 1-5/8" (41.3MM) STRUT OR 1-7/8" (47.6MM) STRUT, FABRICATED OF STEEL TO ASTM A570, GRADE 33., ROLL FORMED OF 12-GAUGE (2.7MM THICK) STEEL INTO 3-SIDED OR TUBULAR SHAPE.

5.11.5. PIPE SUPPORTS AND HANGERS: CONFORM TO MSS SP-58 AND MSS SP-69, FABRICATED OF CARBON STEEL. SINGLE ROLLER SUPPORTS FOR PIPING SUBJECT TO EXPANSION AND CONTRACTION.

5.11.6. PROVIDE PLASTICS AS MOULDED WITH UV RADIATION PROTECTION.

5.11.7. PROVIDE METAL SURFACES HOT DIP GALVANIZED FREE OF ROUGHNESS, WHISKERS, UNSIGHTLY SPANGLES, ICICLES, RUNS, BARBS, SAGS, DROPLETS AND OTHER SURFACE BLEMISHES. GALVANIZING SHALL CONFORM TO ASTM A123 FOR TUBING AND TO ASTM A153 FOR HARDWARE AND ACCESSORIES.

5.12. PIPE HANGER SPACING:

PIPE SIZE (IN)	ROD DIA. (IN)	STEEL PIPE SPACING (FT)	COPPER TUBE SPACING (FT)
1/2	3/8	7	6
3/4	3/8	7	6
1	3/8	7	6
1-1/4	3/8	7	6
2	3/8	9	8
2-1/2	3/8	10	9
3	3/8	12	10
4	5/8	14	12

5.13. FUEL GAS PIPE HANGER SPACING:

PIPE SIZE (IN)	SUPPORT SPACING (FT)
½	6
¾ TO 1	8
1-1/4 TO 2-1/2	10
ALL VERTICAL	AT EVERY FLOOR
TUBING (ALL SIZES)	6

5.1. DUCT HANGER SPACING:

DUCT SIZES (LARGEST SIDE) (IN)	ANGLE SIZE (IN)	ROD DIAMETER (IN)	SPACING (FT)
UP TO 30	1 X 1 X 1/8	¼	10
31 TO 42	1-1/2 X 1-1/2 X 1/8	¼	10
43 TO 60	1-1/2 X 1-1/2 X 1/8	3/8	10
61 TO 84	2 X 2 X 1/8	3/8	8

CONSTRUCTION NORTH

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15 Foundry Street, Dundas, ON, L9H 2V6
Phone: (905)648-0373
www.manteconpartners.com

No.	Revisions:	Date:
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MPI Project No: 21-153
Scale: As Shown
Drawn by: MZE
Plot Date: FEB. 11, 2022
Issue Date:

PRESCHOOL DAY CARE ADDITION
Ecole elementaire catholique Saint-Marguerite-Bourgeoys
60 Clench Avenue, Brantford, Ontario N3T 1B9

MECHANICAL SPECIFICATIONS

M0.2

FIRE PROTECTION SPECIFICATIONS 21-153

1. GENERAL

1.1. PROVIDE MATERIALS AND EQUIPMENT AND PERFORM LABOUR REQUIRED TO INSTALL COMPLETE AND OPERABLE FIRE PROTECTION SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED AND IN COMPLIANCE WITH THE STANDARDS OF THE NATIONAL FIRE PROTECTION ASSOCIATION, INDUSTRIAL RISK INSURERS, FACTORY MUTUAL, AND PROVINCIAL AND LOCAL REGULATIONS.

1.2. COOPERATE WITH OTHER TRADES WHOSE WORK AFFECTS OR IS AFFECTED BY WORK OF THIS DIVISION TO ENSURE SATISFACTORY INSTALLATION AND TO AVOID DELAYS. PROVIDE ALL MATERIALS TO BE BUILT-IN SUCH AS SLEEVES, ANCHORS, ETC., TOGETHER WITH ACCURATE DIMENSIONS OR TEMPLATES, PROMPTLY.

1.3. INSTALL PIPING, WHEREVER POSSIBLE, IN PARTITIONS AND ABOVE CEILING. DO NOT INSTALL PIPING IN OUTSIDE WALLS UNLESS SO SHOWN ON DRAWINGS. WRAP UNINSULATED PIPING IN MASONRY WALLS WITH BUILDING PAPER.

1.4. WHERE PIPING PASSES THROUGH CONCRETE FLOORS, OR WALLS, SLEEVES SHALL BE SIZED TO PERMIT THE PIPE TO EXPAND FREELY WITHOUT BINDING OR CRUSHING PIPE INSULATION

1.5. USE DIELECTRIC COUPLINGS WHERE PIPING OF DISSIMILAR METALS CONNECT.

1.6. FLUSH WATER MAINS IN ACCORDANCE WITH PROCEDURES ESTABLISHED BY NFPA 24. REMOVE, CLEAN AND REPLACE ALL STRAINERS IN SYSTEMS AFTER FLUSHING. THOROUGHLY CLEAN AND LUBRICATE ALL EQUIPMENT AND LEAVE ALL ITEMS IN PERFECT ORDER READY FOR OPERATION.

1.7. PROVIDE FIRE EXTINGUISHERS WHERE INDICATED AND IN CONFORMANCE WITH THE ONTARIO FIRE CODE AND NFPA 10.

2. FIRE EXTINGUISHERS

2.1. PROVIDE 10 LB. (4.54 KG) MULTI-PURPOSE EXTINGUISHERS IN EACH FIRE HOSE CABINET AND IN MECHANICAL ROOMS.

2.2. PROVIDE 10 LB. (4.54 KG) CARBON DIOXIDE EXTINGUISHERS IN ELECTRICAL ROOMS, COMMUNICATIONS ROOMS, AND DATA CENTRES

2.3. PROVIDE A MINIMUM 40:BC RATE EXTINGUISHER IN ALL COMMERCIAL KITCHENS.

2.4. PROVIDE 5 LB. (2.27 KG) MULTI-PURPOSE EXTINGUISHERS IN EACH FIRE HOSE CABINET AND IN EACH KITCHEN/KITCHENETTE

2.5. ACCEPTABLE MANUFACTURERS: NATIONAL FIRE EQUIPMENT, FLAG, KENT, PYRENE CANADA, CFH, SAFETY SUPPLY CHUBB.

2.6. MULTI-PUPURPOSE (ABC) TYPE: DRY CHEMICAL, 5 LB. (2.27 KG) MINIMUM 3A:10BC.

2.7. MULTI-PURPOSE (ABC) TYPE, DRY CHEMICAL, 10 LB. (4.54 KG) MINIMUM 4A:60BC.

2.8. PRESSURIZED WATER: 2-1/2 GALLON (9.5 LITRE), MINIMUM 2A. CONFORM TO CAN4-S507

2.9. CARBON DIOXIDE : 10 LB. (4.54 KG), MINIMUM 5BC.

2.10. PURPLE K (POTASSIUM BICARBONATE) POWDER TYPE, DRY CHEMICAL: 10 LB. (4.54 KG), MINIMUM 60BC.

2.11. CLEAN AGENT, PRESSURIZED WATER TYPE: 2-1/2 GALLON (9.5 LITRE), MINIMUM 2A, CONFORM TO CAN4-S507

3. FEX CABINETS

3.1. FULLY RECESSSED: 18 GA. (1.3 MM) STEEL TUB WITH WHITE PRIME PAINTED FINISH TUB 14 GAUGE (2.1 MM) STAINLESS STEEL DOOR & TRIM, BRUSHED FINISH OR STEEL WITH PRIME PAINTED FINISH, "LEXAN" GLASS PANEL, SIZE TO ACCOMMODATE SPECIFIED EXTINGUISHER

3.2. SEMI-RECESSED: 18 GA. (1.3 MM) STEEL TUB WITH WHITE PRIME PAINTED FINISH TUB, 14 GAUGE (2.1 MM) STEEL DOOR AND TRIM WITH PRIME PAINTED FINISH, FOR SEMI-RECESSED MOUNTING WITH 1/2" (15 MM) RETURN, SHATTER-PROOF TRANSPARENT CANOPY, TO ACCOMMODATE SPECIFIED EXTINGUISHER.

PLUMBING SPECIFICATIONS 21-153

1. PLUMBING PIPING - GENERAL:

1.1. CONFORM TO ONTARIO BUILDING CODE O.REG 332/12 AS AMENDED, DIVISION B, PART 7.

1.2. VERIFY THAT EXCAVATIONS ARE TO REQUIRED GRADE, DRY, AND NOT OVER-EXCAVATED.

1.3. REAM PIPE AND TUBE ENDS. REMOVE BURRS. BEVEL PLAIN END FERROUS PIPE. REMOVE SCALE AND DIRT, ON INSIDE AND OUTSIDE, BEFORE ASSEMBLY. PREPARE PIPING CONNECTIONS TO EQUIPMENT WITH FLANGES OR UNIONS.

1.4. PROVIDE NON-CONDUCTING DIELECTRIC CONNECTIONS WHEREVER JOINTING DISSIMILAR METALS.

1.5. PROVIDE ACCESS WHERE VALVES AND FITTINGS ARE NOT EXPOSED. COORDINATE SIZE AND LOCATION OF ACCESS DOORS WITH GENERAL TRADES.

1.6. INSTALL VENT PIPING PENETRATING ROOFED AREAS TO MAINTAIN INTEGRITY OF ROOF ASSEMBLY

1.7. SUPPORT VERTICAL PIPING AT EVERY OTHER FLOOR. SUPPORT RISER PIPING INDEPENDENTLY OF CONNECTED HORIZONTAL PIPING

1.8. PRIME COAT EXPOSED STEEL HANGERS AND SUPPORTS. HANGERS AND SUPPORTS LOCATED IN CRAWL SPACES, PIPE SHAFTS, AND SUSPENDED CEILING SPACES ARE NOT CONSIDERED EXPOSED.

1.9. SUPPORT CAST IRON DRAINAGE PIPING AT EVERY JOINT.

1.10. DO HYDROSTATIC TESTING PRIOR TO BACKFILLING OVER JOINTS

1.11. DISINFECT NEW AND ALTERED WATER DISTRIBUTION PIPING.

1.12. VERIFY THAT PIPING SYSTEM IS COMPLETE AND HAS BEEN FLUSHED, CLEANED, INSPECTED, AND PRESSURE TESTED.

1.13. ISOLATE EXISTING PIPING TO FULL EXTENT POSSIBLE. ENSURE THAT FIXTURES, EXITING AND NEW THAT ARE SERVED FROM PIPING BEING DISINFECTED, ARE TAKEN OUT OF SERVICE AND SIGNS ARE PLACED AT EACH FIXTURE PROHIBITING USE DURING THE DISINFECTION PERIOD.

1.14. ENSURE PH OF WATER TO BE TREATED IS BETWEEN 7.4 AND 7.6 BY ADDING ALKALI (CAUSTIC SODA OR SODA ASH) OR ACID (HYDROCHLORIC). INJECT DISINFECTANT, FREE CHLORINE IN LIQUID, POWDER, TABLET OR GAS FORM, THROUGHOUT SYSTEM TO OBTAIN 50 TO 80 MG/L RESIDUAL.

1.15. MAKE PROVISONS FOR MAINTAINING THE TRAP SEAL OF FLOOR DRAINS AND HUB DRAINS.

2. SANITARY SEWER PIPING, BURIED WITHIN 1500 MM (5 FEET) OF BUILDING

2.1. CAST IRON PIPE: ASTM A74 EXTRA HEAVY WEIGHT. FITTINGS: CAST IRON. JOINTS: HUB-AND-SPIGOT, CISPI HSN COMPRESSION TYPE WITH ASTM C564 NEOPRENE GASKETS

2.2. CAST IRON PIPE: CISPI 301, HUBLESS. FITTINGS: CAST IRON. JOINTS: CISPI 310, NEOPRENE GASKET AND STAINLESS-STEEL CLAMP AND SHIELD ASSEMBLIES.

2.3. COPPER TUBE: ASTM B306, DWV. FITTINGS: ASME B16.23, CAST BRONZE, OR ASME B16.29, WROUGHT COPPER. JOINTS: ASTM B32, SOLDER, GRADE 50B.

2.4. ABS PIPE: CSA B1800, ASTM D2751 OR ASTM F628. FITTINGS: ABS. JOINTS: ASTM D2235, SOLVENT WELD.

2.5. ABS PIPE: CSA B1800, ASTM D2661 OR ASTM D2751. FITTINGS: ABS. JOINTS: ASTM D2235, SOLVENT WELD.

2.6. PVC PIPE: CSA B1800, ASTM D2665 OR ASTM D3034. FITTINGS: PVC. JOINTS: ASTM D2855, SOLVENT WELD WITH ASTM D2564 SOLVENT CEMENT.

2.7. PVC PIPE: CSA B1800, ASTM D2665, ASTM D3034, OR ASTM F679. FITTINGS: PVC. JOINTS: ASTM F477, ELASTOMERIC GASKETS.

3. SANITARY SEWER PIPING, ABOVE GRADE

3.1. CAST IRON PIPE: ASTM A74, SERVICE WEIGHT. FITTINGS: CAST IRON. JOINTS: ASTM C564, NEOPRENE GASKET SYSTEM

3.2. CAST IRON PIPE: CISPI 301, HUBLESS, SERVICE WEIGHT. FITTINGS: CAST IRON. JOINTS: CISPI 310, NEOPRENE GASKETS AND STAINLESS-STEEL CLAMP-AND-SHIELD ASSEMBLIES.

3.3. COPPER TUBE: ASTM B306, DWV. FITTINGS: ASME B16.23, CAST BRONZE, OR ASME B16.29, WROUGHT COPPER, OR ASME B16.32, SOVENT. JOINTS: ASTM B32, SOLDER, GRADE 50B.

3.4. PVC: IPEX SYSTEM XFR SCH 40 TO CSA B1800, LISTED TO ULC S102.2 WITH FLAME SPREAD RATING OF 25 OR LESS, SMOKE DEVELOPED CLASS OF 50 OR LESS. NOT FOR USE IN SHAFTS.

4. SANITARY SEWER PIPING, ABOVE GRADE (URINALS ONLY)

4.1. COPPER TUBING: ASTM B88M, TYPE K, HARD DRAWN.FITTINGS: ASME B18.18 CAST COPPER ALLOW OR ASME B16.22, WROUGHT COPPER AND BRONZE. JOINTS: ASTM B32, SOLDER, GRADE 95TA.

5. SANITARY VENT PIPING, BURIED

5.1. CAST IRON PIPE: ASTM A74 EXTRA HEAVY WEIGHT. FITTINGS: CAST IRON. JOINTS: HUB-AND-SPIGOT, CISPI HSN COMPRESSION TYPE WITH ASTM C564 NEOPRENE GASKETS OR LEAD AND OAKUM.

5.2. CAST IRON PIPE: CISPI 301, HUBLESS. FITTINGS: CAST IRON. JOINTS: CISPI 310, NEOPRENE GASKET AND STAINLESS-STEEL CLAMP AND SHIELD ASSEMBLIES.

5.3. COPPER TUBE: ASTM B306, DWV. FITTINGS: ASME B16.23, CAST BRONZE, OR ASME B16.29, WROUGHT COPPER. JOINTS: ASTM B32, SOLDER, GRADE 50B.

5.4. ABS PIPE: CSA B1800, ASTM D2751 OR ASTM F628. FITTINGS: ABS. JOINTS: ASTM D2235, SOLVENT WELD.

5.5. ABS PIPE: CSA B1800, ASTM D2661 OR ASTM D2751. FITTINGS: ABS. JOINTS: ASTM D2235, SOLVENT WELD.

5.6. PVC PIPE: CSA B1800, ASTM D2665 OR ASTM D3034. FITTINGS: PVC. JOINTS: ASTM D2855, SOLVENT WELD WITH ASTM D2564 SOLVENT CEMENT.

5.7. PVC PIPE: CSA B1800, ASTM D2665, ASTM D3034, OR ASTM F679. FITTINGS: PVC. JOINTS: ASTM F477, ELASTOMERIC GASKETS.

6. SANITARY VENT PIPING, ABOVE GRADE

6.1. CAST IRON PIPE: ASTM A74, SERVICE WEIGHT. FITTINGS: CAST IRON. JOINTS: ASTM C564, NEOPRENE GASKET SYSTEM

6.2. CAST IRON PIPE: CISPI 301, HUBLESS, SERVICE WEIGHT. FITTINGS: CAST IRON. JOINTS: CISPI 310, NEOPRENE GASKETS AND STAINLESS-STEEL CLAMP-AND-SHIELD ASSEMBLIES.

6.3. COPPER TUBE: ASTM B306, DWV. FITTINGS: ASME B16.23, CAST BRONZE, OR ASME B16.29, WROUGHT COPPER, OR ASME B16.32, SOVENT. JOINTS: ASTM B32, SOLDER, GRADE 50B.

6.4. PVC: IPEX SYSTEM XFR SCH 40 TO CSA B1800, LISTED TO ULC S102.2 WITH FLAME SPREAD RATING OF 25 OR LESS, SMOKE DEVELOPED CLASS OF 50 OR LESS. NOT FOR USE IN SHAFTS.

7. WATER PIPING, BURIED WITHIN 1500 MM (5 FEET) OF BUILDING

7.1. DUCTILE IRON PIPE: AWWA C151. FITTINGS: DUCTILE IRON, STANDARD THICKNESS. LINING: CEMENT. JOINTS: AWWA C111, RUBBER GASKET WITH 3/4" (19 MM) DIAMETER RODS.

8. WATER PIPING, BURIED WITHIN BUILDING

8.1. DOMESTIC HOT AND COLD WATER.

8.1.1. COPPER TUBING: ASTM B88M, TYPE L, SOFT ANNEALED. FITTINGS: ASME B18.18 CAST COPPER ALLOY OR ASME B16.22, WROUGHT COPPER AND BRONZE. JOINTS: ASTM B32, SOLDER, GRADE 95TA.

8.2. DOMESTIC HOT WATER RE-CIRCULATION.

8.2.1. COPPER TUBING: ASTM B88M, TYPE L, SOFT ANNEALED. FITTINGS: ASME B18.18 CAST COPPER ALLOY OR ASME B16.22, WROUGHT COPPER AND BRONZE. JOINTS: ASTM B32, SOLDER, GRADE 95TA.

9. WATER PIPING, ABOVE GRADE

9.1. DOMESTIC HOT AND COLD WATER.

9.1.1. COPPER TUBING: ASTM B88M, TYPE L, HARD DRAWN. FITTINGS: ASME B16.18, CAST COPPER ALLOY OR ASME B16.22, WROUGHT COPPER AND BRONZE. JOINTS: ASTM B32, SOLDER, GRADE 95TA.

9.2. DOMESTIC HOT WATER RE-CIRCULATION.

9.2.1. COPPER TUBING: ASTM B88M, TYPE L, SOFT ANNEALED. FITTINGS: ASME B18.18 CAST COPPER ALLOY OR ASME B16.22, WROUGHT COPPER AND BRONZE. JOINTS: ASTM B32, SOLDER, GRADE 95TA.

10. STORM WATER PIPING, BURIED WITHIN 1500 MM (5 FEET) OF BUILDING

10.1. CAST IRON PIPE: ASTM A74 EXTRA HEAVY WEIGHT. FITTINGS: CAST IRON. JOINTS: ASTM C564, NEOPRENE GASKET SYSTEM

10.2. CAST IRON PIPE: CISPI 301, HUBLESS, SERVICE WEIGHT. FITTINGS: CAST IRON. JOINTS: NEOPRENE GASKETS AND STAINLESS-STEEL CLAMP-AND-SHIELD ASSEMBLIES.

10.3. ABS PIPE: CSA B1800, ASTM D2680 OR ASTM D2751. FITTINGS: ABS. JOINTS: ASTM D2235, SOLVENT WELD, MAXIMUM VOC CONTENT OF 325 G/L.

10.4. PVC PIPE: CSA B1800, ASTM D2665 OR ASTM D3034. FITTINGS: PVC. JOINTS: ASTM D2855, SOLVENT WELD WITH ASTM D2564 SOLVENT CEMENT.

10.5. PVC PIPE: CSA B1800, ASTM D2665, ASTM D3034, OR ASTM F679. FITTINGS: PVC. JOINTS: ASTM F477, ELASTOMERIC GASKETS.

11. STORM WATER PIPING, ABOVE GRADE

11.1. CAST IRON PIPE: ASTM A74 EXTRA HEAVY WEIGHT. FITTINGS: CAST IRON. JOINTS: ASTM C564, NEOPRENE GASKET SYSTEM

11.2. CAST IRON PIPE: CISPI 301, HUBLESS, SERVICE WEIGHT. FITTINGS: CAST IRON. JOINTS: NEOPRENE GASKETS AND STAINLESS-STEEL CLAMP-AND-SHIELD ASSEMBLIES.

11.3. PVC: IPEX SYSTEM XFR SCH 40 TO CSA B1800, LISTED TO ULC S102.2 WITH FLAME SPREAD RATING OF 25 OR LESS, SMOKE DEVELOPED CLASS OF 50 OR LESS. NOT FOR USE IN SHAFTS.

12. FLANGES, UNIONS, AND COUPLINGS

12.1. PIPE SIZE 3-1/4" (80 MM) AND UNDER:

12.1.1. FERROUS PIPE: CLASS 150 MALLEABLE IRON THREADED UNIONS.

12.1.2. COPPER TUBE AND PIPE: CLASS 150 BRONZE UNIONS WITH SOLDERED JOINTS.

12.2. PIPE SIZE OVER 1" (25 MM):

12.2.1. FERROUS PIPE: CLASS 150 MALLEABLE IRON THREADED OR FORGED STEEL SLIP-ON FLANGES; PREFORMED NEOPRENE GASKETS.

12.2.2. COPPER TUBE AND PIPE: CLASS 150 SLIP-ON BRONZE FLANGES; PREFORMED NEOPRENE GASKETS.

12.3. GROOVED AND SHOULDERED PIPE END COUPLINGS:

12.3.1. HOUSING: MALLEABLE IRON CLAMPS TO ENGAGE AND LOCK, DESIGNED TO PERMIT SOME ANGULAR DEFLECTION, CONTRACTION, AND EXPANSION; STEEL BOLTS, NUTS, AND WASHERS; GALVANIZED FOR GALVANIZED PIPE.

PLUMBING SPECIFICATIONS 21-153

12.3.2. SEALING GASKET: "C" SHAPE COMPOSITION SEALING GASKET.

12.4. DIELECTRIC CONNECTIONS: UNION WITH GALVANIZED OR PLATED STEEL THREADED END, COPPER SOLDER END, WATER IMPERVIOUS ISOLATION BARRIER.

13. VALVES - GENERAL (POTABLE)

13.1. CONFORM TO REQUIREMENTS OF ANSI, ASTM, ASME, AND APPLICABLE MSS STANDARDS.

13.2. MANUFACTURER'S NAME AND PRESSURE RATING CLEARLY MARKED ON BODY TO MSS-SP-25.

13.3. VALID CRN (CANADIAN REGISTRATION NUMBER) ISSUED BY PROVINCE OF ONTARIO REQUIRED FOR EACH VALVE.

13.4. PROVIDE VALVES WITH NSF NO LEAD CERIFICATION FOR POTABLE SERVICE.

13.5. MATERIALS:

13.5.1. BRONZE: ASTM B62 OR B61 AS APPLICABLE

13.5.2. BRASS: ASTM B283 C3770

13.5.3. CAST IRON: ASTM A126 CLASS B

13.6. END CONNECTIONS:

13.6.1. FLANGED ENDS: ANSI B16.1 (CLASS 125), ANSI B16.5

13.6.2. FACE-TO-FACE DIMENSIONS: ANSI B16.10

13.7. ISOLATION VALVES

13.7.1. UP TO AND INCLUDING 2" (50MM) - BALL TYPE KITZ #859 MSS SP-110, CLASS 150, 600 PSI (4140 KPA) CWP, FORGED BRASS, TWO PIECE BODY, STAINLESS STEEL BALL AND STEM, FULL PORT, VIRGIN PTFE SEATS AND STEM PACKING, BLOW-OUT PROOF STEM, LEVER HANDLE WITH BALANCING STOPS, STEM EXTENSIONS FOR INSULATED PIPING, SOLDER ENDS. NSF 372 NO LEAD CERTIFICATION.

13.8. THROTTLING VALVES

13.8.1. UP TO AND INCLUDING 2" (50 MM) - GLOBE TYPE: KITZ #812 MSS SP-80, 860 KPA (125PSIG) 200 WOG, BRONZE BODY TO ASTM B62, RISING STEM, UNION BONNET, INSIDE SCREW, PTFE DISK, SOLDER ENDS. NSF 372 NO LEAD CERTIFICATION.

13.9. CHECK VALVES

13.9.1. UP TO AND INCLUDING 3" (75 MM): KITZ #823 MSS SP-80, 860 KPA (125PSIG) 200 WOG, BRONZE BODY TO ASTM B62, BRONZE TRIM, SOLDER ENDS. NSF 372 NO LEAD CERTIFICATION.

13.9.2. 4" (100MM) AND LARGER: KITZ #W30-A-RD-FF, MSS SP-71, 1380 KPA CLASS 125 / 200 WOG, CAST IRON BODY TO ASTM A126 CLASS B, BRONZE TRIM, BOLTED BONNET, FLANGED ENDS. NSF 372 NO LEAD CERTIFICATION.

13.10. DRAIN VALVES

13.10.1. UP TO 150 PSIG - BALL TYPE: KITZ #869 150 PSIG (1034 KPA), 600 WOG, BRASS BODY TO ASTM C37700, TWO PIECE BODY, FULL PORT, PTFE SEATS AND STEM PACKING OR DOUBLE "O" RING, BLOW-OUT PROOF STEM, CHROME PLATED BALL, LEVER HANDLE WITH CAP AND CHAIN, (3/4") 20 MM HOSE CONNECTION. NSF 372 NO LEAD CERTIFICATION.

13.11. STRAINERS

13.11.1. UP TO AND INCLUDING 2": MUELLER LF351 SCREWED ENDS OR LF358 SOLDER ENDS, CLASS 125 C87800 BRONZE BODY, 304 SS MESH STRAINER, METAL FILLED GRAPHITE GASKET, LEAD FREE CONSTRUCTION, C/W PLUG, 200 PSIG RATING.

13.11.2. OVER 2": M.A.S FIG W40-A-YX-FF (CLASS 125 FLANGED) OR W40-A-YX-GG (GROOVED) A536 BODY, 304 SS MESH STRAINER, LEAD FREE CONSTRUCTION, 300 PSIG RATING C/W PLUG.

13.12. WATER PRESSURE REDUCING VALVES

13.12.1. UP TO AND INCLUDING 2" (50 MM): WATTS MODEL LFU5B-Z3, LEAD-FREE, CAST COPPER SILICON ALLOY BODY, STAINLESS STEEL STRAINER, HIGH TEMPERATURE RESISTANT REINFORCED DIAPHRAGM, THREADED ENDS, 300 PSIG RATING, ADJUSTABLE TO 25-75 PSI, SERVICEABLE WITHOUT REMOVING VALVE FROM WATER LINE. LISTED TO ASSE 1003 AND IAPMO, CSA B356.

13.12.2. OVER 2" (50 MM): ARMSTRONG MODEL GD 200.200H OR WATTS MODEL SERIES N223 MSS SP-85, CAST IRON BODY, BRONZE FITTED, ELASTOMERIC DIAPHRAGM AND SEAT DISC, FLANGED.

13.13. RELIEF VALVES

13.13.1. PRESSURE RELIEF: WATTS MODEL SERIES 40 AGA Z21.22 CERTIFIED, BRONZE BODY, TEFLON SEAT, STEEL STEM AND SPRINGS, AUTOMATIC, DIRECT PRESSURE ACTUATED.

14. PLUMBING PIPING INSULATION

14.1. FINISHES:

14.1.1. EXPOSED INDOORS: PVC JACKET.

14.1.2. EXPOSED IN MECHANICAL ROOMS: PVC JACKET.

14.1.3. CONCEALED, INDOORS: CANVAS ON VALVES, FITTINGS. NO FURTHER FINISH.

14.1.4. USE VAPOUR RETARDER JACKET ON TIAC CODE A-3 INSULATION COMPATIBLE WITH INSULATION.

14.1.5. OUTDOORS: WATER-PROOF SS JACKET.

14.1.6. FINISH ATTACHMENTS: SS BANDS, AT 150 MM ON CENTRE. SEALS: CLOSED.

14.2. GLASS FIBRE

14.2.1. JOHNSMANVILLE MICRO-LOK OR EQUAL BY OWENS CORING FIBERGLASS, CERTAINTEED CRIMPWRAP.

14.2.2. INSULATION : ASTM C547 ; ASTM C411, ASTM C356, CAN/ULC-S102, ASTM E84, ASTM D774, NFPA 259. 'KSI' VALUE: 0.23 BTU-in/Hr-Sq. Ft-F AT 75°F, 0.33 W/m- C AT 24 °C. MINIMUM SERVICE TEMPERATURE: 0°F (-18°C). MAXIMUM SERVICE TEMPERATURE: 850°F (454°C). MAXIMUM MOISTURE ABSORPTION: <5% BY WEIGHT.

14.3. VAPOUR BARRIER JACKET. ASTM C136 TYPE I, WHITE KRAFT PAPER REINFORCED WITH GLASS FIBRE YARN AND BONDED TO ALUMINIZED FILM. MOISTURE VAPOUR TRANSMISSION: ASTM E96; 0.02 PERM. SECURE WITH SELF SEALING LONGITUDINAL LAPS AND BUTT STRIPS. SECURE WITH OUTWARD CLINCH EXPANDING STAPLES AND VAPOUR BARRIER MASTIC

14.4. TIE WIRE: 1.3 MM STAINLESS STEEL WITH TWISTED ENDS ON MAXIMUM 12" (300 MM) CENTRES

14.5. VAPOUR BARRIER LAP ADHESIVE COMPATIBLE WITH INSULATION.

14.6. INSULATING CEMENT/MASTIC: ASTM C195; HYDRAULIC SETTING ON MINERAL WOOL, VOC CONTENT NOT TO EXCEED 80 G/L.

14.7. FIBROUS GLASS FABRIC: CLOTH: UNTREATED; 9 OZ/SQ YD (305 G/SQ M) WEIGHT. BLANKET: 1.0 LB/CU FT (16 KG/CU M) DENSITY.

14.8. INDOOR VAPOUR BARRIER FINISH: VINYL EMULSION TYPE ACRYLIC, COMPATIBLE WITH INSULATION, WHITE COLOUR, VOC CONTENT NOT TO EXCEED 250 G/L.

14.9. OUTDOOR VAPOUR BARRIER MASTIC: VINYL EMULSION TYPE ACRYLIC, COMPATIBLE WITH INSULATION, WHITE COLOUR.

14.10. INSULATING CEMENT: ASTM C449, VOC CONTENT NOT TO EXCEED 80 G/L.

14.11. JACKETS

14.11.1. PVC PLASTIC: ONE PIECE MOULDED TYPE FITTING COVERS AND SHEET MATERIAL. CAN/ULC-S102, ASTM E84, ASTM D1784, ULC S102-M88. MAXIMUM SERVICE TEMPERATURE: 151°F (66°C). GLOSS FINISH. MAXIMUM FLAME SPREAD: CAN/ULC-S102, ASTM E84; 25 OR LESS. MAXIMUM SMOKE DEVELOPED: CAN/ULC-S102, ASTM E84; 50 OR LESS. THICKNESS: 20 MIL (0.4 MM) MINIMUM. 30 MIL (0.8 MM) MINIMUM FOR OUTDOOR USE. COLOUR: STANDARD OFF-WHITE COVERING ADHESIVE MASTIC: COMPATIBLE WITH INSULATION, MAXIMUM VOC CONTENT OF 50 G/L. APPROVED MANUFACTURER: CEEL-CO 300 SERIES, ZESTON PVC

14.11.2. ALUMINUM JACKET: ACAN/ULC-S102, STM E84. (APPLY TO ALL EXTERIOR PIPING ONLY) THICKNESS: ASTM C1729 REQUIREMENTS FOR RIGID AND NON-RIGID INSULATION FINISH. FINISH: SMOOTH PLAIN MILL FINISH. JOINING: LONGITUDINAL SLIP JOINTS AND 2" (50 MM) LAPS. FITTINGS: 0.02" (0.40 MM) THICK DIE SHAPED FITTING COVERS WITH FACTORY ATTACHED PROTECTIVE LINER. METAL JACKET BANDS: 3/8" (10 MM) WIDE; 0.01" (0.38 MM) THICK ALUMINUM.

14.12. PROVIDE PHENOLIC PIPE SUPPORTS BETWEEN PIPE HANGERS AND SUPPORTED PIPING TO PREVEN CRUSHING OF INSULATION BETWEEN PIPE AND PIPE HANGERS.

15. PIPE INSULATION THICKNESS

15.1. INSULATE NEW OR ALTERED PIPING WITH RIGID PIPE INSULATION AND RE-INSULATE EXISTING PIPING WHERE INSULATION HAS BEEN REMOVED OR DAMAGED AS FOLLOWS:

SERVICE	OPERATING TEMP. (°F)	PIPE DIA. (IN)	INSULATION THICKNESS (IN)
DCW	0 TO 105	ALL	1
DHW & DHWR	105 TO 180	3/8 TO 1-1/4	1
DHW & DHWR	105 TO 180	1-1/2 & LARGER	1-1/2
SANITARY	TO 55	ALL	1
STORM	TO 55	ALL	1

16. PLUMBING AND DRAINAGE TESTING

16.1. AFTER PIPES HAVE BEEN PLACED IN POSITION AND BRANCHES INSTALLED, BUT BEFORE FIXTURES HAVE BEEN SET OR CONNECTED, TEST THE JOINT TIGHTNESS AND PIPE SOUNDNESS.

16.2. MAKE TESTS BEFORE PIPING IS CONCEALED.

16.3. NOTIFY CONSULTANT AT LEAST 48 HOURS BEFORE COMMENCING TEST AND SUBMIT A WRITTEN CERTIFICATE CONFIRMING TESTS.

16.4. STORM, SANITARY, WASTE, AND VENT PIPING: SECURELY CLOSE OPENINGS IN PIPE ENDS BY MEANS OF APPROVED PLUGS AND FILL THE PIPING SYSTEM INCLUDING STACKS, BRANCHES TO FIXTURES AND HORIZONTAL RUNS WITH WATER. TEST BY RUNNING WATER INTO PIPES, FIXTURES, TRAPS AND APPARATUS TO DETECT IMPERFECT MATERIALS OR WORKMANSHIP. WHERE IT IS IMPOSSIBLE TO TEST THE WHOLE SYSTEM AT ONCE, DIVIDE INTO PARTS. PERFORM THE WATER TEST TO SECTION 7.3 OF THE OBC. PERFORM ADDITIONAL TESTS AS REQUIRED BY THE AUTHORITIES HAVING JURISDICTION.

16.5. TEST WATER LINES HYDROSTATICALLY AT 1.5 TIMES WORKING PRESSURE (NOT LESS THAN 200 PSIG) FOR A PERIOD OF NOT LESS THAN TWO HOURS WITHOUT ANY DROP IN PRESSURE. TEST PRIOR TO PIPE CONCEALMENT. DISCONNECT OR ISOLATE PRODUCTS THAT CANNOT BE SUBJECT TO TEST PRESSURE WITHOUT DAMAGE.

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16.6. CORRECT DEFECTS AND RE-TEST UNTIL RESULTS ARE ACCEPTABLE.

16.7. DO NOT CAULK THREADED JOINTS.

16.8. CHECK HORIZONTAL PIPE WITH AN ACCURATE LEVEL FOR ALTERATIONS IN PITCH.

16.9. INSPECT LATERALS, CROSSARMS AND ELIMINATE AIR POCKETS. CORRECT CASES OF WATER HAMMER.

17. FLUSHING AND CLEANING.

17.1. INSPECT SYSTEMS AND REMOVE DEBRIS, OIL AND DIRT.

17.2. FLUSH COMPLETED SYSTEMS WITH CLEAR WATER.

17.3. MAINTAIN ISOLATING AND CONTROL VALVES IN OPEN POSITION.

17.4. DOMESTIC WATER SYSTEM: FLUSH, CHLORINATE AND RE-FLUSH OUTSIDE WATER MAINS TO AWWA C651-99.

18. FUEL GAS PIPING

18.1. BURIED PIPING

18.1.1. COPPER TUBING: ASTM B88, TYPE K, PROTECTED AGAINST PHYSICAL DAMAGE ABOVE GROUND. FITTINGS: ASME B16.18, CAST COPPER ALLOY OR ASTM B16.22 WROUGHT COPPER OR BRONZE, RATED FOR NOT LESS THAN 125 PSIG WORKING PRESSURE. JOINTS: AWS A5.8 CLASSIFICATION BCUP-3 OR BCUP-4 SILVER BRAZE.

18.1.2. COPPER TUBING: ASTM B88 TYPE L OR ASTM B837 TYPE G, EXTERNALLY COATED WITH EXTRUDED POLYETHYLENE OR PVC RESIN. FITTINGS: ASME B16.26, CAST BRONZE, RATED FOR NOT LESS THAN 125 PSIG WORKING PRESSURE. JOINTS: AWS A5.8 CLASSIFICATION BCUP-3 OR BCUP-4 SILVER BRAZE.

18.1.3. STEEL PIPE: ASTM A53/A53M OR A106, SCHEDULE 40, SEAMLESS. FITTINGS: STEEL TO ANSI/ASME B 16, RATED FOR NOT LESS THAN 125 PSIG WORKING PRESSURE. JOINTS: ANSI B31.1 WELDED. JACKET: AWWA C105 POLYETHYLENE OR DOUBLE LAYER, HALF-LAPPED 0.25 MM POLYETHYLENE TAPE.

18.2. ABOVE GROUND PIPING

18.2.1. COPPER TUBING: ASTM B88, TYPE K, HARD DRAWN. FITTINGS: ASME B16.18, CAST COPPER ALLOY OR ASTM B16.22 WROUGHT COPPER AND BRONZE. JOINTS: AWS A5.8 CLASSIFICATION BCUP-3 OR BCUP-4 SILVER BRAZE.

18.2.2. STEEL PIPE: ASTM A53/A53M GR. B, ERW OR A106 SMLS, SCHEDULE 40. FITTINGS: ASTM B16.3, MALLEABLE IRON CLASS 150, SCREWED OR FLANGED OR ASTM A234/A234M, WROUGHT CARBON STEEL AND ALLOY STEEL WELDING TYPE. JOINTS: NFPA 30, THREADED, FLANGED OR WELDED TO ANSI B31.1.

18.2.3. SCREWED FITTINGS: PULVERIZED LEAD PASTE.

18.2.4. WELDED FITTINGS: BUTT-WELDING FITTINGS TO CSA W47.1.

18.2.5. FLANGE GASKETS: NONMETALLIC FLAT, TO ASME B16.5.

18.2.6. UNIONS: MALLEABLE IRON, BRASS TO IRON, GROUND SEAT, TO ASTM A 47/A47M.

18.2.7. BOLTS AND NUTS: TO ASME B18.2.1.

18.2.8. NIPPLES: SCHEDULE 40, TO ASTM A 53/A53M.

18.2.9. WHERE PIPING IS INSTALLED IN CEILINGS USED AS RETURN AIR PLENUMS, PROVIDE SEAMLESS PIPE AND WELDING FITTINGS.

18.3. ISOLATION VALVES

18.3.1. 2" (50 MM) AND SMALLER: SEMI-STEEL LUBRICATED PLUG VALVES, SCREWED, WRENCH OPERATED. ROCKWELL "NORDSTRUM" FIG. 142, NEWMAN-MILLIKEN 170M.

18.3.2. 2-1/2" (65 MM) AND 3" (75 MM): SEMI-STEEL LUBRICATED PLUG VALVES, FLANGED, WRENCH OPERATED. ROCKWELL "NORDSTRUM" FIG. 143, NEWMAN-MILLIKEN 171M.

18.3.3. PROVIDE TWO (2) STANDARD PATTERN, CAST HANDLE WRENCHES TO OPERATE VALVES.

18.4. GAS PRESSURE REDUCING AND RELIEF VALVES: SPRING LOADED REGULATOR WITH INTERNAL RELIEF VALVE. CAST IRON BODY, ALUMINUM DIAPHRAGM CASE AND ORIFICE. FOR CAPACITIES REFER TO DRAWINGS.

18.5. GAS PIPE INSTALLATION & TESTING

18.5.1. INSTALL AND TEST GAS PIPING TO LOCAL UTILITY REGULATIONS, CSA B149.1, AND LOCAL AUTHORITIES HAVING JURISDICTION.

18.5.2. TEST PIPING WITH INERT GAS TO 50 PSIG AS PER B149.1. PURGE AFTER PRESSURE TEST. AFFIX TAGS TO PIPING AT THE POINT OF PIPING ENTRY INTO BUILDING.

18.5.3. REPAIR LEAKS AND RE-TEST UNITL SYSTEM IS ACCEPTED BY THE CONSULTANT.

18.5.4. DO NOT CAULK THREADED JOINTS.

18.5.5. SLOPE PIPING DOWN IN THE DIRECTION OF FLOW TO LOW POINTS.

18.5.6. PROVIDE ECCENTRIC REDUCEDS AT PIPE SIZE CHANGES TO PROVIDE POSITIVE DRAINAGE.

18.5.7. PROVIDE GAS ISOLATION VALVES AT PIPING BRANCHES AND EQUIPMENT. INSTALL SHUT-OFF VALVES AT MAIN GAS SERVICE ENTERING BUILDING AND OUTSIDE MECHANICAL ROOMS CONTAINING GAS-FIRED EQUIPMENT.

19. PLUMBING FIXTURE AND DRAINAGE SPECIALTIES

19.1. W-1 BARRIER FREE AND NON-BARRIER FREE FLOOR MOUNTED TOILET:

19.1.1. ZURN Z5560-VL 1.6 GPF PRESSURE ASSIST, ADA HEIGHT, ELONGATED TWO-PIECE TOILET, VITREOUS CHINA C/W PRESSURE ASSISTED TANK, TOUCH HANDLE ACTIVATION, SIPHON JET ACTION, 2-1/8" GLAZED TRAPWAY AND VANDAL-PROOF LID.

19.1.2. ZURN Z5956SS-EL (NON-BARRIER FREE) ELONGATED, EXTRA HEAVY DUTY, PREMIUM WHITE, OPEN FRONT TOILET SEAT, LESS COVER, WITH SELF-SUSTAINING STAINLESS STEEL CHECK HINGE, ZURN-SHIELD PROTECTION.

19.1.3. ZURN Z5956SS-EL-ADA (BARRIER-FREE) ELONGATED, EXTRA HEAVY DUTY, PREMIUM WHITE, OPEN FRONT TOILET SEAT, LESS COVER, WITH SELF-SUSTAINING STAINLESS STEEL CHECK HINGE, ZURN-SHIELD PROTECTION, AND 2" LIFT.

19.2. L-1 - WALL HUNG BASIN - ELECTRONIC FAUCET - FLOOR MOUNTED LAVATORY CARRIER

19.2.1. AMERICAN STANDARD WHEELCHAIR #9141.011 BASIN, FAUCET HOLES ON 4" CENTRES, 20-1/16" X 27" X 6-5/8" HIGH, VITREOUS CHINA, WHITE FINISH, FOR CARRIER WITH CONCEALED ARMS, FRONT OVERFLOW, FAUCET LEDGE.

19.2.2. ZURN Z6915-XL-10S-LS-HW6-MJ AQUASENSE FAUCET, ADA COMPLIANT, HARD-WIRED, POLISHED CHROME-PLATED CAST BRASS SENSOR FAUCET WITH INFRARED PROXIMITY SENSOR, 1.5 GPM AERATOR, MOUNTING HARDWARE, HW6 HARD-WIRED POWER CONVERTER AND MINI-JUNCTION BOX.

19.2.3. LAWLER #TMM-1070, BELOW DECK MECHANICAL WATER MIXING VALVE, BRONZE BODY, TEMPERATURE ADJUSTING DIAL, 10 MM (3/8") INLETS AND OUTLET COMPRESSION FITTINGS, HIGH TEMPERATURE THERMOSTATIC LIMIT STOP, SHUT-OFF WITH AUTOMATIC RESET WHEN TEMPERATURE EXCEEDS 120 ºF (48.8 ºC), INTEGRAL CHECKS, OFFER TEMPERATURE RANGE FROM FULL COLD THROUGH 46 °C (114.8 °F).

19.2.4. PROVIDE ADAPTORS AND FLEXIBLE COPPER TUBING TO SUIT INSTALLATION.

19.2.5. MCGUIRE #155A OPEN GRID DRAIN, CAST BRASE ONE-PIECE TOP, 17 GA TUBULAR 1-1/4" TAILPIECE.

19.2.6. MCGUIRE LFH 170BV FAUCET SUPPLIES, CHROME PLATED FINISH, POLISHED BRASS, COMMERCIAL DUTY, ¼ TURN BALL VALVE ANGLE STOPS, ½" INLET X 5" HORIZONTAL EXTENSION TUBES, CONVERTIBLE ¼ TURN/LOOSE KEY HANDLES, ESCUTCHEON AND FLEXIBLE COPPER RISERS.

19.2.7. MCGUIRE #8872C P-TRAP, HEAVY CAST BRASS ADJUSTIBLE BODY, WITH SLIP NUT, 1-1/4" SIZE, SHALLOW WALL FLANGE AND SEAMLESS TUBULAR WALL BEND.

19.2.8. WATTS #WCA-411-WC BASIN CARRIER, CONCEALED ARMS, WALL FLANGES TO ATTACH TO BACKING PLATE SECURED IN WALL WITH LOCKING DEVICE AND LEVELLING SCREWS, HEAVY GAUGE STEEL UPRIGHTS WITH INTEGRAL WELDED FEET.

19.3. DROP-IN SINK - NON-BARRIER FREE

19.3.1. FRANKE COMMERCIAL #LBS6808-1/1 SINGLE BOWL COUNTERTOP MOUNT SINK, 1 HOLE, 508 MM (20") WIDE X 521 MM (20-1/2") LONG X 203 MM (8") HIGH DEEP, COUNTER MOUNTED, BACKLEDGE, GRADE 18-10 20 GA. (0.9 MM) TYPE 302 STAINLESS STEEL, SELF-RIMMING, SATIN FINISH RIM AND BOWLS, MOUNTING KIT PROVIDED, FULLY UNDERCOATED TO REDUCE CONDENSATION AND RESONANCE, FACTORY APPLIED RIM SEAL, 3-1/2" (89 MM) CRUMB CUP WASTE ASSEMBLY WITH 1-1/2" (38 MM) TAILPIECE.

19.3.2. MOEN MODEL: 8562 M. POWER MIXING GOOSENECK ELECTRONIC FAUCET, HARD-WIRED POWER CONNECTION C/W TRANSFORMER, MANUAL ON/OFF LANDLE, CHROME PLATED, CAST BRASS CONSTRUCTION, IN-LINE FILTER, 0.5 GPM LAMINAR FLOW.

19.3.3. LAWLER #TMM-1070, BELOW DECK MECHANICAL WATER MIXING VALVE, BRONZE BODY, TEMPERATURE ADJUSTING DIAL, 10 MM (3/8") INLETS AND OUTLET COMPRESSION FITTINGS, HIGH TEMPERATURE THERMOSTATIC LIMIT STOP, SHUT-OFF WITH AUTOMATIC RESET WHEN TEMPERATURE EXCEEDS 120 ºF (48.8 ºC), INTEGRAL CHECKS, OFFER TEMPERATURE RANGE FROM FULL COLD THROUGH 46 °C (114.8 °F).

19.3.4. MCGUIRE #LFH165LKN3 FAUCET SUPPLIES, CHROME PLATED FINISH POLISHED BRASS, HEAVY DUTY ANGLE STOPS, 10 MM (3/8") I.P.S. INLET X 76 MM (3") LONG RIGID HORIZONTAL NIPPLES, V.P. LOOSE KEYS, ESCUTCHEON AND FLEXIBLE COPPER RISERS.

19.3.5. MCGUIRE #8912CB P-TRAP, HEAVY CAST BRASS ADJUSTABLE BODY, WITH SLIP NUT, 38 MM (1-1/2") SIZE, BOX FLANGE AND SEAMLESS TUBULAR WALL BEND.

19.4. FD-1 STANDARD FLOOR DRAIN

19.4.1. ZURN 415 CAST IRON FLOOR DRAIN C/W DURA COATED CAST IRON BODY WITH BOTTOM OUTLET, COMBINATION INVERTIBLE MEMBRANE CLAMP AND ADJUSTABLE COLLAR WITH SEEPAGE SLOTS, TRAP SEAL PRIMER CONNECTION, TYPE J POLISHED NICKEL BRONZE, LIGHT DUTY SQUARE, HEEL-PROOF STRAINER

19.5. TRAP SEAL PRIMER (SINGLE)

19.5.1. ZURN Z1022-XL AUTOMATIC TRAP PRIMER C/W ALL BRONZE BODY WITH INTEGRAL VACUUM BREAKER, NON-LIMITING INTERNAL OPERATING PISTON, STAINLESS STEEL SPRING, REMOVABLE BRONZE SEAT WITH METERING OROFICE, AND SEALED BRONZE COVER.

19.6. FLOOR CLEANOUT

19.6.1. ZURN Z1400-SZ1-DP CLEANOUT C/W DURA-COATED CAST-IRON BODY, GAS & WATER-TIGHT

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CLEANOUT PLUG, STAINLESS STEEL DECK PLATE, TOP ASSEMBLY, CONCRETE SHEILD TO PROVIDE 1" OF VERTICAL POST-POUR ADJUSTMENT, SHIMS, AND INTEGRATED COVER WITH ROUGH-IN COVER FOR PROTECTION DURING POUR. DESIGNED TO ASME A112.36.2M. VANDAL-PROOF SCREWS.

20. FIXED AIR GAP

20.1. PROVIDE ZURN Z1024 DURA-COATED CAST IRON FIXED AIR GAP WITH SLIP JOINT INLET AND NPT OUTLET

21. WATER HAMMER ARRESTORS

21.1. PROVIDE PROPERLY SIZED ZURN Z17100 WITH NESTING TYPE BELLOWS CONTAINED WITHIN CASING HAVING SUFFICIENT DISPLACEMENT VOLUME TO DISSIPATE THE CALCULATED KINETIC ENERGY GENERATED IN THE PIPING SYSTEM. BOTH CASING AND BELLOWS CONSTRUCTED OF 18-8 STAINLESS STEEL.

21.2. INSTALL WATER HAMMER ARRESTORS COMPLETE WITH AN ACCESSIBLE ISOLATION VALVE ON HOT AND COLD WATER SUPPLY PIPING TO PLUMBING FIXTURES AND FIXTURE GROUPS, DOWNSTREAM OF EACH BACKFLOW PREVENTOR, OWNER'S EQUIPMENT AND APPLIANCES WITH FLUSH VALVES, SOLENOID VALVES OR OTHER QUICK CLOSING VALVES, AND WHEREVER NECESSARY TO PREVENT WATER HAMMER.

CONSTRUCTION NORTH

TRUE NORTH

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STRUCTURAL MECHANICAL ELECTRICAL CIVIL ENGINEERS
15 Foundry Street, Dundas, ON, L9H 2V6
Phone: (905)648-0373
www.manteconpartners.com

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PRESCHOOL DAY CARE ADDITION
Ecole elementaire catholique Saint-Marguerite-Bourgeoys
60 Clench Avenue, Brantford, Ontario N3T 1B9

MECHANICAL SPECIFICATIONS

M0.3

HVAC SPECIFICATIONS 21-153

1. HVAC GENERAL

1.1. CERTAIN ITEMS SUCH AS RISES AND DROPS IN DUCTWORK, ACCESS DOORS, VOLUME DAMPERS, ETC. ARE INDICATED FOR CLARITY FOR A SPECIFIC LOCATION REQUIREMENT. DO NOT INTERPRET AS THE COMPLETE EXTENT OF THE REQUIREMENTS FOR THESE ITEMS.

1.2. CO-ORDINATE DIFFUSERS, REGISTERS, AND GRILLE LOCATIONS WITH ARCHITECTURAL REFLECTED CEILING PLANS, LIGHTING AND OTHER CEILING ITEMS. MAKE MINOR DUCT MODIFICATIONS TO SUIT.

1.3. ARRANGE AND ASSEMBLE FIELD-ERECTED AND FACTORY ASSEMBLED AIR HANDLING UNIT COILS FOR REMOVAL FROM UPSTREAM SIDE WITHOUT DISMANTILING SUPPORTS. PROVIDE GALVANIZED STEEL SUPPORTS FOR COILS IN BANKS OVER TWO COILS HIGH TO PERMIT INDEPENDENT REMOVAL OF INDIVIDUAL COILS.

1.4. ENSURE AIR HANDLING UNITS OPERATE WITHOUT MOISTURE CARRY-OVER.

1.5. LOCATE MECHANICAL EQUIPMENT SUCH AS SINGLE-DUCT, DUAL-DUCT, VARIABLE VOLUME, CONSTANT VOLUME AND FAN-POWERED BOXES, FAN COILS, CABINET HEATERS, UNIT HEATERS, UNIT VENTILATORS, COILS, HUMIDIFIERS, ETC. FOR UNOBSTRUCTED ACCESS TO ACCESS PANELS, CONTROLS AND VALVING.

1.6. PROVIDE WALL-TO-WALL FINNED-TUBE RADIATION ENCLOSURES UNLESS OTHERWISE INDICATED.

1.7. PROVIDE FLEXIBLE CONNECTIONS IN DUCTWORK CONNECTIONS TO AIR-HANDLERS, FANS AND OTHER EQUIPMENT THAT REQUIRES VIBRATION ISOLATION.

2. HVAC DUCTWORK

2.1. HVAC DUCTWORK - GENERAL:

2.1.1. INSTALL AND SEAL DUCTS TO SMACNA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE.

2.1.2. SUPPORT DUCTWORK FROM STRUCTURAL MEMBERS. WHERE STRUCTURAL BEARINGS DO NOT EXIST, SUSPEND STRAPPING OR HANGERS FROM STEEL CHANNELS OR ANGLES. PROVIDE SUPPLEMENTARY STRUCTURAL MEMBERS.

2.1.3. DUCT SIZES ARE INSIDE CLEAR DIMENSIONS. FOR LINED DUCTS, MAINTAIN SIZES INSIDE LINING.

2.1.4. PROVIDE OPENINGS IN DUCT WORK WHERE REQUIRED TO ACCOMMODATE THERMOMETERS AND CONTROLLERS. PROVIDE PILOT TUBE OPENINGS WHERE REQUIRED FOR TESTING OF SYSTEMS, COMPLETE WITH METAL CAN WITH SPRING DEVICE OR SCREW TO ENSURE AGAINST AIR LEAKAGE. WHERE OPENINGS ARE PROVIDED IN INSULATED DUCTWORK, INSTALL INSULATION MATERIAL INSIDE A METAL RING.

2.1.5. INSTALL BALANCING DAMPERS ON BRANCHES AS PER LOCATIONS SHOWN ON THE DRAWINGS AND AS PER THE REQUIREMENTS OF NEBB AND AABC LISTING/MEASURING STANDARDS.

2.1.6. PROVIDE DRAIN IN EVERY FRESH AIR INTAKE AND EXHAUST PLENUM.

2.1.7. LEAK TEST DUCTWORK IN ACCORDANCE WITH THE SMACNA "HVAC AIR DUCT LEAKAGE TEST MANUAL". THE MAXIMUM PERMITTED DUCT LEAKAGE SHALL BE DETERMINED BY MULTIPLYING THE LEAKAGE FACTOR FROM PARAGRAPH 2.4 ABOVE BY THE SURFACE AREA OF THE DUCTWORK IN THE TEST ZONE.

2.1.8. INSTALL DUCTWORK CLEAR OF DOORS AND WINDOWS.

2.1.9. PROVIDE 90-DEGREE ELBOWS WITH DOUBLE-RADIUS TURNING VANES UNLESS OTHERWISE INDICATED. PROVIDE UN-VANED, SMOOTH-RADIUSED ELBOWS IN DISHWASHER, KITCHEN, AND LAUNDRY EXHAUSTS WITH RADIUS 1.5 TIMES DUCT WIDTH. PROVIDE ACCESS DOORS UPSTREAM OF ELBOWS WITH TURNING VANES.

2.1.10. UNLESS OTHERWISE INDICATED, PROVIDE DUCTWORK TIGHT TO UNDERSIDE OF STRUCTURE WITH SPACE FOR INSULATION IF REQUIRED.

2.1.11. CO-ORDINATE DUCTWORK WITH OTHER TRADES. PROVIDE OFFSETS INCLUDING DIVIDED DUCTS AND TRANSITIONS AROUND OBSTRUCTIONS.

2.2. MATERIALS

2.2.1. STANDARD CONSTRUCTION, RIGID HVAC DUCTS, CASINGS AND FITTINGS:

2.2.1.1. ASTM A653 GALVANIZED STEEL SHEET, LOCK FORM QUALITY, G90 ZINC COATING (0.90 OZ/FT2) TO ASTM A90. SHEETS FREE OF PITS, BLISTERS, SLIVERS, AND UNGALVANIZED SPOTS.

2.2.2. RIGID HVAC DUCTS, CASINGS AND FITTINGS INSTALLED UNDERGROUND (BELOW SLABS ON GRADE) AND RIGID HVAC DUCTS, CASINGS AND FITTINGS INSTALLED IN SWIMMING POOLS (NATATORIUM).

2.2.2.1. PVC COATED, GALVANIZED STEEL SHEETS, LOCK FORM QUALITY TO ASTM A653, G90 ZINC COATING (0.90 OZ/FT2 BOTH SIDES) AND FACTORY APPLIED 4-MIL PVC COATING. DUCTWORK SHALL BE UL-181, CLASS 1 LISTED.

2.3. DUCT SEALING

2.3.1. SEAL DUCTWORK IN ACCORDANCE WITH SMACNA DUCT CONSTRUCTION STANDARDS SEALING REQUIREMENT AS FOLLOWS:

2.3.1.1. PROVIDE SEAL CLASS A.

2.3.1.2. SEAL ROTATING SHAFT OPENINGS WITH BUSHINGS, ETC. TO SEAL OFF AIR LEAKAGE.

2.3.1.3. DO NOT USE PRESSURE-SENSITIVE TAPE AS PRIMARY SEALANT UNLESS IT COMPLIES WITH UL-181A OR UL-181B AND IS USED IN ACCORDANCE WITH THAT CERTIFICATION.

2.3.1.4. SEAL CONNECTIONS INCLUDING SPIN-INS, TAPS, BRANCH CONNECTIONS, ACCESS DOORS, ACCESS PANELS, AND DUCT CONNECTIONS TO EQUIPMENT. SPIRAL LOCK SEAMS DO NOT NEED SEALING.

2.3.1.5. LEAK TEST DUCTWORK DESIGNED TO OPERATE IN EXCESS OF 3" W.C. OR EXTERIOR DUCTWORK TO INDUSTRY STANDARDS. TEST AS PER ASHRAE 90.1 REQUIREMENTS.

2.4. DUCTWORK FABRICATION

2.4.1. CONSTRUCT DUCTWORK TO WITHSTAND 1-1/2 TIMES FAN PRESSURE AT SHUT-OFF AND 2" (500 PA) MINIMUM.

2.4.2. FABRICATE AND SUPPORT TO SMACNA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE, AND AS INDICATED. PROVIDE DUCT MATERIAL, GAUGES, REINFORCING, AND SEALING FOR OPERATING PRESSURES INDICATED IN ACCORDANCE WITH RECOMMENDATIONS OF ASHRAE AND SMACNA.

2.5. JOINTS AND REINFORCEMENTS:

2.5.1. TO SMACNA AND ASHRAE

2.5.2. MAY BE MADE WITH THE DUCTMATE SYSTEM OR NEXUS SYSTEM. SYSTEM COMPONENTS SHALL BE MADE OF STANDARD CATALOGUE MANUFACTURE AS SUPPLIED BY DUCTMATE INDUSTRIES, INC. OR NEXUS INC.

2.5.3. CONSTRUCT TEES, BENDS, AND ELBOWS WITH RADIUS OF NOT LESS THAN 1-1/2 TIMES WIDTH OF DUCT ON CENTRELINE. WHERE NOT POSSIBLE AND WHERE RECTANGULAR ELBOWS ARE USED, PROVIDE AIR FOIL TURNING VANES. WHERE ACOUSTICAL LINING IS INDICATED, PROVIDE TURNING VANES OF PERFORATED METAL WITH GLASS FIBRE INSULATION.

2.5.4. INCREASE DUCT SIZES GRADUALLY, NOT EXCEEDING 15 DEGREES DIVERGENCE WHEREVER POSSIBLE; MAXIMUM 30 DEGREES DIVERGENCE UPSTREAM OF EQUIPMENT AND 45 DEGREES CONVERGENCE DOWNSTREAM.

2.6. FABRICATE CONTINUOUSLY WELDED ROUND AND OVAL DUCT FITTINGS TWO GAUGES HEAVIER THAN DUCT GAUGES INDICATED IN SMACNA STANDARD. JOINTS: MINIMUM 80 MM CEMENTED SLIP JOINT, BRAZED OR ELECTRIC WELDED. PRIME COAT WELDED JOINTS.

2.7. PROVIDE STANDARD 45-DEGREE LATERAL WYE TAKEOFFS. ALTERNATIVE 90-DEGREE CONICAL TEE CONNECTIONS MAY BE USED ONLY WHERE SPECIFICALLY INDICATED.

2.8. FLEXIBLE DUCTWORK

2.8.1. MAXIMUM LENGTH: 5-FEET.

2.8.2. PROVIDE RIGID ELBOWS AT CONNECTIONS TO DIFFUSERS, GRILLES AND REGISTERS, ETC.

2.8.3. MANUFACTURER: THERMAFLEX M-KC

2.8.4. FLEXIBLE DUCTWORK CONFORMING TO UNDERWRITERS LABORATORIES LISTED AS CLASS 1 AIR DUCT, UL STANDARD 181 AND CUL S110.

2.8.5. CONFORMS TO NFPA 90A AND 90B.

2.8.6. HEAVY WOVEN AND COATED FIBERGLASS CLOTH CORE.

2.8.7. GREENGUARD CERTIFIED.

2.8.8. FIBERGLASS INSULATING BLANKET AND LOW PERMEABILITY OUTER VAPOR BARRIER OF FIBERGLASS REINFORCED METALLIZED FILM LAMINATE.

2.8.9. 20/50 FLAME/SMOKE SPREAD RATING.

2.8.10. 0.05 PERM VAPOR TRANSMISSION RATING

3. HVAC DUCT INSULATION

3.1. DO NOT BREAK CONTINUITY OF INSULATION VAPOUR BARRIER BY HANGERS OR RODS.

3.2. GLASS FIBRE, FLEXIBLE

3.2.1. MANUFACTURER: CERTAINTEED SOFT TOUCH AND WIDE WRAP

3.2.2. OTHER ACCEPTABLE MANUFACTURERS: JOHNS MANVILLE MICROLITE.

3.2.3. INSULATION: ASTM C553; ASTM C1290, CAN 51.11-92, ASTM C1136, NFPA 90A, CAN/ULC-S102, ASTM E84, ASTM E136.

3.2.4. 'KSI' VALUE: ASTM C518, 0.039 AT 24 °C (0.27 @ 75.2 °F)

3.2.5. MAXIMUM SERVICE TEMPERATURE: 121 °C (250 °F).

3.2.6. MAXIMUM MOISTURE ABSORPTION: ASTM C1104; <5% BY WEIGHT.

3.2.7. CAN/ULC-S102, ASTM E84 MAXIMUM FLAME SPREAD INDEX: 25. MAXIMUM SMOKE DEV INDEX: 50

3.2.8. VAPOUR BARRIER JACKET:

3.2.8.1. KRAFT PAPER WITH GLASS FIBRE YARN AND BONDED TO ALUMINIZED FILM. (FSK)

3.2.8.2. KRAFT PAPER REINFORCED WITH GLASS FIBRE YARN AND BONDED TO WHITE METALIZED POLYPROPYLENE

3.2.8.3. MOISTURE VAPOUR TRANSMISSION : ASTM E96 ; 0.02 PERM.

3.2.8.4. SECURE WITH PRESSURE SENSITIVE TAPE.

3.2.8.5. VAPOUR BARRIER TAPE: KRAFT PAPER REINFORCED WITH GLASS FIBRE YARN AND BONDED TO ALUMINIZED FILM, WITH PRESSURE SENSITIVE RUBBER BASED ADHESIVE.

3.2.8.6. OUTDOOR VAPOUR BARRIER MASTIC: VINYL EMULSION TYPE ACRYLIC OR MASTIC, COMPATIBLE WITH INSULATION, BLACK COLOUR.

3.2.8.7. ON COOLING DUCTS OUTSIDE THE CONDITIONED SPACE PROVIDE VAPOUR BARRIER LOCATED

OUTSIDE THE INSULATION. SEAL JOINTS AND PENETRATIONS.

3.2.9. TIE WIRE: ANNEALED STEEL, 1/16" (1.5 MM).

3.3. GLASS FIBRE, RIGID

3.3.1. MANUFACTURER: CERTAINTEED CERTAPRO BOARD.

3.3.2. OTHER ACCEPTABLE MANUFACTURERS: JOHNS MANVILLE 800 SERIES SPIN-GLASS

3.3.3. INSULATION: ASTM C612; RIGID, NONCOMBUSTIBLE BLANKET.

3.3.3.1. INSULATION: ASTM C553; ASTM C1290, CAN 51.11-92, ASTM C1136, NFPA 90A, CAN/ULC-S102, ASTM E84, ASTM E136.

3.3.3.2. 'KSI' VALUE: ASTM C518, 0.25 BTU-in/Hr-Sq. Ft- F AT 75 F (0.036 W/M- C AT 24 C).

3.3.3.3. MAXIMUM SERVICE TEMPERATURE: 250 °F (121 °C).

3.3.3.4. MAXIMUM MOISTURE ABSORPTION: ASTM C1104, LESS THAN5% BY WEIGHT.

3.3.3.5. A CAN/ULC-S102, STM E84 MAXIMUM FLAME SPREAD INDEX: 25. MAXIMUM SMOKE DEV INDEX: 50

3.3.4. VAPOUR BARRIER JACKET:

3.3.4.1. KRAFT PAPER WITH GLASS FIBRE YARN AND BONDED TO ALUMINIZED FILM.

3.3.4.2. MOISTURE VAPOUR TRANSMISSION : ASTM E96 ; 0.04 PERM.

3.3.4.3. SECURE WITH PRESSURE SENSITIVE TAPE.

3.4. RIGID/FLEXIBLE INSULATION TYPE

3.4.1. PROVIDE RIGID INSULATION ON RECTANGULAR DUCTS, PLENUMS AND DUCT MOUNTED EQUIPMENT SUCH AS COILS.

3.4.2. PROVIDE FLEXIBLE INSULATION TYPE ON ROUND OR FLAT OVAL DUCTWORK.

3.5. DUCT INSULATION THICKNESS

3.5.1. INSULATE NEW OR ALTERED DUCTWORK AND RE-INSULATE EXISTING DUCTWORK WHERE INSULATION HAS BEEN REMOVED OR DAMAGED AS FOLLOWS:

DUCT LOCATION	HEATING ONLY DUCTS	COOLING ONLY DUCTS	RETURN OR EXHAUST DUCTS	COMBINED HEATING & COOLING DUC
EXTERIOR	R-12	R-12	R-12	R-12
VENTILATED ATTIC	R-6	R-1.9	R-3.5	R-6
UNVENTILATED ATTIC ABOVE INSULATED CEILING	R-12	R-12	R-12	R-12
UNVENTILATED ATTIC WITH ROOF INSULATION	NONE	R-1.9	NONE	R-1.9
UNCONDITIONED SPACE	R-12	R-12	R-12	R-12
INDIRECTLY CONDITIONED SPACE	NONE	NONE	NONE	NONE
BURIED	R-6	NONE	NONE	R-3.5

3.6. INDIRECTLY CONDITIONED SPACES IN TABLE ABOVE INCLUDES RETURN AIR PLENUMS WITH OR WITHOUT EXPOSED ROOF ABOVE. UNCONDITIONED SPACES INCLUDE CRAWLSPACES BOTH VENTILATED AND UNVENTILATED.

3.7. INSULATE INLINE DUCT SILENCERS IN THE SAME MANNER AS DUCTWORK.

3.8. ON COOLING DUCTS OUTSIDE CONDITIONED SPACE PROVIDE VAPOUR BARRIER LOCATED OUTSIDE THE INSULATION. SEAL JOINTS AND PENETRATIONS.

3.9. PROTECT INSULATION EXPOSED TO WEATHER WITH ALUMINUM JACKETING.

3.10. PROVIDE INSULATION (EXTERIOR COLUMN) ON EXHAUST DUCTS AND PLENUMS WITHIN 6' OF EXTERIOR WALL PENETRATIONS.

4. DUCT ACCESSORIES

4.1. AIR TURNING DEVICES / EXTRACTORS

4.1.1. TURNING VANES IN RECTANGULAR DUCT ELBOWS SHALL BE DOUBLE WALLED, MULTI-BLADE VANES WITH BLADES ALIGNED IN SHORT DIMENSION; STEEL CONSTRUCTION; WITH INDIVIDUALLY ADJUSTABLE BLADES, MOUNTING STRAPS. ACCEPTABLE PRODUCTS: DURO-DYNE "DURO VANE RAIL", HART & COOLEY "DUCTURN", DYN-AIR OR TUTTLE AND BAILY.

4.1.2. VOLUME EXTRACTORS: GANG OPERATED CURVED BLADES, ADJUSTABLE FROM FULL OPEN TO FULL CLOSED POSITIONS. UNITS SHALL BE FACTORY ASSEMBLED, FABRICATED FROM 14 GA. AND 22 GA. (2 AND .9 MM) STEEL, WITH BLADES ON 1" (25 MM) CENTRES, AND NO. 2 OR NO. 3 OPERATORS TO SUIT APPLICATION.

4.1.3. ACCEPTABLE MANUFACTURERS: EH PRICE MODEL AE1 INDICATED. KRUEGER MODEL EX-8, DURO-DYNE, DYN-AIR.

4.2. BACKDRAFT DAMPERS.

4.2.1. GRAVITY BACKDRAFT DAMPERS, SIZE 18" X 18" (450 X 450 MM) OR SMALLER, PROVIDED WITH AIR MOVING EQUIPMENT: AIR MOVING EQUIPMENT MANUFACTURERS STANDARD CONSTRUCTION.

4.2.2. MULTI-BLADE, PARALLEL ACTION GRAVITY BALANCED BACKDRAFT DAMPERS: 1/16" (1.5 MM) THICK GALVANIZED STEEL, OR, WITH CENTRE PIVOTED BLADES OF MAXIMUM 6" (150 MM) WIDTH, WITH FELT OR FLEXIBLE VINYL SEALED EDGES, LINKED TOGETHER IN RATTLE-FREE MANNER WITH 90 DEGREE STOP, STEEL BALL BEARINGS, AND PLATED STEEL PIVOT PIN; ADJUSTMENT DEVICE TO PERMIT SETTING FOR VARYING DIFFERENTIAL STATIC PRESSURE.

4.2.3. PROVIDE MAXIMUM AIR LEAKAGE OF 4 CFM/SQ. FT AT 1.0" W.C. DIFFERENTIAL PRESSURE.

4.2.4. ACCEPTABLE MANUFACTURERS: EH PRICE.

4.3. VOLUME CONTROL DAMPERS

4.3.1. FABRICATE TO SMACNA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE, AND AS INDICATED.

4.3.2. PROVIDE MAXIMUM AIR LEAKAGE OF 4 CFM/SQ. FT AT 1.0" W.C. DIFFERENTIAL PRESSURE.

4.4. SPLITTER DAMPERS:

4.4.1. MATERIAL: SAME GAUGE AS DUCT TO 24" (600 MM) SIZE IN EITHER DIRECTION, AND TWO GAUGES HEAVIER FOR SIZES OVER 24" (600 MM).

4.4.2. BLADE: FABRICATE OF SINGLE THICKNESS SHEET METAL TO STREAMLINE SHAPE, SECURED WITH CONTINUOUS HINGE OR ROD.

4.4.3. OPERATOR: MINIMUM 24" (600 MM) DIAMETER ROD IN SELF ALIGNING, UNIVERSAL JOINT ACTION, FLANGED BUSHING WITH SET SCREW.

4.5. SINGLE LEAF DAMPERS: FABRICATED FROM MINIMUM 20 GAUGE (1.0 MM) GALVANIZED STEEL, SUITABLY REINFORCED TO PREVENT VIBRATION AND FITTED WITH INDICATING REGULATOR. DURO-DYNE, LAWSON & TAYLOR, DYN-AIR.

4.6. MULTI-BLADE OPPOSED ACTION DAMPERS: FABRICATED FROM 16 GAUGE (1.6 MM) GALVANIZED STEEL, MOUNTED IN SEPARATE CHANNEL FRAMES, REINFORCED TO PREVENT VIBRATION, AND FITTED WITH OPPOSED ACTION LINKAGE HARDWARE. DURO-DYNE "OPAX" BLADE KIT, LAWSON & TAYLOR, DYN-AIR

4.7. END BEARINGS: EXCEPT IN ROUND DUCTWORK 12" (300 MM) AND SMALLER, PROVIDE END BEARINGS. ON MULTIPLE BLADE DAMPERS, PROVIDE OIL-IMPREGNATED NYLON OR SINTERED BRONZE BEARINGS.

4.8. QUADRANTS:

4.8.1. PROVIDE LOCKING, INDICATING QUADRANT REGULATORS ON SINGLE AND MULTI-BLADE DAMPERS.

4.8.2. ON INSULATED DUCTS MOUNT QUADRANT REGULATORS ON STAND-OFF MOUNTING BRACKETS, BASES, OR ADAPTERS.

4.8.3. WHERE ROD LENGTHS EXCEED 30" (750 MM) PROVIDE REGULATOR AT BOTH ENDS.

4.8.4. ACCEPTABLE MANUFACTURERS: DURO-DYNE, DYN-AIR, PRICE, LAWSON & TAYLOR

4.9. FIRE DAMPERS

4.9.1. MANUFACTURERS: PRICE, RUSKIN, NAILOR

4.9.2. PROVIDE ULC LISTED, LABELLED, OR WARNOCK-HERSEY LABEL, MEET REQUIREMENTS OF NFPA 90A, AND CONSTRUCTED AND RATED IN CONFORMANCE WITH:

4.9.2.1. CAN4-S92-M82, "STANDARD FOR FIRE DAMPERS", WHEN USED IN A FIRE SEPARATION OF NOT MORE THAN 2 HOURS, AND WHICH IS NOT A FIREWALL.

4.9.2.2. CAN4-S104-M80, "STANDARD METHOD FOR FIRE TESTS OF DOOR ASSEMBLIES", WHEN USED IN A FIRE SEPARATION OF MORE THAN 2 HOURS OR USED IN A FIREWALL.

4.9.2.3. CAN4-S92.2-M84, "FIRE TEST OF CEILING FIRESTOP FLAP ASSEMBLIES", WHEN USED IN A CEILING FIRE SEPARATION.

4.9.3. PROVIDE GALVANIZED STEEL CHANNEL FRAME CURTAIN TYPE GALVANIZED STEEL INTERLOCKING BLADES, MINIMUM 22 GAUGE (0.9 MM) GALVANIZED STEEL ENCLOSURE, AND 160°F (71°C) FUSIBLE LINK STANDARD.

4.9.4. FOR HORIZONTAL INSTALLATION IN VERTICAL DUCTWORK PROVIDE UNITS OPERATED BY A STAINLESS-STEEL CLOSURE SPRING AND LATCH.

4.9.5. PROVIDE LOW RESISTANCE TYPE B WITH BLADES LOCATED OUTSIDE OF THE AIR STREAM FOR RECTANGULAR DUCTWORK, AND TYPE C FOR ROUND OR OVAL DUCTWORK.

4.9.6. FOR CEILINGS PROVIDE ULC LABELLED, FOR FIRE RATED MEMBRANE TYPE CEILINGS, GALVANIZED STEEL CONSTRUCTION WITH HEAT RETARDANT BLANKET (NON-ASBESTOS) WITH STANDARD 160°F (71°C) FUSIBLE LINK.

4.9.7. PROVIDE ULC LABELLED CEILING BLANKET, FOR FIRE RATED MEMBRANE TYPE CEILINGS, TO COMPLETELY ENSHROUD CEILING PENETRATION.

4.9.8. PROVIDE ALL STAINLESS-STEEL CONSTRUCTION IN STAINLESS STEEL DUCTWORK.

4.9.9. FUSIBLE LINKS: UL 33, SEPARATE AT 160°F (71°C) WITH ADJUSTABLE LINK STRAPS FOR COMBINATION FIRE/BALANCING DAMPERS.

4.10. DUCT ACCESS DOORS

4.10.1. PROVIDE ACCESS DOORS IN DUCTWORK FOR ACCESS TO SMOKE DETECTORS, FIRE DAMPERS, SMOKE DAMPERS, VOLUME DAMPERS, HUMIDIFIERS, COILS, AND OTHER ITEMS LOCATED IN DUCTWORK REQUIRING SERVICE, OPERATION, MAINTENANCE AND/OR INSPECTION.

4.10.2. FABRICATE TO SMACNA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE, AND AS

INDICATED.

4.10.3. FABRICATION: RIGID AND CLOSE-FITTING OF GALVANIZED STEEL WITH SEALING GASKETS AND QUICK FASTENING LOCKING DEVICES. FOR INSULATED DUCT WORK, INSTALL MINIMUM 1" (25 MM) THICK INSULATION WITH SHEET METAL COVER.

4.10.3.1. LESS THAN 12" (300 MM) SQUARE: SECURE WITH SASH LOCKS.

4.10.3.2. UP TO 18" (450 MM) SQUARE: PROVIDE TWO HINGES AND TWO SASH LOCKS.

4.10.3.3. UP TO 24" X 48" (600 X 1200 MM): THREE HINGES AND TWO COMPRESSION LATCHES WITH OUTSIDE AND INSIDE HANDLES.

4.10.4. LARGER SIZES: PROVIDE AN ADDITIONAL HINGE.

4.10.5. ACCESS DOORS WITH SHEET METAL SCREW FASTENERS ARE NOT ACCEPTABLE.

4.10.6. ACCEPTABLE MANUFACTURER: ACUDOOR, DURO-DYNE, DYN-AIR, NAILOR, KREUGER

4.11. DUCT TEST HOLES

4.11.1. PROVIDE TEST PORTS TO SUIT INTENDED APPLICATION, (IE. INSULATED/UNINSULATED DUCT, ROUND/RECTANGULAR DUCT).

4.11.2. TEMPORARY TEST HOLES: CUT OR DRILL IN DUCTS AS REQUIRED. CAP WITH NEAT PATCHES, NEOPRENE PLUGS, THREADED PLUGS, OR THREADED OR TWIST-ON METAL CAPS.

4.11.3. PERMANENT TEST HOLES: FACTORY FABRICATED, AIRTIGHT FLANGED FITTINGS WITH SCREW CAP. PROVIDE EXTENDED NECK FITTINGS TO CLEAR INSULATION.

4.11.4. ACCEPTABLE MANUFACTURERS: AIR POWER CO.

4.12. FLEXIBLE DUCT CONNECTIONS

4.12.1. FABRICATE TO SMACNA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE, AND AS INDICATED.

4.12.2. MIL-C-20696B PARA. 4.4.3, 4.4.4 (OIL AND HYDROCARBON RESISTANCE)

4.12.3. UL CERTIFIED NFPA 701 TESTS FOR FLAME PROPAGATION OF FABRICS AND FILM.

4.12.4. 10/120 CAN/ULC-S102, ASTM E84 FLAME/SMOKE RATING.

4.12.5. -40F TO 250F CONTINUOUS TEMPERATURE RANGE.

4.12.6. WHITE WOVEN FIBERGLASS COLOUR

4.12.7. GALVANIZED STEEL CONFORMING TO ASTM-A-525 G 60 OR BETTER

4.12.8. ACCEPTABLE MANUFACTURERS" DURO-DYNE, DDFDC.

4.13. HANGERS AND SUPPORTS

4.13.1. FABRICATE STRAP HANGERS TO SAME MATERIAL AS DUCT. HANGER CONFIGURATION TO SMACNA DETAILS. 20" (500 MM) IS MAXIMUM DUCT SIZE TO BE SUPPORTED BY STRAP HANGER.

4.13.2. ROD AND ANGLE HANGERS: GALVANIZED STEEL TO SMACNA DETAILS.

4.13.3. HANGER ATTACHMENTS: MANUFACTURED CONCRETE INSERTS, EXPANSION SHIELDS AND BOLTED STEEL CLAMPS. DO NOT WELD RODS TO STEEL DECKS OR USE POWDER ACTUATED FASTENERS.

4.14. ACOUSTIC LINING

4.14.1. MANUFACTURER: ARMACELL AP ARMAFLEX SA

4.14.2. COMPLIANCE: ASTM C54, CAN/ULC-S102, ASTM E84, ULC-S102, NFPA 90A, ASTM C1534, ASTM D1056

4.14.3. THICKNESS: 25mm (1") THICK

4.14.4. THERMAL CONDUCTIVITY: 0.245 BTU-in/Hr-Sq.Ft- F AT 75 F (0.0353 W/mk AT 24 C)

4.14.5. PERMEABILITY: 0.05 PERM-IN

4.14.6. MAXIMUM FLAME SPREAD INDEX: 25

4.14.7. MAXIMUM SMOKE DEVELOPMENT INDEX: 50

4.14.8. WATER ABSORPTION: 0.2% BY VOLUME

4.14.9. MAXIMUM SERVICE TEMPERATURE: 180 F (82 C)

4.14.10. MINIMUM SERVICE TEMPERATURE: -30 F (34 C)

4.14.11. EROSION RESISTANCE: ASTM C1071.

4.15. DUCT SEALANT

4.15.1. GENERAL: LOW VOC, WATER BASED SEALANT, NON-TOXIC, NON-COMBUSTIBLE, NON-FLAMMABLE, AND TESTED IN ACCORDANCE WITH CAN4/ULC-S102. FLAME SPREAD SHALL NOT EXCEED 25 AND SMOKE DEVELOPED SHALL NOT EXCEED 50.

4.15.2. ACCEPTABLE PRODUCTS: MULTI-PURPOSE DUCT SEALANT AS MANUFACTURED BY TRANS CONTINENTAL EQUIPMENT, DURO DYNE SWB DUCT SEALER, IRON GRIP 601 AS SUPPLIED BY ALPHA SHEET METAL CO., OR UNI-GRIP DUCT SEALER FROM UNITED MCGILL CORPORATION.

4.16. ELECTRONIC DAMPER ACTUATORS

4.16.1. MANUFACTURED, BRAND LABELED OR DISTRIBUTED BY BELIMO OR APPROVED EQUIVALENT.

4.16.2. SIZE FOR TORQUE REQUIRED FOR DAMPER SEAL AT LOAD CONDITIONS.

4.16.3. COUPLING: V-BOLT DUAL NUT CLAMP WITH A V-SHAPED, TOOTHED CRADLE.

4.16.4. MOUNTING: ACTUATORS SHALL BE CAPABLE OF BEING MECHANICALLY AND ELECTRICALLY PARALLELED TO INCREASE TORQUE IF REQUIRED.

4.16.5. OVERLOAD PROTECTION: ELECTRONIC OVERLOAD OR DIGITAL ROTATION-SENSING CIRCUITRY WITHOUT THE USE OF END SWITCHES TO PREVENT ANY DAMAGE TO THE ACTUATOR DURING A STALL CONDITION.

4.16.6. FAIL-SAFE OPERATION: MECHANICAL, SPRING-RETURN MECHANISM.

4.16.7. POWER REQUIREMENTS (SPRING RETURN): 120 V AC, MAXIMUM 10 VA AT 24-V AC OR 8 W AT 24-V DC.

4.16.8. PROPORTIONAL ACTUATORS SHALL BE FULLY PROGRAMMABLE. CONTROL INPUT, POSITION FEEDBACK AND RUNNING TIME SHALL BE FACTORY OR FIELD PROGRAMMABLE BY USE OF EXTERNAL COMPUTER SOFTWARE DIAGNOSTIC FEEDBACK SHALL PROVIDE INDICATIONS OF HUNTING OR OSCILLATION, MECHANICAL OVERLOAD AND MECHANICAL TRAVEL. PROGRAMMING SHALL BE THROUGH AN EEPROM WITHOUT THE USE OF ACTUATOR MOUNTED SWITCHES.

4.16.9. TEMPERATURE RATING: -22 TO +122ºF (-30 TO +50ºC)

4.16.10. HOUSING: MINIMUM REQUIREMENT NEMA TYPE 2 MOUNTED IN ANY ORIENTATION.

4.16.11. AGENCY LISTING: ISO 9001, CULUS, AND CSA C22.2 NO. 24-93.

4.16.12. THE MANUFACTURER SHALL WARRANT ALL COMPONENTS FOR A PERIOD OF 5 YEARS FROM THE DATE OF PRODUCTION, WITH THE FIRST TWO YEARS UNCONDITIONAL.

5. STATIONARY LOUVERS

5.1. PROVIDE UNITS CONFORMING TO AAMA 611, AAMA 2603, AAMA 2605, AMCA 500L, ASTM D7091.

5.2. PROVIDE PRICE MODEL DE439 DRAINABLE LOUVER OF SIZE AND SHAPE INDICATED ON THE PLANS AND/OR AS DESCRIBED IN SCHEDULES.

5.3. ENSURE LOUVER PERFORMANCE IS BASED ON TESTS AND PROCEDURES IN ACCORDANCE WITH AMCA PUBLICATION 500-L.

5.4. PROVIDE LOUVERS CONSTRUCTED OF 6063-T5 ALLOY EXTRUDED ALUMINUM.

5.5. PROVIDE LOUVER BLADES AND FRAMES MINIMUM 0.081 INCH WALL THICKNESS, 4" DEEP CONSTRUCTION WITH 39° STATIONARY DRAINABLE BLADES AND WELDED CONSTRUCTION.

5.6. PROVIDE LOUVERS DESIGNED TO WITHSTAND A 25 POUND PER SQUARE FOOT WIND LOAD.

5.7. PROVIDE WITH 1/2 INCH X 0.051 INCH FLATTENED EXPANDED ALUMINUM BIRD SCREEN, MOUNTED ON INTERIOR LOUVER FACE.

5.8. PROVIDE 1.5 INCH FLANGED FRAME.

5.9. PROVIDE CONTINUOUS BLADE APPEARANCE AND CONCEALED MULLIONS.

5.10. [PROVIDE THERMOSETTING ACRYLIC BASED RESIN COATING FOR STANDARD DUTY ARCHITECTURAL APPLICATIONS: FACTORY FINISHED-AFTER-ASSEMBLY WITH A THERMOSETTING ACRYLIC BASED RESIN COATING. RESIN COATING SHALL BE OVEN CURED IN ACCORDANCE WITH THE COATING MANUFACTURER'S INSTRUCTIONS. MINIMUM DRY FILM THICKNESS OF 0.8 MIL IN ACCORDANCE WITH ASTM D7091. MEET SALT SPRAY AND HARDNESS SPECIFICATIONS OF AAMA 2603.]

5.11. [PROVIDE CURED FLUOROPOLYMER BASED RESIN COATING FOR WEATHER PROTECTION IN ARCHITECTURAL APPLICATIONS: FACTORY PRIMED AND FINISHED-AFTER-ASSEMBLY WITH A FLUOROPOLYMER BASED RESIN COATING. PRIMER AND RESIN COATING SHALL BE OVEN CURED IN ACCORDANCE WITH THE COATING MANUFACTURER'S INSTRUCTIONS. MINIMUM DRY FILM THICKNESS OF 0.25 MIL PRIMER AND 1.0 MIL COLOUR COAT IN ACCORDANCE WITH ASTM D7091. MEET SALT SPRAY AND HARDNESS SPECIFICATIONS OF AAMA 2605.

5.12. VERIFY THAT CONDITIONS ARE SUITABLE FOR INSTALLATION.

5.13. VERIFY THAT FIELD MEASUREMENTS ARE AS SHOWN ON THE DRAWINGS.

5.14. INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

5.15. SEE DRAWINGS FOR THE SIZE(S) AND LOCATIONS OF LOUVERS.

6. TESTING, ADJUSTING, BALANCING

6.1. QUALIFICATIONS AND QUALITY CONTROL

6.1.1. PERFORM TOTAL SYSTEM BALANCE TO AABC NATIONAL STANDARDS FOR FIELD MEASUREMENT AND INSTRUMENTATION, TOTAL SYSTEM BALANCE.

6.1.2. AGENCY: COMPANY SPECIALIZING IN THE TESTING, ADJUSTING, AND BALANCING OF SYSTEMS UNDER THIS SECTION WITH MINIMUM FIVE YEARS DOCUMENTED EXPERIENCE CERTIFIED BY AABC

6.1.3. WORK SHALL BE PERFORMED UNDER THE SUPERVISION OF AN AABC CERTIFIED TEST AND BALANCE ENGINEER, AN NEBB CERTIFIED TESTING, ADJUSTING AND BALANCING SUPERVISOR OR A REGISTERED PROFESSIONAL ENGINEER EXPERIENCED IN THE PERFORMANCE OF THIS WORK AND LICENCED AT THE PLACE WHERE THE PROJECT IS LOCATED.

6.1.4. PROVIDE A REPORT FOR REVIEW BY CONSULTANT.

6.2. PREPARATION

6.2.1. PROVIDE INSTRUMENTS REQUIRED FOR TESTING, ADJUSTING, AND BALANCING OPERATIONS. MAKE INSTRUMENTS AVAILABLE TO CONSULTANT TO FACILITATE SPOT CHECKS DURING TESTING.

6.2.2. PROVIDE ADDITIONAL BALANCING DEVICES AS REQUIRED.

6.3. INSTALLATION TOLERANCES

6.3.1. AIR HANDLING SYSTEMS: ADJUST TO WITHIN PLUS OR MINUS 5 PERCENT OF DESIGN FOR SUPPLY SYSTEMS AND PLUS OR MINUS 5 PERCENT OF DESIGN FOR RETURN AND EXHAUST SYSTEMS.

6.3.2. AIR OUTLETS AND INLETS: ADJUST TOTAL TO WITHIN PLUS 5 PERCENT AND MINUS 5 PERCENT OF DESIGN TO SPACE. ADJUST OUTLETS AND INLETS IN SPACE TO WITHIN PLUS OR MINUS 5 PERCENT OF DESIGN.

6.3.3. HYDRONIC SYSTEMS: ADJUST TO WITHIN PLUS OR MINUS 10 PERCENT OF DESIGN.

6.3.4. ROOM PRESSURIZATION: ADJUST TO WITHIN PLUS 20 PERCENT AND MINUS 0 PERCENT OF DESIGN FOR ROOMS UNDER POSITIVE PRESSURE AND WITHIN PLUS 0 PERCENT AND MINUS 20 PERCENT OF DESIGN FOR ROOMS UNDER NEGATIVE PRESSURE.

6.4. ADJUSTING

6.4.1. ENSURE RECORDED DATA REPRESENTS ACTUAL MEASURED OR OBSERVED CONDITIONS.

6.4.2. PERMANENTLY MARK SETTINGS OF VALVES, DAMPERS, AND OTHER ADJUSTMENT DEVICES ALLOWING SETTINGS TO BE RESTORED. SET AND LOCK MEMORY STOPS.

6.4.3. AFTER ADJUSTMENT, TAKE MEASUREMENTS TO VERIFY BALANCE HAS NOT BEEN DISRUPTED OR THAT SUCH DISRUPTION HAS BEEN RECTIFIED.

6.4.4. LEAVE SYSTEMS IN PROPER WORKING ORDER, REPLACING BELT GUARDS, CLOSING ACCESS DOORS, CLOSING DOORS TO ELECTRICAL SWITCH BOXES, AND RESTORING THERMOSTATS TO SPECIFIED SETTINGS.

6.4.5. AT FINAL INSPECTION, RECHECK RANDOM SELECTIONS OF DATA RECORDED IN REPORT. RECHECK POINTS OR AREAS AS SELECTED AND WITNESSED BY THE OWNER.

6.4.6. CHECK AND ADJUST SYSTEMS APPROXIMATELY SIX MONTHS AFTER FINAL ACCEPTANCE AND SUBMIT REPORT.

6.5. AIR SYSTEM PROCEDURE

6.5.1. ADJUST AIR HANDLING AND DISTRIBUTION SYSTEMS TO PROVIDE REQUIRED OR DESIGN SUPPLY, RETURN, AND EXHAUST AIR QUANTITIES AT SITE ALTITUDE.

6.5.2. MAKE AIR QUANTITY MEASUREMENTS IN DUCTS BY PITOT TUBE TRAVERSE OF ENTIRE CROSS-SECTIONAL AREA OF DUCT.

6.5.3. MEASURE AIR QUANTITIES AT AIR INLETS AND OUTLETS.

6.5.4. ADJUST DISTRIBUTION SYSTEM TO OBTAIN UNIFORM SPACE TEMPERATURES FREE FROM OBJECTIONABLE DRAFTS AND NOISE.

6.5.5. USE BRANCH VOLUME CONTROL DAMPERS AND SPLITTERS TO REGULATE AIR QUANTITIES. DEVICES AT AIR OUTLETS MAY BE USED ONLY TO THE EXTENT THAT ADJUSTMENTS DO NOT CREATE OBJECTIONABLE AIR MOTION OR SOUND LEVELS.

6.5.6. VARY TOTAL SYSTEM AIR QUANTITIES BY ADJUSTMENT OF FAN SPEEDS. ADJUST AIRFLOW TO DESIGN QUANTITY. PROVIDE DRIVE CHANGES AS REQUIRED. MAKE ALLOWANCES FOR LOADING OF FILTERS TO 50% OF MANUFACTURERS' RECOMMENDATIONS FOR FINAL PRESSURE AT FANS WITH FIXED SPEED DRIVES AND TO 100% OF MANUFACTURERS' RECOMMENDATIONS FOR FINAL PRESSURE AT FANS WITH VARIABLE SPEED DRIVES.

6.5.7. PROVIDE SYSTEM SCHEMATIC WITH REQUIRED AND ACTUAL AIR QUANTITIES RECORDED AT EACH OUTLET OR INLET.

6.5.8. MEASURE STATIC AIR PRESSURE CONDITIONS ON AIR SUPPLY UNITS, INCLUDING FILTER AND COIL PRESSURE DROPS, AND TOTAL PRESSURE ACROSS THE FAN.

6.5.9. ADJUST OUTSIDE AIR AUTOMATIC DAMPERS, OUTSIDE AIR, RETURN AIR, AND EXHAUST DAMPERS FOR DESIGN CONDITIONS.

6.5.10. MEASURE TEMPERATURE CONDITIONS ACROSS OUTSIDE AIR, RETURN AIR, AND EXHAUST DAMPERS TO CHECK LEAKAGE.

6.5.11. WHERE MODULATING DAMPERS ARE PROVIDED, TAKE MEASUREMENTS AND BALANCE AT EXTREME CONDITIONS. BALANCE VARIABLE VOLUME SYSTEMS AT MAXIMUM AIR FLOW RATE, FULL COOLING, AND AT MINIMUM AIR FLOW RATE, FULL HEATING.

6.5.12. MEASURE BUILDING STATIC PRESSURE AND ADJUST SUPPLY, RETURN, AND EXHAUST AIR SYSTEMS TO PROVIDE REQUIRED RELATIONSHIP BETWEEN EACH TO MAINTAIN APPROXIMATELY 0.05 IN.WG. (10.5 PA) POSITIVE STATIC PRESSURE NEAR THE BUILDING ENTRIES.

6.5.13. CHECK MULTI-ZONE UNITS FOR MOTORIZED DAMPER LEAKAGE. ADJUST AIR QUANTITIES WITH MIXING DAMPERS SET FIRST FOR COOLING, THEN HEATING, THEN MODULATING.

6.5.14. FOR VARIABLE AIR VOLUME SYSTEM POWERED UNITS SET VOLUME CONTROLLER TO AIR FLOW SETTING INDICATED. CONFIRM CONNECTIONS PROPERLY MADE AND CONFIRM PROPER OPERATION FOR AUTOMATIC VARIABLE AIR VOLUME TEMPERATURE CONTROL.

6.5.15. ON FAN POWERED VAV BOXES, ADJUST AIR FLOW SWITCHES FOR PROPER OPERATION.

7. HVAC FANS

7.1. DIRECT DRIVE INLINE FAN

7.1.1. WHEEL: PROVIDE ALUMINUM NON-OVERLOADING BACKWARD INCLINED CENTRIFUGAL STATICALLY AND DYNAMICALLY BALANCED TO AMCA 204. PROVIDE MATCHED WHEEL CONE AND INLET WITH PRECISE RUNNING TOLERANCES. PROVIDE SINGLE THICKNESS BLADES SECURELY RIVETED OR WELDED TO HEAVY-GAUGE BACKPLATE AND WHEEL CONE.

7.1.2. MOTOR: ECM TYPE SPECIFICALLY DESIGNED FOR FAN APPLICATIONS, PERMANENTLY LUBRICATED, HEAVY-DUTY BALL BEARING TYPE C/W INTERNAL CIRCUITRY TO CONVERT AC POWER SUPPLY TO DC POWER TO OPERATE MOTOR OR INTEGRATED VFD. ENSURE MOTOR IS CONTROLLABLE DOWN TO 20% SPEED VIA POTENTIOMETER DIAL OR 0-10 VDC SIGNAL.

7.2. HOUSING/CABINET CONTRUCTION

7.2.1. PROVIDE HEAVY-GAUGE GALVANIZED SQUARE DESIGN C/W STRUCTURAL STEEL DRIVE FRAME WITH FORMED FLANGES.

7.3. PROVIDE NEMA 12 DISCONNECT SWITCH TO PROVIDE POSITIVE ELECTRICAL SHUT-OFF AND WIRED FROM FAN MOTOR TO JUNCTION BOX.

7.4. DUCT COLLAR

7.4.1. PROVIDE SQUARE DUCT MOUNTING COLLARS ON INLET AND DISCHARGE FOR EASY-FIT DUCT CONNECTION WITH LARGE DISCHARGE AREA.

7.5. ACCESS PANEL: PROVIDE TWO-SIDED ACCESS PANELS TO PERMIT EASY ACCESS TO INTERNAL COMPONENTS. LOCATE PERPENDICULAR TO MOTOR MOUNTING PANEL.

7.6. OPTIONS/ACCESSORIES

7.6.1. DAMPER: MOTORIZED C/W GALVANIZED FRAME WITH PRE-PUNCHED MOUNTING HOLES, BALANCED FOR MINIMUM FLOW RESISTANCE.

7.6.2. INSULATED HOUSING: FIBREGLAS LINER 1" THICKNESS.

7.6.3. VIBRATION ISOLATION: NEOPRENE/RUBBER MOUNT SIZED TO MATCH WEIGHT OF FAN.

7.6.4. MOTOR COVER: GALVANIZED STEEL TO COVER MOTOR AND DRIVES.

7.6.5. PRESSURE PROBE: ¼" DIAMETER TUBE IN FAN VENTURI FOR MANOMETER HOOK-UP.

7.6.6. WIRING PIGTAIL.

8. PACKAGED ROOFTOP UNIT (GAS-FIRED HEAT)

8.1. PACKAGED ROOFTOP UNITS COOLING, HEATING CAPACITIES, AND EFFICIENCIES ARE AHRI CERTIFIED WITHIN SCOPE OF AHRI STANDARD (I-P) AND ANSIZ21.47 AND 10 CFR PART 431 PERTAINING TO COMMERCIAL WARM AIR FURNACES.

8.2. FACTORY ASSEMBLED, INTERNALLY WIRED, FULLY CHARGED WITH R-410A, AND 100 PERCENT RUN TESTED TO CHECK COOLING OPERATION, FAN AND BLOWER ROTATION, AND CONTROL SEQUENCE BEFORE LEAVING THE FACTORY

8.3. CASING:ZINC COATED, HEAVY GAUGE, GALVANIZED STEEL.WEATHER-RESISTANT BAKED ENAMEL FINISH ON PHOSPHATIZED EXTERIOR SURFACES MEETS ASTM B117, 672-HOUR SALT SPRAY TEST. REMOVABLE SINGLE SIDE MAINTENANCE ACCESS PANELS LIFTING HANDLES IN MAINTENANCE ACCESS PANELS (CAN BE REMOVED AND REINSTALLED BY REMOVING NO MORE THAN 11 FASTENERS WHILE PROVIDING A WATER AND AIRTIGHT SEAL) EXPOSED VERTICAL PANELS AND TOP COVERS IN THE INDOOR AIR SECTION SHALL BE INSULATED WITH A 1/2-INCH, 1-POUND DENSITY FOIL-FACED, FIRE-RESISTANT, PERMANENT, ODORLESS, GLASS FIBER MATERIAL BASE OF UNIT SHALL BE INSULATED WITH 1/2-INCH, 1-POUND DENSITY, FOIL-FACED, GLASS FIBER MATERIAL.BASE PAN SHALL HAVE NO PENETRATIONS WITHIN THE PERIMETER OF THE CURB OTHER THAN THE RAISED 1 1/8-INCH HIGH DOWNFLOW SUPPLY/RETURN OPENINGS TO PROVIDE AN ADDED WATER INTEGRITY PRECAUTION, IF THE CONDENSATE DRAIN BACKS UP. DOWNFLOW UNIT'S BASE PAN SHALL HAVE NO PENETRATIONS WITHIN THE PERIMETER OF THE CURB OTHER THAN THE RAISED 1 1/8-INCH HIGH SUPPLY/RETURN OPENINGS TO PROVIDE AN ADDED WATER INTEGRITY PRECAUTION, IF THE CONDENSATE DRAIN BACKS UP. BASE OF UNIT SHALL HAVE PROVISIONS FOR FORKLIFT AND CRANE LIFTING.

8.4. COMPRESSORS: DIRECT-DRIVE, HERMETIC, SCROLL TYPE COMPRESSORS WITH CENTRIFUGAL TYPE OIL PUMPS. C/W SUCTION GAS-COOLED MOTOR WITH VOLTAGE UTILIZATION RANGE OF PLUS OR MINUS 10 PERCENT OF UNIT NAMEPLATE VOLTAGE. INTERNAL OVERLOADS STANDARD WITH SCROLL COMPRESSORS. ALL MODELS HAVE PHASE MONITORS AND LOW- AND HIGH-PRESSURE CONTROLS AS STANDARD.

8.5. DISCHARGE LINE THERMOSTAT: A BI-METAL ELEMENT DISCHARGE LINE THERMOSTAT IS INSTALLED AS A STANDARD OPTION ON THE DISCHARGE LINE OF EACH SYSTEM AND PROVIDES EXTRA PROTECTION TO THE COMPRESSORS AGAINST HIGH DISCHARGE TEMPERATURES IN CASE OF LOSS OF CHARGE, EXTREMELY HIGH AMBIENT AND OTHER CONDITIONS WHICH COULD DRIVE THE DISCHARGE TEMPERATURE HIGHER. WIRED IN SERIES WITH HIGH PRESSURE CONTROL. WHEN DISCHARGE TEMPERATURE RISES ABOVE THE PROTECTION LIMIT, THE BI-METAL DISC IN THE THERMOSTAT SWITCHES TO THE OFF POSITION, OPENING THE 24 VAC CIRCUIT WHEN TEMPERATURE ON THE DISCHARGE LINE COOLS DOWN, THE BI-METAL DISC CLOSES THE CONTACTOR CIRCUIT, PROVIDING POWER TO THE COMPRESSOR.

8.6. EVAPORATOR AND CONDENSER COILS: MICROCHANNEL COILS BURST TESTED BY MANUFACTURER. MICROCHANNEL CONDENSER COILS STANDARD ON ALL UNITS. COILS LEAK TESTED TO ENSURE THE PRESSURE INTEGRITY. EVAPORATOR COIL AND CONDENSER COIL LEAK TESTED TO 225 PSIG AND PRESSURE TESTED TO 450 PSIG. SLOPED CONDENSATE DRAIN PANS ARE STANDARD.

8.7. FILTERS: 2" STANDARD FACTORY SUPPLIED.

8.8. GAS HEAT SECTION: PROGRESSIVE TUBULAR HEAT EXCHANGER, STAINLESS STEEL BURNERS AND CORROSION RESISTANT STEEL. INDUCED DRAFT COMBUSTION BLOWER SHALL BE USED TO PULL THE COMBUSTION PRODUCTS THROUGH THE FIRING TUBES. DIRECT SPARK IGNITION (DSI) SYSTEM. ON INITIAL CALL FOR HEAT, THE COMBUSTION BLOWER SHALL PURGE THE HEAT EXCHANGER FOR 20 SECONDS BEFORE IGNITION. AFTER THREE UNSUCCESSFUL IGNITION ATTEMPTS, ENTIRE HEATING SYSTEM SHALL BE LOCKED OUT UNTIL MANUALLY RESET AT THE THERMOSTAT/ZONE SENSOR. SUITABLE FOR USE WITH NATURAL GAS OR PROPANE (FIELD-INSTALLED KIT).

8.9. INDOOR FAN: BELT DRIVEN, FC CENTRIFUGAL FANS WITH ADJUSTABLE MOTOR SHEAVES. MOTORS THERMALLY PROTECTED. OVERSIZED MOTORS AVAILABLE FOR HIGH STATIC APPLICATION. INDOOR FAN MOTORS MEET THE U.S. ENERGY POLICY ACT OF 1992 (EPACT)

8.10. LOCKING SAFETY DEVICE: PRESSURE SWITCH MONITORING ALLOWS FOR LOCKOUT IN A SITUATION WHERE THE SWITCH IS OPENED. BY MONITORING THE Y INPUT AS WELL AS THE PRESSURE SWITCHES, ADVANCED DECISION-MAKING CAN BE MADE TO IDENTIFY SITUATIONS WHERE FAULTS/ERRORS OCCUR.

8.11. OUTDOOR FANS: EXTERNALLY DRIVE, STATICALLY AND DYNAMICALLY BALANCED, DRAW-THROUGH IN THE VERTICAL DISCHARGE POSITION. FAN MOTOR(S) SHALL BE PERMANENTLY LUBRICATED AND SHALL HAVE CURRENT OVERLOAD PROTECTION.

8.12. REFRIGERANT CIRCUITS: EACH REFRIGERANT CIRCUIT SHALL HAVE A FIXED ORIFICE, SERVICE PRESSURE PORTS, AND REFRIGERANT LINE FILTER DRIERS FACTORY INSTALLED AS STANDARD. AN AREA SHALL BE PROVIDED FOR REPLACEMENT SUCTION LINE DRIERS.

8.13. REFRIGERANT PRESSURE CONTROL: HIGH- AND LOW-PRESSURE CUTOUTS AS STANDARD.

8.14. UNIT TOP: DOUBLE HEMMED AND GASKET SEALED TO PREVENT WATER LEAKAGE.

8.15. MULTI-SPEED INDOOR FAN SYSTEM: INCORPORATES A MULTI-SPEED FAN CONTROL TO CHANGE THE SPEED OF THE FAN TO 70% OF FULL AIRFLOW BASED OFF OF COMPRESSOR STAGES.

8.16. CONDENSATE OVERFLOW SWITCH: THIS OPTION SHALL SHUT THE UNIT DOWN IN THE EVENT THAT A CLOGGED CONDENSATE DRAIN LINE PREVENTS PROPER CONDENSATE REMOVAL FROM THE UNIT.

8.17. HAIL GUARDS: TOOL-LESS, HAIL PROTECTION QUALITY COIL GUARDS ARE AVAILABLE FOR CONDENSER COIL PROTECTION.

8.18. LOW LEAK ECONOMIZER WITH FAULT DETECTION & DIAGNOSTICS - DOWNFLOW: CONTROLLER SHALL HAVE THE CAPABILITY TO PROVIDE THE VALUE OF EACH SENSOR USED IN CONTROLLING THE ECONOMIZER OPERATION. SYSTEM STATUS IS ALSO INDICTED FOR THE FOLLOWING CONDITIONS: FREE COOLING AVAILABLE, ECONOMIZER ENABLED, COMPRESSOR ENABLED, HEATING ENABLED, MIXED AIR LOW LIMIT CYCLE ACTIVE. FAULT DETECTION AND DIAGNOSTIC SYSTEM DETECTS THE FOLLOWING FAULTS: AIR TEMPERATURE SENSOR FAILURE/FAULT, NOT ECONOMIZING WHEN CONDITIONS INDICATE SYSTEM SHOULD BE ECONOMIZING, ECONOMIZING WHEN CONDITIONS INDICATE SYSTEM SHOULD NOT BE ECONOMIZING, DAMPERS ARE NOT MODULATING, EXCESSIVE AMOUNTS OF OUTSIDE AIR ARE BEING INTRODUCED THOUGH THE ECONOMIZER. FAULT DETECTION AND DIAGNOSTIC SYSTEM IS CERTIFIED BY THE CALIFORNIA ENERGY COMMISSION AS MEETING REQUIREMENTS OF CALIFORNIA TITLE 24 120.2(I)1 THROUGH 120.2(I)8 IN ACCORDANCE WITH SECTION 100(H).

8.19. MOTORIZED OUTSIDE AIR DAMPER: MANUALLY SET OUTDOOR AIR DAMPERS SHALL PROVIDE UP TO 50% OUTSIDE AIR. OUTDOOR AIR DAMPERS SHALL OPEN TO SET POSITION WHEN INDOOR FAN STARTS. DAMPER SHALL CLOSE TO THE FULL CLOSED POSITION WHEN INDOOR FAN SHUTS DOWN.

8.20. OVERSIZED MOTORS SHALL BE AVAILABLE FOR HIGH STATIC APPLICATIONS.

8.21. POWERED EXHAUST: PROVIDE EXHAUST OF RETURN AIR, WHEN USING AN ECONOMIZER, TO MAINTAIN BETTER BUILDING PRESSURIZATION.

8.22. REFERENCE OR COMPARATIVE ENTHALPY: USED TO MEASURE AND COMMUNICATE OUTDOOR HUMIDITY. UNIT RECEIVES AND USES THIS INFORMATION TO PROVIDE IMPROVED COMFORT COOLING WHILE USING THE ECONOMIZER. COMPARATIVE ENTHALPY MEASURES AND COMMUNICATES HUMIDITY FOR BOTH OUTDOOR AND RETURN AIR CONDITIONS, AND RETURN AIR TEMPERATURE - UNIT RECEIVES AND USES THIS INFORMATION TO MAXIMIZE USE OF ECONOMIZER COOLING, AND TO PROVIDE MAXIMUM OCCUPANT COMFORT CONTROL. REFERENCE OR COMPARATIVE ENTHALPY OPTION SHALL BE AVAILABLE WHEN A FACTORY OR FIELD INSTALLED DOWNFLOW ECONOMIZER IS ORDERED.

8.23. THROUGH THE BASE UTILITIES ACCESS: ELECTRICAL SERVICE ENTRANCE SHALL BE PROVIDED ALLOWING ELECTRICAL ACCESS FOR BOTH CONTROL AND MAIN POWER CONNECTIONS INSIDE THE CURB AND THROUGH THE BASE OF THE UNIT. OPTION SHALL ALLOW FOR FIELD INSTALLATION OF LIQUID-TIGHT CONDUIT AND AN EXTERNAL FIELD INSTALLED DISCONNECT SWITCH.

CONSTRUCTION NORTH

TRUE NORTH

MANTECON PARTNERS
STRUCTURAL MECHANICAL ELECTRICAL CIVIL ENGINEERS
15 Foundry Street, Dundas, ON, L9H 2V6
Phone: (905)648-0373
www.manteconpartners.com

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PRESCHOOL DAY CARE ADDITION
Ecole elementaire catholique Saint-Marguerite-Bourgeoys

60 Clench Avenue, Brantford, Ontario N3T 1B9

MECHANICAL SPECIFICATIONS

M0.4

BMS SPECIFICATIONS 21-153

1. <u>GENERAL</u>
   - 1.1 PROVIDE DESIGN, SUPPLY, INSTALLATION, AND COMMISSIONING A COMPLETE MICROPROCESSOR BASED AUTOMATIC CONTROL SYSTEM.
   - 1.2 FOR EXISTING SITES VISIT THE PREMISES PRIOR TO TENDER TO BECOME FAMILIAR WITH FIELD CONDITIONS AND EXISTING EQUIPMENT.
   - 1.3 PROVIDE CONTROL SYSTEM AS AN INTEGRAL PART OF THE MECHANICAL SUB-CONTRACT. THE SYSTEM SHALL BE INSTALLED BY TRADE CERTIFIED ELECTRICIANS REGULARLY EMPLOYED BY THE CONTROL SUB-CONTRACTOR.
   - 1.4 EXAMINE MECHANICAL AND ELECTRICAL DRAWINGS, SPECIFICATIONS, AND ADDENDA AND COORDINATE THE WORK OF OTHER CONTRACTORS AND TO MAKE A COMPLETELY COORDINATED BUILDING AUTOMATION CONTROL SYSTEM (BACS) FOR THE MECHANICAL SYSTEMS. EXAMINE THE CONTRACT DOCUMENTS FOR CONTRADICTIONS AND OVERLAP AND PROVIDE PRICING FOR THE MOST ONEROUS CONDITIONS.
   - 1.5 PROVIDE THE NECESSARY ENGINEERING, INSTALLATION, SUPERVISION, COMMISSIONING AND PROGRAMMING FOR A COMPLETE AND FULLY OPERATIONAL SYSTEM. PROVIDE AS MANY TRIPS TO THE JOB SITE FOR INSTALLATION, SUPERVISION, AND COMMISSIONING AS ARE NECESSARY TO COMPLETE THE PROJECT TO THE SATISFACTION OF THE CONSULTANT AND/OR BUILDING PROJECT SUPERVISOR.
   - 1.6 PROVIDE OPERATOR INTERFACES, MICROPROCESSOR-BASED CONTROLLERS, SENSORS, WELLS, AUTOMATIC CONTROL VALVES, CONTROL DAMPERS, TRANSDUCERS, RELAYS, AUTOMATIC CONTROL VALVES, DAMPER ACTUATORS, ETC. AS REQUIRED.
2. <u>SCOPE OF WORK</u>:
   - 2.1 INTEGRATE NEW CONTROLS WITH EXISTING BMS SYSTEM.
   - 2.2 PREPARATION OF CONTROL SHOP DRAWINGS FOR REVIEW AND APPROVAL. SEE SUBMITTALS. SUPPLY AND INSTALL A NETWORK OF DIRECT DIGITAL CONTROL (DDC) PANELS AND FIELD DEVICES.
   - 2.3 PROVIDE CUSTOMIZED GRAPHICS SOFTWARE TO BUILDING STANDARDS, SYSTEM SOFTWARE, AND THIRD PARTY SOFTWARE AS SPECIFIED. SEE SOFTWARE
   - 2.4 INSTALL, WIRE AND LABEL ALL DDC CONTROL SYSTEM COMPONENTS.
   - 2.5 CALIBRATE AND COMMISSION THE INSTALLED CONTROL SYSTEM.
   - 2.6 PROVIDE MAINTENANCE MANUALS AND AS-BUILT DRAWINGS.
   - 2.7 PROVIDE CUSTOMIZED TRAINING FOR BUILDING OPERATIONS, MAINTENANCE AND TECHNICAL STAFF.
   - 2.8 PROVIDE A ONE-YEAR ON SITE PARTS AND LABOUR WARRANTY ON ALL COMPONENTS. SEE WARRANTY.
3. <u>APPROVED SYSTEMS</u>
   - 3.1 PROVIDE BID FROM EXISTING BUILDING AUTOMATION SYSTEM CONTROLS SUPPLIER.
4. <u>SYSTEM PERFORMANCE</u>
   - 4.1 GRAPHIC DISPLAY: DISPLAY A GRAPHIC WITH A MINIMUM OF 20 DYNAMIC POINTS. CURRENT DATA DISPLAYED WITHIN 10 SECONDS OF THE OPERATOR'S REQUEST.
   - 4.2 GRAPHIC REFRESH: 10 SECONDS.
   - 4.3 OBJECT COMMAND: 5 SECONDS MAXIMUM. ANALOG OBJECTS SHALL START TO ADJUST WITHIN 5 SECONDS.
   - 4.4 OBJECT SCAN: CURRENT WITHIN THE PRIOR 10 SECONDS.
   - 4.5 ALARM RESPONSE TIME: 10 SECONDS.
   - 4.6 PROGRAM EXECUTION FREQUENCY: AS OFTEN AS ONCE EVERY 5 SECONDS. SELECT EXECUTION TIMES CONSISTENT WITH THE MECHANICAL PROCESS UNDER CONTROL.
   - 4.7 PROGRAMMABLE CONTROLLERS SHALL BE ABLE TO EXECUTE DDC PID CONTROL LOOPS AT A SELECTABLE FREQUENCY FROM AT LEAST ONCE EVERY 5 SECONDS. THE CONTROLLER SHALL SCAN AND UPDATE THE PROCESS VALUE AND OUTPUT GENERATED BY THIS CALCULATION AT THIS SAME FREQUENCY.
   - 4.8 MULTIPLE ALARM ANNUNCIATIONS: ALL WORKSTATIONS ON THE NETWORK SHALL RECEIVE ALARMS WITHIN 5 SECONDS OF EACH OTHER.
   - 4.9 TABLE 1: REPORTING ACCURACY

MEASURED VARIABLE	REPORTED ACCURACY
SPACE TEMPERATURE	±0.25°C [±0.45°F]
DUCTED AIR	±0.25°C [±0.45°F]
OUTSIDE AIR	±0.25°C [±0.45°F]
WATER TEMPERATURE	±0.26°C [±0.47°F]
DELTA -T	±0.2°C [±0.36°F] <- 6-INCH THERMISTOR
RELATIVE HUMIDITY	±3% RH
WATER FLOW	±2% OF FULL SCALE
AIR FLOW (TERMINAL)	±5% OF READING *NOTE 1
AIR FLOW (MEASURING STATIONS)	±3% OF READING
AIR PRESSURE (DUCTS)	±1% OF FULL SCALE
AIR PRESSURE (SPACE)	±1% OF FULL SCALE
WATER PRESSURE	±1% OF FULL SCALE *NOTE 2
ELECTRICAL POWER	5% SOLID-CORE *NOTE 3
NOTE 1:	(10%-100% OF SCALE) (CANNOT READ ACCURATELY BELOW 10%)
NOTE 2:	FOR BOTH ABSOLUTE AND DIFFERENTIAL PRESSURE
NOTE 3:	NOT INCLUDING UTILITY SUPPLIED METERS

5. <u>SUBMITTAL REQUIREMENTS</u>
   - 5.1 PROVIDE THE ENGINEER AND OWNER, ANY ADDITIONAL INFORMATION OR DATA WHICH IS DEEMED NECESSARY TO DETERMINE COMPLIANCE WITH THE SPECIFICATIONS OR WHICH IS DEEMED VALUABLE IN DOCUMENTING AND UNDERSTANDING THE SYSTEM TO BE INSTALLED.
   - 5.2 SUBMIT THE FOLLOWING WITHIN 90 DAYS OF CONTRACT AWARD:
     - .1 BILL OF MATERIALS OF EQUIPMENT TO BE USED INDICATING QUANTITIES, MANUFACTURERS AND MODEL NUMBERS.
     - .2 SCHEDULE OF CONTROL VALVES INCLUDING THE VALVE SIZE, PRESSURE DROP, MODEL NUMBER (INCLUDING PATTERN AND CONNECTIONS), FLOW, CV, BODY PRESSURE RATING, AND LOCATION.
     - .3 SCHEDULE OF CONTROL DAMPERS INCLUDING DAMPER SIZE, PRESSURE DROP, MANUFACTURER, AND MODEL NUMBER.
   - 5.3 PROVIDE MANUFACTURERS' TECHNICAL CUT SHEETS FOR MAJOR SYSTEM COMPONENTS. INCLUDE:
     - .1 BUILDING CONTROLLERS
     - .2 CUSTOM APPLICATION CONTROLLERS
     - .3 APPLICATION SPECIFIC CONTROLLERS
     - .4 OPERATOR WORKSTATIONS
     - .5 PORTABLE OPERATOR TERMINALS
     - .6 AUXILIARY CONTROL DEVICES
   - 5.4 PROVIDE PROPOSED BUILDING AUTOMATION SYSTEM ARCHITECTURAL DIAGRAM DEPICTING VARIOUS CONTROLLER TYPES, WORKSTATIONS, DEVICE LOCATIONS, ADDRESSES, AND COMMUNICATION CABLE REQUIREMENTS
   - 5.5 PROVIDE DETAILED TERMINATION DRAWINGS SHOWING REQUIRED FIELD AND FACTORY TERMINATIONS, AS WELL AS TERMINAL TIE-INS TO DDC CONTROLS PROVIDED BY MECHANICAL EQUIPMENT MANUFACTURERS. CLEARLY LABEL TERMINAL NUMBERS.
   - 5.6 PROVIDE POINTS LIST SHOWING SYSTEM OBJECTS AND THE PROPOSED ENGLISH LANGUAGE OBJECT NAMES.
   - 5.7 PROVIDE SEQUENCE OF OPERATION FOR EACH CONTROLLED MECHANICAL SYSTEM AND TERMINAL END DEVICES.
   - 5.8 PROVIDE A BACNET PROTOCOL IMPLEMENTATION CONFORMANCE STATEMENT (PICS) FOR EACH BACNET SYSTEM LEVEL DEVICE (I.E. BUILDING CONTROLLER & OPERATOR WORKSTATIONS) TYPE. THIS DEFINES THE POINTS LIST FOR PROPER COORDINATION OF INTEROPERABILITY WITH OTHER BUILDING SYSTEMS IF APPLICABLE FOR THIS PROJECT.
6. <u>WARRANTY REQUIREMENTS</u>
   - 6.1 BAS SYSTEM LABOR AND MATERIALS SHALL BE WARRANTED FREE FROM DEFECTS FOR A PERIOD OF TWELVE (12) MONTHS AFTER FINAL COMPLETION ACCEPTANCE BY THE OWNER. BAS FAILURES DURING THE WARRANTY PERIOD SHALL BE ADJUSTED, REPAIRED, OR REPLACED AT NO CHARGE TO THE OWNER. THE BAS MANUFACTURER SHALL RESPOND TO THE OWNER'S REQUEST FOR WARRANTY SERVICE WITHIN 24 HOURS OF THE INITIATED CALL AND WILL OCCUR DURING NORMAL BUSINESS HOURS (8AM-5PM).
   - 6.2 THE BAS MANUFACTURER SHALL PROVIDE A TOTAL OF (16) HOURS OF ONSITE PREVENTATIVE MAINTENANCE DURING WARRANTY PERIOD. EIGHT (8) HOURS AT SIX (6) MONTHS, AND EIGHT (8) HOURS AT TEN (10) MONTHS AFTER SUBSTANTIAL COMPLETION OF ONSITE PREVENTATIVE MAINTENANCE INTO THE WARRANTY PERIOD.
   - 6.3 AT THE END OF THE FINAL START-UP/TESTING, IF EQUIPMENT AND SYSTEMS ARE OPERATING SATISFACTORILY TO THE CUSTOMER, THE CUSTOMER SHALL SIGN CERTIFICATES CERTIFYING THAT THE BAS IS OPERATIONAL AND HAS BEEN TESTED AND ACCEPTED IN ACCORDANCE WITH THE TERMS OF THIS SPECIFICATION. THE DATE OF CUSTOMER ACCEPTANCE SHALL BE THE START OF THE WARRANTY PERIOD.
   - 6.4 OPERATOR WORKSTATION SOFTWARE, PROJECT SPECIFIC SOFTWARE, GRAPHICS, DATABASE, AND FIRMWARE UPDATES SHALL BE PROVIDED TO THE CUSTOMER AT NO CHARGE DURING THE WARRANTY PERIOD. WRITTEN AUTHORIZATION BY THE CUSTOMER MUST BE GRANTED PRIOR TO THE INSTALLATION OF THESE UPDATES.
   - 6.5 THE BAS MANUFACTURER SHALL PROVIDE A WEB-ACCESSIBLE USERS NETWORK FOR THE PROPOSED SYSTEM AND GIVE THE OWNER FREE ACCESS TO QUESTION/ANSWER FORUM, USER TIPS, UPGRADES, AND TRAINING SCHEDULES FOR A ONE YEAR PERIOD OF TIME CORRELATING WITH THE WARRANTY PERIOD.
   - 6.6 THE PROJECT'S CONTROLS CONTRACTOR SHALL PROVIDE AND MAINTAIN SECURE REMOTE ACCESS TO THE FACILITIES BUILDING AUTOMATION SYSTEM (BAS) OR OTHER BUILDING SYSTEMS UNTIL UP TO 1 YEAR AFTER SUBSTANTIAL COMPLETION. PRIOR TO TRANSITION FROM WARRANTY, THE BUILDING OWNER WILL PROVIDE AND MAINTAIN THE SECURED REMOTE ACCESS.
7. <u>DATA MONITORING, STORING, & COLLECTION STANDARDS</u>
   - 7.1 THE SYSTEM SHALL RECORD AND STORE INTERVAL DATA, 24 HOURS/DAY, 7 DAYS/WEEK, 365 DAYS/YEAR.
   - 7.2 DATA TO BE COLLECTED FOR REAL-TIME CONTINUOUS MONITORING AND COLLECTION OF WHOLE-BUILDING ENERGY METERS AND SUB-METERS IF THE METERS HAVE BEEN INSTALLED AS PART OF THE WARRANTED PROJECT.
   - 7.3 DATA TO BE COLLECTED FROM BUILDING AUTOMATION AND CONTROL SYSTEMS SUB-METERS AND SENSORS DATA FOR EQUIPMENT STATUS, SET POINTS, AND OPERATIONAL POINTS.
   - 7.4 DATA SHALL BE STORED IN A CLASS 5 SECURE HOSTING LOCATION PROTECTED BY ISO 5001-COMPLAINT FIREWALL AND INTRUSION DETECTION SYSTEMS WITH SUPPORT FOR MAJOR NETWORK SECURITY PROTOCOLS SUCH AS HTTPS AND SFTP TO SECURELY ACCESS AND STORE DATA.
   - 7.5 DASHBOARD WEB INTERFACE: THE DASHBOARD INTERFACE SHALL ALLOW DISPLAY OF ENERGY

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AND BUILDING SYSTEM DATA IN WIDGETS, CHARTS AND TRACKING APPLICATIONS, AND BE AVAILABLE WITHOUT REQUIRING USERS TO UTILIZE EXTERNAL, THIRD PARTY TOOLS.
     - .1 THE DASHBOARD WEB INTERFACE SHALL BE ACCESSIBLE VIA A WEB BROWSER WITHOUT REQUIRING ANY "PLUG-INS" (I.E. JAVA RUNTIME ENVIRONMENT (JRE), ADOBE FLASH).
     - .2 THE INTERFACE SHALL SUPPORT COMMON INTERNET WEB BROWSERS AT A MINIMUM INCLUDING: INTERNET EXPLORER 10.0+, FIREFOX 4.0+, CHROME 10.0+, OPERA, SAFARI
     - .3 THE INTERFACE SHALL SUPPORT THE FOLLOWING MOBILE WEB BROWSERS AT A MINIMUM: IOS (IPAD/IPHONE) V9.1+, ANDROID (TABLET) V4.3+, ANDROID (PHONE) V2.3+.
     - .4 DASHBOARDS SHALL BE CUSTOMIZABLE FOR EACH INDIVIDUAL OR GROUP OF USERS THE TO MODIFY PERSONAL DASHBOARDS AT ANY TIME USING A LIBRARY OF WIDGETS SPECIFIC TO THE PROJECT SITE.
     - .5 DASHBOARDS SHOULD BE CAPABLE OF TRACKING & DISPLAYING SUMMARY METRICS AND STATUS OF ENERGY AND EMISSIONS GOALS AT VARIOUS LEVELS: FLOOR/AREA, BUILDING, CAMPUS, PORTFOLIO.
   - 7.6 EACH USER SHALL BE REQUIRED TO LOGIN TO THE SYSTEM WITH A USER NAME AND PASSWORD IN ORDER TO VIEW, EDIT, ADD, OR DELETE DATA
   - 7.7 USER PROFILES SHALL RESTRICT THE USER TO ONLY THE OBJECTS, APPLICATIONS, AND SYSTEM FUNCTIONS AS ASSIGNED BY THE SYSTEM ADMINISTRATOR.
   - 7.8 EACH USER SHALL BE ALLOWED TO CHANGE THEIR USER PASSWORD.
   - 7.9 THE SYSTEM ADMINISTRATOR SHALL BE ABLE TO MANAGE THE SECURITY FOR ALL OTHER USERS.
   - 7.10 THE SYSTEM SHALL INCLUDE PRE-DEFINED "ROLES" THAT ALLOW A SYSTEM ADMINISTRATOR TO QUICKLY ASSIGN PERMISSIONS TO A USER.
   - 7.11 BEMS DASHBOARD SHALL INCLUDE AN OBJECT-BASED WIDGET BUILDER FOR THE CREATION OF CUSTOM WIDGETS, AS WELL AS A LIBRARY OF OFF-THE-SHELF ENERGY WIDGETS TO UTILIZE:
     - .1 USERS SHALL MODIFY PERSONAL DASHBOARDS AT ANY TIME USING A LIBRARY OF WIDGETS SPECIFIC TO THE PROJECT SITE OR DRAWING ON A VENDOR-PROVIDED LIBRARY OF ENERGY WIDGETS WITH EMBEDDED LOGIC FOR COMMON ENERGY CALCULATIONS.
     - .2 USERS ARE ALLOWED TO PICK AND CHOOSE WHICH WIDGETS ARE DISPLAYED, AND WHERE THEY ARE LOCATED.
     - .3 SHALL PROVIDE AN OBJECT-BASED WIDGET BUILDER FOR THE CREATION OF CUSTOM WIDGETS INCLUDING:
       - .1 TARGET A SPECIFIC BUILDING OR SYSTEM/EQUIPMENT
       - .2 CONFIGURE TIME PERIODS, PARAMETER VALUES (MAXIMUM/MINIMUM), UNITS OF MEASURE
       - .3 SELECT DISPLAY COLORS
       - .4 PREVIEW WIDGETS USING TARGET OBJECT.
   - 7.12 ENERGY CONSERVATION MEASURE (ECM) CREATION AND TRACKING
   - 7.13 THE BEMS SHALL INCLUDE EMBEDDED APPLICATION FOR THE CREATION AND TRACKING OF ENERGY CONSERVATION MEASURES (ECMS) AND OPPORTUNITIES FOR FACILITY IMPROVEMENTS INCLUDING:
     - .1 CAPABILITY TO CREATE AND TRACK THE STATUS OF OPPORTUNITIES, ENERGY EFFICIENCY PROJECTS AND ENERGY CONSERVATION MEASURES (ECMS), INCLUDING ATTACHING DOCUMENTATION.
     - .2 SHALL PROVIDE EMBEDDED COST ESTIMATOR TO QUANTIFY ENERGY COST SAVINGS FOR EACH RECOMMENDED ENERGY CONSERVATION MEASURE OR SYSTEM OPTIMIZATION RECOMMENDATION
8. <u>OPERATOR INTERFACE</u>
   - 8.1 FURNISH PC BASED OPERATOR WEB INTERFACE ABLE TO ACCESS ALL INFORMATION IN THE SYSTEM. THE BUILDING OPERATOR WEB INTERFACE SHALL RESIDE ON THE BUILDING WIDE NETWORK, WHICH IS SAME HIGH-SPEED IP COMMUNICATIONS NETWORK AS THE SYSTEM CONTROLLERS. THE BUILDING WIDE NETWORK WILL BE PROVIDED BY THE OWNER AND SUPPORTS THE INTERNET PROTOCOL (IP).
   - 8.2 EACH OPERATOR INTERFACE PC SHALL INCLUDE THE FOLLOWING: (3) YEARS OF SOFTWARE SERVICE UPDATES, TREND DATA STORAGE, BACKUPS. PREFERRED CONNECTIVITY FOR BACKUPS IS THROUGH THE CLOUD. IF CLOUD IS NOT AVAILABLE PROVIDE AN ONSITE SERVER WITH 2 TB OF SECURE STORAGE.
   - 8.3 SERVICE TOOL - LAPTOP C/W MINIMUM HARDWARE INTEL CORE I5 OR BETTER, 16 GB RAM, 2 TB HARD DRIVE SPACE.
   - 8.4 INTERNET BROWSER COMPATIBILITY: THE OPERATOR WEB INTERFACE SHALL BE ACCESSIBLE VIA A WEB BROWSER WITHOUT REQUIRING ANY "PLUG-INS" (I.E. JAVA RUNTIME ENVIRONMENT (JRE), ADOBE FLASH). THE OPERATOR WEB INTERFACE SHALL SUPPORT THE FOLLOWING INTERNET WEB BROWSERS: INTERNET EXPLORER 11.0+, FIREFOX 47.0+, CHROME 75.0+, EDGE 13.0+
   - 8.5 THE OPERATOR WEB INTERFACE SHALL SUPPORT THE FOLLOWING MOBILE WEB BROWSERS: IOS (IPAD/IPHONE) V9.1+, ANDROID (TABLET) V4.3+, ANDROID (PHONE) V2.3+
   - 8.6 THE BUILDING OPERATOR WEB INTERFACE SHALL BE ACCESSIBLE VIA A WEB BROWSER WITHOUT REQUIRING ANY "PLUG-INS" (I.E. JAVA RUNTIME ENVIRONMENT (JRE), ADOBE FLASH)
   - 8.7 SYSTEM SECURITY
     - .1 EACH OPERATOR SHALL BE REQUIRED TO LOGIN TO THE SYSTEM WITH A USER NAME AND PASSWORD IN ORDER TO VIEW, EDIT, ADD, OR DELETE DATA.
     - .2 USER PROFILES SHALL RESTRICT THE USER TO ONLY THE OBJECTS, APPLICATIONS, AND SYSTEM FUNCTIONS AS ASSIGNED BY THE SYSTEM ADMINISTRATOR.
     - .3 EACH OPERATOR SHALL BE ALLOWED TO CHANGE THEIR USER PASSWORD.
     - .4 THE SYSTEM ADMINISTRATOR SHALL BE ABLE TO MANAGE THE SECURITY FOR ALL OTHER USERS.
     - .5 THE SYSTEM SHALL INCLUDE PRE-DEFINED "ROLES" THAT ALLOW A SYSTEM ADMINISTRATOR TO QUICKLY ASSIGN PERMISSIONS TO A USER.
     - .6 USER LOGON/LOGOFF ATTEMPTS SHALL BE RECORDED.
     - .7 THE SYSTEM SHALL PROTECT ITSELF FROM UNAUTHORIZED USE BY AUTOMATICALLY LOGGING OFF FOLLOWING THE LAST KEYSTROKE. THE DELAY TIME SHALL BE USER DEFINABLE.
     - .8 SYSTEM SECURITY DATA SHALL BE STORED IN AN ENCRYPTED FORMAT.
   - 8.8 ON-LINE HELP AND TRAINING
     - .1 PROVIDE A CONTEXT SENSITIVE, ONLINE HELP SYSTEM TO ASSIST THE OPERATOR IN OPERATION AND CONFIGURATION OF THE SYSTEM.
     - .2 ON-LINE HELP SHALL BE AVAILABLE FOR SYSTEM FUNCTIONS AND SHALL PROVIDE THE RELEVANT DATA FOR EACH PARTICULAR SCREEN.
   - 8.9 SYSTEM DIAGNOSTICS
     - .1 THE SYSTEM SHALL AUTOMATICALLY MONITOR THE OPERATION OF NETWORK CONNECTIONS, BUILDING MANAGEMENT PANELS, AND CONTROLLERS.
     - .2 THE FAILURE OF ANY DEVICE SHALL BE ANNUNCIATED TO THE OPERATORS.
   - 8.10 EQUIPMENT & APPLICATION PAGES
     - .1 THE BUILDING OPERATOR WEB INTERFACE SHALL INCLUDE STANDARD PAGES FOR ALL EQUIPMENT AND APPLICATIONS. THESE PAGES SHALL ALLOW AN OPERATOR TO OBTAIN INFORMATION RELEVANT TO THE OPERATION OF THE EQUIPMENT AND/OR APPLICATION, INCLUDING:
     - .2 ALARMS RELEVANT TO THE EQUIPMENT OR APPLICATION WITHOUT REQUIRING A USER TO NAVIGATE TO AN ALARM PAGE AND PERFORM A FILTER.
     - .3 HISTORICAL DATA (AS DEFINED IN DATA LOG SECTION BELOW) FOR THE EQUIPMENT OR APPLICATION WITHOUT REQUIRING A USER TO NAVIGATE TO A DATA LOG PAGE AND PERFORM A FILTER.
   - 8.11 SYSTEM GRAPHICS. BUILDING OPERATOR WEB INTERFACE SHALL BE GRAPHICALLY BASED AND SHALL INCLUDE AT LEAST ONE GRAPHIC PER PIECE OF EQUIPMENT OR OCCUPIED ZONE, GRAPHICS FOR EACH CHILLED WATER AND HOT WATER SYSTEM, AND GRAPHICS THAT SUMMARIZE CONDITIONS ON EACH FLOOR OF EACH BUILDING INCLUDED IN THIS CONTRACT. INDICATE THERMAL COMFORT ON FLOOR PLAN SUMMARY GRAPHICS USING COLORS TO REPRESENT ZONE TEMPERATURE RELATIVE TO ZONE SET POINT.
     - .1 FUNCTIONALITY. GRAPHICS SHALL ALLOW OPERATOR TO MONITOR SYSTEM STATUS, TO VIEW A SUMMARY OF THE MOST IMPORTANT DATA FOR EACH CONTROLLED ZONE OR PIECE OF EQUIPMENT, TO USE POINT AND-CLICK NAVIGATION BETWEEN ZONES OR EQUIPMENT, AND TO EDIT SET POINTS AND OTHER SPECIFIED PARAMETERS.
     - .2 GRAPHIC IMAGERY - GRAPHICS SHALL USE 3D IMAGES FOR ALL STANDARD AND CUSTOM GRAPHICS. THE ONLY ALLOWABLE EXCEPTIONS WILL BE PHOTO IMAGES, MAPS, SCHEMATIC DRAWINGS, AND SELECTED FLOOR PLANS.
     - .3 ALARM INDICATION. INDICATE AREAS OR EQUIPMENT IN AN ALARM CONDITION USING COLOR OR OTHER VISUAL INDICATOR.
   - 8.12 CUSTOM GRAPHICS
     - .1 THE OPERATOR INTERFACE SHALL BE CAPABLE OF DISPLAYING CUSTOM GRAPHICS IN ORDER TO CONVEY THE STATUS OF THE FACILITY TO ITS OPERATORS.
     - .2 GRAPHICAL NAVIGATION. THE BUILDING OPERATOR WEB INTERFACE SHALL PROVIDE DYNAMIC COLOR GRAPHICS OF BUILDING AREAS, SYSTEMS AND EQUIPMENT.
     - .3 GRAPHICAL DATA VISUALIZATION. THE BUILDING OPERATOR WEB INTERFACE SHALL SUPPORT DYNAMIC POINTS INCLUDING ANALOG AND BINARY VALUES, DYNAMIC TEXT, STATIC TEXT, AND ANIMATION FILES.
   - 8.13 MANUAL CONTROL AND OVERRIDE
     - .1 POINT CONTROL. PROVIDE A METHOD FOR A USER TO VIEW, OVERRIDE, AND EDIT IF APPLICABLE, THE STATUS OF ANY OBJECT AND PROPERTY IN THE SYSTEM. THE POINT STATUS SHALL BE AVAILABLE BY MENU, ON GRAPHICS OR THROUGH CUSTOM PROGRAMS.
     - .2 TEMPORARY OVERRIDES. THE USER SHALL BE ABLE TO PERFORM A TEMPORARY OVERRIDE WHEREVER AN OVERRIDE IS ALLOWED, AUTOMATICALLY REMOVING THE OVERRIDE AFTER A SPECIFIED PERIOD OF TIME.
     - .3 OVERRIDE OWNERS. THE SYSTEM SHALL CONVEY TO THE USER THE OWNER OF EACH OVERRIDE FOR ALL PRIORITIES THAT AN OVERRIDE EXISTS.
     - .4 PROVIDE A SPECIFIC ICON TO SHOW TIMED OVERRIDE OR OPERATOR OVERRIDE, WHEN A POINT, UNIT CONTROLLER OR APPLICATION HAS BEEN OVERRIDDEN MANUALLY.
   - 8.14 SCHEDULING. A USER SHALL BE ABLE TO PERFORM THE FOLLOWING TASKS UTILIZING THE BUILDING OPERATOR WEB INTERFACE:
     - .1 CREATE A NEW SCHEDULE, DEFINING THE DEFAULT VALUES, EVENTS AND MEMBERSHIP.
     - .2 CREATE EXCEPTIONS TO A SCHEDULE FOR ANY GIVEN DAY.
     - .3 APPLY AN EXCEPTION THAT SPANS A SINGLE DAY OR MULTIPLE DAYS.
     - .4 VIEW A SCHEDULE BY DAY, WEEK AND MONTH.
     - .5 EXCEPTION SCHEDULES AND HOLIDAYS SHALL BE SHOWN CLEARLY ON THE CALENDAR.
     - .6 MODIFY THE SCHEDULE EVENTS, MEMBERS AND EXCEPTIONS.
9. <u>DATA LOGS</u>
   - 9.1 THE BUILDING OPERATOR WEB INTERFACE SHALL ALLOW A USER WITH THE APPROPRIATE SECURITY PERMISSIONS TO DEFINE A DATA LOG FOR ANY DATA IN THE SYSTEM.

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   - 9.2 THE BUILDING OPERATOR WEB INTERFACE SHALL ALLOW A USER TO DEFINE ANY DATA LOG OPTIONS AS DESCRIBED IN THE APPLICATION AND CONTROL SOFTWARE SECTION.
   - 9.3 DATA LOG VIEWER.
     - .1 THE BUILDING OPERATOR WEB INTERFACE SHALL ALLOW DATA LOG DATA TO BE VIEWED AND PRINTED.
     - .2 THE BUILDING OPERATOR WEB INTERFACE SHALL ALLOW A USER TO VIEW DATA LOG DATA IN A TEXT-BASED FORMAT (TIME -STAMP/VALUE).
     - .3 THE OPERATOR SHALL BE ABLE TO VIEW THE DATA COLLECTED BY A DATA LOG IN A GRAPHICAL CHART IN THE BUILDING OPERATOR WEB INTERFACE.
     - .4 DATA LOG VIEWING CAPABILITIES SHALL INCLUDE THE ABILITY TO SHOW A MINIMUM OF 5 POINTS ON A CHART.
     - .5 EACH DATA POINT DATA LINE SHALL BE DISPLAYED AS A UNIQUE COLOR.
     - .6 THE OPERATOR SHALL BE ABLE TO SPECIFY THE DURATION OF HISTORICAL DATA TO VIEW BY SCROLLING AND ZOOMING.
     - .7 THE SYSTEM SHALL PROVIDE A GRAPHICAL TRACE DISPLAY OF THE ASSOCIATED TIME STAMP AND VALUE FOR ANY SELECTED POINT ALONG THE X-AXIS.
   - 9.4 EXPORT DATA LOGS.
     - .1 THE BUILDING OPERATOR WEB INTERFACE SHALL ALLOW A USER TO EXPORT DATA LOG DATA IN CSV OR PDF FORMAT FOR USE BY OTHER INDUSTRY STANDARD WORD PROCESSING AND SPREADSHEET PACKAGES.
   - 9.5 ALARM/EVENT NOTIFICATION
     - .1 AN OPERATOR SHALL BE NOTIFIED OF NEW ALARMS/EVENTS AS THEY OCCUR WHILE NAVIGATING THROUGH ANY PART OF THE SYSTEM VIA AN ALARM ICON.
     - .2 ALARM/EVENT LOG. THE OPERATOR SHALL BE ABLE TO VIEW ALL LOGGED SYSTEM ALARMS/EVENTS FROM ANY BUILDING OPERATOR WEB INTERFACE.
     - .3 THE OPERATOR SHALL BE ABLE TO SORT AND FILTER ALARMS FROM EVENTS. ALARMS SHALL BE SORTED IN A MINIMUM OF 4 CATEGORIES BASED ON SEVERITY.
     - .4 ALARM/EVENT MESSAGES SHALL USE FULL LANGUAGE, EASILY RECOGNIZED DESCRIPTORS.
     - .5 AN OPERATOR WITH THE PROPER SECURITY LEVEL MAY ACKNOWLEDGE AND CLEAR ALARMS/EVENTS.
     - .6 ALL ALARMS/EVENTS THAT HAVE NOT BEEN CLEARED BY THE OPERATOR SHALL BE STORED BY THE BUILDING CONTROLLER.
     - .7 THE ALARM/EVENT LOG SHALL INCLUDE A COMMENT FIELD FOR EACH ALARM/EVENT THAT ALLOWS A USER TO ADD SPECIFIC COMMENTS ASSOCIATED WITH ANY ALARM.
   - 9.6 ALARM PROCESSING.
     - .1 THE OPERATOR SHALL BE ABLE TO CONFIGURE ANY OBJECT IN THE SYSTEM TO GENERATE AN ALARM WHEN TRANSITIONING IN AND OUT OF A NORMAL STATE.
     - .2 THE OPERATOR SHALL BE ABLE TO CONFIGURE THE ALARM LIMITS, WARNING LIMITS, STATES, AND REACTIONS FOR EACH OBJECT IN THE SYSTEM.
   - 9.7 REPORTS AND LOGS.
     - .1 THE BUILDING OPERATOR WEB INTERFACE SHALL PROVIDE A REPORTING PACKAGE THAT ALLOWS THE OPERATOR TO SELECT REPORTS.
     - .2 THE BUILDING OPERATOR WEB INTERFACE SHALL PROVIDE THE ABILITY TO SCHEDULE REPORTS TO RUN AT SPECIFIED INTERVALS OF TIME.
     - .3 THE BUILDING OPERATOR WEB INTERFACE SHALL ALLOW A USER TO EXPORT REPORTS AND LOGS FROM THE BUILDING CONTROLLER IN A FORMAT THAT IS READILY ACCESSIBLE BY OTHER STANDARD SOFTWARE APPLICATIONS INCLUDING SPREADSHEETS AND WORD PROCESSING. ACCEPTABLE FORMATS INCLUDE: CSV, HTML, XML, PDF
     - .4 REPORTS AND LOGS SHALL BE READILY PRINTED TO THE SYSTEM PRINTER.
     - .5 PROVIDE A MEANS TO LIST AND ACCESS THE LAST 10 REPORTS VIEWED BY THE USER.
     - .6 THE FOLLOWING STANDARD REPORTS SHALL BE AVAILABLE WITHOUT REQUIRING A USER TO MANUALLY CONFIGURE THE REPORT:
       - .1 ALL POINTS IN ALARM REPORT: PROVIDE AN ON-DEMAND REPORT SHOWING ALL CURRENT ALARMS.
       - .2 ALL POINTS IN OVERRIDE REPORT: PROVIDE AN ON-DEMAND REPORT SHOWING ALL OVERRIDES IN EFFECT.
       - .3 COMMISSIONING REPORT: PROVIDE A ONE-TIME REPORT THAT LISTS ALL EQUIPMENT WITH THE UNIT CONFIGURATION AND PRESENT OPERATION.
       - .4 POINTS REPORT: PROVIDE A REPORT THAT LISTS THE CURRENT VALUE OF ALL POINTS
10. <u>CONTROLLER SOFTWARE</u>
   - 10.1 FURNISH THE FOLLOWING APPLICATIONS SOFTWARE FOR BUILDING AND ENERGY MANAGEMENT. SOFTWARE APPLICATIONS SHALL RESIDE AND RUN IN THE SYSTEM CONTROLLERS. EDITING OF APPLICATIONS SHALL OCCUR AT THE BUILDING OPERATOR INTERFACE.
   - 10.2 SCHEDULING. PROVIDE THE CAPABILITY TO SCHEDULE EACH OBJECT OR GROUP OF OBJECTS IN THE SYSTEM. EACH OF THESE SCHEDULES SHALL INCLUDE THE CAPABILITY FOR START, STOP, OPTIMAL START, OPTIMAL STOP, AND NIGHT ECONOMIZER ACTIONS. EACH SCHEDULE MAY CONSIST OF UP TO [10] EVENTS. WHEN A GROUP OF OBJECTS ARE SCHEDULED TOGETHER, PROVIDE THE CAPABILITY TO DEFINE ADVANCES AND DELAYS FOR EACH MEMBER. EACH SCHEDULE SHALL CONSIST OF THE FOLLOWING:
     - .1 WEEKLY SCHEDULE: PROVIDE SEPARATE SCHEDULES FOR EACH DAY OF THE WEEK.
     - .2 EXCEPTION SCHEDULES: PROVIDE THE ABILITY FOR THE OPERATOR TO DESIGNATE ANY DAY OF THE YEAR AS AN EXCEPTION SCHEDULE. THIS EXCEPTION SCHEDULE SHALL OVERRIDE THE STANDARD SCHEDULE FOR THAT DAY. EXCEPTION SCHEDULES MAY BE DEFINED UP TO A YEAR IN ADVANCE. ONCE AN EXCEPTION SCHEDULE IS EXECUTED IT WILL BE DISCARDED AND REPLACED BY THE STANDARD SCHEDULE FOR THAT DAY OF THE WEEK.
     - .3 HOLIDAY SCHEDULES: PROVIDE THE CAPABILITY FOR THE OPERATOR TO DEFINE UP TO 99 SPECIAL OR HOLIDAY SCHEDULES. THESE SCHEDULES MAY BE PLACED ON THE SCHEDULING CALENDAR AND WILL BE REPEATED EACH YEAR. THE OPERATOR SHALL BE ABLE TO DEFINE THE LENGTH OF EACH HOLIDAY PERIOD.
     - .4 OPTIMAL START: THE SCHEDULING APPLICATION OUTLINED ABOVE SHALL SUPPORT AN OPTIMAL START ALGORITHM. THIS SHALL CALCULATE THE THERMAL CHARACTERISTICS OF A ZONE AND START THE EQUIPMENT PRIOR TO OCCUPANCY TO ACHIEVE THE DESIRED SPACE TEMPERATURE AT THE SPECIFIED OCCUPANCY TIME. THE ALGORITHM SHALL CALCULATE SEPARATE SETS OF HEATING AND COOLING RATES FOR ZONES THAT HAVE BEEN UNOCCUPIED FOR LESS THEN AND GREATER THAN 24 HOURS. PROVIDE THE ABILITY TO MODIFY THE START ALGORITHM BASED ON AIR TEMPERATURE. PROVIDE AN EARLY START LIMIT IN MINUTES TO PREVENT THE SYSTEM FROM STARTING BEFORE AN OPERATOR DETERMINED TIME LIMIT.
   - 10.3 TREND LOG APPLICATION
     - .1 TREND LOG DATA SHALL BE SAMPLED AND STORED ON THE SYSTEM CONTROLLER PANEL AND SHALL BE CAPABLE OF BEING ARCHIVED TO A BACNET WORKSTATION FOR LONGER TERM STORAGE.
     - .2 TREND LOGS SHALL INCLUDE INTERVAL, START-TIME, AND STOP-TIME.
     - .3 TREND LOG INTERVALS SHALL BE CONFIGURABLE AS FREQUENTLY AS 1 MINUTE AND AS INFREQUENTLY AS 1 YEAR.
   - 10.4 TREND LOGS
     - .1 THE SYSTEM CONTROLLER SHALL CREATE TREND LOGS FOR DEFINED KEY PERFORMANCE INDICATORS FOR EACH CONTROLLED HVAC DEVICE AND HVAC APPLICATION.
     - .2 THE TREND LOGS SHALL MONITOR THESE PARAMETERS FOR A MINIMUM OF 7 DAYS AT 15 MINUTE INTERVALS. THE AUTOMATIC TREND LOGS SHALL BE USER ADJUSTABLE.
   - 10.5 ALARM/EVENT LOG
     - .1 ANY OBJECT IN THE SYSTEM SHALL BE CONFIGURABLE TO GENERATE AN ALARM WHEN TRANSITIONING IN AND OUT OF A NORMAL OR FAULT STATE.
     - .2 ANY OBJECT IN THE SYSTEM SHALL ALLOW THE ALARM LIMITS, WARNING LIMITS, STATES, AND REACTIONS TO BE CONFIGURED FOR EACH OBJECT IN THE SYSTEM.
     - .3 AN ALARM/EVENT SHALL BE CAPABLE OF TRIGGERING ANY OF THE FOLLOWING ACTIONS:
       - .1 ROUTE THE ALARM/EVENT TO ONE OR MORE ALARM LOG
       - .2 THE ALARM MESSAGE SHALL INCLUDE THE NAME OF THE ALARM LOCATION, THE DEVICE THAT GENERATED THE ALARM, AND THE ALARM MESSAGE ITSELF.
       - .3 ROUTE AN E-MAIL MESSAGE TO AN OPERATOR(S)
       - .4 LOG A DATA POINT(S) FOR A PERIOD OF TIME
       - .5 RUN A CUSTOM CONTROL PROGRAM
   - 10.6 POINT CONTROL. USER SHALL HAVE THE OPTION TO SET THE UPDATE INTERVAL, MINIMUM ON/OFF TIME, EVENT NOTIFICATION, CUSTOM PROGRAMMING ON CHANGE OF EVENTS.
   - 10.7 TIMED OVERRIDE. A STANDARD APPLICATION SHALL BE UTILIZED TO ENABLE/DISABLE TEMPERATURE CONTROL WHEN A USER SELECTS ON/CANCEL AT THE ZONE SENSOR, BUILDING OPERATOR INTERFACE, OR THE LOCAL OPERATOR DISPLAY. THE AMOUNT OF TIME THAT THE OVERRIDE TAKES PRECEDENCE WILL BE SELECTABLE FROM THE BUILDING OPERATOR INTERFACE.
   - 10.8 ANTI-SHORT CYCLING. ALL BINARY OUTPUT POINTS SHALL BE PROTECTED FROM SHORT CYCLING
11. <u>BUILDING CONTROLLERS</u>
   - 11.1 THERE SHALL BE ONE OR MORE INDEPENDENT, STANDALONE MICROPROCESSOR BASED SYSTEM CONTROLLERS TO MANAGE THE GLOBAL STRATEGIES DESCRIBED IN APPLICATION AND CONTROL SOFTWARE SECTION.
   - 11.2 THE SYSTEM CONTROLLER SHALL HAVE SUFFICIENT MEMORY TO SUPPORT ITS OPERATING SYSTEM, DATABASE, AND PROGRAMMING REQUIREMENTS.
   - 11.3 THE CONTROLLER SHALL PROVIDE A USB COMMUNICATIONS PORT FOR CONNECTION TO A PC.
   - 11.4 THE OPERATING SYSTEM OF THE CONTROLLER SHALL MANAGE THE INPUT AND OUTPUT COMMUNICATIONS SIGNALS TO ALLOW DISTRIBUTED CONTROLLERS TO SHARE REAL AND VIRTUAL POINT INFORMATION AND ALLOW CENTRAL MONITORING AND ALARMS.
   - 11.5 SYSTEM CONTROLLERS SHALL HAVE A REAL TIME CLOCK.
   - 11.6 DATA SHALL BE SHARED BETWEEN NETWORKED SYSTEM CONTROLLERS.
   - 11.7 THE SYSTEM CONTROLLER SHALL CONTINUALLY CHECK THE STATUS OF ITS PROCESSOR AND MEMORY CIRCUITS. IF AN ABNORMAL OPERATION IS DETECTED, THE CONTROLLER SHALL:
     - .1 ASSUME A PREDETERMINED FAILURE MODE.
     - .2 GENERATE AN ALARM NOTIFICATION.
     - .3 CREATE A RETRIEVABLE FILE OF THE STATE OF ALL APPLICABLE MEMORY LOCATIONS AT THE TIME OF THE FAILURE.
     - .4 AUTOMATICALLY RESET THE SYSTEM CONTROLLER TO RETURN TO A NORMAL OPERATING MODE.
     - .5 ENVIRONMENT. CONTROLLER HARDWARE SHALL BE SUITABLE FOR THE ANTICIPATED AMBIENT CONDITIONS. CONTROLLER USED IN CONDITIONED AMBIENT SHALL BE MOUNTED IN AN ENCLOSURE AND SHALL BE RATED FOR OPERATION AT -40° C TO 50° C [-40° F TO 122° F].
   - 11.8 CLOCK SYNCHRONIZATION.

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     - .1 SYSTEM CONTROLLERS SHALL BE ABLE TO SYNCHRONIZE WITH A NTP SERVER FOR AUTOMATIC TIME SYNCHRONIZATION.
     - .2 SYSTEM CONTROLLERS SHALL BE ABLE TO ACCEPT A BACNET TIME SYNCHRONIZATION COMMAND FOR AUTOMATIC TIME SYNCHRONIZATION.
     - .3 SYSTEM CONTROLLERS SHALL AUTOMATICALLY ADJUST FOR DAYLIGHT SAVINGS TIME IF APPLICABLE.
   - 11.9 SERVICEABILITY
     - .1 PROVIDE DIAGNOSTIC LEDS FOR POWER, COMMUNICATIONS, AND PROCESSOR.
     - .2 THE SYSTEM CONTROLLER SHALL HAVE A DISPLAY ON THE MAIN BOARD THAT INDICATES THE CURRENT OPERATING MODE OF THE CONTROLLER.
     - .3 SD CARD SHOULD BE PROVIDED AND USED FOR LOCAL BACKUP. IF LOCAL BACKUP THROUGH SD CARD OR SIMILAR DEVICE IS NOT AVAILABLE THEN PROVIDE OPERATOR WORKSTATION WITH SUFFICIENT MEMORY PROVIDE SCHEDULED BACKUPS OF THE SYSTEM. BAS SERVICE PROVIDER SHALL BE RESPONSIBLE FOR BAS BACKUPS DURING THE WARRANTY PERIOD.
     - .4 WIRING CONNECTIONS SHALL BE MADE TO FIELD REMOVABLE, MODULAR TERMINAL CONNECTORS.
     - .5 THE SYSTEM CONTROLLER SHALL UTILIZE STANDARD DIN MOUNTING METHODS FOR INSTALLATION AND REPLACEMENT.
     - .6 MEMORY. THE SYSTEM CONTROLLER SHALL MAINTAIN ALL BIOS AND PROGRAMMING INFORMATION INDEFINITELY WITHOUT POWER TO THE SYSTEM CONTROLLER.
     - .7 IMMUNITY TO POWER AND NOISE. CONTROLLER SHALL BE ABLE TO OPERATE AT 90% TO 110% OF NOMINAL VOLTAGE RATING AND SHALL PERFORM AN ORDERLY SHUT-DOWN BELOW 80% NOMINAL VOLTAGE.
     - .8 BACNET TEST LABS (BTL) LISTING. EACH SYSTEM CONTROLLER SHALL BE LISTED AS A BUILDING CONTROLLER (B-BC) BY THE BACNET TEST LABS WITH A MINIMUM BACNET PROTOCOL REVISION OF 14.
12. <u>MOTORIZED DAMPERS</u>
   - 12.1 MOTORIZED DAMPERS, UNLESS OTHERWISE SPECIFIED ELSEWHERE, SHALL BE AS FOLLOWS:
     - .1 DAMPER FRAMES SHALL BE 16 GAUGE GALVANIZED SHEET METAL OR 1/8" EXTRUDED ALUMINUM WITH REINFORCED CORNER BRACING.
     - .2 DAMPER BLADES SHALL NOT EXCEED 8" IN WIDTH OR 48" IN LENGTH. BLADES ARE TO BE SUITABLE FOR MEDIUM VELOCITY PERFORMANCE (2,000 FPM). BLADES SHALL BE NOT LESS THAN 16 GAUGE.
     - .3 DAMPER SHAFT BEARINGS SHALL BE AS RECOMMENDED BY MANUFACTURER FOR APPLICATION.
     - .4 BLADE EDGES AND TOP AND BOTTOM OF THE FRAME SHALL BE PROVIDED WITH COMPRESSIBLE SEALS. SIDE SEALS SHALL BE COMPRESSIBLE STAINLESS STEEL. THE BLADE SEALS SHALL PROVIDE FOR A MAXIMUM LEAKAGE RATE OF 10 CFM PER SQUARE FOOT AT 2.5" W.C. DIFFERENTIAL PRESSURE.
     - .5 LEAKAGE TESTING AND PRESSURE RATINGS WILL BE BASED ON AMCA PUBLICATION 500.
     - .6 INDIVIDUAL DAMPER SECTIONS SHALL NOT BE LARGER THAN 48" X 60". PROVIDE A MINIMUM OF ONE DAMPER ACTUATOR PER SECTION.
     - .7 CONTROL DAMPERS SHALL BE PARALLEL FOR 2 POSITION CONTROL AND OPPOSED BLADE FOR MODULATING CONTROL UNLESS DETAILED ON THE DRAWINGS.
   - 12.2 ELECTRIC DAMPER/VALVE ACTUATORS
     - .1 THE ACTUATOR SHALL HAVE ELECTRONIC OVERLOAD OR DIGITAL ROTATION SENSING CIRCUITRY TO PREVENT DAMAGE TO THE ACTUATOR THROUGHOUT THE ROTATION OF THE ACTUATOR
     - .2 WHERE SHOWN, FOR POWER-FAILURE/SAFETY APPLICATIONS, AN INTERNAL MECHANICAL, SPRING RETURN MECHANISM SHALL BE BUILT INTO THE ACTUATOR HOUSING.
     - .3 ROTARY SPRING RETURN ACTUATORS SHALL BE CAPABLE OF BOTH CLOCKWISE AND COUNTERCLOCKWISE SPRING RETURN OPERATION. LINEAR ACTUATORS SHALL SPRING RETURN TO THE RETRACTED POSITION.
     - .4 PROPORTIONAL ACTUATORS SHALL ACCEPT A 0-10 VDC OR 0-20 MA CONTROL SIGNAL AND PROVIDE A 2-10 VDC OR 4-20 MA OPERATING RANGE.
     - .5 NON-SPRING RETURN ACTUATORS SHALL HAVE AN EXTERNAL MANUAL GEAR RELEASE TO ALLOW MANUAL POSITIONING OF THE DAMPER WHEN THE ACTUATOR IS NOT POWERED. SPRING RETURN ACTUATORS WITH MORE THAN 60 IN-LB. TORQUE CAPACITY SHALL HAVE A MANUAL CRANK FOR THIS PURPOSE.
     - .6 ACTUATORS SHALL BE PROVIDED WITH A CONDUIT FITTING AND A MINIMUM 1M ELECTRICAL CABLE AND SHALL BE PRE-WIRED TO ELIMINATE THE NECESSITY OF OPENING THE ACTUATOR HOUSING TO MAKE ELECTRICAL CONNECTIONS.
     - .7 ACTUATORS SHALL BE UNDERWRITERS LABORATORIES STANDARD 873 LISTED.
     - .8 ACTUATORS SHALL BE DESIGNED FOR A MINIMUM OF 60,000 FULL STROKE CYCLES AT THE ACTUATOR'S RATED TORQUE.
13. <u>CONTROL VALVES</u>
   - 13.1 CLOSE-OFF (DIFFERENTIAL) PRESSURE RATING: VALVE ACTUATOR AND TRIM SHALL BE FURNISHED TO PROVIDE THE FOLLOWING MINIMUM CLOSE-OFF PRESSURE RATINGS:
     - .1 WATER VALVES: TWO-WAY: 150% OF TOTAL SYSTEM (PUMP) HEAD. THREE-WAY: SHALL BE INSTALLED IN MIXING CONFIGURATION, 2 IN 1 OUT. IN THE MIXING CONFIGURATION, ACTUATOR SHALL BE RATED FOR 100% OF TOTAL SYSTEM (PUMP) HEAD
     - .2 STEAM VALVES: 150% OF OPERATING (INLET) PRESSURE.
   - 13.2 BODY AND TRIM STYLE AND MATERIALS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS FOR DESIGN CONDITIONS AND SERVICE SHOWN, WITH EQUAL PERCENTAGE PORTS FOR MODULATING SERVICE.
   - 13.3 TWO-POSITION SERVICE: LINE SIZE.
   - 13.4 TWO-WAY MODULATING SERVICE: PRESSURE DROP SHALL BE EQUAL TO TWICE THE PRESSURE DROP THROUGH HEAT EXCHANGER (LOAD), 50% OF THE PRESSURE DIFFERENCE BETWEEN SUPPLY AND RETURN MAINS, OR 34.5 KPA (5 PSI), WHICHEVER IS GREATER. VALVE SHALL NOT BE LESS THAN 1 LINE SIZE SMALLER THAN DESIGN PIPING SIZE.
   - 13.5 THREE-WAY MODULATING SERVICE: PRESSURE DROP EQUAL TO TWICE THE PRESSURE DROP THROUGH THE COIL EXCHANGER (LOAD), 34.5 KPA (5 PSI) MAXIMUM. VALVE SHALL NOT BE LESS THAN 1 LINE SIZE SMALLER THAN DESIGN PIPING SIZE.
   - 13.6 VALVES DN 15 (1/2 IN.) THROUGH DN 50 (2 IN.) SHALL BE BRONZE BODY OR CAST BRASS ANSI CLASS 250, SPRING-LOADED, PTFE PACKING, QUICK OPENING FOR TWO-POSITION SERVICE. TWO-WAY VALVES TO HAVE REPLACEABLE COMPOSITION DISC OR STAINLESS STEEL BALL.
   - 13.7 VALVES DN 65 (2 1/2 IN.) AND LARGER SHALL BE CAST IRON ANSI CLASS 125 WITH GUIDED PLUG AND PTFE PACKING.
   - 13.8 WATER VALVES SHALL FAIL IN LAST POSITION UNLESS USED FOR EQUIPMENT PROTECTION APPLICATION. EQUIPMENT PROTECTION SHALL FAIL IN NORMALLY OPEN OR CLOSED, AS SCHEDULED ON PLANS, OR AS FOLLOWS:
     - .1 HEATING COILS IN AIR HANDLERS - NORMALLY OPEN
     - .2 OTHER APPLICATIONS--AS SCHEDULED OR AS REQUIRED BY SEQUENCES OF OPERATION
   - 13.9 ZONE VALVES SHALL BE SIZED TO MEET THE CONTROL APPLICATION AND THEY SHALL MAINTAIN THEIR LAST POSITION IN THE EVENT OF A POWER FAILURE.
14. <u>COMPACT POWER AND ENERGY METER WITH BACNET COMMUNICATION</u>
   - 14.1 THE POWER METER SHALL BE FULLY ELECTRONIC WITH MULTI-LINE BACKLIT LCD DISPLAY SHOWING MEASURED PARAMETERS AS WELL AS ALARM FUNCTIONS AND PULSE OUTPUT.
   - 14.2 THE POWER METER SHALL PERFORM THE FOLLOWING MEASUREMENTS:
     - .1 ACCUMULATED REAL ENERGY (KWH) FOR EACH PHASE AND TOTAL OF ALL PHASES
     - .2 ACCUMULATED REACTIVE ENERGY (KVARH) AND APPARENT ENERGY (KVAH) TOTALS FOR ALL PHASES
     - .3 NET PRESENT DEMAND FOR REAL (KW), REACTIVE (KVAR) AND APPARENT (KVA) POWER OVER A USER-SPECIFIED INTERVAL (BLOCK OR SLIDING WINDOW)
     - .4 MAXIMUM (PEAK) REAL (KW), REACTIVE (KVAR) AND APPARENT (KVA) DEMAND INTERVALS
     - .5 INSTANTANEOUS REAL (KW), REACTIVE (KVAR) AND APPARENT POWER (KVA), BY PHASE AND IN TOTAL
     - .6 CURRENT (AMPS) FOR EACH PHASE AND AVERAGE OF ALL PHASES
     - .7 PHASE-TO-PHASE VOLTAGE FOR EACH PHASE AND AVERAGE OF ALL PHASE PAIRS
     - .8 PHASE-TO-NEUTRAL VOLTAGE FOR EACH PHASE PAIR AND AVERAGE OF ALL PHASES
     - .9 POWER FACTOR FOR EACH PHASE AND AVERAGE OF ALL PHASES
     - .10 AC FREQUENCY
   - 14.3 THE POWER METER SHALL COMMUNICATE USING THE BACNET MS/TP PROTOCOL AT SPEEDS FROM 9600 TO 115,200 BAUD (NO PARITY). THE METER SHALL PROVIDE A BACNET DEVICE OBJECT, A SET OF WRITABLE ANALOG VALUE OBJECTS FOR REMOTE CONFIGURATION, A SET OF ANALOG INPUT OBJECTS TO PROVIDE ACCESS TO SCALED 32-BIT MEASUREMENT VALUES AND THEIR UNIT TYPES, AND A SET OF BINARY INPUT OBJECTS FOR INDICATING INDIVIDUAL ALARM CONDITIONS.
   - 14.4 THE METER SHALL BE UL/CUL LISTED TO THE LATEST APPLICABLE SAFETY STANDARDS.
   - 14.5 POWER METER MODELS MUST BE AVAILABLE TO DIRECTLY ACCEPT VOLTAGE INPUT OVER THE RANGE OF 90 TO 600 VAC (50 OR 60HZ).
   - 14.6 THE POWER METER SHALL ACCEPT EITHER 0 TO 0.333VAC OR 0 TO 1VAC INPUT FROM UP TO THREE CURRENT TRANSDUCERS TO 32000 AMPS.
   - 14.7 THE MEASURED ENERGY CONSUMPTION SHALL BE RETAINED IN NON-VOLATILE MEMORY FOR THE LIFE OF THE PRODUCT WARRANTY.
   - 14.8 THE POWER METER SHALL HAVE DEMAND MEASUREMENT PROGRAMMABLE FOR UP TO 6 SUB-INTERVALS OF 10 SECONDS TO 546 MINUTES DURATION.
   - 14.9 METER SHALL BE OPTIONALLY AVAILABLE IN A NEMA 4X ENCLOSURE.
   - 14.10 THE POWER METER SHALL OPERATE FROM -30C TO +70C.
   - 14.11 THE POWER METER SHALL HAVE DIMENSIONS NOT EXCEEDING 4.2" X 3.6" X 2.3".
   - 14.12 THE POWER METER SHALL BE TRANE E50H2, VERIS E50H2, OR EQUIVALENT.
   - 14.13 THE POWER METER SHALL MEET BOTH ANSI C12.20 .5% AND IEC 62053-22 CLASS .5S REAL POWER AND ENERGY ACCURACY SPECIFICATIONS.
   - 14.14 THE POWER METER SHALL MEET IEC 62053-22 CLASS 2 REACTIVE POWER AND ENERGY ACCURACY SPECIFICATIONS.
   - 14.15 THE POWER METER SHALL BE CONFIGURABLE FOR OPERATION ON SINGLE PHASE (AN OR AB), SPLIT PHASE (ABN), DELTA (ABC), AND WYE (ABCN) SYSTEMS.
   - 14.16 THE POWER METER SHALL HAVE AUTOMATIC PHASE REVERSAL COMPENSATION SUCH THAT IT IS INSENSITIVE TO THE CT'S LOAD ORIENTATION.
   - 14.17 THE POWER METER SHALL HAVE SEPARATE CONTROL POWER INPUTS SUCH THAT IS MAY BE POWERED FROM A DIFFERENT SERVICE THAN IT MEASURES.
   - 14.18 THE POWER METER SHALL HAVE PHASE LOSS ALARM CONTACTS WITH A USER CONFIGURABLE PHASE LOSS THRESHOLD.
   - 14.19 THE POWER METER SHALL HAVE A USER-CONFIGURABLE PULSE CONTACT INPUT TO SUPPORT

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MEASUREMENT OF OTHER RELATED ENERGY (GAS, WATER, STEAM, ETC.) VIA BACNET USING A SIMPLE PULSE-OUTPUT TRANSDUCER.
   - 14.20 THE POWER METER SHALL BE CONFIGURABLE FOR USE WITH POTENTIAL TRANSFORMERS TO 32000 VOLTS.
   - 14.21 THE POWER METER SHALL SUPPORT WARNINGS FOR LOW POWER FACTOR (PHASE CURRENT OR VOLTAGE MISS-WIRED), CURRENT OVER RANGE, VOLTAGE OVER RANGE, AND FREQUENCY OUT OF RANGE.
   - 14.22 THE PRODUCT SHALL HAVE A 5-YEAR WARRANTY.
15. <u>BINARY TEMPERATURE DEVICES</u>
   - 15.1 LOW-VOLTAGE SPACE THERMOSTAT SHALL BE 24 V, BIMETAL-OPERATED, MERCURY-SWITCH TYPE, WITH EITHER ADJUSTABLE OR FIXED ANTICIPATION HEATER, CONCEALED SETPOINT ADJUSTMENT, 13°C TO 30°C (55°F TO 85°F) SETPOINT RANGE, 1°C (2°F) MAXIMUM DIFFERENTIAL, AND VENTED ABS PLASTIC COVER.
   - 15.2 LINE-VOLTAGE SPACE THERMOSTAT SHALL BE BIMETAL-ACTUATED, OPEN CONTACT TYPE, OR BELLOWS-ACTUATED, ENCLOSED, SNAP-SWITCH TYPE OR EQUIVALENT SOLID-STATE TYPE, WITH HEAT ANTICIPATOR, UL LISTED FOR ELECTRICAL RATING, CONCEALED SETPOINT ADJUSTMENT, 13°C TO 30°C (55°F TO 85°F) SETPOINT RANGE, 1°C (2°F) MAXIMUM DIFFERENTIAL, AND VENTED ABS PLASTIC COVER.
   - 15.3 LOW-LIMIT THERMOSTATS. LOW-LIMIT AIRSTREAM THERMOSTATS SHALL BE UL LISTED, VAPOR PRESSURE TYPE, WITH AN ELEMENT OF 6 M (20 FT) MINIMUM LENGTH. ELEMENT SHALL RESPOND TO THE LOWEST TEMPERATURE SENSED BY ANY 30 CM (1 FT) SECTION. THE LOW-LIMIT THERMOSTAT SHALL BE MANUAL RESET ONLY.
16. <u>WIRED TEMPERATURE SENSORS</u>
   - 16.1 TEMPERATURE SENSORS SHALL BE RTD OR THERMISTOR.
   - 16.2 DUCT SENSORS SHALL BE SINGLE POINT OR AVERAGING AS SHOWN. AVERAGING SENSORS SHALL BE A MINIMUM OF 1.5 M (5 FT) IN LENGTH PER 1 M2 (10 FT2) OF DUCT CROSS SECTION.
   - 16.3 IMMERSION SENSORS SHALL BE PROVIDED WITH A SEPARABLE STAINLESS STEEL WELL. PRESSURE RATING OF WELL IS TO BE CONSISTENT WITH THE SYSTEM PRESSURE IN WHICH IT IS TO BE INSTALLED. THE WELL MUST WITHSTAND THE FLOW VELOCITIES IN THE PIPE.
   - 16.4 SPACE SENSORS SHALL BE EQUIPPED WITH SETPOINT ADJUSTMENT, OVERRIDE SWITCH, DISPLAY, AND/OR COMMUNICATION PORT AS SHOWN ON PLANS.
   - 16.5 PROVIDE MATCHED TEMPERATURE SENSORS FOR DIFFERENTIAL TEMPERATURE MEASUREMENT.
17. <u>STATIC PRESSURE SENSORS</u>
   - 17.1 SENSOR SHALL HAVE LINEAR OUTPUT SIGNAL. ZERO AND SPAN SHALL BE FIELD-ADJUSTABLE.
   - 17.2 SENSOR SENSING ELEMENTS SHALL WITHSTAND CONTINUOUS OPERATING CONDITIONS PLUS OR MINUS 50% GREATER THAN CALIBRATED SPAN WITHOUT DAMAGE.
   - 17.3 WATER PRESSURE SENSOR SHALL HAVE STAINLESS STEEL DIAPHRAGM CONSTRUCTION, PROOF PRESSURE OF 150 PSI MINIMUM. SENSOR SHALL BE COMPLETE WITH 4-20 MA OUTPUT, REQUIRED MOUNTING BRACKETS, AND BLOCK AND BLEED VALVES. MOUNT IN LOCATION ACCESSIBLE FOR SERVICE.
   - 17.4 WATER DIFFERENTIAL PRESSURE SENSOR SHALL HAVE STAINLESS STEEL DIAPHRAGM CONSTRUCTION, PROOF PRESSURE OF 150 PSI MINIMUM. OVER-RANGE LIMIT (DP) AND MAXIMUM STATIC PRESSURE SHALL BE 3,000 PSI. TRANSMITTER SHALL BE COMPLETE WITH 4-20 MA OUTPUT, REQUIRED MOUNTING BRACKETS, AND FIVE-VALVE MANIFOLD. MOUNT IN A LOCATION ACCESSIBLE FOR SERVICE.
18. <u>LOW LIMIT THERMOSTATS</u>
   - 18.1 SAFETY LOW LIMIT THERMOSTATS SHALL BE VAPOR PRESSURE TYPE WITH AN ELEMENT 6M [20 FT] MINIMUM LENGTH. ELEMENT SHALL RESPOND TO THE LOWEST TEMPERATURE SENSED BY ANY ONE FOOT SECTION.
   - 18.2 LOW LIMIT SHALL BE MANUAL RESET ONLY.
19. <u>RELAYS</u>
   - 19.1 CONTROL RELAYS SHALL BE UL LISTED PLUG-IN TYPE WITH DUST COVER AND LED "ENERGIZED" INDICATOR. CONTACT RATING, CONFIGURATION, AND COIL VOLTAGE SHALL BE SUITABLE FOR APPLICATION.
   - 19.2 TIME DELAY RELAYS SHALL BE UL LISTED SOLIDSTATE PLUG-IN TYPE WITH ADJUSTABLE TIME DELAY. DELAY SHALL BE ADJUSTABLE ±200% (MINIMUM) FROM SETPOINT SHOWN ON PLANS. CONTACT RATING, CONFIGURATION, AND COIL VOLTAGE SHALL BE SUITABLE FOR APPLICATION. PROVIDE NEMA 1 ENCLOSURE WHEN NOT INSTALLED IN LOCAL CONTROL PANEL.
20. <u>CURRENT SWITCHES</u>
   - 20.1 CURRENT-OPERATED SWITCHES SHALL BE SELF-POWERED, SOLID STATE WITH ADJUSTABLE TRIP CURRENT. THE SWITCHES SHALL BE SELECTED TO MATCH THE CURRENT OF THE APPLICATION AND OUTPUT REQUIREMENTS OF THE DDC SYSTEM.
21. <u>DIFFERENTIAL PRESSURE TYPE SWITCHES (AIR OR WATER SERVICE)</u>
   - 21.1 UL LISTED, SPDT SNAP-ACTING, PILOT DUTY RATED (125 VA MINIMUM), NEMA 1 ENCLOSURE, WITH SCALE RANGE AND DIFFERENTIAL SUITABLE FOR INTENDED APPLICATION OR AS SHOWN.
22. <u>COORDINATION</u>
   - 22.1 SITE
     - .1 WHERE THE MECHANICAL WORK WILL BE INSTALLED IN CLOSE PROXIMITY TO, OR WILL INTERFERE WITH, WORK OF OTHER TRADES, THE CONTRACTOR SHALL ASSIST IN WORKING OUT SPACE CONDITIONS TO MAKE A SATISFACTORY ADJUSTMENT. IF THE CONTRACTOR INSTALLS HIS/HER WORK BEFORE COORDINATING WITH OTHER TRADES, SO AS TO CAUSE ANY INTERFERENCE WITH WORK OF OTHER TRADES, THE CONTRACTOR SHALL MAKE THE NECESSARY CHANGES IN HIS/HER WORK TO CORRECT THE CONDITION WITHOUT EXTRA CHARGE.
     - .2 COORDINATE AND SCHEDULE WORK WITH ALL OTHER WORK IN THE SAME AREA, OR WITH WORK THAT IS DEPENDENT UPON OTHER WORK, TO FACILITATE MUTUAL PROGRESS.
   - 22.2 TEST AND BALANCE
     - .1 FURNISH A SINGLE SET OF ALL TOOLS NECESSARY TO INTERFACE TO THE CONTROL SYSTEM FOR TEST AND BALANCE PURPOSES.
     - .2 PROVIDE TRAINING IN THE USE OF THESE TOOLS. THIS TRAINING WILL BE PLANNED FOR A DURATION OF 4 HOURS.
     - .3 PROVIDE A QUALIFIED TECHNICIAN TO ASSIST IN THE TEST AND BALANCE PROCESS, UNTIL THE FIRST 20 TERMINAL UNITS ARE BALANCED.
     - .4 THE TOOLS USED DURING THE TEST AND BALANCE PROCESS SHALL BE RETURNED AT THE COMPLETION OF THE TESTING AND BALANCING.
   - 22.3 COORDINATION WITH CONTROLS SPECIFIED IN OTHER SECTIONS OR DIVISIONS. OTHER SECTIONS AND/OR DIVISIONS OF THIS SPECIFICATION INCLUDE CONTROLS AND CONTROL DEVICES THAT ARE TO BE PART OF OR INTERFACED TO THE CONTROL SYSTEM SPECIFIED IN THIS SECTION. INTEGRATE THESE CONTROLS INTO THE SYSTEM AND COORDINATE AS FOLLOWS:
     - .1 COMMUNICATION MEDIA AND EQUIPMENT SHALL BE PROVIDED AS SPECIFIED ELSEWHERE.
     - .2 ENSURE EACH SUPPLIER OF A CONTROLS PRODUCT IS RESPONSIBLE FOR THE CONFIGURATION, PROGRAMMING, START-UP, AND TESTING OF THAT PRODUCT TO MEET THE SEQUENCES OF OPERATION DESCRIBED IN THIS SECTION
   - 22.4 COORDINATE AND RESOLVE INCOMPATIBILITY ISSUES THAT ARISE BETWEEN THE CONTROL PRODUCTS PROVIDED UNDER THIS SECTION AND THOSE SHOWN ELSEWHERE IN THE CONTRACT DOCUMENTS.
   - 22.5 ENSURE PARTS SUPPLIED BY CONTROLS ARE TURNED OVER TO MECHANICAL FOR INSTALLATION. PARTS INCLUDE BUT ARE NOT LIMITED TO CONTROL VALVES, DAMPERS, INLINE DEVICES, THERMAL DEVICES, THERMAL WELLS.
23. <u>WIRING</u>
   - 23.1 PROVIDE MECHANICAL INTERLOCK WIRING, SENSOR WIRING, AND CONTROL WIRING REQUIRED UNLESS SPECIFIED TO BE FACTORY MOUNTED.
   - 23.2 CONTROL AND INTERLOCK WIRING SHALL COMPLY WITH THE NATIONAL, LOCAL ELECTRICAL CODES, AND SECTION 26 00 00 OF THESE CONTRACT DOCUMENT SPECIFICATIONS. WHERE THE REQUIREMENTS OF THIS SECTION DIFFER WITH THOSE IN ELECTRICAL SPECIFICATIONS, THE REQUIREMENTS OF THIS SECTION SHALL TAKE PRECEDENCE. THIS WORK INCLUDES INTERLOCK WIRING FOR MECHANICAL EQUIPMENT REQUIRED FOR A COMPLETE INSTALLATION. EQUIPMENT SPECIFIED TO HAVE FACTORY MOUNTED CONTROLLERS AND DEVICE ARE NOT INCLUDE BY THIS DIVISION.
   - 23.3 CEC CLASS 1 (LINE VOLTAGE) WIRING SHALL BE UL LISTED IN APPROVED RACEWAY ACCORDING TO CEC REQUIREMENTS.
   - 23.4 WHERE CLASS 2 WIRES ARE IN CONCEALED AND ACCESSIBLE LOCATIONS; INCLUDING CEILING RETURN AIR PLENUMS, APPROVED CABLES OUTSIDE OF ELECTRICAL RACEWAY CAN BE USED PROVIDED THAT THE FOLLOWING CONDITIONS ARE MET:
     - .1 CIRCUITS MEET CEC CLASS 2 (CURRENT_LIMITED) REQUIREMENTS. (LOW_VOLTAGE POWER CIRCUITS SHALL BE SUB_FUSED WHEN REQUIRED TO MEET CLASS 2 CURRENT_LIMIT.)
     - .2 CABLES SHALL BE UL LISTED FOR APPLICATION (I.E., CABLES USED IN CEILING PLENUMS SHALL BE UL LISTED SPECIFICALLY FOR THAT PURPOSE).
   - 23.5 DO NOT INSTALL CLASS 2 WIRING IN CONDUITS CONTAINING CLASS 1 WIRING. BOXES AND PANELS CONTAINING HIGH VOLTAGE MAY NOT BE USED FOR LOW VOLTAGE WIRING EXCEPT FOR THE PURPOSE OF INTERFACING THE TWO VIA CONTROL RELAYS AND TRANSFORMERS.
   - 23.6 WHERE CLASS 2 WIRING IS RUN EXPOSED, RUN PARALLEL ALONG A SURFACE OR PERPENDICULAR TO IT, AND BUNDLED, USING APPROVED WIRE TIES AT NO GREATER THAN 3 M (10 FT.) INTERVALS. SUCH BUNDLED CABLE SHALL BE FASTENED TO THE STRUCTURE, USING INDUSTRY APPROVED FASTENERS, AT 1.5 M (5 FT.) INTERVALS OR MORE OFTEN TO ACHIEVE A NEAT AND WORKMANLIKE RESULT.
   - 23.7 MAKE WIRE-TO-DEVICE CONNECTIONS AT TERMINAL BLOCKS OR TERMINAL STRIP. MAKE WIRE-TO WIRE CONNECTIONS AT TERMINAL BLOCK, OR WITH A CRIMPED CONNECTOR. MAKE WIRING WITHIN ENCLOSURES NEATLY BUNDLED AND ANCHORED TO PERMIT ACCESS AND PREVENT RESTRICTION TO DEVICES AND TERMINALS.
   - 23.8 MAXIMUM ALLOWABLE VOLTAGE FOR CONTROL WIRING SHALL BE 120VAC. IF ONLY HIGHER VOLTAGES ARE AVAILABLE FOR USE, THE BAS MANUFACTURER SHALL PROVIDE STEP-DOWN TRANSFORMERS TO ACHIEVE THE DESIRED CONTROL VOLTAGES.
   - 23.9 INSTALL CONTROL WIRING AS CONTINUOUS LENGTHS. MAKE REQUIRED SPLICES WITHIN AN APPROVED JUNCTION BOX OR OTHER APPROVED PROTECTIVE DEVICE.
   - 23.10 INSTALL PLENUM WIRING IN SLEEVES WHERE IT PASSES THROUGH WALLS AND FLOORS. MAINTAIN FIRE RATING AT ALL PENETRATIONS IN ACCORDANCE WITH CONTRACT DOCUMENTS AND NATIONAL AND/OR LOCAL CODES.
   - 23.11 CONDUIT AND WIRE SIZING SHALL BE DETERMINED BY THE BAS MANUFACTURER IN ORDER TO MAINTAIN MANUFACTURER'S RECOMMENDATION AND MEET NATIONAL AND LOCAL CODES.
   - 23.12 CONTROL AND STATUS RELAYS ARE TO BE LOCATED IN PRE-FABRICATED ENCLOSURES THAT MEET THE APPLICATION. THESE RELAYS MAY ALSO BE LOCATED WITHIN PACKAGED EQUIPMENT CONTROL PANEL ENCLOSURES AS COORDINATED. THESE RELAYS SHALL NOT BE LOCATED WITHIN CLASS 1 STARTER ENCLOSURES.
   - 23.13 FOLLOW MANUFACTURER'S INSTALLATION RECOMMENDATIONS FOR ALL COMMUNICATION AND NETWORK BUS CABLING. NETWORK OR COMMUNICATION CABLING SHALL BE RUN SEPARATELY FROM ALL CONTROL POWER WIRING.
   - 23.14 ADHERE TO ELECTRICAL REQUIREMENTS FOR INSTALLATION OF ELECTRICAL RACEWAYS.

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Phone: (905)648-0373
www.manteconpartners.com

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PRESCHOOL DAY CARE ADDITION
Ecole elementaire catholique Saint-Marguerite-Bourgeoys
60 Clench Avenue, Brantford, Ontario N3T 1B9

MECHANICAL SPECIFICATIONS

M0.5

BMS SPECIFICATIONS 21-153

23.15 BAS MANUFACTURER SHALL TERMINATE ALL CONTROL AND/OR INTERLOCK WIRING AND SHALL MAINTAIN UPDATED (AS_BUILT) WIRING DIAGRAMS WITH TERMINATIONS IDENTIFIED AT THE JOB SITE.

23.16 FLEXIBLE METAL CONDUITS AND LIQUID_TIGHT FLEXIBLE METAL CONDUITS SHALL NOT EXCEED 3' IN LENGTH AND SHALL BE SUPPORTED AT EACH END. FLEXIBLE METAL CONDUIT LESS THAN 1/2" ELECTRICAL TRADE SIZE SHALL NOT BE USED. IN AREAS EXPOSED TO MOISTURE, INCLUDING CHILLER AND BOILER ROOMS, LIQUID_TIGHT, FLEXIBLE METAL CONDUITS SHALL BE USED.

24. SUPPLY OF CONTROL DEVICES

24.1 UNLESS OTHERWISE SPECIFIED, SUPPLY REQUIRED CONTROL DAMPERS. HAND THE DAMPERS TO THE SHEET METAL TRADE AT THE SITE IN THE LOCATION WHERE THEY ARE REQUIRED FOR INSTALLATION AS PART OF THE SHEET METAL WORK. ENSURE THAT EACH DAMPER IS CORRECTLY LOCATED AND MOUNTED.

24.2 PROVIDE LINKAGE AND OPERATORS FOR THE DAMPERS. WHEREVER POSSIBLE LOCATE DAMPER OPERATORS SO THAT THEY ARE ACCESSIBLE FROM OUTSIDE DUCT, PLENUM, AND EQUIPMENT CASINGS. BRACKET MOUNT OPERATORS ON DUCTS OR PLENUMS CLEAR OF INSULATION WHERE APPLICABLE.

24.3 WHERE SEQUENCE OPERATION IS INDICATED, OR WHERE MULTIPLE OPERATORS DRIVE A SERIES OF DAMPERS, PROVIDE PILOT POSITIONERS TO COUPLE THEIR ACTION.

24.4 ENSURE THAT DAMPERS LOCATED IN DUCTWORK OTHER THAN GALVANIZED STEEL ARE CONSTRUCTED OF TYPE 316 STAINLESS STEEL.

24.5 UNLESS OTHERWISE SPECIFIED, SUPPLY REQUIRED AUTOMATIC CONTROL VALVES. HAND THE VALVES TO THE APPROPRIATE PIPING TRADES AT THE SITE IN THE LOCATIONS THEY ARE REQUIRED FOR INSTALLATION AS PART OF THE PIPING WORK. ENSURE THAT EACH VALVE IS PROPERLY SIZED, LOCATED AND INSTALLED.

24.6 PROVIDE AN OPERATOR FOR EACH VALVE WITH ON/OFF CONTROL FOR 2 POSITION, 0-10VDC OR 4-20MA FOR MODULATING FOR CONTROL. SPRING RETURN ACTUATORS ARE REQUIRED ON AS DEFINED ON THE DRAWINGS FOR FAIL SAFE OPERATION, OR AS NEEDED TO PROTECT THE EQUIPMENT, SUCH AS NORMAL CLOSED POSITION FOR OUTSIDE AIR DAMPERS.

25. TRAINING

25.1 PROVIDE MINIMUM OF (4) TRAINING SESSIONS, AND (4) HOURS FOR EACH SESSION, THROUGHOUT THE CONTRACT PERIOD. THE TRAINING WILL BE PROVIDED FOR PERSONNEL DESIGNATED BY THE OWNER.

25.2 THESE OBJECTIVES WILL BE DIVIDED INTO LOGICAL GROUPINGS; PARTICIPANTS MAY ATTEND ONE OR MORE OF THESE, DEPENDING ON LEVEL OF KNOWLEDGE REQUIRED:

.1 DAY-TO-DAY BAS OPERATORS

.2 BAS TROUBLESHOOTING & MAINTENANCE

25.3 ENSURE THE INSTRUCTOR(S) ARE FACTORY-TRAINED AND EXPERIENCED IN TEACHING THIS TECHNICAL MATERIAL.

25.4 TRAINING WILL BEGIN WHEN THE OPERATING AND MAINTENANCE MANUALS HAVE BEEN DELIVERED TO THE OWNER OR REVIEWED BY THE ENGINEER'S REPRESENTATIVE.

25.5 INCLUDE THE FOLLOWING:

.1 BUILDING WALK THROUGH AND LOCATION OF CONTROL DEVICES

.2 OPERATING PROCEDURES

.3 MAINTENANCE PROCEDURES

.4 TROUBLE-SHOOTING PROCEDURES

.5 SPARE PARTS REQUIRED

26. PROJECT RECORD DOCUMENTS

26.1 UPON COMPLETION OF INSTALLATION, SUBMIT THREE (3) COPIES OF RECORD (AS-BUILT) DOCUMENTS IN ADDITION TO AN ELECTRONIC COPY. THE DOCUMENTS SHALL BE SUBMITTED FOR APPROVAL PRIOR TO FINAL COMPLETION AND INCLUDE:

26.2 PROJECT RECORD DRAWINGS - THESE SHALL BE AS-BUILT VERSIONS OF THE SUBMITTAL SHOP DRAWINGS. ONE SET OF ELECTRONIC MEDIA (PDF) DRAWING FILES SHALL BE PROVIDED.

26.3 TESTING AND COMMISSIONING REPORTS AND CHECKLISTS SIGNED OFF BY TRAINED FACTORY (EQUIPMENT MANUFACTURERS) AND FIELD (BAS) COMMISSIONING PERSONNEL.

27. OPERATING AND MAINTENANCE (O & M) MANUALS

27.1 PROVIDE AS-BUILT VERSIONS OF THE SUBMITTAL PRODUCT DATA. IN ADDITION TO THE INFORMATION REQUIRED FOR THE SUBMITTALS, INCLUDE:

.1 24-HOUR/7-DAY PER WEEK EMERGENCY SERVICE TELEPHONE NUMBERS OF CONTRACTOR SERVICE DEPARTMENT ALONG WITH NAMES, ADDRESS OF SERVICE PERSONNEL RESPONSIBLE FOR SUPPORTING THE ONGOING WARRANTY AND SERVICES OF THE CONTROL SYSTEM.

.2 PREVENTATIVE MAINTENANCE AND CALIBRATION PROCEDURES; HARDWARE TROUBLESHOOTING; AND HARDWARE REPAIR AND/OR REPLACEMENT PROCEDURES.

.3 ONE SET OF ELECTRONIC MEDIA CONTAINING FILES OF ALL OPERATOR COLOR GRAPHIC SCREENS FOR THE PROJECT.

.4 LOCAL SUPPLY STORE SHOULD HAVE A MINIMUM 3 UNIT CONTROLLERS, SYSTEM CONTROLLERS, AND ROOM SENSORS AVAILABLE FOR SAME DAY PURCHASE.

.5 DOCUMENTATION, INSTALLATION, AND MAINTENANCE INFORMATION FOR ALL THIRD PARTY HARDWARE/SOFTWARE PRODUCTS PROVIDED INCLUDING PERSONAL COMPUTERS, PRINTERS, HUBS, SENSORS, VALVES, ETC.

.6 ORIGINAL ISSUE MEDIA FOR ALL SOFTWARE PROVIDED, INCLUDING OPERATING SYSTEMS, PROGRAMMING LANGUAGE, OPERATOR WORKSTATION SOFTWARE, AND GRAPHICS SOFTWARE.

.7 LICENSES, GUARANTEE, AND WARRANTY DOCUMENTS FOR ALL EQUIPMENT AND SYSTEMS.

.8 RECOMMENDED PREVENTIVE MAINTENANCE PROCEDURES FOR ALL SYSTEM COMPONENTS INCLUDING A SCHEDULE OF TASKS (INSPECTION, CLEANING, CALIBRATION, ETC.) AND TASK DESCRIPTIONS.

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Ecole elementaire catholique
Saint-Marguerite-Bourgeoys
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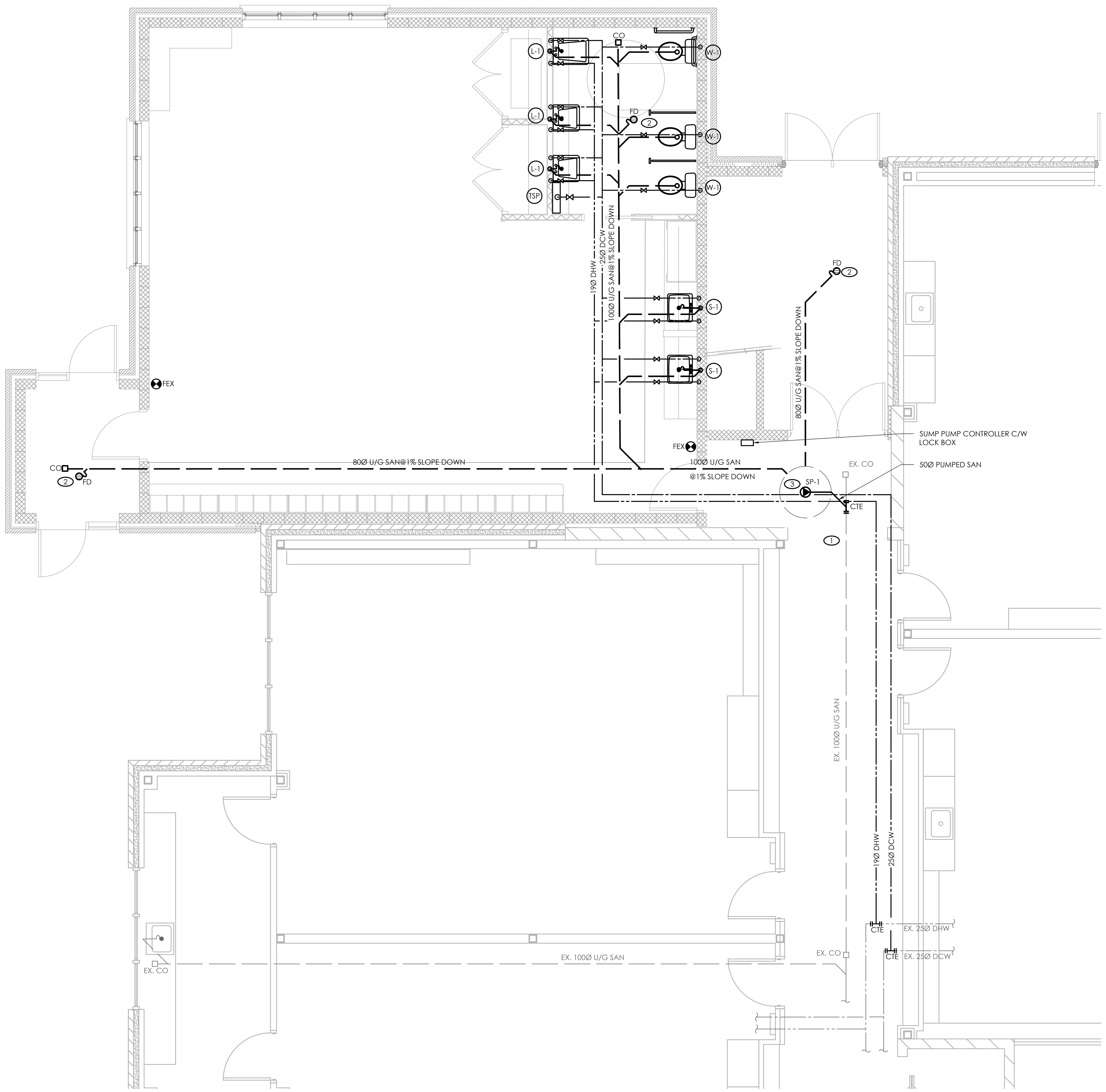
MECHANICAL SPECIFICATIONS

M0.6



DRAWING NOTES

1. VERIFY EXISTING INVERT OF EXISTING PIPE PRIOR TO COMMENCING ANY NEW WORK, REPORT TO ENGINEER OF ANY CONCERNS.
2. NEW FLOOR DRAIN SHALL BE PROVIDED WITH TRAP SEAL PRIMER AS PER SPECIFICATIONS.

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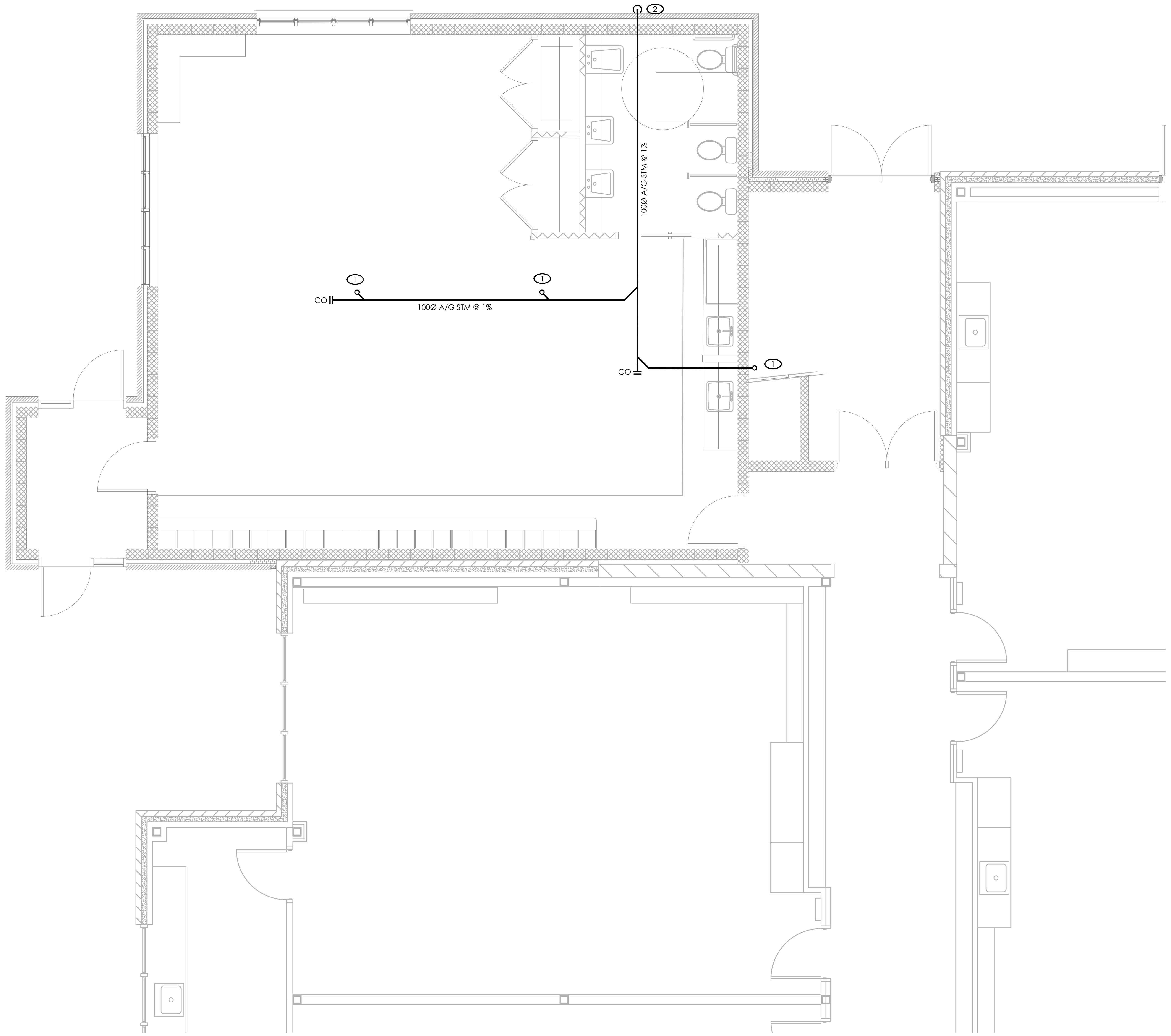
PROPOSED PLUMBING/SAN/FP PLAN

M1.1

1/M1.1 PROPOSED PLUMBING, SANITARY, & FIRE PROTECTION PLAN
1:50



DRAWING NOTES

1. CONNECT TO NEW ROOF DRAIN ABOVE.
2. CONNECT TO RAINWATER LEADER IN APPROX. LOCATION. REFER TO ARCHITECTURAL DRAWINGS.

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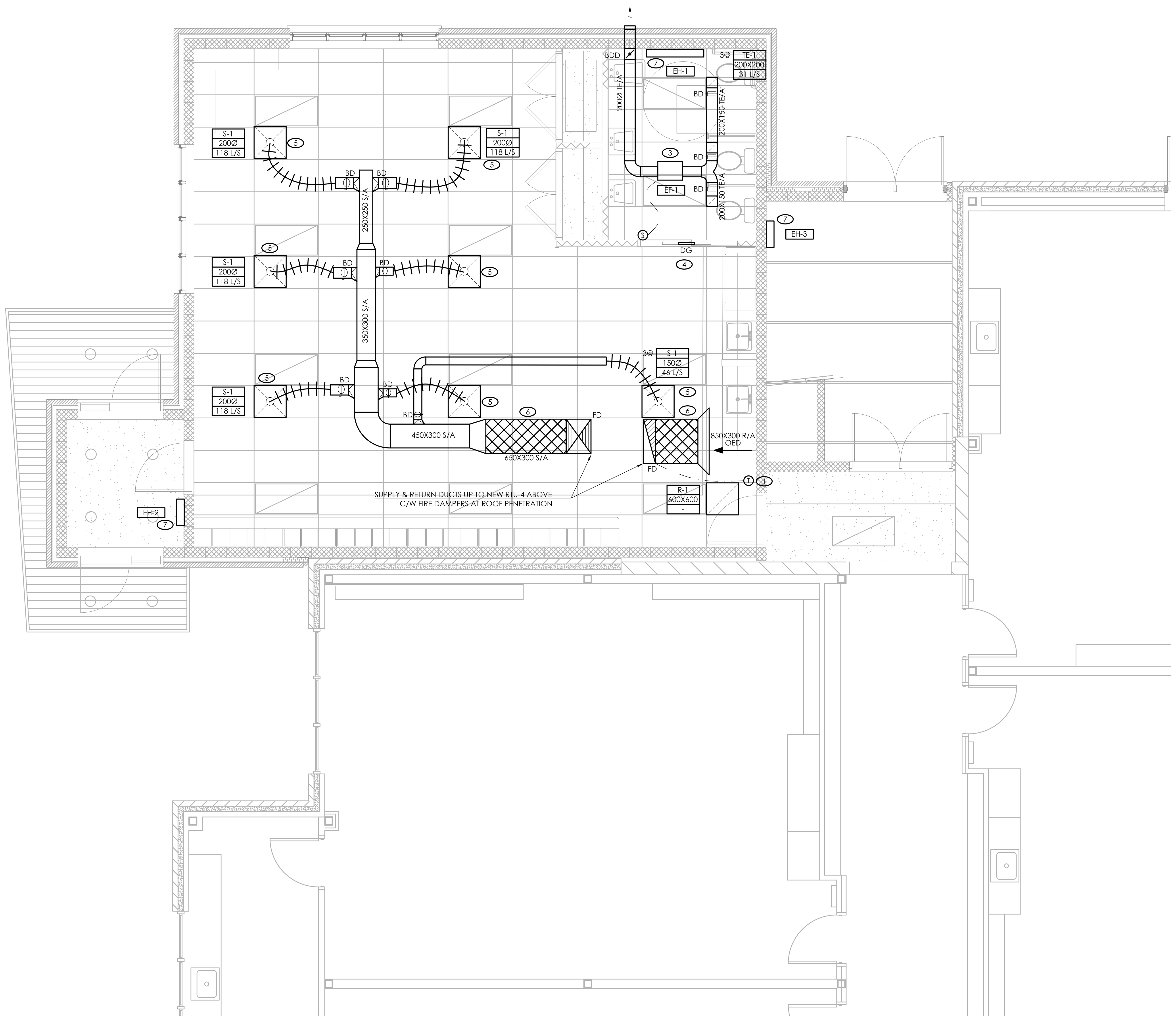
PROPOSED STORM PLAN

M1.2

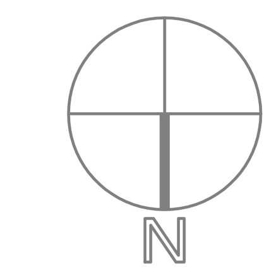
1/M1.2 GROUND FLOOR PROPOSED STORM PLAN
1:50



1 / M2.1 PROPOSED HVAC PLAN
1:50

DRAWING NOTES

1. NEW T-STAT TO BE INTERFACED WITH NEW RTU-4 ABOVE.
2. TERMINATE EXHAUST FAN DUCT OUTSIDE AT HIGH LEVEL C/W BACKDRAFT DAMPER AND MANUFACTURER-SUPPLIED WALL CAP. INSULATE DUCT AS PER SPECIFICATIONS FOR 6' FROM WALL PENETRATION.
3. NEW EXHAUST FAN SHALL BE INTERLOCKED WITH WASHROOM LIGHTING CONTROLS WITH A 30 MINUTE MINIMUM RUNTIME.
4. NEW DOOR GRILLE 300X300 INSTALL UNDERCUT @ THE DOOR.
5. PROVIDE ROUND ELBOW AT DIFFUSER.
6. PROVIDE ACOUSTIC INSULATION LINER.
7. ELECTRIC HEATERS TO BE MOUNTED AT A HIGH LEVEL, OUT OF REACH OF CHILDREN. CONNECT TO EXISTING BMS.



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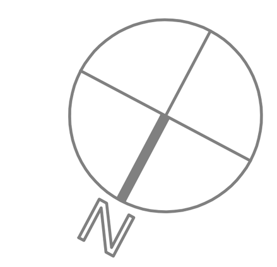

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ENGINEERS
15 Foundry Street, Dundas, ON, L9H 2V6
Phone: (905)648-0373
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No.	Revisions:	Date:
4	Issued For Tender	2025-02-12
3	Issued For Permit	2023-01-20
2	Issued For Owner Review	2022-03-03
1	Issued For Review	2022-03-01

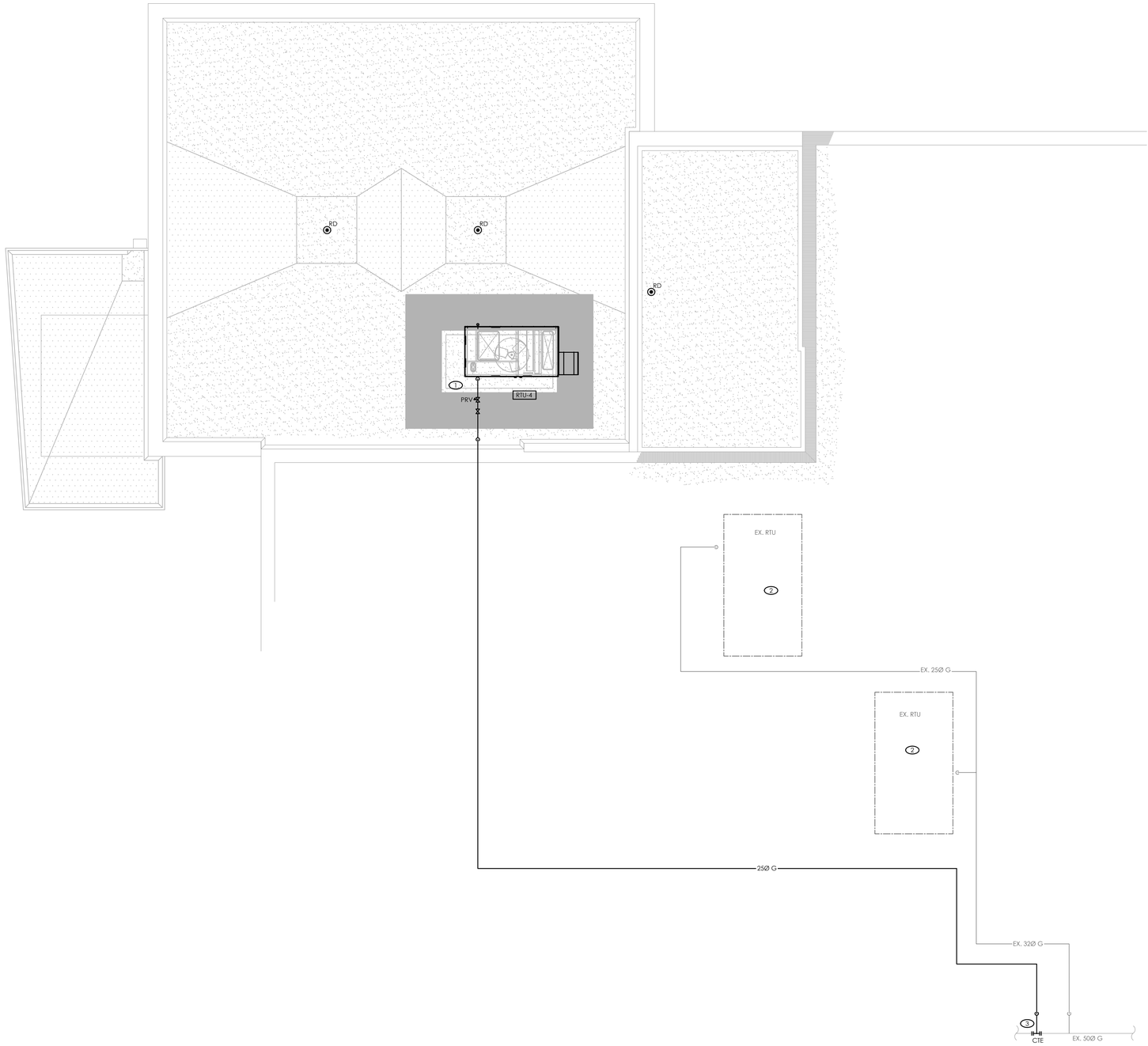
MPI Project No: 21-153
Scale: As Shown
Drawn by: MZE
Plot Date: FEB. 11, 2022
Issue Date:

PRESCHOOL DAY CARE ADDITION
Ecole elementaire catholique Saint-Marguerite-Bourgeoys

60 Clench Avenue, Brantford, Ontario N3T 1B9

PROPOSED HVAC PLAN

M2.1



DRAWING NOTES

1. NEW ROOFTOP UNIT TO BE INSTALLED ON MANUFACTURER-SUPPLIED ROOF CURB.
2. EXISTING ROOFTOP UNITS ON HIGH ROOF TO REMAIN.
3. CONNECT TO EXISTING GAS LINE ON LOW ROOF.

1 / M2.2 PROPOSED ROOF PLAN
1:50

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PROPOSED ROOF PLAN

M2.2

ROOFTOP UNIT SCHEDULE

TAG	SUPPLY FAN AIR FLOW (CFM)	SUPPLY FAN E.S.P. (IN.WG.)	SUPPLY FAN FRPM	SUPPLY FAN HP	DEMAND CONTROL VENTILATION MIN. OUTDOOR AIR FLOW (CFM)	DEMAND CONTROL VENTILATION MAX. OUTDOOR AIR FLOW (CFM)	COOLING COIL E.A.T. DB/WB (°F)	COOLING COIL L.A.T. DB/WB °C (°F)	COOLING COIL REFRIGERANT	COOLING COIL TOTAL CAP. (MBH)	COOLING COIL SENS. CAP. (MBH)	GAS HEATING INPUT (MBH)	GAS HEATING OUTPUT (MBH)	GAS HEATING EFFICIENCY	GAS HEATING TURNDOWN	ELECTRICAL (MAIN POWER) MCOP	ELECTRICAL (MAIN POWER) MCA	ELECTRICAL (MAIN POWER) FLA	ELECTRICAL (MAIN POWER) VOLTAGE	WEIGHT (lbm)	MANUFACTURER AND MODEL (BASIS OF DESIGN: AAON)
RTU-4	1300	0.35	1187	1	200	650	81.00/69.30	56.89/55.93	R-410A	54.66	34.46	100	81	81%	8.3:1	-	-	26	208V/3Ø/60Hz	901	AAON MODEL: RQ-004-8-V-EA09-33B:A000-Q0B-PJC-AGA-C0DAHBE-00-00A0H00VB ROOFTOP UNIT C/W FULLY MODULATING DUAL ENTHALPY ECONOMIZER, 115V CONVENIENCE OUTLET FIELD WIRED, MERV 13 FILTERS, VAV UNIT CONTROLLER (VAV COOL, CV HEAT), CLOGGED FILTER SWITCH, VARIABLE CAPACITY COMPRESSOR, HIGH TURNDOWN GAS BURNER, DEMAND CONTROL VENTILATION C/W DUCT CO2 SENSOR (FIELD INSTALLED). MANUFACTURER-SUPPLIED 18" ROOF CURB. UNIT CONTROLLER C/W BACNET OUTPUT, MANUFACTURER-SUPPLIED THERMOSTAT WITH UNIT MONITORING OF STANDARD FACTORY CONTROL POINTS.

EXHAUST FAN SCHEDULE

TAG	LOCATION	AREA SERVED	AIRFLOW (CFM)	E.S.P. (IN.WG.)	ELECTRICAL HP	ELECTRICAL AMPS	ELECTRICAL VOLT/PH/Hz	TYPE	FAN RPM	MANUFACTURER AND MODEL (BASIS OF DESIGN: GREENHECK)
EF-1	AS INDICATED	ROOM 135A	200	0.2	-	0.71	115V/1Ø/60Hz	IN-LINE	908	GREENHECK MODEL: CSP-B200 C/W SOLID STATE SPEED CONTROL, 6 AMP, SHIPPED LOOSE. ISOLATION KIT SHIPPED LOOSE, ROUND DUCT CONNECTION, PLUG TYPE DISCONNECT, HOODED WALL CAP.

GRILLES REGISTERS DIFFUSERS

TAG	SIZE (MM)	APPLICATION	NECK SIZE (MM)	AIR FLOW RANGE (CFM)	MANUFACTURER AND MODEL (BASIS OF DESIGN: EH. PRICE)
S-1	24"X24"	SUPPLY AIR	AS INDICATED	AS INDICATED	EH. PRICE MODEL: SCD DIFFUSER, WHITE POWDER COAT FINISH, 3 COCNENTRIC CONES
R-1	AS INDICATED	RETURN AIR	AS INDICATED	AS INDICATED	EH. PRICE MODEL: 80 SERIES, ALUMNIUM CONSTRUCTION, EGGCRATE FACE RETURN, WHITE POWDER COAT FINISH.
TE-1	AS INDICATED	EXHAUST	AS INDICATED	AS INDICATED	EH. PRICE MODEL: 80 SERIES, ALUMNIUM CONSTRUCTION, EGGCRATE FACE RETURN, WHITE POWDER COAT FINISH.

PLUMBING FIXTURE CONNECTION SCHEDULE

REFER	DESCRIPTION	SANITARY	SANITARY VENT	DHWS	DCWS
W-1	FLOOR MOUNTED WATERCLOSETS	75Ø (3"Ø)	38Ø (1-1/2"Ø)	-	13Ø (1/2"Ø)
L-1 S-1	LAVATORIES/SINKS	32Ø (1-1/4"Ø)	32Ø (1-1/4"Ø)	13Ø (1/2"Ø) 2	13Ø (1/2"Ø)
FD	FLOOR DRAIN	75Ø (3"Ø)	38Ø (1-1/2"Ø)	13Ø (1/2"Ø)	-
TSP	TRAP SEAL PRIMER	-	-	-	9Ø (3/8"Ø) 1

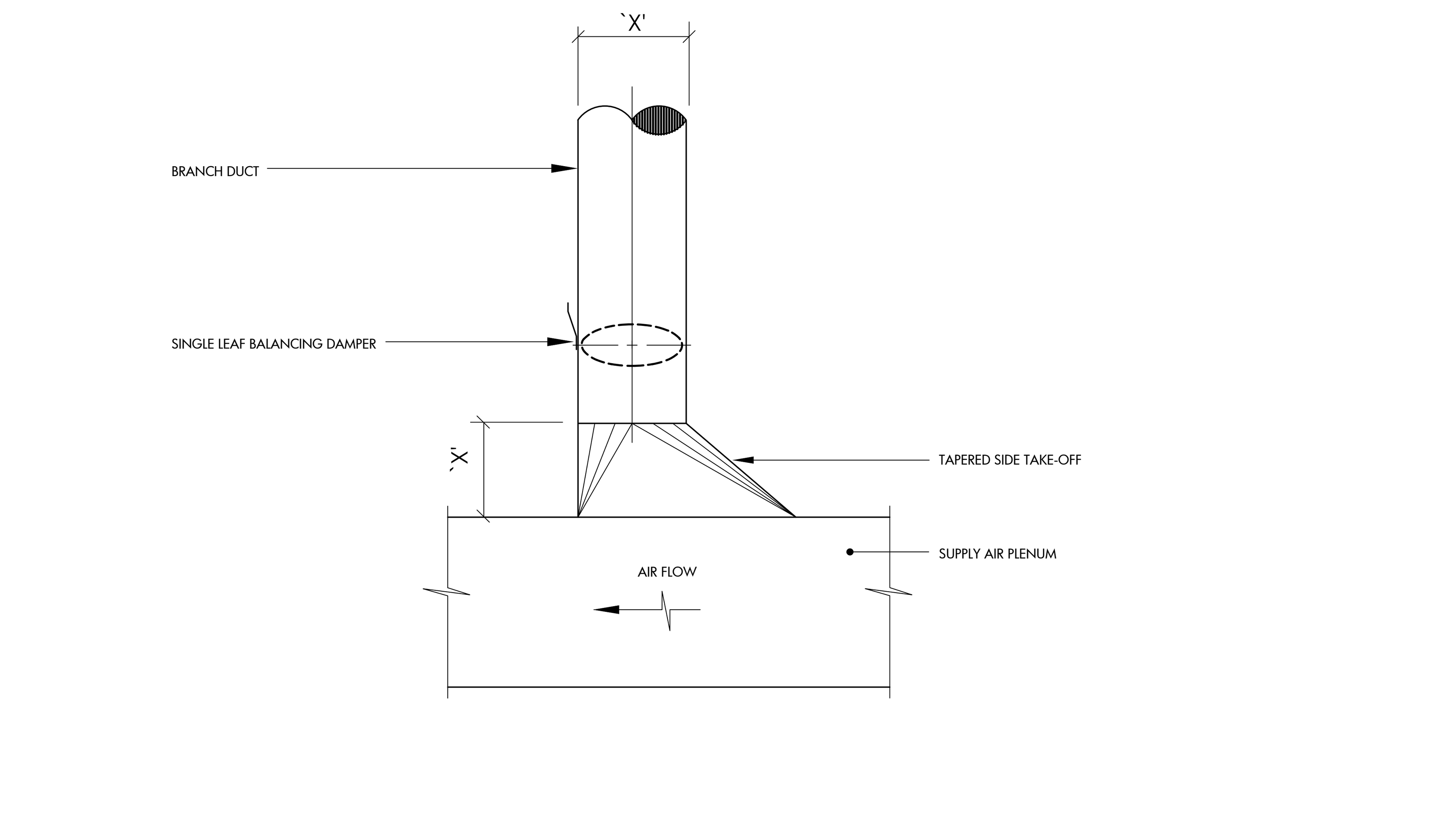
NOTES
1. ONE PER FLOOR DRAIN
2. PROVIDE TEMPERED WATER TO ALL L-1 LAVATORIES AND LOWER S-1 SINKS

PUMP SCHEDULE

SYMBOL	SERVICE	FLOW RATE L/S (GPM)	PRESSURE DROP KPA (FT. HD)	FLUID TYPE	MOTOR HP	MOTOR VOLTAGE	MOTOR RPM	MANUFACTURER AND MODEL (BASIS OF DESIGN: GRUNDFOS)
SP-1	SANITARY PUMP	5.24 (83)	57.7 (19.3)	WASTE WATER	2.00	208V/3Ø/60Hz	1751	GRUNDFOS SLV.30.A30.15.EX.4.60J.C GRINDER PUMP C/W LC 2311 x 1-9,6 DOL PI MOTOR CONTROL BOX

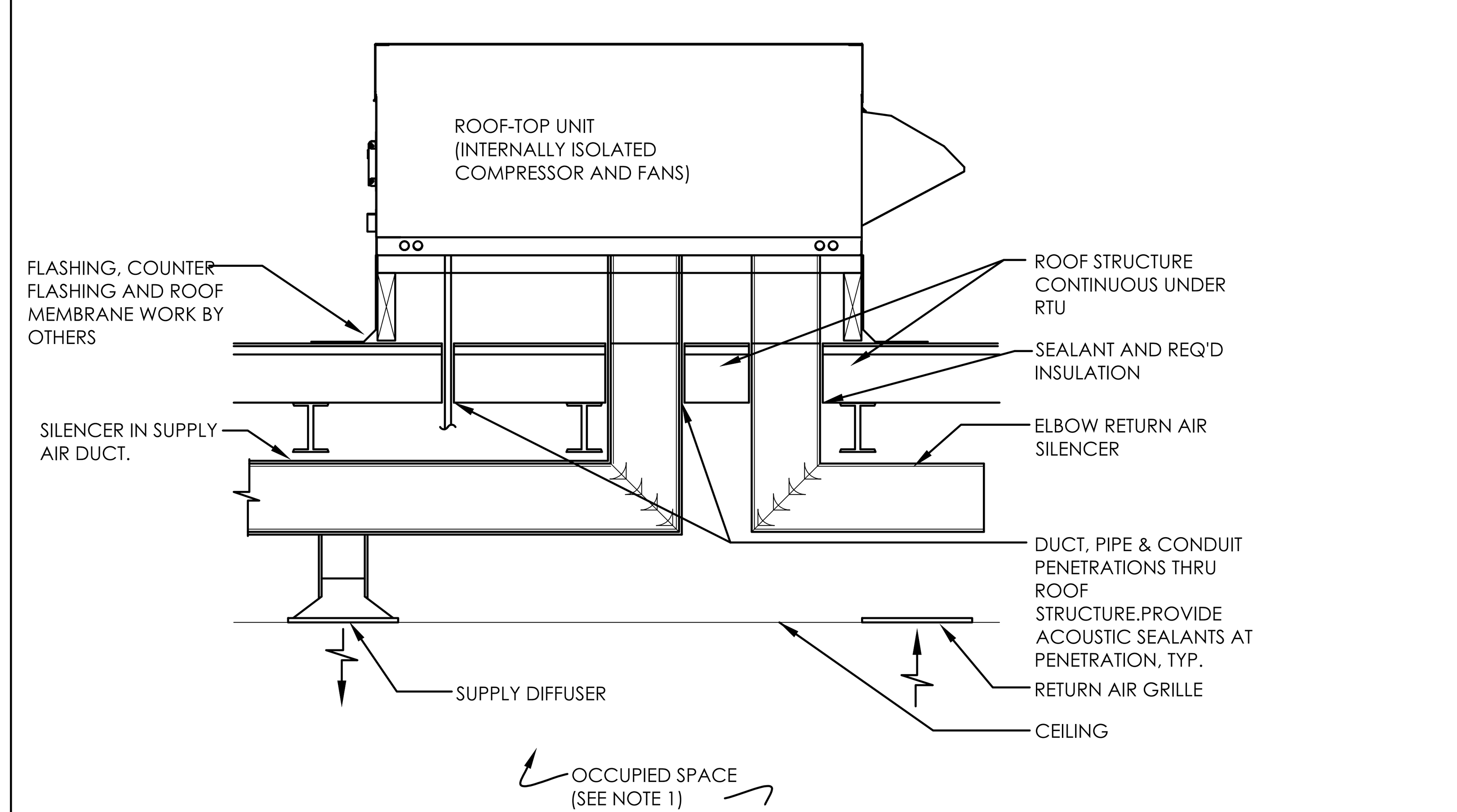
ELECTRIC HEATER SCHEDULE

TAG	LOCATION	WATTS	ELECTRICAL V / PH / Hz	WEIGHT (LBS)	MANUFACTURER AND MODEL (BASIS OF DESIGN: OUELLET)
EH-1	ROOM 135B	1000	120 / 1 / 60	15.1	OUELLET MODEL: # ODL01002. STANDARD WHITE COLOUR, BUILT-IN THERMOSTAT WITH KNOB CONTROL, FACTORY SUPPLIED DISCONNECT SWITCH.
EH-2, EH-3	AS INDICATED	1500	120 / 1 / 60	24.0	OUELLET MODEL: # OAC01502-T STANDARD WHITE COLOUR, BUILT-IN THERMOSTAT WITH KNOB CONTROL, FACTORY SUPPLIED DISCONNECT SWITCH.

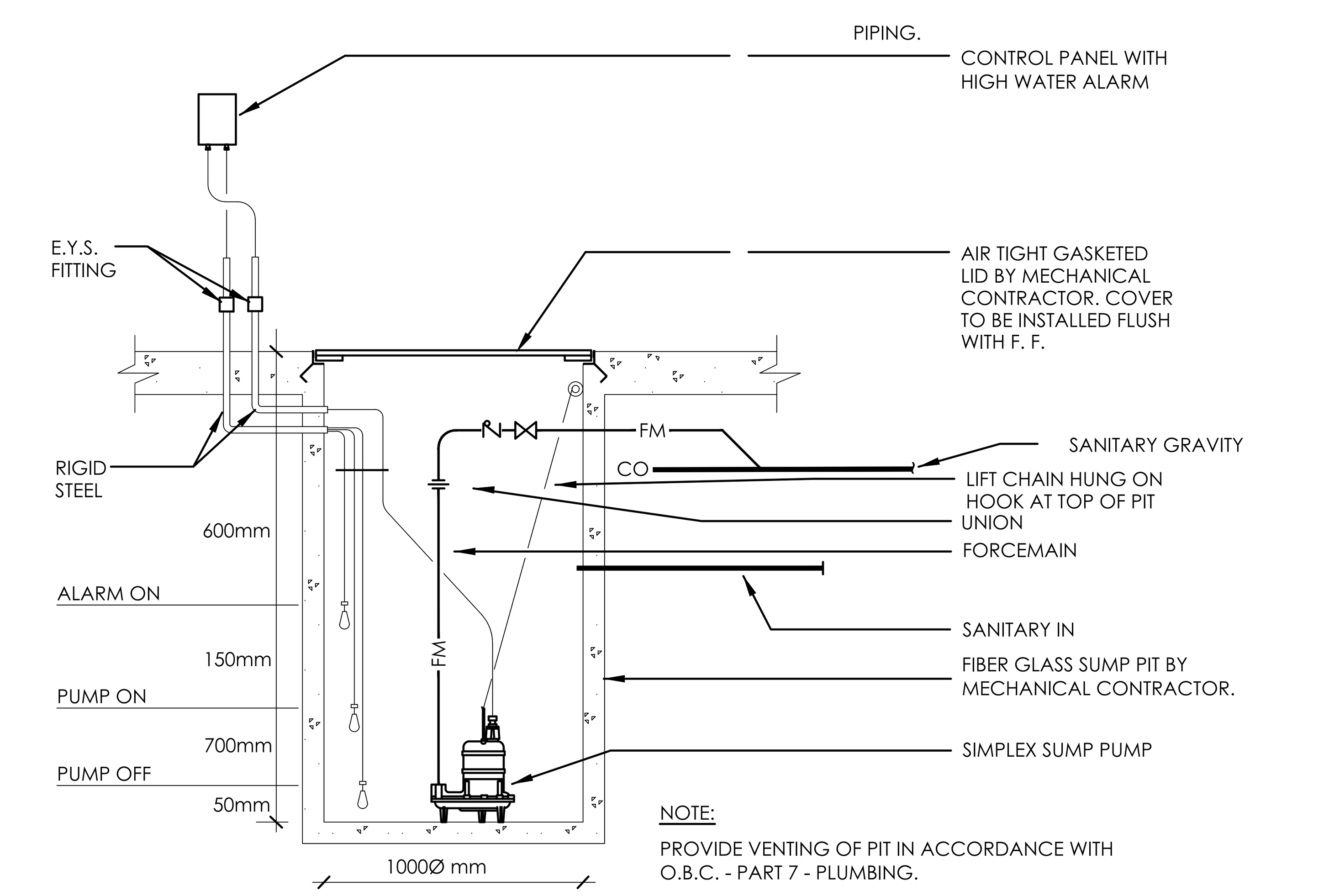


1 M3.1 DETAIL OF ROUND DUCT TAKEOFF
SCALE: N.T.S.

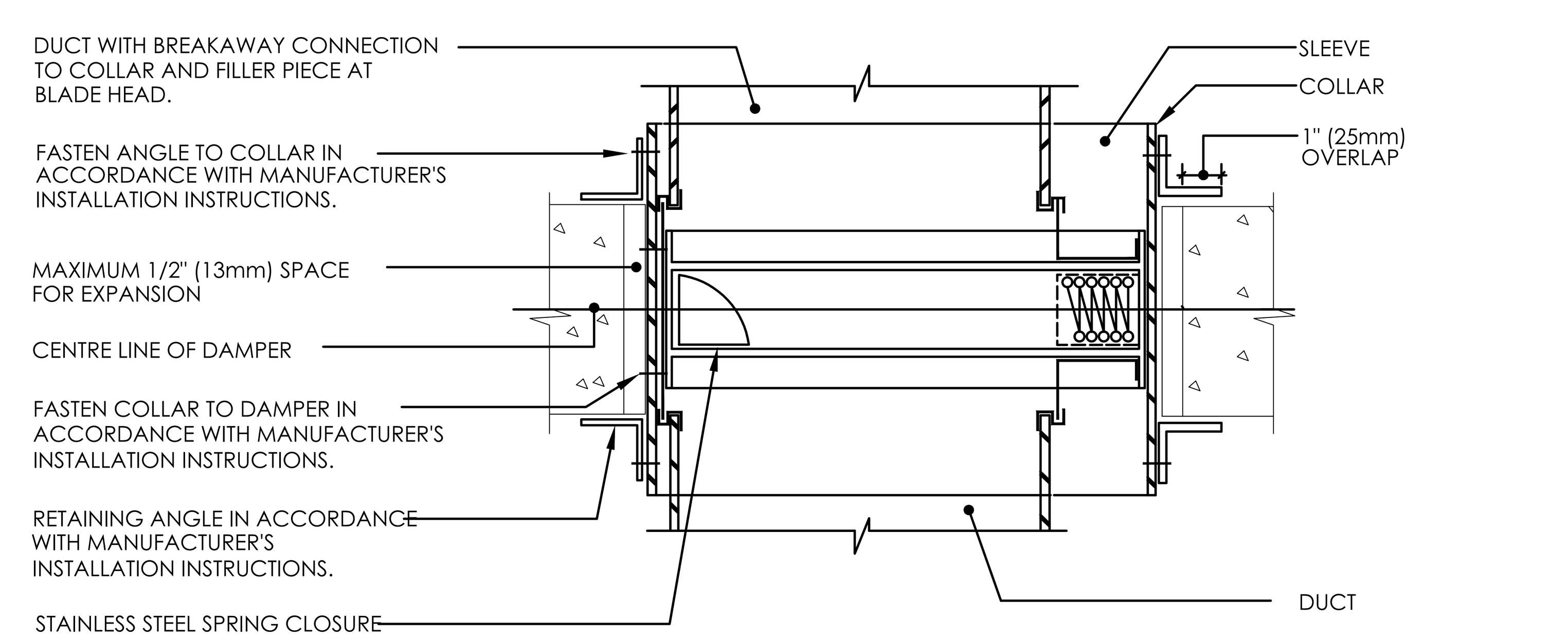
NOTES:
1. NOISE LEVELS FROM COMBINED DUCT BREAKOUT AND AERODYNAMIC NOISE SHALL BE : OPEN OFFICE - NC/RC 35, CRITICAL SPACES - NC 30, CORRIDORS, UTILITY SPACES - NC 40



2 M3.1 DETAIL OF ROOF TOP UNIT INSTALLATION
SCALE: N.T.S.

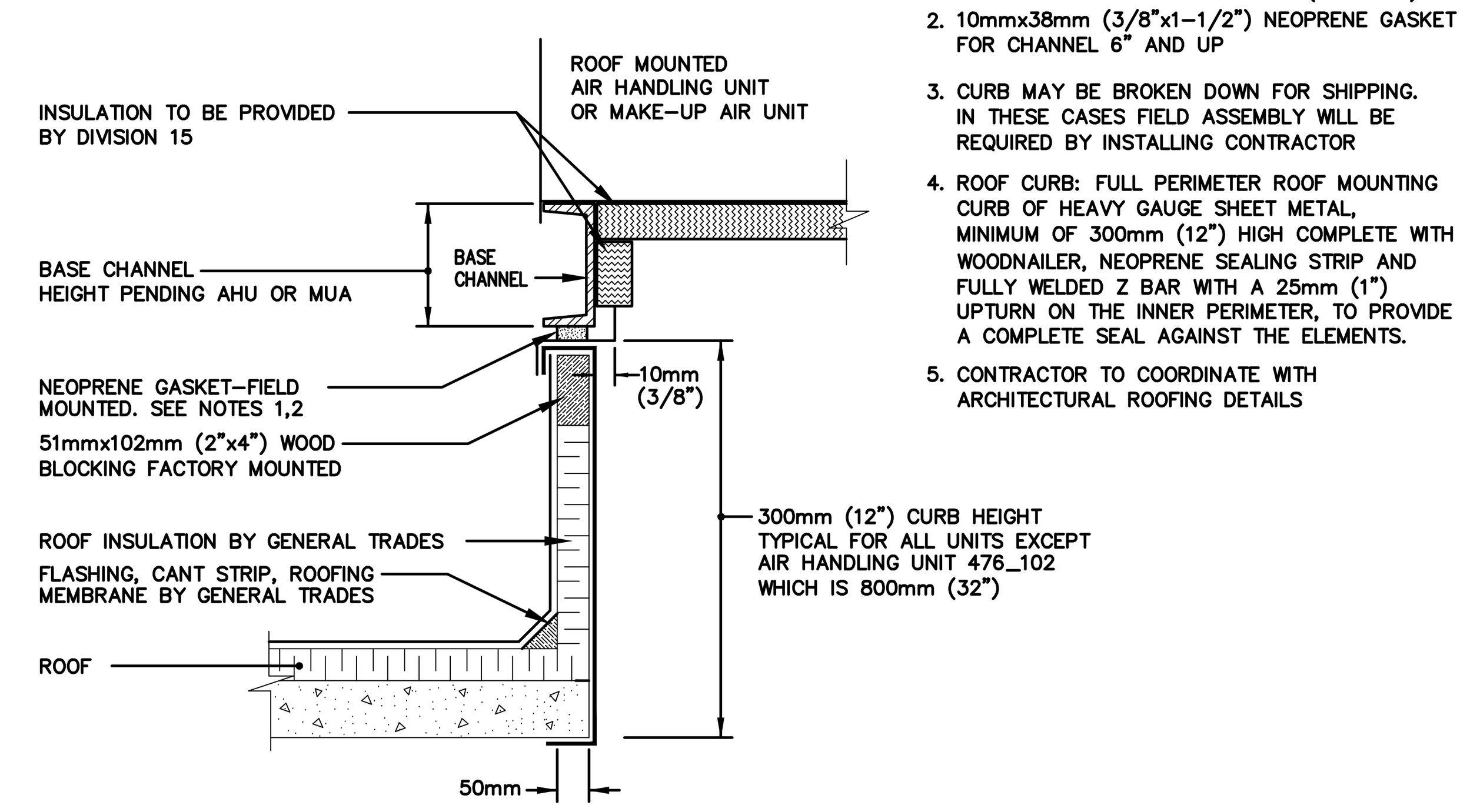


3 M3.1 DETAIL OF SUMP PIT AND PUMP
SCALE: N.T.S.



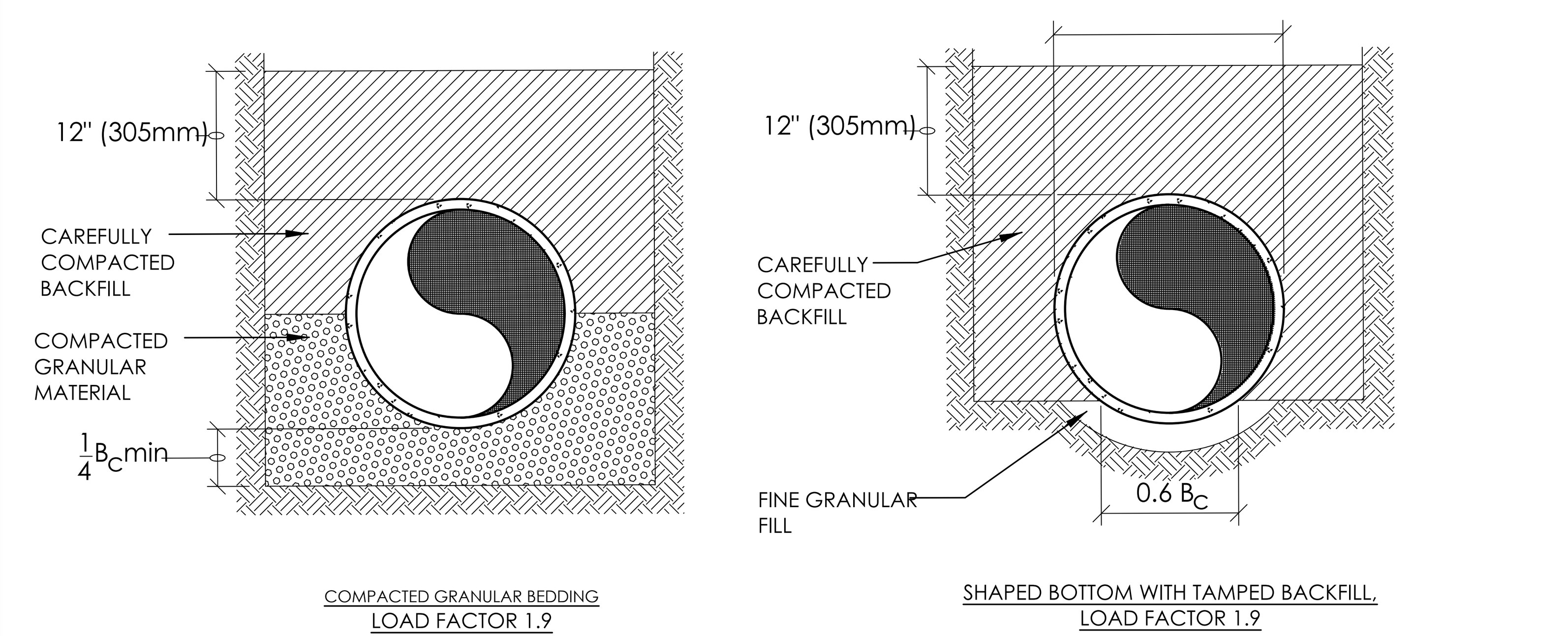
NOTES:
1. FIRE DAMPERS TO BE INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS.
2. INSPECT FLOOR OPENINGS PRIOR TO DAMPER INSTALLATION TO VERIFY SIZE OF OPENING AND PROPER PREPARATION. REFER TO MANUFACTURER'S INSTALLATION INSTRUCTIONS FOR PREPARATION OF OPENINGS IN STUD FRAMED PARTITIONS OR WALLS.
3. INSTALL DAMPER IN PLANE OF FIRE SEPARATION.
4. INSTALL DAMPER SQUARE AND PLUMB.
5. DO NOT CAST DAMPER IN PLACE.
6. DO NOT CAULK OR SEAL DAMPER TO WALL. ENSURE THAT EXPANSION CLEARANCES ARE KEPT.
7. DO NOT FASTEN RETAINING ANGLES OR DAMPER DIRECTLY TO WALL.
8. CYCLE DAMPER AFTER INSTALLATION TO ENSURE FREE MOVEMENT

4 M3.1 DETAIL OF FIRE DAMPER INSTALATION
SCALE: N.T.S.



NOTES:
1. 10mmx19mm (3/8"x3/4") NEOPRENE GASKET FOR CHANNEL 50mm TO 100mm (2" TO 4") OR
2. 10mmx38mm (3/8"x1-1/2") NEOPRENE GASKET FOR CHANNEL 6" AND UP
3. CURB MAY BE BROKEN DOWN FOR SHIPPING. IN THESE CASES FIELD ASSEMBLY WILL BE REQUIRED BY INSTALLING CONTRACTOR
4. ROOF CURB: FULL PERIMETER ROOF MOUNTING CURB OF HEAVY GAUGE SHEET METAL, MINIMUM OF 300mm (12") HIGH COMPLETE WITH WOODNAILER, NEOPRENE SEALING STRIP AND FULLY WELDED Z BAR WITH A 25mm (1") UPTURN ON THE INNER PERIMETER, TO PROVIDE A COMPLETE SEAL AGAINST THE ELEMENTS.
5. CONTRACTOR TO COORDINATE WITH ARCHITECTURAL ROOFING DETAILS

5 M3.1 DETAIL OF ROOF CURB FOR ROOF MOUNTED AIR HANDLING UNIT
SCALE: N.T.S.



6 M3.1 DETAIL OF CLASS 'B' BEDDING FOR SANITARY AND STORM SEWERS
SCALE: N.T.S.

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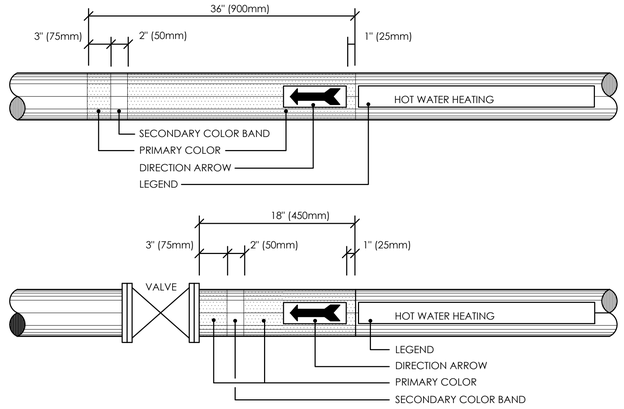
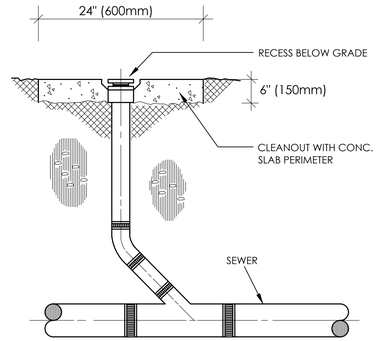


1 M3.2 DETAIL OF PIPING IDENTIFICATION
SCALE: N.T.S.



2 M3.2 CLEANOUT TO GRADE DETAIL
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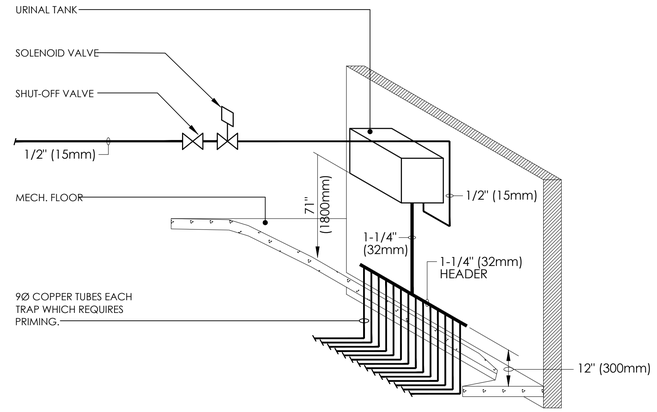
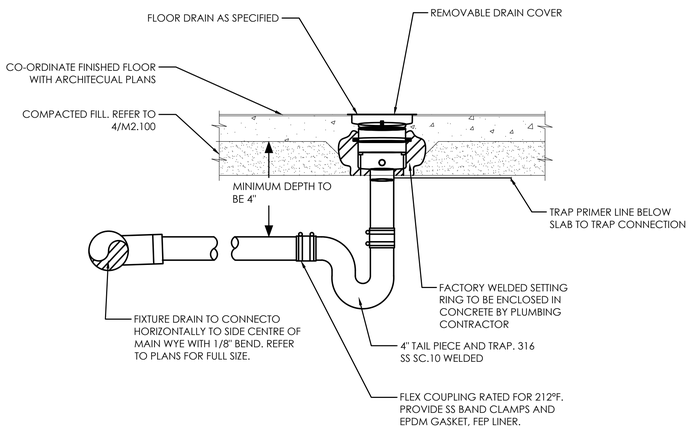


3 M3.2 TRAP SEAL PRIMER SCHEMATIC
SCALE: N.T.S.

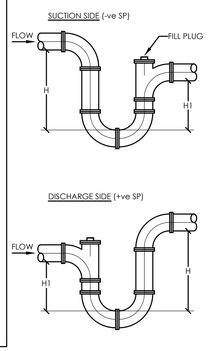


4 M3.2 DETAIL OF FLOOR DRAIN INSTALLATION
SCALE: N.T.S.

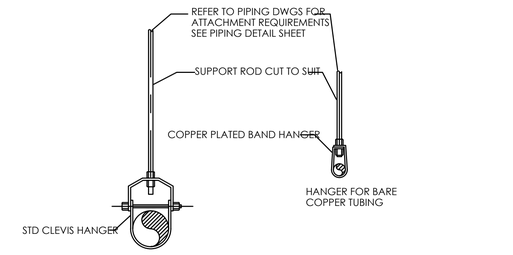
H = 1.5 x S.P. +1"
H1 = 0.5 x S.P. +0.5"

WHERE S.P. DENOTES STATIC PRESSURE AT DRAIN OUTLET (TRAP INLET)

S.P. (in. wg.)	H (in.)	H1 (in.)
-5.00	8.50	3.00
-4.75	8.13	2.88
-4.50	7.75	2.75
-4.25	7.38	2.63
-4.00	7.00	2.50
-3.75	6.63	2.38
-3.50	6.25	2.25
-3.25	5.88	2.13
-3.00	5.50	2.00
-2.75	5.13	1.88
-2.50	4.75	1.75
-2.25	4.38	1.63
-2.00	4.00	1.50
-1.75	3.63	1.38
-1.50	3.25	1.25
-1.25	2.88	1.13
-1.00	2.50	1.00
-0.75	2.13	0.88
-0.50	1.75	0.75
-0.25	1.38	0.63
0.00	1.00	0.50
0.25	1.38	0.63
0.50	1.75	0.75
0.75	2.13	0.88
1.00	2.50	1.00
1.25	2.88	1.13
1.50	3.25	1.25
1.75	3.63	1.38
2.00	4.00	1.50
2.25	4.38	1.63
2.50	4.75	1.75
2.75	5.13	1.88
3.00	5.50	2.00
3.25	5.88	2.13
3.50	6.25	2.25
3.75	6.63	2.38
4.00	7.00	2.50
4.25	7.38	2.63
4.50	7.75	2.75
4.75	8.13	2.88
5.00	8.50	3.00



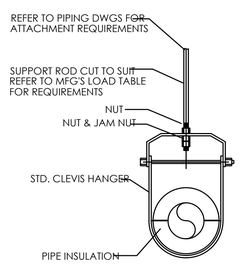
5 M3.2 DETAIL OF TRAPS FOR AIR HANDLING UNITS
SCALE: N.T.S.



NOTES:

1. REFER TO MFGR'S LOAD TABLES & INSTALLATION REQUIREMENTS FOR SELECTION

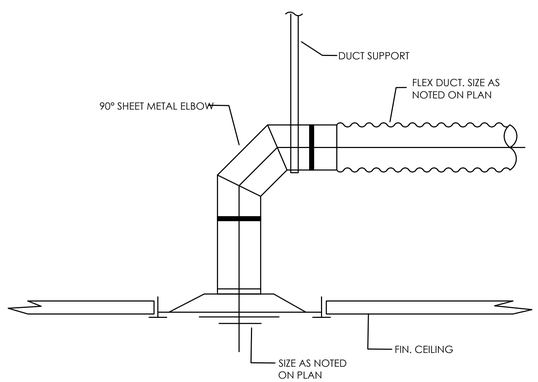
6 M3.2 CLEVIS HANGER (UNINSULATED PIPE)
SCALE: N.T.S.



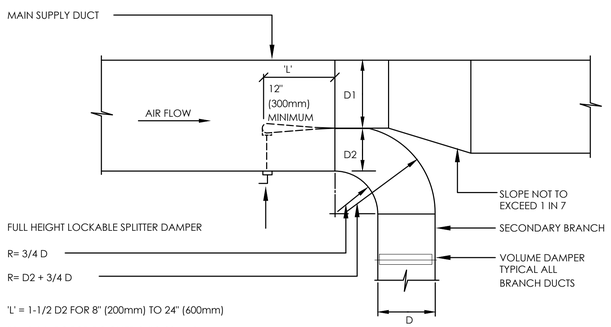
NOTES:

1. FOR HOT INSULATED LINES - 180° STD GALV. INSUL. SHIELD WITH CAL SIL INSUL. INSERT IF REQUIRED STRAP TO OUTSIDE OF INSUL. WITH 1/2" WIDE BANDS.
2. FOR COLD INSUL. LINES - USE SPECIAL INSUL. SHIELD WITH VAPOR BARRIER. REFER TO INSUL. SPEC.
3. REFER TO MRGR'S LOAD TABLES & INSTALLATION REQUIREMENTS FOR SELECTION.

7 M3.2 CLEVIS HANGER (INSULATED PIPE)
SCALE: N.T.S.



8 M3.2 SUPPLY AIR DIFFUSER C/W FLEXIBLE DUCT DETAIL
SCALE: N.T.S.



'L' = 1-1/2 D2 FOR 8" (200mm) TO 24" (600mm)

'L' = 1-1/4 D2 FOR D2 OVER 24" (600mm)

RATIO D2 = VOLUME IN SECONDARY BRANCH
D1 = VOLUME IN MAIN DUCT AFTER TAKE-OFF

9 M3.2 DETAIL OF FULL RADIUS ELBOW BRANCH TAKE-OFF
SCALE: N.T.S.

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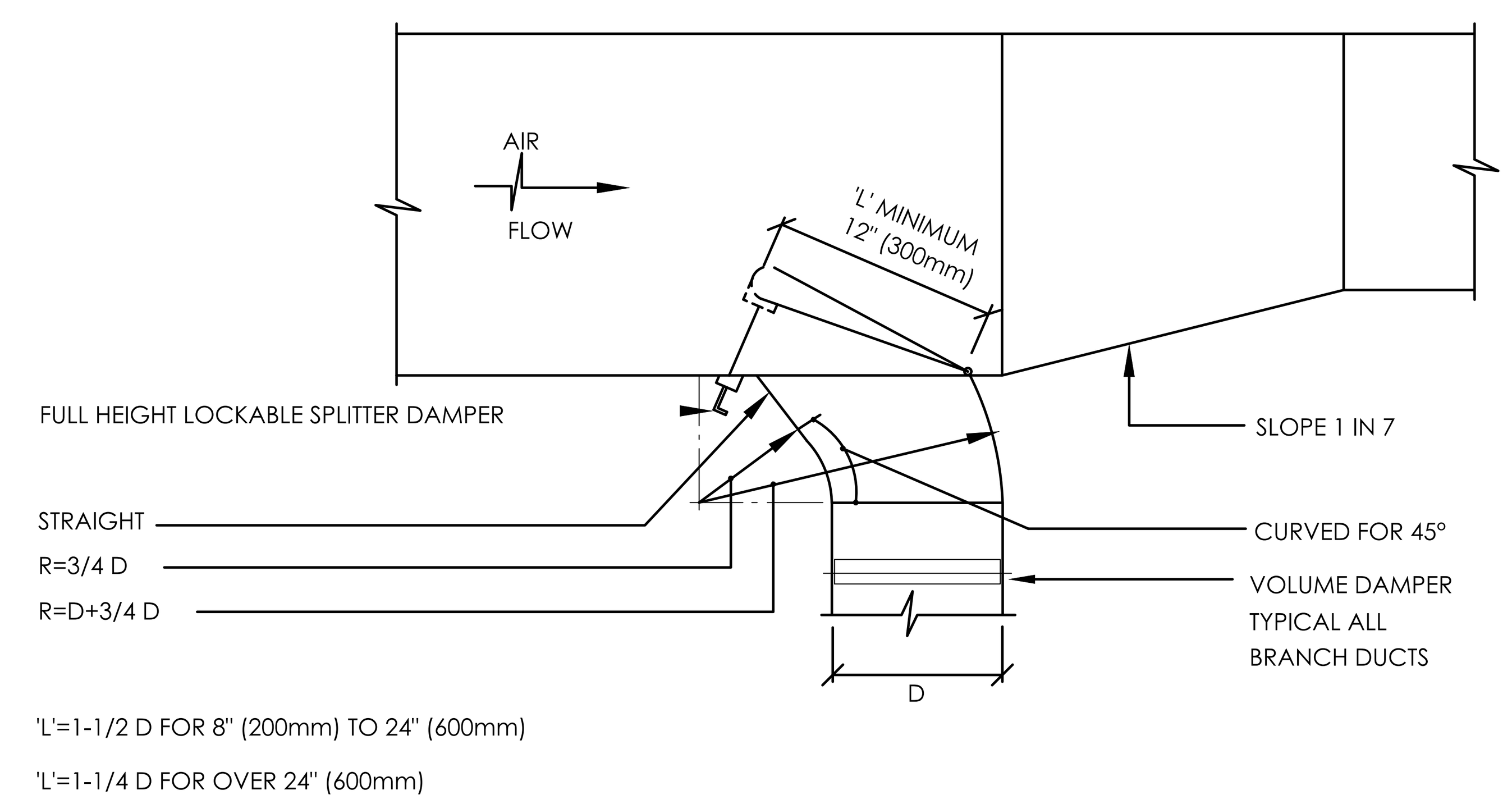
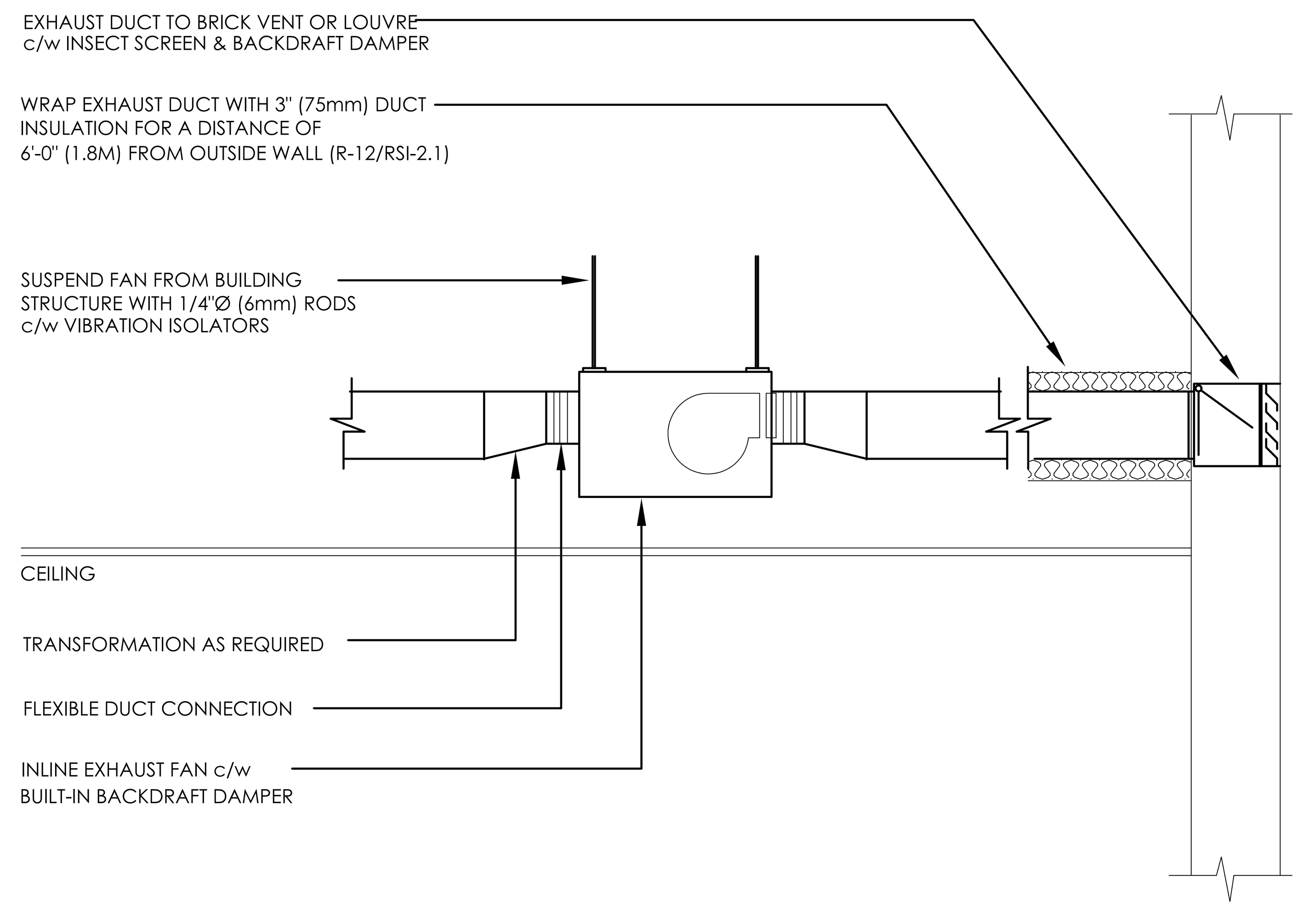


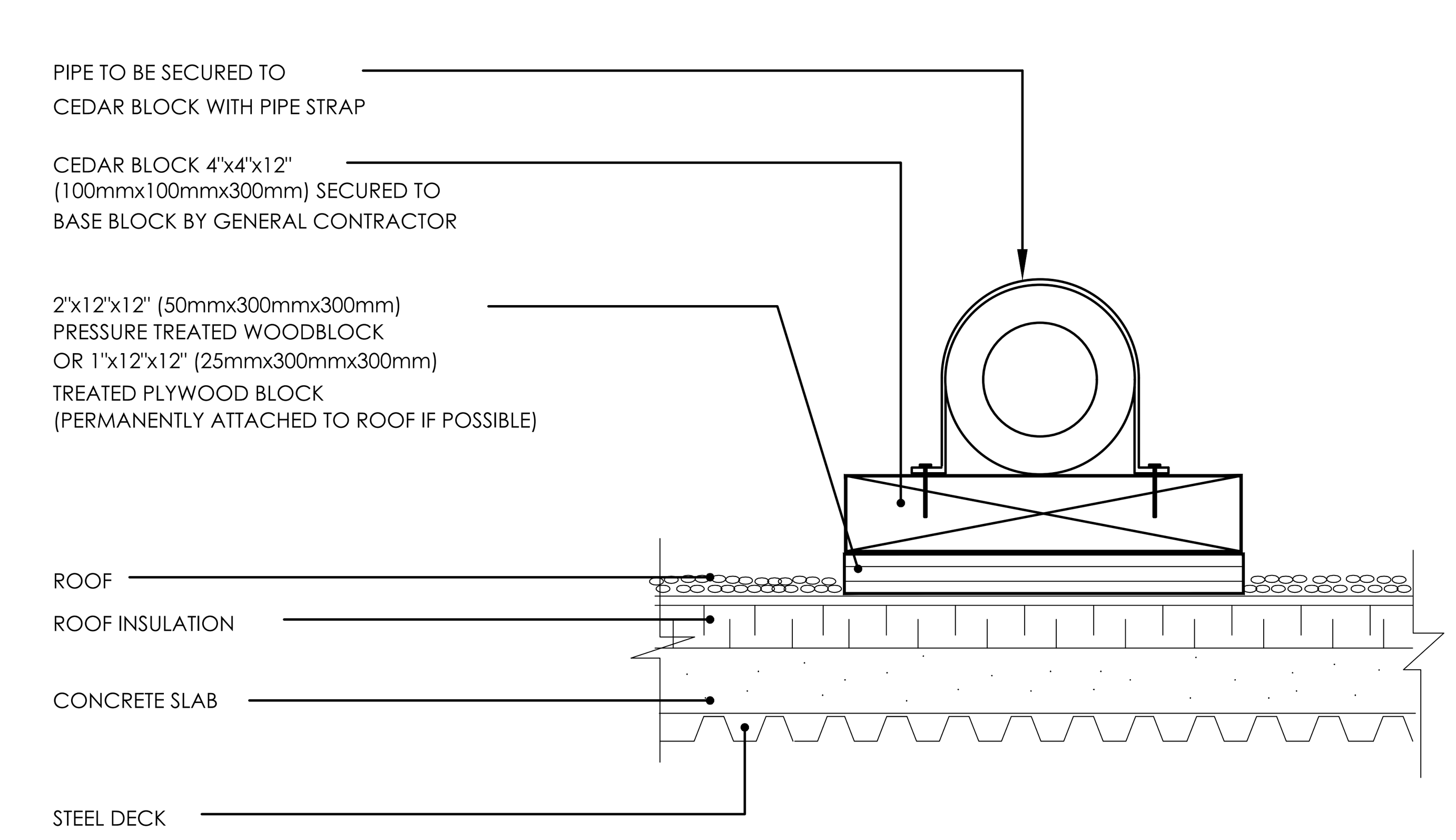
'L'=1-1/2 D FOR 8" (200mm) TO 24" (600mm)

'L'=1-1/4 D FOR OVER 24" (600mm)

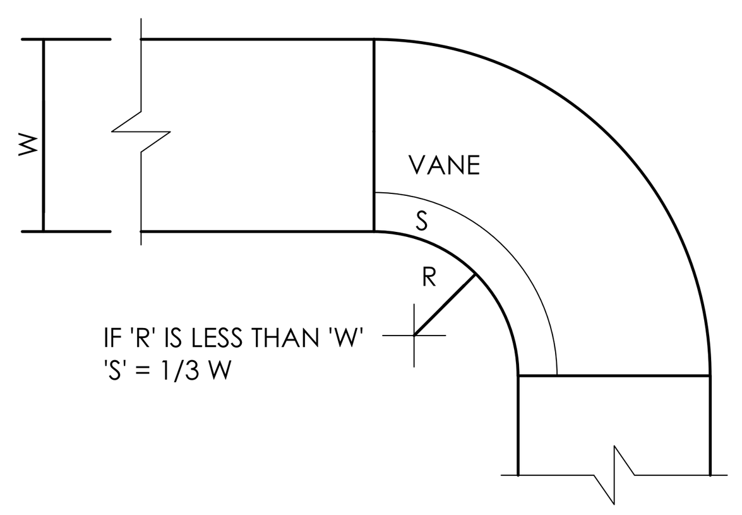
1 M3.3 DETAIL OF SUPPLY TAP-IN CONNECTION
SCALE: N.T.S.



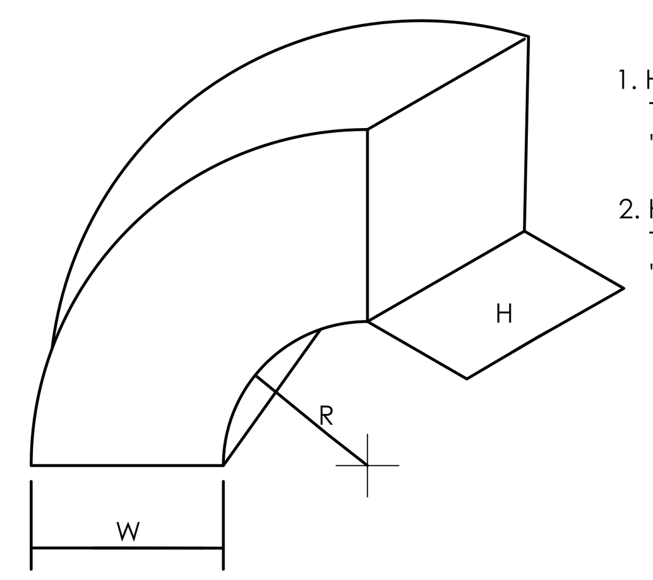
2 M3.3 DETAIL OF INLINE EXHAUST FAN
SCALE: N.T.S.



3 M3.3 DETAIL OF GAS PIPING INSTALLATION ON ROOF
SCALE: N.T.S.

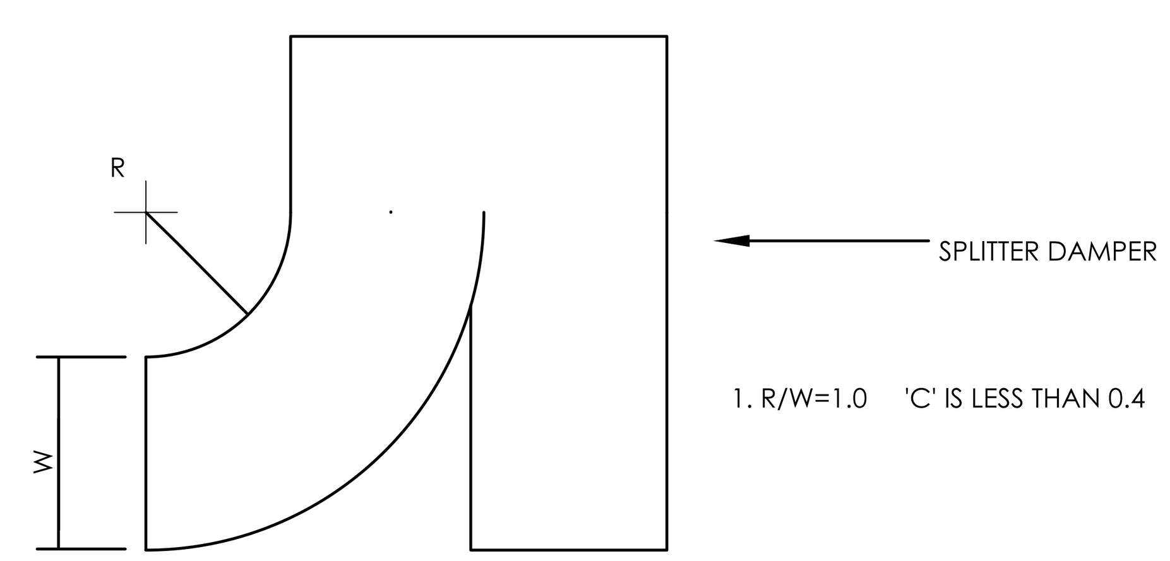


SHORT RADIUS ELBOW - DESIGNATED E3



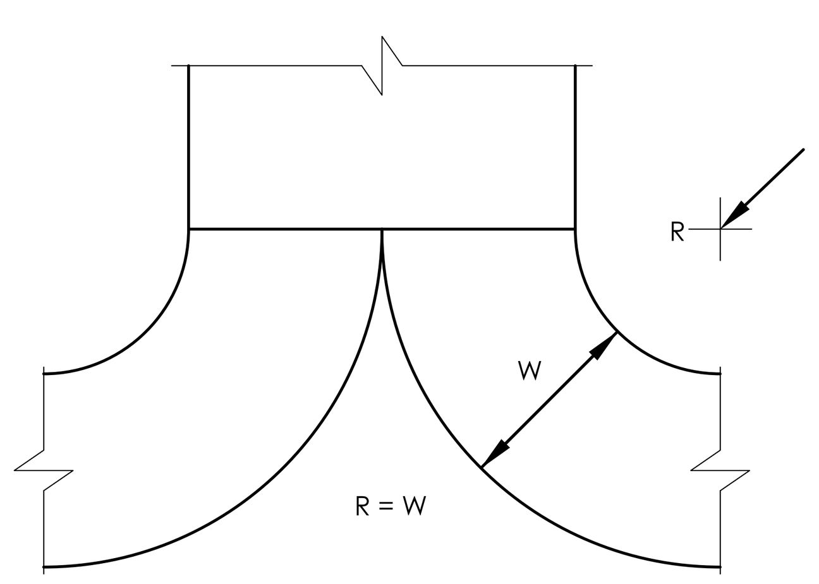
1. H/W AND R/W: 1.0 AND LESS SPLITTER TYPE TURNING VANES MUST BE USED SO THAT 'C' IS LESS THAN 0.15
2. H/W R/W: 1.5 AND LARGE SPLITTER TYPE TURNING VANES ARE NET REQUIRED WHEN 'C' IS LESS THAN 0.15 .

FULL RADIUS RECTANGULAR ELBOW - SMACNA 14-10 G ELBOW-DESIGNATED E1

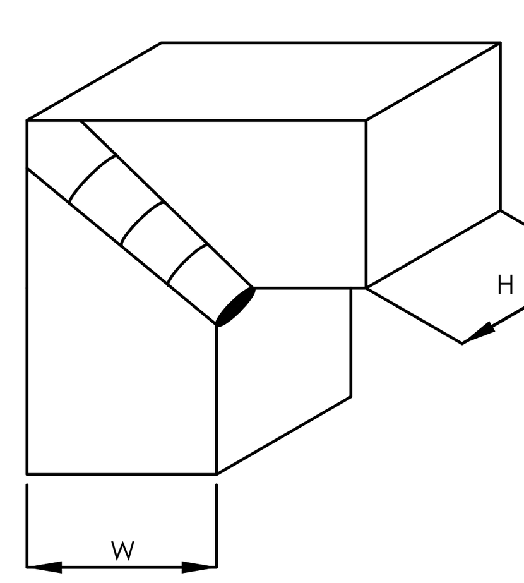


1. R/W=1.0 'C' IS LESS THAN 0.4

BRANCH DUCT SMACNA 14-14 WYE - DESIGNATED W1

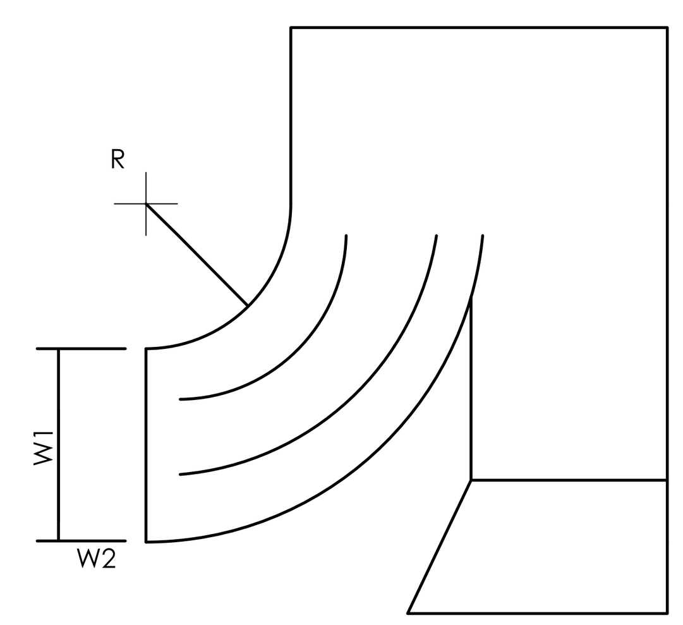


FULL RADIUS TEE - DESIGNATED T1



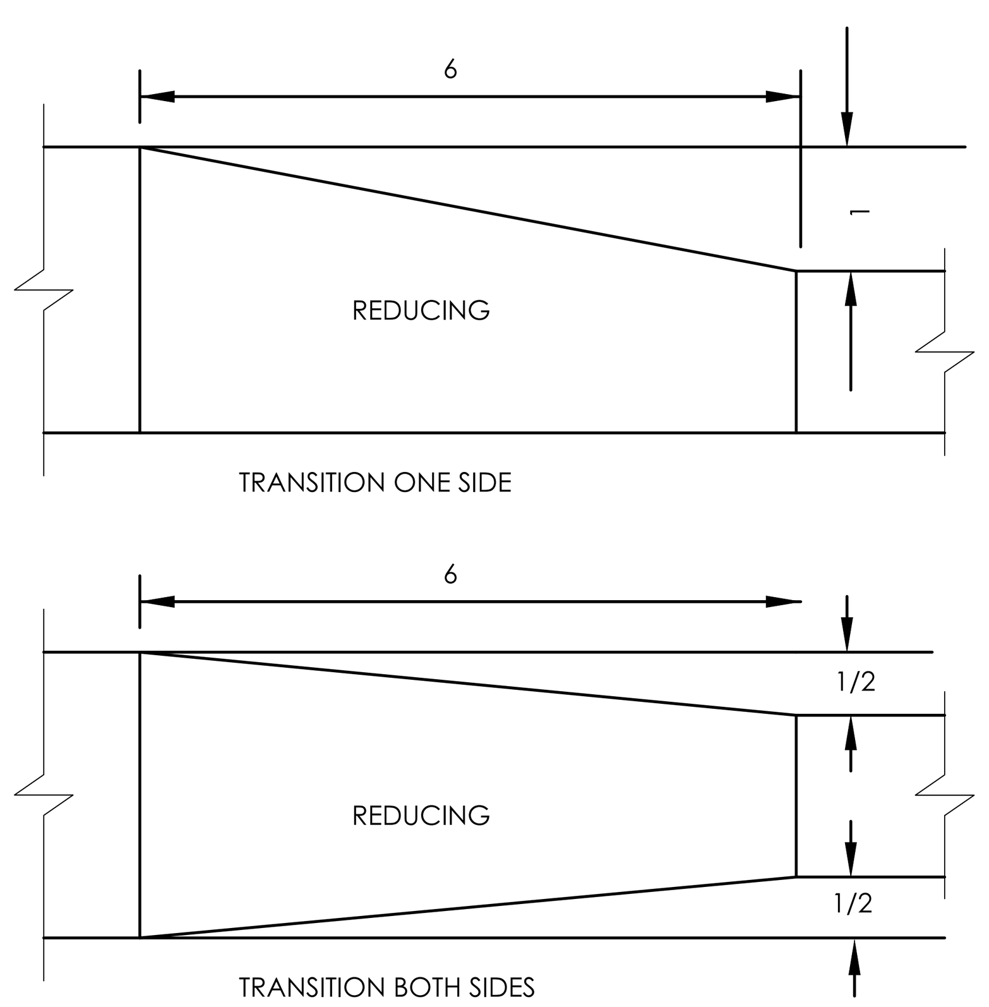
1. ALL ELBOWS GREATER THAN 30° TO HAVE 115MM SINGLE THICKNESS TURNING VANES ON CENTER.
2. ALL ELBOWS TO HAVE A 45° OR RADIUS THROAT. 90° THROAT IS NOT ACCEPTABLE HIGH LOSS.
3. ALL TURNING VANES ARE TO BE ADJUSTED SO THAT THE TRAILING EDGE ARE TANGENT TO THE AIR STREAM. SMACNA FIG.5-15
4. DOUBLE THICKNESS TURNING VANES THAT REDUCE THE DUCT AREA MAY NOT BE USED

MITRED RECTANGULAR ELBOW - SMACNA 14-10 D ELBOW-DESIGNATED E2



1. WHERE SPACE IS NOT AVAILABLE FOR R/W=1.0 OR GREATER R/W=0.1
2. 'C' IS LESS THAN 0.2
3. WITH TWO SPLITTER VANES 90MM ON CENTER

DUCT RISER - DESIGNATED W2



DUCT CONSTRUCTION NOTE:

1. ALL DUCTS AND FITTINGS TO BE CONSTRUCT FABRICATED TO BE SMACNA H.V.A.C. SYSTEMS DUCT DESIGN 1990 THIRD EDITION LOW FITTING LOSS PRACTICE.
2. TRANSITIONS SHALL NOT EXCEED 20° AT VELOCITIES ABOVE 1000/PM.
3. R/W EXCEEDING 1.0 SHALL BE USED IN ALL OPEN AREAS.

4 M3.3 DETAIL OF SQUARE, RADIUS ELBOW AND TRANSITION FITTINGS
SCALE: N.T.S.

SEQUENCE OF OPERATION:

1. WALL FAN HEATER (TYPICAL OF 2)

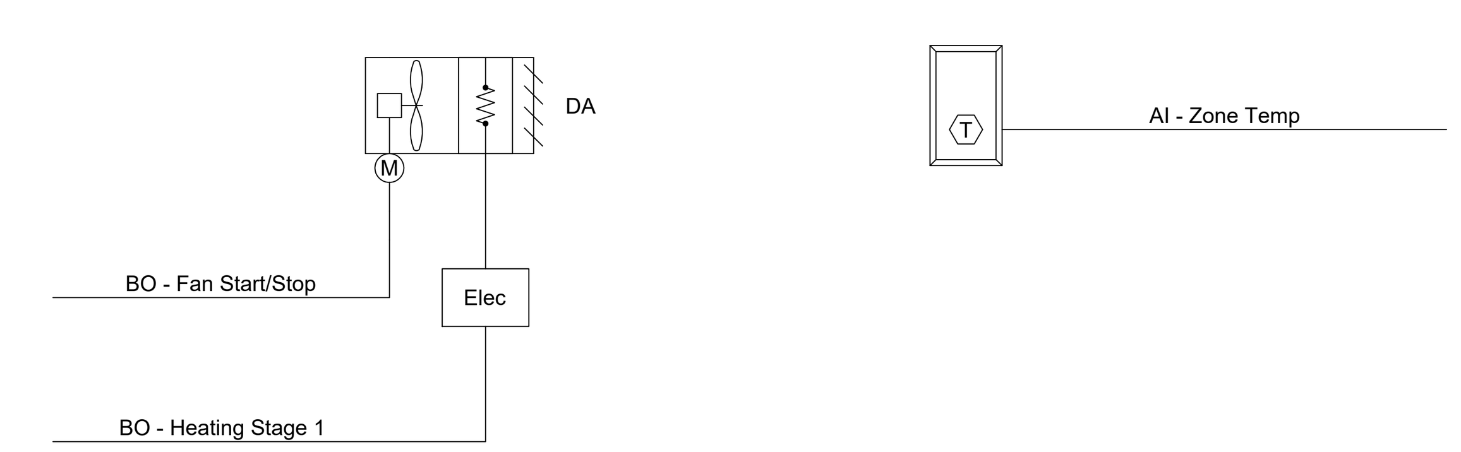
RUN CONDITIONS - SCHEDULED:
THE UNIT SHALL RUN ACCORDING TO A USER DEFINABLE TIME SCHEDULE IN THE FOLLOWING MODES:
- OCCUPIED MODE: THE UNIT SHALL MAINTAIN A HEATING SETPOINT OF 70°F (ADJ.).
- UNOCCUPIED MODE (NIGHT SETBACK): THE UNIT SHALL MAINTAIN A HEATING SETPOINT OF 65°F (ADJ.).

ALARMS SHALL BE PROVIDED AS FOLLOWS:
- LOW ZONE TEMP: IF THE ZONE TEMPERATURE IS LESS THAN THE HEATING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).

FAN:
THE FAN SHALL RUN ANYTIME THE ZONE TEMPERATURE DROPS BELOW HEATING SETPOINT, UNLESS SHUTDOWN ON SAFETIES.

ELECTRIC HEATING STAGE:
THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND STAGE THE HEATING TO MAINTAIN ITS HEATING SETPOINT. TO PREVENT SHORT CYCLING, THE STAGE SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME.

THE HEATING SHALL BE ENABLED WHENEVER:
- OUTSIDE AIR TEMPERATURE IS LESS THAN 65°F (ADJ.).
- AND THE ZONE TEMPERATURE IS BELOW HEATING SETPOINT.
- AND THE FAN IS ON.



	Hardware Points				Software Points						
Point Name	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show On Graphic
Zone Temp	x								x		x
Fan Start/Stop				x					x		x
Heating Stage 1				x					x		x
Heating Setpoint					x				x		x
Schedule								x			
Low Zone Temp										x	
Totals	**1**	**0**	**0**	**2**	**1**	**0**	**0**	**1**	**4**	**1**	**4**

Total Hardware (3) Total Software (7)

5 M3.3 CONTROL SCHEMATIC - WALL FAN HEATER
SCALE: N.T.S.

CONSTRUCTION NORTH

TRUE NORTH

MANTECON PARTNERS
STRUCTURAL MECHANICAL ELECTRICAL CIVIL ENGINEERS
15 Foundry Street, Dundas, ON, L9H 2V6
Phone: (905)648-0373
www.manteconpartners.com

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3	Issued For Permit	2023-01-20
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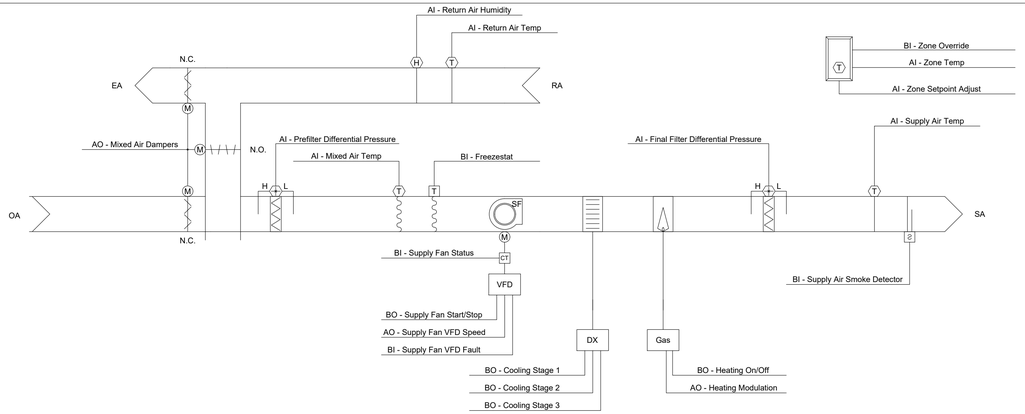
MPI Project No: 21-153
Scale: As Shown
Drawn by: MZE
Plot Date: FEB. 11, 2022
Issue Date:

PRESCHOOL DAY CARE ADDITION
Ecole elementaire catholique Saint-Marguerite-Bourgeoys
60 Clench Avenue, Brantford, Ontario N3T 1B9

DETAILS & SCHEDULES

M3.3



SEQUENCE OF OPERATION:

1. RTU (TYPICAL OF 1)

RUN CONDITIONS - SCHEDULED:
THE UNIT SHALL RUN ACCORDING TO A USER DEFINABLE TIME SCHEDULE IN THE FOLLOWING MODES:

- OCCUPIED MODE: THE UNIT SHALL MAINTAIN
- A 24°C (ADJ.) COOLING SETPOINT
- A 21°C (ADJ.) HEATING SETPOINT.

- UNOCCUPIED MODE (NIGHT SETBACK): THE UNIT SHALL MAINTAIN
- A 30°C (ADJ.) COOLING SETPOINT.
- A 13°C (ADJ.) HEATING SETPOINT.

ALARMS SHALL BE PROVIDED AS FOLLOWS:

- HIGH ZONE TEMP: IF THE ZONE TEMPERATURE IS GREATER THAN THE COOLING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).
- LOW ZONE TEMP: IF THE ZONE TEMPERATURE IS LESS THAN THE HEATING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).

DEMAND LIMITING - ZONE SETPOINT OPTIMIZATION:
TO LOWER POWER CONSUMPTION, THE ZONE SETPOINTS SHALL AUTOMATICALLY RELAX WHEN THE FACILITY POWER CONSUMPTION EXCEEDS DEFINABLE THRESHOLDS. THE AMOUNT OF RELAXATION SHALL BE INDIVIDUALLY CONFIGURABLE FOR EACH ZONE. THE ZONE SETPOINTS SHALL AUTOMATICALLY RETURN TO THEIR PREVIOUS SETTINGS WHEN THE FACILITY POWER CONSUMPTION DROPS BELOW THE THRESHOLDS.

ZONE SETPOINT ADJUST:
THE OCCUPANT SHALL BE ABLE TO ADJUST THE ZONE TEMPERATURE HEATING AND COOLING SETPOINTS AT THE ZONE SENSOR.

ZONE OPTIMAL START:
THE UNIT SHALL USE AN OPTIMAL START ALGORITHM FOR MORNING START-UP. THIS ALGORITHM SHALL MINIMIZE THE UNOCCUPIED WARM-UP OR COOL-DOWN PERIOD WHILE STILL ACHIEVING COMFORT CONDITIONS BY THE START OF SCHEDULED OCCUPIED PERIOD.

ZONE UNOCCUPIED OVERRIDE:
A TIMED LOCAL OVERRIDE CONTROL SHALL ALLOW AN OCCUPANT TO OVERRIDE THE SCHEDULE AND PLACE THE UNIT INTO AN OCCUPIED MODE FOR AN ADJUSTABLE PERIOD OF TIME. AT THE EXPIRATION OF THIS TIME, CONTROL OF THE UNIT SHALL AUTOMATICALLY RETURN TO THE SCHEDULE.

FREEZE PROTECTION:
THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING A FREEZESTAT STATUS.

SUPPLY AIR SMOKE DETECTION:
THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING A SUPPLY AIR SMOKE DETECTOR STATUS.

SUPPLY FAN:
THE SUPPLY FAN SHALL RUN ANYTIME THE UNIT IS COMMANDED TO RUN, UNLESS SHUTDOWN ON SAFETIES. TO PREVENT SHORT CYCLING, THE SUPPLY FAN SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME.

ALARMS SHALL BE PROVIDED AS FOLLOWS:

- SUPPLY FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- SUPPLY FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
- SUPPLY FAN RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

ZONE TEMPERATURE CONTROL:
THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND SHALL MODULATE THE SUPPLY FAN VFD SPEED TO MAINTAIN ZONE TEMPERATURE SETPOINT. THE FAN SPEED SHALL INCREASE AS THE ZONE TEMPERATURE RISES ABOVE COOLING SETPOINT, OR AS THE ZONE TEMPERATURE DROPS BELOW HEATING SETPOINT. THE SUPPLY FAN VFD SPEED SHALL NOT DROP BELOW 30% (ADJ.).

COOLING STAGES:
THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND STAGE THE COOLING TO MAINTAIN ITS COOLING SETPOINT. TO PREVENT SHORT CYCLING, THERE SHALL BE A USER DEFINABLE (ADJ.) DELAY BETWEEN STAGES, AND EACH STAGE SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME.

THE COOLING SHALL BE ENABLED WHENEVER:

- OUTSIDE AIR TEMPERATURE IS GREATER THAN 15°C (ADJ.).
- AND THE ECONOMIZER (IF PRESENT) IS DISABLED OR FULLY OPEN.
- AND THE ZONE TEMPERATURE IS ABOVE COOLING SETPOINT.
- AND THE SUPPLY FAN STATUS IS ON.
- AND THE HEATING IS NOT ACTIVE.

GAS HEATING MODULATION:
THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND MODULATE THE HEATING TO MAINTAIN ITS HEATING SETPOINT. TO PREVENT SHORT CYCLING, THERE SHALL BE A USER DEFINABLE (ADJ.) DELAY BETWEEN STARTS, AND EACH START SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME.

THE HEATING SHALL BE ENABLED WHENEVER:

- OUTSIDE AIR TEMPERATURE IS LESS THAN 18°C (ADJ.).
- AND THE ZONE TEMPERATURE IS BELOW HEATING SETPOINT.
- AND THE SUPPLY FAN STATUS IS ON.
- AND THE COOLING IS NOT ACTIVE.

ECONOMIZER:
THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND MODULATE THE ECONOMIZER DAMPERS IN SEQUENCE TO MAINTAIN A SETPOINT 1°C LESS THAN THE ZONE COOLING SETPOINT. THE OUTSIDE AIR DAMPERS SHALL MAINTAIN A MINIMUM ADJUSTABLE POSITION OF 20% (ADJ.) OPEN WHENEVER OCCUPIED.

THE ECONOMIZER SHALL BE ENABLED WHENEVER:

- OUTSIDE AIR TEMPERATURE IS LESS THAN 18°C (ADJ.).
- AND THE OUTSIDE AIR ENTHALPY IS LESS THAN 22BTU/LB (ADJ.).
- AND THE OUTSIDE AIR TEMPERATURE IS LESS THAN THE RETURN AIR TEMPERATURE.
- AND THE OUTSIDE AIR ENTHALPY IS LESS THAN THE RETURN AIR ENTHALPY.
- AND THE SUPPLY FAN STATUS IS ON.

THE ECONOMIZER SHALL CLOSE WHENEVER:

- MIXED AIR TEMPERATURE DROPS FROM 7°C TO 4°C (ADJ.).
- OR ON LOSS OF SUPPLY FAN STATUS.
- OR FREEZESTAT (IF PRESENT) IS ON.

THE OUTSIDE AND EXHAUST AIR DAMPERS SHALL CLOSE AND THE RETURN AIR DAMPER SHALL OPEN WHEN THE UNIT IS OFF. IF OPTIMAL START UP IS AVAILABLE, THE MIXED AIR DAMPER SHALL OPERATE AS DESCRIBED IN THE OCCUPIED MODE EXCEPT THAT THE OUTSIDE AIR DAMPER SHALL MODULATE TO FULLY CLOSED.

MINIMUM OUTSIDE AIR VENTILATION - FIXED PERCENTAGE:
THE OUTSIDE AIR DAMPERS SHALL MAINTAIN A MINIMUM POSITION (ADJ.) DURING BUILDING OCCUPIED HOURS AND BE CLOSED DURING UNOCCUPIED HOURS.

PREFILTER DIFFERENTIAL PRESSURE MONITOR:
THE CONTROLLER SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE PREFILTER.

ALARMS SHALL BE PROVIDED AS FOLLOWS:

- PREFILTER CHANGE REQUIRED: PREFILTER DIFFERENTIAL PRESSURE EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

FINAL FILTER DIFFERENTIAL PRESSURE MONITOR:
THE CONTROLLER SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE FINAL FILTER.

ALARMS SHALL BE PROVIDED AS FOLLOWS:

- FINAL FILTER CHANGE REQUIRED: FINAL FILTER DIFFERENTIAL PRESSURE EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

MIXED AIR TEMPERATURE:
THE CONTROLLER SHALL MONITOR THE MIXED AIR TEMPERATURE AND USE AS REQUIRED FOR ECONOMIZER CONTROL (IF PRESENT) OR PREHEATING CONTROL (IF PRESENT).

ALARMS SHALL BE PROVIDED AS FOLLOWS:

- HIGH MIXED AIR TEMP: IF THE MIXED AIR TEMPERATURE IS GREATER THAN 32°C (ADJ.).
- LOW MIXED AIR TEMP: IF THE MIXED AIR TEMPERATURE IS LESS THAN 7°C (ADJ.).

RETURN AIR HUMIDITY:
THE CONTROLLER SHALL MONITOR THE RETURN AIR HUMIDITY AND USE AS REQUIRED FOR ECONOMIZER CONTROL (IF PRESENT) OR HUMIDITY CONTROL (IF PRESENT).

ALARMS SHALL BE PROVIDED AS FOLLOWS:

- HIGH RETURN AIR HUMIDITY: IF THE RETURN AIR HUMIDITY IS GREATER THAN 70% (ADJ.).
- LOW RETURN AIR HUMIDITY: IF THE RETURN AIR HUMIDITY IS LESS THAN 35% (ADJ.).

RETURN AIR TEMPERATURE:
THE CONTROLLER SHALL MONITOR THE RETURN AIR TEMPERATURE AND USE AS REQUIRED FOR ECONOMIZER CONTROL (IF PRESENT).

ALARMS SHALL BE PROVIDED AS FOLLOWS:

- HIGH RETURN AIR TEMP: IF THE RETURN AIR TEMPERATURE IS GREATER THAN 32°C (ADJ.).
- LOW RETURN AIR TEMP: IF THE RETURN AIR TEMPERATURE IS LESS THAN 7°C (ADJ.).

SUPPLY AIR TEMPERATURE:
THE CONTROLLER SHALL MONITOR THE SUPPLY AIR TEMPERATURE.

ALARMS SHALL BE PROVIDED AS FOLLOWS:

- HIGH SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS GREATER THAN 48°C (ADJ.).
- LOW SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS LESS THAN 7°C (ADJ.).

ENVIRONMENTAL INDEX:
WHEN THE ZONE IS OCCUPIED, THE CONTROLLER WILL MONITOR THE DEVIATION OF THE ZONE TEMPERATURE FROM THE HEATING OR COOLING SETPOINT. THE CONTROLLER WILL ALSO MONITOR THE RELATIVE HUMIDITY AND COMPARE IT TO COMFORT CONDITIONS. THIS DATA WILL BE USED TO CALCULATE A 0 - 100% ENVIRONMENTAL INDEX WHICH GIVES AN INDICATION OF HOW WELL THE ZONE IS MAINTAINING COMFORT. THE CONTROLLER WILL ALSO CALCULATE THE PERCENTAGE OF TIME SINCE OCCUPANCY BEGAN THAT THE ENVIRONMENTAL INDEX IS 70% OR HIGHER. OPTIONALLY, A WEIGHTING FACTOR CAN BE CONFIGURED TO ADJUST THE CONTRIBUTION OF THE ZONE TO THE ROLLUP AVERAGE INDEX BASED UPON THE FLOOR AREA OF THE ZONE, IMPORTANCE OF THE ZONE, OR OTHER STATIC CRITERIA.

THE SYSTEM IS TO BE INTERLOCKED WITH DOOR SWITCHES AS PER ASHRAE 90.1 6.5.10.

THE SYSTEM IS TO PREVENT SIMULTANEOUS HEATING AND COOLING.

THE UNIT IS TO HAVE THE CAPACITY TO HOLD SCHEDULES FOR 7 DIFFERENT DAY TYPES PER WEEK AND RETAIN THE PROGRAM IF POWER IS LOST FOR 10 HOURS. A MANUAL OVERRIDE IS TO BE INCLUDED WHICH WILL ALLOW FOR OPERATION FOR 2 HOURS.

THE BOILER AND CONVECTORS SHALL BE USED FOR PRIMARY ZONE HEATING AND THE RTU SHALL BE USED FOR SECONDARY ZONE HEATING.

RTU TO BE CONNECTED TO EXISTING BMS CONTROLS.

POINT NAME	HARDWARE POINTS AI	AO	BI	BO	SOFTWARE POINTS AV	BV	LOOP	SCHED	TREND	ALARM	SHOW ON GRAPHIC
FINAL FILTER DIFFERENTIAL PRESSURE	X								X		
MIXED AIR TEMP	X								X		X
OUTSIDE AIR HUMIDITY	X								X		X
OUTSIDE AIR TEMP	X								X		X
PREFILTER DIFFERENTIAL PRESSURE	X								X		
RETURN AIR HUMIDITY	X								X		X
RETURN AIR TEMP	X								X		X
SUPPLY AIR TEMP	X								X		X
ZONE SETPOINT ADJUST	X										X
ZONE TEMP	X								X		X
MIXED AIR DAMPERS		X							X		X
SUPPLY FAN VFD SPEED		X							X		X
FREEZESTAT			X						X	X	X
SUPPLY AIR SMOKE DETECTOR			X						X	X	X
SUPPLY FAN STATUS			X						X		X
SUPPLY FAN VFD FAULT			X						X		X
ZONE OVERRIDE			X						X		X
COOLING STAGE 1				X					X		X
COOLING STAGE 2				X					X		X
COOLING STAGE 3				X					X		X
HEATING STAGE ON/OFF				X					X		X
HEATING MODULATION		X							X		X
SUPPLY FAN START/STOP				X					X		X
COOLING SETPOINT					X				X		X
ECONOMIZER ZONE TEMP SET-POINT					X				X		X
ENVIRONMENTAL INDEX					X				X		
HEATING SETPOINT					X				X		X
PERCENT OF TIME SATISFIED					X				X		
SCHEDULE								X			
COMPRESSOR RUNTIME EXCEEDED										X	
FINAL FILTER CHANGE REQUIRED										X	X
HIGH MIXED AIR TEMP										X	
HIGH RETURN AIR HUMIDITY										X	
HIGH RETURN AIR TEMP										X	
HIGH SUPPLY AIR TEMP										X	
HIGH ZONE TEMP										X	
LOW MIXED AIR TEMP										X	
LOW RETURN AIR HUMIDITY										X	
LOW RETURN AIR TEMP										X	
LOW SUPPLY AIR TEMP										X	
LOW ZONE TEMP										X	
PREFILTER CHANGE REQUIRED										X	X
SUPPLY FAN FAILURE										X	
SUPPLY FAN IN HAND										X	
SUPPLY FAN RUNTIME EXCEEDED										X	
TOTALS	**10**	**3**	**5**	**5**	**5**	**0**	**0**	**1**	**27**	**18**	**26**

TOTAL HARDWARE (23) — **TOTAL SOFTWARE (51)**

1 M3.4 CONTROL SCHEMATIC - ROOF TOP UNIT
SCALE: N.T.S.

SEQUENCE OF OPERATION:

1. EXHAUST FAN (TYPICAL OF 2)

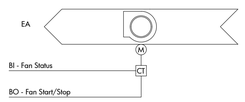
RUN CONDITIONS - INTERLOCKED:
THE FAN(S) EF --- SHALL BE INTERLOCKED TO RUN WHENEVER THE WASHROOM IS OCCUPIED BASED ON THE LIGHT SWITCH UNLESS SHUTDOWN ON SAFETIES.

FAN:
THE FAN SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME.

FAN STATUS:
THE CONTROLLER SHALL MONITOR THE FAN STATUS.

ALARMS SHALL BE PROVIDED AS FOLLOWS:

- FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
- FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
- FAN RUNTIME EXCEEDED: FAN STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).



POINT NAME	HARDWARE POINTS AI	AO	BI	BO	SOFTWARE POINTS AV	BV	LOOP	SCHED	TREND	ALARM	SHOW ON GRAPHIC
FAN STATUS			X						X		X
FAN START/STOP				X					X		X
FAN FAILURE										X	
FAN IN HAND										X	
FAN RUNTIME EXCEEDED										X	
TOTALS	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**2**	**3**	**2**

TOTAL HARDWARE (2) — **TOTAL SOFTWARE (5)**

2 M3.4 CONTROL SCHEMATIC - EXHAUST FAN
SCALE: N.T.S.

SEQUENCE OF OPERATION:

1. ELECTRIC BASEBOARD HEATER (TYPICAL OF 1)

RUN CONDITIONS - CONTINUOUS:
THE UNIT SHALL RUN CONTINUOUSLY AND SHALL MAINTAIN A HEATING SETPOINT OF 70°F (ADJ.).

ALARMS SHALL BE PROVIDED AS FOLLOWS:

- LOW ZONE TEMP: IF THE ZONE TEMPERATURE IS LESS THAN THE HEATING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).

ELECTRIC HEATING STAGE:
THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND STAGE THE HEATING TO MAINTAIN ITS HEATING SETPOINT. TO PREVENT SHORT CYCLING, THE STAGE SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME.

THE HEATING SHALL BE ENABLED WHENEVER:

- OUTSIDE AIR TEMPERATURE IS LESS THAN 65°F (ADJ.).
- AND THE ZONE TEMPERATURE IS BELOW HEATING SETPOINT.

Point Name	Hardware Points AI	AO	BI	BO	Software Points AV	BV	Loop	Sched	Trend	Alarm	Show On Graphic
Zone Temp	x								x		x
Heating Stage 1				x					x		x
Heating Setpoint					x				x		x
Low Zone Temp										x	
Totals	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**3**	**1**	**3**

Total Hardware (2) — **Total Software (5)**

3 M3.4 CONTROL SCHEMATIC - ELECTRIC BASEBOARD HEATER
SCALE: N.T.S.

CONSTRUCTION NORTH

TRUE NORTH

MANTECON PARTNERS
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15 Foundry Street, Dundas, ON, L9H 2V6
Phone: (905)648-0373
www.manteconpartners.com

No.	Revisions:	Date:
1	Issued For Tender	2025-02-12

MPI Project No: 21-153
Scale: As Shown
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Plot Date: FEB. 11, 2022
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PRESCHOOL DAY CARE ADDITION
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Saint-Marguerite-Bourgeoys
60 Clench Avenue, Brantford, Ontario N3T 1B9

DETAILS & SCHEDULES

M3.4

ELECTRICAL DRAWING LIST

GENERAL NOTES

1. 1.DO NOT SCALE DRAWINGS FOR INSTALLATION PURPOSES. OBTAIN ALL DIMENSIONS FROM THE ARCHITECTURAL PLANS, MANUFACTURER'S SHOP DRAWINGS, AND ON SITE INSPECTIONS.
2. PRIOR TO INSTALLATION OF BOXES IN WALLS, VERIFY THAT NO INTERFERENCES EXIST. CHECK ARCHITECTURAL PLANS AND ELEVATIONS.
3. MECHANICAL AND ELECTRICAL TRADES SHALL WORK IN CONJUNCTION WITH EACH OTHER SO AS TO AVOID INTERFERENCES BETWEEN PIPING, DUCTWORK, CONDUIT, LIGHTING FIXTURES, ETC.
4. WORK IN CONJUNCTION WITH THE ARCHITECTURAL REFLECTED CEILING PLAN WHEN LOCATING LIGHT FIXTURES.
5. REVIEW ARCHITECTURAL, MECHANICAL, AND STRUCTURAL DRAWINGS AND PROVIDE ON SITE INSPECTIONS TO DETERMINE FULL EXTENT OF PROJECT PRIOR TO SUBMITTING BID.
6. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE ONTARIO BUILDING CODE (OBC), ONTARIO ELECTRICAL SAFETY CODE (OESC) AND THE LOCAL AUTHORITIES REQUIREMENTS.
7. THE ELECTRICAL CONTRACTOR SHALL COORDINATE THE INSTALLATION WITH THE WORK OF OTHER TRADES. PROVIDE HORIZONTAL AND/OR VERTICAL OFFSETS AS REQUIRED TO SUIT THIS COORDINATION.
8. REFER TO THE ARCHTECTURAL DRAWINGS FOR ALL WIRING DEVICE FINAL HEIGHT AND LOCATION.
9. ALL WIRING SHALL BE A MINIMUM #12 AWG IN CONDUIT SUITABLE FOR THE APPLICATION.
10. AC90 (BX) SHALL ONLY BE ALLOWED FOR SHORT RUNS OF LESS THAN 5 FEET IN LENGTH, UNLESS OTHERWISE NOTED.
11. ALL MATERIALS SHALL BEAR A CSA (CANADIAN STANDARDS ASSOCIATION LABEL.
12. ALL INTERIOR LIGHT SWITCHES, RECEPTACLES, AND DATA OUTLETS, INCLUDING CONDUITS SHALL BE "CONCEALED" WITIN THE WALL STRUCTURE.
13. ELECTRICAL SWITCHES, OUTLETS, PUSH-BUTTONS ETC. SHALL COMPLY WITH ACCESSIBILITY FOR ONTARIANS WITH DISABILITES ACT (AODA) FOR MOUNTING HEIGHTS AND LOCATION WHERE APPLICABLE.
14. EXIT SIGNS SHALL BE GREEN, EDGE-LIT, "RUNNING-MAN" PICTOGRAM C/W LED LIGHT SOURCE, ALUMINUM HOUSING, AND UNIVERSAL MOUNTING. WHERE HIGH CEILING EXIST PROVIDE A PENDANT MOUNT TYPE SUSPENDED FROM A THREADED ROD OR EMT CONDUIT AT THE HEIGHT SPECIFIED.
15. ALL UNIVERSAL WASHROOM HARDWARE DEVICES TO BE PROVIDED BY THE ELECTRICAL CONTRACTOR C/W WIRING AND CONDUIT FOR A COMPLETE INSTALLATION, UNLESS OTHERWISE NOTED.
16. ALL SECURITY DOOR ACCESS HARDWARE DEVICES SHALL BE SUPPLIED "BY OTHERS". THE ELECTRICAL CONTRACTOR SHALL PROVIDE ALL WIRING AND CONDUIT ROUGH-IN FOR A COMPLETE INSTALLATION, UNLESS OTHERWISE NOTED.
17. ALL COMMUNICATION CABLING TO BE PROVIDED BY THE ELECTRICAL CONTRACTOR C/W CONDUIT, OUTLET JACKS, AND FACE PLATES FOR A COMPLETE INSTALLATION, UNLESS OTHERWISE NOTED. MAXIMUM LENGTH OF ETHERNET CABLES SHALL BE 300 FEET.
18. ALL AUDIO/VISUAL DEVICES SHALL BE SUPPLIED "BY OTHERS". THE ELECTRICAL CONTRACTOR SHALL PROVIDE CONDUIT ROUGH-IN ONLY, UNLESS OTHERWISE NOTED.
19. POWER AND CONTROL WIRING FOR MECHANICAL EQUIPMENT ON THE ROOF MUST RISE WITHIN THE CURB UNLESS OTHERWISE NOTED.
20. ALL EXTERIOR OUTLET BOXES TO BE "CONCEALED" AND SHALL C/W A VAPOUR BARRIER CHAMBER TO PREVENT AIR LEAKAGE.
21. THE ELECTRICAL CONTRACTOR SHALL PROVIDE BALANCED PHASING (A,B,C) FOR ALL EQUIPMENT PANEL LOADS, ADJUST BREAKER SCHEDULES AS REQUIRED.
22. PROVIDE FIRE-STOP MATERIAL AS REQUIRED FOR ALL WALL AND FLOOR PENETRATIONS TO MAINTAIN THE SMOKE SEAL AND FIRE RATING. FOR RECESSED JUNCTION BOXES USE HILTI - FIRE BLOK.
23. PROVIDE ALL MATERIALS AND ACCESSORIES REQUIRED FOR A COMPLETE GROUNDING SYSTEM AS REQUIRED BY THE GOVERNING AUTHORITIES. GROUND ALL EQUIPMENT AND DEVICES AS REQUIRED AND IN ACCORDANCE WITH THE OESC.
24. UPON THE COMPLETION OF THE CONTRACT, ISSUE A FORMAL CERTIFICATE INDICATING THE DATE OF COMPLETION OF WORK. REPAIR OR REPLACE ANY DEFECTS WHICH MAY APPEAR IN ANY OF THE WORK WITHIN ONE (1) YEAR.

DEMOLITION NOTES

1. ELECTRICAL SYSTEMS SHOWN ON DEMOLITION PLANS ARE BASED ON INFORMATION OBTAINED FROM ORIGINAL CONSTRUCTION CONTRACT/TENDER DOCUMENTS. THESE DRAWINGS ARE NOT BASED ON 'AS-BUILT RECORD' OR ON EXHAUSTIVE FIELD MEASUREMENT AND ARE PROVIDED TO ASSIST THE CONTRACTOR IN DETERMINING THE EXTENT OF WORK REQUIRED. THE CONTRACTOR SHALL MAKE ALLOWANCE IN THEIR TENDER PRICE FOR THE REMOVAL OF ADDITIONAL ABANDONED SERVICES AND THE PROTECTION OF EXISTING SERVICES THAT MUST REMAIN. RECORD THE LOCATION OF ALL EXISTING SERVICES THAT REMAIN ON AS-BUILT RECORD DRAWINGS.

FIXTURE SCHEDULE

NOTES:

1. CONTRACTOR AND FIXTURE SUPPLIER ARE RESPONSIBLE TO PROVIDE ALL PLASTER AND FINISHING FRAMES, MOUNTING HARDWARE, AND ACCESSORIES TO SUIT ARCHITECTURAL CEILING SCHEDULE.

TYPE	DESCRIPTION	LAMPS	MTG
AA	2'X4' RECESSED LED TROFFER C/W 3500°K, 4800LM, 120V, 0-10V DIM, ACRYLIC LENS. LITHONIA CAT No. 2GTL-4-48L-120-GZ1-LP835 OR APPROVED EQUIVALENT	LED @ 35W	APPROX. 10' AFF REFER TO ARCH DWG
BB	4-INCH RECESSED LED DOWN LIGHT, C/W 3500°K, 120, 0-10V DIM, SEMI SPECULAR REFLECTOR, NO LENS, NO TRIM RING. LITELINE CAT No. ALR401-2635W-HCWH OR APPROVED EQUIVALENT	LED @ 22W	APPROX. 10' AFF REFER TO ARCH DWG
CC	LOW PROFILE, UNDER CABINET LIGHT C/W 3200K LED TAPE, ALUMINUM EXTRUDED HOUSING, FROSTED LENS, 120V DRIVER AND ACCESSORIES FOR A COMPLETE INSTALLATION. SENSO - KATANA CAT No. 555-815-500-095-32 OR APPROVED EQUIVALENT	LED @ 22W	APPROX. 10' AFF REFER TO ARCH DWG

LEGEND - LIGHTING SYSTEM

THIS LEGEND OF SYMBOLS REPRESENTS MANTECON PARTNERS INC. STANDARD LEGEND. ALL SYMBOLS MAY NOT APPEAR ON DRAWINGS.

SYMBOL	DESCRIPTION
	2'X2' FIXTURE
	2'X4' FIXTURE
	1'X4' FIXTURE
	4' STRIP FIXTURE
	4' STRIP FIXTURE - WALL
	POT LIGHT
	PENDANT
	WALL SCONCE
	TOGGLE SWITCH
	DUAL TOGGLE SWITCH
	TRIPLE TOGGLE SWITCH
	DIMMER SWITCH
	DUAL DIMMER SWITCH
	TRIPLE DIMMER SWITCH
	LOW VOLTAGE SWITCH
	SWITCH WITH MOTION SENSOR - WALL
	SWITCH WITH PIR MOTION SENSOR - 20 MIN DELAY - CEILING
	SWITCH WITH DUAL TECH. MOTION SENSOR - 20 MIN DELAY - CEILING
	SWITCH WITH PIR + DAYLIGHT MOTION SENSOR - 15 MIN DELAY - CEILING
	POWER PACK
	TIME CLOCK
	PHOTOCELL
	POLE MOUNTED LIGHT
	DAYLIGHT SENSOR

LEGEND - POWER SYSTEM

THIS LEGEND OF SYMBOLS REPRESENTS MANTECON PARTNERS INC. STANDARD LEGEND. ALL SYMBOLS MAY NOT APPEAR ON DRAWINGS.

SYMBOL	DESCRIPTION
	DUPLEX RECEPTACLE
	GFCI RECEPTACLE
	20A T-SLOT RECEPTACLE
	ISOLATED GROUND RECEPTACLE
	SINGLE RECEPTACLE
	QUAD RECEPTACLE
	DUPLEX RECEPTACLE - CEILING MOUNTED
	DIRECT CONNECTION
	NON FUSED DISCONNECT SWITCH
	FUSED DISCONNECT SWITCH
	NON-FUSED DIRECT CONNECTION
	MOTOR NON FUSED DISCONNECT
	MOTOR
	JIFFY/PAC POLE
	JUNCTION BOX
	CONTROL SWITCH
	RELAY
	ELECTRICAL PANEL
	GROUND BAR

LEGEND - EMERGENCY SYSTEM

THIS LEGEND OF SYMBOLS REPRESENTS MANTECON PARTNERS INC. STANDARD LEGEND. ALL SYMBOLS MAY NOT APPEAR ON DRAWINGS.

SYMBOL	DESCRIPTION
	EXIT SIGN - SINGLE FACE - CEILING
	EXIT SIGN - SINGLE FACE - WALL
	EXIT SIGN - SINGLE FACE DIRECTIONAL - CEILING
	EXIT SIGN - DOUBLE FACE DIRECTIONAL - CEILING
	SINGLE REMOTE HEAD - CEILING
	DOUBLE REMOTE HEADS - CEILING
	SINGLE REMOTE HEAD - WALL
	DOUBLE REMOTE HEADS - WALL
	BATTERY PACK W/ DOUBLE REMOTE HEADS - WALL

LEGEND - FIRE ALARM SYSTEM

THIS LEGEND OF SYMBOLS REPRESENTS MANTECON PARTNERS INC. STANDARD LEGEND. ALL SYMBOLS MAY NOT APPEAR ON DRAWINGS.

SYMBOL	DESCRIPTION
	HORN - WALL
	FIRE ALARM PULLSTATION
	HORN AND STROBE - WALL
	SMOKE DETECTOR - CEILING
	DUCT SMOKE DETECTOR
	SMOKE DETECTOR W/CARBON MONOXIDE - CEILING
	HEAT DETECTOR - CEILING
	SMOKE ALARM W/CARBON MONOXIDE & STROBE
	FLOW SWITCH
	PRESSURE SWITCH
	SUPERVISORY VALVE
ISO	LINE ISOLATOR
EOL	END OF LINE RESISTOR

LEGEND - SECURITY SYSTEM

THIS LEGEND OF SYMBOLS REPRESENTS MANTECON PARTNERS INC. STANDARD LEGEND. ALL SYMBOLS MAY NOT APPEAR ON DRAWINGS.

SYMBOL	DESCRIPTION
ES	ELECTRIC STRIKE
DC	DOOR CONTACT
ML	MAGLOCK
CR	CARD READER
	PUSH BUTTON
	SECURITY PANEL
	SECURITY INTERCOM
	SECURITY CAMERA
	PIR MOTION DETECTOR

LEGEND - SINGLE LINE DIAGRAM

THIS LEGEND OF SYMBOLS REPRESENTS MANTECON PARTNERS INC. STANDARD LEGEND. ALL SYMBOLS MAY NOT APPEAR ON DRAWINGS.

SYMBOL	DESCRIPTION
	BREAKER (MCCB)
	FUSED DISCONNECT SWITCH
	SWITCH
	FUSE
	DRAWOUT BREAKER
M	METER SOCKET
	TRANSFORMER
	GENERATOR
DMM	DIGITAL MULTIMETER
	AUTOMATIC TRANSFER SWITCH (ATS)
LSI	BREAKER WITH LSI PROTECTION
LSIG	BREAKER WITH LSIG PROTECTION
SPD	SURGE PROTECTION DEVICE

LEGEND - COMMUNICATIONS

THIS LEGEND OF SYMBOLS REPRESENTS MANTECON PARTNERS INC. STANDARD LEGEND. ALL SYMBOLS MAY NOT APPEAR ON DRAWINGS.

SYMBOL	DESCRIPTION
	DATA OUTLET
	TELEPHONE OUTLET
	DATA OUTLET - CEILING
	DATA OUTLET - FLOOR
	TELEPHONE AND DATA OUTLET
	COAXIAL OUTLET
	FURNITURE WHIP - DATA
	ANALOG CLOCK
	PUBLIC ADDRESS SPEAKER - CEILING
	PUBLIC ADDRESS SPEAKER AND CALL SWITCH
PA	PUBLIC ADDRESS PAGING SPEAKER AND HANDSET
WAP	WIRELESS ACCESS POINT

LEGEND - ABBREVIATION

THIS LEGEND OF SYMBOLS REPRESENTS MANTECON PARTNERS INC. STANDARD LEGEND. ALL SYMBOLS MAY NOT APPEAR ON DRAWINGS.

SYMBOL	DESCRIPTION
R	REMOVE
R/R	REMOVE AND REINSTALL
ER	EXISTING TO BE RELOCATED
EX	EXISTING TO REMAIN
GFI	GROUND FAULT INTERRUPT
NL	NIGHT LIGHT
WP	WEATHER-PROOF
ADO	AUTOMATIC DOOR OPENER
HD	HAND DRYER
D/W	DISHWASHER
F/R	REFRIGERATOR
M/W	MICROWAVE
TMP	TEMPORARY

LEGEND - LIGHTING SYSTEM

THIS LEGEND OF SYMBOLS REPRESENTS MANTECON PARTNERS INC. STANDARD LEGEND. ALL SYMBOLS MAY NOT APPEAR ON DRAWINGS.

SYMBOL	DESCRIPTION
	WALL SCONCE
	POLE MOUNTED LIGHT

EMERGENCY LIGHTING SCHEDULE

TYPE	DESCRIPTION	MANUFACTURER	LAMPS
E1	ALUMINUM RUNNING MAN SIGN CAT:RMXL-WH-UDC	STANPRO	LED
R1	MR16 SURFACE MOUNT DOUBLE REMOTE HEADS CAT:MR16-M2-12-24V-6W-LA-WH	STANPRO	LED
BU-1	COMBINATION STEEL COMBO WITH DUAL REMOTES CAT:SLC24144-2M-6LA-WH	STANPRO	LED

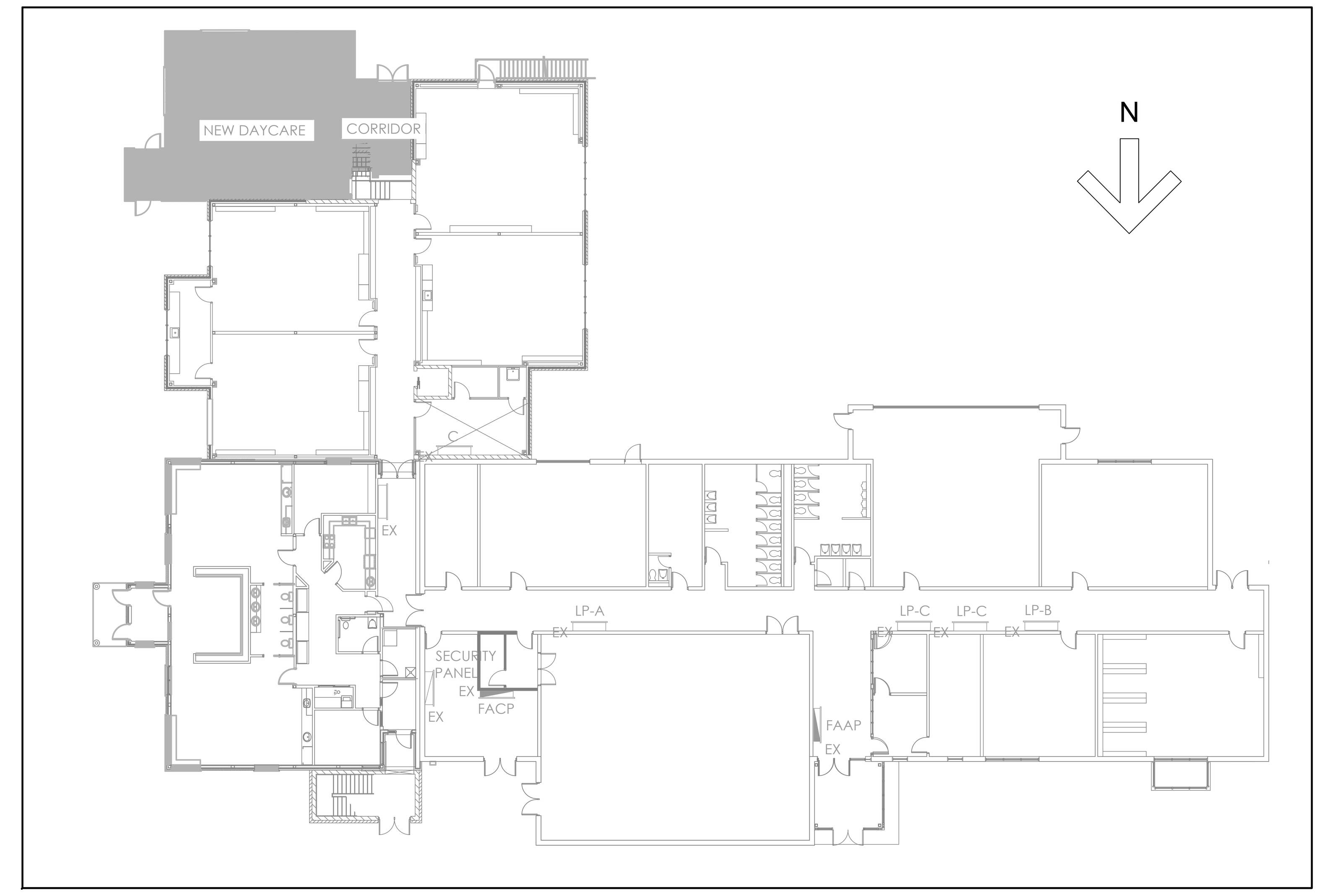
SITE LIGHTING SCHEDULE

TYPE	DESCRIPTION	MANUFACTURER	LAMPS	MH(m)	NO. OF FIXTURES
S1	LED WALL PACK 1396 LUMENS, 4000K, 70 CRI CAT:XTOR1B-W-BK	COOPER LIGHTING	LED	10	2
S1A	LED WALL PACK 2103 LUMENS, 4000K, 70 CRI CAT:XTOR2B-W-BK	COOPER LIGHTING	LED	12	1
S1B	LED WALL PACK 1396 LUMENS, 4000K, 70 CRI CAT:XTOR1B-W-BK	COOPER LIGHTING	LED	12	2
S2	LED POLE MOUNT FIXTURE WITH HOUSE SIDE SHIELD WITH TYPE IV DISTRIBUTION WITH SPILL CONTROL 11528 LUMENS, 4000K, 70 CRI CAT:LDRV-SL4-E04-E-HSS	COOPER LIGHTING	LED	25	2

LIGHTING CONTROL NARRATIVE

LIGHTING CONTROL NARRATIVE SHALL BE ACCOMPLISHED USING SWITCHES, POWER PACKS, 0-10V DIMMING AND OTHER WIRING METHODS. SUPPLIER SPECIFIC SYSTEMS SHALL NOT BE USED.

ROOM TYPE	DESCRIPTION
PRE-SCHOOL	LIGHTS AUTOMATIC ON 100%. IF NO MOTION IS DETECTED AFTER 20 MINUTES, OCCUPANCY SENSOR WILL TURN LIGHTS OFF. LOW-VOLTAGE SWITCH SHALL OVERRIDE LIGHTS AND PROVIDE DIMMING CONTROL.
VESTIBULE	LIGHTS AUTOMATIC ON 100%. IF NO MOTION IS DETECTED AFTER 20 MINUTES, OCCUPANCY SENSOR WILL TURN LIGHTS OFF.
BATHROOM	LIGHTS AUTOMATIC ON 100%. IF NO MOTION IS DETECTED AFTER 20 MINUTES, OCCUPANCY SENSOR WILL TURN LIGHTS OFF. LOW-VOLTAGE SWITCH SHALL OVERRIDE LIGHTS.
STAIRWELL	LIGHTS AUTOMATIC ON 100%. IF NO MOTION IS DETECTED AFTER 20 MINUTES, OCCUPANCY SENSOR WILL TURN LIGHTS OFF.



1 E0.1 KEY PLAN
SCALE: 1 : 300

MANTECON PARTNERS
STRUCTURAL MECHANICAL ELECTRICAL CIVIL ENGINEERS
15 Foundry Street, Dundas, ON, L9H 2V6
Phone: (905)648-0373
www.manteconpartners.com

No.	Revisions:	Date:
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1	ISSUED FOR REVIEW	2022/03/01

MPI Project No: 21-153
Scale: N.T.S
Drawn by: MZE
Plot Date: FEB. 11, 2022
Issue Date:

PRESCHOOL DAY CARE ADDITION
Ecole elementaire catholique Saint-Marguerite-Bourgeoys
60 Clench Avenue, Brantford, Ontario N3T 1B9

GENERAL NOTES & LEGENDS

E0.1

ELECTRICAL SPECIFICATIONS

PART 1 - GENERAL

1. DEFINITIONS: FOLLOWING ARE DEFINITIONS OF WORDS FOUND IN THIS SPECIFICATION AND ON ASSOCIATED DRAWINGS.
   a. "CONCEALED" - HIDDEN FROM NORMAL SIGHT IN FURRED - SPACES, SHAFTS, CEILING SPACES, WALLS, UNDERFLOOR, AND PARTITIONS.
   b. "EXPOSED" - ALL ELECTRICAL WORK VISIBLE TO BUILDING OCCUPANTS.
   c. "PROVIDE" - (AND ALL TENSES OF "PROVIDE") SUPPLY INSTALL, WIRE AND CONNECT COMPLETE.
   d. "INSTALL" - (AND ALL TENSES OF "INSTALL") - INSTALL, WIRE AND CONNECT COMPLETE, PRODUCTS AND SERVICES SPECIFIED.
   e. "SUPPLY" - SUPPLY ONLY.
   f. "FINISHED AREA" - ANY AREA OR PART OF AN AREA WHICH RECEIVES A FINISH SUCH AS PAINT, OR IS FACTORY FINISHED.
   g. "GOVERNING AUTHORITY" AND/OR "REGULATORY AUTHORITY" AND/OR "MUNICIPAL AUTHORITY" - ALL GOVERNMENT DEPARTMENTS, AGENCIES, STANDARDS, RULES AND REGULATIONS THAT APPLY TO AND GOVERN THE ELECTRICAL WORK AND TO WHICH THE WORK MUST ADHERE.
   h. "OR APPROVED EQUAL" - MATERIAL OR EQUIPMENT PROPOSED BY CONTRACTOR, IN LIEU OF THAT SPECIFIED, AS APPROVED BY CONSULTANT.
   i. "AS INDICATED" - AS SHOWN ON DRAWINGS AND/OR NOTED IN SPECIFICATIONS.
   j. "CONSULTANT" - ARCHITECT OR CONSULTING ENGINEER WHO HAS PREPARED THE CONTRACT DOCUMENTS ON BEHALF OF THE OWNER.
2. PROVIDE ALL WORK AND MATERIALS IN ACCORDANCE WITH THE LATEST EDITIONS OF THE ONTARIO ELECTRICAL SAFETY CODE, THE ONTARIO BUILDING CODE, APPLICABLE CSA AND ULC STANDARDS, THE REQUIREMENTS OF THE ELECTRICAL SAFETY AUTHORITY AND ALL OTHER APPLICABLE MUNICIPAL AND PROVINCIAL CODES AND REGULATIONS. ANY MATERIALS, EQUIPMENT OR INSTALLATIONS NOT MEETING ALL REQUIREMENTS OF THE APPROPRIATE REGULATORY AGENCIES WILL NOT BE ACCEPTED. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THESE REQUIREMENTS ARE MET AND PROVIDE EVIDENCE OF SUCH AS REQUESTED.
3. CAREFULLY EXAMINE THE SITE AND TENDER DOCUMENTS FOR THE WORK IN ACCORDANCE WITH THE INSTRUCTIONS TO BIDDERS. VISIT THE EXISTING BUILDING AND BECOME FAMILIAR WITH EXISTING ARCHITECTURAL, STRUCTURAL AND MECHANICAL CONDITIONS, THE LOCATION OF EXISTING ELECTRICAL EQUIPMENT AND INSTALLATIONS, AND OTHER FACTORS RELATED TO THE WORK TO BE DONE. NO EXTRA CHARGES WILL BE CONSIDERED FOR ANYTHING WHICH COULD HAVE BEEN REVEALED IN THE COURSE OF SUCH EXAMINATIONS.
4. THE ELECTRICAL CONTRACTOR SHALL BE HELD RESPONSIBLE FOR THE SATISFACTORY COMPLETION OF ALL WORK BEARING UPON THE ELECTRICAL TRADE. PLAN WORK WELL IN ADVANCE TO ELIMINATE DELIVERY AND INSTALLATION DIFFICULTIES. CO-ORDINATE WORK WITH OTHER TRADES TO PREVENT CONFLICTS ON SITE AND RESOLVE INTERFERENCES. PROVIDE WORK IN STAGES AND AT TIMES REQUIRED BY THE PROJECT SCHEDULE.
5. ALL ELECTRICAL WORK SHALL BE COMPLETED TO BUILDING OWNER REQUIREMENTS AND BUILDING STANDARDS IN ACCORDANCE WITH THE RELEVANT SECTIONS, ARTICLES AND DETAILS OF THE BASE BUILDING SPECIFICATIONS AND DRAWINGS.
6. OBTAIN AND PAY FOR PERMITS REQUIRED BY THE ELECTRICAL SAFETY AUTHORITY (ESA) AND LOCAL INSPECTION AUTHORITIES FOR THIS WORK. PRESENT FINAL CERTIFICATES TO CONSULTANT AND OWNER.
7. ALL WORK SHALL BE PROVIDED BY QUALIFIED JOURNEYMAN ELECTRICIANS OR APPRENTICES HOLDING VALID ONTARIO CERTIFICATES OF QUALIFICATION AND BE SUPERVISED BY A COMPETENT FOREMAN.
8. PRIOR TO THE CONSULTANT RELEASING THEIR COMPLIANCE LETTER THE WORK MUST BE COMPLETE AND SAFE. THE FOLLOWING DOCUMENTATION MUST BE SUBMITTED WITH NO DEFICIENCIES:
   a. ESA INSPECTION CERTIFICATE
   b. FIRE ALARM VERIFICATION REPORT (WITHOUT EXCEPTIONS)
   c. FIRE ALARM AUDIBILITY REPORT (WITHOUT EXCEPTIONS)
   d. EMERGENCY LIGHTING TESTING REPORT
9. CARRY OUT ALL WORK IN ACCORDANCE WITH ONTARIO ELECTRICAL SAFETY CODE (OESC) REGULATIONS INCLUDING BULLETINS, AND ELECTRICAL SAFETY AUTHORITY INSPECTION REQUIREMENTS.
10. PAY ALL FEDERAL AND PROVINCIAL SALES TAXES APPLICABLE.
11. ALL EQUIPMENT SHALL BE NEW AND CSA (OR EQUIVALENT PER OESC) APPROVED UNLESS OTHERWISE NOTED.
12. MATERIALS SUPPLIED SHALL CONFORM TO MINIMUM PUBLISHED REQUIREMENTS AND RECOMMENDATIONS, OR BETTER, OF APPLICABLE STANDARDS OF:
    - CSA - CANADIAN STANDARDS ASSOCIATION
    - EEMAC - ELECTRICAL AND ELECTRONIC MANUFACTURERS' ASSOCIATION OF CANADA
    - NEMA - NATIONAL ELECTRICAL MANUFACTURERS' ASSOCIATION
    - ULC - UNDERWRITERS LABORATORIES OF CANADA LTD.
    - OESC - ONTARIO ELECTRICAL SAFETY CODE
    - ESA - ELECTRICAL SAFETY AUTHORITY
    - OBC - ONTARIO BUILDING CODE
13. DRAWINGS WHICH ACCOMPANY THESE SPECIFICATIONS ARE DIAGRAMMATIC AND SHOW THE REQUIRED DISTRIBUTION, NUMBER AND LOCATIONS OF THE ELECTRICAL EQUIPMENT, FIXTURES AND OUTLETS, AND INDICATE SUGGESTED CIRCUITING. DO NOT SCALE DRAWINGS BUT USE ONLY DIMENSIONS WHICH ARE SHOWN. WHERE EXACT BUILDING DIMENSIONS AND DETAILS ARE REQUIRED, USE ONLY DIMENSIONS FROM THE ARCHITECTURAL DRAWINGS OR JOB SITE DIMENSIONS.
14. KEEP A COMPLETE AND SEPARATE SET OF PRINTS ON SITE AT ALL TIMES AND NOTE THEREON CLEARLY, NEATLY, ACCURATELY AND PROMPTLY ALL ARCHITECTURAL, STRUCTURAL, MECHANICAL AND ELECTRICAL CHANGES, REVISIONS AND ADDITIONS TO THE WORK AND DEVIATIONS FROM THE CONTRACT DOCUMENTS. ACCURATE LOCATIONS, DEPTH, SIZE AND TYPE OF UNDERGROUND UTILITIES SHALL BE INCLUDED IN THESE RECORD DRAWINGS. INDICATE ALSO ON THE RECORD DRAWINGS THE LOCATION OF ACCESS PANELS OR REMOVABLE CEILING TILES WHICH COVER EQUIPMENT OR JUNCTION BOXES WHICH MAY REQUIRE FUTURE ACCESS OR WHERE CONDUIT OR WIRING FOR FUTURE USE IS LOCATED. THE FINAL AS-BUILT DRAWINGS SHALL BE SUBMITTED AT THE COMPLETION OF THE PROJECT WITH AN APPLICATION FOR A CERTIFICATE OF TOTAL PERFORMANCE. INDICATE IN RED INK ON AS-BUILT DRAWINGS ALL DEVIATIONS AND APPROVED CHANGES FROM THE CONTRACT DRAWINGS.
15. SUBMIT FOR REVIEW A SINGLE (1) SET OF SHOP DRAWINGS AND DATA SHEETS IN EITHER .PDF OR HARD COPY FORMAT COVERING ALL ITEMS OR EQUIPMENT TO BE INSTALLED UNDER THE CONTRACT. SHOP DRAWINGS SHALL SHOW ALL RELEVANT PERFORMANCE AND INSTALLATION INFORMATION. EQUIPMENT WILL NOT BE ACCEPTED ON SITE UNTIL REVIEW OF SHOP DRAWINGS IS COMPLETE. SUBMIT SHOP DRAWINGS FOR LIGHTING FIXTURES, EXIT LIGHTS, EMERGENCY LIGHTS AND BATTERY UNITS, STARTERS, FIRE ALARM, VOICE/DATA WIRING, AND OTHER SYSTEMS SPECIFIED IN THIS PROJECT TO CONSULTANT FOR REVIEW.
16. ARCHITECTURAL SPECIFICATIONS AND DRAWINGS SHALL BE REVIEWED IN CONJUNCTION WITH THESE DRAWINGS AS THEY ARE PART OF THIS WORK.
17. COORDINATE WITH ALL TRADES AND ARRANGE EQUIPMENT IN PROPER RELATION WITH OTHER APPARATUS, DUCTS, PIPES, ETC., AND WITH BUILDING CONSTRUCTION AND ARCHITECTURAL FINISHES.
18. IN GENERAL, ALL NECESSARY CUTTING AND PATCHING FOR THE ELECTRICAL WORK SHALL BE PROVIDED BY THE APPROPRIATE TRADE AT THE EXPENSE OF THE CONTRACTOR UNLESS INDICATED OTHERWISE ON THE DRAWINGS. HOLES THROUGH EXTERIOR WALLS AND ROOF ARE TO BE PROPERLY FLASHED AND MADE WEATHERPROOF. REPAIR ANY DAMAGE CAUSED BY THE ELECTRICAL TRADE TO EXISTING BUILDINGS OR EQUIPMENT, ETC., TO THE OWNER'S SATISFACTION. IN GENERAL, PAINTING OF ELECTRICAL WORK AND PATCHES AS REQUIRED WILL BE PROVIDED BY THE ELECTRICAL TRADE.
19. PROVIDE ALL EXCAVATION, TRENCHING, BACKFILLING, COMPACTION AND CONCRETE REQUIRED FOR THE ELECTRICAL WORK UNLESS OTHERWISE INDICATED. ALL EXCAVATIONS SHALL BE BACKFILLED WITH CLEAN MATERIALS (SAND TO 100 mm (4") COVER ALL AROUND FOR DIRECT BURIED CONDUIT OR CABLES) AND BE POWER COMPACTED TO A MINIMUM OF 100% PROCTOR UNLESS INDICATED OTHERWISE. ALL CONCRETE SHALL BE FORMED IN PLACE, BE RATED MINIMUM 25 MPa AND BE PROVIDED AS A CONTINUOUS POUR. PROVIDE STEEL REINFORCEMENT WHERE INDICATED. CONCRETE ENCASED DUCTS SHALL BE PROVIDED WITH A MINIMUM 75 mm (3") CONCRETE ENVELOPE. RESTORE TO ORIGINAL CONDITION ALL SURFACES, LANDSCAPING, ETC. DISTURBED BY EXCAVATION WORK.
20. MATERIALS REMOVED AND NOT REUSED WILL BECOME OWNERS PROPERTY, AND SHALL BE DISPOSED OF FROM THE SITE PRIOR TO COMPLETION OF WORK AS DIRECTED BY OWNER.
21. THOROUGHLY CLEAN ALL ELECTRICAL EQUIPMENT DURING CONSTRUCTION AND ON COMPLETION OF CONTRACT. REMOVE ALL ELECTRICAL DEBRIS FROM THE SITE.
22. PROVIDE LEGIBLE SIGNS AND BARRIERS ON OR AROUND ALL LIVE PANELS AND EQUIPMENT DURING CONSTRUCTION TO PREVENT INJURY OR SHOCK.
23. TEST ALL EQUIPMENT AND WIRING AT ANY TIME REQUESTED BY THE OWNER AS PART OF THE CONTRACT. PROVIDE ALL METERS, MATERIALS AND LABOUR REQUIRED TO CARRY OUT THIS WORK. PRIOR TO CONNECTION OF ADDITIONAL LOADS TO EXISTING SOURCES, ENSURE THROUGH LOAD MEASUREMENT AND MONITORING THAT THE REQUIRED EXCESS CAPACITY IS AVAILABLE.
24. UPON COMPLETION OF THE ELECTRICAL INSTALLATIONS, TRIAL OPERATE ALL EQUIPMENT, SYSTEMS AND DEVICES TO ENSURE CORRECT FUNCTIONING. FOLLOWING SATISFACTORY TRIAL OPERATION, INSTRUCT THE OWNER'S REPRESENTATIVE REGARDING OPERATION AND MAINTENANCE OF THE SYSTEMS AND EQUIPMENT INSTALLED.
25. PERFORM ALL WORK IN SUCH A MANNER AS TO CAUSE AS LITTLE DISTURBANCE OR INCONVENIENCE AS POSSIBLE TO THE EXISTING OPERATIONS. WHERE DEEMED NECESSARY BY THE OWNER OR CONSULTANT, PROVIDE TEMPORARY MEASURES AS REQUIRED TO MAINTAIN

ELECTRICAL SPECIFICATIONS

SPECIFIC SERVICES AND/OR PROVIDE WORK OUTSIDE REGULAR HOURS AT NO ADDITIONAL COST. DO NOT INTERRUPT ANY ELECTRICAL SERVICES WITHOUT PRIOR AUTHORIZATION.

26. PROVIDE ALL SLEEVES, INSERTS, HANGERS AND CORE DRILLING OF SLAB REQUIRED FOR THE ELECTRICAL WORK. TREAT ALL SLEEVES OR HOLES PIERCING ACOUSTICAL SEPARATIONS FOR INSTALLATIONS OF THIS DIVISION TO MAINTAIN ACOUSTICAL RATING. ALL GAPS SHALL BE PACKED WITH ACOUSTICAL INSULATION AND SEALED AT BOTH ENDS WITH ACOUSTICAL CAULKING. PATCH ALL OPENINGS AROUND INSTALLATIONS OF THIS DIVISION PIERCING FIRE OR SMOKE SEPARATIONS WITH AN APPROVED WATERTIGHT SMOKE AND FIRE STOP SEALANT.
27. X-RAY FLOOR SLAB OR STRUCTURAL WALLS AND SUBMIT RESULTS TO THE CONSULTANT FOR REVIEW AND APPROVAL, COMPLETE WITH PROPOSED LOCATIONS OF NEW PENETRATIONS, PRIOR TO DRILLING. CORE DRILLING SHALL BE CARRIED OUT AFTER NORMAL WORKING HOURS AT A TIME ACCEPTABLE TO THE OWNER. ALL COSTS ASSOCIATED WITH THIS WORK SHALL BE INCLUDED IN THE BID PRICE.
28. PROVIDE ALL ACCESS DOORS REQUIRED FOR THE ELECTRICAL INSTALLATIONS. ACCESS DOOR SIZE, TYPE AND FIRE RATING SHALL BE IN ACCORDANCE WITH THE ARCHITECTURAL SPECIFICATIONS AND CONDITIONS.
29. GENERALLY, MOUNT EQUIPMENT AS CLOSE AS PRACTICAL TO THE LOCATION SHOWN ON THE DRAWINGS TAKING INTO CONSIDERATION SITE CONDITIONS. ENSURE ALL EQUIPMENT IS LOCATED IN A MANNER ALLOWING EASY ACCESS FOR MAINTENANCE, REPAIR OR ADJUSTMENT. CONFIRM ALL ARCHITECTURAL CONDITIONS SUCH AS GLAZING, DOOR SWINGS, FURNITURE AND EQUIPMENT TYPES AND LAYOUTS, ETC., ON SITE PRIOR TO INSTALLING ANY RELATED ITEM OR WIRING.
30. REFER TO LIGHTING CONTROL SEQUENCE OF OPERATION FOR EACH SPACE. CONTRACTOR SHALL PROVIDE A COMPLETE SYSTEM CONSISTING OF ALL CONTROL DEVICES, WIRING, CONNECTIONS,ETC. AS REQUIRED.
31. THE OWNER RESERVES THE RIGHT TO RELOCATE ANY FIXTURE, OUTLET, DEVICE, EQUIPMENT, ETC., UP TO 3 m (10') PRIOR TO INSTALLATION WITHOUT INCURRING ANY EXTRA COST. CONFIRM LOCATIONS, MOUNTING HEIGHT AND ARRANGEMENT OF ALL OUTLETS ON SITE PRIOR TO INSTALLATION.
32. PROVIDE SPRINKLERPROOF HOODS AND DOORS FOR ELECTRICAL EQUIPMENT INSTALLED IN SPRINKLERED AREAS.
33. IF ASBESTOS MATERIAL IS ENCOUNTERED, STOP WORK IN THE AFFECTED AREA IMMEDIATELY AND NOTIFY THE CONSULTANT AND OWNER.
34. GUARANTEE ALL MATERIAL AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM DATE OF ACCEPTANCE BY OWNER/CONSULTANT. PROVIDE WRITTEN GUARANTEE.
35. OWNER RESERVES RIGHT TO TRIAL AND/OR TEMPORARY USAGE PRIOR TO ACCEPTING INSTALLATION.
36. ON COMPLETION OF PROJECT AND BEFORE FINAL PAYMENT, SUBMIT:
    a. ONE (1) SET OF AUTOCAD AS-BUILT DRAWINGS WITH ALL CHANGES AND BURIED SERVICES EXACT LOCATIONS NOTED THEREON. ARRANGE COMPUTER FILE IN LAYERS TO EXACTLY MATCH THE LAYERING SYSTEM OF THE CONSULTANT. DRAWING SHALL HAVE THE ELECTRICAL CONTRACTORS LOGO AND CONTACT INFORMATION ISSUED FOR AS BUILT WITH THE CURRENT DATE.
    b. ONE (1) SET OF PDF'S AS-BUILT DRAWINGS WITH ALL CHANGES AND BURIED SERVICES EXACT LOCATIONS NOTED THEREON. PLOT USING THE CONSULTANT CTB FILE. DRAWING SHALL HAVE THE ELECTRICAL CONTRACTORS LOGO AND CONTACT INFORMATION, ISSUED FOR AS BUILT WITH THE CURRENT DATE.
    c. SUBMIT THREE (3) COPIES (BOTH ELECTRONIC (CD) AND HARDCOPIES) OF MAINTENANCE DATA AND OPERATING INSTRUCTIONS IN A HARD-BACK, 3 RING BINDER, EACH OF WHICH IS TO INCLUDE:
       - 1 COPY OF EACH SHOP DRAWING (REVISED AS PER THE REVIEWED DRAWINGS).
       - 1 COPY OF EQUIPMENT PARTS LIST.
       - 1 COPY OF RECOMMENDED LIST OF SPARE PARTS.
       - 1 COPY OF OPERATING AND MAINTENANCE INSTRUCTIONS.
       - 1 COPY OF EQUIPMENT INSTALLATION DETAILS, CONSTRUCTION AND PERFORMANCE DATA.
       - 1 LIST OF ALL MANUFACTURING AND EQUIPMENT SERVICE DEPOTS INCLUDING TELEPHONE NUMBERS.
       - 1 COPY OF THE ELECTRICAL SAFETY AUTHORITY FINAL INSPECTION CERTIFICATE.
       - 1 COPY OF THE EMERGENCY LIGHTING TEST RESULTS
       - 1 COPY OF THE FIRE ALARM VERIFICATION CERTIFICATE
       - 1 COPY OF ANY OTHER CERTIFICATES, APPROVAL LETTERS, ETC.

38. WIRING AND CONDUIT SHALL BE CONCEALED IN WALLS OR ABOVE CEILINGS UNLESS OTHERWISE APPROVED.
39. SUPPLY, INSTALL, WIRE AND CONNECT ALL EQUIPMENT SHOWN, SPECIFIED OR MENTIONED.
40. PROVIDE WIREGUARD ON DEVICES WHERE INDICATED.

PART 2 - PRODUCTS

IDENTIFICATION FOR ELECTRICAL SYSTEMS

39. PROVIDE LAMACOID LABELS (3-PLY) WHITE LETTERED ON BLACK BACKGROUND- 1/4" HIGH LETTERING ON ALL ELECTRICAL EQUIPMENT SUPPLIED, MOUNTED AND/OR CONNECTED BY THIS CONTRACT.
40. PROVIDE BRADY LABELING ON ALL RECEPTACLE COVER PLATES INDICATING PANEL AND CIRCUITING NUMBER CONNECT BY THIS CONTRACT.

WIRE AND CABLE

41. ALL WIRING SHALL BE COLOUR CODED AS PER OESC AND BE IDENTIFIED WITH BRADY OR EQUIVALENT SELF-STICKING PERMACODE WIRE MARKERS.
42. IN GENERAL, ALL WIRING SHALL BE TYPE R90 XLPE INSTALLED IN CONDUIT OR RACEWAYS UNLESS OTHERWISE SPECIFIED. USE ONLY COPPER CONDUCTORS, MINIMUM SIZE NO. 12, SIZED AND COLOUR CODED ACCORDING TO THE ELECTRICAL SAFETY CODE WHERE NOT INDICATED.
43. SIZE ALL WIRING FOR A MAXIMUM OF 3% VOLTAGE DROP IN A FEEDER OR BRANCH CIRCUIT, AND 5% VOLTAGE DROP FROM THE SUPPLY SIDE OF THE CONSUMER SERVICE TO THE POINT OF UTILIZATION.
44. T90 NYLON MAY BE USED IN LIEU OF R90 FOR INTERIOR INSTALLATIONS UP TO SIZE #10, HOWEVER, CONDUIT FILL SHALL BE BASED ON R90 RATING.
45. THE USE OF FLEXIBLE CABLE (TYPE AC90 ONLY) IS TO BE RESTRICTED TO INTERIOR PARTITION WALLS, ACCESSIBLE CEILING SPACES AND FINAL CONNECTIONS TO LIGHT FIXTURES. THE FLEXIBLE CABLE SHALL BE RESTRICTED TO 3600 mm (12') IN LENGTH AND BE SUITABLY CLIPPED AND SUPPORTED EVERY 900 mm (3').
46. ALL 120 V (SINGLE PHASE) BRANCH CIRCUITS SHALL BE PROVIDED WITH A SEPARATE NEUTRAL CONDUCTOR FOR EACH CIRCUIT. PIGTAIL CONNECT NEUTRAL CONDUCTORS AT ALL DEVICES. JOIN ALL CONDUCTORS USING APPROVED SOLDERLESS WING NUT PRESSURE CONNECTORS.
47. ALL WIRING SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS, ALL REGULATORY REQUIREMENTS AND SHALL SATISFY ALL APPLICABLE CODES. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CHECK AND REPLACE AS REQUIRED ANY EXISTING WIRING BEING RE-USED.
48. FEEDERS AND BRANCH CIRCUITS RATED 100 AMPERES OR GREATER SHALL BE CHECKED WITH A 1000 V MEGGAR FOR 15 SECONDS BEFORE ENERGIZATION.
49. WIRE AND CONNECT MOTORS, SUPPLIED BY OTHERS, AS INDICATED.
50. BX (AC-90) CABLE IS ONLY PERMITTED TO LIGHT FIXTURES WITH A MAXIMUM LENGTH OF 1500mm.
51. PROVIDE VFD CERTIFIED CABLES ON THE LOAD SIDE OF VFD'S TO MOTOR TERMINAL CONNECTIONS. COORDINATE WITH EQUIPMENT AND CABLE SUPPLIER RECOMMENDATIONS TO MATCH MOTOR LOAD REQUIREMENTS.

RACEWAYS AND BOXES

52. PROVIDE OUTLET BOXES OF ADEQUATE SIZE OF TYPE APPROVED FOR THE PARTICULAR APPLICATION AS REQUIRED FOR ALL WIRING DEVICES, LIGHT FIXTURES, ETC., OR AS SHOWN. PROVIDE JUNCTION BOXES, COMPLETE WITH BLANK COVERS AS REQUIRED OR SHOWN FOR ALL WIRING SYSTEMS. INSTALL ALL BOXES TO BE ACCESSIBLE, IF NECESSARY PROVIDE ACCESS PANELS. SECURE ALL BOXES INDEPENDENT OF THE CONDUIT/WIRING SYSTEM.
53. IN ALL CASES USE ONLY CONDUIT AND RACEWAYS APPROVED FOR THE PARTICULAR APPLICATION AND OF ADEQUATE SIZE TO SUIT TYPE AND NUMBER OF CONDUCTORS BEING CARRIED. PROVIDE A SEPARATE GROUND CONDUCTOR IN ALL CONDUITS. THE CONDUIT SYSTEM SHALL NOT BE USED AS THE GROUND PATH. WHERE INDICATED, USE CONDUIT AS SPECIFIED. EVERY CONDUIT OR SECTION OF ARMOURED CABLE SHALL BE ADEQUATELY SECURED USING APPROVED SUPPORTS, CLAMPS AND FASTENERS TO ENSURE A SAFE AND SOUND INSTALLATION. ALL CONDUIT OR ARMOURED CABLE RUN IN FINISHED AREAS SHALL BE CONCEALED IN WALLS, CEILINGS OR FURRING UNLESS OTHERWISE INDICATED OR APPROVED BY THE OWNER. ARMOURED CABLE SHALL NOT BE USED WHERE EXPOSED UNLESS OTHERWISE NOTED.
54. BOXES FOR OUTDOOR USE: GALVANIZED CAST FERRALLOY COMPLETE WITH NEOPRENE GASKET.
55. BOXES FOR INDOOR USE: CODE GAUGE ELECTRO-GALVANIZED STEEL FOR CONCEALED MOUNTING AND GALVANIZED CAST FERRALLOY OR CAST BRUSHED ALUMINUM FOR EXPOSED USE, UNLESS OTHERWISE NOTED.
56. FIXTURE BOXES: ELECTRO-GALVANIZED STEEL 100mm (4") OCTAGON COMPLETE WITH 10mm (3/8") FIXTURE STUD WHERE NECESSARY.
57. WHERE OUTLET BOXES ARE INSTALLED IN EXTERIOR WALLS AND/OR INSULATED CEILING HAVING ASSOCIATED VAPOUR BARRIERS ON THE WARM SIDE OF THE INSULATION AND WHERE OUTLET BOXES PERFORATE THE VAPOUR BARRIER, PROVIDE ELECTRICAL BOX VAPOUR BARRIERS BEHIND AND AROUND OUTLET BOXES. VERIFY EXACT REQUIREMENTS ON SITE PRIOR TO PROCEEDING WITH INSTALLATIONS.
58. ALL JUNCTION BOXES IN CONCEALED CEILING SPACES SHALL BE LABELED WITH PEN MARKER AS TO CIRCUITS CONTAINED THEREIN.

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59. SWITCHES AND RECEPTACLE BOXES SHALL BE 1104 TYPE FOR RECESSED MOUNTING.
60. RIGID METAL CONDUIT SHALL BE USED WHERE INSTALLED AS AN EXTERIOR BRANCH CIRCUIT ABOVE FINISHED GRADES. ALL FITTINGS MUST BE THREADED TYPE. ALL CONDUIT TERMINATIONS SHALL HAVE BUSHINGS WITH INSULATED PLASTIC LINING. RIGID METAL EXPANSION JOINT - CROUSE HINDS "XJ" SERIES WITH BONDING STRAP OR EQUIVALENT.
61. IN AREAS WITH SOLID CEILINGS, ELECTRICAL AND SYSTEMS JUNCTION BOXES ALONG WITH ASSOCIATED WIRE AND CONDUIT SHALL BE LOCATED IN AREAS WHERE CEILING ACCESS IS POSSIBLE, OR ACCESS PANELS MAY BE PROVIDED WITH THE APPROVAL OF THE OWNER OR CONSULTANT.
62. EMT CONDUIT SHALL BE USED FOR WIRING AND CONCEALED WHEREVER POSSIBLE. EMT COUPLINGS AND CONNECTORS SHALL BE STEEL SETSCREW CONCRETE TIGHT OR STEEL COMPRESSION RAIN TIGHT.
63. ALL CONDUIT IN PUBLIC AREAS WITH EXPOSED CEILING MUST BE PAINTED EMT. PAINT COLOUR TO BE CONFIRMED BY ARCHITECT.

EMERGENCY/EXIT LIGHTING

64. EXIT SIGNS SHALL BE CSA APPROVED, PICTOGRAM GREEN "RUNNING-MAN" ON WHITE BACKGROUND MADE OF DURABLE EXTRUDED ALUMINUM HOUSING C/W WHITE FINISH, WHITE LED SOURCE, ENERGY EFFICIENT, AND UNIVERSAL MOUNTING.
65. REMOTE HEADS SHALL BE 4-WATT HEAD, COMPATIBLE WITH THE VOLTAGE SUPPLIED, IMPACT RESISTANT, FLAME RETARDANT THERMOPLASTIC, ROTATIONAL, SUPPLIED WITH A CANOPY C/W WHITE FINISH.
66. PROVIDE COMPLETE 12V DC BATTERY POWERED EMERGENCY LIGHTING SYSTEMS FOR THE BUILDING AREAS INDICATED. SYSTEMS SHALL CONSIST OF FULLY AUTOMATIC BATTERY UNITS (SPECIFIED WATTS FOR 1/2 HOUR) WITH MOUNTING BRACKET AND REMOTE LAMP HEADS AS SHOWN ON DRAWINGS. EMERGENCY BATTERY UNITS SHALL BE C/W BATTERY DISCONNECT SWITCH (70% OF NORMAL VOLTAGE) AND AUTOTEST AND AUTOMATED SELF-DIAGNOSTIC CIRCUITRY COMPLYING WITH C.S.A. AND N.B.C. REQUIREMENTS.
67. THE EMERGENCY BATTERIES SHALL BE LONG LIFE LEAD-ACID, CALCIUM ALLOY TYPE IN SEALED PLASTIC CONTAINERS AND BE TOTALLY MAINTENANCE FREE WITH A MINIMUM LIFE EXPECTANCY OF 10 YEARS.
68. THE BATTERY CAPACITY SHALL BE SIZED TO SUPPLY THE NUMBER OF FIXTURES INDICATED ON THE DRAWINGS, PLUS HAVE AN ADDITIONAL MINIMUM 10% SPARE CAPACITY FOR FUTURE HEADS. THE BATTERIES SHALL BE CAPABLE OF PROVIDING POWER TO THE FIXTURES FOR THIRTY MINUTES WITHOUT DROPPING BELOW NINETY-ONE (91) PERCENT OF THE RATED BATTERY VOLTAGE.
69. PROVIDE GREY COLOURED CONDUCTORS IN A SEPARATE CONDUIT SYSTEM, FOR THE D.C. WIRING. WIRE SYSTEM IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS TO MAINTAIN VOLTAGE DROP TO LESS THAN 5% TO FURTHEST FIXTURE. CONNECT REMOTE LAMP HEADS AND EXIT SIGN EMERGENCY SOCKETS TO BATTERY UNIT INDICATED. INSTALL A SINGLE RECEPTACLE ADJACENT TO BATTERY UNIT FOR CONNECTION TO BATTERY SUPPLY FROM A LOCAL LIGHTING CIRCUIT. MOUNTING PLATFORMS AND ACCESSORIES SHALL BE PROVIDED FOR A PERMANENT AND SAFE INSTALLATION OF THE BATTERY UNITS.

LIGHTING

70. LED FIXTURES: MINIMUM TEMPERATURE OF 3000K FOR RESIDENTIAL, 3500K FOR COMMERCIAL AND 4000K FOR EXTERIOR OR NOTED OTHERWISE. ACCEPTABLE MANUFACTURES AS PER LUMINAIRE SCHEDULE.
71. PROVIDE ALL LIGHT FIXTURES AS SPECIFIED ON THE DRAWINGS COMPLETE WITH BALLASTS, DRIVERS, LENSES, LAMPS, AUXILIARY COMPONENTS, MOUNTING HARDWARE, ETC., REQUIRED FOR A COMPLETE INSTALLATION. VERIFY ALL CATALOG NUMBERS WITH DESCRIPTIONS GIVEN. CHECK ALL LIGHTING FIXTURES PRIOR TO THEIR INSTALLATION TO ENSURE THAT THEY ARE THE SPECIFIED FIXTURES FOR THE PROJECT.
72. LED MONOCHROME LIGHTING FIXTURE SHALL HAVE LIGHTING WITH A MINIMUM CRI OF 85 FOR REGULARLY OCCUPIED SPACES, A MINIMUM CRI OF 70 FOR EXTERIOR, AND A MINIMUM OF 75 FOR ALL OTHER SPACES. THE FIXTURE SHALL HAVE A MINIMUM L70 OF 50,000 HOURS. ALL LIGHTING SHALL HAVE IESNA LM-79 AND LM-80 TESTING REPORTS AND LIFE CALCULATIONS BASED ON TM-21. EXTERIOR AND INTERIOR AREA LIGHTING SHALL HAVE A MINIMUM EFFICIENCY OF 80 LUMENS PER WATT.
73. LED DRIVERS SHALL HAVE MINIMUM LIFESPAN EQUAL OR BETTER THAN THE LIFESPAN OF THE L70 LIFESPAN OF THE LED LAMPS IT SERVES. DRIVERS SHALL BE INTEGRATED INTO THE FIXTURE IF SERVING ONLY THAT FIXTURE OR REMOTE IF THE DRIVER SERVES MORE THAN ONE FIXTURE. ALL DRIVERS SHALL BE DIMMABLE USING 0-10V DIMMING TECHNOLOGY UNLESS NOTED OTHERWISE. LED DRIVERS SHALL HAVE HIGH POWER FACTOR. ALL LED LIGHTING AND DRIVERS USED IN EXTERIOR OR UNHEATED APPLICATIONS SHALL PROVIDE START-UP AND OPERATION IN TEMPERATURES FROM -30 °C TO +50 °C.
74. THE CONTRACTOR SHALL ENSURE THAT ALL LIGHT FIXTURES ARE ADEQUATELY SUPPORTED. FIXTURES MUST BE SUPPORTED DIRECTLY FROM THE BUILDING STRUCTURAL MEMBERS. CO-ORDINATE THE REQUIREMENTS OF THE LIGHT FIXTURE SUPPORTS WITH THE OTHER TRADES (WHERE APPLICABLE) PRIOR TO FIXTURE INSTALLATION. FIXTURE SAFETY CHAINS OR WIRES SHALL ALSO BE PROVIDED AS REQUIRED BY REGULATORY AGENCIES.
75. THE METHOD OF ATTACHING SUSPENSION WIRES AND SAFETY CHAINS TO FIXTURES AND BUILDING ELEMENTS SHALL BE DISCUSSED AND APPROVED BY THE CONSULTANT OR OWNER PRIOR TO INSTALLATION.
76. SHOP DRAWINGS FOR LUMINAIRES INDICATING LIGHTING PERFORMANCE DETAILS, FIXTURE CONSTRUCTION DETAILS, AIR CONTROL AND DUCTWORK CONNECTION DETAILS, ETC., AND PICTURES OF EACH TYPE OF LIGHTING FIXTURE SHALL BE SUBMITTED FOR REVIEW.
77. SHOP DRAWINGS SHALL BE SUBMITTED FOR LED DRIVERS FOR ALL FIXTURES TO BE INSTALLED. THESE SHALL BE SUBMITTED SEPARATELY FROM THE LIGHTING FIXTURES BEING INSTALLED AND SHOULD INDICATE EACH FIXTURE THE PRODUCT IS INSTALLED.
78. FOR APPROVED EQUALS TO BASE DESIGN FIXTURES, SHOP DRAWINGS FOR EXTERIOR LIGHTING SHALL INCLUDE A COMPUTER GENERATED SITE PLAN PLOT POINT-BY-POINT CALCULATIONS AT NO LESS THAN 3 m (10') SPACING FOR THE FULL EXTERIOR SPACE UP TO 2 m BEYOND THE PROPERTY LINE INCLUDING ALL SITE LIGHTING FIXTURES. PROVIDE LIGHTING POWER DENSITY FOR ALL PARKING, DRIVEWAY AND ROADWAY AREAS.
79. FIXTURES SHALL NOT BE RELEASED PRIOR TO REVIEW OF THE SHOP DRAWINGS. CANCELLATION CHARGES WILL NOT BE PAID FOR CHANGES TO FIXTURES MADE BEFORE THE FIXTURE CUTS HAVE BEEN REVIEWED.

OCCUPANCY SENSORS

80. DUAL TECHNOLOGY CEILING AND WALL MOUNT SENSORS.
81. SENSORS SHALL SENSE A PERSON OF AVERAGE SIZE MOVING DISTANCE OF 2" AND RETAIN LIGHTS IN "ON" STATE.
82. SENSORS SHALL HAVE AN INTEGRAL BYPASS SHUNT SWITCH FOR SERVICE OR MANUAL OPERATION.
83. MULTIPLE SENSORS SHALL BE WIRED IN PARALLEL TO OBTAIN COVERAGE NOTED ON DRAWINGS.
84. TIME DELAY TO "OFF" SHALL BE ADJUSTABLE FROM 5 TO 30 MINUTES AND THE SENSOR SHALL BE COMPLETE WITH WALK-THROUGH AND TEST MODES.
85. SENSORS SHALL CARRY A 5 YEAR WARRANTY.
86. SENSORS SHALL INTERFACE WITH POWER/RELAY PACKS AS REQUIRED BY THE SAME MANUFACTURER TO CONTROL THE LOADS NOTED ON THE DRAWINGS.
87. CEILING MOUNT OCCUPANCY SENSOR TO HAVE COVERAGE OF 2000 SQUARE FEET.

WIRING DEVICES

88. SWITCHES AND RECEPTACLES: PROVIDE SPECIFICATION GRADE WIRING DEVICES AS SHOWN ON THE DRAWINGS. DEVICES SHALL BE AS MANUFACTURED BY HUBBELL (OR APPROVED EQUAL) AS NOTED BELOW:
    - DECORATOR STYLE 120 VOLT DEVICES
    - 15 AMP., 120 V ROCKER SWITCH - DS115
    - 20 AMP., 120 V ROCKER SWITCH - DS120
    - 15 AMP., 120 V DUPLEX RECEPTACLE - DR15
    - 20 AMP. DUPLEX RECEPTACLE (T-SLOT) - DR20
    - 15 AMP. GROUND FAULT DUPLEX RECEPTACLE - GF15
    - 20 AMP. GROUND FAULT DUPLEX RECEPTACLE - GF20
99. PROVIDE SMOOTH HIGH IMPACT LEXAN OR NYLON COVERPLATES, COLOURED TO MATCH DEVICE, FOR FLUSH MOUNTED DEVICES OR GALVANIZED STEEL TYPE COVERPLATES WITH ROUNDED CORNERS FOR SURFACE MOUNTED DEVICES AS APPROPRIATE FOR ALL OUTLETS, GANGED TYPE FOR ALL GROUPED OUTLETS. PROVIDE SPECIAL RECEPTACLES AND OUTLET TYPES AS IDENTIFIED ON THE DRAWINGS.
100. WHITE FINISH WITH WHITE THERMOPLASTIC WHEN INSTALLED ON DRYWALL EXCEPT FOR HOSPITALS, CLINICS, MEDICAL CENTRES OF SIMILAR NATURE SHALL BE STAINLESS STEEL COVER PLATES. BACK OF HOUSE SPACES (STORAGE, SERVICE ROOMS, ETC) WITH CONCRETE OR BLOCK WALL SHALL BE STAINLESS STEEL COVER PLATES. SWITCHES AND RECEPTACLES SHALL BE DECORA STYLE MEETING ACCESSIBILITY STANDARDS UNLESS OTHERWISE NOTED.
101. ALL EXTERIOR RECEPTACLES SHALL BE GFCI AND COME WITH WHILE-IN-USE COVERS AS PER OESC.
102. MOUNT DEVICES AT THE FOLLOWING HEIGHTS UNLESS NOTED OTHERWISE OR TO COMPLY WITH OBC, BARRIER FREE DESIGN:
     a. SWITCHES - 1200MM (47")
     b. RECEPTACLES - 450MM (17.7")
     c. COMMUNICATION BACKBOXES - 450MM (17.7")
     d. ELECTRICAL PANELS - 1981MM (78") TO TOP
     e. PUSH BUTTONS - 1200MM (47")
     f. EXIT SIGNS - ABOVE DOOR OR 2032MM (80")
     g. FIRE ALARM PULL STATION - 1150MM (45")

EMPTY CONDUIT SYSTEMS

ELECTRICAL SPECIFICATIONS

103. PROVIDE EMPTY CONDUIT/OUTLET BOX SYSTEM TO ALLOW INSTALLATION OF COMMUNICATIONS AND SPECIAL SYSTEMS (TELEPHONE, SECURITY, PAGING AND COMPUTER) EQUIPMENT AND WIRING AS DETAILED BELOW AND INDICATED ON THE DRAWINGS. INSTALL PULL CORDS IN ALL EMPTY CONDUITS.
104. IN GENERAL, PROVIDE 38 mm (1½") EMPTY CONDUITS FROM THE SYSTEM EQUIPMENT MOUNTING BACKBOARD TO SUITABLE AREAS OF ACCESSIBLE CEILING SPACES AS SHOWN, TO ALLOW INSTALLATION OF TELEPHONE AND COMPUTER SYSTEMS DISTRIBUTION WIRING. TERMINATE CONDUITS WITH AN APPROPRIATE INSULATED BUSHING. FOR EACH GENERAL WALL OUTLET INDICATED PROVIDE A 19 mm (3/4") EMPTY CONDUIT FROM A STANDARD SINGLE GANG BOX WITH BLANK COVERPLATE TO AN ACCESSIBLE CEILING SPACE WITHIN 3 m (10') OF THE MAIN RACEWAY.
105. TO ALLOW INSTALLATION AND CONNECTION OF PAGING SYSTEM EQUIPMENT SPEAKERS AND WIRING BY THE OWNER, PROVIDE 19 mm (3/4") EMPTY CONDUITS FROM TELEPHONE BACKBOARD TO ACCESSIBLE CEILING SPACES AS SHOWN.
106. REFER TO CONDUIT SYSTEM RISER DIAGRAMS (WHERE PROVIDED) FOR DETAILS OF DISTRIBUTION CONDUIT AND COMPONENT DETAILS AND TO FLOOR PLANS FOR COMPONENT AND OUTLET LOCATIONS. CONTACT OWNER'S SYSTEMS INSTALLATION CONTRACTORS TO VERIFY ALL CONDUIT SIZES, OUTLET LOCATIONS AND INSTALLATION DETAILS PRIOR TO PROCEEDING WITH INSTALLATIONS.
107. PROVIDE EMPTY CONDUIT/OUTLET BOX SYSTEM AS REQUIRED TO ALLOW THE INSTALLATION OF THE MECHANICAL CONTRACTOR'S THERMOSTATS. COORDINATE INSTALLATION WITH THE MECHANICAL CONTRACTOR AND MECHANICAL DRAWINGS PRIOR TO ROUGH-IN. INSTALL PULL CORDS IN ALL EMPTY CONDUITS.

FIRE ALARM SYSTEM

108. COMPLY WITH CAN/CSA-S524 (INSTALLATION OF FIRE ALARM SYSTEMS), CAN/CSA-S537 (VERIFICATION OF FIRE ALARM SYSTEMS), AND OBC.
109. SUBMIT SHOP DRAWINGS FOR FIRE ALARM CONTROL PANEL, ANNUNCIATOR, SIGNALING DEVICES, DETECTION DEVICES, AND PULL STATIONS.
110. PROVIDE COMPLETE ELECTRICALLY SUPERVISED, CLOSED CIRCUIT, FIRE ALARM SYSTEM WITH ZONE COMPONENTS AND SIGNAL CIRCUIT COMPONENTS FOR PRESENT AND FUTURE AS INDICATED. IF FIRE ALARM IS EXISTING AND WORK DESCRIBED IS TO TIE INTO EXISTING, PROVIDE DEVICES COMPATIBLE WITH EXISTING FIRE ALARM SYSTEM.
111. DESIGN FIRE ALARM SYSTEM SO THAT THE OPERATION OF ANY ONE OF THE MANUAL FIRE ALARM STATIONS OR AUTOMATIC DETECTORS WILL CAUSE ALL FIRE ALARM SIGNALS TO SOUND IF THE SYSTEM IS SINGLE STAGE.
112. MANUAL FIRE ALARM PULL STATIONS SHALL BE PROVIDED WITH TWELVE (12) SPARE GLASS RODS TO BE LEFT WITH OWNER.
113. AUTOMATIC THERMAL DETECTORS: CONSTRUCTED AS PER CAN/ULC-S530.
     a. RATED AT 58°C(135°F) FIXED TEMPERATURE NON-RESTORABLE AND 8°C DEGREES PER MINUTE RATE-OF-RISE. USE WHERE NORMAL TEMPERATURES DO NOT EXCEED 38°C (100°F).
     b. RATED AT 88°C(194°F) FIXED TEMPERATURE NON-RESTORABLE AND 8°C DEGREES PER MINUTE RATE-OF-RISE. USE WHERE NORMAL TEMPERATURES FLUCTUATIONS EXIST, BUT AMBIENT TEMPERATURES EXCEED 38°C (100°F), BUT DO NOT EXCEED 66°C (150°F).
     c. RATED 58°C(135°F) FIXED TEMPERATURE NON-RESTORABLE. USE WHERE VIOLENT TEMPERATURE FLUCTUATIONS EXIST, BUT NORMAL TEMPERATURES DO NOT EXCEED 38°C (100°F).
     d. RATED 88°C(194°F) FIXED TEMPERATURE NON-RESTORABLE. USE WHERE VIOLENT TEMPERATURE FLUCTUATIONS EXIST, BUT NORMAL TEMPERATURES EXCEED 38°C (100°F) BUT DO EXCEED 66°C (150°F).
123. SMOKE DETECTOR:
     a. PROVIDE COMPLETE SMOKE DETECTOR SYSTEM AS INDICATED.
     b. MOUNT DETECTORS ON CEILING AS INDICATED, AT THE HIGHEST POINT WHERE VARIATIONS IN CEILING HEIGHT EXIST. DO NOT MOUNT DETECTORS ON SIDES, UNDERSIDES, OR LESS THAN 12" (300mm) FROM WALLS, BEAMS, JOISTS, DUCTS, OPEN WEB STEEL JOISTS OR ANY STRUCTURE PROJECTING BELOW ACTUAL CEILING HEIGHT, OR LESS THAN 48" (1220mm) FROM AIR HANDLING OR HEATING OUTLETS. COMPLY WITH CAN/CSA-S524.
     c. SHOULD INTERFERENCE FROM OBSTRUCTION, LAMP POSITIONS, AIR OUTLET OR HEAT RADIATING SURFACES BE ENCOUNTERED IN LOCATING ANY DETECTOR WHERE SHOWN, LOCATE THE DETECTOR AS NEAR AS POSSIBLE TO THE INDICATED POSITION, CLEAR OF OBSTACLES, TO THE SATISFACTION OF THE CONSULTANT, BUT MAINTAIN A CLEAR SPACE OF 24" (610mm), ON THE CEILING, BELOW AND AROUND.PROTECTIVE WIRE GUARDS OR GLASS COVERS FOR DETECTORS IN AREAS PRONE TO DAMAGE OR TAMPER MAY EXIST.
124. PHOTO ELECTRIC TYPE SMOKE DETECTORS: PROVIDE RELAY BASE WHEN DETECTORS ARE INSTALLED IN ELEVATOR LOBBIES, MACHINE ROOMS, CONTROL ROOMS, SHAFTS OR ADJACENT TO HOLD OPEN DEVICES.
125. DUCT SMOKE DETECTOR: PHOTO ELECTRIC TYPE DUCT SMOKE DETECTOR AND HOUSING WITH FORM-C SHUT DOWN RELAY AND LED REMOTE INDICATOR AND SAMPLING TUBES TO SUIT DUCT DIMENSIONS <AND/OR REMOTE TEST STATION>. WALL MOUNT REMOTE INDICATOR MINIMUM 300 MM (1 FT) BELOW CEILING AT DETECTOR LOCATION
126. PROVIDE COMBINATION CARBON MONOXIDE OPTIONS AS SPECIFIED ON THE DRAWINGS.
127. PROVIDE PROTECTIVE WIRE GUARDS OR GLASS COVERS FOR DETECTORS IN AREAS PRONE TO DAMAGE OR TAMPER.
128. FIRE ALARM BELLS OR STROBES: MINIMUM 15CD AND 80 dB @ 3m.
129. PROVIDE WIRING, CONNECTION OF SUPERVISED VALVES AND FLOW SWITCHES SPRINKLER VALVES AS INDICATED.
130. LOCATE END-OF-LINE RESISTORS IN CONTROL PANEL (CLASS A) OR IN SEPARATE BOX LOCATED NOT MORE THAN 6'-0" (1830mm) ABOVE FINISHED FLOOR BEYOND LAST MANUAL STATION, AUTOMATIC INITIATING DEVICES OR SIGNAL (CLASS B).
131. PROVIDE THRID-PARTY VERIFICATION OF FIRE ALARM EQUIPMENT DISTURBED BY THIS WORK, INCLUDING THOSE COMPONENTS NECESSARY TO DIRECT OPERATION OF SYSTEM, SUCH AS MANUAL STATIONS, THERMAL DETECTORS AND CONTROLS AS PER CAN/ULC-S537.
     a. ON COMPLETION OF VERIFICATION AND WHEN ALL ABOVE CONDITIONS HAVE BEEN COMPLIED WITH, MANUFACTURER SHALL ISSUE TO THE OWNER:
     b. COPY OF INSPECTING TECHNICIAN'S REPORT SHOWING LOCATION OF EACH DEVICE AND CERTIFYING TEST RESULTS OF EACH DEVICE.
     c. CERTIFICATE OF VERIFICATION CONFIRMING THAT INSPECTION HAS BEEN COMPETED AND SHOWING CONDITIONS UPON WHICH, SUCH INSPECTION AND CERTIFICATION HAVE BEEN RENDERED.
133. PROOF OF LIABILITY INSURANCE FOR INSPECTION.
134. PROVIDE LEGIBLE PERMANENTLY MOUNTED NOTICE AT EACH MANUAL STATION AS PER OBC-3.2.4.7(5).
135. FOR RENOVATIONS: INFORM GENERAL TRADE/OWNER OF ANY FIRE ALARM ZONE OR DEVICE WHICH IS DISCONNECTED OR RENDERED INOPERATIVE, TO PREVENT FALSE ALARMS, AT THE BEGINNING OF THE WORKDAY. RECONNECT ALL FIRE ALARM ZONES AND DEVICES AT END OF WORKDAY AND INFORM GENERAL TRADE/OWNER.

PART 3 - EXECUTION

1. PROVIDE ALL GROUNDING REQUIRED BY THE ONTARIO ELECTRICAL SAFETY CODE OR ANY LOCAL AUTHORITIES REGARDLESS OF WHETHER IT HAS BEEN SHOWN. THIS INCLUDES EQUIPMENT GROUNDING AS WELL AS SYSTEM (SERVICE) AND DISTRIBUTION GROUNDING. PROVIDE ADDITIONAL SPECIFIC PROVISIONS AS INDICATED, INCLUDING GROUND CONNECTIONS FOR MAIN ELECTRICAL ROOM AND BUILDING STRUCTURE. PROVIDE THESE INSTALLATIONS ACCORDING TO ELECTRICAL SAFETY CODE REGULATIONS. COLLECT ALL GROUND CONNECTIONS AT A COMMON POINT IN THE MAIN ELECTRICAL ROOM, WHICH IN TURN IS CONNECTED TO THE MAIN SERVICE GROUND.
2. ALL GROUNDED FEEDERS AND BRANCH CIRCUITS SHALL BE PROVIDED WITH A SEPARATE GROUND CONDUCTOR SIZED ACCORDING TO THE ELECTRICAL SAFETY CODE REGULATIONS. THE CONDUIT SYSTEM SHALL NOT BE USED AS THE GROUND PATH, HOWEVER ALL CONDUITS SHALL BE SOLIDLY GROUNDED.
3. ARRANGE GROUNDS SUCH THAT UNDER NORMAL OPERATING CONDITIONS CURRENT FLOW IN ANY GROUNDING CONDUCTOR IS NOT OBJECTIONABLE AND WILL NOT HARM PERSONNEL OR EQUIPMENT. ARRANGE SERVICE GROUNDS AND DISTRIBUTION GROUNDS TO PROVIDE GROUND RESISTANCE READINGS WITHIN VALUES REQUIRED BY THE ONTARIO ELECTRICAL SAFETY CODE AND THE ELECTRICAL SAFETY AUTHORITY.
4. IN GENERAL, PROVIDE ALL POWER SUPPLY WIRING, LINE VOLTAGE CONTROL WIRING AND ELECTRICAL SAFETY CODE REQUIRED DISCONNECT SWITCHES FOR ANY EQUIPMENT INSTALLED BY OTHER TRADES. VERIFY THE ELECTRICAL CHARACTERISTICS AND WIRING REQUIREMENTS OF ALL EQUIPMENT BEFORE PROCEEDING WITH THE ACTUAL INSTALLATIONS. REFER TO THE DRAWINGS FOR A DESCRIPTION OF EQUIPMENT WIRING AND CONTROL REQUIREMENTS AND COMPONENTS TO BE PROVIDED BY THE CONTRACTOR.
5. CO-OPERATE WITH ALL OTHER TRADES ON THE JOB SUCH THAT ALL EQUIPMENT CAN BE INSTALLED WITHOUT ANY CONFLICTS OR DELAYS. PROVIDE AND MAINTAIN TEMPORARY WIRING, LIGHTING AND POWER SUPPLY INSTALLATIONS AS REQUIRED BY OTHER TRADES DURING CONSTRUCTION.
6. THE CONTRACTOR SHALL VISIT THE SITE TO DETERMINE THE EXTENT OF DEMOLITION, REMOVAL, RELOCATION, RE-ROUTING AND RECONNECTION OF EXISTING ELECTRICAL EQUIPMENT, FIXTURES, OUTLETS AND WIRING REQUIRED FOR THE EXECUTION AND COMPLETION OF THIS PROJECT. IN GENERAL, RELOCATE EXISTING SERVICES AS REQUIRED TO ACCOMMODATE NEW EQUIPMENT AND INSTALLATIONS AND ARCHITECTURAL CHANGES. IN AREAS BEING TOTALLY RENOVATED, PROVIDE ALL ELECTRICAL DEMOLITION WORK AND REPLACE EXISTING INSTALLATIONS WITH NEW AS SHOWN. EXTRA CHARGES FOR PREMIUM TIME LABOUR, IF

ELECTRICAL SPECIFICATIONS

REQUIRED TO COMPLETE THE PROJECT AS DESCRIBED, SHALL BE INCLUDED IN THE BID PRICE.

7. SEQUENCE OF DISCONNECTION AND REMOVAL AND/OR RELOCATION OF EXISTING EQUIPMENT AND WIRING SHALL BE CO-ORDINATED WITH THE OWNER AND OTHER TRADES AND SHALL CONFORM TO THE REQUIREMENTS AND CONDITIONS OUTLINED IN THE SPECIFICATIONS.
8. WIRING LOCATED IN AREAS BEING ALTERED BUT FEEDING OUTLETS OR EQUIPMENT IN OTHER AREAS REQUIRED TO REMAIN IN SERVICE, SHALL BE REWORKED, EXTENDED AND RE-ROUTED AS REQUIRED TO MAINTAIN THE CONTINUITY OF THESE SERVICES. PROVIDE ADEQUATE PROTECTION TO EXISTING WIRING AND EQUIPMENT WHICH HAS BECOME EXPOSED TO MECHANICAL INJURY IN THE COURSE OF ALTERATIONS OR NEW INSTALLATIONS.
9. INSTALL ALL CONDUIT AND FEEDERS RUNNING THROUGH THE EXISTING BUILDING ALONG ROUTES APPROVED ON SITE BY THE OWNER. NEW INSTALLATIONS WILL NOT NECESSARILY BE ALLOWED ALONG SHORTEST ROUTES BUT SHOULD FOLLOW CORRIDORS OR ROUTES OF EXISTING MAIN RUNS WHERE POSSIBLE.
10. IN SOME INSTANCES, NEW OUTLETS AND EQUIPMENT ARE SHOWN IN THE SAME LOCATION AS THE EXISTING OUTLETS. THESE MAY BE FED THROUGH THE EXISTING CONDUITS PROVIDED THAT THE CONDUITS ARE IN GOOD CONDITION AND ARE ACCEPTABLE TO THE ELECTRICAL SAFETY AUTHORITY FOR RE-USE. ALL WIRING TO NEW OUTLETS AND EQUIPMENT SHALL BE NEW UNLESS OTHERWISE INDICATED. ALL UNUSED CONDUIT ENTRANCE OPENINGS SHALL BE SEALED.
11. UNLESS NOTED OTHERWISE, ALL EXISTING ELECTRICAL EQUIPMENT WHICH IS NOT TO BE RE-USED SHALL BECOME THE PROPERTY OF THIS CONTRACTOR (FOR DISPOSAL OR REMOVAL FROM THE SITE AS APPLICABLE) AND HAVE AN APPROPRIATE SALVAGE VALUE INCLUDED IN THE CONTRACT. EXISTING ELECTRICAL EQUIPMENT TO BE RE-USED (RELOCATED AND RECONNECTED) SHALL BE CLEANED, PAINTED, REFURBISHED AND REPAIRED AS REQUIRED BEFORE REINSTALLATION. (TURN OVER EXISTING LIGHT FIXTURES, ELECTRICAL PANELS AND STIPULATED DEVICES NOT TO BE RE-USED OR DISPOSED OF TO THE OWNER.)
12. IN FINISHED AREAS OF THE EXISTING BUILDING, AS MUCH WIRING AS POSSIBLE SHALL BE CONCEALED. WHERE, IN THE CONTRACTOR'S OPINION IT IS ABSOLUTELY NECESSARY OR ADVANTAGEOUS TO RUN WIRING ON THE SURFACE, (NOT SIMPLY TO AVOID CUTTING WALL OR FLOOR) OBTAIN APPROVAL FROM THE OWNER BEFORE PROCEEDING. ALL SURFACE RACEWAYS INSTALLED SHALL BE AS MANUFACTURED BY WIREMOLD UNLESS OTHERWISE INDICATED. WIREMOLD RACEWAYS SHALL BE SIZED AS INDICATED OR TO SUIT CONDUCTORS BEING CARRIED. USE ONLY APPROVED COMPONENTS, FITTINGS AND METHODS FOR SECURING, JOINING AND SUPPORTING SURFACE RACEWAYS AND OUTLET BOXES. SURFACE MOUNT RACEWAYS SHALL BE PAINTED BY THE CONTRACTOR TO MATCH THE ADJACENT WALL OR CEILING FINISH.
13. SERVICE AND DISTRIBUTION SYSTEM POWER INTERRUPTIONS SHALL BE KEPT TO A MINIMUM. POWER INTERRUPTIONS MUST BE CO-ORDINATED WITH THE OWNER AND ALL OTHER TRADES BY THIS CONTRACTOR. WRITTEN APPLICATION FOR ELECTRICAL INTERRUPTIONS MUST BE RECEIVED FROM THE CONTRACTOR INDICATING THE DATE, TIME AND ESTIMATED DURATION OF THE INTERRUPTION. APPLICATION FOR APPROVAL OF THE POWER INTERRUPTIONS MUST BE SUBMITTED TO THE OWNERS AND CONSULTANT AT LEAST TWO WEEKS PRIOR TO THE REQUESTED SHUT-DOWN DATE.
14. IN SOME SECTIONS OF THIS SPECIFICATION, MATERIALS AND EQUIPMENT ARE SPECIFICALLY DESCRIBED AND NAMED BY MANUFACTURER FOR THE PURPOSE OF ESTABLISHING A MINIMUM STANDARD OF MATERIALS, PRODUCT QUALITY AND OTHER SPECIFIED REQUIREMENTS.
15. THE PROJECT SYSTEMS DESIGN AS PER THE DRAWINGS AND SPECIFICATIONS IS BASED ON THE SPECIFIED MANUFACTURER'S EQUIPMENT BUT IS INTENDED TO BE APPROPRIATE FOR EQUIVALENT EQUIPMENT OF ALL OTHER MANUFACTURERS CONTAINED ON THE "APPROVED MANUFACTURER'S LIST"
16. PRODUCTS OF MANUFACTURER'S LISTED AS "ALTERNATES" ARE SUBJECT TO SHOP DRAWING REVIEW TO ENSURE THAT THEY ARE EQUIVALENT TO THE PRODUCTS OF THE SPECIFIED MANUFACTURER. ALTERNATE MANUFACTURER'S EQUIPMENT SHALL CONFORM TO THE SPACE LIMITATIONS IMPOSED BY THE PROJECT AND THE INTENT AS OUTLINED IN THIS SPECIFICATION AND DRAWINGS.
17. THE CONTRACTOR MAY SUBMIT ALTERNATIVE PROPOSALS OF MANUFACTURERS NOT LISTED IN THE APPROVED MANUFACTURERS LIST OF PROPOSALS OR MODIFIED DESIGN WITH APPROPRIATE COSTS, DELIVERY, AND SYSTEM DESIGN ADJUSTMENTS WHICH HE FEELS MAY BE ADVANTAGEOUS CONSIDERATIONS FOR THE PROJECT.

APPROVED MANUFACTURERS LIST

DIVISION 26

TESTING / COMMISSIONING COMPANY:
RONDAR; G.T. WOOD; SCHNEIDER ELECTRIC

FUSES:
GOULD; BUSSMAN

WIRING DEVICES:
HUBBELL; PASS AND SEYMOUR; LEVITON

DECORATIVE AND SPECIALTY LIGHT FIXTURES:
AS SUPPLIED ON FIXTURE SCHEDULE

INTERIOR LIGHT FIXTURES:
LITHONIA; EATON; HUBBELL; PHILIPS

EXTERIOR LIGHT FIXTURES:
EATON; HOLOPHANE; HUBBELL; LITHONIA; PHILIPS; CREE

EMERGENCY LIGHTING FIXTURES AND BATTERY UNITS:
THOMAS & BETTS; BEGHELLI; STANPRO; AIMLITE

LIGHTING CONTROLS:
LEGRAND/WATT STOPPER; LEVITON; SENSOR SWITCH/ACUITY; LUTRON; EATON; PHILIPS

EXIT SIGNS:
THOMAS & BETTS; BEGHELLI; STANPRO; AIMLITE

DIVISION 27

CLOCKS:
TO BE SUPPLIED BY OWNER, AND INSTALLED BY CONTRACTOR.

SOUND SYSTEM:
BOGEN; TELECOR

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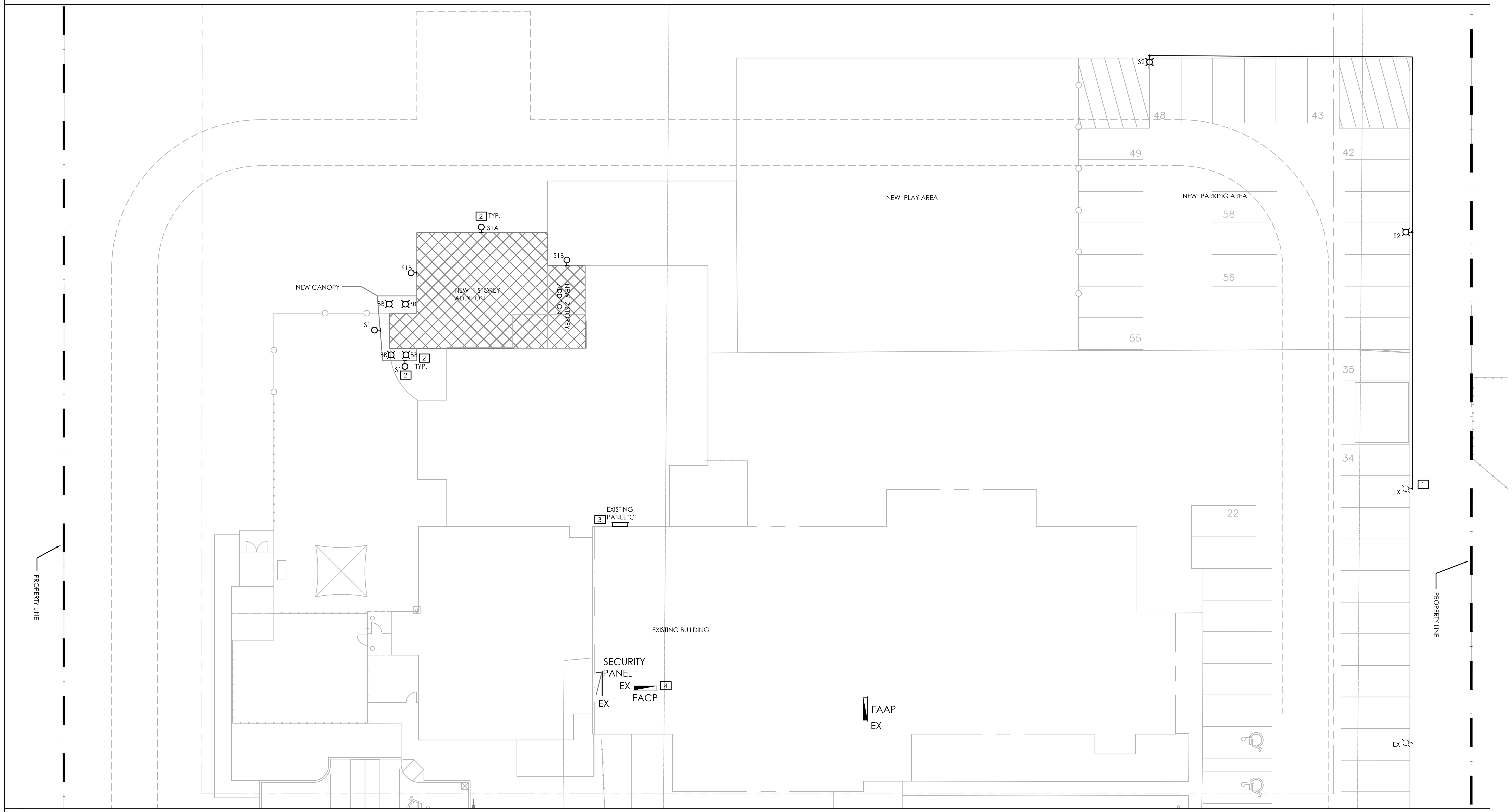
PRESCHOOL DAY CARE ADDITION
Ecole elementaire catholique Saint-Marguerite-Bourgeoys
60 Clench Avenue, Brantford, Ontario N3T 1B9
ELECTRICAL SPECIFICATIONS

E0.2



ELECTRICAL SITE PLAN
SCALE: 1 : 200

DRAWING NOTES

1. EXTEND THE EXISTING UNDERGROUND WIRING AND CONDUIT TO THE NEW POLE MOUNTED LIGHT FIXTURES. ENSURE THAT THE NEW POLE MOUNTED LIGHTS ARE CONTROLLED VIA THE SAME SWITCHING SCHEME AS THE EXISTING POLE MOUNTED LIGHTS.
2. EXTEND THE EXISTING WALL PACK LIGHTING CIRCUIT TO THE NEW WALL PACK LOCATION. ALL CONDUITS SHALL BE CONCEALED WITHIN THE NEW WALL AND CANOPY STRUCTURE. THE NEW WALL PACK AND POT LIGHT LIGHTING SHALL BE CONTROLLED VIA THE SAME SWITCHING SCHEME AS THE EXISTING WALL PACK LIGHTS.
3. LOCATE EXISTING PANEL 'C' FOR NEW ADDITION POWER CONNECTIONS.
4. CONNECT NEW FIRE ALARM DEVICES TO EXISTING FIRE ALARM PANEL.

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PRESCHOOL DAY CARE ADDITION
Ecole elementaire catholique Saint-Marguerite-Bourgeoys

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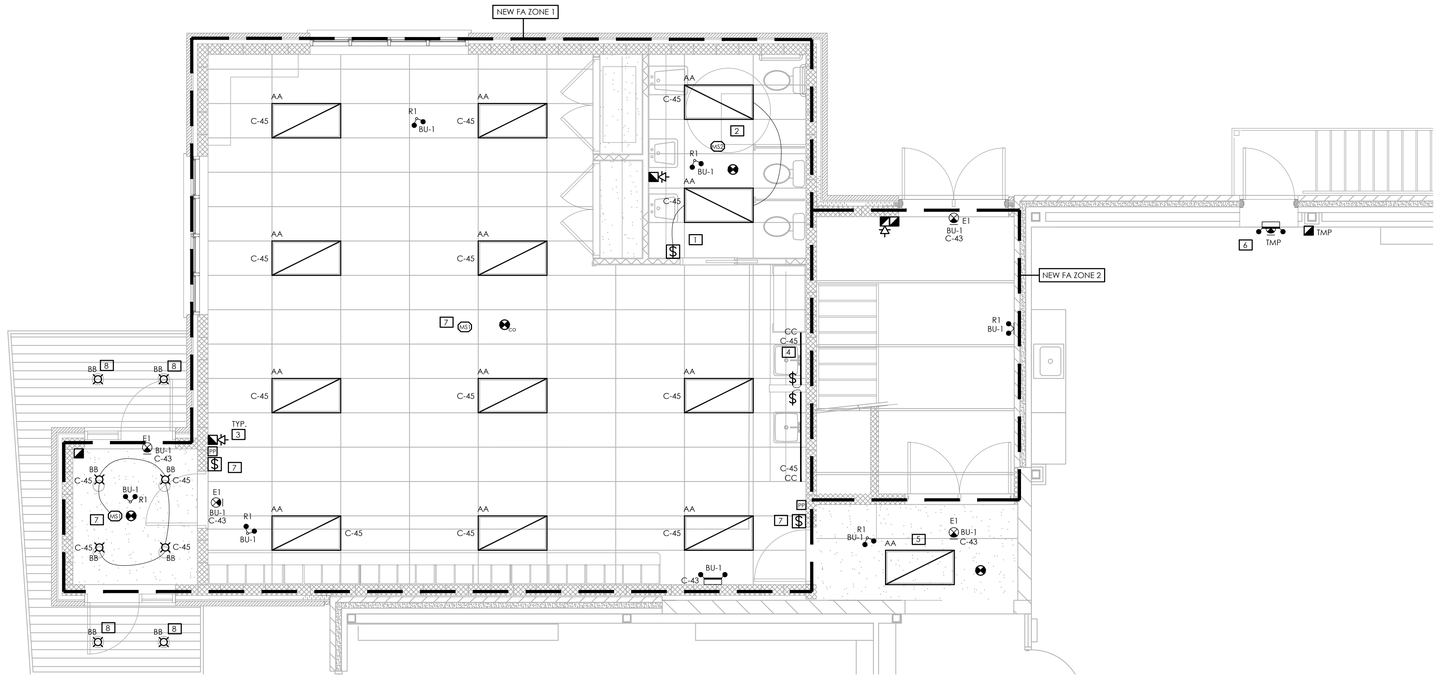
ELECTRICAL SITE PLAN

E1.1

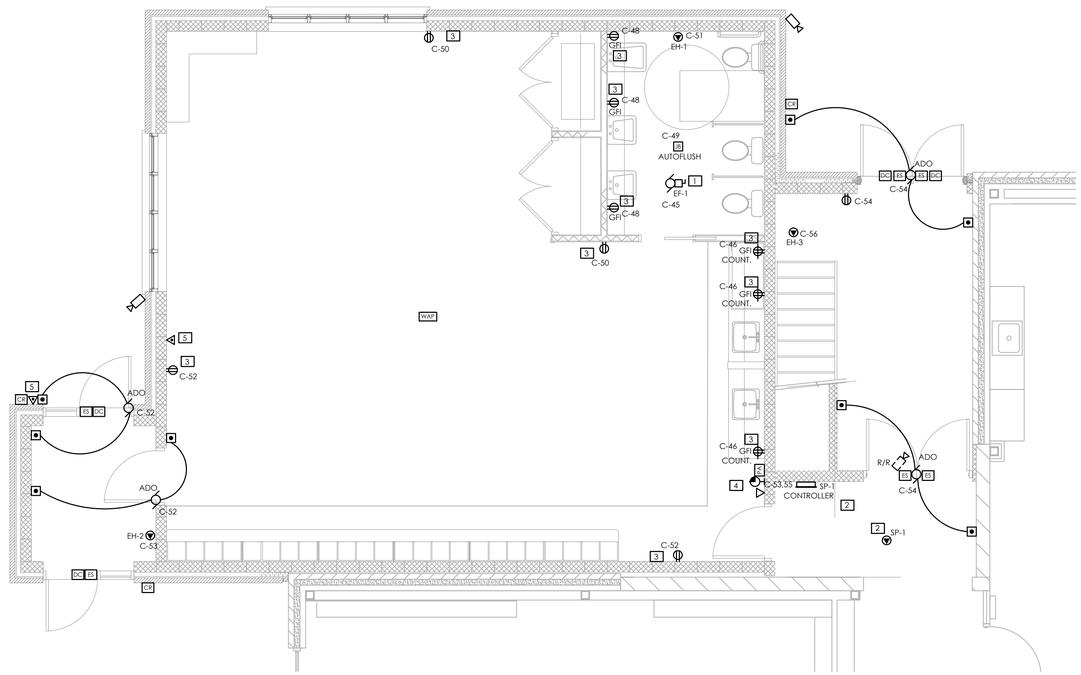


1 / E1.2 GROUND FLOOR LIGHTING & FIRE ALARM PLAN

SCALE: 1 : 50

DRAWING NOTES

1. PROVIDE A 120V GFCI CIRCUIT FOR THE WASHROOM LIGHTS AND LOW VOLTAGE SWITCH.
2. PROVIDE ONE (1) DUAL TECHNOLOGY CEILING MOUNTED OCCUPANCY SENSOR. UPON ACTIVATION OF THE SENSOR THE LIGHTS AND EXHAUST FAN SHALL TURN ON AND TIME OUT AFTER 20MINS UPON NO DETECTION. THE LOW VOLTAGE SWITCH WITHIN THE ROOM SHALL OVERRIDE THE OCCUPANCY SENSOR.
3. THE ELECTRICAL CONTRACTOR SHALL TIE THE NEW FIRE ALARM DEVICES INTO THE EXISTING FIRE ALARM SYSTEM. PROVIDE NEW INITIATION AND SIGNALING CIRCUITS FROM THE NEW SCOPE OF WORK AREA TO THE EXISTING FIRE ALARM PANEL LOCATED IN THE EXISTING ELECTRICAL ROOM. REFER TO KEYPLAN E0.1.
4. PROVIDE AN UNDER CABINET LIGHT CONNECTED TO A TOGGLE SWITCH. THE DRIVER SHALL BE HIDDEN WITHIN THE CABINET HOWEVER BE ACCESSIBLE FOR MAINTENANCE.
5. CONNECT NEW GROUND FLOOR CORRIDOR LIGHT TO EXISTING CORRIDOR LIGHTING CIRCUIT.
6. PROVIDE TEMPORARY EXIT SIGN COMBO UNIT AND A TEMPORARY MANUAL PULL STATION UP UNTIL THE REMOVAL OF THE TEMPORARY EXTERIOR STAIRS.
7. LIGHTING CONTROL NARRATIVE SHALL BE ACCOMPLISHED USING SWITCHES, POWER PACKS, 0-10V DIMMING AND OTHER WIRING METHODS. SUPPLIER SPECIFIC SYSTEMS SHALL NOT BE USED.
8. EXTEND THE EXISTING WALL PACK LIGHTING CIRCUIT TO THE NEW POT LIGHT LOCATION. ALL CONDUITS SHALL BE CONCEALED WITHIN THE NEW WALL AND CANOPY STRUCTURE. THE NEW POT LIGHT LIGHTING SHALL BE CONTROLLED VIA THE SAME SWITCHING SCHEME AS THE EXISTING WALL PACK LIGHTS.



2 / E1.2 GROUND FLOOR POWER AND SYSTEMS PLAN

SCALE: 1 : 50

DRAWING NOTES

1. THE EXHAUST FAN SHALL BE CONTROLLED VIA THE CEILING MOUNTED OCCUPANCY SENSOR.
2. SUMP PUMP TO BE CONNECTED TO SP-1 CONTROLLER USING E.Y.S FITTING AND RIGID STEEL CONDUIT. REFER TO SUMP PUMP DETAIL IN DRAWING M3.1. COORDINATE WITH MECHANICAL.
3. RECEPTACLES SHALL HAVE TAMPER RESISTANT SOCKET COVERS.
4. CONTROL PANEL TO CONTAIN PA SPEAKER, HANDSET, DATA OUTLET, AND AIPHONE INTERCOM. TIE NEW CONTROL PANEL WITH EXISTING SYSTEMS. FOR FINAL LOCATION COORDINATE WITH ARCHITECT AND OWNER.
5. INTERCOM TO BE AIPHONE OR APPROVED EQUIVALENT. COORDINATE WITH OWNER.

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Ecole elementaire catholique
Saint-Marguerite-Bourgeoys

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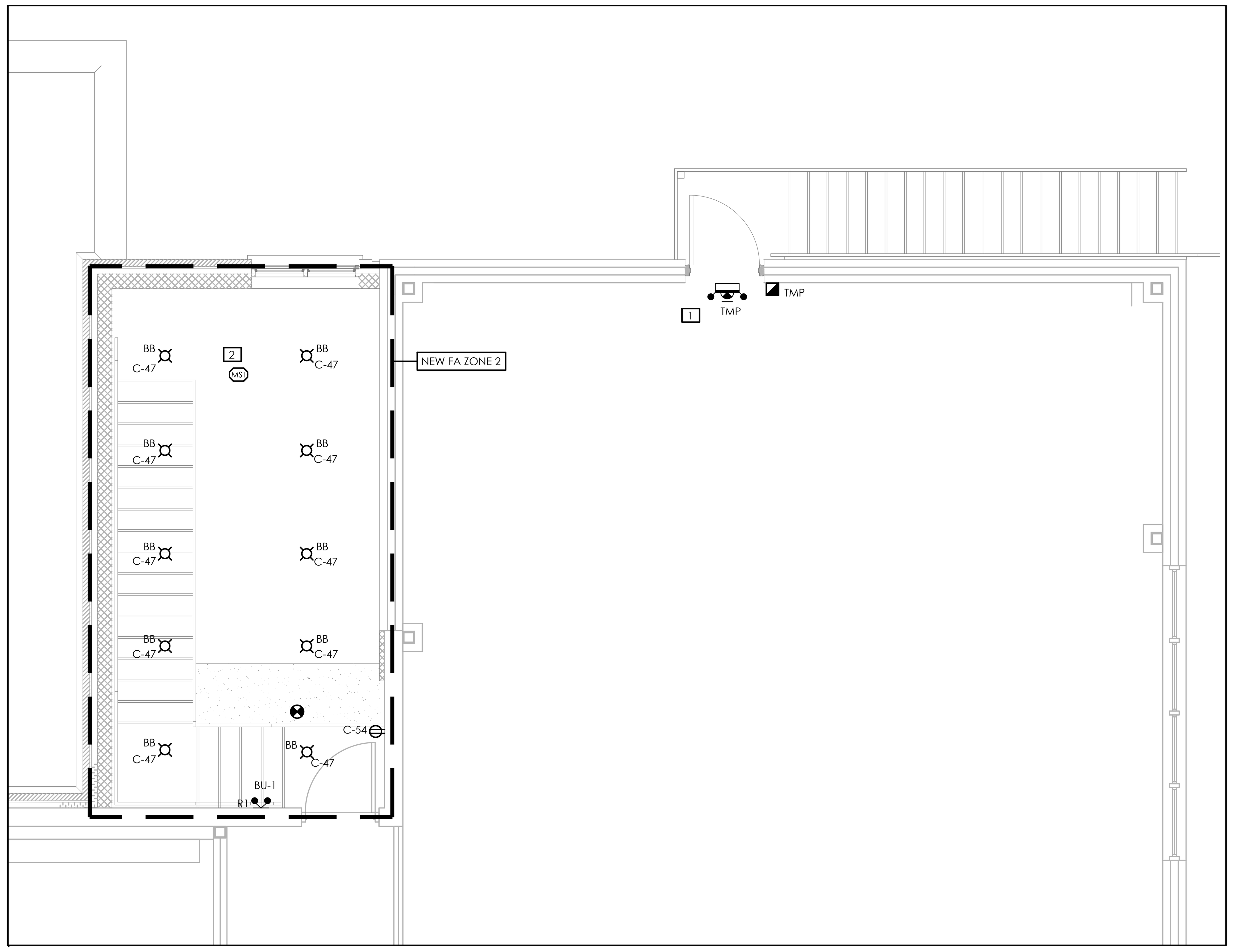
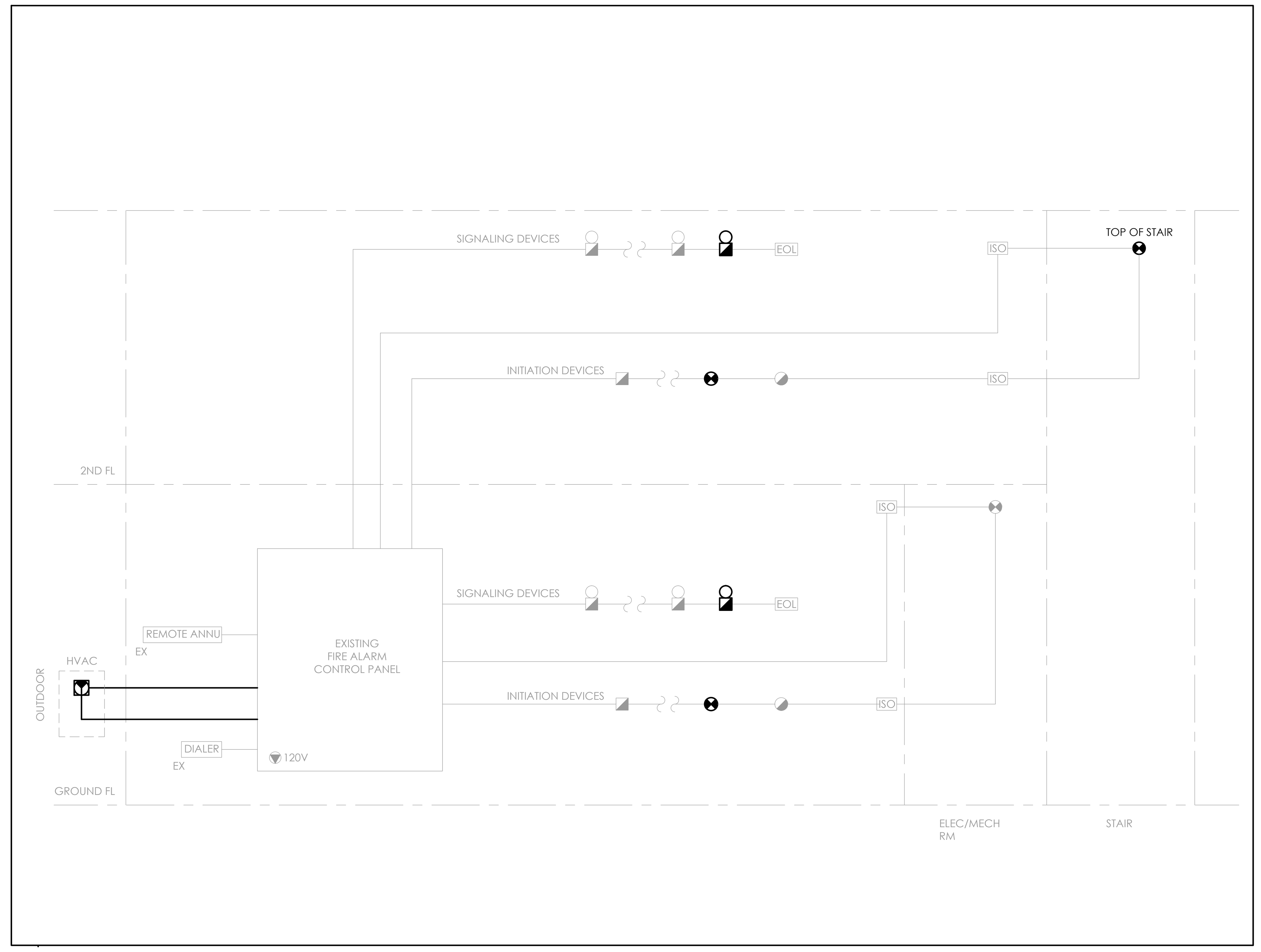
GROUND FLOOR LIGHTING, FIRE ALARM, POWER & COMMUNICATIONS PLAN

E1.2



2ND FLOOR LIGHTING, POWER, FIRE ALARM AND SYSTEMS PLAN

1 / E1.3 SCALE: 1 : 50

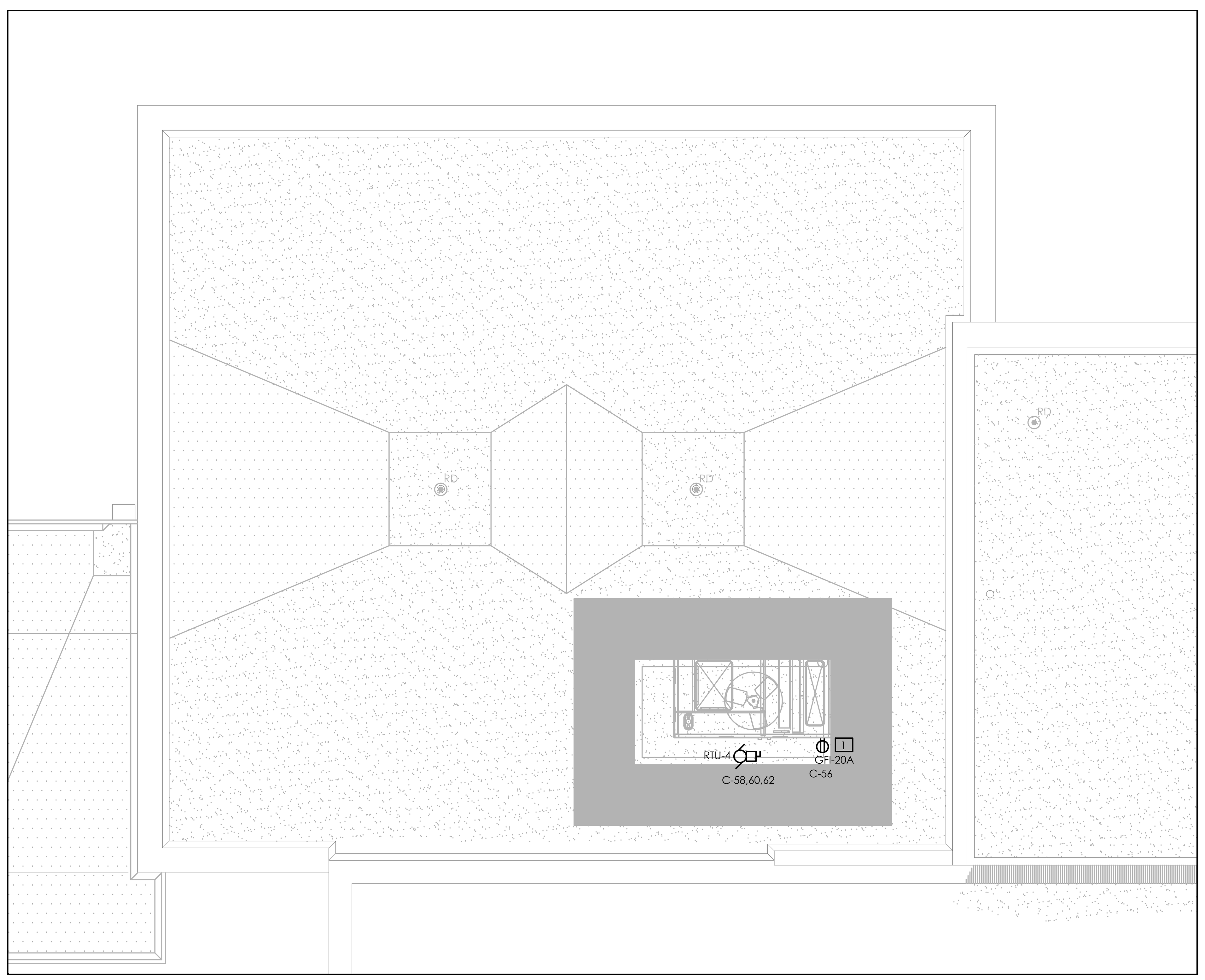


EXISTING FIRE ALARM RISER DIAGRAM

3 / E1.3 SCALE: 1 : 50

DRAWING NOTES

1. PROVIDE TEMPORARY EXIT SIGN COMBO UNIT AND A TEMPORARY MANUAL PULL STATION UP UNTIL THE REMOVAL OF THE TEMPORARY EXTERIOR STAIRS.
2. LIGHTING CONTROL NARRATIVE SHALL BE ACCOMPLISHED USING SWITCHES, POWER PACKS, 0-10V DIMMING AND OTHER WIRING METHODS. SUPPLIER SPECIFIC SYSTEMS SHALL NOT BE USED.



ROOF LEVEL POWER PLAN

2 / E1.3 SCALE: 1 : 50

DRAWING NOTES

1. PROVIDE ONE (1) 120V, 20A CIRCUIT C/W WEATHER-PROOF GFCI OUTLET AND WHILE-IN-USE COVER FOR SERVICE MAINTENANCE.

PANEL : EXISTING PANEL 'C'

NOTES: -

VOLTAGE: 120/208 V, 3PH, 4W
AMPERAGE: 225 A
kA RATING: -
PANEL LOCATION: -
FED FROM: SWITCHGEAR
LOAD (KW): -
LOAD (A): -

☐ RECESSED
☒ SPRINKLERPROOF
☐ MAIN BREAKER
☐ FEED-THRU LUGS
☐ GROUND I.G

WATTS	DESCRIPTION	BRK	CCT	PH	CCT	BRK	DESCRIPTION	WATTS
-	LIGHTS CLASS 137	15	1	A	2	15	RECEPTACLE CLASS 137	-
	LIGHTS CLASS 136	15	3	B	4	15	RECEPTACLE CLASS 137	
	LIGHTS CLASS 138	15	5	C	6	15	RECEPTACLE CLASS 136	
	LIGHTS CLASS 139	15	7	A	8	15	RECEPTACLE CLASS 136	
	LIGHTS JANITORS RM	15	9	B	10	15	RECEPTACLE CLASS 138	
	LIGHTS ELEVATOR PIT	15	11	C	12	15	RECEPTACLE CLASS 138	
	BASEBOARD HEATER CLASS 137	20/2P	13	A	14	15	RECEPTACLE CLASS 139	
			15	B	16	15	RECEPTACLE CLASS 139	
	BASEBOARD HEATER CLASS 136	20/2P	17	C	18	15	RECEPTACLE TEACHERS PREP	
			19	A	20	15	RECEPTACLE TEACHERS PREP	
	BASEBOARD HEATER CLASS 138	20/2P	21	B	22	15	RECEPTACLE JANITORS RM	
			23	C	24	15	RECEPTACLE ELEVATOR GFCI PIT	
	BASEBOARD HEATER CLASS 139	20/2P	25	A	26		SPACE	
			27	B	28	15	ELEVATOR CAB LIGHTING	
	EXISTING LOAD	20/2P	29	C	30	30/3P	ELEVATOR CONTROL PANEL	
			31	A	32			
3000	STAIRWELL FAN FORCED HEATER	20/2P	33	B	34			
			35	C	36	15	JANITOR EF1 + EF2	
	CORRIDOR LIGHTING/EMERGENCY	15	37	A	38	15	OUTSIDE LIGHTS (NORTH)	
	SUMP PIT RECEPTACLE	15	39	B	40	15	OUTSIDE LIGHTS (SOUTH)	
	SUMP PIT RECEPTACLE	15	41	C	42	15/2P	JANITORS SINK RM HEATER	
	PRESCHOOL EMERG. AND EXIT	15	43	A	44			
	PRESCHOOL LIGHTING	15	45	B	46	20	**PRESCHOOL GFI RC.**	
	STAIRWELL LIGHTING	15	47	C	48	15	**PRESCHOOL WC GFI RC.**	
	PRESCHOOL LIGHTING	15	49	A	50	15	**PRESCHOOL RC.**	
	EH-1	15	51	B	52	15	**PRESCHOOL RC.**	
	EH-2	20	53	C	54	20	**EH-3**	
	SP-1	15/2P	55	A	56	20	**ROOF UTILITY RC.**	
			57	B	58	35/3P	**RTU-4**	
	SPACE		59	C	60			
	EXISTING LOAD	30/3P	61	A	62			
			63	B	64	20/2P	PANEL RECEPTACLE	
			65	C	66			

PANEL C PROPOSED SCHEDULE

2 / E1.3 SCALE: 1 : 50

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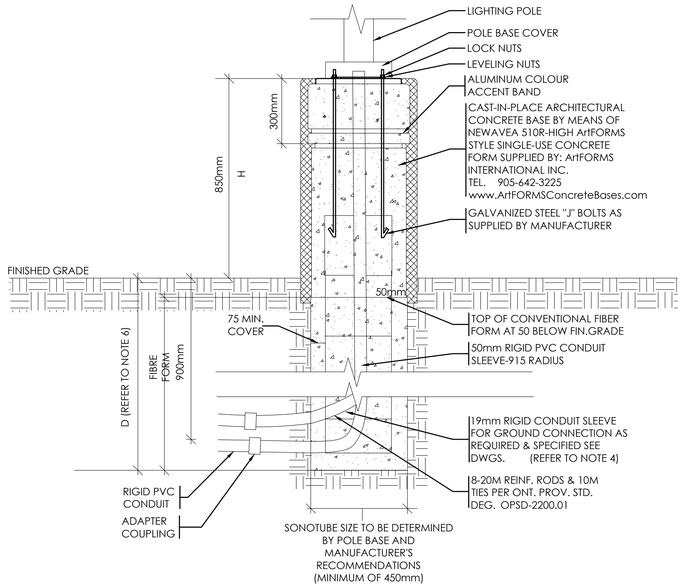
60 Clench Avenue, Brantford, Ontario N3T 1B9

2ND FLOOR & ROOF LIGHTING, POWER, FIRE ALARM PLAN & PANEL SCHEDULE

E1.3



POLE LENGTH (m)	BASE BURIAL DEPTH 'D' (m)	REINF. ROD LENGTH (m)
3.0	1.50	H + 1.35
5.6	2.15	H + 2.00
7.0	2.15	H + 2.00
7.5	2.15	H + 2.00
8.7	2.45	H + 2.30
9.0	2.45	H + 2.30
10.5	2.60	H + 2.45

NOTE:

1. TOP OF FOUNDATION SHALL BE TROWELLED SMOOTH & LEVEL.
2. CLASS OF CONCRETE SHALL BE 25mPa. CONCRETE SHALL BE VIBRATED.
3. MINIMUM OF TWO SLEEVES REQUIRED FOR EACH CONC. FOUNDATION UNLESS OTHERWISE SHOWN.
4. PROVIDE A 19mm DIA. 3000mm STEEL COPPER COATED GROUND ROD ADJACENT TO POLES AS SPECIFIED ON PLAN AND CONNECT TO METAL POLE WITH BARE COPPER CONDUCTOR.
5. CONTRACTOR TO VERIFY OPENING SIZE IN POLE BASE PLATE PRIOR TO SETTING CONDUIT SLEEVES.
6. SUBJECT TO SOIL CONDITIONS, REFER TO SOIL REPORT.

1 / E2.1 LIGHT POLE DETAIL
SCALE: N.T.S

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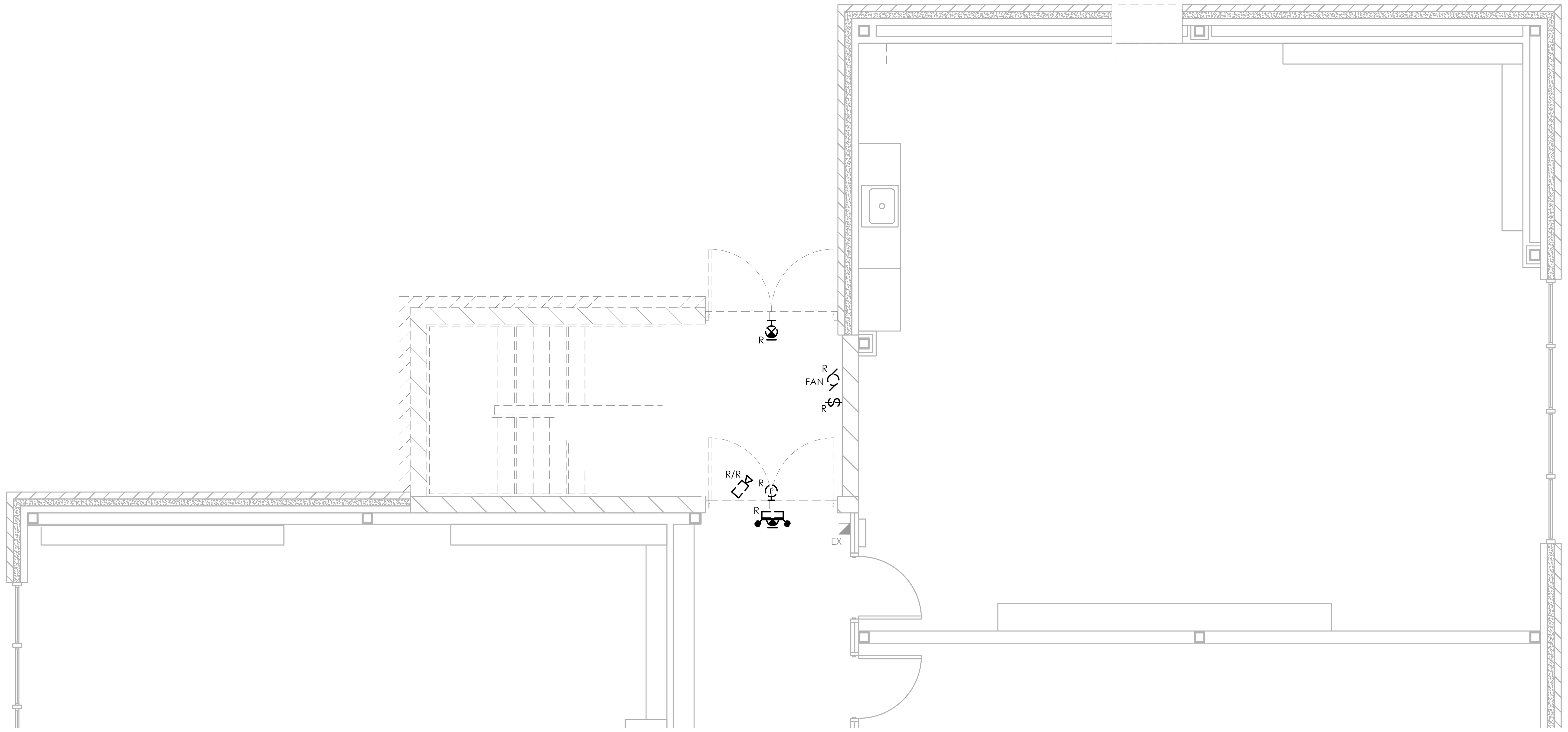
ELECTRICAL DETIALS

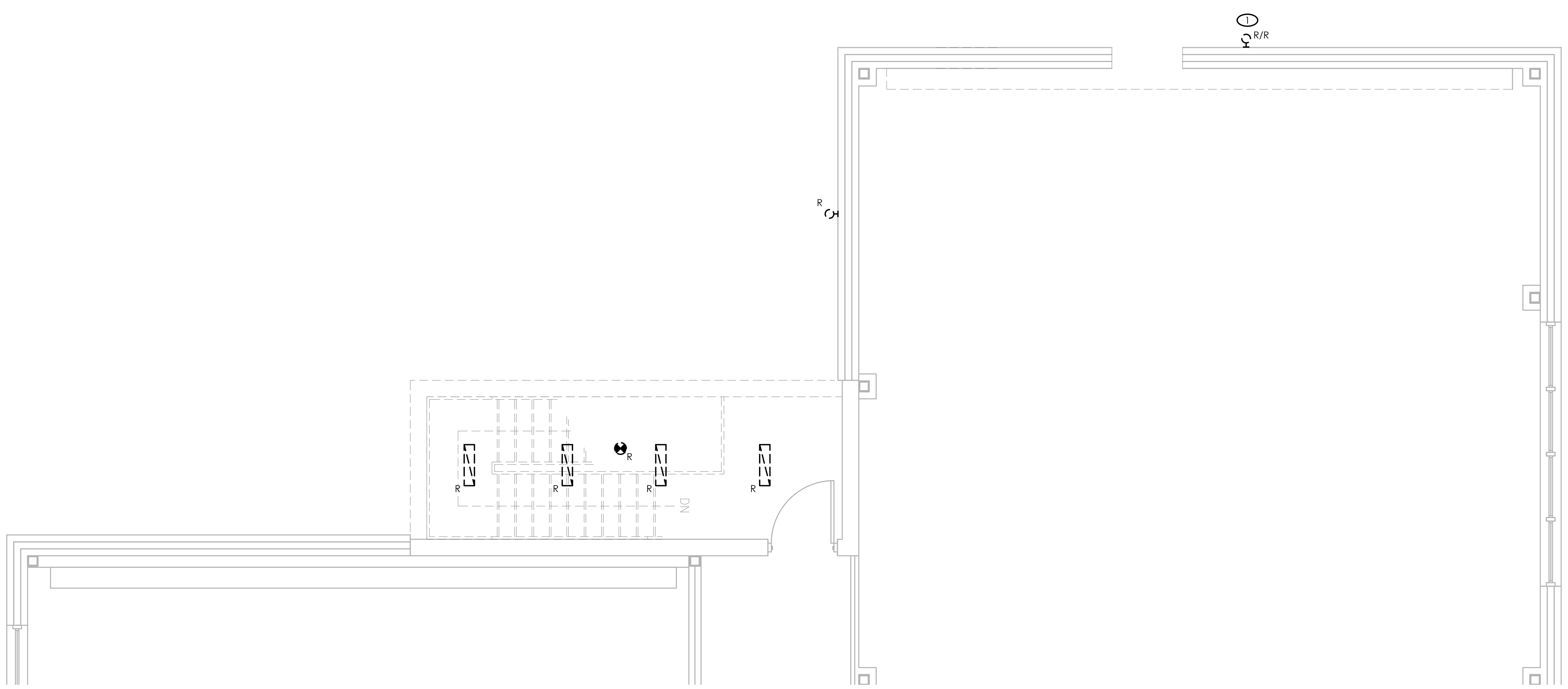
E2.1

DRAWING NOTES

1. ALLOW FOR THE REMOVAL AND RE-INSTALLATION OF THE EXISTING LIGHT FIXTURE TO SUIT THE NEW TEMPORARY EXIT STAIRS. UPON REMOVAL OF THE EXIT STAIR RETURN THE LIGHT FIXTURE TO THE ORIGINAL LOCATION.



1 / ED1.1 GROUND FLOOR DEMOLITION PLAN
SCALE: 1 : 50



2 / ED1.1 2ND FLOOR DEMOLITION PLAN
SCALE: 1 : 50

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LIGHTING & FIRE ALARM DEMOLITION PLAN

ED1.1