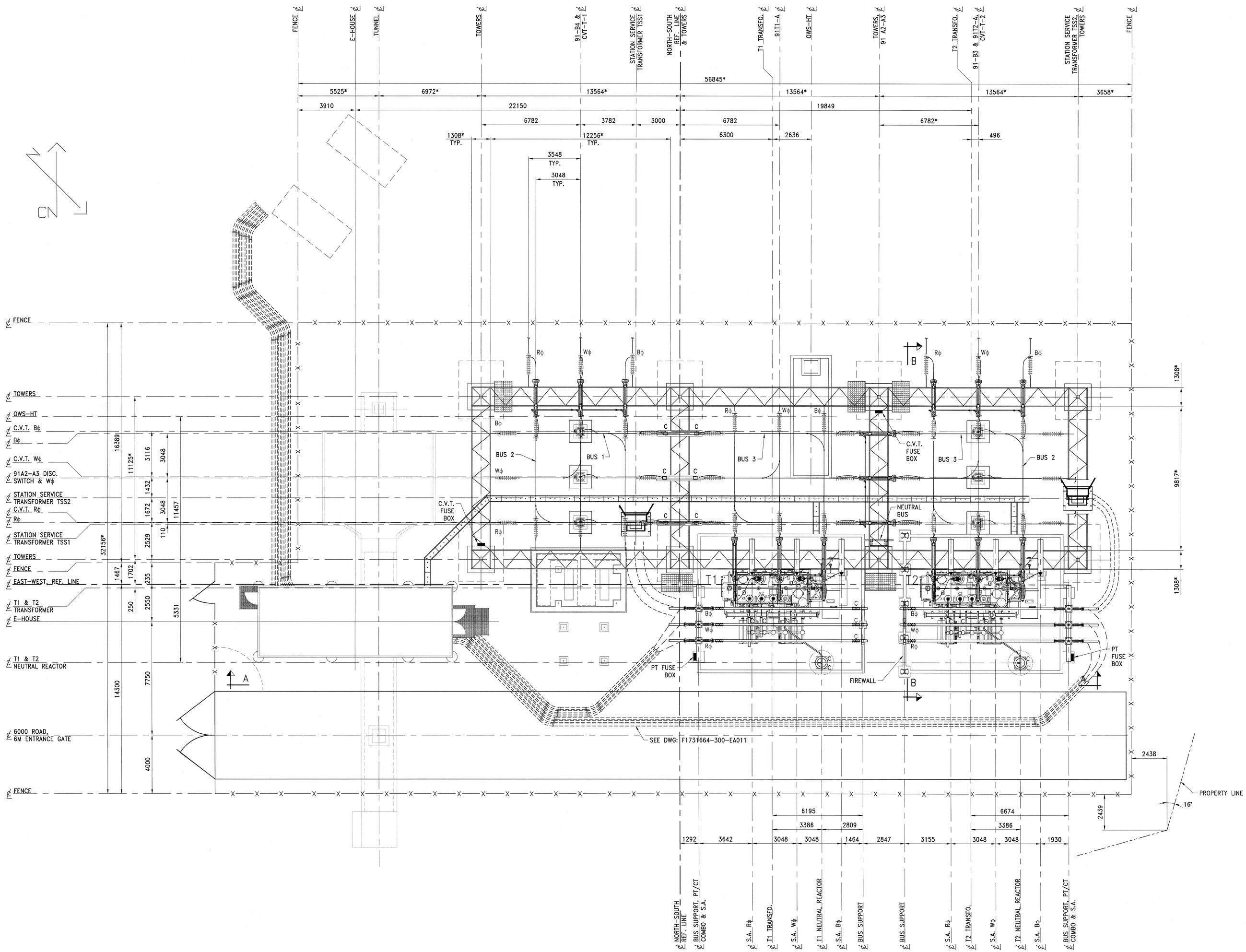


PLAN

PHASING DIAGRAM

R W B

B

W

R

SAG BUS 1

CALCULATED SAGS (m) BASED ON 13mm ICE AND 90 km/h OF WIND: 115kV 1 X 795 kCMIL ACSR BETWEEN GIRDER ANCHOR POINTS. MAXIMAL HORIZONTAL TENSION 5.14N.

SPAN (M)	2.0 KN TENSION FOR 4% SAG, 795KCMIL ACSR AT 20 DEG. C					
12.256M	TEMP °C	-40	-20	0	20	40
	SAG-OPERATION CONDITIONS (M)	0.36	0.40	0.43	0.46	0.48

SAG BUS 2

CALCULATED SAGS (m) BASED ON 13mm ICE AND 90 km/h OF WIND: 115kV 1 X 795 kCMIL ACSR BETWEEN GIRDER ANCHOR POINTS. MAXIMAL HORIZONTAL TENSION 6.0kN.

SPAN (M)	3.2 KN TENSION FOR 4%, 795KCMIL ACSR					
9.817M	TEMP °C	-40	-20	0	20	40
	SAG-OPERATION CONDITIONS (M)	0.29	0.32	0.34	0.37	0.39

SAG BUS 3

CALCULATED SAGS (m) BASED ON 13mm ICE AND 90 km/h OF WIND: 115kV 1 X 795 kCMIL ACSR BETWEEN GIRDER ANCHOR POINTS. MAXIMAL HORIZONTAL TENSION 5.7kN.

SPAN (M)	2.3 KN MAX. TENSION FOR 4%, 795KCMIL ACSR					
12.25M	TEMP °C	-40	-20	0	20	40
	SAG-OPERATION CONDITIONS (M)	0.36	0.40	0.43	0.46	0.48

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.
2. DIMENSIONS MARKED WITH '*' HAVE BEEN SOFT CONVERTED TO THE NEAREST MILLIMETER.

REFERENCE DRAWINGS:

1. GENERAL LAYOUT & DETAILS ----------1796-D-C1
2. LAYOUT AND ELEVATIONS ----------1796-D-E4
3. 115/13.8KV STATION, ELEVATIONS, ELECTRICAL ARRANGEMENT ---F1731664-300-EA009
4. 115/13.8KV STATION, CABLE, CONDUITS, NEUTRAL & LIGHTING, PLAN & DETAILS, ELECTRICAL ARRANGEMENT ---F1731664-300-EA011
5. 115/13.8KV STATION, MAIN GROUNDING GRID, PLAN & DETAILS, ELECTRICAL ARRANGEMENT --F1731664-300-EA012

PROFESSIONALS:

N°	DATE	TRANSMISSION	BY

SMi THE S.M. GROUP INTERNATIONAL INC.
6205B Airport rd, Suite 205, Mississauga (Ontario) L4V 1E3
Tel. : 905 677 9009 / Fax. : 905 677 9014
www.groupesm.com

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CLIENT:

PROJECT:

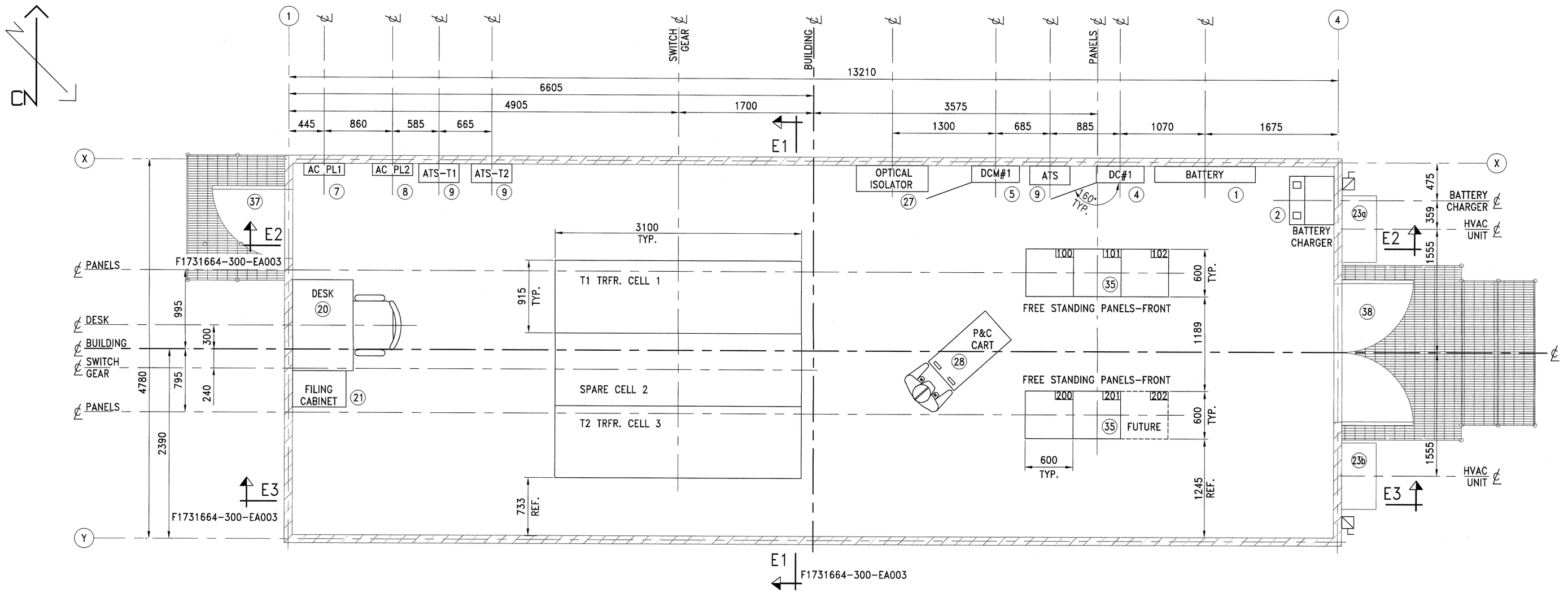
MCMASTER UNIVERSITY-NF91

TITLE:

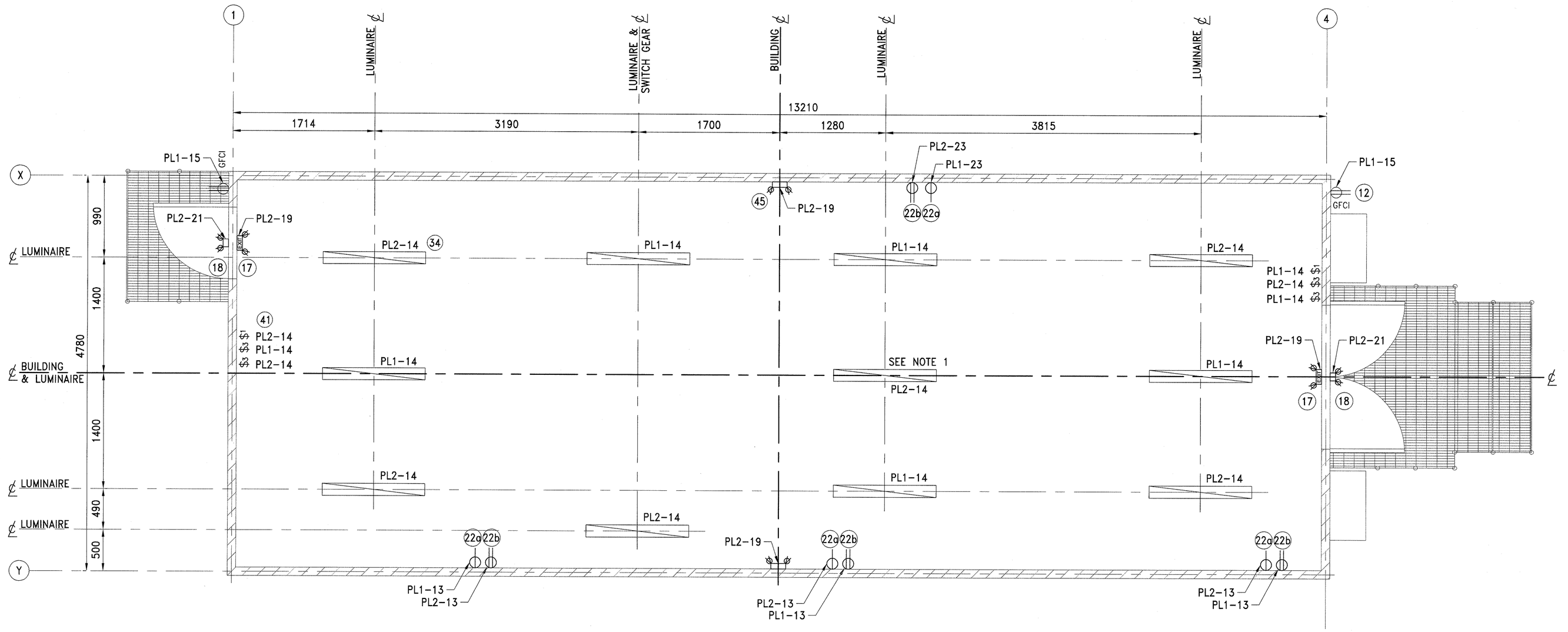
115/13.8KV STATION
BASIC LAYOUT
ELECTRICAL ARRANGEMENT

PREPARED BY:	DATE:
Y.LESSARD	2018-06-27
DRAWN BY:	SCALE:
C.BAZINET	1:100
VERIFIED BY:	DISCIPLINE:
M. LAROCQUE	ELECTRICAL ARRANGEMENT
APPROVED BY:	CAD FILE NAME:
Y. LESSARD	F1731664-300-EA001.dwg

PROJECT N°	LOT	DWG #	REV.	PAGE:
F1731664	300	EA001	00	



EQUIPMENT LAYOUT PLAN



RECEPTACLE & LIGHTING

NOTES:

1. NO CONSECUTIVE LIGHTING FIXTURE TO BE SUPPLIED FROM THE SAME CIRCUIT.

LEGEND:

SYMBOL	DESCRIPTION
(12) GFCI	DUPLEX RECEPTACLE-15A 120V GFCI
(22b)	DUPLEX RECEPTACLE-15A 120V
(22a)	SINGLE RECEPTACLE-20A 120V TWISTLOCK
(41) $1	SINGLE POLE SWITCH
(42) $3	THREE WAY SWITCH
(17) EXIT	TWIN HEAD EMERGENCY LIGHT C/W BATTERY
(18)	EXTERIOR LUMINAIRE
(34)	INDOOR LUMINAIRE
	FUTURE EQUIPMENT FOR DG READY BUILDING
	UNFUSED DISCONNECT SWITCH, 60A

PROFESSIONALS:

N°	DATE	TRANSMISSION	BY ENG

THE S.M. GROUP INTERNATIONAL INC.
6205B Airport rd, Suite 205, Mississauga (Ontario) L4V 1E3
Tel. : 905 677.9009 / Fax. : 905 677.9014
www.groupesm.com

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CLIENT :

PROJECT :

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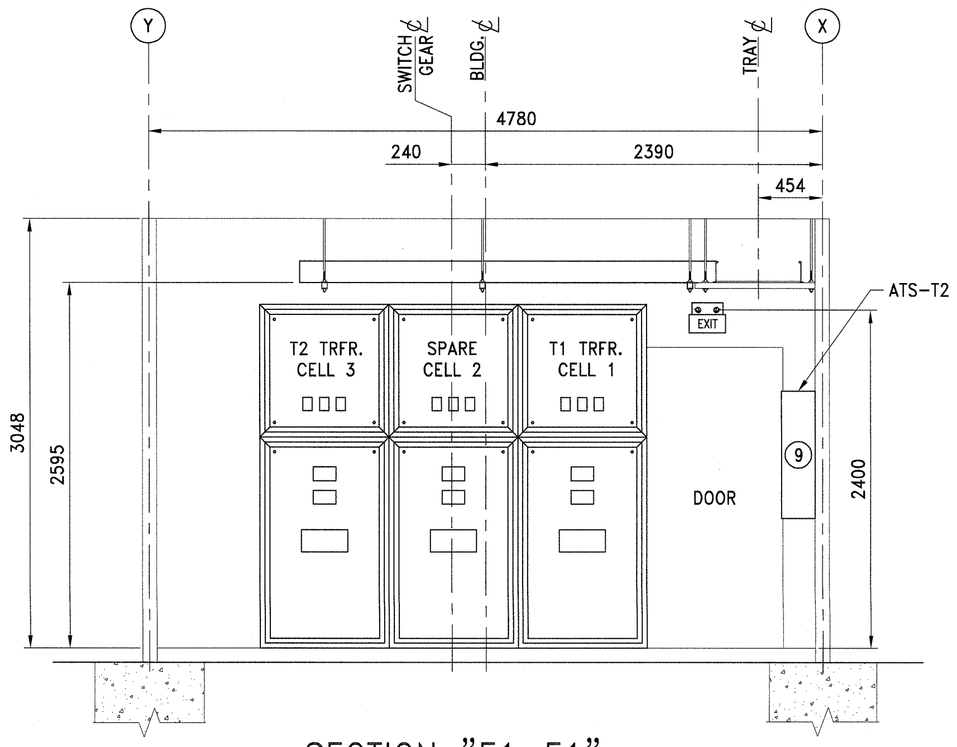
TITLE :

13.8kV AREA E-HOUSE EQP, LTG & RECEPTACLE ELECTRICAL ARRANGEMENT

PREPARED BY : M.GUAY	DATE : 2018/07/15
DRAWN BY : M.GUAY	SCALE : AS SHOWN
VERIFIED BY : M.LAROCQUE	DISCIPLINE : ELECTRICAL ARRANGEMENT
APPROVED BY : Y.LESSARD	CAD FILE NAME : F1731664-300-EA002_NEW.dwg

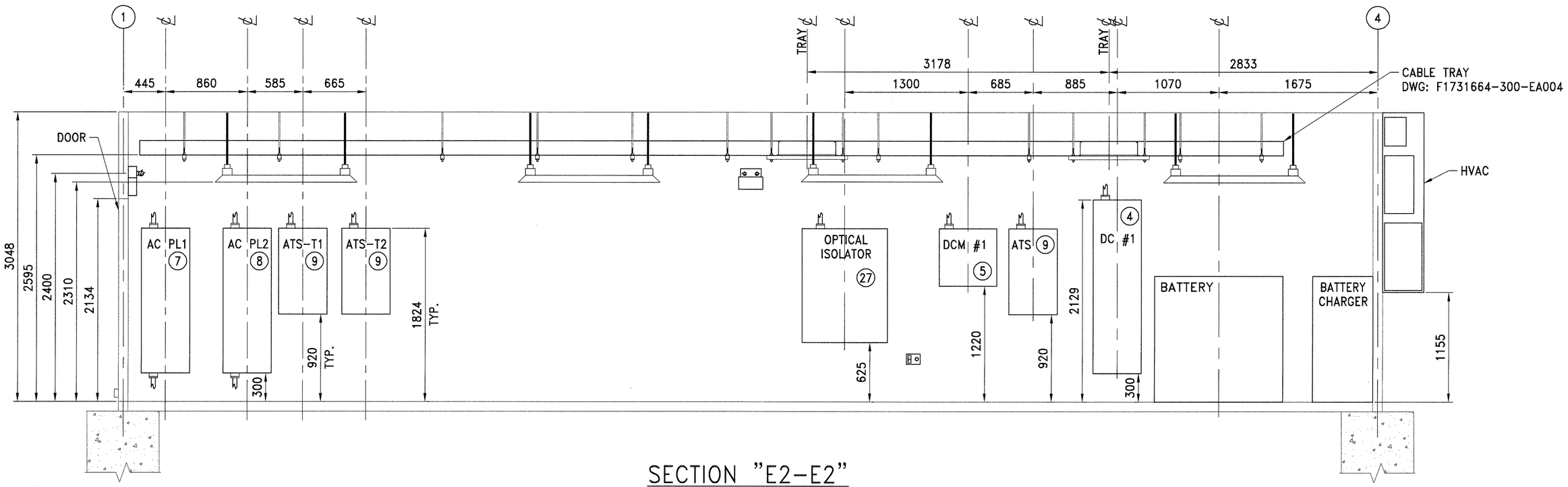
PROJECT No:	LOT:	DWG. #	REV:	PAGE :
F1731664	300	EA002	00	

A1



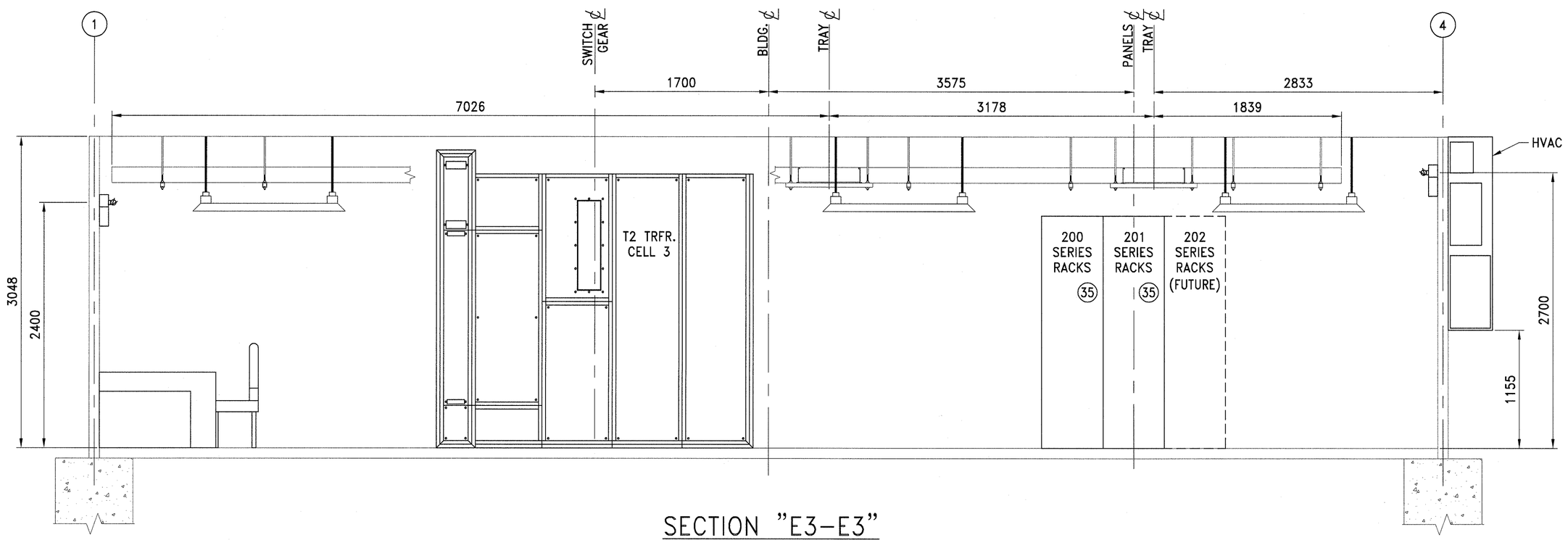
SECTION "E1-E1"

SCALE: 1:30



SECTION "E2-E2"

SCALE: 1:30



SECTION "E3-E3"

SCALE: 1:30

NOTES:

1. THE BUILDING MANUFACTURER TO PROVIDE PLATFORM SUPPORTING BRACKETS THE DEPTH OF PERIMETER BEAM, OR EQUIVALENT.
2. THE BUILDING MANUFACTURER TO PROVIDE RIGID PVC PIPE CONNECTION TO HVAC DRAIN OUTLET DOWN THE SIDE OF BUILDING.
3. ALL WALL MOUNTED RECEPT. TO BE INSTALLED 450MM ABOVE FINISHED FLOOR UNLESS OTHERWISE NOTED. LIGHTING SWITCHES TO BE MOUNTED 1370MM FINISHED FLOOR CENTERLINE OF SWITCH LOCATED 100MM FROM DOOR FRAME.
4. FOR DC-MONITORING CABINETS WIRING USE 2" FR PVC PIPE.
5. REQUIRED ONLY FOR STATIONS WITH DG.

PROFESSIONALS:

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6205B Airport rd, Suite 205, Mississauga (Ontario) L4V 1E3
Tel.: 905 677.9009 / Fax.: 905 677.9014
www.groupesm.com

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LICENSED PROFESSIONAL ENGINEER
Y.Lessard
100128893
PROVINCE OF ONTARIO

CLIENT:

PROJECT:

MCMASTER UNIVERSITY-NF91

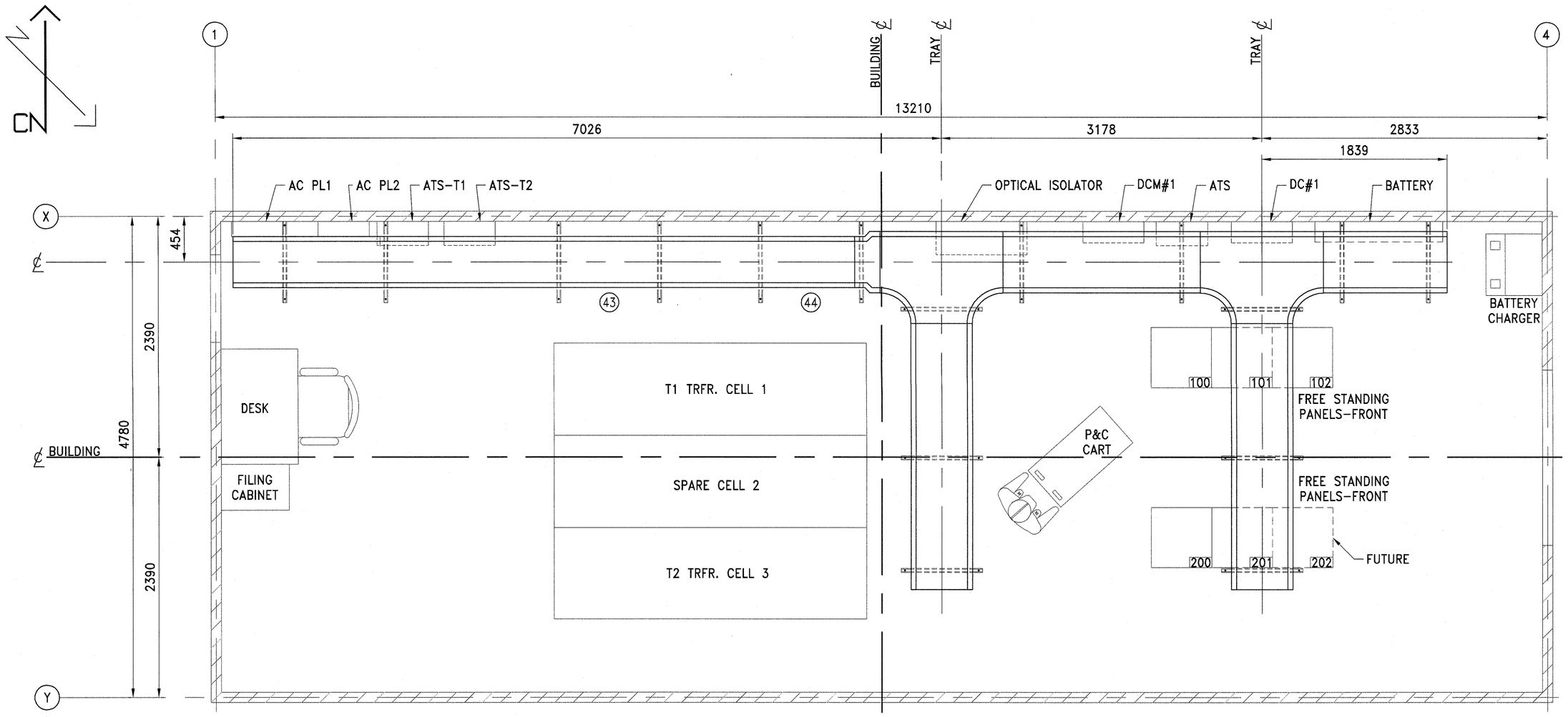
TITLE:

13.8kV AREA E-HOUSE SECTIONS VIEW ELECTRICAL ARRANGEMENT

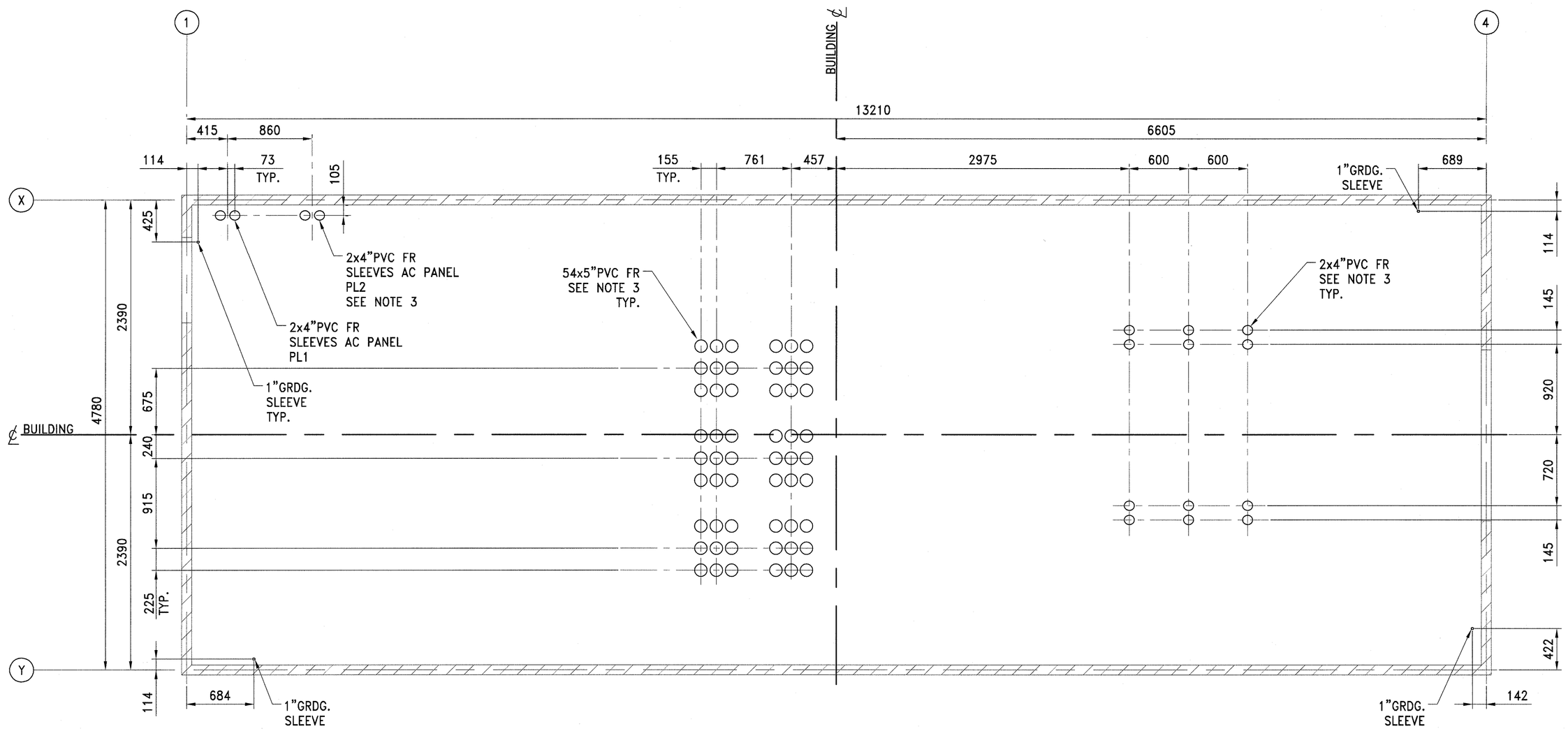
PREPARED BY: M.GUAY	DATE: 2018/07/15
DRAWN BY: M.GUAY	SCALE: 1:30
VERIFIED BY: M.LAROCQUE	DISCIPLINE: ELECTRICAL ARRANGEMENT
APPROVED BY: Y.LESSARD	CAD FILE NAME: F1731664-300-EA003.dwg

PROJECT No:	LOT:	DWG. #	REV:	PAGE:
F1731664	300	EA003	00	

A1



CABLE TRAY ARRANGEMENT



FLOOR OPENINGS LAYOUT

NOTES:

1. ALL INSTALLATIONS TO BE AS PER ELECTRICAL CODE.
2. NO CONSECUTIVE LIGHTING FIXTURE TO BE SUPPLIED FROM THE SAME CIRCUIT.
3. ALL PVC PIPE SHOULD BE SEALED WITH CAULKING/HEAT SHRINK SLEEVE & CUT FLUSH WITH THE FLOOR.

PROFESSIONALS:

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CLIENT:

PROJECT:

MCMASTER UNIVERSITY-NF91

TITLE:

13.8kV AREA E-HOUSE CABLE TRAY & FLOOR OPENING ELECTRICAL ARRANGEMENT

PREPARED BY: M.GUAY	DATE: 2018/07/15
DRAWN BY: M.GUAY	SCALE: 1:30
VERIFIED BY: M.LAROCQUE	DISCIPLINE: ELECTRICAL ARRANGEMENT
APPROVED BY: Y.LESSARD	CAD FILE NAME: F1731664-300-EA004.dwg

PROJECT No:	LOT:	DWG. #	REV:	PAGE:
F1731664	300	EA004	00	

A1

BILL OF MATERIAL – MAJOR COMPONENTS

ITEM	QTY	MAKE	DESCRIPTION	WIDTH mm	DEPTH mm	HEIGHT mm	WIDTH in	DEPTH in	HEIGHT in	APPROX. WEIGHT [kg]	REFERENCE DRAWING/ MANUFACTURER PART #	SUPPLY & INSTALL BY MCMASTER	FREE ISSUE BY MCMASTER	SUPPLY& INSTALL BY VENDOR
1	58	SBS	BATTERY, FLOODED, NICKEL CADIUM, 200AHR, 125V. HVL SERIES – LONG DURATION	205.5	334.9	386.6	8.09	13.59	15.22	63[3 Cell] 44[2 Cell]	TBD			Y
2	1	IE POWER	BATTERY CHARGER, 208VAC 3–PHASE INPUT, 120V DC 100A OUTPUT	610	559	864	24	22	34					Y
4	1	CUTLER HAMMER	DC#1, 125V, 225A, 2–PHASE	508	152	1829	20	6	72					Y
5	1		DC MONITORING CABINET #1	604	210	604	23.78	8.27	23.78	50				Y
7	1	CUTLER HAMMER	AC PANEL #1, 120/208V, 225A, 3–PHASE 5–WIRE	508	152	1524	20	6	60	160	24B415400 SHT 1			Y
8	1	CUTLER HAMMER	AC PANEL #2, 120/208V, 225A, 3–PHASE 5–WIRE	508	152	1524	20	6	60	160	24B415400 SHT 2			Y
9	3	CUTLER HAMMER	ATS, 208V, 100A, 3–PHASE 4–WIRE	510	238	905	20	11.3	35.6	71	ATH3FDA300100BSC			Y
10	1	NOTIFIER	TRANSFORMER, BATTERY ROOM & HVAC FIRE PANEL	609.6	132.54	318.77	24	5.22	12.55		NOTIFIER BB–25			
11	TBD		AC CABLE RACEWAY UNISTRUT CHANNEL @ 1200mm SPACING	VARIES	125		24.4	5						Y
12	2	HUBBELL	DUPLEX GFCI RECEPTACLE 15A, 120V AC WITH WEATHERPROOF COVER											Y
16	2	KIDDE	FIRE EXTINGUSHER, 20LBS ABC							30LBS	ANSUL			Y
17	2	LUMACELL	EMERGENCY LIGHTING, 12V 50W, TWO HEADS LED 12V 5W, WITH AUTO TEST. C/W PICTOGRAM "STRAIGHT FROM HERE" CSA C22.2 #141 CERTIFIED.	32.40	11.7	30.8	12 3/4	4 3/4	12 1/4		LAC–1–W–1250–2–LD7–AT			Y
18	2	HOLOPHANE	EXTERIOR LUMINAIRE, HOLOPHANE WALLPACK 4, TYPE 3 OPTICS, LED, 1A DRIVER, 120V 60Hz, BRONZE FINISH, CAST AL. HOUSING	406	381	203	16	15	8		W4GLED 20C 1000 50K T3M 120 BZ			Y
20	1		OPERATOR DESK AND NON METALLIC CHAIR	1143	762	737	45	30	29					Y
21	1	STAPLES	4 DRAWER VERTICAL FILING CABINET	381	675	1321	15	26.6	52		STAPLES IT# 10110 OR EQUIVALENT			Y
22a	4	HUBBELL	SINGLE RECEPTACLE–20A 120V TWISTLOCK											Y
22b	6	HUBBELL	DUPLEX RECEPTACLE–15A 120V											Y
23a	1	BARD MANUFACTURING CO.	HVAC UNIT 208V AC, 3–PHASE,3–TON C/W 9KW HEATER – ONE LEFT HAND UNIT	838	435	1792	8.66	17.125	70.6	182	W36L–1–B–09–EPX–XXX			Y
23b	1	BARD MANUFACTURING CO.	HVAC UNIT 208V AC, 3–PHASE,3–TON C/W 9KW HEATER – ONE RIGHT HAND UNIT	838	435	1792	8.66	17.125	70.6	182	W36A–1–B–09–EPX–XXX			Y
25	1 LOT	NOTIFIER	FIRE PANEL NOTIFIER NFS320, DETECTORS, PULL STATION, BELL, DOOR CONTACTS, ETC.	479.3	147.75	469.11	18.87	5.817	18.469					Y
26	1		FIRST AID KIT C/W INSPECTION CARD				46							
27	1	SNC	OI (OPTICAL ISOLATOR) FULL, BACKBOARD, BIX, SLIDE, LINKS. SNC.	1168	330	2438	46	13	96		P31097G01–CB			Y
28	1	RUBBERMAID	PROTECTION AND CONTROL CART – RUBBERMAID FLAT SHELD UTILITY CART	962	487	846	11	19.19	33.31	15	MODEL #4505			Y
29	1	HELIX	50 KEY CAPACITY KEY CABINET	279	76	279	48	3	11		STAPLES IT# 585165			Y
30	1	STAPLES	CORK BOARD	1219	12.7	914		0.5	36		STAPLES IT# 782409			Y
31	1	HOFFMAN	TEMPERATURE CONTROL SWITCHES (HIGH/LOW)								ATEMNC / ATEMNO			Y
34	11	HOLOPHANE	INTERIOR LUMINAIRE, HOLOPHANE EVT4 PRISMATITE, TWO 32W FLUORESCENT LAMPS, 120V 60Hz, 4000K. CCT & 80 CRI	1391	210	105	54 3/4	21	4 1/8	5.90	EVT4–4000LM–PCL–MD–120–GZ10–4 0K–80CRI			Y
35	5		PROTECTION & CONTROL RACKS 600 x 600 x 2100	600	600	2100	24	24	72					Y
36a	1	EATON	SAFETY SWITCH 60A – OUTDOOR; NON FUSIBLE – LEFT SIDE HANDLE	206	260	356	8.125	10.25	14		4HD362NFW–LH–H1			Y
36b	1	EATON	SAFETY SWITCH 60A – OUTDOOR; NON FUSIBLE – RIGHT SIDE HANDLE	206	260	356	8.125	10.25	14		4HD362NFW–H1			Y
37	1		3'–6" x 7'–0" x 1–3/4" STEEL INSULATED DOOR W/ KICKPLATE, CLOSURE W/ HOLD OPEN ARM. INCLUDES ONE 24" x 22" GLASS, THRESHOLD, JAMB SEAL & SWEEP. RIM EXIT HARDWARE W/ PULL PLATE ON INSIDE OF DOOR & PULL/THUMBPIECE ON EXTERIOR.	1067	44	2134	42	1.75	84					Y
38	1		6' x 8'0" x 1–3/4" STEEL DOOR W/ KICKPLATE, CLOSURE W/ HOLD OPEN ARM. INCLUDES ONE 24" x 22" GLASS PANEL, THRESHOLD, JAMB SEAL & SWEEP. RIM EXIT HARDWARE W/ PULL PLATE ON INSIDE & DOOR PULL/THUMBPIECE ON EXTERIOR.	1829	44	2438	72	1.75	96					Y
40	1	BARD	SOLID STATE HVAC CONTROLLER LEAD/LAG	235	75	345	9.25	3	13.5		MC 3000B			Y
41	2	HUBBELL	SINGLE POLE SWITCH											Y
42	4	HUBBELL	THREE–WAY SWITCH											Y
43	1 LOT	HOFFMAN	QUICKTRAY WIRE MESH CABLE TRAY C/W SPLICING HARDWARE & ASSOCIATED PARTS	152		152	6		6		QT2X6			Y
44	1 LOT	CANSTRUT	CABLE TRAY, VENTILATED TYPE & ASSOCIATED PARTS	609.9		152	24		6		CPC660L253			Y
45	2	LUMACELL	EMERGENCY LIGHTING, 12V 50W, TWO HEADS LED 12V 4W, WITH AUTO TEST. CSA C22.2 #141 CERTIFIED.	32.40	11.7	30.8	12 3/4	4 3/4	12 1/4		LAC–1–W–1250–2–LD7–AT			Y

A1

NOTES :

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Tel. : 905 677.9009 / Fax. : 905 677.9014
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LICENSED PROFESSIONAL ENGINEER
Y. Lessard
100128893
2018 / 07 / 20
PROVINCE OF ONTARIO

CLIENT :

PROJECT :

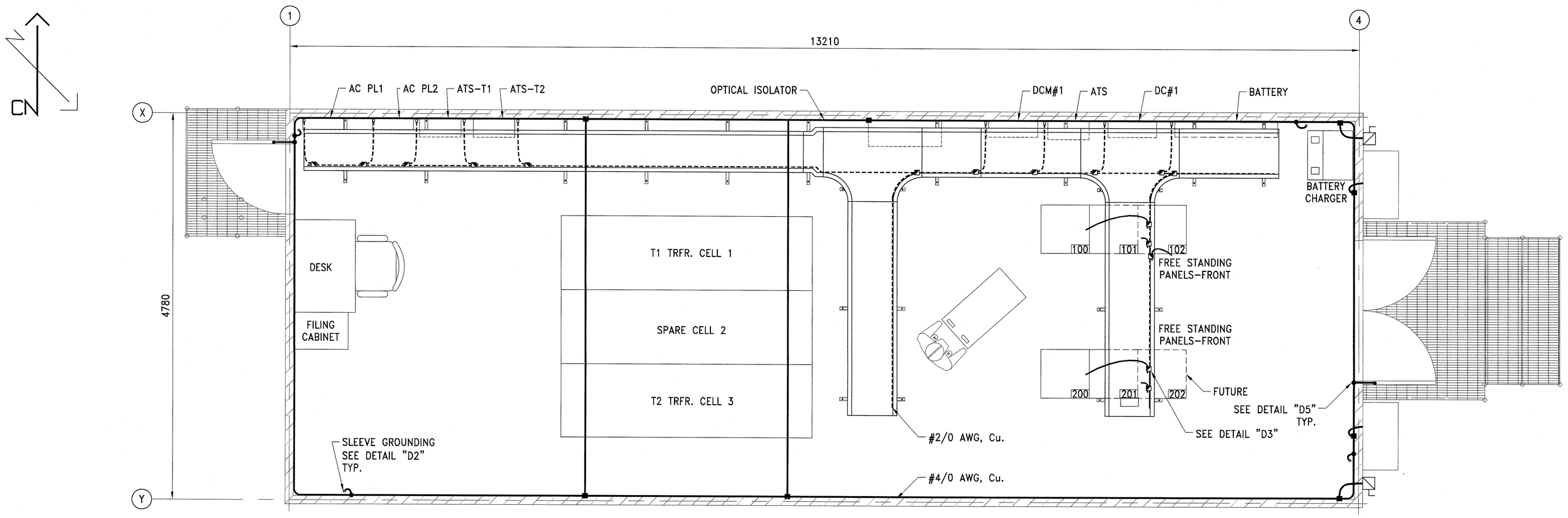
MCMASTER UNIVERSITY–NF91

TITLE :

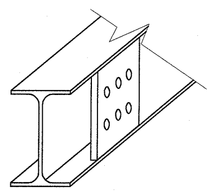
13.8kV AREA
E-HOUSE
BILL OF MATERIALS
ELECTRICAL ARRANGEMENT

PREPARED BY : **M.GUAY**	DATE : **2018/07/15**
DRAWN BY : **M.GUAY**	SCALE : **1:30**
VERIFIED BY : **M.LAROCQUE**	DISCIPLINE : **ELECTRICAL ARRANGEMENT**
APPROVED BY : **Y.LESSARD**	CAD FILE NAME : F1731664-300-EA005.dwg

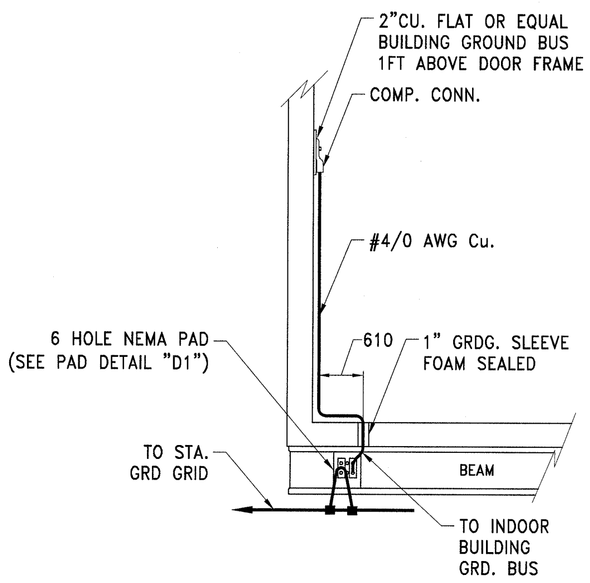
PROJECT No:	LOT:	DWG. #	REV:	PAGE :
F1731664	**300**	**EA005**	**00**	



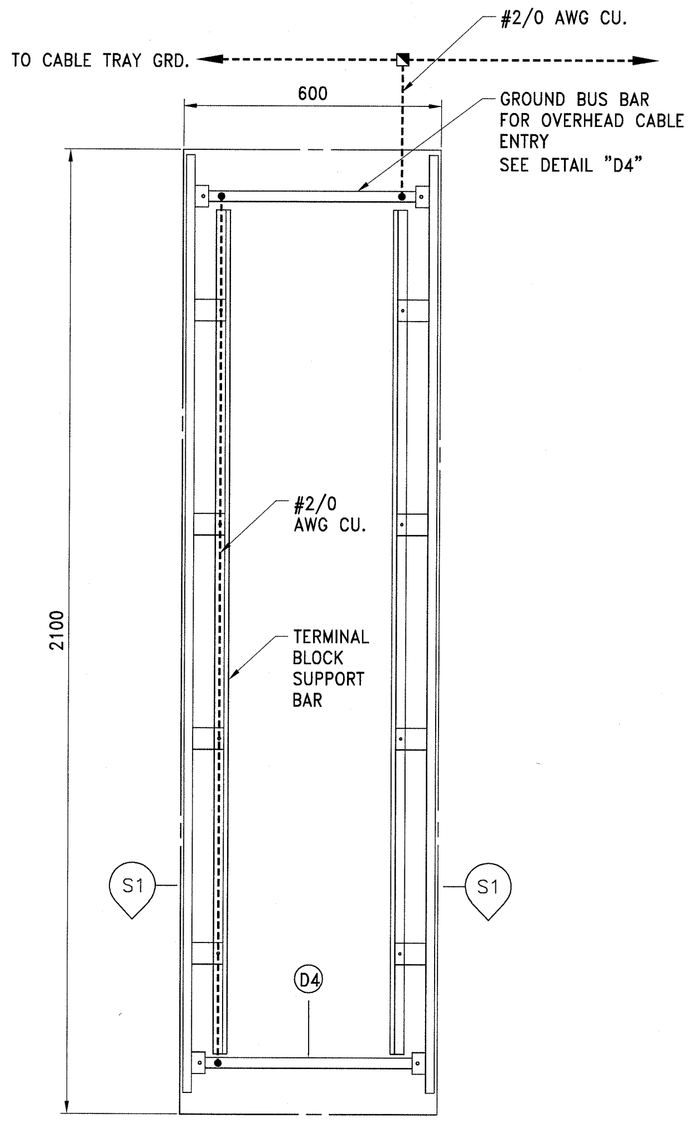
GROUNDING ARRANGEMENT



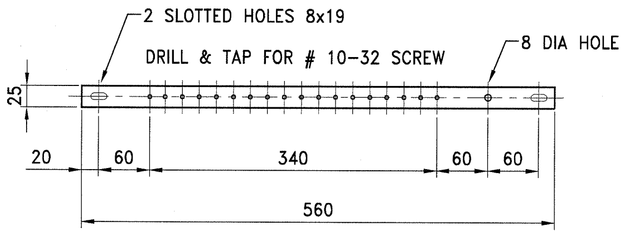
DETAIL "D1"
6 HOLE NEMA PAD TO BE WELDED ON EDGE OF BEAM
N.T.S.



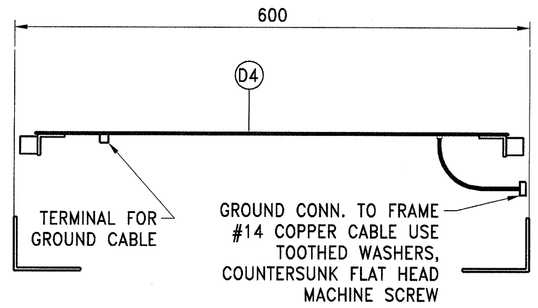
DETAIL "D2"
N.T.S.



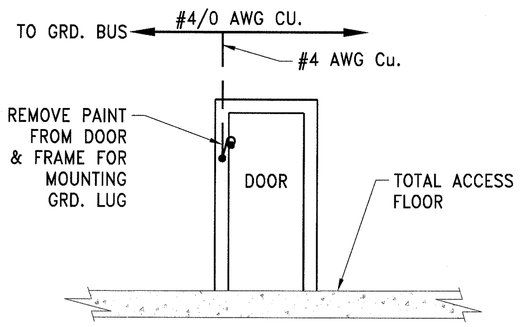
DETAIL "D3"
N.T.S.



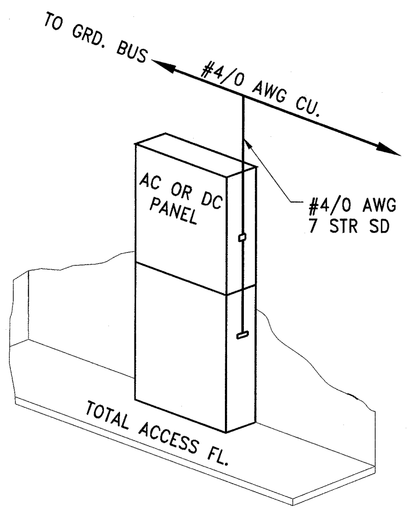
DETAIL "D4"
GROUND BUS BAR 25x3x560 COPPER
N.T.S.



SECTION "S1"
GROUND BUS BAR 25x3x560 COPPER
N.T.S.



DETAIL "D5"
DOOR FRAME GRDG
N.T.S.



DETAIL "D6"
CABINET GRD. CONN.(TYP.)
N.T.S.

NOTES:

1. CABLE TRAY GROUNDING TO BE RUN #2/0 CU. THE ENTIRE LENGTH OF THE CABLE TRAY. GROUNDING CONDUCTOR TO FASTENED WITH TERM. IN THE INSIDE WALL OF THE CABLE TRAY.
2. EACH FREE-STANDING RACK TO BE GROUNDED PER DETAIL "D3"
3. AC/DC PANEL BOARDS & DOORS GRD. AS DETAIL"D6" & "D5".
4. ALL INSTALLATIONS TO BE AS PER ULC, CSA AND ONTARIO ELECTRICAL SAFETY CODE.

LEGEND:

SYMBOL	DESCRIPTION
----------	#2/0 AWG Cu.
————	#4/0 AWG Cu.
— — — —	#4 AWG Cu.
■	#4/0 Cu. – #4/0 Cu.
◪	#2/0 Cu. – #2/0 Cu.

PROFESSIONALS:

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6205B Airport rd. Suite 205, Mississauga (Ontario) L4V 1E3
Tel. : 905 677.9009 / Fax. : 905 677.9014
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Y.Lessard
100128932

CLIENT :

PROJECT :

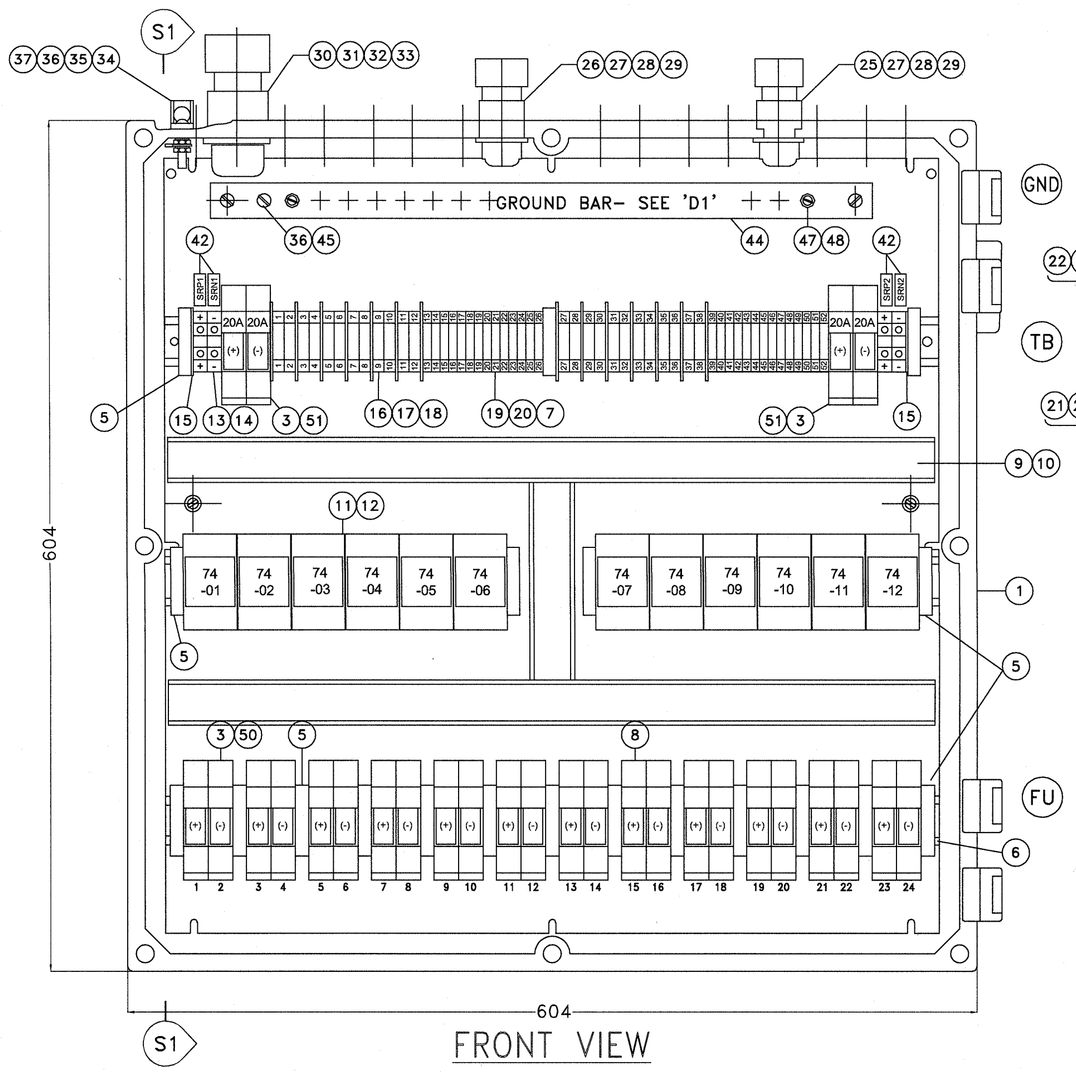
MCMASTER UNIVERSITY–NF91

TITLE :
13.8kV AREA E-HOUSE GROUNDING ELECTRICAL ARRANGEMENT

PREPARED BY : M.GUAY	DATE : 2018/07/15
DRAWN BY : M.GUAY	SCALE : 1:30 & NOTED
VERIFIED BY : M.LAROCQUE	DISCIPLINE : ELECTRICAL ARRANGEMENT
APPROVED BY : Y.LESSARD	CAD FILE NAME F1731664-300-EA006.dwg

PROJECT No:	LOT:	DWG. #	REV:	PAGE :
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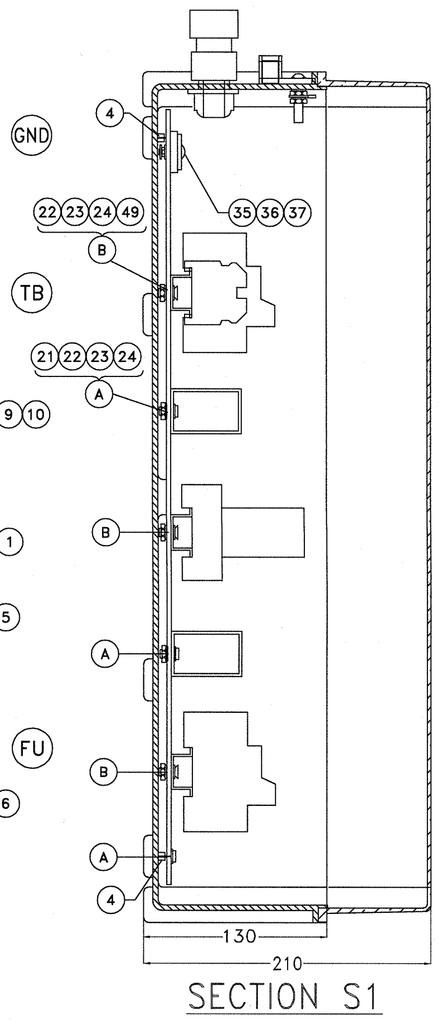
A1



FRONT VIEW

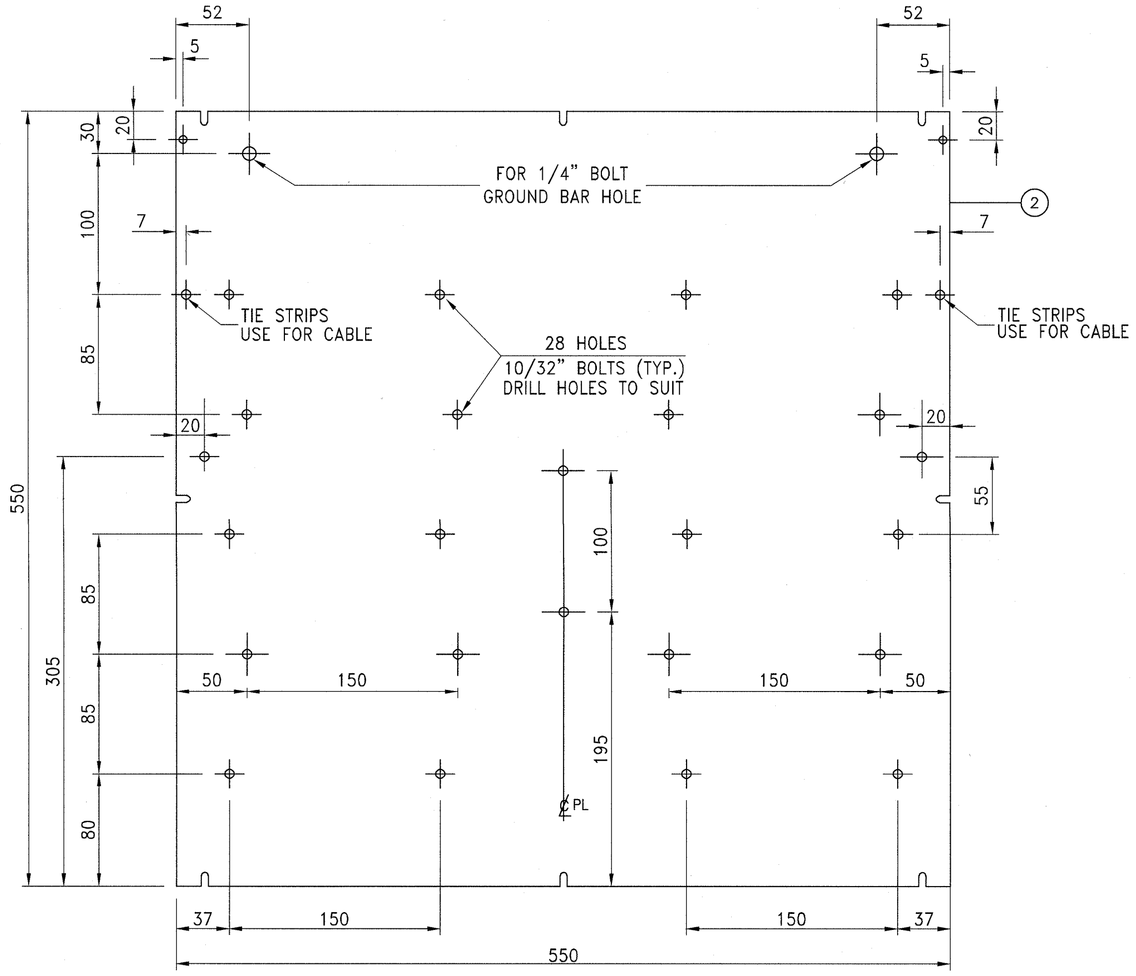
(NOT ALL CONNECTORS ARE SHOWN)

N.T.S.



SECTION S1
SIDE VIEW

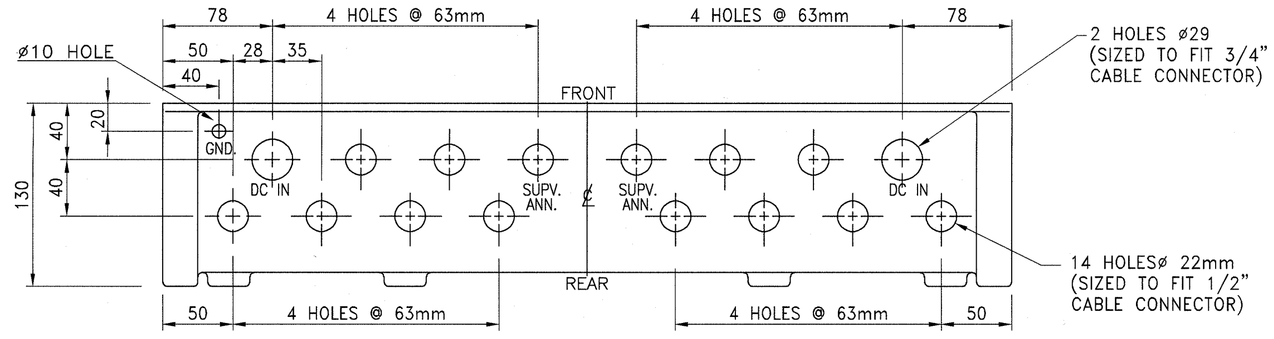
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BACK PLATE DRILL PLAN

SEE NOTE #14

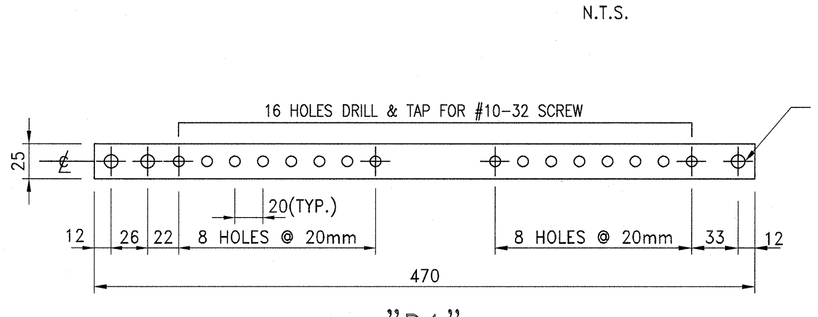
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OUTSIDE VIEW

(CABINET DRILL PLAN TOP)

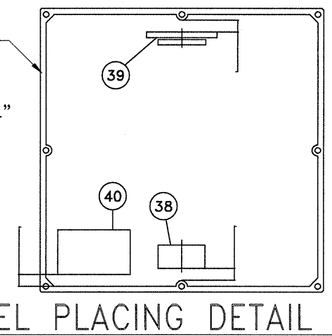
N.T.S.



"D1"

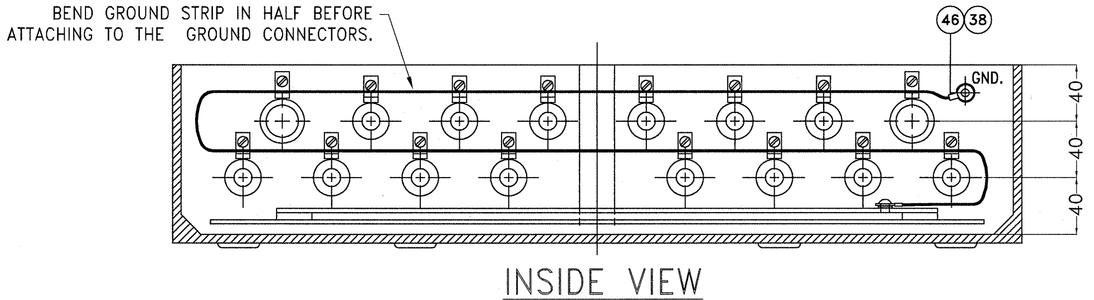
(GROUND BAR DRILL PLAN)

N.T.S.



LABEL PLACING DETAIL "D2"

N.T.S.



INSIDE VIEW

GROUND WIRE ROUTING (TOP OF THE CABINET)

N.T.S.

BILL OF MATERIAL FOR 125V DC DISTRIBUTION AND MONITORING CABINET

ITEM#	QTY.	MATERIAL DESCRIPTION	PART NUMBER	SUPPLIER	REMARKS
1	1	ENCLOSURE-GEC TYPE APO (VYNCKIER APO CT)	A12-2424 CTH	FERRAZ	SEE NOTE #4
2	1	BACK PLATE	BP2424N	FERRAZ	NON-METALLIC
3	14	FUSE HOLDER- ITC DBL. 400.102/ PHOENIX UK10,3 HESI-2P	205085DF38-1/551604	ITC / PHOENIX	
4	7	BRASS PLATE MOUNTING INSERTS	-	FERRAZ	SEE NOTE #15
5	20	UNIVERSAL END HOLDER - E/NS35N	08 00 88 6	PHOENIX	
6	1	NS 35/15 PERFORATED MOUNTING RAIL	12 01 73 0	PHOENIX	SUPPORTS FUSE HOLDERS, TERMINALS & RELAYS
7	40m	WIRE, #14 AWG FLUOROPOLYMER INSULATED	M22759/16/14	ANIXTER	ALL ALARMS
8	5m	WIRE, #12 AWG FLUOROPOLYMER INSULATED	M22759/16/12	ANIXTER	ALL FUSED CIRCUITS
9	1	CABLE DUCT, 1 1/4" x 2"	C1LG6	PANDUIT	
10	1	CABLE DUCT COVER	F1X2LG6	PANDUIT	
11	12	RELAY, RELECO	C2A20X/125V DC	CHARTWELL	SEE NOTE #3 & #6
12	12	RELAY SOCKET, RELECO	S-2B	CHARTWELL	
13	4	TERMINAL BLOCK, UK10N	30 05 07 3	PHOENIX	
14	8	MARKERS, ZB 10	10 53 00 1	PHOENIX	
15	2	END COVER, D-UK 4/10	30 03 02 0	PHOENIX	
16	24	TERMINAL BLOCK, UK6N	30 04 52 4	PHOENIX	
17	48	MARKERS, ZB 6	10 51 02 9	PHOENIX	
18	14	PARTITION PLATE, ATP-UK	30 03 22 4	PHOENIX	
19	28	TERMINAL BLOCK, UK5N	30 04 36 2	PHOENIX	
20	56	MARKERS, ZB 5	10 50 02 0	PHOENIX	FOR BACK PLATE & CABLE DUCT
21	17	BOLT PLATED, 10/32"x3/8"		BRAFASCO	
22	29	FLAT WASHER PLATED, #10		BRAFASCO	
23	29	TOOTH WASHER PLATED, #10		BRAFASCO	
24	29	NUT PLATED, #10/32		BRAFASCO	
25	12	BOX CONNECTOR, 1/2", T&B STO50-464		NEDCO	SEE NOTE #8, #9 & #10 (FUSED DC OUTPUT)
26	2	BOX CONNECTOR, 1/2", T&B STO50-466		NEDCO	SEE NOTE #8, #9 & #10 (SUPV. ANNUNCIATION)
27	14	LOCK NUT, 1/2", T&B		NEDCO	
28	14	GROUND BUSHING, 1/2", T&B	3870-TB	THOMAS&BETTS	WITH LAY-IN-LUG & WIRE CLAMPING SCREW
29	14	BOX CONNECTOR STEEL DISK, 1/2", T&B ____		NEDCO	SEE NOTE #9 & #10
30	2	BOX CONNECTOR, 3/4", T&B, STO75-467		NEDCO	SEE NOTE #7, #9 & #10
31	2	LOCK NUT, 3/4", T&B		NEDCO	
32	2	GROUND BUSHING, 3/4", T&B	3871-TB	THOMAS&BETTS	WITH LAY-IN-LUG & WIRE CLAMPING SCREW
33	2	BOX CONNECTOR STEEL DISK, 3/4", T&B 816		NEDCO	SEE NOTE #9 & #10
34	1	GROUNDING 'UNIVERSAL TERMINAL'	KA26U	FCI BURNDY,FRAMATOME GRP.	
35	3	BRASS BOLTS, 1/4"x1 "LG.		BRAFASCO	
36	5	BRASS LOCK WASHERS, 1/4"		BRAFASCO	
37	4	BRASS NUTS, 1/4"		BRAFASCO	
38	1	GRD. WIRE, TINNED COPPER FLAT BRAID 1/2" WIDE	1233/2-100	ALPHA WIRE CO.	
39	1	2"x3" LABEL, 'CABINET No. ____'		HYDRO ONE	SEE DETAIL 'D2'
40	1	12mm LABEL, LINE 1: 125V DC DISTRIBUTION AND MONITORING CABINET, LINE 2: '__' BATTERY		HYDRO ONE	SEE DETAIL 'D2'
41	1	6"x4" SELF ADHESIVE TAB HOLDER C/W INSTALLATION MANUAL		BARON LOOSELEAF	SEE DETAIL 'D2'
42	4	TRANSPARENT TERMINAL COVER EA5 C/W PRINTED LABEL AND DESCRIPTION AS SHOWN.	10 24 01 4	PHOENIX	USE LAMINATED TAPE 5mm WIDE, BLACK ON WHITE
43	1m	WIRE, #8 AWG FLUOROPOLYMER INSULATED	-		INPUT FUSE INCOMMING MAIN SR TERMINALS & SUPPLY FUSES
44	1	GROUND BAR, COPPER BAR 25x3x470	-	DL CUSTOM	
45	1	BRASS BOLTS, 1/4"x3/8"LG.	-	BRAFASCO	
46	2	RING TERMINALS FOR GRD. WIRE FOR 1/4"SCREWS	-	ANIXTER	
47	16	BRASS SCREWS, 10-32 3/8"	-	BRAFASCO	
48	16	BRASS EXT. TOOTH WASHER, #10	-	BRAFASCO	
49	12	FLAT BOLT PLATED, 10/32"x3/8"		BRAFASCO	FOR MOUNTING RAILS
50	24	600VAC/600VDC, 10A FAST-ACTING MIDGET FUSES	ATM10	FERRAZ SHAWMUT	TO BE ORDERED BY DESIGN
51	4	71290 NEUTRAL LINKS	MNL30	FERRAZ SHAWMUT	TO BE ORDERED BY DESIGN

NOTES:

1. THE EQUIPMENT USED TO BE CSA OR ESA APPROVED.
2. DIMENSIONS ARE IN MILLIMETERS, UNLESS OTHERWISE SPECIFIED.
3. THE INDICATING LAMP IS ON WHEN THE RELAY IS ENERGIZED.
4. ENCLOSURE GEC. APO TYPE A12-2424CTH (C/N 741C5255) FIBERGLASS BASE, TRANSPARENT (LEXAN) COVER COMES WITH NON-METALLIC BACK PLATE, HINGES, TWO VENTILATORS(NEMA3,3R,3S) 4 WALL MTG NON-METALLIC FEET AND THUMB SCREW INSERTS (41520-155)- FOR THE COVER SCREWS.
5. STICK LABELS ON FUSE HOLDERS TO SHOW FUSE RATING OF ACTUAL FUSE IN USE.
6. ATTACH LABELS WITH RELAYS IDENTIFICATION.
7. USE TWO 3/4" BOX CONNECTORS FOR DC FEEDS INTO THE CABINET.
8. USE 12 OF 1/2" BOX CONNECTORS FOR FUSED DC OUTPUTS AND 2 FOR LOCAL & SUPERVISORY ANNUNCIATIONS.
9. INST. STEEL DISKS (T&B CAT. ID 816) INSIDE THE BOX CONNECTORS FOR FIRE & RODENT CONTROL BEFORE SHIPPING.
10. STEEL DISKS TO BE REMOVED IN THE FIELD BEFORE CABLE INSTALLATION.
11. MOUNTING OF THE MONITORING CABINET TO BE DETERMINED BY FIELD.
12. FUSE HOLDER ACCOMMODATES HRC MIDGET FUSE. THE RECOMMENDED TYPES ARE LITTELFUSE KLK AND KLKD SERIES OF STANDARD SIZE 10.3x38mm.
13. FUSE COORDINATION SHALL BE PROVIDED WITH UPSTREAM FUSE/PROTECTION DEVICES.
14. THE EXACT DRILLING DIM. ALLOWS FOR A SLIGHT ADJUSTMENT TO ACCOM. THE BACK PLATE & MOUNTING RAILS CUTOUT POSITIONS.
15. POSITION PLATE MOUNTING INSERTS UNDER EACH HOLE WHERE REQUIRED.

N°	DATE	TRANSMISSION	BY ENG

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STAMP :

LICENSED PROFESSIONAL ENGINEER
Y.Lessard
100126893
2018 07 27
PROVINCE OF ONTARIO

CLIENT :

PROJECT :

MCMASTER UNIVERSITY-NF91

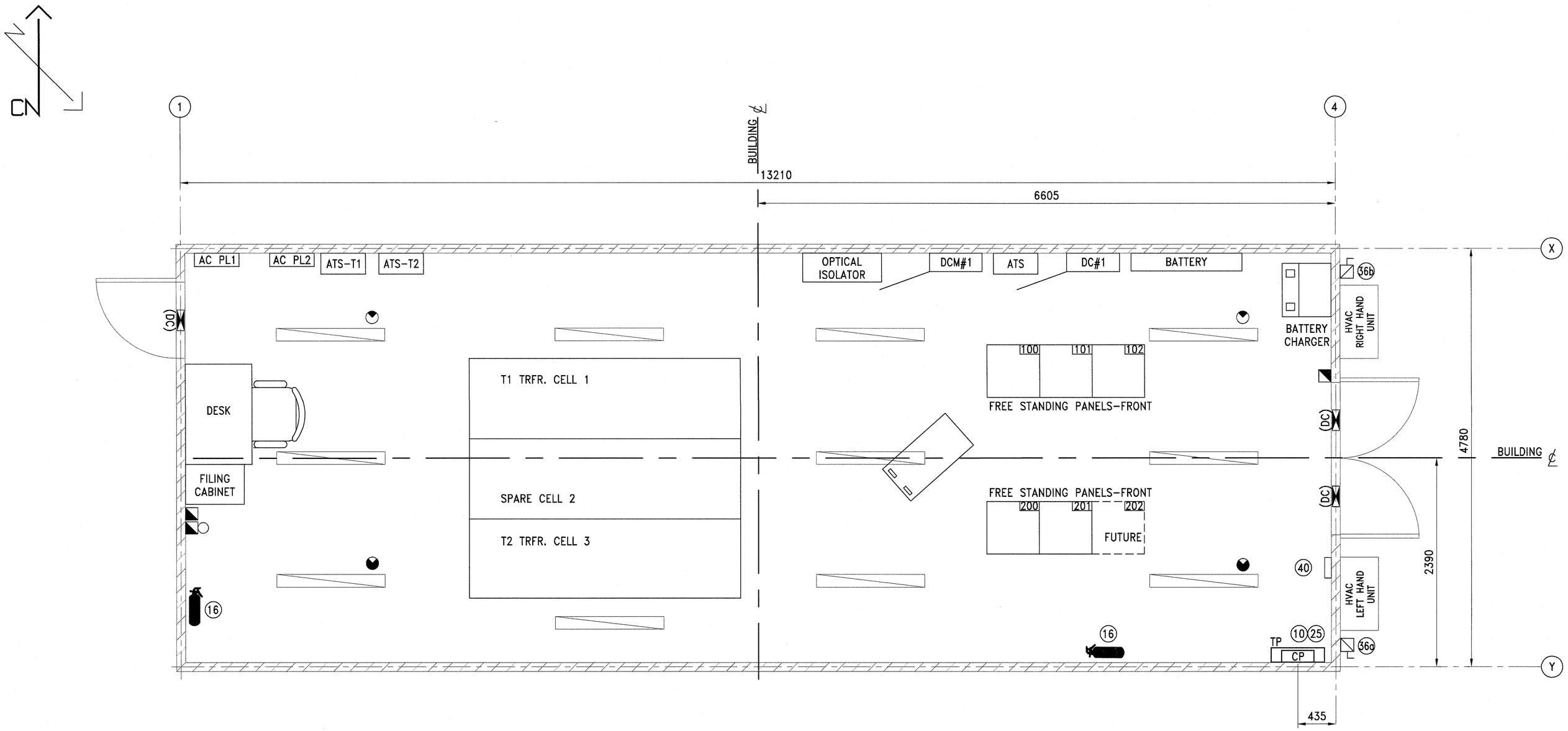
TITLE :

13.8kV AREA E-HOUSE MONITORING CABINET ELECTRICAL ARRANGEMENT

PREPARED BY : M.GUAY	DATE : 2018/07/15
DRAWN BY : M.GUAY	SCALE : AS SHOWN
VERIFIED BY : M.LAROCQUE	DISCIPLINE : ELECTRICAL ARRANGEMENT
APPROVED BY : Y.LESSARD	CAD FILE NAME : F1731664-300-EA007.dwg

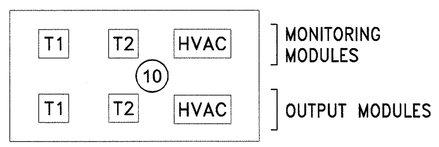
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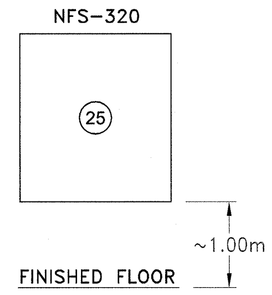
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EQUIPMENT LAYOUT PLAN

SCALE: 1:30





CONTROL FIRE PANEL AND DETECTION MODULES PANEL LAYOUT

N.T.S.

HVAC LOAD CALCULATION FOR NF91 – PCT BUILDING 16'X44'X12' (4.88m X 13.41m X 3.66m)

SYSTEM TYPE: ONE MAIN HVAC UNIT AND ONE BACK-UP HVAC UNIT, INDUSTRIAL GRADE HVAC, WALL MOUNTED, 230/208V AC C/W GRILLES, EXTERIOR DISCONNECT SWITCH, BAROMETRIC FRESH AIR DAMPER.

JOB LOCATION: HAMILTON ONTARIO

WINTER DESIGN: INSIDE TEMPERATURE: 68°F (20°C) DB
OUTSIDE TEMPERATURE: -3°F (-19°C) DB

SUMMER DESIGN: INSIDE TEMPERATURE: 68°F (20°C) DB
OUTSIDE TEMPERATURE: 88°F (31°C) DB, 73°F (23°C) WB
RELATIVE HUMIDITY: 50%

MISC. EQUIPMENT/LIGHTING LOADS: 5000 W

CONDUCTION HEAT LOSS= AREA X TEM. DIFF / R-VALUE
AIR INFILTRATION LOSS =CFM X TEM. DIFF. X 1.1
REFERENCES: 2005 ASHRAE HANDBOOK AND CARRIER LOAD ESTIMATE FORMS

LEGEND:

	(DC)	DOOR CONTACT
		IONIZATION DETECTOR
		PHOTO ELECTRIC DETECTOR
	(PS)	ADDRESSABLE FIRE ALARM MANUAL PULL STATION
	(FA-A)	FIRE ALARM AUDIBLE SIGNAL – (BELL)
CP	25	NFS-320 FIRE ALARM SYSTEM CONTROL PANEL
TP	10	TRANSFORMER, BATTERY & HVAC SHUTDOWN INTERFACE PANEL
	40	HVAC CONTROL PANEL
	16	20LBS A,B,C FIRE EXTINGUISHER
	36a 36b	UNFUSED DISCONNECT SWITCH, 60A

HEATING LOAD

1-CONDUCTION HEAT LOSS			
SURFACE	INSULATION VALUE	FT^2	BTUH
ROOF	R30	704	1706
DOOR	R7	81	1532
WALL	R14	1359	5516
FLOOR(NO BASEMENT)	R30	704	1490
SUBTOTAL			19550
2-AIR INFILTRATION LOSS			9306
3-VENTILATION			3272
TOTAL (BTUH)			22442
TOTAL (KW)			6.58

COOLING LOAD

1-CONDUCTION HEAT LOSS			
SURFACE	INSULATION VALUE	FT^2	BTUH
ROOF	R30	704	387
DOOR	R7	81	190
WALL	R15	1359	2346
FLOOR(NO BASEMENT)	R30	704	-196
2-VENTILATION			717
3-MISC EQUIPMENT/LIGHTING LOADS)			17853
SUBTOTAL (SENSIBLE HEAT)			21493
LATENT HEAT			840
TOTAL (BTUH)			22333
TOTAL (TONS)			1.91

NOTES:

1. ALL DETECTORS SHALL BE MOUNTED AT THE HIGHEST POINT WHERE VARIATIONS IN CEILING HEIGHT EXIST, AND AS INDICATED ON DRAWINGS.
2. DETECTORS SHALL NOT BE MOUNTED OVER CONTROL RELAY PANELS, LIGHTS, ETC.
3. BELL SHALL BE MOUNTED 2440MM ABOVE THE FLOOR TO CENTER LINE OF BELL.
4. PULL STATIONS SHALL BE MOUNTED 1370mm FROM FLOOR TO CENTER LINE OF PULL STATIONS.
5. ALL WIRING SHALL BE COLOR CODED.
6. ALL INSTALLATION TO BE AS PER ULC AND CSA STD. & ONTARIO ELECTRICAL CODE.
7. PROVIDE FAULT ISOLATORS AFTER 20 DEVICES IN ANY LOOP.
8. CLASS 'A' WIRING IN SEPARATE METALLIC E.M.T. REQUIRED FOR DETECTORS.
9. CLASS 'B' WIRING CAN BE USED FOR FIRE ALARM, BELLS STROBE LIGHTS ETC.
10. MOUNT FIRE DETECTION AND SECURITY SYSTEM DRAWING IN FRAME & INSTALL ON WALL NEAR CONTROL PANEL.
11. ALL FANS AND AIR CONDITIONERS TO SHUT OFF WHEN FIRE ALARM IS ACTIVATED.
12. HEATING DESIGNED FOR 97.5% DESIGN DB FOR TIMMINS.
13. COOLING DESIGNED FOR 2.5% DESIGN DB FOR WINDSOR.
14. BARD MODEL, (ITEM23), 3 TON COOLING, 9KW HEATING INSTALLED WITH 100% REDUNDANCY AND LEAD/LAG CONTROL WITH DIGITAL CONTROLLER BARD MODEL (ITEM 40).

PROFESSIONALS:

N°	DATE	TRANSMISSION	BY ENG

THE S.M. GROUP INTERNATIONAL INC.
6205B Airport rd, Suite 205, Mississauga (Ontario) L4V 1E3
Tel. : 905 677.9009 / Fax. : 905 677.9014
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STAMP :

LICENSED PROFESSIONAL ENGINEER Y. Lessard 100128892 PROVINCE OF ONTARIO

CLIENT :

PROJECT :

MCMASTER UNIVERSITY-NF91

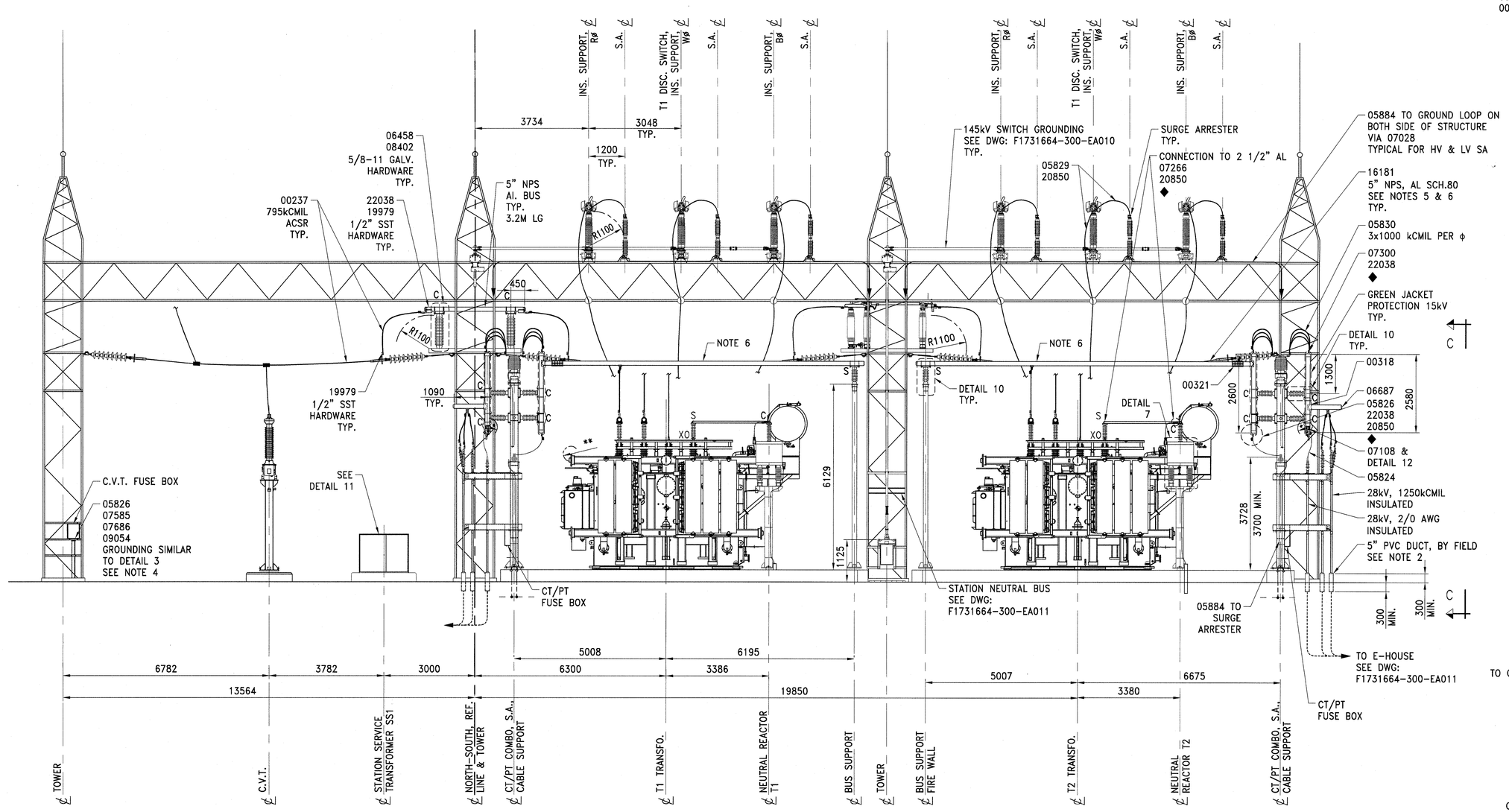
TITLE :

13.8kV AREA E-HOUSE
HVAC, FIRE ALARM & SECURITY SYSTEM ELECTRICAL ARRANGEMENT

PREPARED BY : M.GUAY	DATE : 2018/07/15
DRAWN BY : M.GUAY	SCALE : 1:30
VERIFIED BY : M.LAROCQUE	DISCIPLINE : ELECTRICAL ARRANGEMENT
APPROVED BY : Y.LESSARD	CAD FILE NAME F1731664-300-EA008.dwg

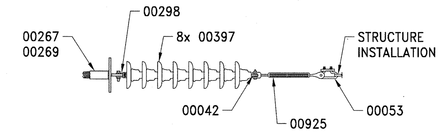
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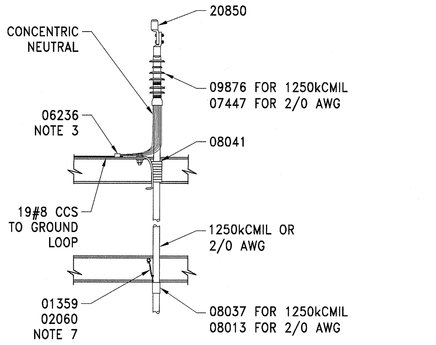
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DWG: F1731664-300-EA001



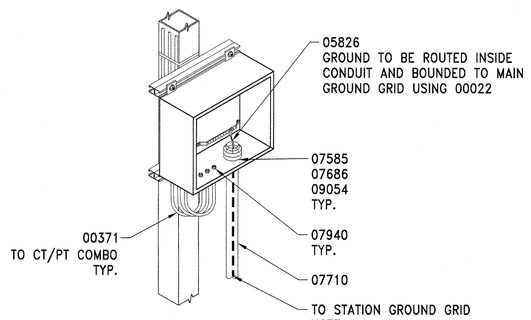
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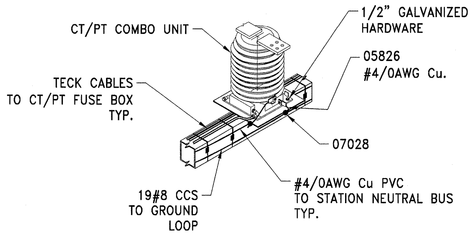
DETAIL 2

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DETAIL 3

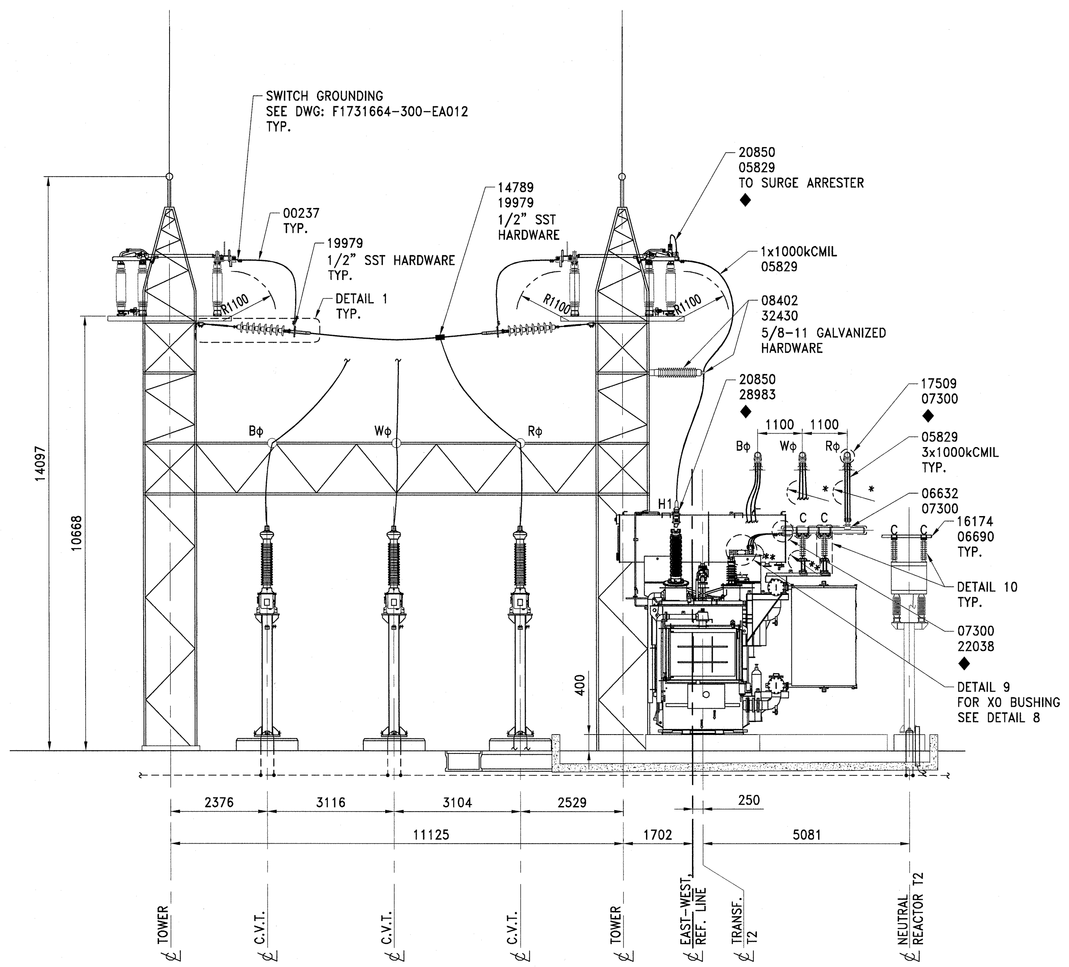
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DETAIL 6

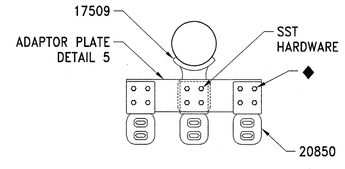
TYPICAL CT/PT COMBO UNIT INSTALLATION. REMOVE GROUND STRAP.
N.T.S.

BIL	NOMINAL VOLTAGE	MINIMUM STRIKING DISTANCE PH TO GRD	MINIMUM STRIKING DISTANCE PH TO PH
110	15kV	250mm (**)	300mm (*)
550	115kV	1100mm	1300mm



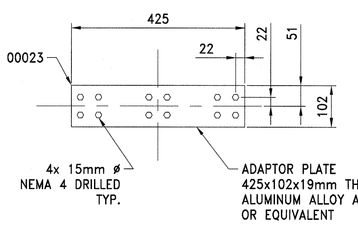
ELEVATION B–B

DWG: F1731664-300-EA001



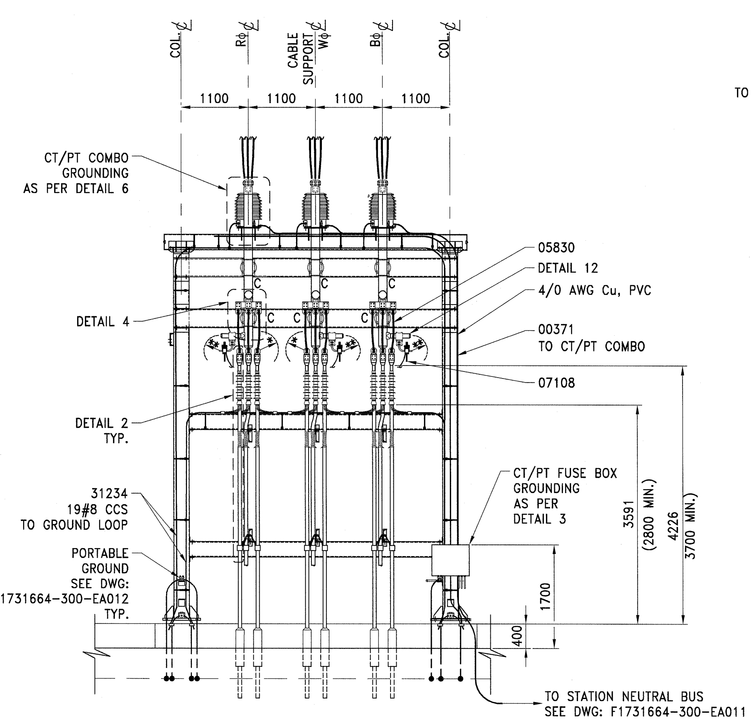
DETAIL 4

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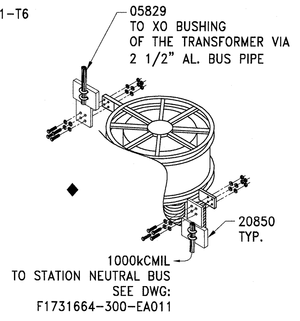
DETAIL 5

ADAPTOR PLATE.
SCALE: 1:10



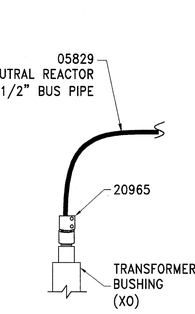
ELEVATION C–C

SCALE: 1:50



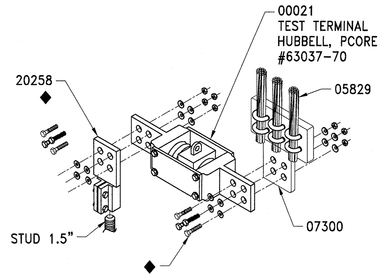
DETAIL 7

N.T.S.



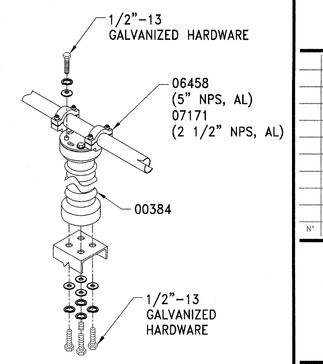
DETAIL 8

CONNECTION TO XO BUSHING
N.T.S

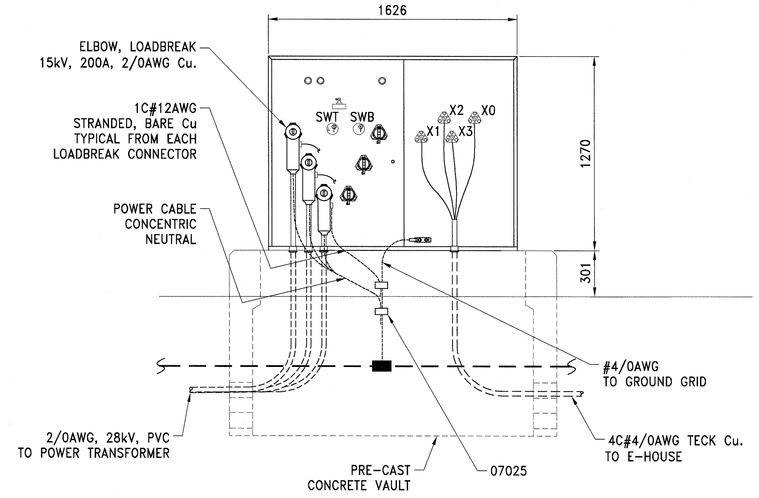


DETAIL 9

CONNECTION TO LV BUSHING
N.T.S

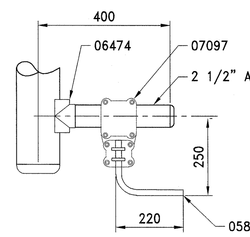


DETAIL 10



DETAIL 11

STATION SERVICE TRANSFORMER
SCALE: 1:20



DETAIL 12

N.T.S.

BILL OF MATERIAL (NOTE 8)

ITEM	SHORT DESCRIPTION	UNIT	QTY.
00021	TEST TERMINAL HUBBELL, PCORE #63037-70	EA	6
00022	SWAGE CONNECTOR CROSS/TEE-CU-#4/0 RUN-#4/0 TAP	EA	4
00023	ADAPTOR PLATE, 3X NEMA DRILLED	EA	6
00042	BALL EYE, 5/8"SHANK,11/16'EYE,B/J HDWRE	EA	42
00053	VL LINK-STRAIN-5/8"-	EA	42
00237	BARE COND-ACSR-795KCMIL-26/7STRD-DRAKE	M	AR
00267	CONN,TERM,MULTI,COMP,AL,795KCMIL,4 HO	EA	42
00269	CONN,TERM,DE,COMP,ST,795,959KCML,7#8ALWD	EA	42
00298	CH ADAPTER-STRAIN-"J" SOCKET-135KN	EA	42
00318	CONN-TAP WLD -AL-5"IN NPS-5"IN NPS	EA	12
00321	CONN,SPL,COUP,AL,BLTD,P-P,5"-5"NPS AL	EA	12
00371	CONDUIT,FLEX LIQUID TITE,1",30 M LG	M	90
00384	INS SP-250BIL,1092LK,559H,2000LB,76-76BC	EA	48
00397	INS SUSP-GLASS,120KN,146L,BALL-SKT	EA	336
00925	PL TURNBUCKLE-CL/CL-5/8", 12" TAKEUP	EA	42
01359	BOLT,EYE GALV,STL,PLAIN,3/8"UNC,6-1/8"LG	EA	24
02060	PL TURNBUCKLE-HOOK/HOOK-	EA	24
05824	BARE COPPER COND-2/0AWG-259STRD SOFT DWN	M	15
05826	BARE COPPER COND-4/0AWG-259STRD SOFT DWN	M	14
05829	BARE COPPER COND-1000KCML-STRD-100/REEL, 97 STRANDS	M	122
05830	BARE COPPER COND-1000KCML-STRD-100/REEL, 427 STRANDS	M	100
05838	BUS BAR-CU-19.05MM OD-3660MM LG	FT	AR
05884	BLDG WIRE-600V-CU-4/0AWG-TWU-1COND	M	80
06236	CONN-TAP BLTD COND2COND-CU-350-500 -2/0-	EA	24
06458	CH BUS SUPP-BLTD-AL-5"NPS-SL-76/127MMBC	EA	48
06474	CONN-TAP WLD -AL-5"IN NPS-4"IN NPS	EA	6
06632	CONN,TAP,WELD,AL,P-PAD,5"NPS-4 HO PAD	EA	6
06687	PLUG,230KV,5"NPS,SCH.80	EA	26
06690	PLUG,230KV,2-1/2"NPS,INTERNAL,62.68MM ID	EA	10
07025	CONN,GRD,C-COMP,CU,3/0-250--3/0-250 R/T	EA	12
07028	CONN-GRD COMP-CU-350/500KCMIL-4/0AWG	EA	10
07108	CONN,CLAMP,LIVE,AL,0.806"-0.806" OD R/T	EA	6
07097	CONN,TAP,BLTD,AL,P-P,2.5"-0.75"NPS90 R/T	EA	6
07171	CH BUS SUPP-BLTD-AL-2.5"NPS-76/127MMBC	EA	4
07266	CONN,TAP,WELD,AL,P-PAD,2.5"NPS-4HO PAD	EA	36
07300	CONN,TERM,PAD,BLTD,CU,3x1000-1500MCM-4HO	EA	6
07447	CH TERM KIT-28KV-2/0AWG-COLD SHRINK	EA	6
07585	4" BUSHING, MALLEABLE IRON	EA	4
07686	ADAPT,RIGID CON,PVC-MET,MALE THXSOC4"	EA	4
07710	DUCT,PVC,4",DB2/ES2,BELL END	EA	2
07940	CONDUIT BOX, CONN,FLEX LIQ TIGHT,1"	EA	12
08013	SLEEVE,CABLE SUPPORT,CBL 43.2MM DIA	EA	6
08037	SLEEVE,CBL SUPPORT,71.1MM DIA,STR 305MM	EA	18
08041	SUPPORT,FOR CBL&MOLDD TERMINATION	EA	24
08402	INS SP-550BIL,2515LK,1143H,1700E,127-127	EA	12
09054	ADHESIVE, PVC SOLVENT CEMENT 500 ML	CAR	2
09876	CH TERM KIT-28KV-1250KCMIL-COLD SHRINK	EA	18
14789	CONN-TAP COMP-TEE-4 HO PAD-AL-795KCMIL-	EA	18
16174	BUS PIPE-ALUM-2-1/2"NPS-73MM ODSAP	FT	40
16181	BUS PIPE-ALUM-5NPS-141.3MM OD-, SCH.80	FT	215
17509	CONN,TAP,WELD,P-PAD,AL,5"NPS-4 HO PD,90	EA	12
19979	CONN,TERM,CBL-PAD,COMP,AL,795KCMIL ACSR	EA	36
20258	CONN-TERM-BLTD STUD-AL-4HO PD-1.5"STUD	EA	6
20850	CONN,TERM,CL-PAD,BLTD,CU,4/0-1000MCM-4HO	EA	54
20965	CONN,TERM,BLTD,CU,#2-1000KCMIL-1.5"STUD	EA	2
22038	CONN,TERM,P-PAD,WELD,AL,5"NPS-4 HO PAD	EA	30
28983	CONN,DOBLE TEST,230KV,2000A,STD TO PAD	EA	6
31234	19#8 CU-CLAD STEEL,DSA, 40% CONDUCTIVITY	FT	200
32430	CH BUS SUPP-BLTD-BRZ-4/0-1000KCMIL-127MM	EA	6

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.
2. USE HEAT SHRINKABLE SLEEVE ALONG WITH SEALANT (MM # 30023391).
3. EXTEND MIN 50MM CCS FROM CONNECTION IF REQUIRED & COAT THE END WITH CORROSION INHIBITOR COMPOUND.
4. RUN GROUND CONDUCTOR INSIDE CONDUIT. NO EXTERNAL GROUND REQUIRED.
5. DRILL 2 HOLES ON THE BOTTOM OF BUS FOR DRAINAGE.
6. 4/0 AWG 600V INSULATED (05884) INSIDE RIGID BUS. FOR DAMPER INSTALLATION.
7. APPLY ZINC BASED COATING AFTER DRILLING, "GALVICON" OR EQUIVALENT.
8. QUANTITIES ARE PROVIDED FOR REFERENCE ONLY.

REFERENCE DRAWINGS:

1. 115/13.8KV STATION, BASIC LAYOUT, ELECTRICAL ARRANGEMENT — --F1731664-300-EA001
2. 115kV AREA, DISCONNECT SWITCH, GROUNDING DETAILS, ELECTRICAL ARRANGEMENT — --F1731664-300-EA010
3. 115/13.8KV STATION, CABLE, CONDUITS, NEUTRAL & LIGHTING, PLAN & DETAILS, ELECTRICAL ARRANGEMENT — --F1731664-300-EA011
4. 115/13.8KV STATION, MAIN GROUNDING GRID, PLAN & DETAILS, ELECTRICAL ARRANGEMENT — --F1731664-300-EA012

LEGEND:

SYMBOL	DESCRIPTION
C	CLAMP BUS SUPPORT
S	SLIDE BUS SUPPORT
◆	1/2" SILICON-BRONZE HARDWARE

PROFESSIONALS:

N°	DATE	TRANSMISSION	BY ENG

SMi THE S.M. GROUP INTERNATIONAL INC.
6200B Airport rd, Suite 205, Mississauga (Ontario) L4V 1E3
Tel. : 905 677.3009 / Fax : 905 677.3604
www.groupsmi.com

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LICENSED PROFESSIONAL ENGINEER Y. Lessard 100128937 PROVINCE OF ONTARIO

CLIENT:

PROJECT:

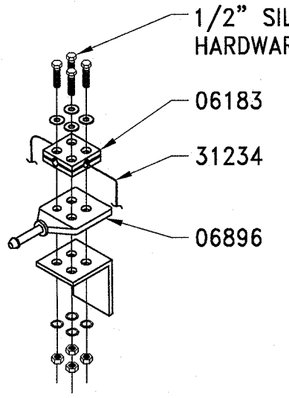
MCMASTER UNIVERSITY–NF91

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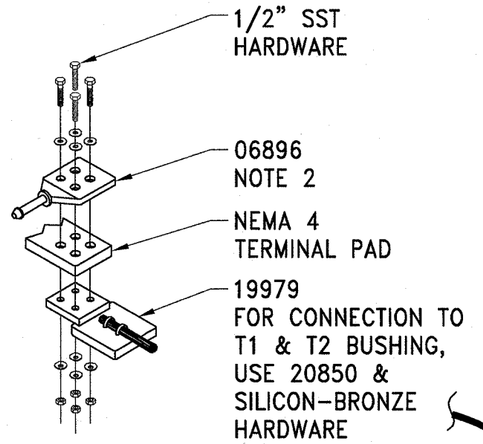
115/13.8KV STATION
ELEVATIONS
ELECTRICAL ARRANGEMENT

PREPARED BY: M. LAROCQUE	DATE: 2018-08-17
DRAWN BY: C.BAZINET	SCALE: 1:75 & AS SHOWN
VERIFIED BY: M. LAROCQUE	DISCIPLINE: ELECTRICAL ARRANGEMENT
APPROVED BY: Y. LESSARD	CAD FILE NAME: F1731664-300-EA009.dwg

PROJECT No: F1731664 | LOT: 300 | DWG. #: EA009 | REV: 00 | PAGE:



DETAIL 1



DETAIL 2

DETAIL 3
OPERATING MECHANISM GROUNDING

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.
2. GROUNDING STIRRUPS FOR PORTABLE GROUNDING WILL BE MOUNTED ON TOP OF CD ALLOY CONDUCTOR TERMINAL.
3. LOCATION OF CONNECTION BETWEEN GRDG. BRAID W /2–HOLE NEMA PAD AND GRDG. LOOP TO BE DETERMINED BY FIELD TO SUIT APPLICATION.

REFERENCE DRAWINGS:

1. 115/13.8KV STATION, BASIC LAYOUT, ELECTRICAL ARRANGEMENT ---F1731664–300–EA001
2. 115/13.8KV STATION, ELEVATIONS, ELECTRICAL ARRANGEMENT ---F1731664–300–EA009
3. 115/13.8KV STATION, MAIN GROUNDING GRID, PLAN & DETAILS, ELECTRICAL ARRANGEMENT ---F1731664–300–EA012

BILL OF MATERIAL

ITEM	SHORT DESCRIPTION	UNIT	QTY.
06183	CONN,TERM CLAMP,BLTD,CU,1/0AWG–1250KCMIL	EA	60
06896	CONN–GRD BLTD–CU–STIRRUP–4 HOLE PAD	EA	60
07026	CONN,GRD,C–COMP,CU,300–500KCMIL R/T	EA	AR
07028	CONN–GRD COMP–CU–350/500KCMIL–4/0AWG	EA	AR
19979	CONN,TERM,CBL–PAD,COMP,AL,795KCMIL ACSR	EA	24
20850	CONN,TERM,CL–PAD,BLTD,CU,4/0–1000MCM–4HO	EA	6
31234	19#8 CU–CLAD STEEL,DSA, 40% CONDUCTIVITY	FT	1250

N°	DATE	TRANSMISSION	BY ENG

THE S.M. GROUP INTERNATIONAL INC.
6205B Airport rd, Suite 205, Mississauga (Ontario) L4V 1E3
Tel. : 905 677.9009 / Fax. : 905 677.9014
www.groupesm.com

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LICENSED PROFESSIONAL ENGINEER
Y.Lessard
100128893
PROVINCE OF ONTARIO
2018 / 08 / 24

CLIENT :

PROJECT :

MCMASTER UNIVERSITY–NF91

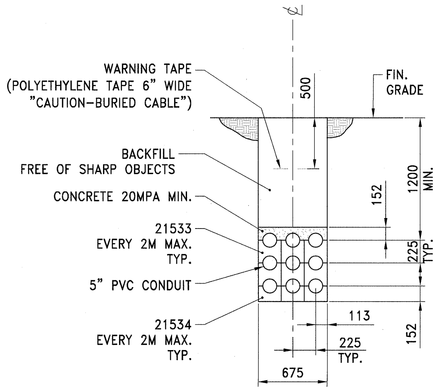
TITLE :
115kV AREA
DISCONNECT SWITCH
GROUNDING DETAILS
ELECTRICAL ARRANGEMENT

PREPARED BY :	DATE :
C. BAZINET	2018/08/24
DRAWN BY :	SCALE :
C. RAVAGNAN	NTS
VERIFIED BY :	DISCIPLINE :
M. LAROCQUE	ELECTRICAL ARRANGEMENT
APPROVED BY :	CAD FILE NAME
Y. LESSARD	F1731664-300-EA010.dwg

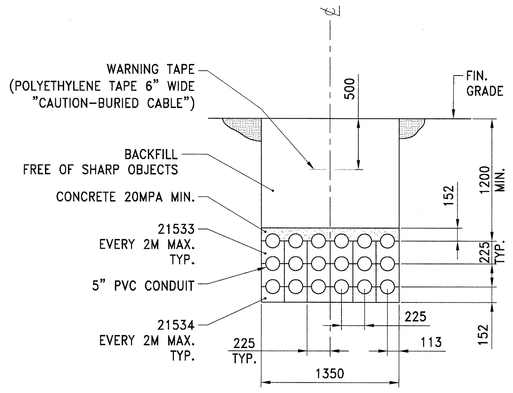
PROJECT No:	LOT:	DWG. #	REV:	PAGE :
F1731145	300	EA010	00	

A2





SECTION S1–S1
CONCRETE ENCASED
CABLE DUCT INSTALLATION
SCALE: 1:30



SECTION S2–S2
CONCRETE ENCASED
CABLE DUCT INSTALLATION
SCALE: 1:30

BILL OF MATERIAL (NOTE 2)

ITEM	SHORT DESCRIPTION	UNIT	QTY.
00020	CONN-GRD-SWG-OFFSET SPLIT CROSS/TEE-CU-#4/0 RUN-500KCMIL TAP	EA	2
00385	INS SP-110BIL,394LK,254H,2000LB,76-76BC	EA	2
02913	CONNECTOR,WEBBED,90°,LH,3-1/2"X4-1/8"	EA	AR
02925	CHANNEL,41.2MMX41.2MM, 6M LG,GALV	M	2
02964	NUT,1/2" 13 UNC, WITH SPRING	EA	AR
02965	CLAMP,CBL, PORCELAIN FOR 2-3/8" OD	EA	AR
03007	COVER,SOLID, 300 MMX3M,GALV	EA	2
03068	CBL TRAY,VO BND,S,3"D,12"W,90°,12"R,G,HG	EA	AR
05882	BLDG WIRE-600V-CU-500KCMIL-RWU90-1COND, 37STRD	M	10
05884	BLDG WIRE-600V-CU-4/0AWG-TWU-1COND, 19STRD	M	90
05997	BLDG WIRE-1000V-CU-1000KCMIL-RWU90-1COND	M	38
06690	PLUG,230KV,2-1/2"NPS,INTERNAL,62.68MM ID	EA	2
07171	CH BUS SUPP-BLTD-AL-2.5"NPS-76/127MMBC	EA	2
07266	CONN,TAP,WELD,AL,P-PAD,2.5"NPS-4HO PAD	EA	7
10138	UGRND CAB-28KV-2/0AWG-CU-1 COND	M	165

BILL OF MATERIAL (NOTE 2)

ITEM	SHORT DESCRIPTION	UNIT	QTY.
16174	BUS PIPE-ALUM-2-1/2"NPS-73MM OD	FT	10
17726	UGRND CAB-28KV-1250KCMIL-CU-1 COND	M	1700
20850	CONN-TERM BLTD PAD-CU-4/0-1000KCMIL-4HOL	EA	7
21533	SPACER, DUCT SADDLE,5"DUCT,3"SPACE	EA	426
21534	SPACER, DUCT SADDLE,5"DUCT,3"SPACE	EA	213
24561	BASE, SQ, STL PST, 6 HOLES	EA	AR
24642	CBL TRAY,PKD CVR,12"W,72" LG,HDG	EA	4
27595	CBL TRAY,SFC,VO BND,3"D,12"W,90°,12"R,HG	EA	2
27602	CBL TRAY, SPLICE PLATE, 3"H, SS	EA	2
28985	CBL TRAY,PKD END CAP,12"W,HDG	EA	2
33904	OUT-LTG,LUMINAIRE,120V,98W,LED	EA	5
33905	OUT-LTG,LUMINAIRE,120V,74W,LED	EA	5
34042	OUT-LTG,LUMINAIRE, ARM, DOUBLE	EA	5
90010	ANCHOR HILTI ITEM#2160187, HAS-E-B HDG 1/2"-8", HY200 ADHESIVE, EMBEDMENT -70MM MIN.	EA	4

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.
2. QUANTITIES ARE PROVIDED FOR REFERENCE ONLY.
3. NEUTRAL CABLES BURIED AS PER DETAIL 1.
4. CABLE TRAY SUPPORT LOCATION CAN BE ADJUSTED BASED ON SITE CONDITION.
5. CABLE TRAY EXTENDED TO FINISHED GRADE.
6. CABLE OPENING SHALL BE SIZED & PERFORMED AT SITE.
7. FIELD TO WEEP 6MM HOLES IN THE BOTTOM AND SIDES OF CABLE TRAY AT 1M INTERVALS.
8. CABLE TRAY SUPPORTS, WHETHER BOLTED TO FOUNDATIONS OR FREE STANDING, TO BE LOCATED NOT MORE THAN 760MM FROM THE END OF EACH TRAY SECTION.
9. CABLE TRAY SUPPORT TO BE INSTALLED AT INTERVALS OF 3 METERS. CABLE TRAY SUPPORT LOCATION CAN BE ADJUSTED BASED ON SITE CONDITION.

REFERENCE DRAWINGS:

1. 115/13.8KV STATION, BASIC LAYOUT, ELECTRICAL ARRANGEMENT — --F1731664-300-EA001
2. 115/13.8KV STATION, ELEVATIONS, ELECTRICAL ARRANGEMENT — --F1731664-300-EA009

NORTH-SOUTH REF. LINE & TOWERS

EAST-WEST, REF. LINE & TRANSFO. FDN

6000 ROAD

05997 DETAIL 1

2 X 4C #4/0 AWG TECK DIRECT BURIED

37000

TRENCH 300 X 180 TYP.

6000

135° TYP.

1930

TSS1

TSS2

S3

S3

T1

T2

3000 TYP.

STATION NEUTRAL BUS SEE DETAIL 1 & 2

CABLE TRAY SEE DETAIL 4 TYP.

10138
1 X 2/0AWG PVC INSULATED PER ø DIRECT BURIED

17726
3 X 1250kCMIL PVC INSULATED PER ø

NEUTRAL REACTOR

NEUTRAL REACTOR

TO CT/PT COMBO

TO CT/PT COMBO

05884

05997

05884

S2

S2

S1

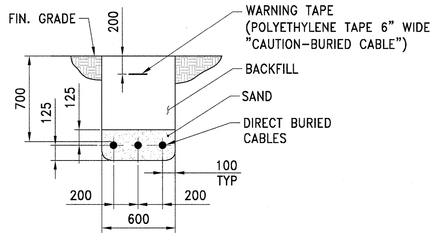
S1

18 X 5", 42"RADIUS, 45° TYP.

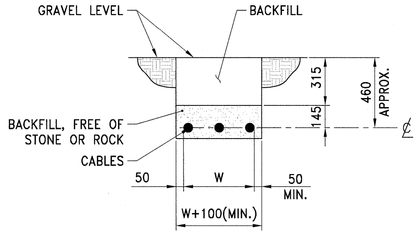
18 X 5" PVC CONDUIT ENCASED IN CONCRETE DUCT BANK TYP.

9 X 5" PVC CONDUIT ENCASED IN CONCRETE DUCT BANK TYP.

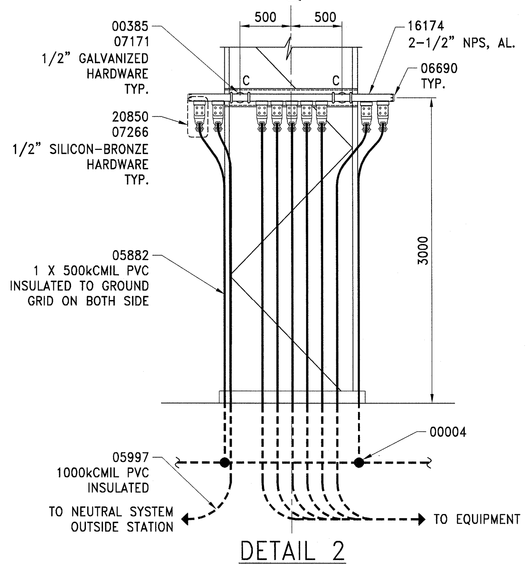
9 X 5", 42"RADIUS, 45° TYP.



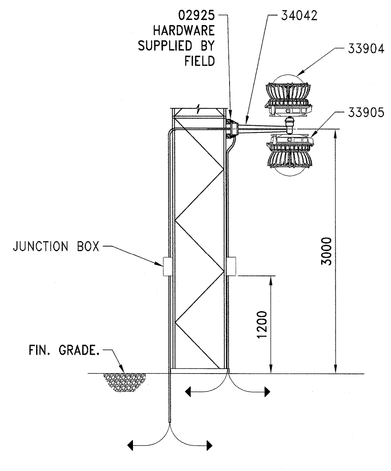
SECTION S3–S3
DIRECT BURIED CABLE INSTALLATION
SCALE: 1:25



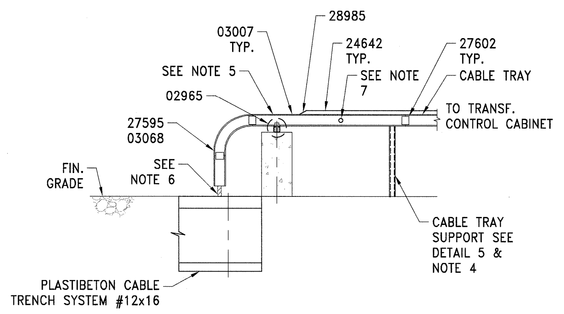
DETAIL 1
TYPICAL INSTALLATION
FOR NEUTRAL CABLE
SCALE: 1:20



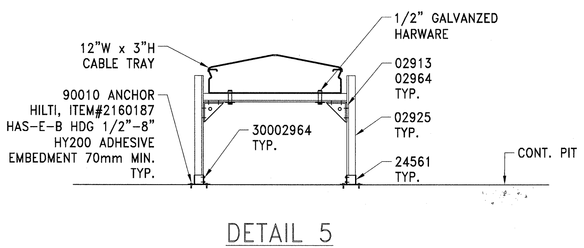
DETAIL 2
STATION NEUTRAL BUS
SCALE: 1:30



DETAIL 3
TYPICAL ARRANGEMENT ON FIVE STRUCTURE
COLUMNS WITH DISCONNECT SWITCH HANDLE
N.T.S



DETAIL 4
CABLE TRAY MOUNTING ON SPILL PIT WALL.
N.T.S.



DETAIL 5
TYPICAL FOR T1 & T2
CABLE TRAY SUPPORT ASSEMBLY IN CONT. PIT.
SEE NOTE 8 & 9.
N.T.S.

PROFESSIONALS:

N°	DATE	TRANSMISSION	BY ENG

SMi THE S.M. GROUP INTERNATIONAL INC.
6205B Airport rd, Suite 205, Mississauga (Ontario) L4V 1E3
Tel. : 905 677 8009 / Fax. : 905 677 3604
www.groupsmi.com

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STAMP:

LICENSED PROFESSIONAL ENGINEERS
Y. LESSARD
100128983
PROVINCE OF ONTARIO

CLIENT:

PROJECT:

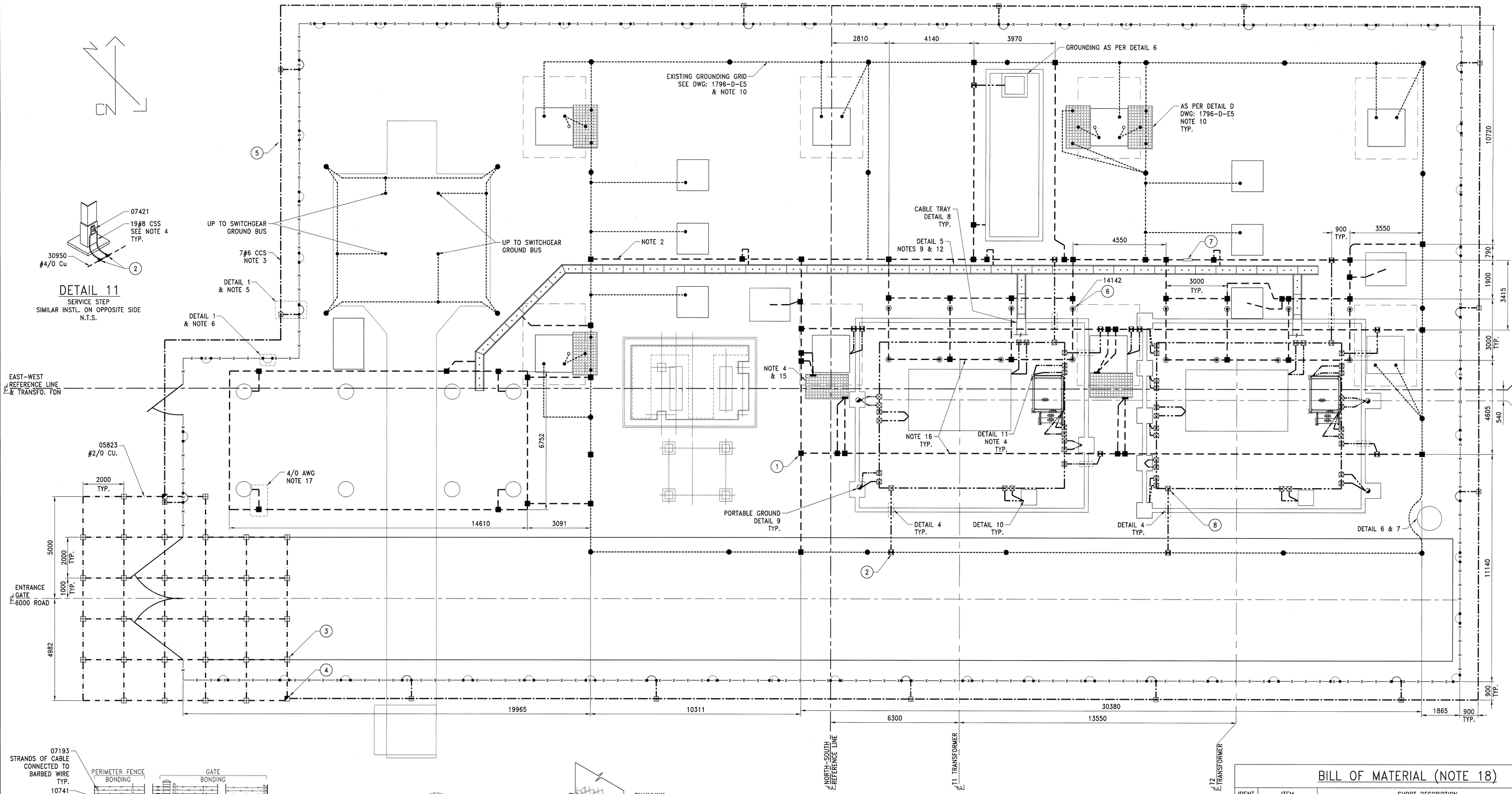
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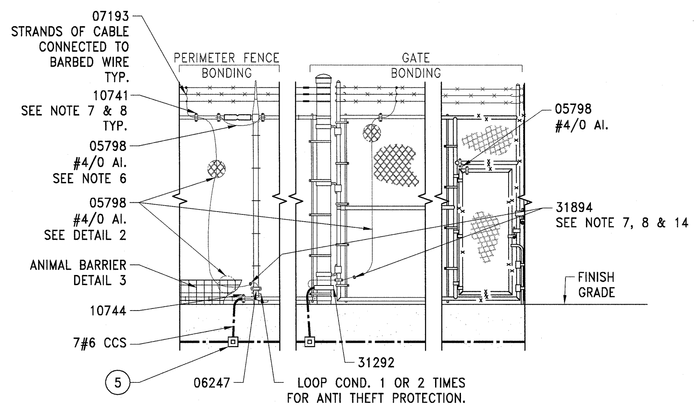
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115/13.8KV STATION
CABLE, CONDUITS, NEUTRAL & LIGHTING PLAN & DETAILS
ELECTRICAL ARRANGEMENT

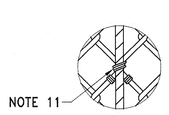
PREPARED BY: M. LAROCQUE	DATE: 2018-08-21
DRAWN BY: C.BAZINET	SCALE: 1:75 & AS SHOWN
VERIFIED BY: M. LAROCQUE	DISCIPLINE: ELECTRICAL ARRANGEMENT
APPROVED BY: Y. LESSARD	CAD FILE NAME: F1731664-300-EA011.dwg

PROJECT No	LOT:	DWG.#	REV:	PAGE:
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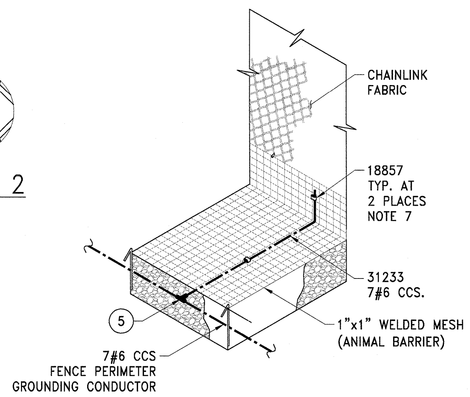




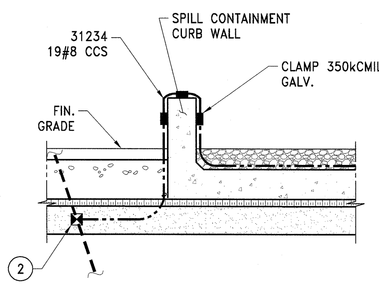
DETAIL 1
TYPICAL FENCE BONDING
SCALE: N.T.S.



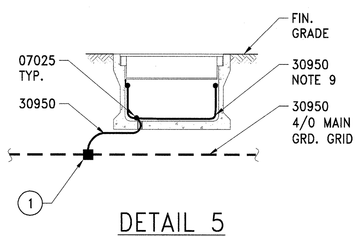
DETAIL 2
N.T.S.



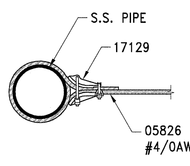
DETAIL 3
TYPICAL GROUNDING OF EACH ANIMAL BARRIER SECTION.
N.T.S.



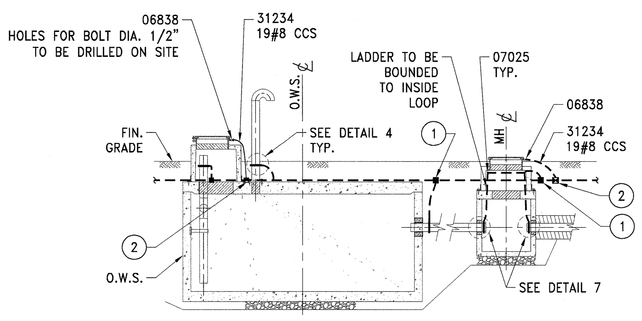
DETAIL 4
TYP. GROUNDING CONDUCTOR CROSSING SPILL CONTAINMENT PIT.
N.T.S.



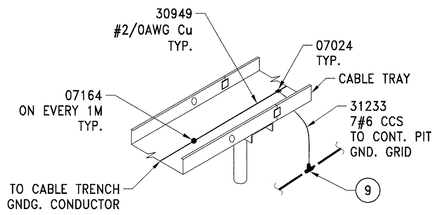
DETAIL 5
N.T.S.



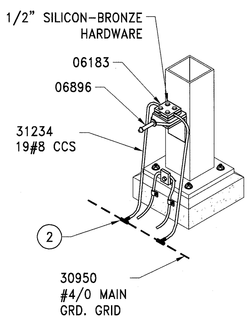
DETAIL 7
TYPICAL PIPE GRD.
N.T.S.



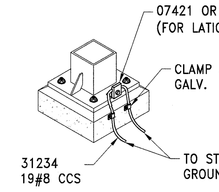
DETAIL 6
O.W.S. & MANHOLE
TYPICAL GROUNDING
N.T.S.



DETAIL 8
CABLE TRAY FIXATION
N.T.S.



DETAIL 9
PORTABLE GROUND
N.T.S.



DETAIL 10
N.T.S.

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.
2. STATION GROUND GRID BURIED 460mm BELOW FINISHED GRADE.
3. FENCE & GATE GROUND BURIED APPROX. 150 TO 200MM BELOW FINISHED GRADE & 1M OUTSIDE OF FENCE.
4. PROVIDE 1M CABLE SLACK TO ALLOW RELOCATION OF THE SERVICE PLATFORM & GROUND MAT.
5. GROUND CONNECTIONS AND BARBED WIRE BONDINGS ARE TO BE SPACED AT 12M INTERVALS MAX.
6. ALL HORIZONTAL PIPES TO BE BONDED, AT EACH COUPLING (APPROX. 1.22M INTERVALS).
7. ALL COPPER CONNECTIONS, ABOVE GROUND, SHALL BE PAINTED IN GRAY FOR CAMOUFLAGE.
8. TO AVOID DEGRADATION OF AL COND. OR BOUNDED JOINT DUE TO CORROSION THE AL TO CU TRANSITION IS TO BE MADE AT MIN OF 300MM ABOVE GRADE.
9. A CONTINUOUS 4/0 BARE CU. COND. TO BE RUN ON BOTH SIDES AND FULL LENGTH OF TRENCHES, CLIPPED TO TOP OF TRENCHES AT 1M INTERVALS. BONDED TO STATION GROUND AT 12M INTERVALS.
10. REPLACE EXISTING CONDUCTORS SHOWN ON THIS DRAWING, IF DAMAGED DURING CONSTRUCTION.
11. CONDUCTOR TO BE WOVEN THROUGH FENCE FABRIC IN AT LEAST 2 PLACES USING STAINLESS STEEL TIE WRAPS OR WIRE TIES. TWIST ENDS 3 TIMES AROUND FENCE MESH. AT 6 EQUAL SPACES.
12. CABLE TRENCH COVERS SHOULD NOT OVERLAP TWO TRENCH SECTIONS.
13. APPLY ZINC BASED COATING AFTER DRILLING, "GALVICON" OR EQUIVALENT.
14. EXTEND MIN 50mm CCS FROM CONNECTION IF REQUIRED & COAT THE END WITH CORROSION INHIBITOR COMPOUND.
15. DISTANCE BETWEEN GROUND MAT AND FOUNDATION SHOULD NOT EXCEED 305mm.
16. ALL GROUNDING ASSOCIATED WITH HV SURGE ARRESTERS WITHIN PIT TO BE INSTALLED IN THE NATIVE SOIL UNDERNEATH THE SPILL CONTAINMENT, BEFORE THE CONTAINMENT IS IN PLACE.
17. EXTEND GROUND TAIL 3M ABOVE GROUND LEVEL.
18. QUANTITIES ARE PROVIDED FOR REFERENCE ONLY.

REFERENCE DRAWINGS:

1. 115/13.8KV STATION, BASIC LAYOUT, ELECTRICAL ARRANGEMENT ----F1731664-300-EA001
2. GROUNDING PLAN AND DETAILS ----------1796-D-35

LEGEND

SYMBOL	DESCRIPTION	ITEM#
	NEW #4/0 Cu BURIED CONDUCTOR (STATION GROUND GRID):	
	EXISTING COPPER BURIED CONDUCTOR (STATION GROUND GRID):	
	#2/0 Cu BURIED CONDUCTOR (ENTRANCE GATE):	
	7#6 CCS FENCE PERIMETER GROUND CONDUCTOR:	
	19#8 CCS	
■	SWAGE CONNECTION #4/0 RUN #4/0 TAP (HORIZONTAL X & T):	(1)
◘	SWAGE CONNECTION #4/0 RUN 19#8 TAP (HORIZONTAL T):	(2)
⊞	SWAGE CONNECTION #2/0 RUN #2/0 TAP (HORIZONTAL X & T):	(3)
◩	SWAGE CONNECTION 7#6 RUN #2/0 TAP (HORIZONTAL X):	(4)
⧈	SWAGE CONNECTION 7#6 RUN 7#6 TAP (HORIZONTAL X & T):	(5)
⊠	SWAGE CONNECTION 19#8 RUN 19#8 TAP (HORIZONTAL T):	(8)
●	EXISTING CONNECTION	
▬	BOLTED CONNECTION #4/0 TO FLAT STEEL	
	GROUND LOOP	
	FENCE GROUNDING (DETAIL 1)	
	FENCE BONDING (DETAIL 1)	(6)
◉	NEW CONNECTION TO GROUND ROD (14142)	
●	EXISTING CONNECTION TO GROUND ROD	
◕	PORTABLE GROUND CONNECTION (DETAIL 9)	

BILL OF MATERIAL (NOTE 18)

IDENT	ITEM	SHORT DESCRIPTION	UNIT	QTY.
(1)	90001	CONN-GRD-SWG-OFFSET SPLIT CROSS/TEE-CU-#4/0 RUN-#4/0 TAP	EA	52
(2)	90002	CONN-GRD-SWG-OFFSET SPLIT CROSS/TEE-CU-#4/0 RUN-19#8 TAP	EA	19
(3)	90003	CONN-GRD-SWG-OFFSET SPLIT CROSS/TEE-CU-#2/0 RUN-#2/0 TAP	EA	30
(4)	90004	CONN-GRD-SWG-OFFSET SPLIT CROSS/TEE-CU-7#6 RUN-#2/0 TAP	EA	2
(5)	90005	CONN-GRD-SWG-OFFSET SPLIT CROSS/TEE-CU-7#6 RUN-7#6 TAP	EA	14
(6)	90006	CONN-GRD-SWG-OFFSET SPLIT TEE-CU-#4/0 RUN TO 3/4" ROD	EA	16
(7)	90007	CONN-GRD-SWG-SPLICE-CU-#4/0 RUN-#4/0 TAP	EA	5
(8)	90008	CONN-GRD-SWG-OFFSET SPLIT CROSS/TEE-CU-19#8 RUN-19#8 TAP	EA	48
(9)	90009	CONN-GRD-SWG-OFFSET SPLIT CROSS/TEE-CU-19#8 RUN-7#6 TAP	EA	2
–	05798	BARE COND-ASC-4/0AWG-7STRD-OXLIP	M	60
–	05823	BARE COPPER COND-2/0AWG-STRD	M	30
–	05826	BARE COPPER COND-4/0AWG-STRD	M	AR
–	06183	CONN,TERM CLAMP,BLTD,CU,1/0AWG-1250KCMIL	EA	4
–	06247	CONN-GRD TERM BLTD COND-PIPE-IR-2/0-250	EA	15
–	06742	CONN-GRD SPL BLTD-CU-300KCMIL-500KCMIL	EA	10
–	06838	CONN-TERM COMP PAD-AL-400KCMIL-2X12MM HO	EA	AR
–	06896	CONN-GRD BLTD-CU-STIRRUP-4 HOLE PAD	EA	4
–	07024	CONN,GRD,C-COMP,CU,#1-2/0 TO #1-2/0 R/T	EA	2
–	07025	CONN-GRD "C" COMP-CU-CAB-CAB-3/0-STR 250	EA	25
–	07164	CONN-GRD TERM BLTD-CU-CAB-BAR-2/0-250,TP	EA	10
–	07193	CONN-TAP COMP-AL-2-3/OAWG-8AWG	EA	45
–	07421	CONN-GRD TERM BLTD CAB-BAR-CU-300-500	EA	5
–	10741	CONN-GRD TERM BLTD CAB-PIPE-CU-2/0-250	EA	135
–	10744	CONN-SPL COMP NON TEN--1/0-2/0AWG-	EA	15
–	14142	ROD,GROUND,3/4" X 10 FT, GALV	EA	9
–	17129	CONN,GRD,SPL,BLTD,CU,CBL-PIPE,2/0-250-6"	EA	AR
–	18857	CONN-TAP BLTD COND2COND-CU-1/0-4/0-6-4/0	EA	135
–	30949	BARE COPPER COND-2/0AWG-STRD-CUT	M	10
–	30950	BARE COPPER COND-4/0AWG-STRD-CUT	M	350
–	31233	7#6 CU-CLAD STEEL,DSA, 40% CONDUCTIVITY	FT	1000
–	31234	19#8 CU-CLAD STEEL,DSA, 40% CONDUCTIVITY	FT	600
–	31292	CONN,GRD,BLTD,CU,CBL-PIPE,2/0-250MCM,6"	EA	1
–	31894	CONN-TAP COMP-AL/CU- 4/0 -7#6 CCS	EA	15

PROFESSIONALS:

N°	DATE	TRANSMISSION	BY ENG

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LICENCED PROFESSIONAL ENGINEER Y. Lessard 100128893 2018-08-20 PROVINCE OF ONTARIO

CLIENT:

PROJECT:
MCMASTER UNIVERSITY–NF91

TITLE:
115/13.8KV STATION
MAIN GROUNDING GRID
PLAN & DETAILS
ELECTRICAL ARRANGEMENT

PREPARED BY: Y.LESSARD	DATE: 2018/08/20
DRAWN BY: C. RAVAGNAN	SCALE: 1:75
VERIFIED BY: M. LAROCQUE	DISCIPLINE: ELECTRICAL ARRANGEMENT
APPROVED BY: Y. LESSARD	CAD FILE NAME: F1731664-300-EA012.dwg

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