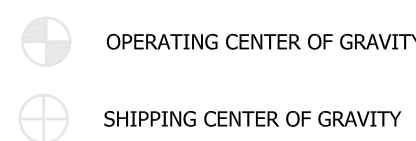


NOTES:

1. \* ITEMS REMOVED FOR SHIPMENT
2. TANK DESIGNED FOR FULL VACUUM
3. MANUFACTURED IN ACCORDANCE WITH ANSI & NEMA
4. PAINT FINISH: ANSI #70 SKY GRAY EXTERIOR, WHITE INTERIOR
5. ALL DIMENSIONS IN INCHES
6. DESIGNED FOR -20° C
7. UNIT DESIGNED FOR RAIL SHIPMENT
8. MATCH-MARKED RADIATORS FOR PROPER REINSTALLATION
9. (1) EA SPARE HV, LV BUSHINGS
10. (1) SET SPARE GASKETS REQUIRED
11. UNDERCOAT BASE
12. UNIT TO BE FILLED WITH FR3 OIL

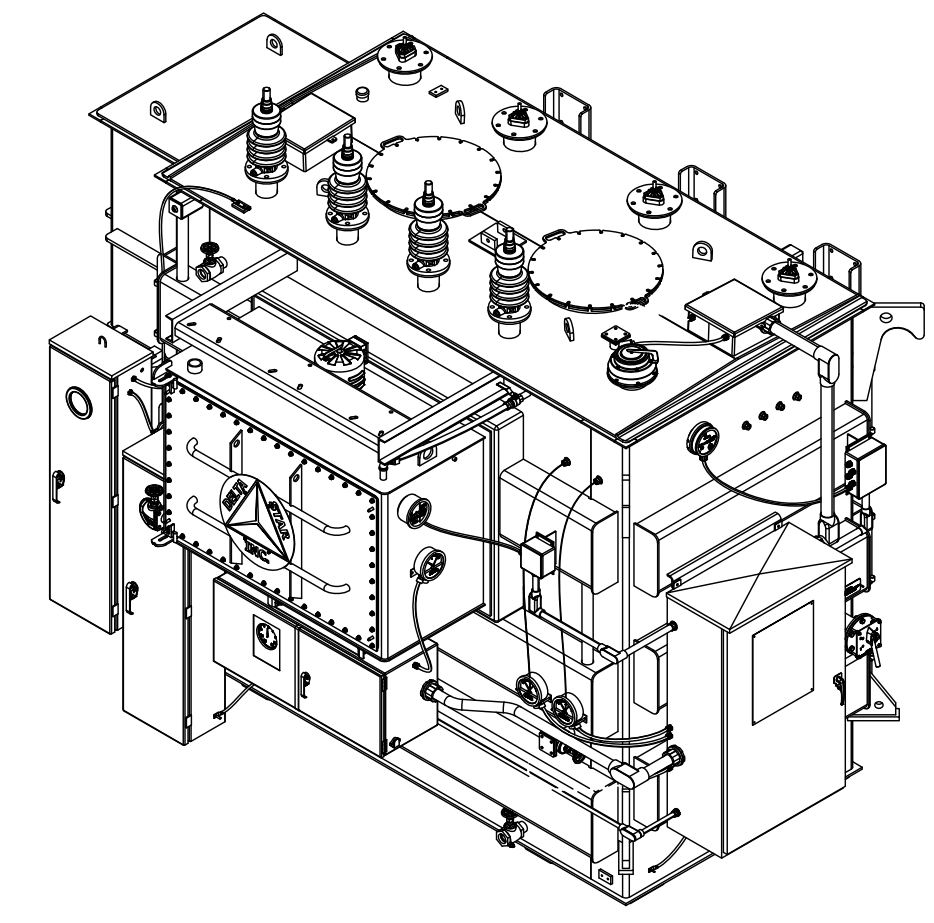
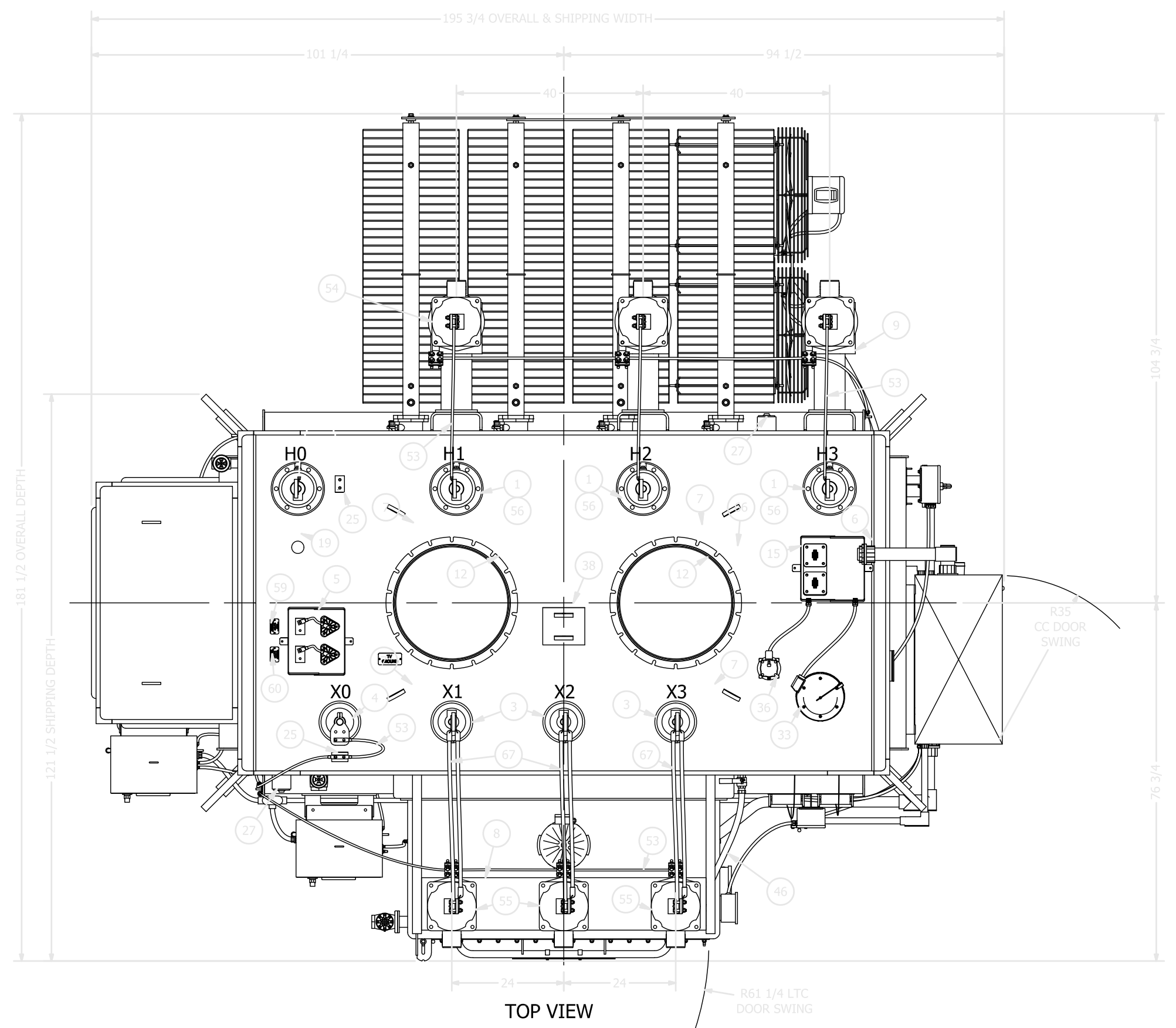
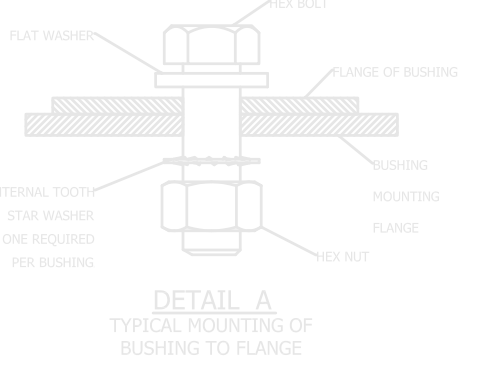


SHIPPING WEIGHT WITHOUT OIL = 71,000 LBS

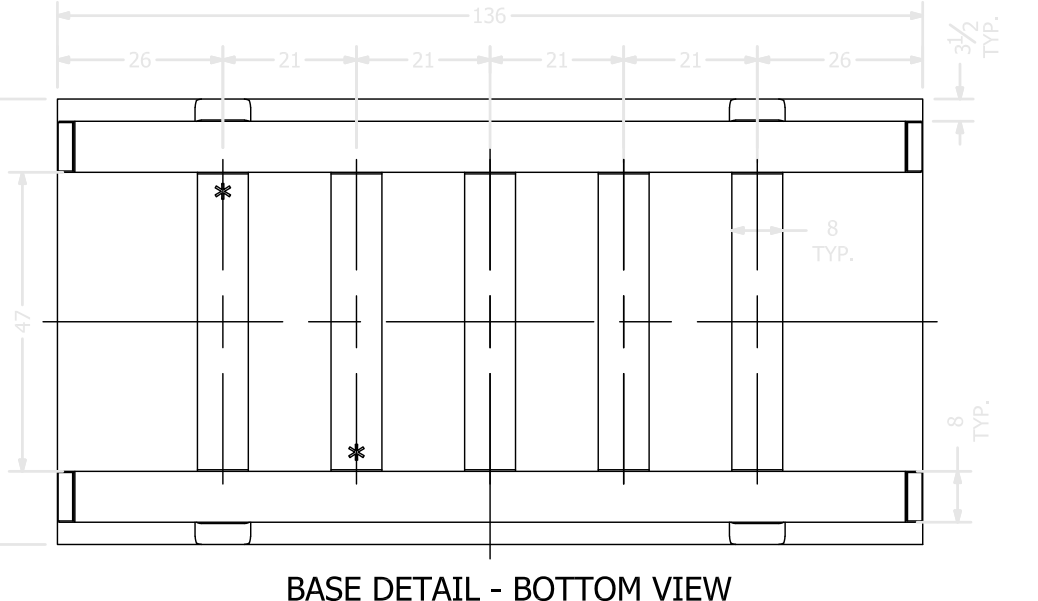
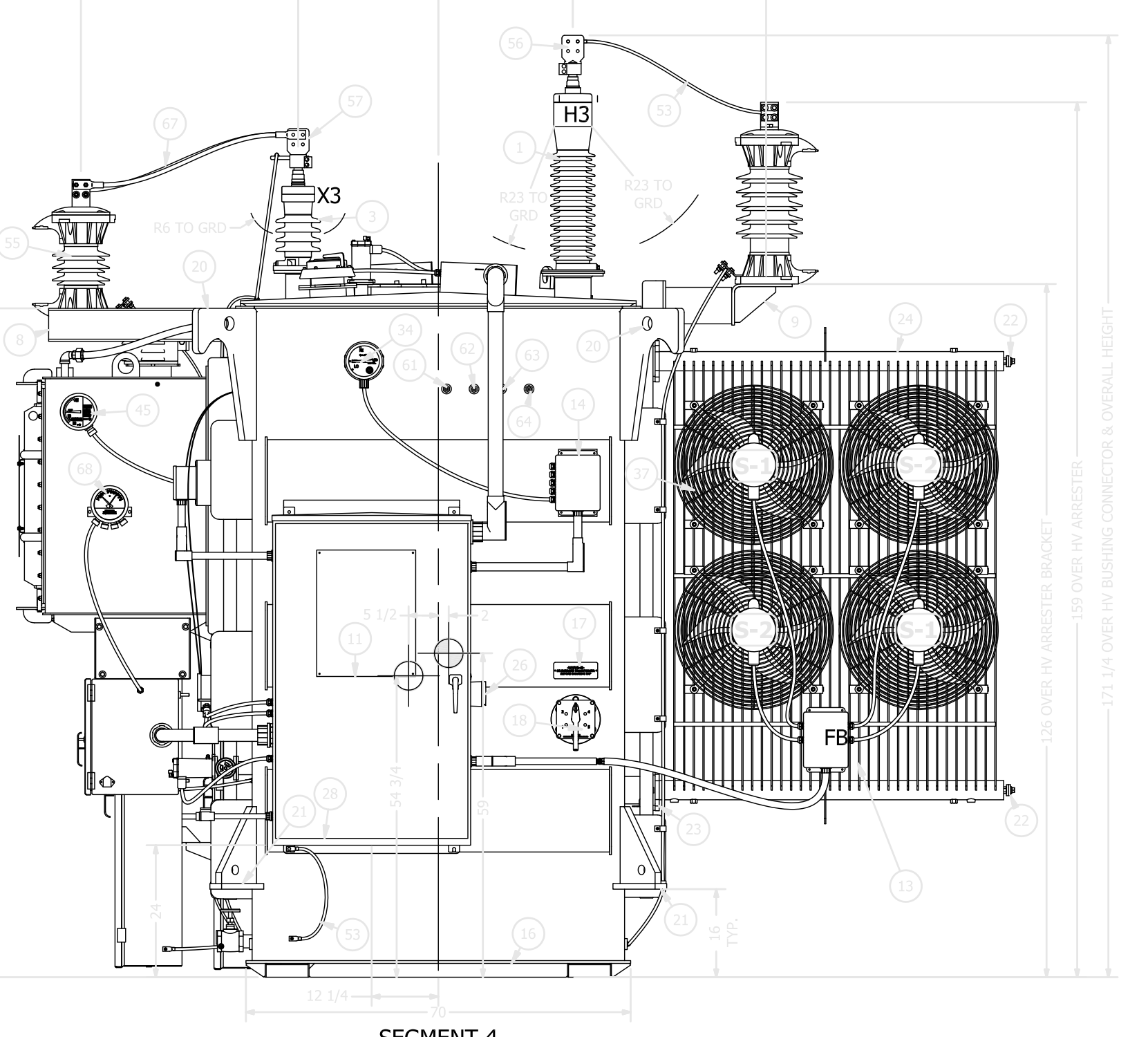
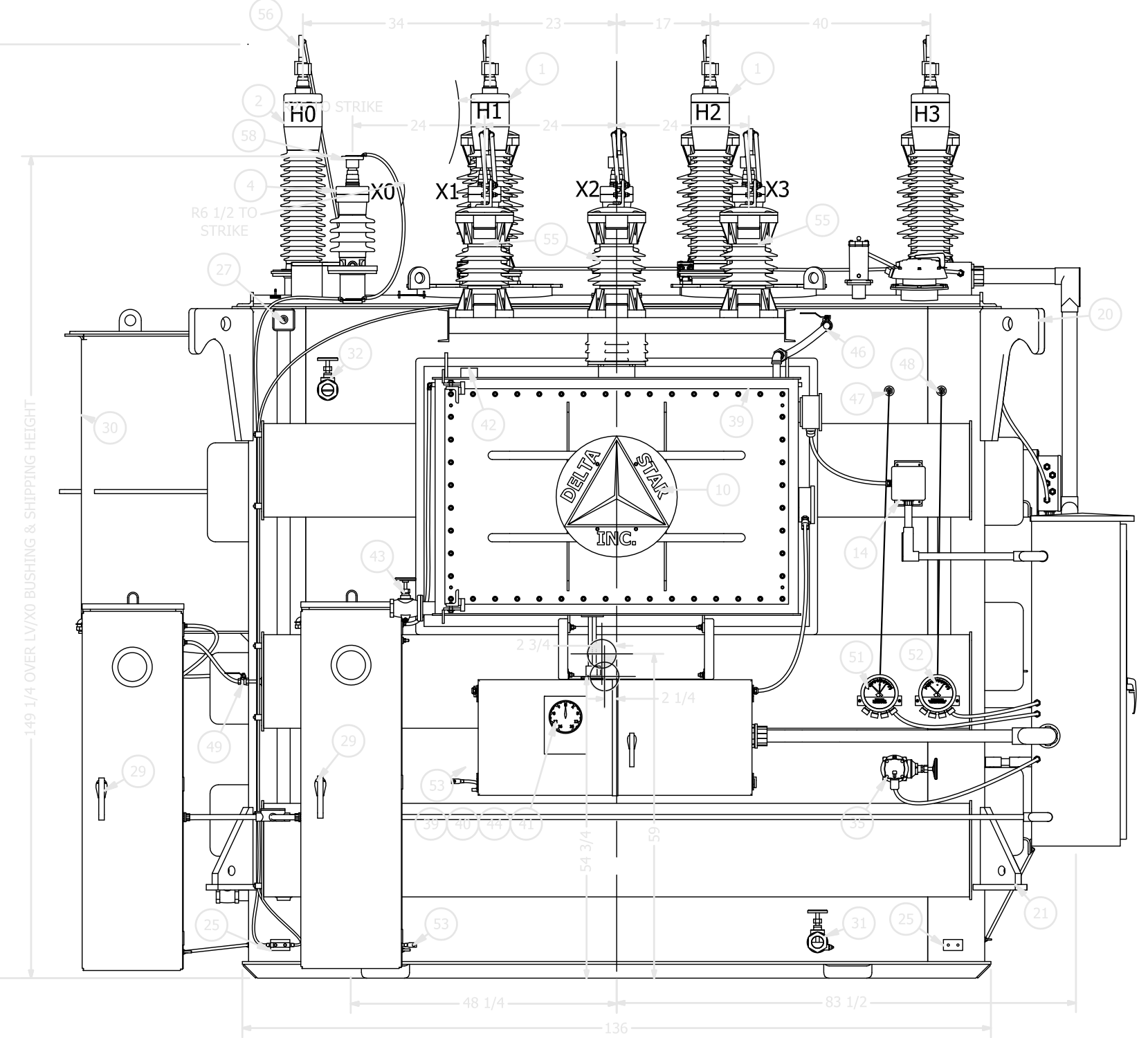
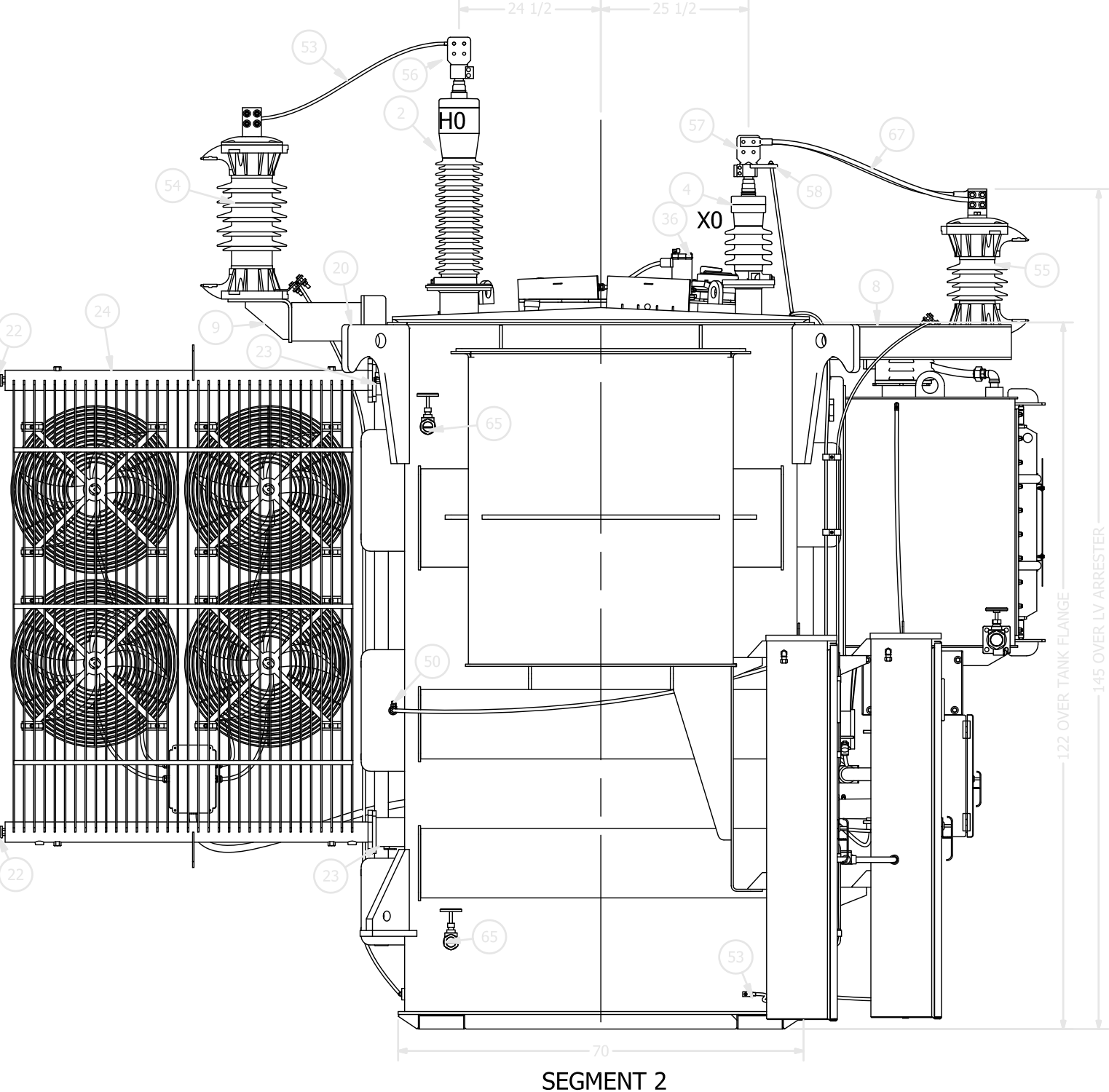
APPROXIMATE WEIGHTS (POUNDS)

DESCRIPTION	WEIGHT
UNTANKING (CORE & COIL)	43,800
TANK & FITTINGS	30,100
OIL (KEROSENE)	
MAIN TANK (GAL.)	9,720
RADIATORS (GAL.)	340
LTC (GAL.)	280
TOTAL (GAL.)	10,340
TOTAL	106,500

\* INCLUDES 1,700 LBS FOR PREVENTIVE AUTO



ITEM		QTY	DESCRIPTION
1	3	HV BUSHING, ABB, 1.5-12UN-2A (SILVER PLATED THREAD), #8682H12AN, 69 KV, 400/1200 A, DRAIN LEAD	
2	1	HV BUSHING, ABB, 1.5-12UN-2A (SILVER PLATED THREAD), #8682H12AN, 69 KV, 400/1200 A, DRAIN LEAD	
3	3	LV BUSHING, ABB, 1.5-12UN-2A (SILVER PLATED THREAD), #0250H12AT, 25 KV, 400/1200 A, BOTTOM CONNECTED	
4	1	X0 BUSHING, ABB, 1.5-12UN-2A (SILVER PLATED THREAD), #0250H12AT, 25 KV, 400/1200 A, BOTTOM CONNECTED	
5	2	CORE GROUND BUSHING, CENTRAL MALONEY #F013151 (WITH GROUND PAD & STAINLESS STEEL NAMEPLATE, 1 FOR MAIN TANK, 1 FOR PREVENTIVE AUTO)	
6	2	DOMED NON-SKID COVER, WELDED	
7	4	LIFTING LOOP FOR LIFTING COVER ONLY	
8	1	LV SURGE ARRESTER MOUNTING	
9	7	HV SURGE ARRESTER MOUNTING	
10	7	DELTA STAR LEADS	
11	1	HEAVY TRANSPARENT WAREHOUSE (STAINLESS STEEL)	
12	1	ROCKET HANDLE COVER WITH FLUSH LIFTING HANDLES, 90° ROUNDED OPENING, ON BASSIS PLAMER	
13	1	PANI CONNECTION BOX	
14	2	CONDUIT JUNCTION BOX	
15	1	CURRENT TRANSFORMER LEAD JUNCTION BOX	
16	1	CHANNEL BASE, SEE BASE DETAIL	
17	1	DE-ENERGIZED TAP CHANGER WARNING NAMEPLATE	
18	1	TAP CHANGER MECHANISM FOR HV WINDING FOR DE-ENERGIZED OPERATION (ONLY, PADLOCKING IN ANY POSITION (ALPHABETIC DESIGNATIONS))	
19	2	02.00" NPT MALE CONNECTION FOR VACUUM FILLING, WELDED NIPPLE WITH CAP	
20	4	LIFTING LUG FOR LIFTING COMPLETE UNIT	
21	4	JACKING LUG WITH LIFTING LOOP FOR PULLING IN ALL DIRECTIONS FULLY ASSEMBLED AND OIL-FILLED	
22	1	RADIATOR GROUP BRACKET, DWG #A-4823	
23	8	RADIATOR GROUP COIL WINDING	
24	4	REMOVABLE RADIATOR, TYPICAL, MOUNTED ON SHUT-OFF VALVE, GALVANIZED	
25	0	GROUND PAD, (2) 6.5-1.0W, 1.75" CENTER TO CENTER	
26	1	GFI RECEPTACLE	
27	2	06.25" NPT FEMALE TEST CONNECTION WITH PLUG, GAS SPACE BOX	
28	1	MAIN CONTROL CABINET 60H X 36H X 16D WITH OPENING IN BOTTOM FOR USERS CONDUIT, PROVISIONS FOR PADLOCKING (NEMA 3R)	
29	2	DELTA STAR NITROGEN SYSTEM GAS CABINET (1 FOR MAIN TANK, 1 FOR LTC)	
30	1	PREVENTIVE AUTO COMPARTMENT	
31	1	DRAIN CONNECTION - 2" GLOBE VALVE, UNITED # 12TSSB-2 (WITH 3/8" SAMPLER)	
32	1	UPPER FILTER PRESS CONNECTION - 2" GLOBE VALVE, UNITED # 12T72	
33	1	PRESSURE RELIEF DEVICE WITH SEMAPHORE, QUALITROL # 1P050-00748309	
34	1	TRANSFORMER OIL LEVEL INDICATOR, WITH LOW LEVEL ALARM CONTACTS, QUALITROL #932-028-01-03-4732	
35	1	SURGE PRESSURE RELAY, QUALITROL #900-009-03, WITH SHUT-OFF VALVE (IN CASE)	
36	1	SURGE PRESSURE RELAY, QUALITROL #910-010-03 (IN CASE)	
37	4	COOLING FAN, ARNEZ, #F206-1A712-108, 208-230V, 1 PHASE, 1140 RPM, 1/2 HP, 1.8 A	
38	1	PROVISIONS FOR MOUNTING UNI-HOIST (FOR SAFETY HARNESS ATTACHMENT)	
39	1	LTC MECHANISM COMPARTMENT, REINHARDT, TYPE RMVD-1000 15KV, WITH VENDOR-SUPPLIED HESSKO PRESSURE RELIEF DEVICE	
40	1	LTC HANDCRANK BOSS LOCATED INSIDE MOTOR DRIVE COMPARTMENT	
41	1	LTC POSITION INDICATOR	
42	1	LTC 02.00" VACUUM CONNECTION, WELDED NIPPLE WITH CAP	
43	1	LTC 02.00" FLANGE MOUNTED DRAIN VALVE, UNITED #12T7SSB2	
44	1	LTC MOTOR DRIVE HOUSING	
45	1	LTC LIQUID LEVEL GAUGE	
46	1	VACUUM EQUALIZATION PIPING (READY TANK TO LTC)	
47	1	SEALED WELL BU.B FOR LIQUID TEMPERATURE INDICATOR	
48	1	SEALED WELL BU.B FOR WINDING TEMPERATURE INDICATOR	
49	1	06.25" BALL VALVE WITH PLUG FOR GAS SAMPLING, UNITED #99-114	
50	1	06.25" BALL VALVE WITH PLUG FOR GAS SHUT-OFF, UNITED #99-124	
51	1	LIQUID TEMPERATURE INDICATOR, HESSKO, #635-20663	
52	1	WINDING TEMPERATURE INDICATOR, HESSKO, #635-20663	
53	10	4/8 BARE COPPER CABLE (GROUNDING FOR CONTROL CABINET, LTC MOTOR DRIVE, NITROGEN CABINETS, LV ARRESTERS, HV ARRESTERS, X0 BUSHING, HV BUSHING TO ARRESTER CONNECTIONS)	
54	3	HV ARRESTER, ABB, #Q54H40K2A, 54KV, 42 kV MCOV	
55	3	LV ARRESTER, ABB, #R010R40A, 10KV, 8 kV MCOV	
56	3	HV BUSHING CONNECTOR, NEMA 4 HOLE PAD, SEFCOR #SMT-44-88	
57	1	LV BUSHING CONNECTOR, NEMA 4 HOLE PAD, SEFCOR #SMT-44-48	
58	1	X0 BUSHING CONNECTOR, NEMA 4 HOLE PAD, SEFCOR #SMT-44-48	
59	1	MAIN UNIT CORE GROUND NAMEPLATE	
60	1	PREVENTIVE AUTO CORE GROUND NAMEPLATE	
61	1	SEALED WELL FOR FUTURE TOP OIL STD	
62	1	SEALED WELL FOR FUTURE HV WINDING TEMPERATURE STD	
63	1	SEALED WELL FOR FUTURE LV WINDING TEMPERATURE STD	
64	1	SEALED WELL FOR FUTURE HV WINDING TEMPERATURE STD	
65	2	01.50" OIL SAMPLING VALVES FOR FUTURE OGA MONITORING, UNITED #12ST-1-12	
66	1	TV IDENTIFICATION NAMEPLATE	
67	0	150 MM BARE COPPER CABLE, LV BUSHING TO ARRESTER CONNECTION	
68	1	LTC LIQUID TEMPERATURE INDICATOR, SUPPLIED WITH LTC	



REV	DESCRIPTION	BY	DATE	APP
2	UPDATED SHIPPING VIEW, MARKED ITEM 58 TO SHIP LOOSE	JPF	3/18/2018	
1	REVISED PER FINAL DESIGN	JPF	3/27/2018	
0	RELEASED FOR APPROVAL	GHW	12/27/2017	

TRaverse CITY LIGHT & POWER  
 S.O.# E4887/8  
 P.O.# P-2017-1482  
 BARLOW SUBSTATION

HVA PHASE	12/16/20/22.4
HERTZ	60
CLASS	KNAN/KNAP/KNAP
RISE	55/65°C
PRIMARY VOLTAGE (KV)	69Y/39.84
SECONDARY VOLTAGE (KV)	13.8Y/7.97



DELTA STAR, INC.  
 LYNCHBURG OPERATION (434) 845-0921  
 3550 MAYFLOWER DR. LYNCHBURG, VA 24501

TITLE:	TRANSFORMER OUTLINE
D	E488730
SIZE	DRAWING NO.
2	1 of 1
REV	SHEET



ENG.	NMA		
DR	JPB		
CK	NMA	12-30-2020	RECORD DRAWINGS
APP	MPM	02-21-2020	CONSTRUCTION
DATE		ISSUED FOR	

**GRP Engineering, Inc.**  
 PETOSKEY, MICHIGAN, 231-439-9683  
 GRAND RAPIDS, MICHIGAN, 616-942-7183

**TRaverse CITY LIGHT & POWER**  
 BARLOW SUBSTATION - 69KV SWITCH STATION  
 TRANSFORMER NO.2 - OUTLINE DIAGRAM

PROJECT NUMBER  
 19-1025.01  
 DRAWING NUMBER  
 870

P:\19-1025.01\_TCL&P BARLOW SWITCHING STATION\PDS\BW-870 (WIRING DIAGRAM T2 OUTLINE).DWG 12/30/2020 10:16:28 AM #####