

# SUBSTATION TRANSFORMER DRAWINGS 20/26.66/33.33/37.33 MVA, 138KV / 6.9KV

BY

SIEMENS ENERGY, INC.

FOR

TRANSCANADA PIPELINE LTD.

KXL PROJECT

GRASSY CREEK PUMP STATION -  
3 PUMP ARRANGEMENT

## DRAWING LIST:

DRAWING NO.	REV.	DESCRIPTION
SIE-KXL-TXF-0138-GRSSY	4	TITLE SHEET
D-9664	0	NAME PLATE
D-9665	0	OUTLINE DIMENSIONS
D-9707	0	LV BOX CONNECTION
D-9666	0	ACCESSORIES
D-9667	0	SCHEMATIC MOTOR DRIVE
D-9669	0	CONTROLS LAYOUT CONNECTIONS LEFT COMPARTMENT
D-9665	0	SCHEMATIC CONTROL COOLING
D-9668	0	AUTO CONTROL
D-9660	0	CONTROLS LAYOUT MOTOR DRIVE COMPARTMENT
D-9661	0	CONTROLS LAYOUT CONNECTIONS RIGHT COMPARTMENT
T138M0800XA	4	TYPE 0 Plus C, IEEE, CONDENSER BUSHING (138KV)
T0150400AN	1	TYPE A, IEEE, BULK BUSHING (138V)
S00362400	3	STATION CLASS SURGE ARRESTER, 217598-0001, 38KV MCOV
B-11823	0	TAG NUMBER



25472-101-V1A-MPC0-W0078  
05

## Supplier Document Status

Code 1

Code 1 = Work may proceed.  
Code 2 = Revise and resubmit. Work may proceed subject to resolution of indicated comments  
Code 3 = Revise and resubmit. Work may not proceed.  
Code 4 = Review not required. Work may proceed.  
Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods, or materials developed or selected by the Supplier and does not relieve the Supplier from full compliance with contractual obligations.  
Responsible Engineer - Landry, Nicole  
Date Signed - 3/27/2012  
VPTL - VPTL-03639  
Equipment No. - 128-GRSSY-B0-T-01

## NOTES

THIS DRAWING SET PERTAINS TO THE FOLLOWING PUMP STATIONS:		
STA #	USE/NO/NO	EQUIPMENT TAG
PS-8	GRSSY	GRASSY CREEK STA 128-GRSSY-B0-T-01

## REFERENCE DRAWINGS

**SIEMENS** Siemens Energy Inc.  
Oil & Gas  
TransCanada Pipeline  
Doc Number SIE-KXL-TXF-0138-GRSSY  
Release 4  
Issued by Mainda Pitts

REV.	DATE	DESCRIPTION	BY	CHK	APP
4	12/03/12	Per cust comments, add SA info	BW	MB	BW
3	12/02/01	Per customer comments	BW	MB	BW
2	11/04/05	Code2 comments, 12/15/2011 addressed	SUP	MB	BW
1	11/17/01	For approval	FW	MB	BW
0	10/11/01	For approval	FW	MB	BW

## REVISION HISTORY

**SIEMENS**

Siemens Energy, Inc. / Oil & Gas  
15000 N. Barkers Landing Houston, TX 77079  
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TITLE  
SUBSTATION TRANSFORMER DRAWINGS

TITLE SHEET  
GRASSY CREEK PUMPING STATION PS-8

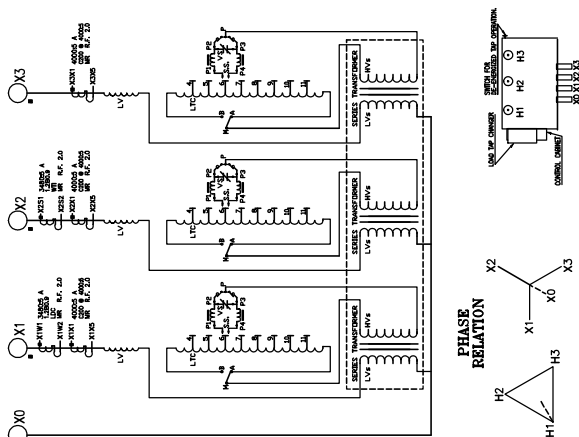
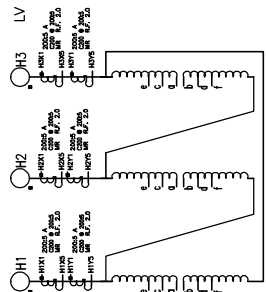
PROJECT	SCALE
TOPIC KEYSTONE - KXL PROJECT	1.0=1.0
DRAWING NO. SIE-KXL-TXF-0138-GRSSY	SHT 1 OF 15 REV 4

## SUBSTATION TRANSFORMER

**SUBSTATION TRANSFORMER**  
SES, 60 Hz, 55//65°C RISE  
.66/29.86/33.33/37.33 MVA  
.66/29.86/33.33/37.33 MVA

## FULL WAVE IMPULSE LEVELS

550 kV, HV BUSHINGS 650 kV  
110 kV, LV BUSHINGS 110 kV  
LV NEUTRAL BUSHING 110 kV  
BASED ON 20 MVA ON TAP 3



MATERIAL : STAINLESS STEEL 0.031" (0.7937mm) THK  
STEEL BACKGROUND, LINES LETTERS, ETC. BLACK.

GUARANTEED IMPEDANCE AT TAP 3 IS 9.5% AT 20 MVA  
DATA, SERIAL AND TESTED IMPEDANCE WILL BE STAMPED ON NAMEPLATE.

NO.-LOAD CHARGER	POS.	SWITCH	VOLTS		AMPERES		
			20	26.66	33.3	37.3	
		a-b	144900	80	106	133	149
		b-c	141450	82	109	136	152
		c-d	139000	84	112	139	156
		d-e	134550	86	114	143	160
		e-f	131100	88	117	147	164

[illegible]

- 1) READ INSTRUCTION BOOK BEFORE INSTALLING AND ENERGIZING TRANSFORMER.
- 2) DO NOT OPERATE THE TRANSFORMER WHEN THE LIQUID LEVEL IS BELOW THE LOW POINT ON THE SCALE.
- 3) DO NOT OPERATE THE "NO LOAD," DE-ENERGIZED, TAP CHANGER WHEN THE TRANSFORMER IS ENERGIZED.
- 4) TRANSFORMER IS DESIGNED FOR 14.7 PSI AND FULL VACUUM FILLING.
- 5) ALL WINDINGS ARE COPPER.
- 6) UNIT CONTAINS LUMINOIL TYPICAL OIL
- 7) AT TIME OF MANUFACTURE, THIS TRANSFORMER CONTAINED NO DETECTABLE PGB'S.
- 8) TRANSFORMER IS RATED FOR SITE ALTITUDES NOT EXCEEDING 1000 METERS.

POS.	CURRENT TRANSFORMERS		CLASS
	RATIO	CONNECTION	
	50:5 A	X3-X4	
	50:5 A	X1-X2	
	50:5 A	X4-X5	
	50:5 A	X2-X3	
	100:5 A	X2-X4	
	100:5 A	X1-X3	
	100:2 A	X1-X4	
	150:5 A	X1-X5	
	150:5 A	X2-X5	

POS.	CURRENT TRANSFORMERS	RATIO	CONNECTION	CLASS
LV		500:5 A	X1-X2	
		1000:5 A	X1-X4	
		1500:5 A	X2-X3	
		2000:5 A	X1-X3	
		2500:5 A	X2-X4	
		3000:5 A	X1-X4	
		3500:5 A	X2-X5	
		3500:5 A	X2-X5	

POS.	CURRENT TRANSFORMERS	CLASS.	Q2
X1	RATIO 3480:5 A	CONNECTION W1-W2	1.2B0.9


APPROXIMATE WEIGHT	LB	KG
CORE & WINDINGS (MAIN TRANSFORMER)	2900	1315
CORE & WINDINGS (REACTOR)	3200	1450
CORE & WINDINGS (SERIES)	14600	6620
TANK & FITTINGS	27100	12290
REMOVABLE RADATORS	16600	7520
LOAD TAP CHANGER & MOTOR DRIVE	2907	1319
	USG	
LIQUID IN TRANSFORMER	6394	47880
LIQUID IN RADATORS	690	5148
LIQUID (LOAD TAP CHANGER)	345	2460
TOTAL LIQUID	7418	55642
TOTAL MASS WITH OIL		168600
TOTAL MASS WITHOUT OIL		112958
SHIPPING WEIGHT		95200

CAN/CSA-C88-M90	
INSTRUCTION BOOK (SIEMENS)	T.040N.001092.02
SERIAL No.	T.040N.001092.02
MONTH/YEAR BUILT	
CUSTOMER ORDER No.	9000017832

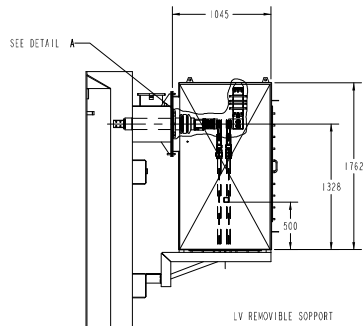
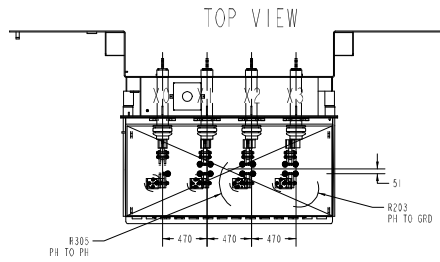
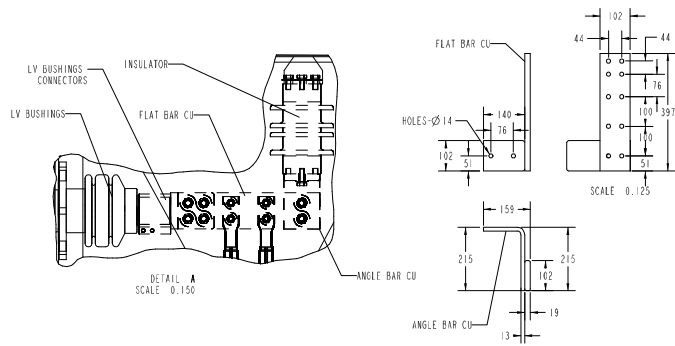
SIEMENS TRANSFORMADORES S.A. DE C.V.  
MADE IN MEXICO

DWG. D-9664 REV. 0

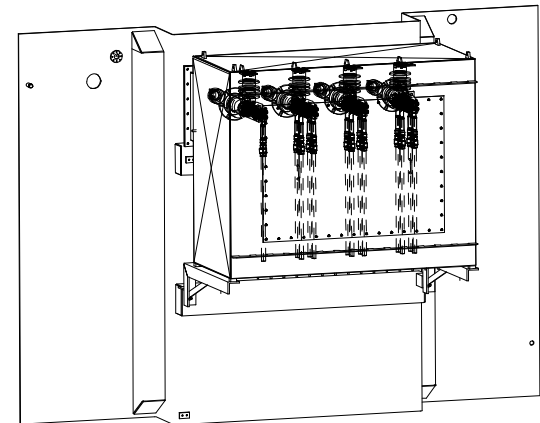
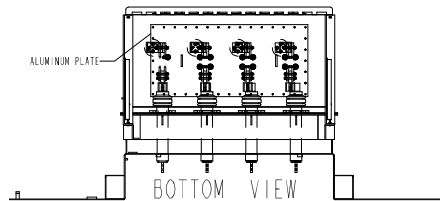
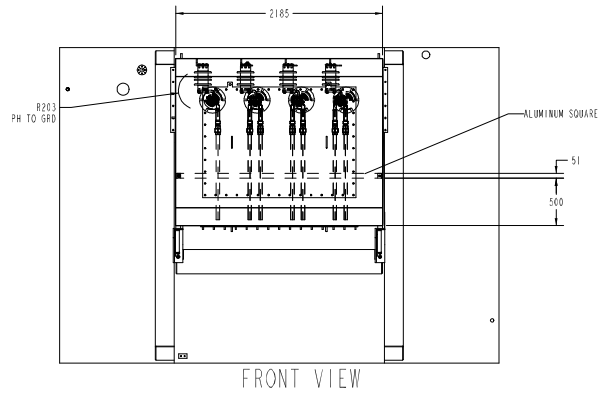
**SIEMENS** Siemens Energy Inc.  
Oil & Gas  
**TransCanada Pipeline**  
Doc Number SEI-KXL-TXF-0138-GRSSY  
Release 4  
Issued by Mainda Pitts

FARMER'S FARM	TRANS CANADA PIPELINES LIMITED				DRAWING NO. REV.
	GRASSY CREEK PUMPING STATION (PS-C) EQUIPMENT TAG128-GRSSY-R0-Y-01				
	20L IMBERT SUBSTATION POWER TRANSFORMER, 3 PHASE, 20/25A/12666/2386/133/37.3/23.5MVA, 60 HZ 115KV/13.8KV HV/LV 6.9 KV Grd Y 2.30K VOLT, 32/55KV IEEE.				
	CLASS DMM/OW/OW/OW				
	CS# 8888 PURCHASE ORDER# 9000017832				
	 NAMEPLATE				
SIEMENS TRANSFORMADORES S.A. DE C.V.					
DATE	3/26/2002	REV	ISAC G.		
ACQS	IMBES	CS#	8888		
BUILD		REV	EDWARD G.	D-9664	REV.





LEFT VIEW

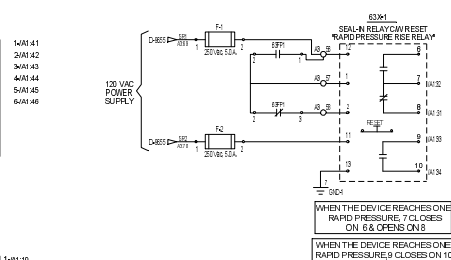
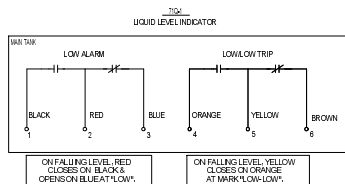
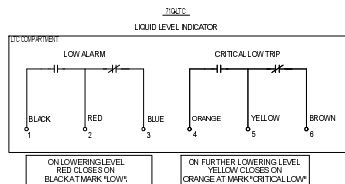


P.O. 9000017832  
TAG 128-GRSSY-BD-T-01

Unit 1092.02

**SIEMENS** Siemens Energy Inc.  
Oil & Gas  
TransCanada Pipeline  
Doc Number SE1-KXL-TXF0138-GRSSV  
Release 4  
Issued by Maïnda Pitts

SIEMENS				
MILITARY CONNECTION				
PROJ	REV	DATE	BY	APP
100	1	10/11/11	MAINDA PITS	
0.025	D-9707			1092.02

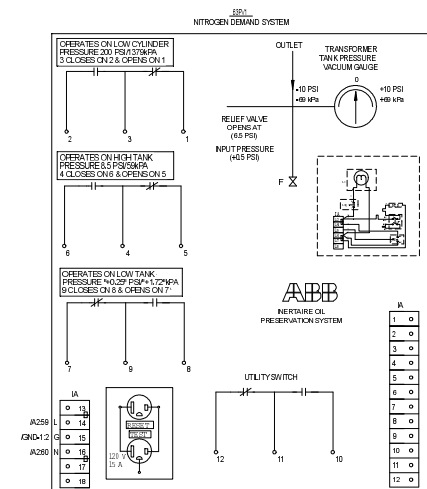


CONTACT RATINGS (SEAL-IN-DELAY "909"=300=01")				
	VOLTAGE VOLTS	SWAGE (AMPS)	CARRY (AMPS)	BREAK (AMPS) RESISTIVE INDUCTIVE
* 120 VAC	20	10	10	5
240 VAC	20	10	5	2.5
24 DC	20	10	5	3
48 DC	20	10	2	1
125 DC	20	10	0.5	0.25

\*NOTE: RESPONSE TIME OF CONTACTS ( 40-50 msec.)

REFERENCE DNGS: D-9655, D-9657, D-9658, D-9659, D-9660, D-966

DEVICE NUMBER	ACCESSORY	RATING	MODEL	MANUFACTURER
3C5A2	SWITCH	30A	20K-2	STATES
	3-POSITION SWITCH-W/TEST FLUG			
B1_3	TERMINAL BLOCKS	100VAC/47A	TERMINAL BLOCK	WEDERKILM
	TERMINAL BLOCK/MOUNTS ON DIN RAIL TYPE S&B; LOG.			
A1_3	TERMINAL BLOCK	50.0A	UT-6	ROBBER CONTACT
	TERMINAL BLOCKS (UL 94V0, 80A+ & W/G)			
63PM	RELAY	125Vdc/cont(50A)	XPR000-0002570	QUALITROL
	PRESSURE RELIEF DEVICE (100PSI @50A, No Inductive Contact) ADDITION (P/C PHINHS KIT)			
63PALT	RELAY	125Vdc/cont(50A)	XPR000-0002570	QUALITROL
	PRESSURE RELIEF DEVICE (100PSI @50A, No Inductive Contact) ADDITION (P/C PHINHS KIT)			
63PFI	RELAY	125 Vdc/Cont(50A)	6000-015-32-40B4	QUALITROL
	RAPID PRESSURE RISE RELAY FLANGE MOUNTING			
6321	RELAY	125Vdc	600-320-01	QUALITROL
	SEMI-N RELAY C/W RESE			
71G1	GAUGE	125Vdc, 0.50A (Cont'd)	3255-0601/32-5555	QUALITROL
	LIQUID LEVEL INDICATOR SWITCHES,ENGLISH/LOI 28.3P			
71G1C	GAUGE	125Vdc (Cont'd)	MSH2-12	MR
	LIQUID LEVEL INDICATOR SWITCH,ENGLISH/ENGLISH (LOI 28.3P)			
M_2	DOUBLE FLUIDE FLUSE WITH TIME DELAY	250VAC/5A	FIRH96	BUSSMANN
ADDITION	FLUSE BASE	250VAC/5A	R25X30-2FR	BUSSMANN
	FLUSE BASE (2 POLES)			
46P1	GAUGE	125 Vdc/Cont(50A)	TB8000-0002672	QUALITROL
	WINDING TEMP. INDICATOR (ANALOG) 4 FORM C SWITCHES			
ADDITION	CALIBRATING RESISTOR (3.0/5.0, 50/100S)		DE0030	OMITE
	CALIBRATING RESISTOR (3.0/5.0, 50/100S) MOUNTING			
26-1	GAUGE	125V AC/Cont(50A)	TB8000-0002594	QUALITROL
	LIQUID TEMP. INDICATOR ANALOG 4 FORM C SWITCHES			
ADDITION	TERMINAL FLATE	1.0A	2W-1470242	QUALITROL
	TERMINAL FLATE-257L IN TERMINAL BLOCK			
A1_3	TERMINAL BLOCK	50.0A	UT-6	ROBBER CONTACT
	TERMINAL BLOCKS (UL 94V0, 80A+ & W/G)			
K1_2	TERMINAL BLOCK	50.0A	UT-6	ROBBER CONTACT
	TERMINAL BLOCKS (UL 94V0, 80A+ & W/G)			
63PVI	HYDROGEN SYSTEM	125Vdc/1.0A (Non-Inductive Cont'd) (M2)		ABB
	NEUTRAL OR GND PRESERVATION (NON-INDUCTIVE) PRESSURE & EMPTY CYLINDER ALARMS			



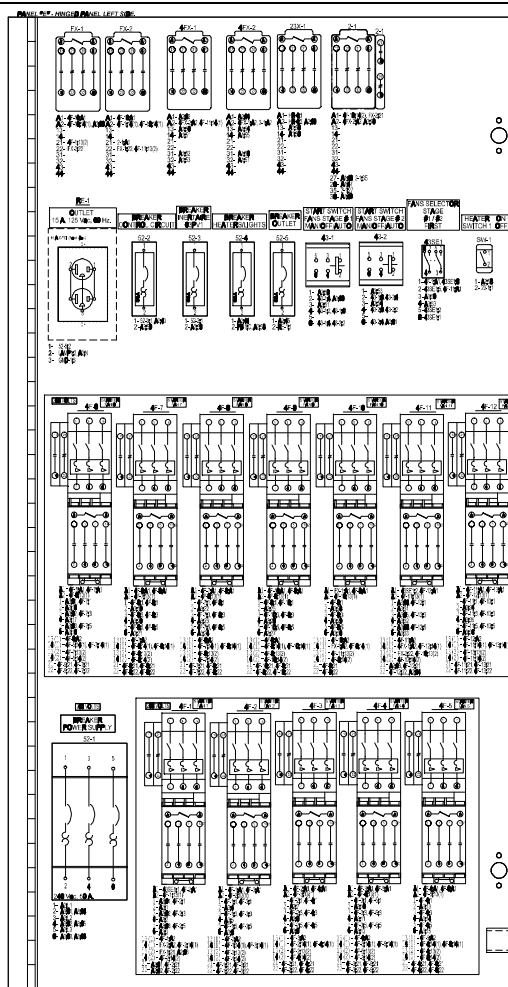
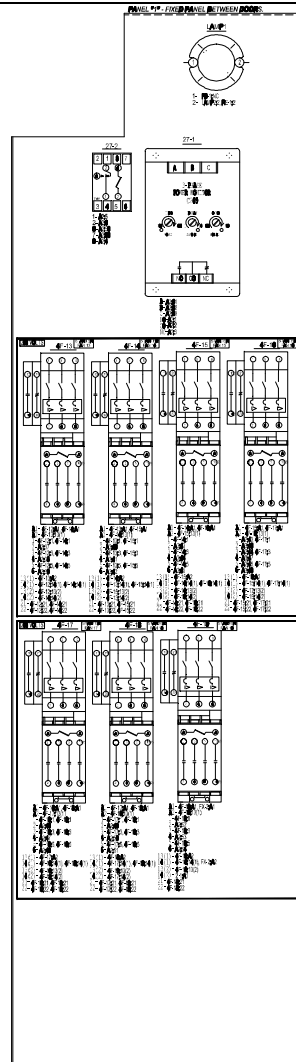
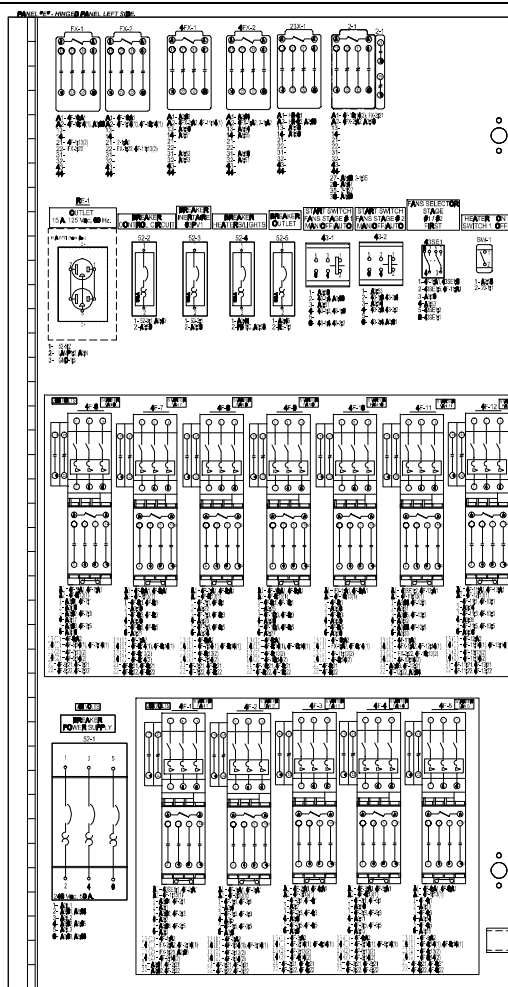
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12	○

REVISIONS

TÍTULO Y DESCRIPCIÓN	TRANS CANADA PIPELINES LIMITED			
	GRASSY CREEK PUMPING STATION (PS-3) EQUIPMENT TAG 122-GRSSY-00-T-01			
	OIL IMMERSED SUBSTATION POWER TRANSFORMER, 3PHASE, 2022.45A @ 60/28.6/33.3/37.33 MA @ 60 LV 138 KV DEL TA, LV 6.9KV GND Y 3.8KV @ 596°C RISE			
	CUBA CHANNON COUNCIL			
	CSA	PURCHASE ORDER NO. 6000017822		
TÍTULO Y DESCRIPCIÓN	SIEMENS		ACCESSORIES	
	Siemens Transformadores S.A de C.V.			
	DATE: 3/05/2012	DR.: BAACG.	DRAWING NO:	REV:
ACCT.: JNVE	CH: JEBJLG.	D-9656	0	

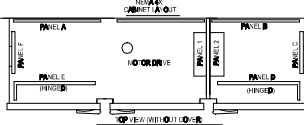
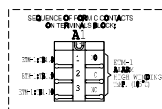
**SIEMENS** Siemens Energy Inc.  
Oil & Gas  
**TransCanada Pipeline**  
Doc Number SEI-KXL-TXF-0138-GRSSY  
Release 4  
Issued by Mainda Pitts





**NOTES**

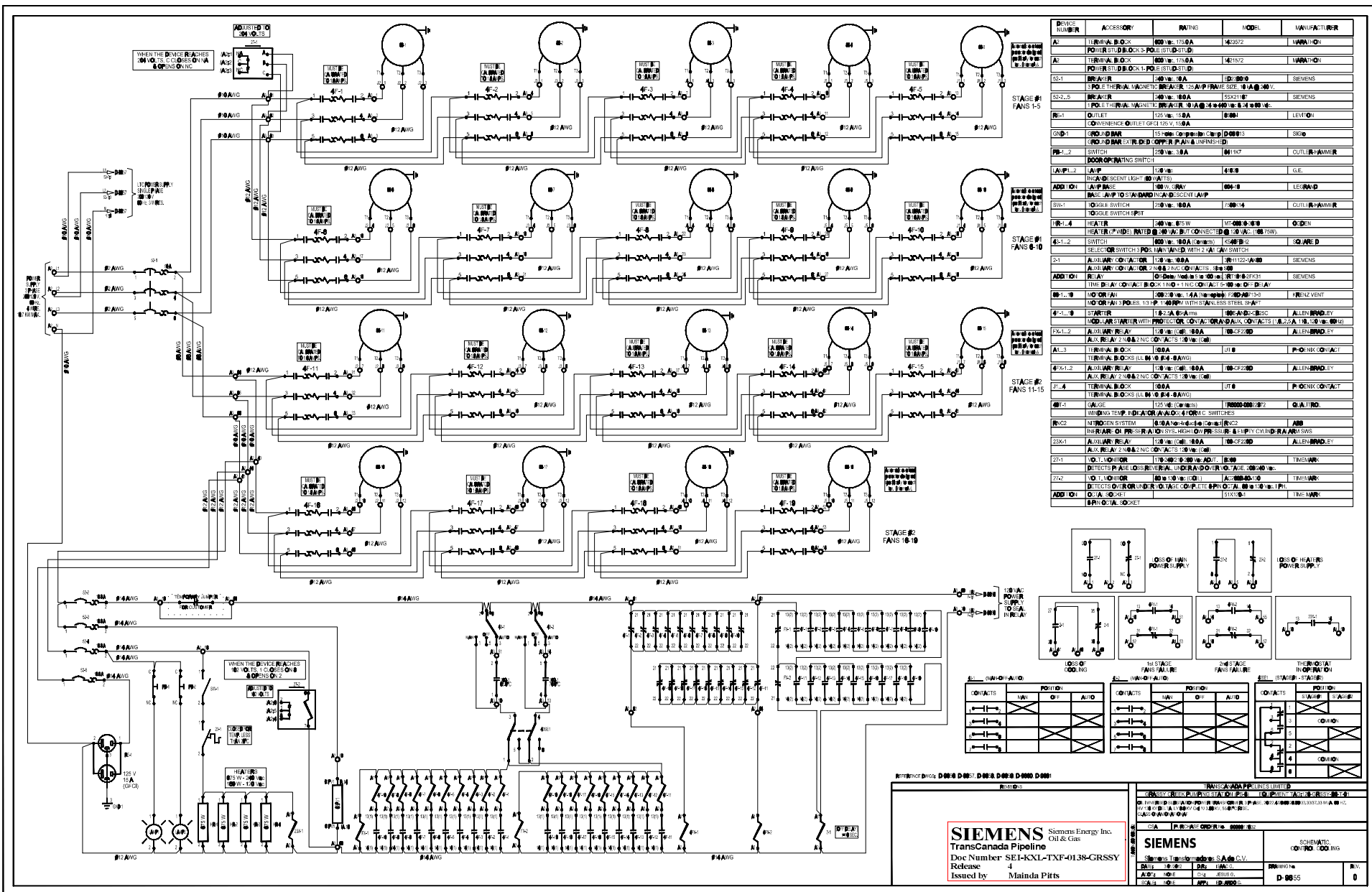
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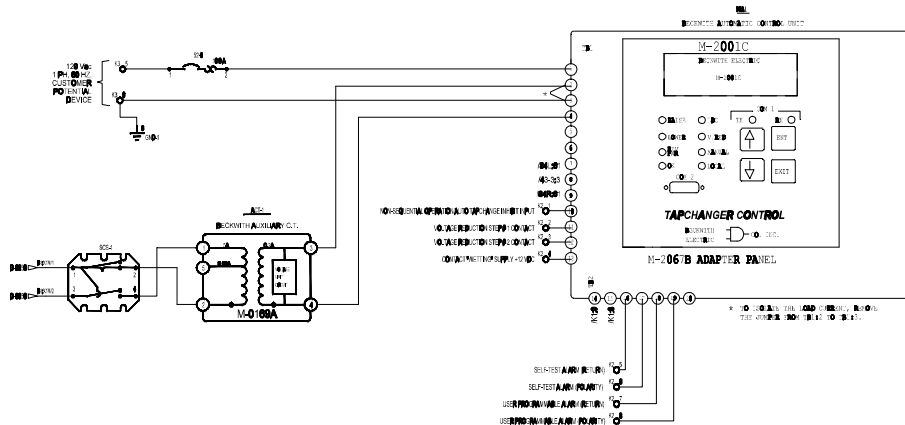


REFERENCE DINGS: D-0055, D-0056, D-0057, D-0058, D-0060, D-006

**SIEMENS** Siemens Energy Inc.  
Oil & Gas  
**TransCanada Pipeline**  
Doc Number SEI-XXL-TXF-0138-GRSSY  
Release 4  
Issued by Mainda Pitts

TRANS-AMDA PIPES LIMITED			
CASSY GREEN BUILDING SUPPLIES		EQ. 4011 / 4016 / 38355 / 3701	
0. Inlet: 10" x 10" x 10" (10" x 10" x 10") 10" x 10" x 10" (10" x 10" x 10") 10" x 10" x 10" (10" x 10" x 10") 10" x 10" x 10" (10" x 10" x 10")			
CSA		P. 10000 / 10000	
<b>SIEMENS</b>		<b>CONTROLS LAYOUT</b>	
Siemens Trans-AMDA PIPES C.V.		CONNECTIONS LEFT	
		COMPARTMENT	
DATE: 10/10/10	BY: 10/10/10	DRAWING NO:	REV:
0.000	0.000	D-000	0
0.000	APP. 10.000		



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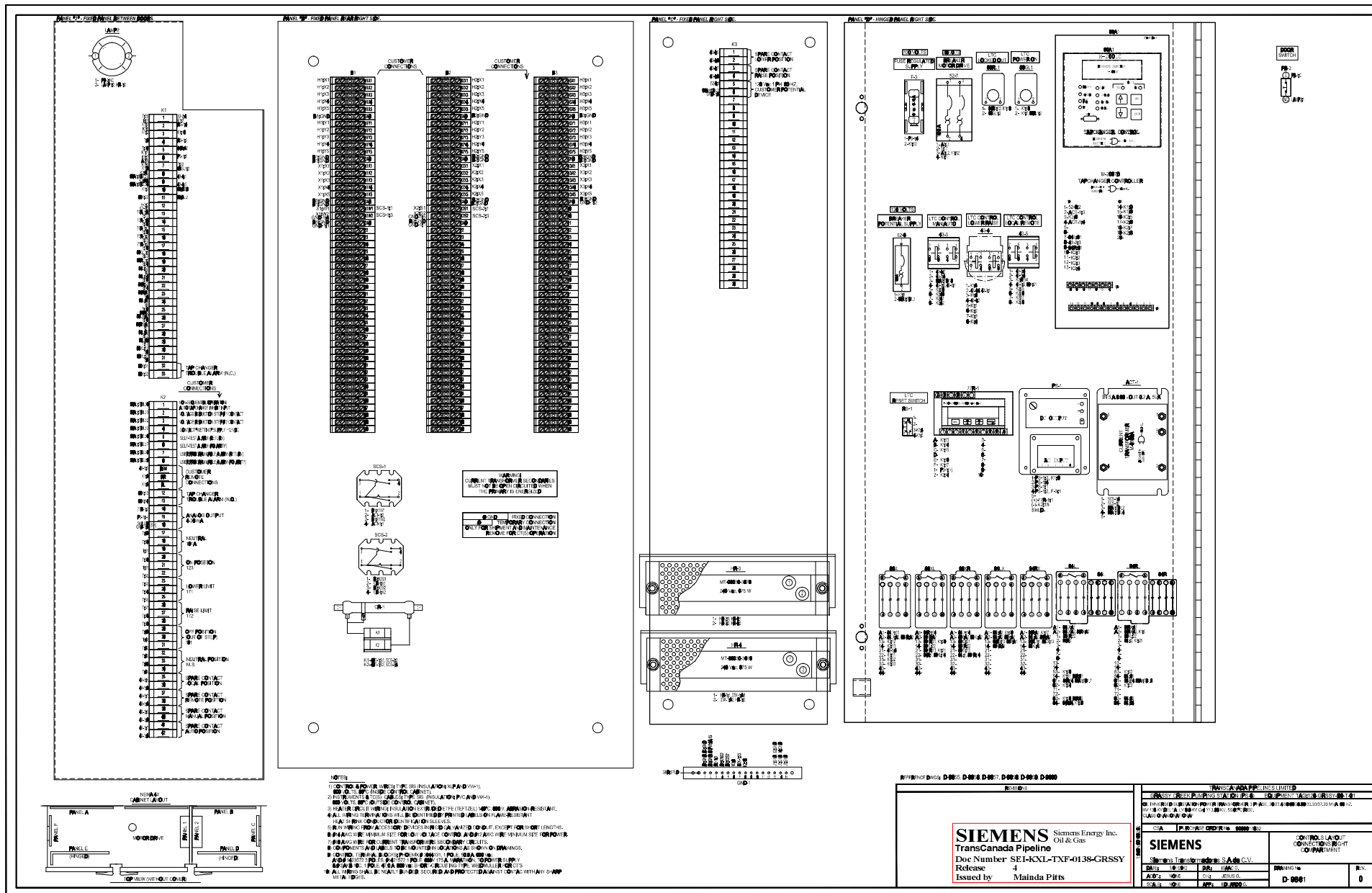
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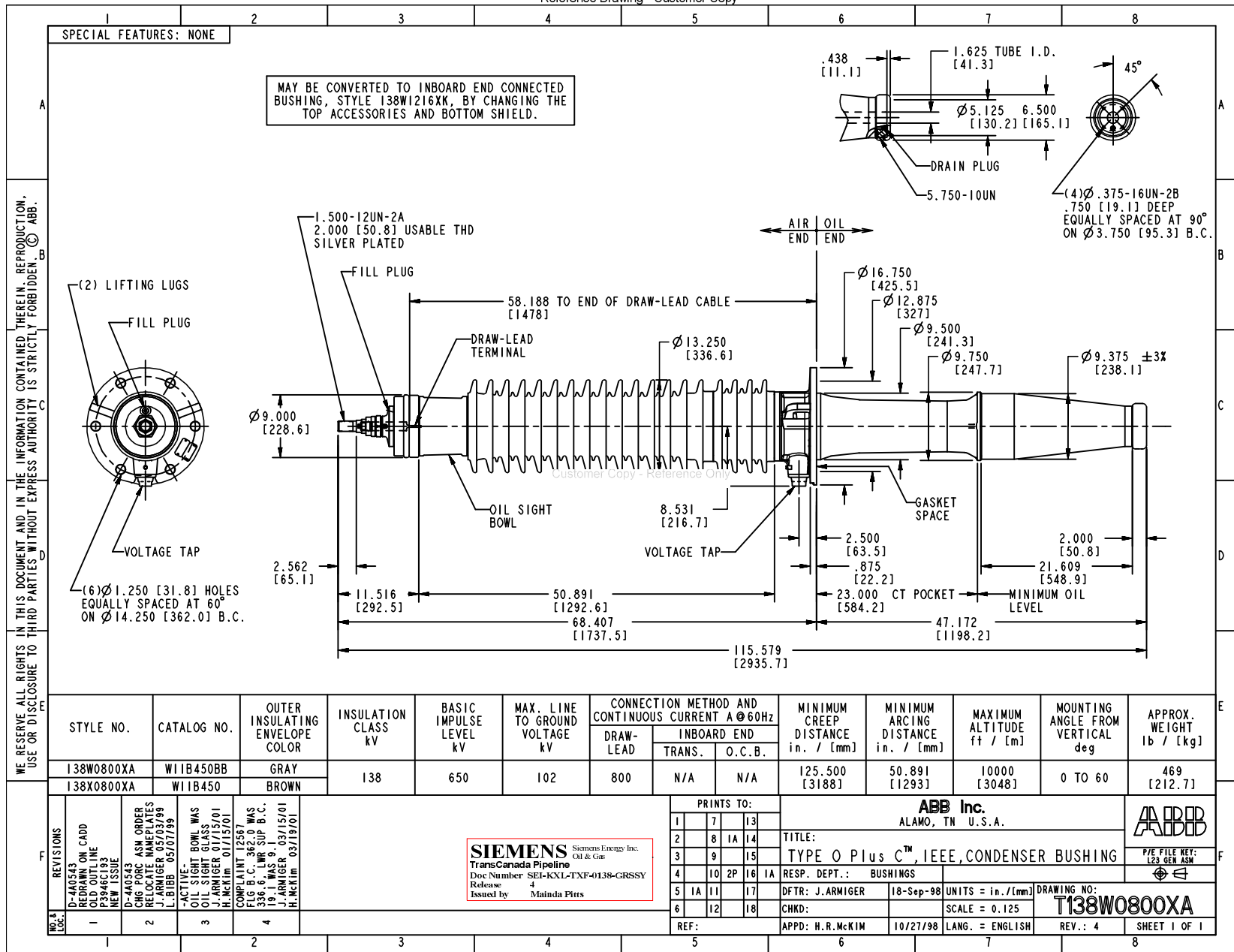
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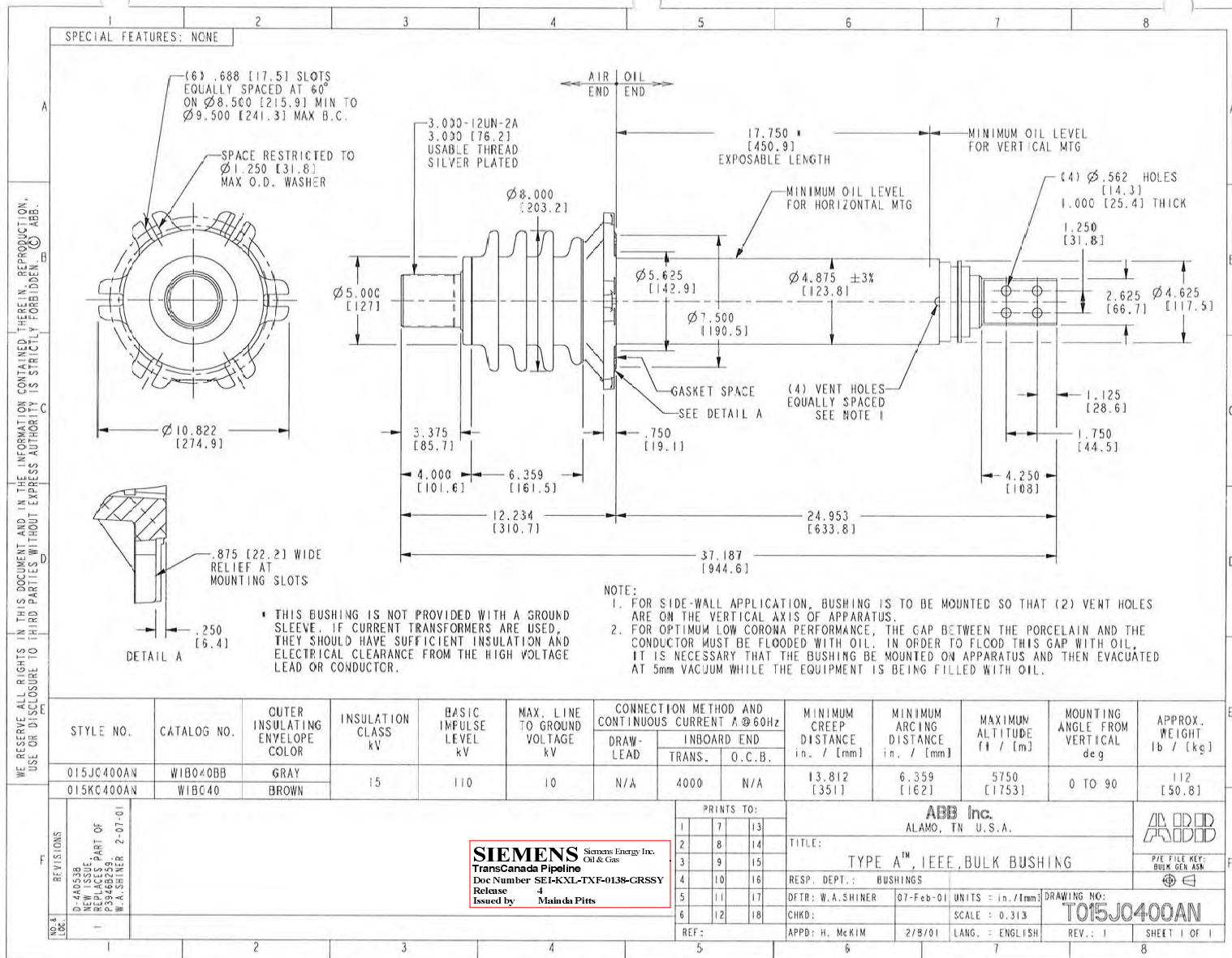
**SIEMENS** Siemens Energy Inc.  
Oil & Gas  
**TransCanada Pipeline**  
Doc Number SEI-KXL-TXF-0138-GRSSY  
Release 4  
Issued by Mainda Pitts

[illegible]



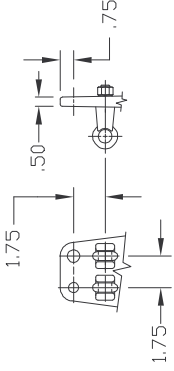






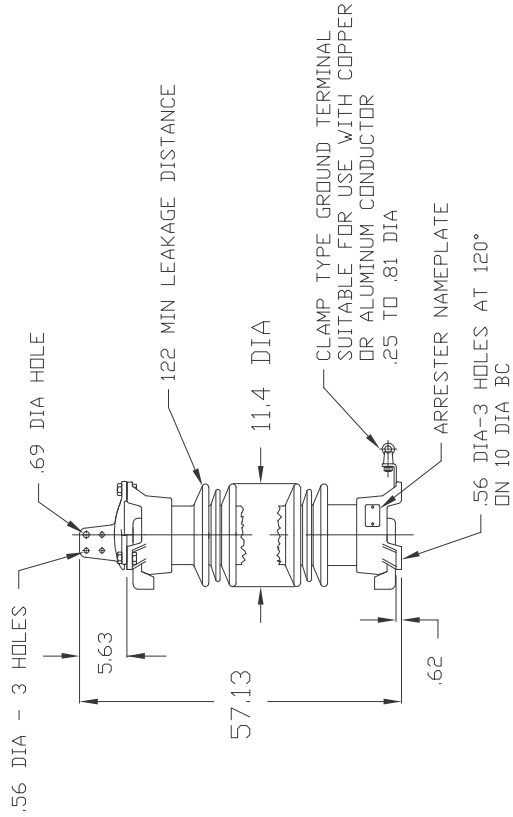
NOTES:

- 1 ARRESTER PACKAGED FOR DOMESTIC SHIPMENT
- 2 NET WEIGHT 272 LB
- 3 MAXIMUM CONTINUOUS LINE TO GROUND OPERATING VOLTAGE, 98 KV RMS
- 4 DIMENSIONS SUBJECT TO  $\pm 3\%$  TOLERANCE
- 5 DUTY CYCLE VOLTAGE RATING 120 KV RMS



CAP DETAIL

CLAMP TYPE LINE TERMINALS SUITABLE FOR USE WITH COPPER OR ALUMINUM CONDUCTOR .25 TO .81 DIA



**SIEMENS** Siemens Energy Inc.  
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TransCanada Pipeline  
Doc Number SEI-KXL-TXF-0138-GRSSY  
Release 4  
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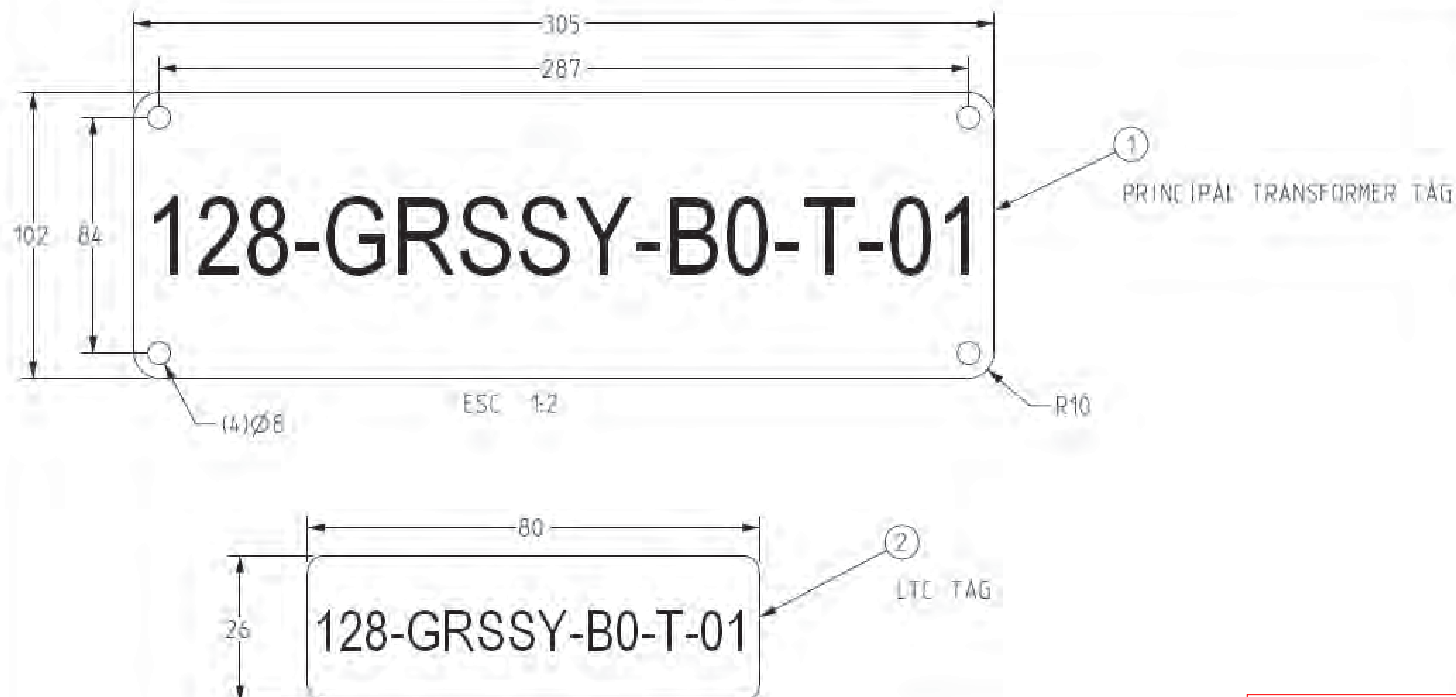
ANSI-70 GREY GLAZE  
ALTITUDE TO 12000 FT

.5 $\mu$ SEC 10kA IR kV	1 KA SURGE IR kV	MAXIMUM 8/20 DISCHARGE VOLTAGE - kV AT					
		1.5 kA	3.0 kA	5 kA	10 kA	20 kA	40 kA
306	235	242	254	265	283	307	341

STATION CLASS SURGE ARRESTER	HUBBELL® POWER SYSTEMS, INC., 8711 WADSWORTH ROAD, WADSWORTH, OHIO					
	PART NAME	VN 98 KV MCOV 217598-5001				SCALE .06=1
	DESIGN DWL	DATE 10/06/93				REV. NO.
	DRAWN JVR	DATE 04/17/01				S006352-00 03

Approved 04-20-2001

E	"ING, PER, MEC, ACC, ELE" Parte/Ensamble referencia para Ingeniería solamente.			Parte	
Cons	Part/Ens No	Material No	Parte/Material Description	Ctd	
1	TBD	NA	STAINLESS STEEL (0.031") 0.787mm THK	1	
2	TBD	NA	STAINLESS STEEL (0.031") 0.787mm THK	1	



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<b>SIEMENS</b>						Siemens Transformadores S.A. de C.V.	
TITULO DEL DIBUJO: TAG NUMBER							
	PESO (kg): 0.0	FECHA: 30-Mar-11	DIBUJO:	REVISO:	APROBO:		
	DIBUJO ESCALA: 1:1		B-11823		TP. NUMERO: 1092.02	HOJA: 1/1	

-----A MENOS QUE OTRA COSA SEA ESPECIFICADA  
TODAS LAS DIMENSIONES ESTAN EN MILIMETROS

ESTE DIBUJO CONTIENE INFORMACIÓN PROPIEDAD DE Siemens Transformadores S.A. de C.V.  
QUEDA PROHIBIDO LA REPRODUCCIÓN TOTAL O PARCIAL, SIN AUTORIZACIÓN

REV:0    ## ## ##. NOMBRE