

CERTIFIED AS BUILT

COPY OF EI JOB:-11-3014A/B
 DWN SP CKD KW

NOZZLE SCHEDULE					
MARK	SIZE	RATING	TYPE	SCH.	SERVICE
T1	4"	CL.300	RFLWN	-	CHANNEL INLET
T2	4"	CL.300	RFLWN	-	CHANNEL OUTLET
S1	4"	CL.300	RFLWN	-	SHELL INLET
S2	4"	CL.300	RFLWN	-	SHELL OUTLET

This drawing is the property of Exchanger Industries and shall not be used in any way detrimental to Exchanger Industries nor shall be copied, lent or used for any purpose other than that intended.

REVISION CONTROL BOX \odot Denotes DCR & Rev.# Added to This Sheet Only

1 PER CUST. MARK-UPS & E.I. MAY 16/2013 (FZ)

2 PER E.I. JULY 17/2013 (AG) \odot DCR-IFP-016523

3 PER E.I. AUG 2/2013 (AG) \odot DCR-NI-016545

4 PER E.I. Oct. 30/2013 (JL) DCR-A-016717 \odot

5 PER EIL JAN 09/2014 (JL) DCR-B-016845 \odot

CUSTOMER: CANADIAN NATURAL RESOURCES LTD.

FOR: KIRBY NORTH PHASE 1 PROJECT/CONKLIN, AB

P.O. NO.: CE416040-CC088996-00

TEMA TYPE: BEU

SIZE: 381-6096(15"-240")

SERVICE: SALES OIL TANK HEATER

SHELL & TUBE EXCHANGER OUTLINE DRAWING

NO. OF EXCHANGERS REQ'D: TWO

DWN FX CKD KW ITEM 104-E-135/136

EXCHANGER INDUSTRIES LIMITED
 CALGARY, ALBERTA

DWG NO. 13-3353A/B

SHEET 1 OF 13

MATERIAL LIST

LINE	PART	MATERIAL
CHANNEL		
1	COVER/HEAD	SA-516-70N
2	TEMA FLANGE	SA-105N
3	CYLINDER	SA-516-70N
4	NOZZLE FLANGE	SA-105N
5	NOZZLE NECK	--
6	NOZZLE REINFORCEMENT PAD	--
7	COUPLING/THREDOLET/PLUG	--
8	PASS PLATE	SA-516-70N/SA-106-B
9	STUDBOLTS	SA-193-B7
10	NUTS	SA-194-2H
11		
12		
SHELL		
13	TEMA FLANGE	SA-105N
14	CYLINDER	SA-516-70N
15	COVER/HEAD	SA-516-70N
16	CONE	--
17	NOZZLE FLANGE	SA-105N
18	NOZZLE NECK	--
19	NOZZLE REINFORCEMENT PAD	--
20	COUPLING/THREDOLET/PLUG	--
21	SUPPORT WRAPPER PLATE	SA-516-70N&i.T.
22	SUPPORT	SA-516-70N&i.T.
23	STUDBOLTS	SA-193-B7
24	NUTS	SA-194-2H
25		
26		
27		
FLOATING HEAD		
28	BACKING RING	--
29	COVER FLANGE	--
30	DISH	--
31	PASS PLATE	--
32	STUDBOLTS	--
33	NUTS	--
34		
35		
36		

LINE	PART	MATERIAL
TUBE BUNDLE		
37	TUBESHEET	SA-516-70N
38	TUBES	SA-179 ANNEALED
39	BAFFLE/SUPPORT PLATES	SA-36 OR EQ.
40	IMPINGEMENT PLATE	SA-36 OR EQ.
41	TIE-ROD/NUT/SPACER	CARBON STEEL
42		
43		
GASKETS		
44	CHANNEL	KAMMPROFILE*
45	SHELL	KAMMPROFILE*
46	FLOATING HEAD	--
47	CHANNEL NOZZLE	--
48	SHELL NOZZLE	--
49		
50		

MATERIAL NOTES

*316 S.S. CORE, FLEX, GRAPHITE

(1) E.I. TO SUPPLY ONE SET OF SPARE TEMA FLANGE GASKETS AND 10% (MIN 2 SETS) OF SPARE TEMA FLANGE BOLTING

(2) FLG FACES TO HAVE A SURFACE FINISH 125-150 Ra.

(3) MDMT FOR LIFTING LUGS & SUPPORTS TO BE -45°C(-49°F).

CONSTRUCTION NOTES

(12) PAINT:
 (a) SANDBLAST TO SSPC-SP6
 (b) PRIME WITH ONE COAT OF INTERNATIONAL INTERTHERM 228 4-5 MILS DFT
 (c) PROTRUSIONS ONLY - FINISH WITH (1) ONE COAT OF INTERNATIONAL INTERFINE 629-HS 2-3 MILS DFT (GRAY 80326)

(13) 5USG INHIBITED PROPYLENE GLYCOL FOR TUBESIDE & SHELLSIDE.

REVISIONS

△ PER CUST. MARK-UPS & E.I. MAY 16/2013 (FZ)

△ PER E.I. JULY 17/2013 (AG)

△ PER E.I. AUG 2/2013 (AG)

△ PER E.I. Oct. 30/2013 (JL)

△ PER E.I. JAN 08/2014 (JL)


MATERIALS & DESIGN CONDITIONS

NO. OF EXCHANGERS REQ'D: TWO

PO #: CE416040-CC088996-00

△ CANADIAN NATURAL RESOURCES LTD KIRBY NORTH PHASE 1 PROJECT/CONKLIN, AB

DWN FX | CKD KW | ITEM 104-E-135/136


EXCHANGER INDUSTRIES LIMITED
 CALGARY, ALBERTA

DWG NO. 13-3353A/B

SHEET 1A OF 13

CONSTRUCTION NOTES

- (1) CONSTRUCTION TO BE PER ASME CODE SECTION VIII DIVISION 1 2010 EDITION, 2011a ADDENDA, TEMA CLASS "R" 9th EDITION, API 660 AND CUSTOMER SPECIFICATIONS.
 - (2) ALL BOLT HOLES TO STRADDLE CENTER LINES UNLESS NOTED OTHERWISE.
 - (3) CODE STAMP REQ'D: YES (PROVINCE OF ALBERTA).
 - (4) IMPACT TESTING: EXEMPT PER UG-20 (f) 1-5
 - (5) STRESS RELIEVE: (CHARTED) U-BENDS & 152mm(6") OF STRAIGHT LENGTH @ 635°C ±15°C FOR 1 HOUR (ELECTRIC RESISTANCE METHOD). (1175°F ±27°F)
 - (6) RADIOGRAPHY: RT1 SHELL & CHANNEL. △△△△
 - (7) WELD PROCEDURES: WPS 210, WPS-SAW 4/210, C2 & C17(REPAIRS IF REQUIRED)
 - (8) INSULATION: 64mm(2.5") THK. MINERAL WOOL C/W ALUMINUM ON SHELL & △ 51mm(2") THK. ON CHANNEL. INSULATION BLANKETS ON TEMA FLGS (BY E.I.)
 - (9) 100% MT LIFT LUG WELDS.
 - (10) SUPPLIED BUNDLES ARE INTERCHANGEABLE.
 - (11) TOLERANCE PER "STANDARD FABRICATION TOLERANCE" REV.0 (LOCATED IN WELDING PROCEDURE LOG BOOK)
- * REGISTER AT MAWP # CHARTED

DESIGN CONDITIONS	SHELL SIDE	CHANNEL SIDE
PROCESS DESIGN PRESSURE*	3500 kPaG(507 PSIG)	3500 kPaG(507 PSIG)
EXTERNAL PRESSURE	FV @ 148°C(299°F)	FV @ 148°C(299°F)
DESIGN TEMPERATURE.	150°C(302°F)	150°C(302°F)
MDMT	-29°C(-20°F)	-29°C(-20°F)
C&H MAWP	3585 kPaG(520 PSIG)	3585 kPaG(520 PSIG)
C&H MAWP LIMITED BY	TEMA FLANGE	TEMA FLANGE
FIELD HYDRO TEST PRESSURE	4661 kPaG(676 PSIG)	4661 kPaG(676 PSIG)
CORROSION ALLOWANCE	3.2 mm(0.126")	3.2 mm(0.126")
N&C MAX. PRESS.	4729 kPaG(686 PSIG)	4302 kPaG(624 PSIG)
N&C M.P. LIMITED BY	TEMA FLANGE	TEMA FLG BOLTING
SHOP HYDRO TEST PRESS.#	6151 kPaG(892 PSIG)	5599 kPaG(812 PSIG)
NUMBER OF PASSES	E-SHELL	FOUR
SURFACE AREA	36.6 SQ. M(393.9 SQ.Ft)	(EACH)
SHIPPING WEIGHT	2500 kgs(5511 Lbs)	(EACH)
WEIGHT FULL OF WATER	3250 kgs(7165 Lbs)	(EACH)
BUNDLE WEIGHT	820 kgs(1808 Lbs)	(EACH)
CHANNEL WEIGHT	210 kgs(463 Lbs)	(EACH)
CAPACITY	0.75 CU. M(26.49 CU.Ft)	(EACH)

1. NOTE: Any material welding to a pressure component must have a MTR and traceability or be qualified under Section VIII, Div. 1 ASME code for welding to a pressure part.

2. For removable-bundle heat exchangers, the permissible out-of-roundness of a completed shell, after all welding and heat treatment, shall allow a metal template to pass through the entire shell length without binding. The template shall consist of two rigid disks (each with a diameter equal to the diameter of the transverse baffle or support plate), rigidly mounted perpendicularly on a shaft and spaced not less than 300 mm (12") apart.

3. Welds attaching non-pressure attachments (such as lugs or structural steel supports, except for insulation support rings) shall be continuous.

4. All exposed flange gasket surfaces shall be coated with an easily removable rust preventative and shall be protected by a wood, plastic, or steel cover complete with rubber gasket and (4) four bolts minimum.

5. All welded attachments provided with tell tale holes shall be pneumatically tested with 350 kPag (50.76 PSIG) air prior to PWHT and/or hydrotest.

6. The item number, shipping weight, center of gravity and purchase order number shall be painted on the exchanger.

7. All boxes, crates, or packages shall be identified with the purchaser's order and equipment number.

8. RT - Radiography Examination & acceptance criteria in accordance with ASME Section VIII, Div.1, UW-51, ASME Section V Article 2 T220, standards as defined in ASME Section V Article 22.

9. a). The interior of all exchangers shall be free of oil, grease, weld slag, scale, dirt, grit, weld splatter, rust, rags, wood, and other foreign matter.

b) Exchangers containing or coated with insulating fluids, corrosion inhibitors, antifreeze solutions, desiccants, or other chemicals shall be prominently tagged or labeled at openings or other appropriate locations to indicate the nature of the contents and precautions for shipping, storage, and handling.

c) Material Safety Data Sheets (MSDS) for these chemicals shall comply with all relevant regulations where the equipment will be located. If any chemical is exempt from such laws, a statement to that effect shall be included on the MSDS.

d) Material Safety Data Sheets (MSDS) for the exchanger shall be provided to the shipper at the time of shipping.

10. MPI - Magnetic particle examination and criteria for acceptance shall comply with ASME Section V Article 7 (T720), Appendix 6 of Sec.VIII Div.1 and standards as defined in ASME Section V Article 25.

11. LPI - Liquid penetrant examination and criteria for acceptance shall comply with appendix 8 of section VIII, Div 1, ASME code.

12. UT- Ultrasonic examination in accordance with ASME Section V Art. 4 T420 (for welds) and ASME section V Art.5 T520 (for materials), and standards as defined in ASME Section V Art.23.

13. Weld Hardness Testing:

a) The weld metal and heat-affected zone of pressure retaining welds in components made from a material that has a P number of 1 shall be tested.

b) Examination shall be made after any postweld heat treatment.

c) Hardness shall not exceed 237 Brinell for materials with P numbers of 1 (for sweet service).

d) Hardness shall be determined using a 10 millimeter diameter ball unless otherwise specified.

e) One longitudinal weld, one circumferential weld, and each connection-to-component weld where the connection is NPS 2 or larger shall be tested.

f) If more than one welding procedure is used to fabricate longitudinal or circumferential welds, hardness readings shall be made of welds deposited by each procedure.

14. The hydrotest pressure shall be maintained for at least 1 hour, using potable water & charted.

15. Gasket used for hydrotest shall be of the same material and design as the gasket to be furnished with the exchanger.

16. Flanged joints that have been taken apart after hydrostatic test shall be reassembled with unused gaskets and re-hydrotest.

17. Paint or other external coatings shall not be applied over welds before the final hydrostatic test.

18. The following parts shall be stamped with the manufacturer's serial number: channel & shell girth flanges, tubsheet.

19. No welding after hydrotest.

20. Permanent backing rings shall not be used.

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AS BUILT**

REVISIONS
1 PER CUST. MARK-UPS MAY 16/2013 (FZ)

API 660 8th EDITION
NOTES & CUST. SPEC'S

PO #: CE416040-CC088996-00

1 CANADIAN NATURAL RESOURCES LTD KIRBY NORTH PHASE 1 PROJECT/CONKLIN, AB

DWN FX CKD KW ITEM 104-E-135/136


EXCHANGER INDUSTRIES
LIMITED
CALGARY, ALBERTA

DWG NO. 13-3353A/B

SHEET 1B OF 13

0.8(0.03125") THK X 152(6") X 159(6.25")
 MAT'L: STAINLESS STEEL



CERTIFIED BY
EXCHANGER INDUSTRIES LIMITED
 CALGARY, ALBERTA, CANADA

U	MAWP: SHELL	3585 kPaG	AT	150 °C
W	MAWP: SHELL	103 kPaG	AT	148 °C
RT1	MAWP: TUBE	3585 kPaG	AT	150 °C
PHT-T	MAWP: TUBE	103 kPaG	AT	148 °C
-	MDMT: SHELL	-29 °C	AT	3585 kPaG
-	MDMT: TUBE	-29 °C	AT	3585 kPaG

SERIAL NO. **13-3353*** YEAR MFD. **2014**

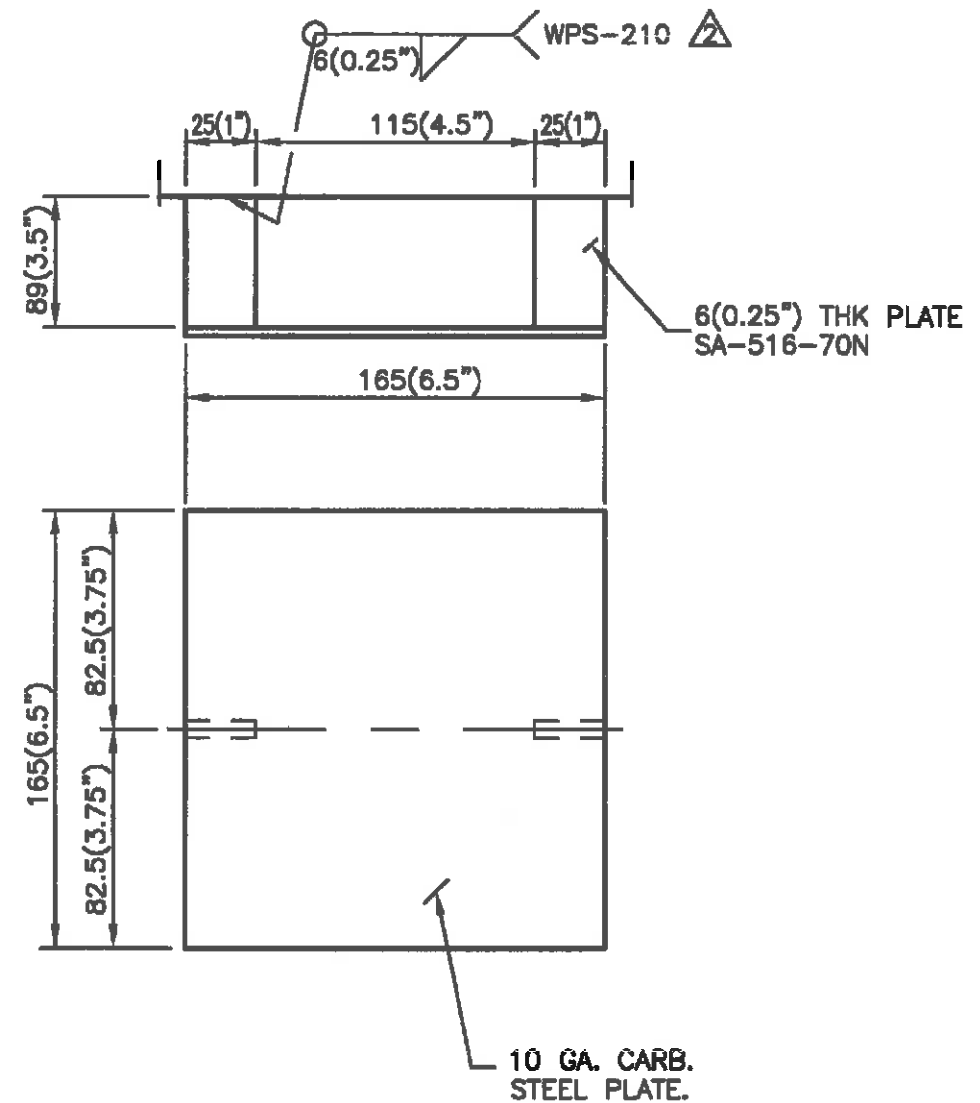
SALES OIL TANK HEATER
 PO NO.: CE416040-CC088996-00 ITEM #: 104-E-** CNRL KNP-1
 SIZE: 381-6096 TYPE: BEU TEMA CLASS: "R"
 TEST PRESS: SHELL: 4661 kPaG TUBE SIDE: 4661 kPaG
 SHELL MAT'L SA-516-70N THK 14 MIN. C.A. 3.2
 CHAN. MAT'L SA-516-70N THK 14 MIN. C.A. 3.2
 TUBE MAT'L: SA-179 ANNEALED 14 BWG M/W

PROV. REG. CRN

NO. REQ'D EACH EXCHANGER: ONE

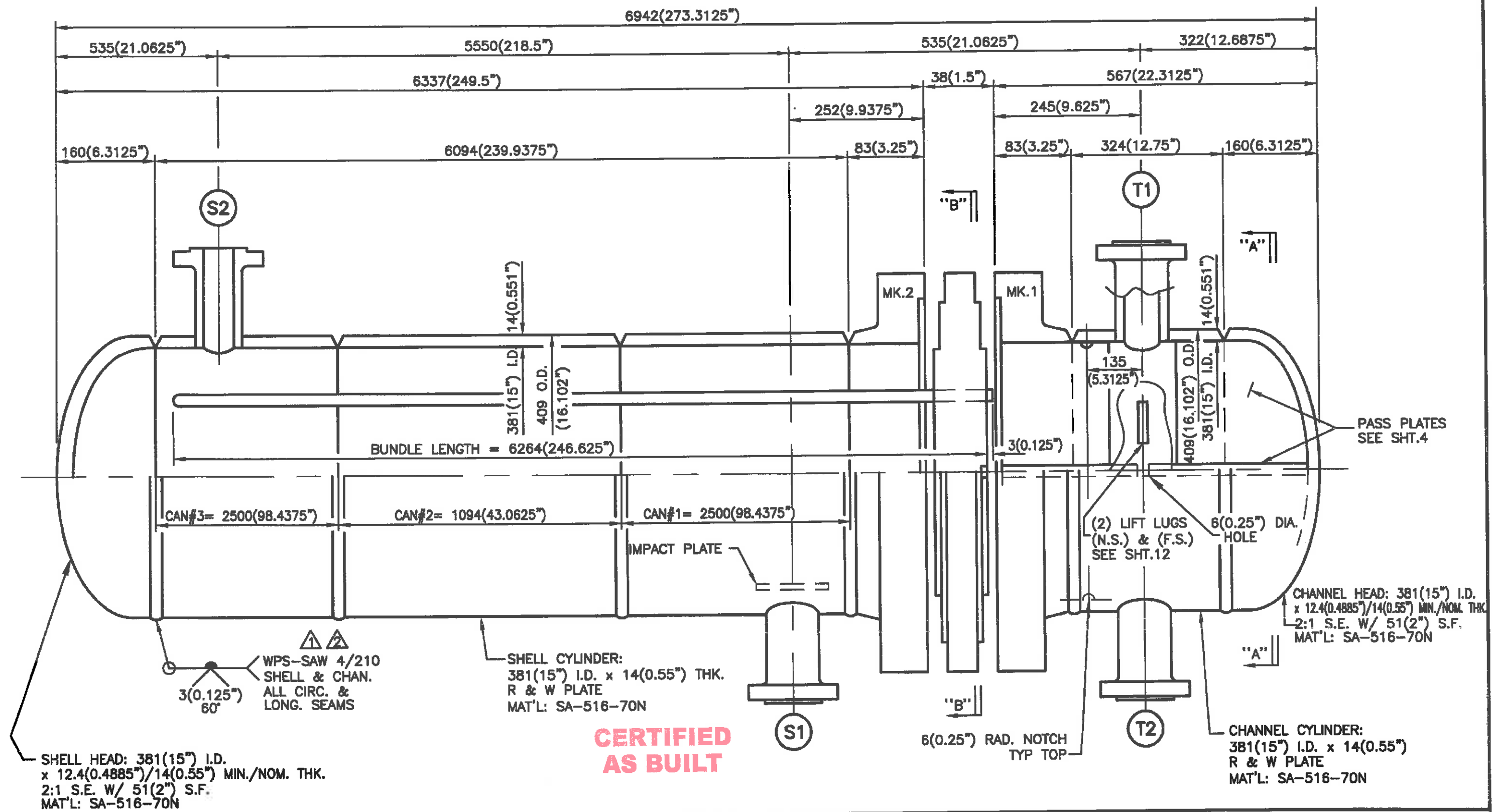
*	**
A	135
B	136

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 AS BUILT**



NAMEPLATE BKT DETAIL

REVISIONS PER CUST. MARK-UPS & E.I. MAY 16/2013 (FZ) PER E.I. JULY 17/2013 (AG)	NAME PLATE DETAIL NO. REQ'D EACH EXCHANGER: ONE NO. OF EXCHANGERS REQ'D: TWO	 EXCHANGER INDUSTRIES LIMITED CALGARY, ALBERTA
	PO #: CE416040-CC088996-00 CANADIAN NATURAL RESOURCES LTD KIRBY NORTH PHASE 1 PROJECT/CONKLIN, AB	
	DWN FX CKD KW ITEM 104-E-135/136	SHEET 2 OF 13



SHELL HEAD: 381(15") I.D.
 x 12.4(0.4885")/14(0.55") MIN./NOM. THK.
 2:1 S.E. W/ 51(2") S.F.
 MAT'L: SA-516-70N

WPS-SAW 4/210
 SHELL & CHAN.
 ALL CIRC. &
 LONG. SEAMS

SHELL CYLINDER:
 381(15") I.D. x 14(0.55") THK.
 R & W PLATE
 MAT'L: SA-516-70N

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 AS BUILT**

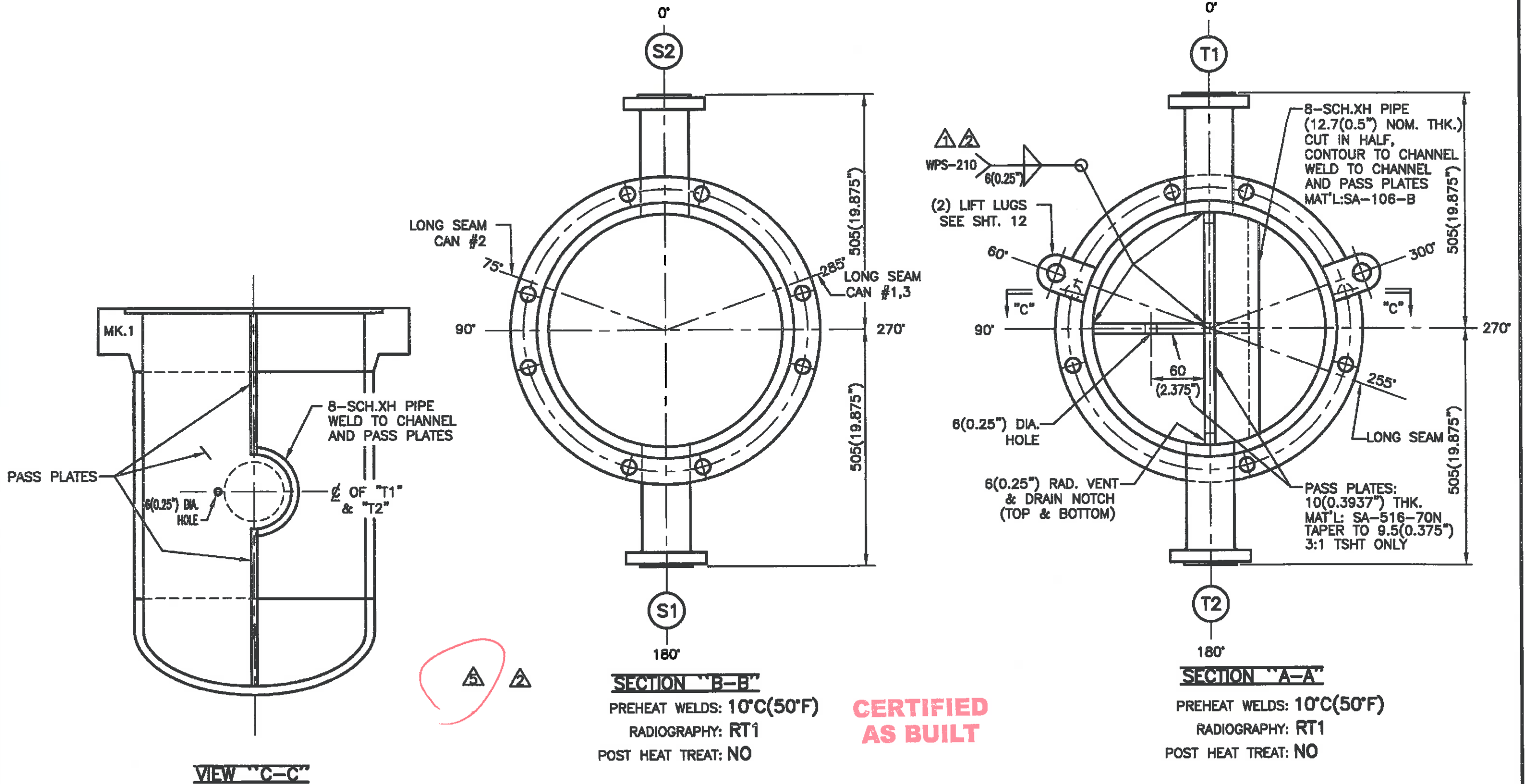
CHANNEL HEAD: 381(15") I.D.
 x 12.4(0.4885")/14(0.55") MIN./NOM. THK.
 2:1 S.E. W/ 51(2") S.F.
 MAT'L: SA-516-70N

CHANNEL CYLINDER:
 381(15") I.D. x 14(0.55")
 R & W PLATE
 MAT'L: SA-516-70N

REVISIONS	
⚠	PER CUST. MARK-UPS MAY 16/2013 (FZ)
⚠	PER E.I. JULY 17/2013 (AG)

SHELL & CHANNEL DETAIL	
NO. OF EXCHANGERS REQ'D: TWO	
PO #: CE416040-CC088996-00	
CANADIAN NATURAL RESOURCES LTD KIRBY NORTH PHASE 1 PROJECT/CONKLIN, AB	
DWN FX	CKD KW ITEM104-E-135/136

EXCHANGER INDUSTRIES LIMITED	
CALGARY, ALBERTA	
DWG NO. 13-3353A/B	
SHEET 3 OF 13	




REVISIONS

⚠	PER CUST. MARK-UPS MAY 16/2013 (FZ)
⚠	PER E.I. JULY 17/2013 (AG)
⚠	PER EIL JAN 08/2014 (JL)

SHELL & CHANNEL SECTIONS

NO. OF EXCHANGERS REQ'D: TWO

PO #: CE416040-CC088996-00



EXCHANGER INDUSTRIES LIMITED

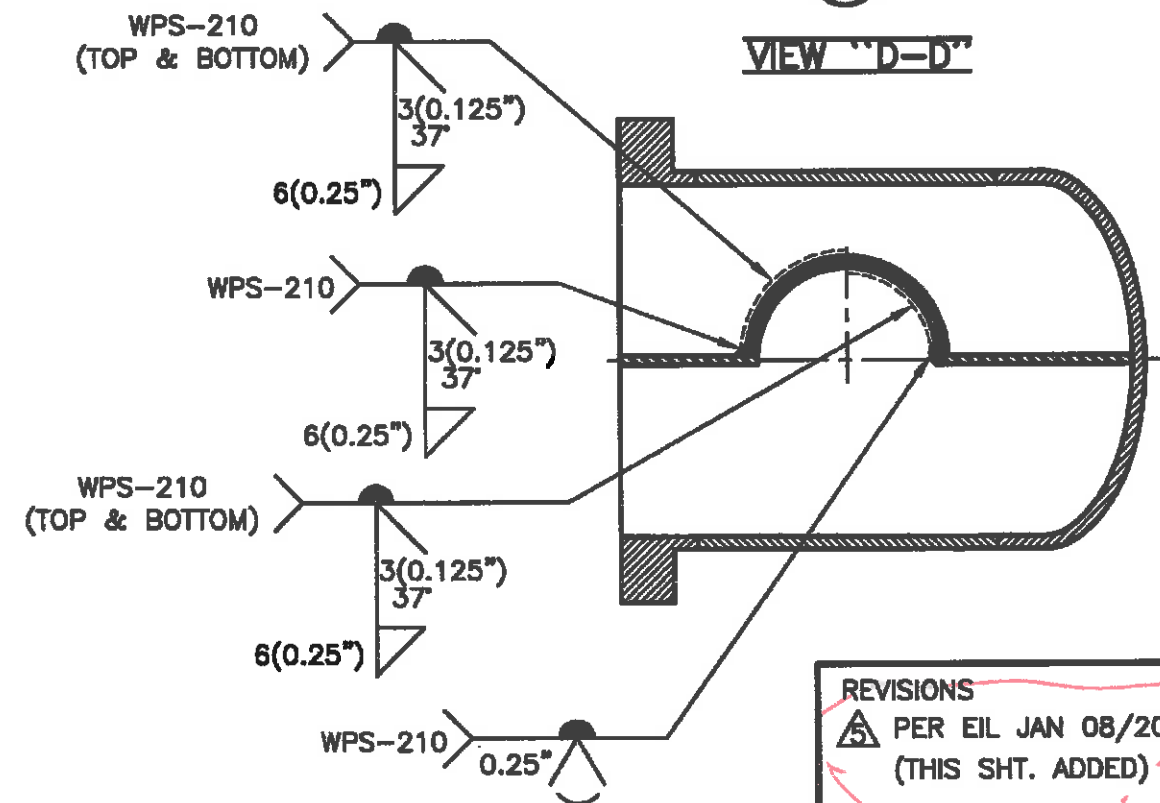
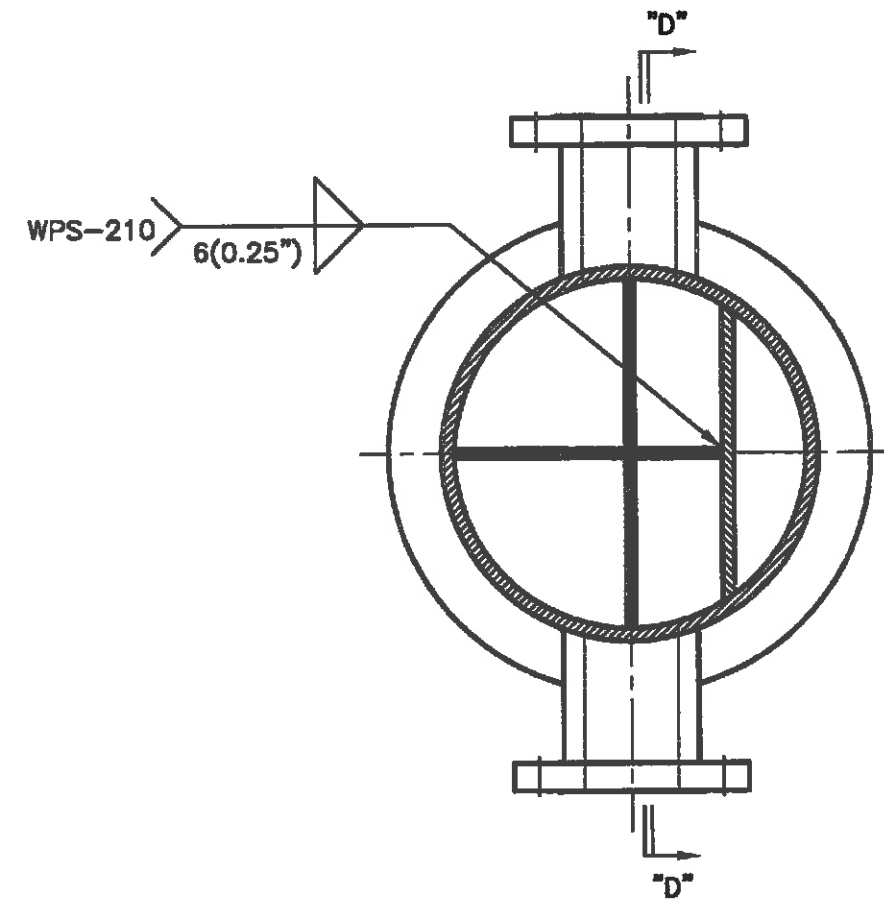
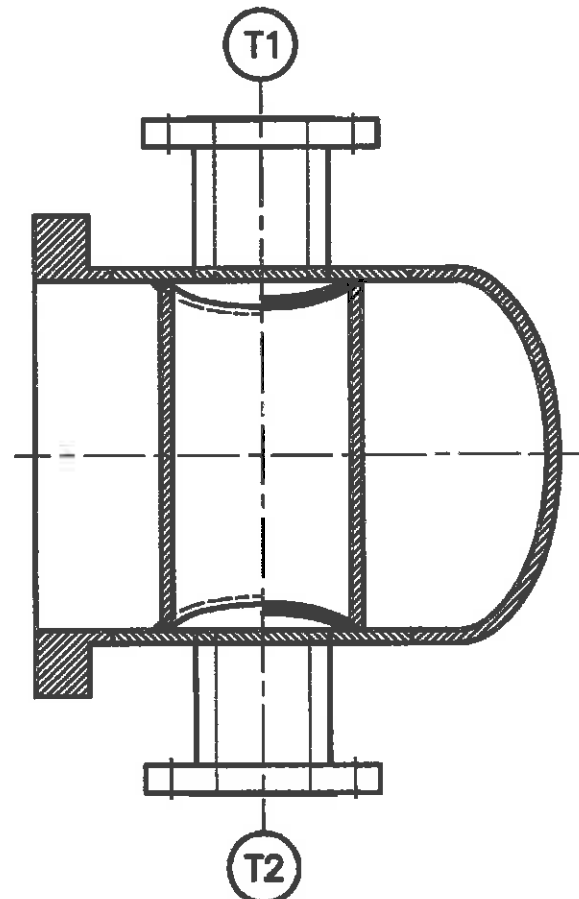
CALGARY, ALBERTA

⚠ CANADIAN NATURAL RESOURCES LTD KIRBY NORTH PHASE 1 PROJECT/CONKLIN, AB

DWN FX | CKD KW | ITEM 104-E-135/136

DWG NO. 13-3353A/B

SHEET 4 OF 13

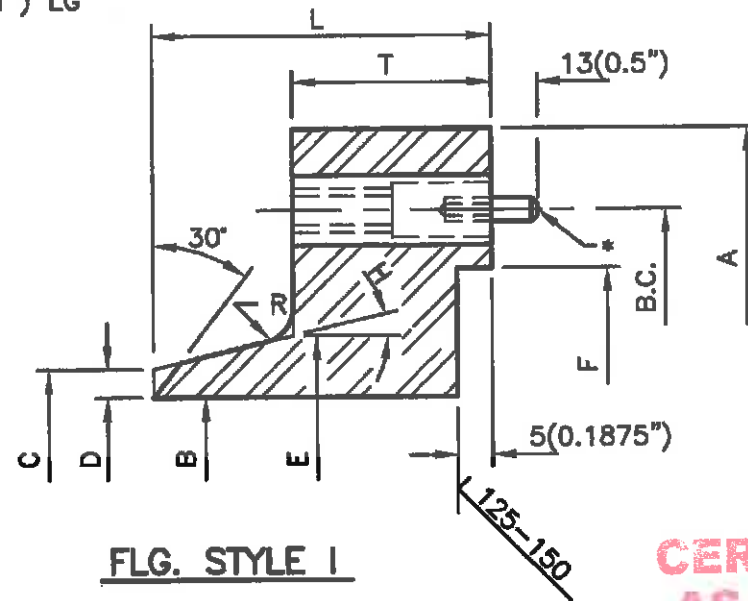


VIEW "D-D"

**CERTIFIED
AS BUILT**

REVISIONS 5 PER EIL JAN 08/2014 (JL) (THIS SHT. ADDED) <i>JL</i>	HALF PIPE WELDING DETAILS		 EXCHANGER INDUSTRIES LIMITED CALGARY, ALBERTA
	NO. OF EXCHANGERS REQ'D: TWO		
	PO #: CE416040-CC088996-00		DWG NO. 13-3353A/B
	DWN JL	CKD <i>JL</i>	ITEM 104-E-135/136

* (1) 10(0.3937") DIA. X 25(1") LG
 CARB. STL DOWEL PIN.
 DRILL & TAP 13(0.5") DEEP
 ON B.C. @ 0° IN MK.1 & 2.



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MATERIAL: SA-105N

250 OVERALL FINISH EXCEPT AS NOTED.

LOCATE (2) 12.7(0.5") DIA. JACKSCREWS ON 495(19.5") DIA. @ 90° & 270°. DRILL & TAP(BACK FLG. SIDE)
 19.05(0.75") DEEP & COUNTERBORE REMAINDER TO 15.9(0.625") DIA. ON MK.1 & 2

LINE NO.	MK. NO.	NO. REQ'D	FLG. STYLE	A	B	C	D	E	F	G	H	R	T	L	B.C.	BOLT HOLES	
																NO.	DIA.
1	1	ONE	I	524 (20.625")	381 (15")	409 (16.102")	14 (0.551")	416 (16.352")	448 (17.625")	-	7.12"	11.1 (0.4375")	57 (2.25")	83 (3.25")	483 (19")	32	22.2 (0.875")
2	2	ONE	I	↓	↓	↓	↓	↓	↓	-	↓	↓	↓	↓	↓	↓	↓

REVISIONS

△ PER CUST. MARK-UPS MAY 16/2013 (FZ)

FLANGE DETAIL

MK.1 381(15") - 4661 kPaG(678 PSIG)
 MK.2 381(15") - 4661 kPaG(678 PSIG)
 DESIGN TEMA "R"
 NO. OF EXCHANGERS REQ'D:TWO

PO #: CE416040-CC088996-00

△ CANADIAN NATURAL RESOURCES LTD KIRBY NORTH PHASE 1 PROJECT/CONKLIN, AB

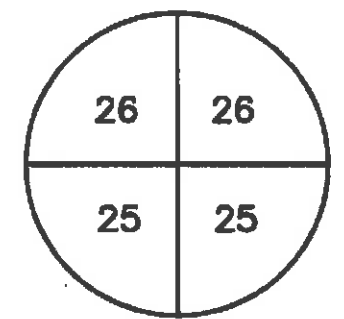
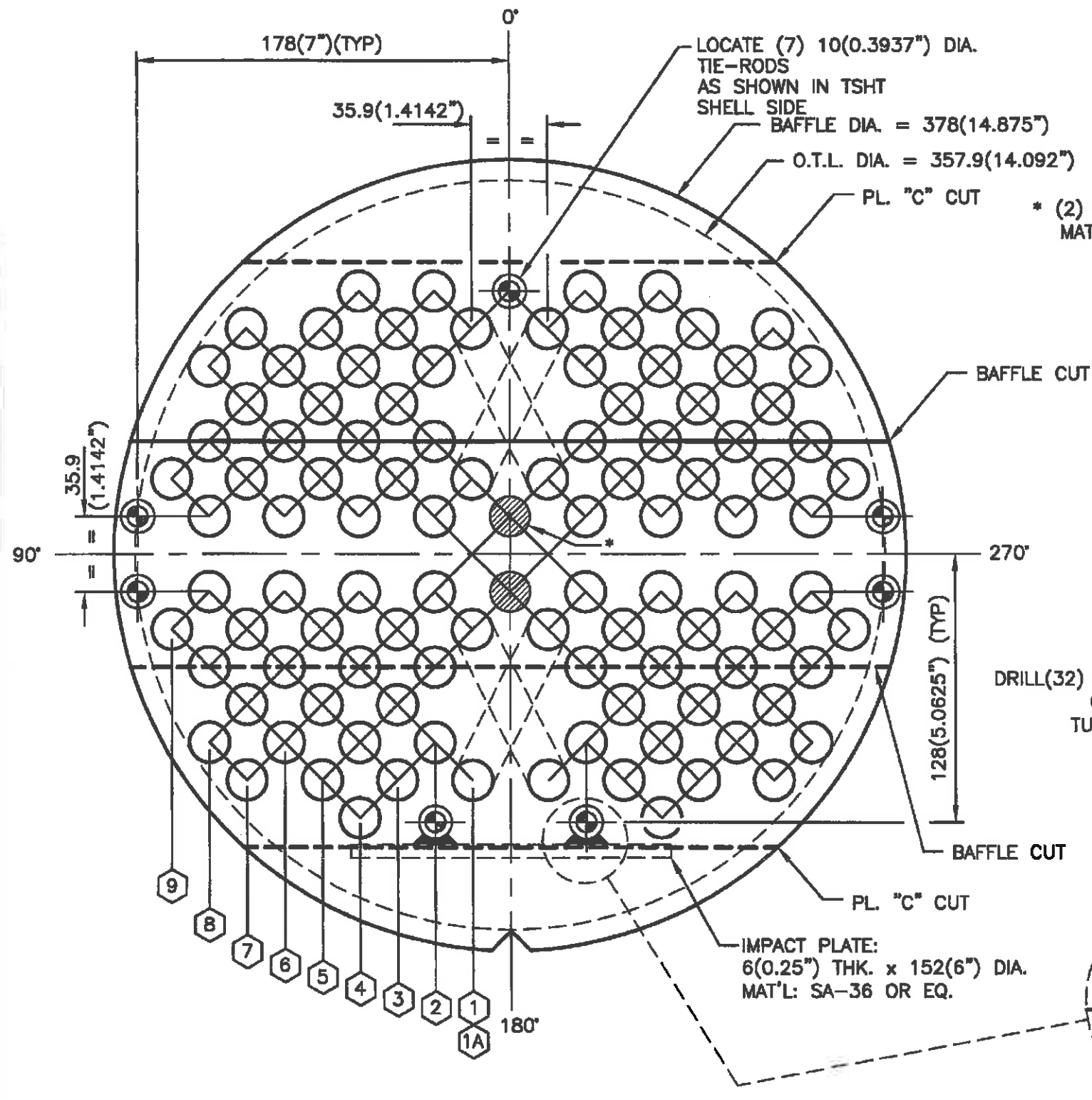
DWN FX CKD KW ITEM 104-E-135/136



**EXCHANGER INDUSTRIES
 LIMITED**
 CALGARY, ALBERTA

DWG NO. 13-3353A/B

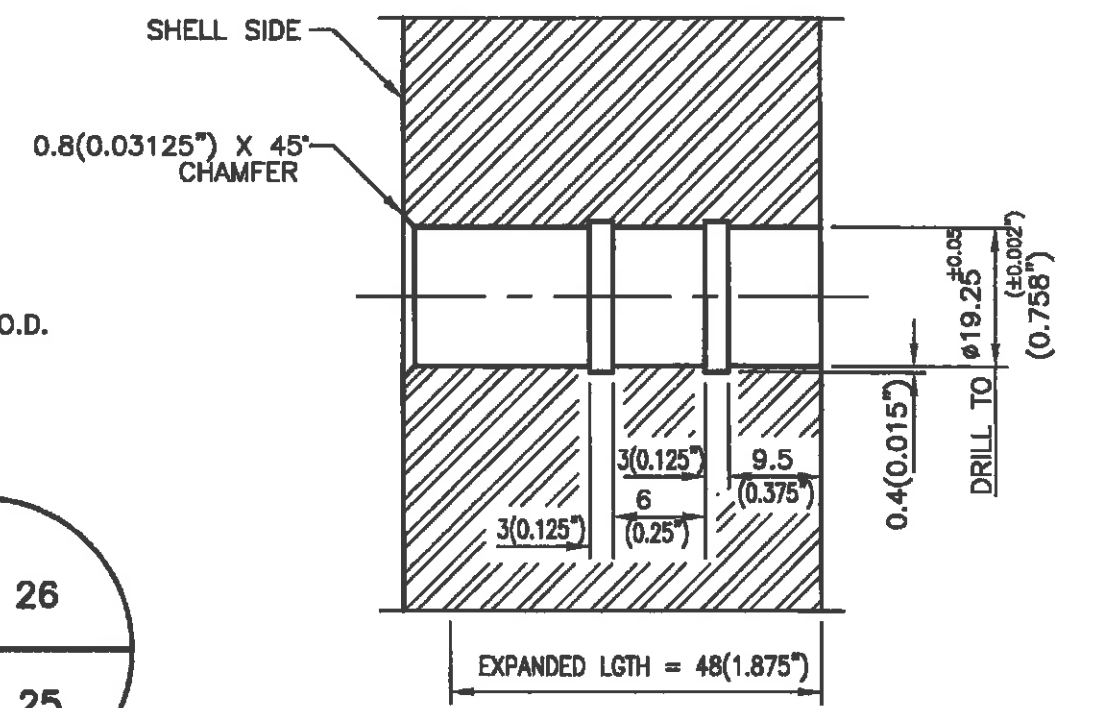
SHEET 5 OF 13



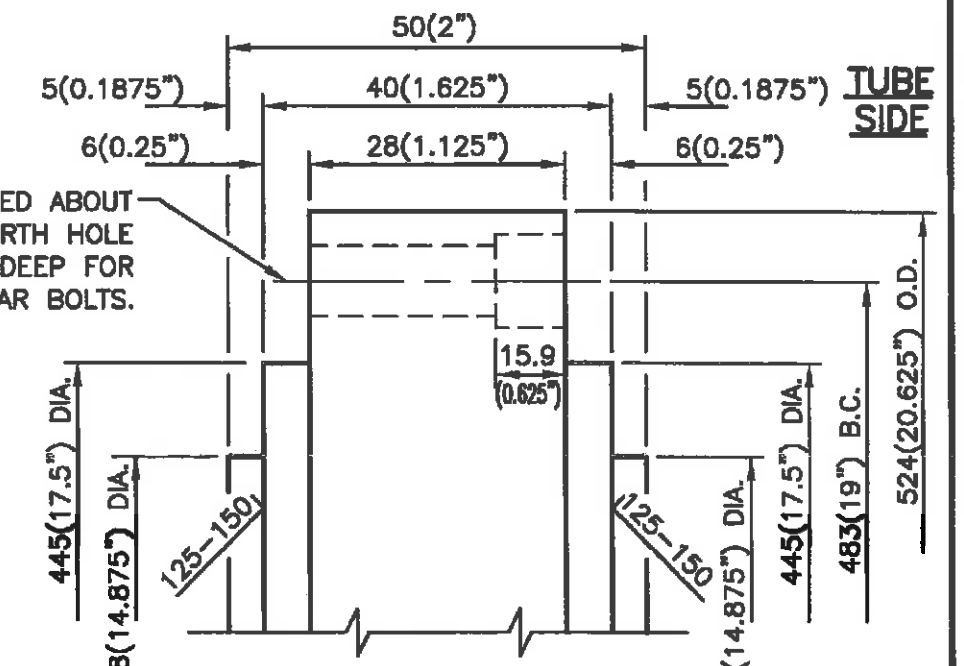
TUBES PER PASS

DRILL(32) 22.2(0.875") DIA. HOLES EQUALLY SPACED ABOUT CTR LINES. COUNTERBORE(8) EVERY FOURTH HOLE TUBESIDE 30(1.1875") DIA x 16(0.625") DEEP FOR (8) 19.05(0.75") DIA. 10 T.P.I. COLLAR BOLTS.

CERTIFIED AS BUILT



TUBE HOLE GROOVING DETAIL



TUBESHEET DETAIL
ONE REQ'D EACH EXCHANGER
MAT'L: SA-516-70N

TUBE O.D. = 19.05(0.75")

TUBE PITCH = 25.4(1") 45° \diamond

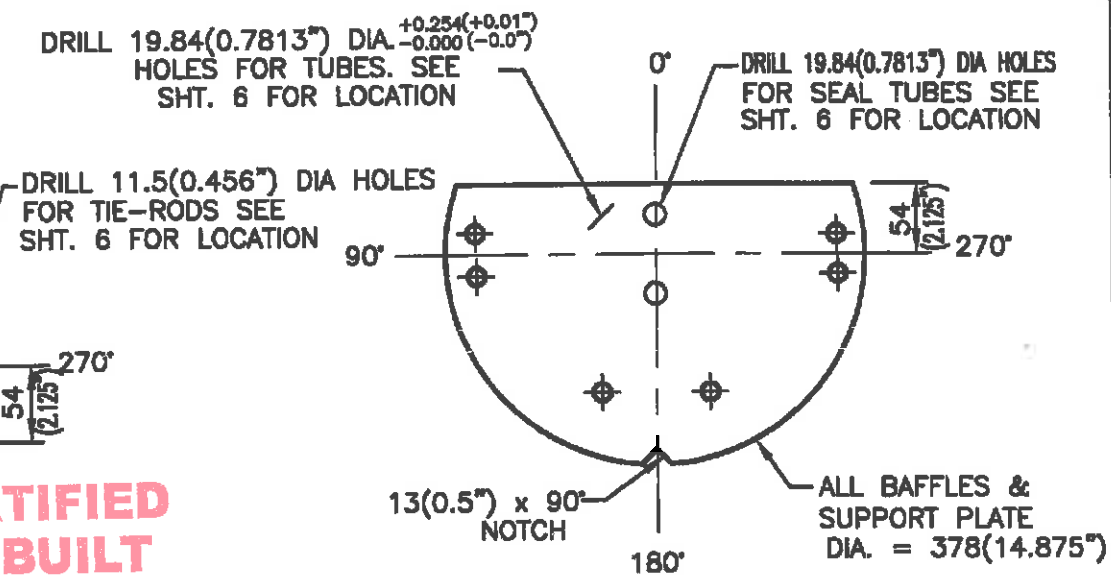
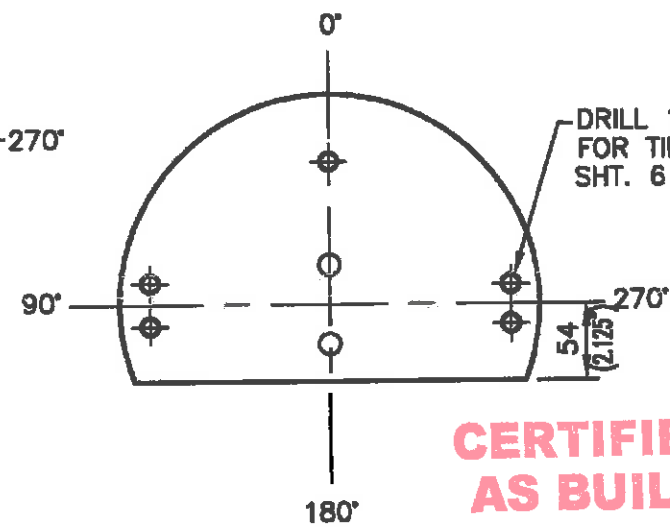
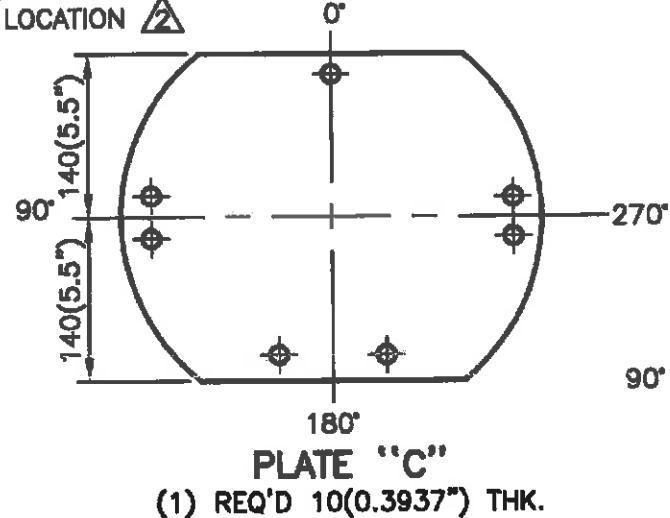
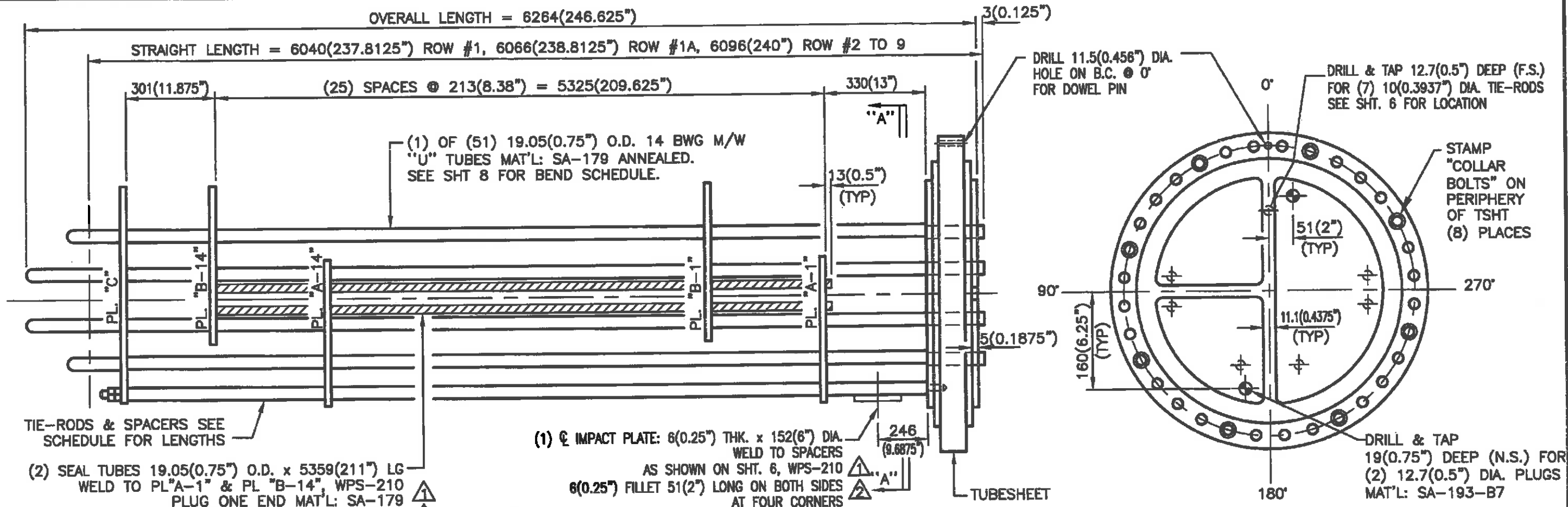
NO. OF TUBES = (51) "U"

NO. OF PASSES = FOUR

REVISIONS
△ PER CUST. MARK-UPS MAY 16/2013 (FZ)

TUBE HOLE LAYOUT		
NO. OF EXCHANGERS REQ'D: TWO		
PO #: CE416040-CC088996-00		
CANADIAN NATURAL RESOURCES LTD KIRBY NORTH PHASE 1 PROJECT/CONKLIN, AB		
DWN FX	CKD KW	ITEM 104-E-135/136

EXCHANGER INDUSTRIES LIMITED
CALGARY, ALBERTA
DWG NO. 13-3353A/B
SHEET 6 OF 13



CERTIFIED AS BUILT

VIEWED ON "A-A"

TIE-ROD SCHEDULE						
TIE-ROD DIA.: 10(0.3937")			TIE-ROD MAT'L: SA-36 OR EQ			
TOTAL NO. REQ'D EACH BUNDLE: (7) C/W (2) CARB. STL NUTS EACH						
NO.:	(7)					
LGTH:	6013 (236.75")					
SPACER SCHEDULE						
SPACER O.D.: 15.9(0.625")			SPACER MAT'L: SA-179			
TOTAL NO. REQ'D EACH BUNDLE: (150)						
NO.:	(6)	(1)	(100)	(36)	(2)	(5)
LGTH:	330 (13")	543 (21.38")	205 (8.066")	418 (16.44")	506 (19.94")	293 (11.56")

REVISIONS

⚠ PER CUST. MARK-UPS MAY 16/2013 (FZ)

⚠ PER E.I. JULY 17/2013 (AG)

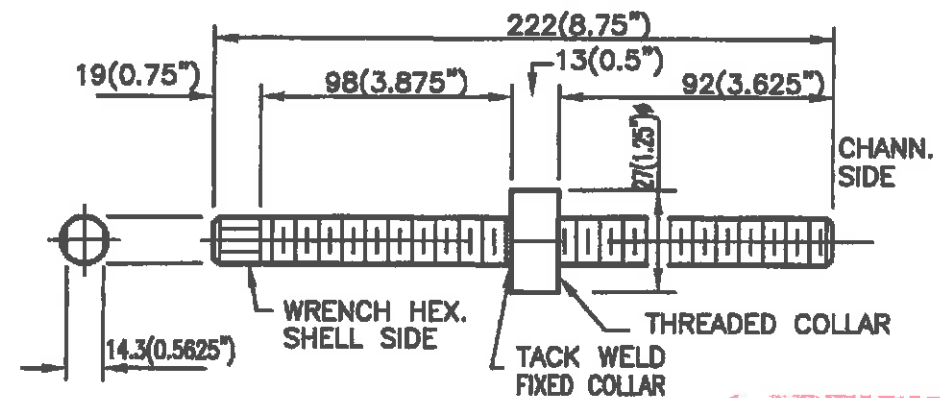
BUNDLE DETAIL			
NO. OF EXCHANGERS REQ'D: TWO			
PO #: CE416040-CC088996-00			
CANADIAN NATURAL RESOURCES LTD KIRBY NORTH PHASE 1 PROJECT/CONKLIN, AB			
DWN	FX	CKD	KW
ITEM		104-E-135/136	

EXCHANGER INDUSTRIES LIMITED	
CALGARY, ALBERTA	
DWG NO. 13-3353A/B	
SHEET 7 OF 13	

LOCATION	NO. REQ'D	SIZE	LENGTH	T.P.I.
CHANNEL TO SHELL	27*	19.05(0.75") DIA.	203(8")	10
CHANNEL TO SHELL COLLAR BOLTS	9*	19.05(0.75") DIA.	222(8.75")	10
JACKSCREWS	4	12.7(0.5") DIA.	89(3.5")	13

* INCLUDES 10% SPARE STUDS & NUTS

SIZE	SHOP TORQUE VALUES	
	(Nm)	(FT.LBS)
19.05(0.75") DIA.	260	192



COLLAR BOLT DETAIL

**CERTIFIED
AS BUILT**

NOTES:

- (1) NUMBER SHOWN IS NUMBER OF STUDBOLTS REQ'D FOR EACH EXCHANGER.
- (2) TWO AMERICAN STANDARD HEAVY HEX. NUTS REQ'D FOR EACH STUDBOLT UNLESS NOTED OTHERWISE.
- (3) COAT ENTIRE LENGTH OF STUDBOLTS WITH JET LUBE 550 OR OKS-250 LUBRICANT.

MATERIAL:

STUDBOLTS: SA-193-B7
 NUTS: SA-194-2H
 JACKSCREWS: SA-193-B7

REVISIONS

- ⚠ PER CUST. MARK-UPS & E.I. MAY 16/2013 (FZ)
- ⚠ PER E.I. JULY 17/2013 (AG)
- ⚠ PER E.I. Oct. 30/2013 (JL)

BOLT SCHEDULE

NO. OF EXCHANGERS REQ'D: TWO

PO #: CE416040-CC088996-00

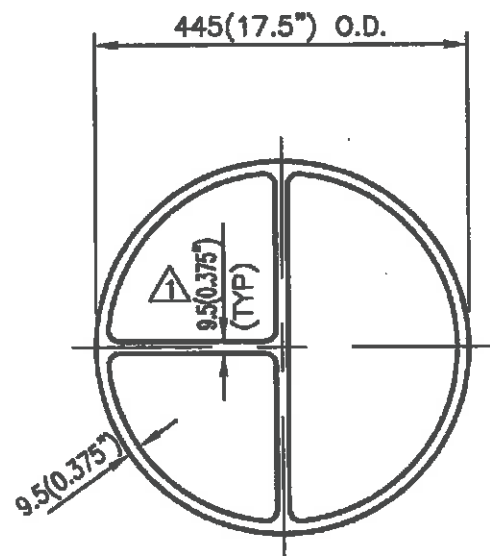
⚠ CANADIAN NATURAL RESOURCES LTD NIRBY NORTH PHASE 1 PROJECT/CONKLIN, AB

DWN FX CKD KW ITEM 104-E-135/136

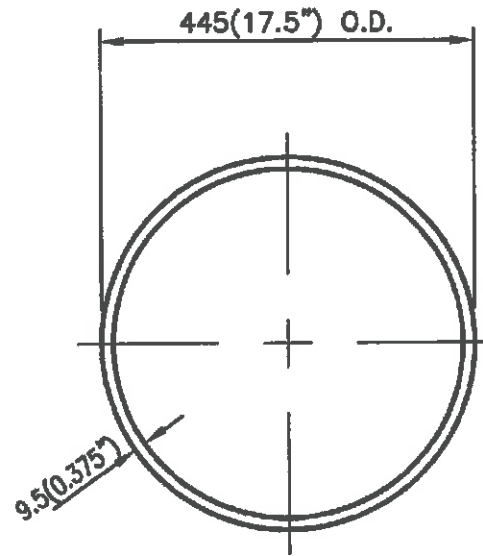
**EXCHANGER INDUSTRIES
LIMITED**
 CALGARY, ALBERTA

DWG NO. 13-3353A/B

SHEET 9 OF 13



MK.1 TO TUBESHEET




MK.2 TO TUBESHEET

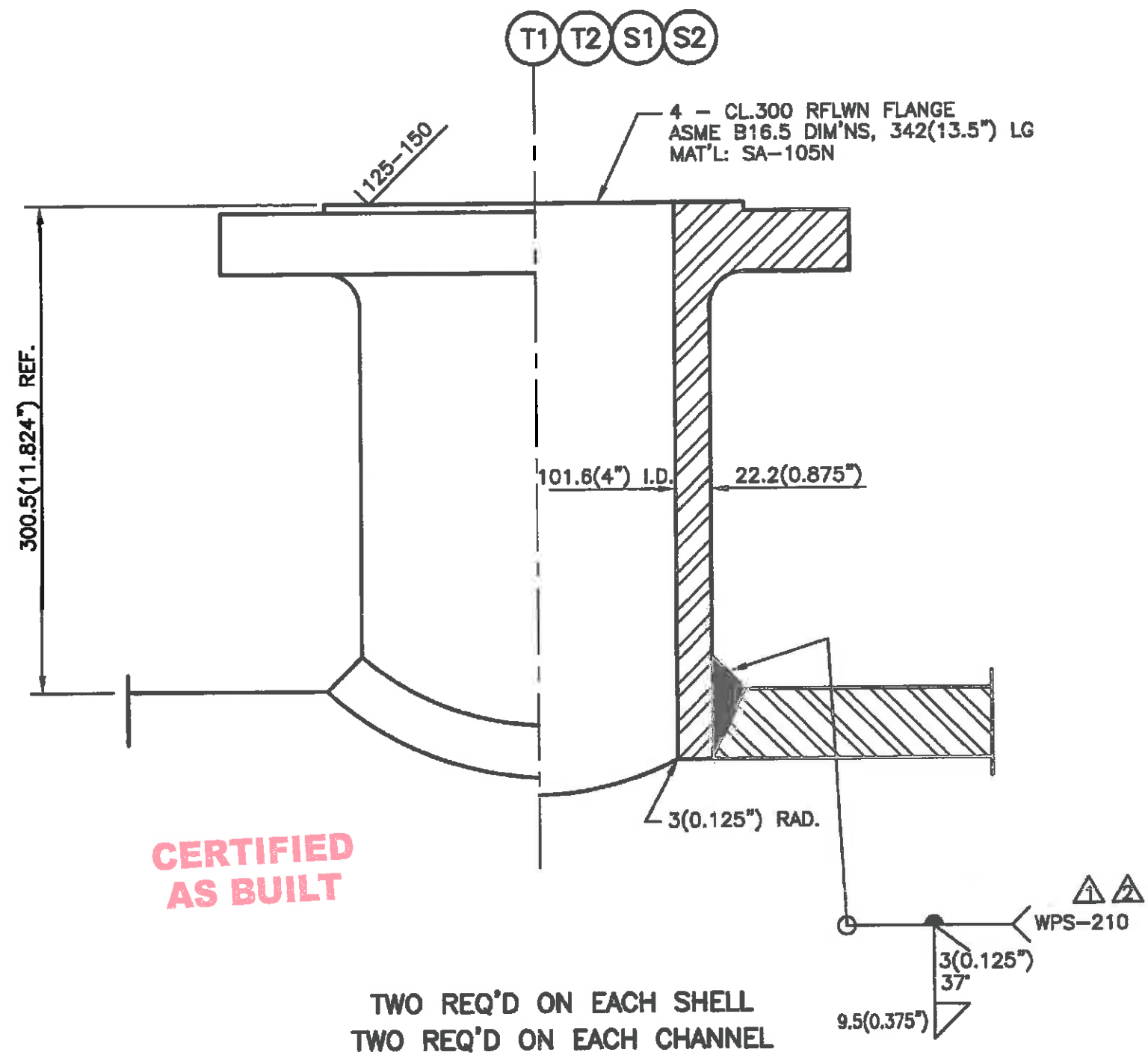
**CERTIFIED
AS BUILT**

NOTES:

- (1) UNLESS OTHERWISE NOTED ALL GASKETS ARE TO BE: 3.2(0.125") THK. KAMMPROFILE - 316 S.S. CORE, FLEX, GRAPHITE.
- (2) THICKNESS CALLED FOR IS THE TOTAL THICKNESS REQUIRED
- (3) ALL GASKETS ARE TO BE ONE PIECE CONSTRUCTION

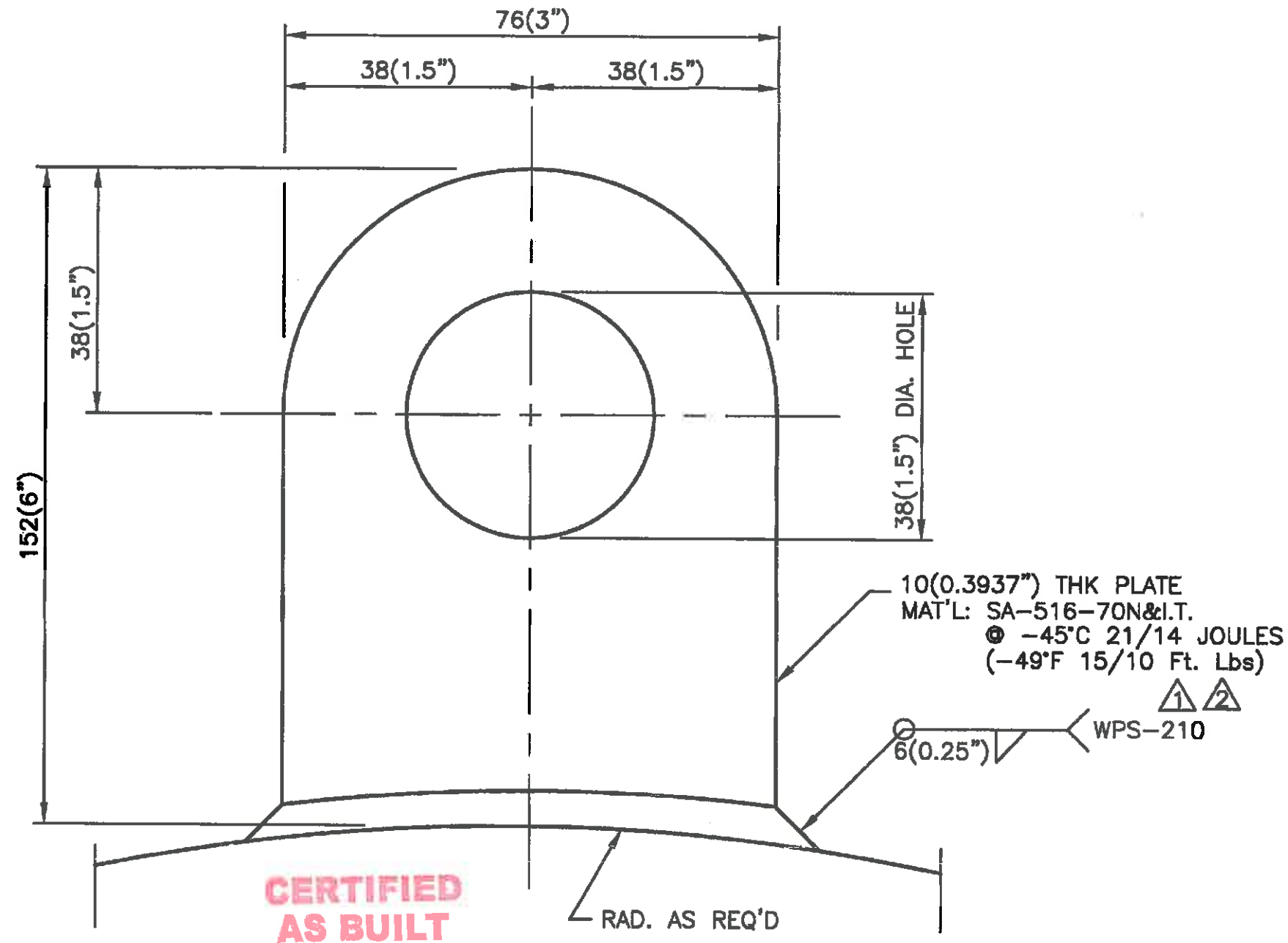
* INCLUDES ONE SPARE SET

REVISIONS △ PER CUST. MARK-UPS MAY 16/2013 (FZ)	GASKET DETAIL NO. OF SETS REQ'D EACH EXCHANGER: TWO* NO. OF EXCHANGERS REQ'D: TWO		 EXCHANGER INDUSTRIES LIMITED CALGARY, ALBERTA
	PO #: CE416040-CC088996-00		
△ CANADIAN NATURAL RESOURCES LTD KIRBY NORTH PHASE 1 PROJECT/CONKLIN, AB	DWG NO. 13-3353A/B		SHEET 10 OF 13
DWN FX CKD KW ITEM 104-E-135/136			




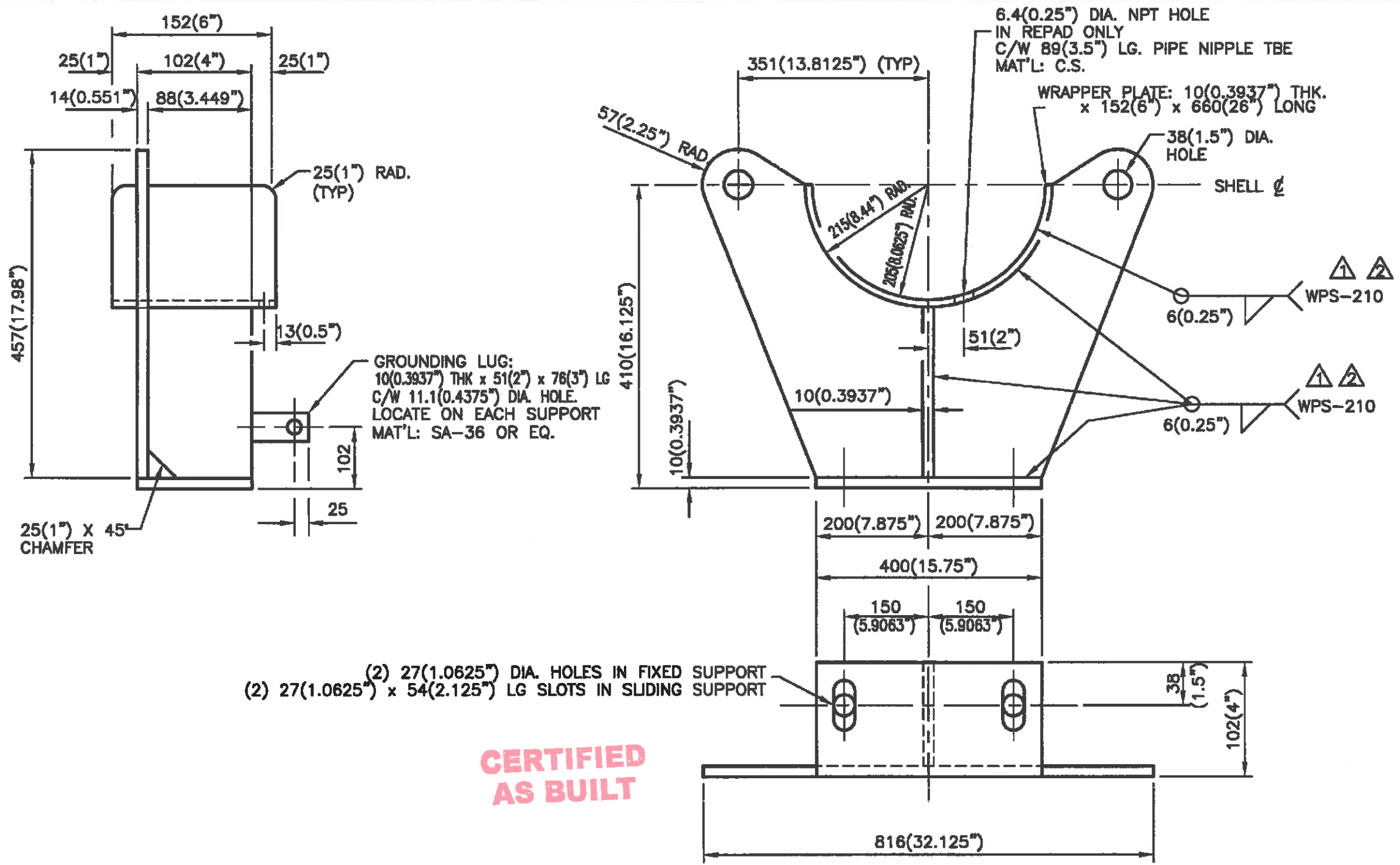
NOZZLE ORIENTATION SEE SHT.1

REVISIONS ⚠ PER CUST. MARK-UPS MAY 16/2013 (FZ) ⚠ PER E.I. JULY 17/2013 (AG)	NOZZLE DETAILS		 EXCHANGER INDUSTRIES LIMITED CALGARY, ALBERTA	
	NO. OF EXCHANGERS REQ'D: TWO			
	PO #: CE416040-CC088996-00			
	⚠ CANADIAN NATURAL RESOURCES LTD KIRBY NORTH PHASE 1 PROJECT/CONKLIN, AB			
	DWN FX	CKD KW	ITEM 104-E-135/136	DWG NO. 13-3353A/B
				SHEET 11 OF 13



TWO REQ'D ON EACH CHANNEL CYLINDER

REVISIONS ⚠ PER CUST. MARK-UPS MAY 16/2013 (FZ) ⚠ PER E.I. JULY 17/2013 (AG)	LIFT LUG DETAIL		 EXCHANGER INDUSTRIES LIMITED CALGARY, ALBERTA
	NO. OF EXCHANGERS REQ'D: TWO		
	PO #: CE416040-CC088996-00		
	⚠ CANADIAN NATURAL RESOURCES LTD KIRBY NORTH PHASE 1 PROJECT/CONKLIN, AB		
	DWN FX CKD KW	ITEM 104-E-135/136	DWG NO. 13-3353A/B SHEET 12 OF 13



(2) 27(1.0625") DIA. HOLES IN FIXED SUPPORT
 (2) 27(1.0625") x 54(2.125") LG SLOTS IN SLIDING SUPPORT

**CERTIFIED
AS BUILT**

NOTES:

(1) ALL MATERIAL TO BE SA-516-70N&I.T. ● -45°C 21/14 JOULES (-49°F 15/10 Ft.Lbs) EXCEPT FOR GROUNDING LUG.

REVISIONS ▲ PER CUST. MARK-UPS MAY 16/2013 (FZ) ▲ PER E.I. JULY 17/2013 (AG)	SUPPORT DETAIL NO. OF EXCHANGERS REQ'D: TWO NO. OF SUPPORTS REQ'D: TWO		 EXCHANGER INDUSTRIES LIMITED CALGARY, ALBERTA
	PO #: CE416040-CC088996-00		
	CANADIAN NATURAL RESOURCES LTD KIRBY NORTH PHASE 1 PROJECT/CONKLIN, AB		DWG NO. 13-3353A/B
	DWN FX	CKD KW	ITEM104-E-135/136 SHEET 13 OF 13