

NOZZLE SCHEDULE

MARK	SIZE (NPS)	RATING (CO)	SERVICE	REMARKS
N1	4	300	CONDENSATE INLET	IT # 8,10,11,12,13
N2	6	300	CONDENSATE OUTLET	IT # 15,16,17,18,19
V				
AA-PH02-SR-LT-R1	IV	AA-PH02-SR-LT-R1	III	AA-PH02-SR-LT-R1
CA-B-PH02-SR-LT-R4	II	CA-B-PH02-SR-LT-R0	I	CA-PH02-SR-LT-R3
MISCELLANEOUS WELD DETAILS				

DESIGN DATA

CODE:	ASME B31.3 2008 Edition
M.A.W.P.:	400 PSIG @ 400°F
M.D.M.T.:	-20°F @ 400 PSIG
CORROSION ALLOWANCE:	1/8"
P.W.H.T.:	RES. 1150°F ±25°F FOR 1 HR.
RADIOGRAPHY:	100% TO ASME B31.3
HYDROTEST:	600 PSIG (NOTE 7)/1
PIPE: (SIZE & SCH.)	NPS 4 & 6, SCH. STD
FLANGE RATING:	CL300 RFWN
MATL SPEC.: PIPE	SA-106-B
T.O.L.	N/A
WELD FTS	SA-234-WPB
MISC.	SA-36
SURFACE AREA (ft²):	447.6 ft²
COIL VOLUME (ft³):	33.6 ft³
C.R.N.:	-
SURFACE PREPARATION:	COMMERCIAL BLAST TO SSPC-SP6 (ON EXPOSED SURFACES ONLY).
PAINT:	AS PER LINE HEATER AFTER COIL IS INSTALLED.

ESTIMATING SHIPPING WEIGHT:	4,840 lbs. (EMPTY)
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NOTES

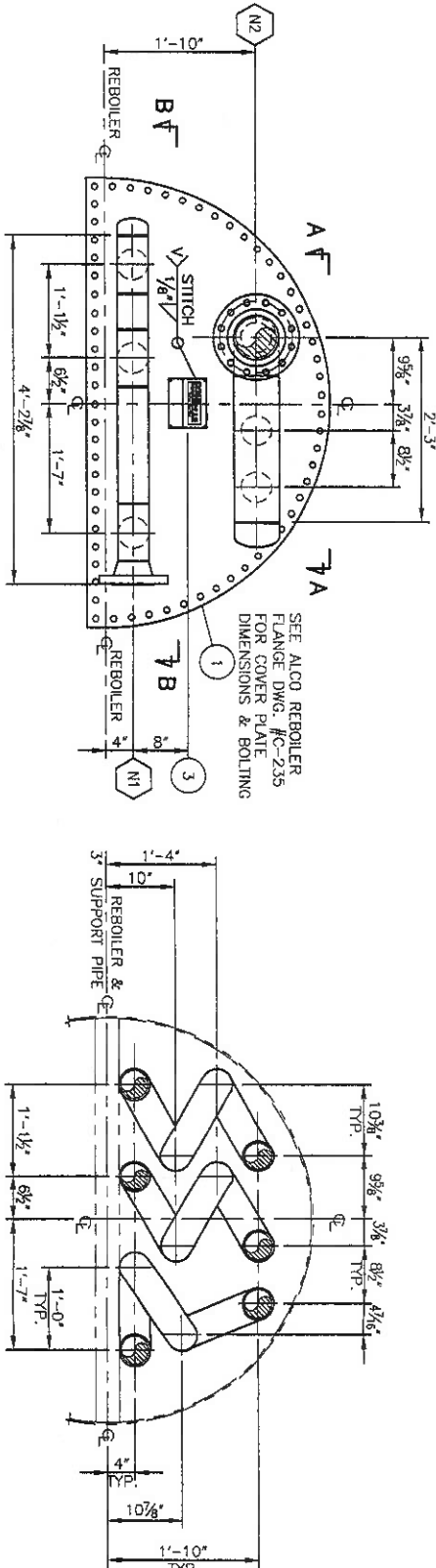
1. ALL BOLTS TO STRADDLE NATURAL VESSEL CENTRELINES.
2. PROTECT ALL OPENINGS FOR SHIPMENT.
3. IMPACT TEST EXEMPT PER FIG. 323.2.2A
4. ALCO STANDARD FABRICATION TOLERANCES (DWG #A-4540).
5. ALCO STANDARD JOINT DESIGN & WELD TOLERANCE (DWG #B-2007-WELD JOINT-001).
6. ALL PRESSURE CONTAINING FILET WELDS TO BE 100% MPD AND UT'D.
7. HYDROTEST TO BE CHART RECORDED (PRESS. & TEMP.) FOR 1 HOUR MIN. / 3
8. COIL TO BE REGISTERED IN ALBERTA, BC. & SASK.

MATERIAL IS TO COMPLY WITH MACE MR0175 (PRESSURE RETAINING COMPONENTS ONLY):

- 1.) CARBON AND LOW ALLOY STEELS NOT TO EXCEED 22HRC, AND MATERIALS SHALL BE "HOT ROLLED", "ANNEALED", "NORMALIZED AND TEMPERED", OR "NORMALIZED, AUSTENITIZED, AND TEMPERED".
- 2.) MATERIALS MUST CONTAIN LESS THAN 1% NICKEL.
- 3.) FORGINGS PRODUCED WITH REQUIREMENTS OF ASTM A106 SHALL NOT EXCEED 187 HB MAXIMUM.
- 4.) FITTINGS IN ACCORDANCE WITH A-234-WPB SHALL NOT EXCEED 197 HB.
- 5.) BOLTING MATERIALS ASTM A193-B7M AND NUTS ASTM A194 G-2HM SHALL BE USED WITH 22HRC MAXIMUM FOR ALL BOLTING EXPOSED DIRECTLY TO SOUR SERVICE.
- 6.) WELDING RODS, ELECTRODES, FLUXES, FILLER METAL AND CARBON STEEL CONSUMABLES WITH MORE THAN 1% NICKEL SHALL NOT BE USED.
- 7.) ONLY LOW STRESS (ROUND V) IDENTIFICATION STAMPING SHALL BE USED. SHARP V STAMPING IS NOT PERMITTED UNLESS SUBSEQUENTLY STRESS RELIEVED.
- 8.) ONE SET OF HARDNESS TEST (WELD, HAZ, BASE METAL) SHALL BE CONDUCTED AFTER PWHT FOR EACH WELDER PER - C S 0.20% WELD PROCEDURE. HARDNESS OF WELDMENT SHOULD BE 22HRC MAXIMUM.

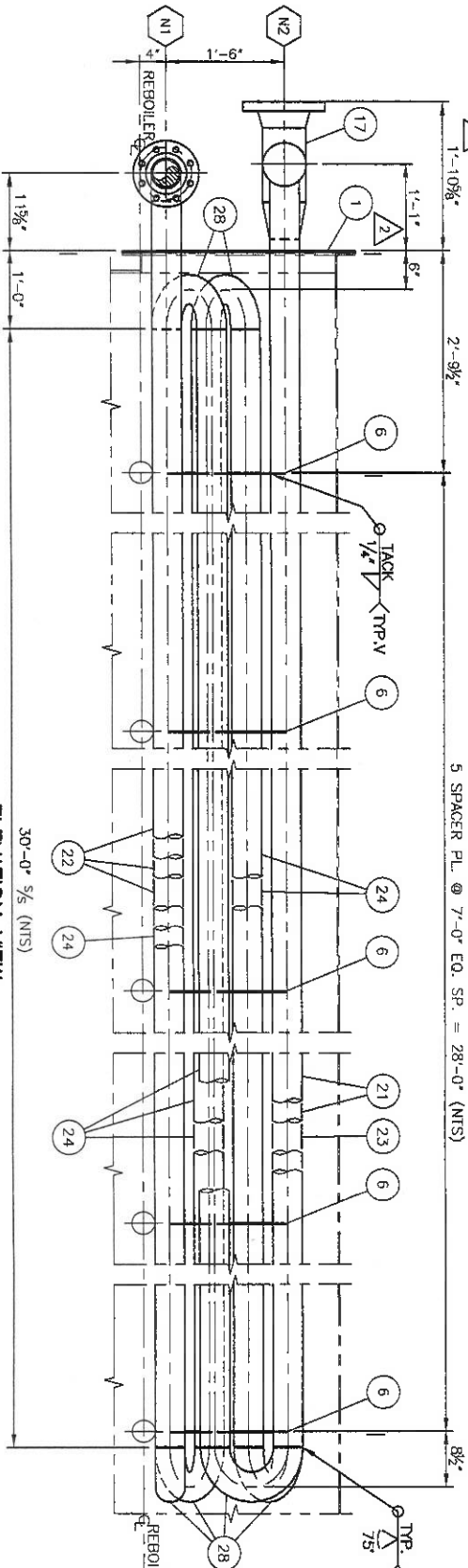
- CE ≤ 0.45% WHERE CE = C + Mn/6 + (Cr + Mo + V)/5 + (Ni + Cu)/15

ONE (1) UNIT REQUIRED

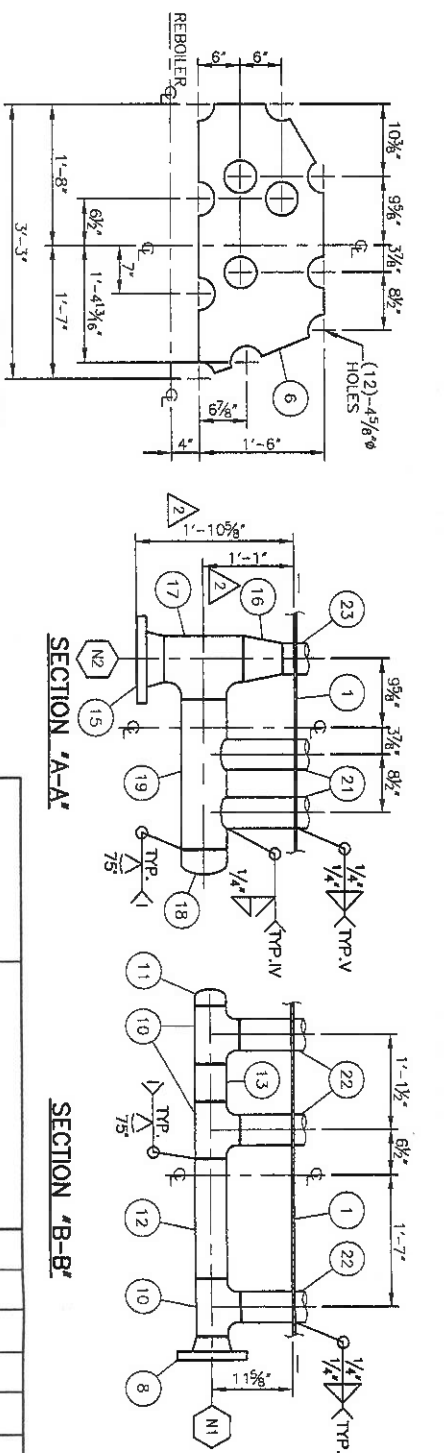


FRONT VIEW

TUBE LAYOUT



ELEVATION VIEW



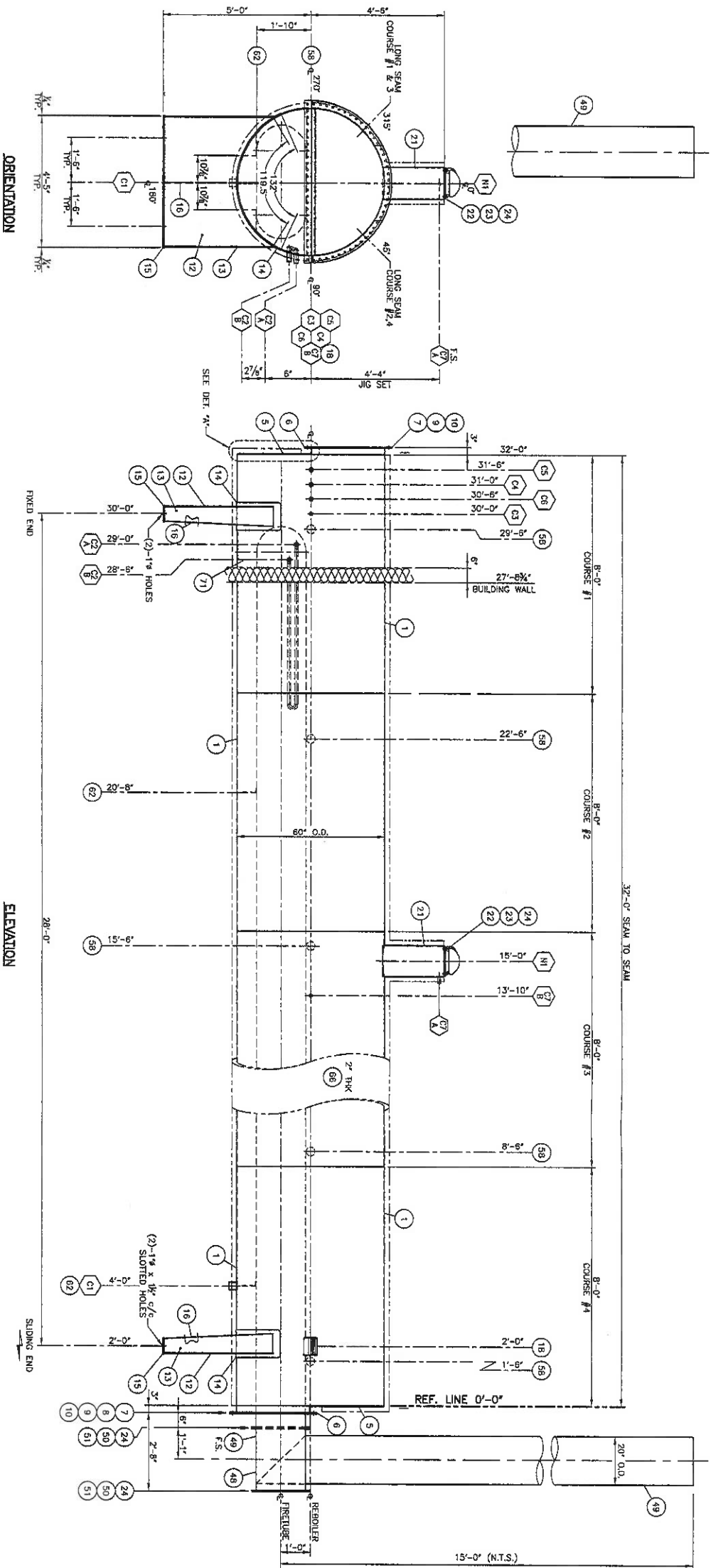
SECTION 'A-A'

SECTION 'B-B'

SPACER PLATE DETAIL (ITEM #6)

FOUR (4) REQ'D

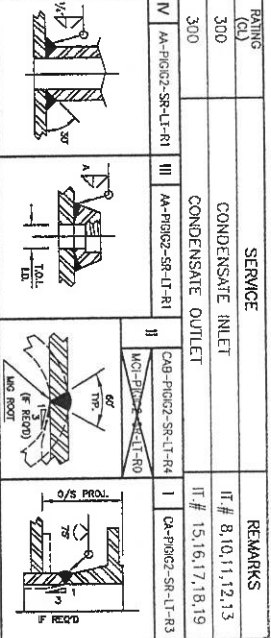
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100	2010-08-11	ISSUED FOR CONSTRUCTION			



NOZZLE SCHEDULE					
MARK	SIZE	RANGE	TYPE	SERVICE	U.S.P. REMARKS
N1	8	-	FL FLANGE	THEFT HATCH	
C1	2	3000	COUPLING	HEATER MAN	
C2 1/2	1	3000	LONG CRG	FUEL GAS PREHEAT COIL	
C3	1	3000	LONG CRG	TEMPERATURE CONTROL	
C4	1	3000	LONG CRG	TEMPERATURE CONTROL	
C5	1	3000	LONG CRG	TEMPERATURE INDICATOR	
C6	1/4	3000	LONG CRG	TEMPERATURE INDICATOR	
C7 1/8	1/2	3000	LONG CRG	TEMPERATURE INDICATOR	
SPECIFICATIONS					
REBOILER SHELL: 0.250" PL. SA-36					
EXP. TANK SHELL: 0.250" PL. SA-36					
FIRE TUBE: 0.25" THK. STRUCTURAL					
STILL COLUMN: 0.250" THK. STRUCTURAL					
COIL HEATING AREA: -					
TUBING: -					
MISC. PLATE & SUPPLIES: SA-36/44W					
WORKING PRESSURE: 0 PSIG					
TESTING: FILL W/ WATER & CHECK FOR LEAKS					
RADIOPHANT: 5% ON FUEL GAS PRE-HEAT COIL PER 831.3 - 2008 EDITION					
CAPACITY: (FIRE TUBE) 4911.8 GAL. (W/ FIRE TUBE INSTALLED)					
EST. SHIPPING WEIGHT: 12,430 lbs.					
SURFACE PREPARATION: COMMERCIAL BLAST TO SSPC-SP6					
PAINT: PRIMER (COOL): 1% CLOVERBONE #1101 ZINC PHOSPHATE PRIMER GREY OVERALL					
FINISH (HOT/INSULATED): 1% CLOVERBONE #3206 SILICONE ACRYLIC HEAT RESISTANT, WARM GREY					
FINISH (HOT/INSULATED): 1% CLOVERBONE #3206 SILICONE ACRYLIC HEAT RESISTANT, WARM GREY					
INSULATION: 2" THK. FIBERGLASS INSULATION 5% EMBOSSED ALUMINUM JACKETING ON HEATER					
END PLATES & EXPANSION POT.					
NOTE: ALL BOLT HOLES TO BE EQUALLY SPACED STRONGHOLD NATURAL GAS					

ONE (1) UNIT REQUIRED	
DATE	2010-07-02
SCALE	1/2"=1'-0"
CHRG	2,500,000 Btu/hr. INDIRECT FIRED STABILIZER REBOILER
LOCATOR	60" O.D. x 32'-0" LG. REBOILER / 12 1/2" O.D. x 2'-0" LG. EXPANSION POT
CUSTOMER	K&R, AB
DWG/SHOP ORDER	D-2010-8101-02-001/001
REV.	0

NOZZLE SCHEDULE

MARK	SIZE	RATING	SERVICE	REMARKS
N1	4	300	CONDENSATE INLET	IT # 8.10.11.12.13
N2	6	300	CONDENSATE OUTLET	IT # 15.16.17.18.19
V				
AA-P10G2-SR-LT-R1	IV	AA-P10G2-SR-LT-R1	III	AA-P10G2-SR-LT-R1
MO-P10G2-SR-LT-R0	II	MO-P10G2-SR-LT-R4	I	CA-P10G2-SR-LT-R3
MISCELLANEOUS WELD DETAILS				
				

DESIGN DATA

CODE:	ASME B31.3 2008 Edition
M.A.W.P.:	400 PSIG @ 400°F
M.D.M.T.:	-20°F @ 400 PSIG
CORROSION ALLOWANCE:	1/8"
P.W.M.T.:	YES, 1150°F ±25°F FOR 1 HR.
RADIOGRAPH:	100% TO ASME B31.3
HYDROTEST:	600 PSIG (NOTE 7/1)
PIPE (SIZE & SCH.):	NPS 4 & 6, SCH. STD
FLANGE RATING:	CL300 RFRN
MAIL SPEC. PIPE:	SA-106-B
T.O.L.	N/A
WELD FITS	SA-234-WPB
MISC.	SA-36
SURFACE AREA (9%):	447.6 ft ²
COIL VOLUME (9%):	33.6 ft ³
C.R.N.:	
SURFACE PREPARATION:	COMMERCIAL BLAST TO SSPC-SP6 (ON EXPOSED SURFACES ONLY).
PAINT:	AS PER LINE HEATER AFTER COIL IS INSTALLED.
ESTIMATING SHIPPING WEIGHT:	4,840 lbs. (EMPTY)

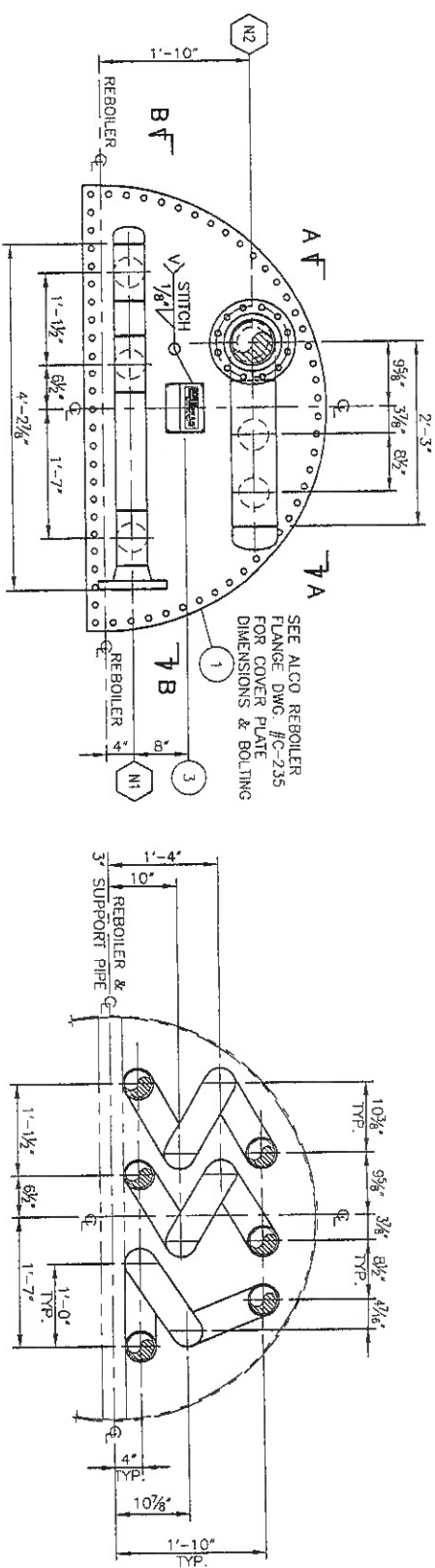
NOTES

- ALL BOLTS TO STRADDLE NATURAL VESSEL CENTRELINES.
- PROTECT ALL OPENINGS FOR SHIPMENT.
- IMPACT TEST EXEMPT PER FIG. 323.2.2A
- ALCO STANDARD FABRICATION TOLERANCES (DWG #A-4540).
- ALCO STANDARD JOINT DESIGN & WELD TOLERANCE (DWG #B-2007-WELD JOINT-001).
- ALL PRESSURE CONTAINING FILLET WELDS TO BE 100% MIPID AND UTD.
- HYDROTEST TO BE CHART RECORDED (PRESS. & TEMP.) FOR 1 HOUR MIN.
- COIL TO BE REGISTERED IN ALBERTA, BC & SASK.

MATERIAL IS TO COMPLY WITH NACE MR0175 (PRESSURE RETAINING COMPONENTS ONLY).

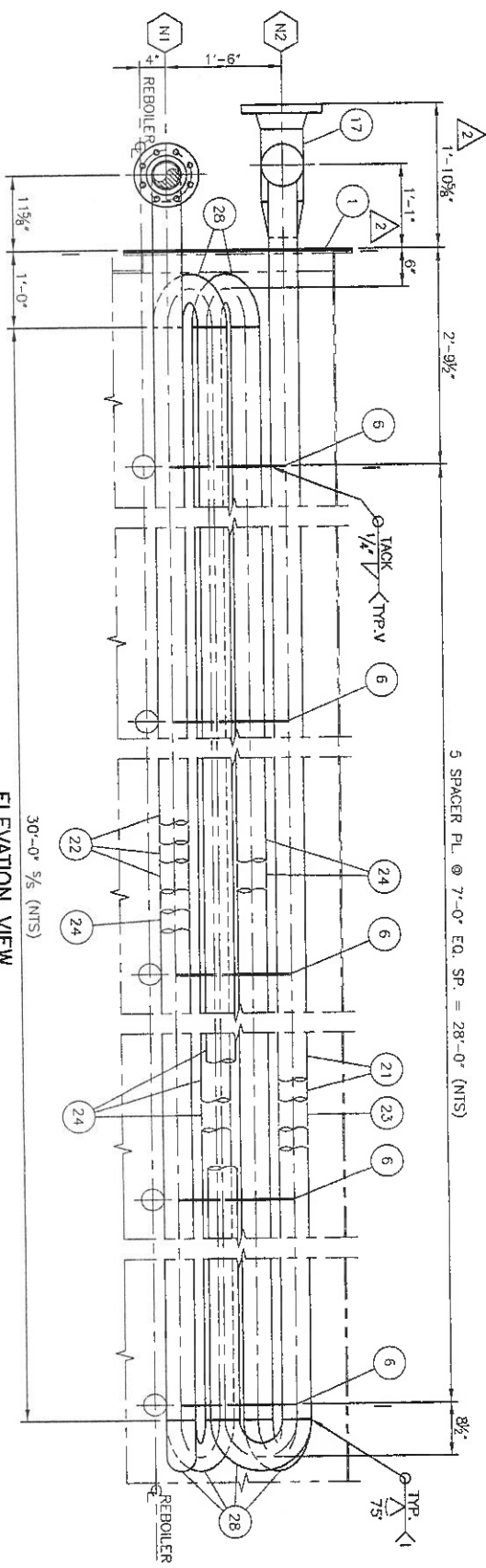
- CARBON AND LOW ALLOY STEELS NOT TO EXCEED 22HRC, AND MATERIALS SHALL BE "HOT ROLLED", "ANNEALED", "NORMALIZED AND TEMPERED", OR "NORMALIZED, AND TEMPERED".
- MATERIALS MUST CONTAIN LESS THAN 1% NICKEL.
- FORGINGS PRODUCED WITH REQUIREMENTS OF ASTM A105 SHALL NOT EXCEED 187 HB MAXIMUM.
- FITTINGS IN ACCORDANCE WITH A-234-WPB SHALL NOT EXCEED 187 HB.
- BOLTING MATERIALS ASTM A193-B7M AND NUTS ASTM A194-G-2HM SHALL BE USED WITH 22HRC MAXIMUM FOR ALL BOLTING EXPOSED DIRECTLY TO SOUR SERVICE.
- WELDING RODS, ELECTRODES, FILLET METAL AND CARBON STEEL CONSUMABLES WITH MORE THAN 1% NICKEL SHALL NOT BE USED.
- ONLY LOW STRESS (ROUND V) IDENTIFICATION STAMPING SHALL BE USED. SHARP V STAMPING IS NOT PERMITTED UNLESS SUBSEQUENTLY STRESS TESTED.
- ONE SET OF HARDNESS TEST (WELD, HAZ, BASE METAL) SHALL BE CONDUCTED AFTER PWHT FOR EACH WELDER PER WELD PROCEDURE. HARDNESS OF WELDMENT SHOULD BE 22HRC MAXIMUM.
- $C \leq 0.20\%$
- $CE \leq 0.45\%$ WHERE $CE = C + Mn/6 + (Cr + Mo + V)/5 + (Ni + Cu)/15$

ONE (1) UNIT REQUIRED

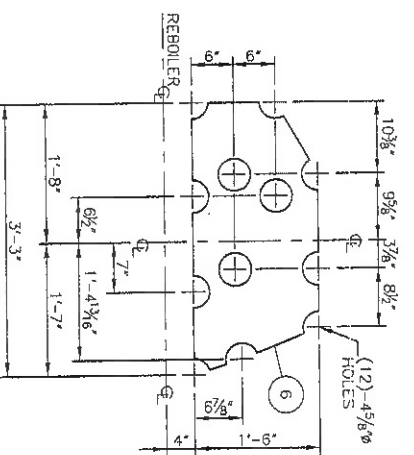


FRONT VIEW

TUBE LAYOUT



ELEVATION VIEW

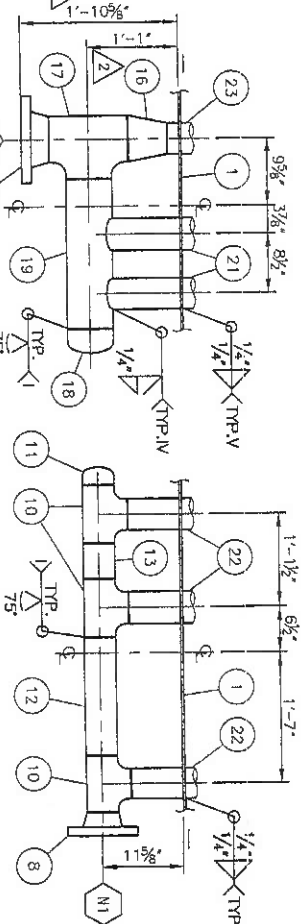


SPACER PLATE DETAIL (ITEM #6)

FOUR (4) REQ'D

SECTION 'A-A'

SECTION 'B-B'



REV.	DATE	BY	CHKD	DESCRIPTION
0	2010-07-26	MKG		ISSUED FOR CONSTRUCTION
1	2010-08-11	JZ		STABILIZER REBOILER
2	2010-08-11	JZ		HEATER FLANGE (60" O.D. HEATER)
3	2010-08-11	JZ		REBOILER
4	2010-08-11	JZ		FLANGE OF MATERIALS
5	2010-08-11	JZ		REBOILER
6	2010-08-11	JZ		REBOILER
7	2010-08-11	JZ		REBOILER
8	2010-08-11	JZ		REBOILER
9	2010-08-11	JZ		REBOILER
10	2010-08-11	JZ		REBOILER
11	2010-08-11	JZ		REBOILER
12	2010-08-11	JZ		REBOILER
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97	2010-08-11	JZ		REBOILER
98	2010-08-11	JZ		REBOILER
99	2010-08-11	JZ		REBOILER
100	2010-08-11	JZ		REBOILER

CALCULATION REVISIONS

REFERENCE DRAWINGS

REVISIONS

LOCATION: KARR, AB

LSD: 06-18-06-04 W6M

CUSTOMER: PARAMOUNT RESOURCES % EXCELSIOR ENGINEERING LTD.

DWG/SHOP ORDER: C-2010-8101-03-001/001

REV. 3

NPS 4 (INLET)/NPS 6 (OUTLET) x 30'-0" LG. @ 400 PSIG + 1/8" C.A.

COIL FOR 60" O.D. VESSEL

TAG#: E-1656-2

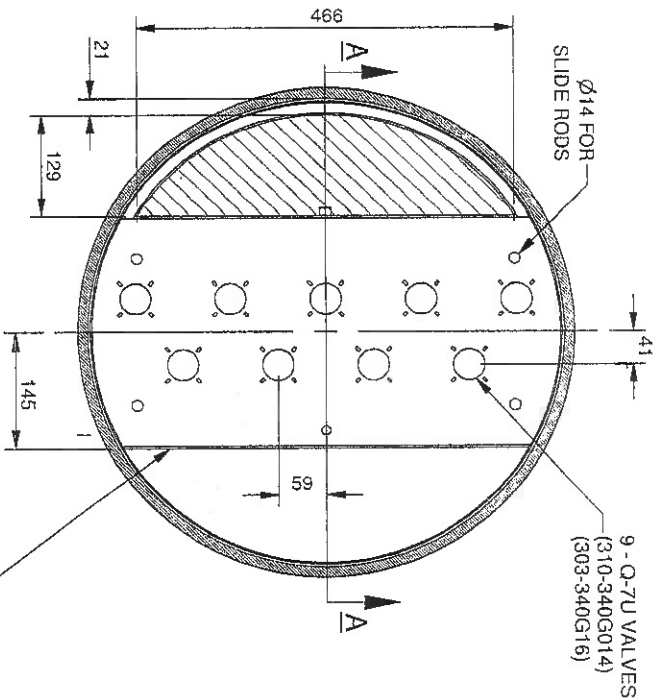
ALCO GAS & OIL PRODUCTION EQUIPMENT LTD.

The information contained herein is the confidential property of Alco Gas and Oil Production Equipment Ltd. and is not to be disclosed or used for any purpose other than that for which it was provided without the written consent of Alco Gas and Oil Production Equipment Ltd.

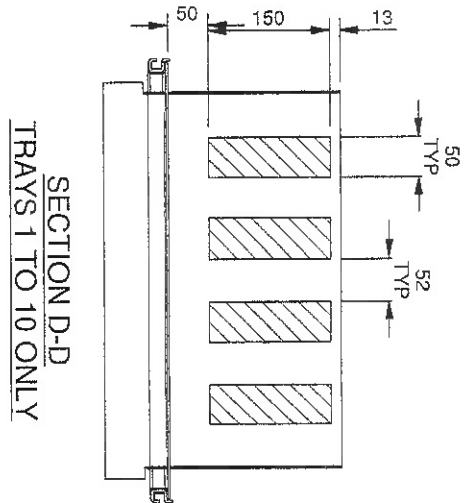
DATE: 2010-07-06

SCALE: 3/4" = 1'-0"

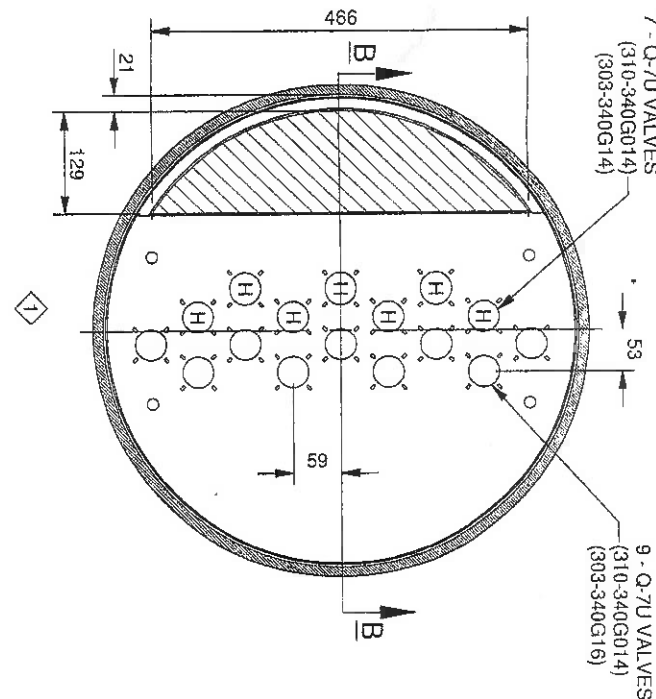
CHNO: RKL



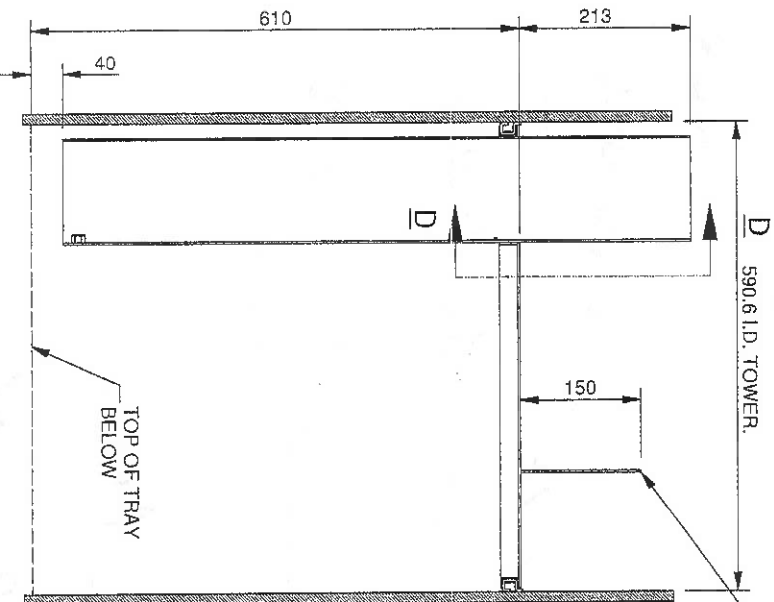
PLAN VIEW OF TRAYS
1 TO 10 AS SHOWN
AND NOTED



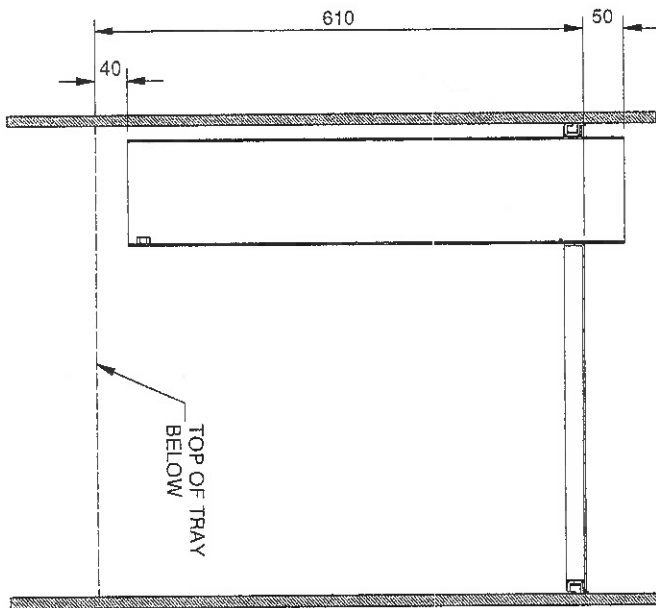
SECTION D-D
TRAYS 1 TO 10 ONLY



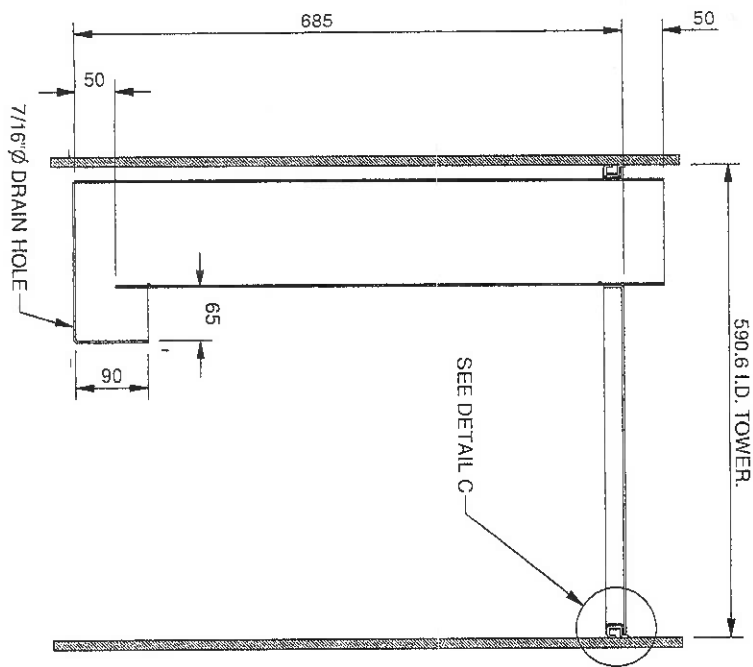
PLAN VIEW OF TRAYS
11 TO 20



SECTION VIEW OF TRAYS 1 TO 10
AS SHOWN AND NOTED



SECTION VIEW OF TRAYS
11 TO 19



SECTION VIEW OF TRAY 20
WITH SEAL PAN BELOW

- NOTES
1. TOWER MANHOLE I.D. ACTUAL: 590.6 BODY FLANGE.
 2. PARTS SUPPLIED BY KOCH-GLITSCH ARE IDENTIFIED BY MARK # (E.G. A-301) ENCLOSED AS SHOWN (A-301).
 3. BOLTING ASSEMBLIES ARE ENCLOSED THUS: QUANTITY PER TRAY ASSEMBLY NUMBER
 4. DIMENSIONS ARE GIVEN IN: MILLIMETERS
 5. ANY MODIFICATIONS BY CUSTOMER OR ANY THIRD PARTY TO THE EQUIPMENT SHOWN ON THIS DRAWING WITHOUT THE PRIOR WRITTEN APPROVAL OF KOCH-GLITSCH WILL VOID ALL EXPRESSED AND IMPLIED WARRANTIES, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PURPOSE.
 6. TRAYS ARE NUMBERED FROM TOP TO BOTTOM.

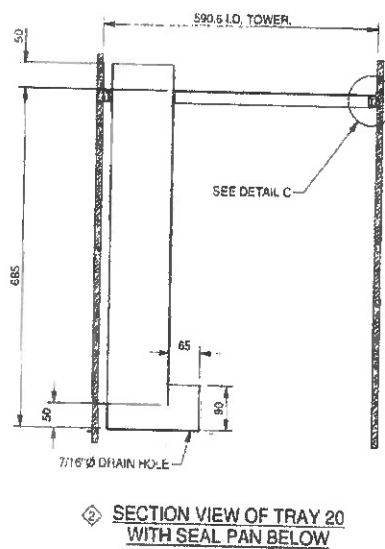
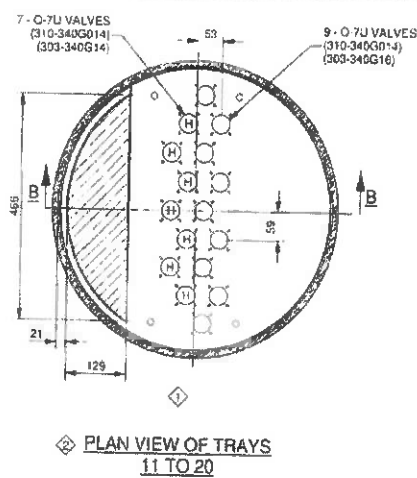
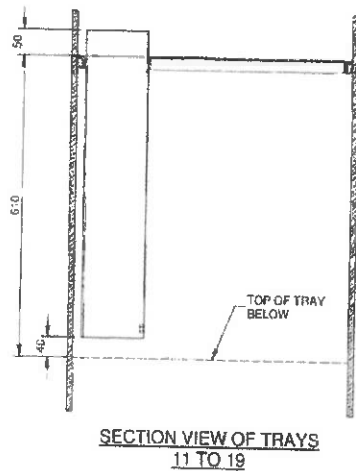
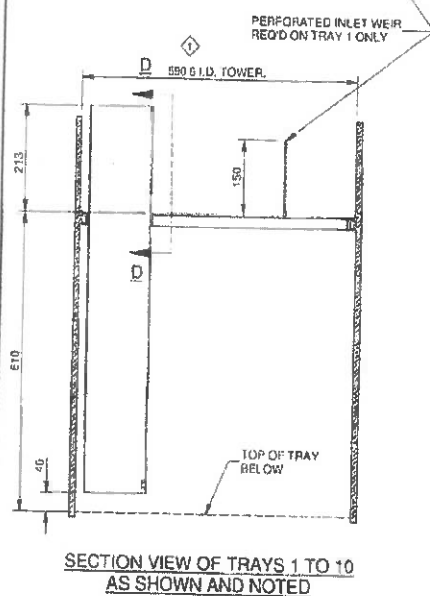
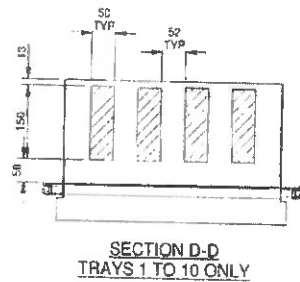
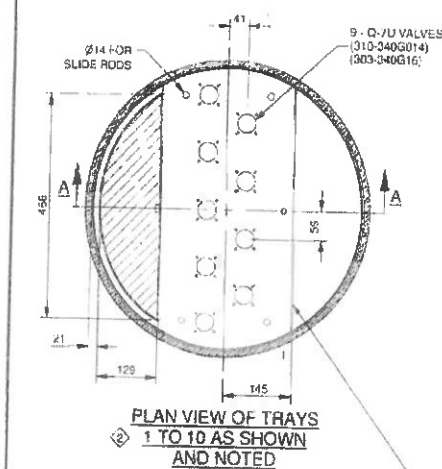
LIST OF MATERIAL	
DESCRIPTION	TYPE & THICKNESS
TRAY PANELS	316L - 12 GA.
DOWNCOMERS	316L - 12 GA.
SEAL PAN	316L - 12 GA.
DNCR BRACES	316L - 12 GA.
BANDING	316L - 14 GA.
RETAINING RING	316L - 14 GA.
SLIDE RODS	316L - 1/2" DIA
SPACERS	316L - 14 GA.
SPACER ANGLE	316L - 1/4"
ROD SUPPORTS	316L - 1/4"
SUPPORT LUGS	316L - 1/4"
GASKET 2-1/2" WIDE	PTFE COATED FIBERGLASS
BOLTS	316L - 1/4", 3/8" & 1/2"
NUTS	316L - 1/4", 3/8" & 1/2"
MISC HARDWARE	316L

EQUIPMENT DESCRIPTION		REMARKS	
QUAN	ITEM	DESCRIPTION	REMARKS
20		MVC-114CT	AS SHOWN & NOTED
NO. DESCRIPTION OF REVISION			
1	APPROVED FOR FABRICATION PER CUST.	DH, 16 JULY 10	DH
2	MARKED PRINTS RECEIVED 13 JULY 10	CJM 02 APR 13	MS
	CERTIFIED FINAL AS FABRICATED.		

CUSTOMER'S IDENTIFICATION	
P.O. NO. 123383	PLANT SITE: ALBERTA
USER: PARAMOUNT RESOURCES	REFERENCE:
SPEC. NO. KOCH-GLITSCH	PLANT SECTION:
TOWER SERVICE: STABILIZER	

MASS TRANSFER TECHNOLOGY	
MODEL: MVC-114CT	KOCH-GLITSCH LP
CARTRIDGE TRAY	UXBRIDGE, ONT.
SALES ORDER NO: 16462	CANADA
PART NO.	
WORK ORDER NO: 54851	

DRAWING ISSUE	
APPROVED FOR FABRICATION:	TOWER NO. 1
BY: DH	CERTIFIED FINAL
DATE: 7/16/2010	AS FABRICATED
CHECK BY: HAG	DATE: 7/16/2010
PROCESS: BCO	DATE: 7/16/2010
DATE: 7/16/2010	DATE: 7/16/2010

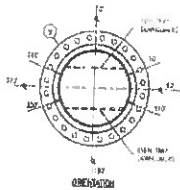


- NOTES**

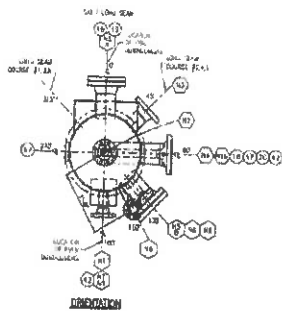
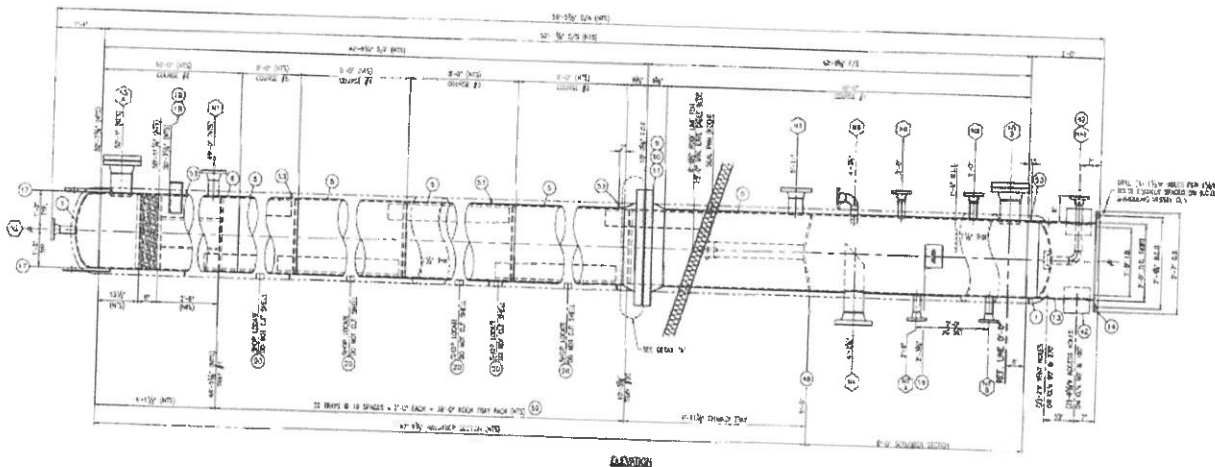
 1. TOWER MANHOLE L.O. ACTUAL 5/16" B BODY FRACTION.
 2. PARTS SUPPLIED BY CUSTOMER GUSCH ARE IDENTIFIED BY MARK (E.G. A361) ENCLOSED AS SHOWN (SEE 3/23/70)
 3. BOLTING ASSEMBLIES ARE ENCLOSED THUS QUANTITY PER TRAY = ASSEMBLY NUMBER
 4. DIMENSIONS ARE GIVEN IN MILLIMETERS
 5. ANY MODIFICATIONS BY CUSTOMER OR ANY THIRD PARTY TO THE EQUIPMENT SHOWN ON THIS DRAWING WITHOUT THE WRITTEN APPROVAL OF KOCH-GLTSCH WILL VOID ALL EXPRESS AND IMPLIED WARRANTIES, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PURPOSE
 6. MECHANICAL PARTS ARE NUMBERED FROM TOP TO BOTTOM

LIST OF MATERIAL			
DESCRIPTION		TYPE & THICKNESS	
TRAY PANELS		316L - 12 GA	
DOWNCOMERS		316L - 12 GA	
SEAL PAN		316L - 12 GA	
DNCR BRACES		316L - 12 GA	
BANDING		316L - 14 GA	
RETAINING RIG		316L - 14 GA	
S. RODS		316L - 1/2" DIA	
SPACERS		316L - 14 GA	
SPACER ANGLE		316L - 1/4"	
ROD SUPPORTS		316L - 1/4"	
SUPPORT LUGS		316L - 1/4"	
GASKET 2-1/2" WIDE		PTFE COATED FIBERGLASS	
BOLTS		316L - 1/4", 3/8" & 1/2"	
NUTS		316L - 1/4", 3/8" & 1/2"	
MISC HARDWARE		316L	
EQUIPMENT DESCRIPTION			
QUAN	ITEM	DESCRIPTION	REMARKS
20		MYC-11AC7	AS SHOWN & NOTED
NO. DESCRIPTION OF REVISION		CHG BY/DATE	APPROV
1	APPROVES FOR FABRICATION PER QUST MARKED PRINTS RECEIVED 13 JULY 10	DN 16 JULY 10	DN
2	CERTIFIED FINAL AS FABRICATED	CH 22 APR 13	MS
CUSTOMER'S IDENTIFICATION			
(PURCHASED BY) ALCO RD & GAS (P.O. NO. 12738)			
P.O.#/ACCOUNT RESOURCES SHEL INC. KOCH-GLITCH TOWER SERVICE ESTABLISHER		PLANT SITE ALBERTA REFERENCE: PLANT SECTION:	
 KOCH-GLITCH™ MASS TRANSFER TECHNOLOGY		KOCH-GLITCH LP URBINOX, ONT. CANADA	
MODEL: MYC-11AC7 CATRICAT TRAY			
DRAWS BY: DM DATE: 7/5/2010 CHECK BY: MAC DATE: 7/6/2010 PROC239 BAG DATE:		SALES ORDER NO: 16462 PART NO. ORDER NUMBER: 56851	
DRAWING ISSUE			
APPROVED FOR: _____ BY: DM NY: CJM DATE: 7/6/2010 DATE: 5/2/2013		TOWER I.D.: _____ TOWER: V-1056-1 SHEET: C10-10462-0359 DWT. 1 OF 3 REV. 0	

W:\016xxx\16462\MechDesign - Uxbridge\Native\C10-16415-D359\SH-1 TOP TRAY PLAN AND SECTION.dwg



NOZZLE SCHEDULE									
NO.	SIZE	RATING	TYPE	SERVICE	NOZZLE	REPAIR	TEST	WELD	REMARKS
N1	2"	CL300	RF	CONDENSATE INLET					
N2	2"	CL300	RF	CONDENSATE INLET					
N3	4"	CL300	RF	CONDENSATE INLET					
N4	4"	CL300	RF	CONDENSATE INLET					
N5	4"	CL300	RF	CONDENSATE INLET					
N6	4"	CL300	RF	CONDENSATE INLET					
N7	4"	CL300	RF	CONDENSATE INLET					
N8	4"	CL300	RF	CONDENSATE INLET					
N9	4"	CL300	RF	CONDENSATE INLET					
N10	4"	CL300	RF	CONDENSATE INLET					
N11	4"	CL300	RF	CONDENSATE INLET					
N12	4"	CL300	RF	CONDENSATE INLET					



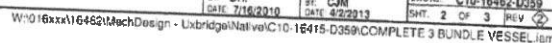
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PROJECT	CONDENSATE INLET	PROJECT	CONDENSATE INLET	PROJECT	CONDENSATE INLET	PROJECT	CONDENSATE INLET	PROJECT	CONDENSATE INLET
DESIGNER	SA-101-701	DESIGNER	SA-101-701	DESIGNER	SA-101-701	DESIGNER	SA-101-701	DESIGNER	SA-101-701
CHECKER	SA-101-701	CHECKER	SA-101-701	CHECKER	SA-101-701	CHECKER	SA-101-701	CHECKER	SA-101-701
DATE	2010-01-01	DATE	2010-01-01	DATE	2010-01-01	DATE	2010-01-01	DATE	2010-01-01
REVISION	1	REVISION	1	REVISION	1	REVISION	1	REVISION	1
DESCRIPTION	CONDENSATE INLET	DESCRIPTION	CONDENSATE INLET	DESCRIPTION	CONDENSATE INLET	DESCRIPTION	CONDENSATE INLET	DESCRIPTION	CONDENSATE INLET
WELDING	SA-101-701	WELDING	SA-101-701	WELDING	SA-101-701	WELDING	SA-101-701	WELDING	SA-101-701
NOZZLES	SA-101-701	NOZZLES	SA-101-701	NOZZLES	SA-101-701	NOZZLES	SA-101-701	NOZZLES	SA-101-701
FLANGES	SA-101-701	FLANGES	SA-101-701	FLANGES	SA-101-701	FLANGES	SA-101-701	FLANGES	SA-101-701
STUDS	SA-101-701	STUDS	SA-101-701	STUDS	SA-101-701	STUDS	SA-101-701	STUDS	SA-101-701
NUTS	SA-101-701	NUTS	SA-101-701	NUTS	SA-101-701	NUTS	SA-101-701	NUTS	SA-101-701
WASHERS	SA-101-701	WASHERS	SA-101-701	WASHERS	SA-101-701	WASHERS	SA-101-701	WASHERS	SA-101-701
SPACERS	SA-101-701	SPACERS	SA-101-701	SPACERS	SA-101-701	SPACERS	SA-101-701	SPACERS	SA-101-701
COUPLERS	SA-101-701	COUPLERS	SA-101-701	COUPLERS	SA-101-701	COUPLERS	SA-101-701	COUPLERS	SA-101-701
INTERVALS	SA-101-701	INTERVALS	SA-101-701	INTERVALS	SA-101-701	INTERVALS	SA-101-701	INTERVALS	SA-101-701
TESTING	SA-101-701	TESTING	SA-101-701	TESTING	SA-101-701	TESTING	SA-101-701	TESTING	SA-101-701
SHIPPING	SA-101-701	SHIPPING	SA-101-701	SHIPPING	SA-101-701	SHIPPING	SA-101-701	SHIPPING	SA-101-701
REMARKS	SA-101-701	REMARKS	SA-101-701	REMARKS	SA-101-701	REMARKS	SA-101-701	REMARKS	SA-101-701

NOTES									
1. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.									
2. ALL MATERIALS SHALL BE AS SPECIFIED IN THE MATERIAL SPECIFICATION.									
3. ALL WELDING SHALL BE DONE IN ACCORDANCE WITH THE WELDING SPECIFICATION.									
4. ALL NOZZLES SHALL BE INSTALLED IN ACCORDANCE WITH THE NOZZLE SCHEDULE.									
5. ALL FLANGES SHALL BE INSTALLED IN ACCORDANCE WITH THE FLANGE SPECIFICATION.									
6. ALL STUDS SHALL BE INSTALLED IN ACCORDANCE WITH THE STUD SPECIFICATION.									
7. ALL NUTS SHALL BE INSTALLED IN ACCORDANCE WITH THE NUT SPECIFICATION.									
8. ALL WASHERS SHALL BE INSTALLED IN ACCORDANCE WITH THE WASHER SPECIFICATION.									
9. ALL SPACERS SHALL BE INSTALLED IN ACCORDANCE WITH THE SPACER SPECIFICATION.									
10. ALL COUPLERS SHALL BE INSTALLED IN ACCORDANCE WITH THE COUPLER SPECIFICATION.									
11. ALL INTERVALS SHALL BE INSTALLED IN ACCORDANCE WITH THE INTERVAL SPECIFICATION.									
12. ALL TESTING SHALL BE DONE IN ACCORDANCE WITH THE TESTING SPECIFICATION.									
13. ALL SHIPPING SHALL BE DONE IN ACCORDANCE WITH THE SHIPPING SPECIFICATION.									
14. ALL REMARKS SHALL BE DONE IN ACCORDANCE WITH THE REMARKS SPECIFICATION.									

REFERENCE DRAWINGS									
NO.	DESCRIPTION	NO.	DESCRIPTION	NO.	DESCRIPTION	NO.	DESCRIPTION	NO.	DESCRIPTION
1	SA-101-701	2	SA-101-701	3	SA-101-701	4	SA-101-701	5	SA-101-701
6	SA-101-701	7	SA-101-701	8	SA-101-701	9	SA-101-701	10	SA-101-701
11	SA-101-701	12	SA-101-701	13	SA-101-701	14	SA-101-701	15	SA-101-701
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36	SA-101-701	37	SA-101-701	38	SA-101-701	39	SA-101-701	40	SA-101-701
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76	SA-101-701	77	SA-101-701	78	SA-101-701	79	SA-101-701	80	SA-101-701
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86	SA-101-701	87	SA-101-701	88	SA-101-701	89	SA-101-701	90	SA-101-701
91	SA-101-701	92	SA-101-701	93	SA-101-701	94	SA-101-701	95	SA-101-701
96	SA-101-701	97	SA-101-701	98	SA-101-701	99	SA-101-701	100	SA-101-701

DATE	2010-01-01	DATE	2010-01-01	DATE	2010-01-01	DATE	2010-01-01	DATE	2010-01-01
W.D. NO.	2010-01-01	W.D. NO.	2010-01-01	W.D. NO.	2010-01-01	W.D. NO.	2010-01-01	W.D. NO.	2010-01-01
PROJECT	CONDENSATE INLET	PROJECT	CONDENSATE INLET	PROJECT	CONDENSATE INLET	PROJECT	CONDENSATE INLET	PROJECT	CONDENSATE INLET
DESIGNER	SA-101-701	DESIGNER	SA-101-701	DESIGNER	SA-101-701	DESIGNER	SA-101-701	DESIGNER	SA-101-701
CHECKER	SA-101-701	CHECKER	SA-101-701	CHECKER	SA-101-701	CHECKER	SA-101-701	CHECKER	SA-101-701
DATE	2010-01-01	DATE	2010-01-01	DATE	2010-01-01	DATE	2010-01-01	DATE	2010-01-01
REVISION	1	REVISION	1	REVISION	1	REVISION	1	REVISION	1
DESCRIPTION	CONDENSATE INLET	DESCRIPTION	CONDENSATE INLET	DESCRIPTION	CONDENSATE INLET	DESCRIPTION	CONDENSATE INLET	DESCRIPTION	CONDENSATE INLET
WELDING	SA-101-701	WELDING	SA-101-701	WELDING	SA-101-701	WELDING	SA-101-701	WELDING	SA-101-701
NOZZLES	SA-101-701	NOZZLES	SA-101-701	NOZZLES	SA-101-701	NOZZLES	SA-101-701	NOZZLES	SA-101-701
FLANGES	SA-101-701	FLANGES	SA-101-701	FLANGES	SA-101-701	FLANGES	SA-101-701	FLANGES	SA-101-701
STUDS	SA-101-701	STUDS	SA-101-701	STUDS	SA-101-701	STUDS	SA-101-701	STUDS	SA-101-701
NUTS	SA-101-701	NUTS	SA-101-701	NUTS	SA-101-701	NUTS	SA-101-701	NUTS	SA-101-701
WASHERS	SA-101-701	WASHERS	SA-101-701	WASHERS	SA-101-701	WASHERS	SA-101-701	WASHERS	SA-101-701
SPACERS	SA-101-701	SPACERS	SA-101-701	SPACERS	SA-101-701	SPACERS	SA-101-701	SPACERS	SA-101-701
COUPLERS	SA-101-701	COUPLERS	SA-101-701	COUPLERS	SA-101-701	COUPLERS	SA-101-701	COUPLERS	SA-101-701
INTERVALS	SA-101-701	INTERVALS	SA-101-701	INTERVALS	SA-101-701	INTERVALS	SA-101-701	INTERVALS	SA-101-701
TESTING	SA-101-701	TESTING	SA-101-701	TESTING	SA-101-701	TESTING	SA-101-701	TESTING	SA-101-701
SHIPPING	SA-101-701	SHIPPING	SA-101-701	SHIPPING	SA-101-701	SHIPPING	SA-101-701	SHIPPING	SA-101-701
REMARKS	SA-101-701	REMARKS	SA-101-701	REMARKS	SA-101-701	REMARKS	SA-101-701	REMARKS	SA-101-701

0-1000-1500-00-001/001



(iv) Aircraft Liability insurance covering all aircraft owned or non-owned, operated and/or licensed by Contractor (but only insofar as any such aircraft are used to provide the Services), with a bodily injury, death and property damage limit of Two Million Dollars (\$2,000,000.00) inclusive.

Insurance policies herein maintained by the Contractor shall include a waiver of subrogation in favor of Corporation. Insurance policies herein maintained by the Contractor shall include a provision obligating the insurer to give Corporation thirty (30) days advance written notice of cancellation or of any material changes to commencement of the Services hereunder and from time to time during the term of this Contract. Contractor shall deliver to Corporation evidence of full compliance with the above insurance provisions. Failure to obtain and maintain such insurance as aforesaid shall constitute sufficient grounds for immediate termination of this Contract.

ACCEPTANCE OF SERVICES

(a) When Contractor considers it has completed the Services to be performed under this Contract, including all testing and inspection required by the terms hereof, Contractor shall inform Corporation in writing that the Services have been completed and are ready for turning over to the care, custody and control of Corporation.

(b) Corporation shall either, within a period of thirty (30) days, accept the Services or inform Contractor by means of a Certificate of Substantial Completion, of the outstanding Services to be performed. This procedure will be repeated until Corporation is satisfied that the Services herein have been properly completed to the satisfaction of the Corporation.

TITLE
Title to the Goods shall pass from Contractor to Corporation upon receipt and acceptance of the Goods by Corporation at delivery location.

PREVIOUS DEALINGS

No previous waiver or course of dealing shall affect Corporation's rights to strict performance of this Contract.

ACQUAINTANCE WITH JOB SITE

(a) Contractor shall fully acquaint itself with the job site, the location and the nature of any underground facilities including, but not limited to electrical transmission lines, pipeline transmission lines, and petroleum and natural gas storage facilities. Corporation shall not accept responsibility for failure of Contractor to effect such acquaintance. In particular, Corporation shall not be liable for any increase in consideration due to Contractor's failure to anticipate difficulties which may be encountered.

(b) The consideration to be paid by Corporation to Contractor for the Goods supplied and the Services performed shall be the amount agreed upon between Corporation and Contractor prior to commencement of the performance of the Services and the supply of the Goods and Services in the locality where the Services are to be performed or the Goods are to be supplied. Regardless of any prices shown on this Contract, it must be understood that any decrease in market prices will be given effect when submitting invoices. No increase in price will be accepted without Corporation's written consent.

TERMINATION FOR CAUSE

If, in the opinion of Corporation, Contractor is in breach of any term hereof or if Contractor fails to supply the Goods or perform the Services, or if Contractor becomes bankrupt or insolvent, Corporation may in addition to any other remedy, on twenty-four (24) hours written notice to Contractor, terminate this Contract and recover from Contractor any losses sustained by reason of such termination.

TERMINATION WITHOUT CAUSE

Corporation may at any time cancel this Contract, in whole or in part, by written notice to Contractor. Corporation shall pay Contractor all actual direct costs and expenses incurred by Contractor with respect to this Contract, or cancelled portion of this Contract, prior to the date of cancellation.

FORCE MAJEURE

(a) For the purposes of this Article, "force majeure" means Acts of God, strikes, walkouts, or other industrial disturbances, acts of public enemies, wars, blockades, insurrections, riots, epidemics, and slides, lightning, earthquakes, fires storms, floods, washouts, nuclear and radiation activity, wars or Services are to be performed, or prohibitions by any board, department, commission or agency of a government within whose jurisdiction, inability to obtain materials, orders, restraints, or prohibitions by any board, department, commission or agency of a government within whose jurisdiction, inability to limitation any arrests and restraints of rules and people, civil disturbances, explosions and any other causes (except financial) not within the reasonable control of the party claiming a suspension of its obligations so far as they are affected by such cause which by the exercise of due diligence such party shall not have been able to avoid or overcome.

(b) If, during the term of this Contract, Corporation is prevented by force majeure from accepting the Services or Goods, then delivery or performance of this Contract shall be partially or wholly suspended during the force majeure and the time for delivery of the Goods or performance of the Services shall be correspondingly extended. In the event of force majeure Corporation necessarily reserves the right to cancel this Contract but Corporation shall pay Contractor all actual direct costs and expenses incurred by Contractor with respect to this Contract prior to the date of cancellation. In the event of force majeure, Contractor shall be excused from performance of the Service or delivery of the Goods but only for the duration of force majeure. The contractor shall promptly give the Corporation notice of the force majeure and the affected obligations.

RECORDS

(a) Contractor shall maintain a true and correct set of records pertaining to the Services performed and shall allow Corporation to audit such records upon reasonable request, provided, however, Contractor shall have the right to exclude any trade secrets, formulas or processes from such audit.

(b) Upon termination or expiry of this Contract, Contractor shall upon request return or provide to Corporation all data, information, records and documents, in all forms, obtained from the Corporation or produced in performance of the Contract.

DOCUMENTS

All drawings and specification furnished by Corporation or Contractor shall vest in Corporation and such documents shall not be disclosed by Contractor to any third party (except in connection with performance of the Contract) or used by Contractor to supply Goods or perform Services for third parties without the written consent of the Corporation.

INTERPRETATION
(a) Time shall be of the essence of this Contract.

(b) This Contract shall be governed and construed in accordance with the laws of Alberta and the courts of Alberta shall have exclusive jurisdiction with respect to any dispute arising directly or indirectly out of the Contract.

(c) Whenever the neuter, singular number or gender is used in this instrument the same shall be construed as including the plural and the masculine, feminine and neuter respectively where the fact or context so requires.

(d) The captions, headings, paragraph or section numbers appearing in this Contract are inserted only as a matter of convenience and in no way define, limit or describe the scope or intent of this Contract or any part thereof.

(e) This Contract shall bind the Contractor's permitted assigns, successors, executors, administrators and personal representatives.

TERMS AND CONDITIONS

1.
GENERAL

(a) Notwithstanding any provision of this Contract, the delivery of any goods pursuant to this Contract shall be deemed to constitute acceptance of this Contract and the terms and conditions herein by Contractor.
(b) The term "Goods" shall include all material parts, stock, merchandise, supplies and equipment that are sold, leased or rented by Contractor to Corporation pursuant to this Contract.
(c) The term "Services" shall include all work, labor, repair, maintenance and construction required to be performed by Contractor pursuant to this Contract date specified. Contractor shall make immediate shipment of Goods unless otherwise specified by Corporation. If Contractor is unable to make shipment of Goods on date specified, Corporation reserves the right to cancel all or any part of this Contract.
(d) Shipping of Goods and risk to Goods will be agreed upon in writing by the Corporation and Contractor in accordance with INCOTERMS (2010).
(e) All packages, cases, bundles, items, shall show Corporation's Contractor number and any other markings requested.
(f) Contractor agrees to deliver only the Goods or perform only the Services called for in this Contract. Corporation will accept no substitutes without prior agreement in writing between both parties.
(g) **QUALITY AND INSPECTION**
(a) All workmanship regarding the Services shall be first class in every respect and shall be performed diligently and continuously in a thorough, workmanlike manner in accordance with all terms and conditions of this Contract. Corporation's requirements and policies, including Corporation's Code of Business Conduct Policy (a copy of these policies is available upon request) and all applicable laws, regulations and orders.
(b) All Goods supplied hereunder shall comply strictly with all terms and conditions of Corporation's requirements and policies and all applicable laws, regulations and orders.
(c) All Goods and Services shall be subject to inspection, approval and acceptance by Corporation in order to ensure that the Goods and/or Services comply with the specifications herein. No payment thereunder shall be made until the Goods and/or Services provided herein have been approved and accepted by Corporation.
(d) Rejected Goods shall be held by Corporation or returned to Contractor both at Contractor's risk and expense.
(e) Contractor shall refund in full all moneys paid to it by Corporation for all rejected Services within thirty (30) days of date of written notice sent to it by Corporation.
(f) Payment for all, or part of the Goods and/or Services shall not constitute a waiver of Corporation's rights or privileges to reject any or all of the Goods and/or Services at any time within the duration of this Contract.
2.
WARRANTY

(a) Contractor warrants and guarantees that the Goods and Services supplied herein shall be suitable for and capable of meeting all designs and specifications required and shall be free from defects due to workmanship for a period of one (1) year from the date of acceptance by Corporation unless otherwise stated herein.
(b) Contractor also warrants that Contractor, its agents and employees have the necessary professional skills to ensure successful completion of the Services.
(c) Contractor warrants and guarantees the Goods supplied herein shall be fit for the purposes intended and capable of meeting all specifications and conditions reasonably made known to Contractor by Corporation or if no purpose has been made known, the Goods shall be of merchantable quality and shall be free from defects in material and workmanship. This warranty and guarantee shall apply and be in force for a period of one (1) year from the date of title passing from Contractor to Corporation pursuant to clause 12 hereof unless otherwise stated herein. Contractor shall not be obligated to guarantee Goods supplied by others except Contractor shall endeavor to obtain on behalf of Corporation the usual manufacturer's guarantee in respect of such Goods.
(d) In the event that within one (1) year from the date of acceptance, any of the Services and/or Goods supplied hereunder fail to meet the specifications and conditions required herein, in the sole opinion of the Corporation, Contractor shall, upon receipt of written notice from Corporation either:
(i) furnish all Goods and Services to replace or repair the same, without any further, charges or costs, to the satisfaction of Corporation; or
(ii) pay forthwith to Corporation the cost of all Goods and Services to replace or repair same
3.
INDEPENDENT CONTRACTOR

(a) Contractor is an independent contractor, and all persons employed by Contractor in connection herewith shall be its own employees or agents and not employees or agents of Corporation in any respect.
(b) **INDEMNITY**
Contractor shall indemnify and defend Corporation against all suits, fines, costs, including solicitor and client costs, claims, demands, actions, losses, damages and expenses of any kind or nature whatsoever by law or equity, including without limiting the generality of the foregoing, claims relating to patents, copyrights or similar rights and liability for injury or harm to persons or property resulting from, arising out of, or in any way connected with the performance of the Services or the supply of Goods by Contractor, its agents, or employees, excepting only such injury or harm as may be caused solely by the gross negligence of Corporation
(c) **INDEMNITY AGAINST CLAIMS**
(a) Contractor shall promptly pay all claims of persons, corporations or firms furnishing the Goods or Services
(b) Corporation may, as a condition precedent to any payment hereunder, require Contractor to submit satisfactory evidence of payment and releases of all such claims in the form of a lien waiver duly commissioned or notarized as required.
(c) If there is any evidence of such unpaid claims, Corporation may withhold any payment until Contractor furnishes evidence of such payment and release of all such claims.
(d) Contractor shall indemnify and defend Corporation from and against any liability or loss arising from any such claim
4.
NON-ASSIGNMENT

(a) Any assignment of this Contract, by operation of law or otherwise, without the prior written consent of Corporation, shall be void.
(b) **LAWS AND REGULATIONS**
(a) Contractor shall comply with all Federal, Provincial and local statutes, regulations and orders of authorities having jurisdiction in connection with the performance of this Contract.
(b) Contractor shall comply with all Federal, Provincial and local statutes and regulations applicable to employees, including without limiting the generality of the foregoing, the Workers' Compensation Act (Alberta), the Occupational Health and Safety Act (Alberta), the Employment Insurance Act (Canada) and the Income Tax Act (Canada)
5.
ADDITIONAL EXPENDITURES

(a) Contractor acknowledges that any loss or additional expenditures incurred except those set out herein shall be the full and sole responsibility of Contractor.
(b) **INSURANCE**
When providing Services under this Contract, Contractor shall take out, pay for and maintain with a reputable insurance company or companies the following insurance, namely:
(i) Employee's Liability Insurance covering every employee engaged in the Services to the extent of Five Hundred Thousand Dollars (\$500,000.00) where such employee is not covered by the Workers' Compensation Legislation.
(ii) Automobile Liability Insurance covering all motor vehicles, owned or non-owned, operated and/or licensed by Contractor, with a bodily injury and property damage limit of Two Million Dollars (\$2,000,000.00) inclusive.
(iii) Comprehensive General Liability Insurance with a bodily injury, death and property damage limit of Two Million Dollars (\$2,000,000.00) inclusive and, without restricting the generality of the foregoing, such provision shall include Contractual Liability, Tortious Liability, Contractor's Protective Liability and Products and Completed Operations Liability
6.
INSURANCE

(a) Contractor acknowledges that any loss or additional expenditures incurred except those set out herein shall be the full and sole responsibility of Contractor.
(b) **INSURANCE**
When providing Services under this Contract, Contractor shall take out, pay for and maintain with a reputable insurance company or companies the following insurance, namely:
(i) Employee's Liability Insurance covering every employee engaged in the Services to the extent of Five Hundred Thousand Dollars (\$500,000.00) where such employee is not covered by the Workers' Compensation Legislation.
(ii) Automobile Liability Insurance covering all motor vehicles, owned or non-owned, operated and/or licensed by Contractor, with a bodily injury and property damage limit of Two Million Dollars (\$2,000,000.00) inclusive.
(iii) Comprehensive General Liability Insurance with a bodily injury, death and property damage limit of Two Million Dollars (\$2,000,000.00) inclusive and, without restricting the generality of the foregoing, such provision shall include Contractual Liability, Tortious Liability, Contractor's Protective Liability and Products and Completed Operations Liability
7.
INSURANCE

(a) Contractor acknowledges that any loss or additional expenditures incurred except those set out herein shall be the full and sole responsibility of Contractor.
(b) **INSURANCE**
When providing Services under this Contract, Contractor shall take out, pay for and maintain with a reputable insurance company or companies the following insurance, namely:
(i) Employee's Liability Insurance covering every employee engaged in the Services to the extent of Five Hundred Thousand Dollars (\$500,000.00) where such employee is not covered by the Workers' Compensation Legislation.
(ii) Automobile Liability Insurance covering all motor vehicles, owned or non-owned, operated and/or licensed by Contractor, with a bodily injury and property damage limit of Two Million Dollars (\$2,000,000.00) inclusive.
(iii) Comprehensive General Liability Insurance with a bodily injury, death and property damage limit of Two Million Dollars (\$2,000,000.00) inclusive and, without restricting the generality of the foregoing, such provision shall include Contractual Liability, Tortious Liability, Contractor's Protective Liability and Products and Completed Operations Liability
8.
INSURANCE

(a) Contractor acknowledges that any loss or additional expenditures incurred except those set out herein shall be the full and sole responsibility of Contractor.
(b) **INSURANCE**
When providing Services under this Contract, Contractor shall take out, pay for and maintain with a reputable insurance company or companies the following insurance, namely:
(i) Employee's Liability Insurance covering every employee engaged in the Services to the extent of Five Hundred Thousand Dollars (\$500,000.00) where such employee is not covered by the Workers' Compensation Legislation.
(ii) Automobile Liability Insurance covering all motor vehicles, owned or non-owned, operated and/or licensed by Contractor, with a bodily injury and property damage limit of Two Million Dollars (\$2,000,000.00) inclusive.
(iii) Comprehensive General Liability Insurance with a bodily injury, death and property damage limit of Two Million Dollars (\$2,000,000.00) inclusive and, without restricting the generality of the foregoing, such provision shall include Contractual Liability, Tortious Liability, Contractor's Protective Liability and Products and Completed Operations Liability
9.
INSURANCE

(a) Contractor acknowledges that any loss or additional expenditures incurred except those set out herein shall be the full and sole responsibility of Contractor.
(b) **INSURANCE**
When providing Services under this Contract, Contractor shall take out, pay for and maintain with a reputable insurance company or companies the following insurance, namely:
(i) Employee's Liability Insurance covering every employee engaged in the Services to the extent of Five Hundred Thousand Dollars (\$500,000.00) where such employee is not covered by the Workers' Compensation Legislation.
(ii) Automobile Liability Insurance covering all motor vehicles, owned or non-owned, operated and/or licensed by Contractor, with a bodily injury and property damage limit of Two Million Dollars (\$2,000,000.00) inclusive.
(iii) Comprehensive General Liability Insurance with a bodily injury, death and property damage limit of Two Million Dollars (\$2,000,000.00) inclusive and, without restricting the generality of the foregoing, such provision shall include Contractual Liability, Tortious Liability, Contractor's Protective Liability and Products and Completed Operations Liability
10.
INSURANCE

(a) Contractor acknowledges that any loss or additional expenditures incurred except those set out herein shall be the full and sole responsibility of Contractor.
(b) **INSURANCE**
When providing Services under this Contract, Contractor shall take out, pay for and maintain with a reputable insurance company or companies the following insurance, namely:
(i) Employee's Liability Insurance covering every employee engaged in the Services to the extent of Five Hundred Thousand Dollars (\$500,000.00) where such employee is not covered by the Workers' Compensation Legislation.
(ii) Automobile Liability Insurance covering all motor vehicles, owned or non-owned, operated and/or licensed by Contractor, with a bodily injury and property damage limit of Two Million Dollars (\$2,000,000.00) inclusive.
(iii) Comprehensive General Liability Insurance with a bodily injury, death and property damage limit of Two Million Dollars (\$2,000,000.00) inclusive and, without restricting the generality of the foregoing, such provision shall include Contractual Liability, Tortious Liability, Contractor's Protective Liability and Products and Completed Operations Liability

	Revision 1	
	SPECIFICATION NUMBER	PR-CS-01
	CONSTRUCTION SPECIFICATION	GENERAL PIPELINE CONSTRUCTION SPECIFICATION
	September 29, 2010	

Table 6 -Bolt Torque Data for RF Flanges and Spiral Wound Gaskets

Note: Target Pre-load Stress: 207 MPa (30,000 psi)

Bolt Diameter inches	Area @ Thread Root in ²	Torque Non-Lubricated ft-lb	Torque Lubricated ft-lb
1/2 (unc series)	0.126	60	30
5/8 (unc series)	0.202	120	60
3/4 (unc series)	0.302	200	100
7/8 (unc series)	0.419	320	160
1 (unc series)	0.551	490	245
1 1/8 (8 pitch series)	0.728	710	355
1 1/4 (8 pitch series)	0.929	1000	500
1 3/8 (8 pitch series)	1.155	1360	680
1 1/2 (8 pitch series)	1.405	1600	800
1 5/8 (8 pitch series)	1.680	2200	1100
1 3/4 (8 pitch series)	1.980	3000	1500
1 7/8 (8 pitch series)	2.304	4000	2000
2 (8 pitch series)	2.652	4400	2200
2 1/4 (8 pitch series)	3.423	6360	3180
2 1/2 (8 pitch series)	4.292	8800	4400
2 3/4 (8 pitch series)	5.259	11840	5920
3 (8 pitch series)	6.324	15440	7720

General Notes:

- These values are recommended for all medium and high strength bolting (e.g., A193-B7, A193-B7M, A193-L7, A193-L7M, and A193-B8/B8M Cl.2). These values are not suitable for low strength bolting materials such as A307-B and A193-B8/B8M Cl.1. Low strength bolting should not normally be used.
- For lubricated bolts, actual required torque values may be 50 to 150% of that specified due to large variations in lubrication efficiency (in part due to variations in lubrication products). The efficiency of a non-lubricated bolt is normally about 50% of a well-lubricated bolt, but may be as low as 25%.
- Stress relaxation of bolts will occur over time. At normal ambient temperatures, approximately 85 to 90% of initial stress will be retained after 1000 hours; at higher temperatures much more stress relaxation may occur.
- All bolting, with the exception of Teflon coated, shall be lubricated prior to installation.
- Preload stresses for critical service bolting should not be achieved using torque control. Critical service bolting should be tightened using tensioning equipment, or direct stress measurement (ultrasonic equipment).
- Alternatively, specialized bolts with stress indicating devices built in are available and are recommended when ongoing confirmation of bolt stress levels is required.