

Client: Encana Corporation

Project: Tower 03-07 Sweet Gas Plant

Location: Dawson Creek, BC, Canada

Contract Number: A6UE

Inquiry Number: A6UE-4-0607-03-07-RQ-01

PO Number:

Equipment Service: Produced Water Disposal Pumps

Item Tag(s): TOW0307-P-9104A/B/C

TOW0307-PM-9104A/B/C

B	20-Mar-15	Issued for Quotation	HL	RC	RK	DS	
A	5-Mar-15	Issued for Review	SG	HL	RK	DS	
Rev	Date	Description	By	Checked	Process Checked	Approved	
			Document Number: TOW0307-C-070-EDS-P-9104				
			Sheet: 1 Of 10				

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CENTRIFUGAL PUMP



DATA SHEET

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1	CLIENT: Encana Corporation
2	SERVICE: Produced Water Disposal Pumps PLANT: Tower 03-07 Sweet Gas Plant Site: Dawson Creek, BC, Canada
3	NO. REQ'D: 3 PUMP SIZE: TYPE: NO. STAGES:
4	MANUFACTURER: MODEL: SERIAL NO.:
5	APPLICABLE TO: <input checked="" type="radio"/> Proposal DRIVER: TOW0307-PM-9104A/B/C

LIQUID CHARACTERISTICS						
UNITS	MAXIMUM	MINIMUM	NOTE	SERVICE :	INTERMITTENT	
LIQUID TYPE OR NAME:	Produced Water	Produced Water	Max & Min values refer only to the property listed	*IF INTERMITTENT NO. OF STARTS / DAY		
VAPOR PRESSURE:	kPa(a) 4.24	1.26		PUMPS OPERATE IN:	PARALLEL	
RELATIVE DENSITY:	1132	1114		CORROSION DUE TO: (6.12.1.19)		
SPECIFIC HEAT:	kJ/kg°C 4.318	4.313		EROSION DUE TO: (6.12.1.19)		
VISCOSITY:	Pa s 1.300	0.797		H ₂ S CONCENTRATION (ppm): (6.12.1.12)		
OPERATING CONDITIONS						
UNITS	MAXIMUM	RATED	NORMAL	MINIMUM	PARTICULATE SIZE (DIA. IN MICRONS):	
NPSHa Datum	C.L. IMPELLER					PARTICULATE CONCENTRATION (ppm):
PUMPING TEMP.:	°C	30.0				
FLOW:	m³/h	50.0				
DISCHARGE PRESS: (6.3.2)	kPa g	10324.0				
SUCTION PRESSURE:	kPa g	-4.8				
DIFFERENTIAL PRESS.:	kPa	10329				
DIFFERENTIAL HEAD:	m	945.1				
NPSH _a :	m	6.47 (Note 2)				
HYDRAULIC POWER:	KW	143.5 (Note 3)				

SITE AND UTILITY DATA																									
LOCATION:			COOLING WATER: Not Available																						
<input checked="" type="checkbox"/> INDOOR <input checked="" type="checkbox"/> HEATED <input checked="" type="checkbox"/> UNDER ROOF																									
MOUNTED AT:			<input type="checkbox"/> TROPICALIZATION REQ'D <input checked="" type="checkbox"/> UNCLASSIFIED																						
ELECTRICAL AREA CLASSIFICATION:			SOURCE																						
CLASS:	ZONE:	TEMP ID:	COOLING WATER CHLORIDE CONCENTRATION: ppm																						
SITE DATA:			INSTRUMENT AIR: MAX: 730 kPa g MIN: 414 kPa g																						
ELEVATION (MSL):	795.6 m	BAROMETER:	92 kPa a	Normal Press: 690 kPa g @ 27 deg C normal, 35 deg C max.																					
RANGE OF AMBIENT TEMPS: MIN / MAX	-40 / 35 °C	STEAM: Not Available																							
RELATIVE HUMIDITY: MIN / MAX	/ %	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2"></th> <th style="width: 15%;">DRIVERS</th> <th style="width: 15%;">HEATING</th> </tr> </thead> <tbody> <tr> <td>TEMP</td> <td>°C</td> <td>MAX</td> <td></td> </tr> <tr> <td></td> <td></td> <td>MIN</td> <td></td> </tr> <tr> <td>PRESS.</td> <td>kPa g</td> <td>MAX</td> <td></td> </tr> <tr> <td></td> <td></td> <td>MIN</td> <td></td> </tr> </tbody> </table>						DRIVERS	HEATING	TEMP	°C	MAX				MIN		PRESS.	kPa g	MAX				MIN	
		DRIVERS	HEATING																						
TEMP	°C	MAX																							
		MIN																							
PRESS.	kPa g	MAX																							
		MIN																							
UNUSUAL CONDITIONS:																									
UTILITY CONDITIONS:																									
ELECTRICITY:	DRIVERS	HEATING	CONTROL	SHUTDOWN																					
VOLTAGE	575	208/120	120																						
PHASE	3	1	1																						
HERTZ	60	60	60																						

- NOTES**
- 1 Non API pump is required for the service even with API pump template being used.
 - 2 NPSH Available is based on pump suction and discharge nozzle centerline at 1750mm above grade and includes 1m safety margin.
 - 3 The required horsepower was calculated using the density of produced water (1114kg/m3) and the differential head at rated flow
 - 4 The Produced Water chloride level is 142000 ppmw. Produced Water also contains 12 ppmw O2.



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	PERFORMANCE	DRIVER (7.1.5)
2	PROPOSAL CURVE NO.: _____ RPM	DRIVER TYPE: INDUCTION MOTOR
3	As Tested Curve No.: _____	GEAR: _____ NO
4	IMPELLER DIA.: RATED: _____ MAX: _____ MIN: _____ mm	VARIABLE SPEED REQUIRED: _____ YES
5	RATED POWER: _____ KW EFFICIENCY: _____ %	SOURCE OF VARIABLE SPEED: _____ MOTOR
6	RATED CURVE BEP FLOW (at rated impeller dia.) _____ m ³ /s	OTHER: _____
7	MIN. FLOW THERMAL : _____ m ³ /s STABLE : _____ m ³ /s	MANUFACTURER: _____
8	PREFERRED OPERATING REGION: (6.1.11) _____ to _____ m ³ /s	NAMEPLATE POWER: _____ KW
9	ALLOWABLE OPERATING REGION: _____ to _____ m ³ /s	NOMINAL RPM: _____
10	MAX. HEAD @ RATED IMPELLER: _____ m	RATED LOAD RPM: _____
11	_____ mt	FRAME OR MODEL: _____
12	NPSHR at RATED FLOW : _____ m	ORIENTATION: HORIZONTAL
13	CL PUMP TO U/S BASEPLATE: _____ m	LUBE: _____
14	NPSHR MARGIN at RATED FLOW : _____ m	BEARING TYPE: _____
15	SPECIFIC SPEED: (6.1.9) _____ m ³ /s,rpm,m	RADIAL: _____ / _____
16	SUCTION SPECIFIC SPEED LIMIT: _____ gpm,rpm,ft 11,000	THRUST: _____ / _____
17	SUCTION SPECIFIC SPEED: _____ m ³ /s,rpm,m	STARTING METHOD: _____
18	MAX. ALLOW. SOUND PRESS. LEVEL REQ'D (6.1.14) _____ 85 (dBA)	SEE DRIVER DATA SHEET: TOW0307-P-070-DSX-PM-9104
19	EST. MAX SOUND PRESS. LEVEL _____ (dBA)	
20	MAX. SOUND POWER LEVEL REQ'D (6.1.14) _____ (dBA)	
21	EST. MAX SOUND POWER LEVEL _____ (dBA)	

	CONSTRUCTION	DRIVER (7.1.5)																																																	
23	API PUMP TYPE: BB4 [Based on API 610 Definitions]	CASING MOUNTING: _____																																																	
24		CASING TYPE: (6.3.10) _____																																																	
25	NOZZLE CONNECTIONS: (6.5.5)	OH3 BACKPULLOUT LIFTING DEVICE REQ'D (9.1.2.6) _____																																																	
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28 DISCHARGE			900	TOP																																															
29	PRESSURE CASING AUX. CONNECTIONS: (6.4.3.2)	MAWP: (6.3.6) _____ kPa g @ _____ °C																																																	
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36 WARM-UP LINE																																																			
37		SUCTION PRESS. REGIONS DESIGNED FOR MAWP _____																																																	
38	DRAIN VALVE SUPPLIED BY _____ SUPPLIER	ROTATION: (VIEWED FROM COUPLING END)																																																	
39	DRAINS MANIFOLDED _____ YES	- IMPELLERS INDIVIDUALLY SECURED: _____																																																	
40	VENT VALVE SUPPLIED BY _____	- BOLT OH 3/4/5 PUMP TO PAD / FOUNDATION: _____																																																	
41	VENTS MANIFOLDED _____	- PROVIDE SOLEPLATE FOR OH 3/4/5 PUMPS: _____																																																	
42	THREADED CONS FOR PIPELINE SERVICE & < 50°C (6.4.3.2) _____	ROTOR:																																																	
43	SPECIAL FITTINGS FOR TRANSITIONING (6.4.3.3) _____	SHAFT FLEXIBILITY INDEX (SFI) (9.1.1.3) _____																																																	
44	CYLINDRICAL THREADS REQUIRED (6.4.3.8) _____	First Critical Speed Wet (Multi stage pumps only) _____																																																	
45	GUSSET SUPPORT REQUIRED Note 5 _____ YES	COMPONENT BALANCE TO ISO 1940 G1.0 _____ Note 6																																																	
46	MACHINED AND STUDDED CONNECTIONS (6.4.3.12) _____	SHRINK FIT LIMITED MOVEMENT IMPELLERS (9.2.2.3) _____																																																	
47	VS 6 DRAIN _____	COUPLING: (7.2.3) (7.2.13.F)																																																	
48	DRAIN TO SKID EDGE _____ YES	MANUFACTURER: _____																																																	
49		MODEL: _____																																																	
50		RATING (POWER/100 RPM) _____																																																	
51		SPACER LENGTH _____ mm																																																	
52		SERVICE FACTOR _____ 1.5 Min.																																																	
53		RIGID _____ NO																																																	
54		COUPLING WITH HYDRAULIC FIT (7.2.10) _____ NO																																																	
55		COUPLING BALANCED TO ISO 1940-1 G6.3 (7.2.3) _____ Note 6																																																	
56		COUPLING WITH PROPRIETARY CLAMPING DEVICE (7.2.11) _____																																																	
57		COUPLING IN COMPLIANCE WITH (7.2.4) _____																																																	
58		COUPLING GUARD STANDARD PER (7.2.13.a) _____ Non-Sparking																																																	
59		WINDOW ON COUPLING GUARD _____																																																	

	NOTES
55	5 All casing connections shall be braced with gussets in two orthogonal planes.
57	6 Drive train components, including but not limited to impeller, pump rotor, motor rotor, shall be dynamically balanced to ISO 1940 G1.0. Transmission units of couplings shall be balanced to ISO 1940-1 balance quality grade 2.5.
58	
59	
60	

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1	CONSTRUCTION (CONT'D)		REV
2	MATERIAL (6.12.1.1)	BASEPLATE	
3	APPENDIX H CLASS: S-6: CS / 12% Cr (Note 8)	API BASEPLATE NUMBER:	
4	MINIMUM DESIGN METAL TEMP (6.12.4.1) -29 °C	BASEPLATE CONSTRUCTION (7.3.14) FULL TOP DECKING	
5	REDUCED HARDNESS MATERIALS REQ'D (6.12.1.12.1)	BASEPLATE DRAINAGE (7.3.1) ENTIRE BASEPLATE DRAIN RIM	
6	APPLICABLE HARDNESS STANDARD (6.12.1.12.3)	MOUNTING: BOLTED ON STEEL WORK	
7	BARREL:	NON-GROUT CONSTRUCTION: (7.3.13) REQUIRED	
8	CASE: CS + Internal Coating	VERTICAL LEVELING SCREWS: REQUIRED	
9	DIFFUSERS: 12% Cr	LONGITUDINAL DRIVER POSITIONING SCREWS: REQUIRED	
10	IMPELLER: 12% Cr	SUPPLIED WITH: - GROUT VENT HOLES YES	
11	IMPELLER WEAR RING:	- DRAIN CONNECTION YES	
12	CASE WEAR RING:	MOUNTING PADS SIZED FOR BASEPLATES LEVELING (7.3.5) YES	
13	SHAFT: AISI 4140	MOUNTING PADS TO BE MACHINED (7.3.6) YES	
14	BOWL (IF VS TYPE):	PROVIDE SPACER PLATE UNDER ALL EQUIPMENT FEET	
15	INSPECTION CLASS:	OTHER: Please refer to specific baseplate requirements in the requisition engineering notes.	
16	BEARINGS AND LUBRICATION (6.10.1.1)	NOTES	
17	BEARING (TYPE / NUMBER): (6.11.4)	7. All pumps and drivers shall be provided with flats in two planes to permit the use of hand held vibration monitoring equipment.	
18	RADIAL /	8. API D2 Super Duplex SS (A 890 grade 5A or 6A) shall be quoted as an option.	
19	THRUST /		
20	REVIEW AND APPROVE THRUST BEARING SIZE: (9.2.5.2.4)		
21	LUBRICATION: (6.10.2.2) (6.11.3) (9.6.1) Oil Lubricated		
22	PRESSURE LUBE SYSTEM TO ISO 10438- (9.2.6.5)		
23	○ ISO 10438 DATA SHEETS ATTACHED		
24	PRESSURIZED LUBE OIL SYSTEM MTD. ON PUMP BASEPLATE		
25	LOCATION OF PRESSURIZED LUBE OIL SYSTEM MOUNTED ON BASEPLATE:		
26			
27	INTERCONNECTING PIPING PROVIDED BY: SUPPLIER		
28	OIL VISC. ISO GRADE		
29	CONSTANT LEVEL OILER: REQUIRED (TRICO)	SEAL SUPPORT SYSTEM MOUNTING	
30	INSTRUMENTATION	SEAL SUPPORT MOUNTED ON PUMP BASEPLATE (7.5.1.4): YES	
31	SEE ATTACHED API-670 DATA SHEET NO	IDENTIFY LOCATION ON BASEPLATE:	
32	ACCELEROMETER (7.4.2.1)	INTERCONNECTING PIPING BY: SUPPLIER	
33	NUMBER OF ACCELEROMETERS		
34	MOUNTING LOCATION OF ACCELEROMETERS	MECHANICAL SEAL (6.8.1)	
35		SEE ATTACHED ISO 21049/API 682 DATA SHEET YES	
36	PROVISION FOR MTG ONLY (6.10.2.10) NO	ADDITIONAL CENTRAL FLUSH PORT (6.8.9)	
37	NUMBER OF ACCELEROMETERS	HEATING JACKET REQ'D (6.8.11) N/A	
38	MOUNTING LOCATION OF ACCELEROMETERS		
39		HEATING AND COOLING (6.1.17)	
40	FLAT SURFACE REQUIRED (6.10.2.11) YES	COOLING REQ'D NO	
41	NUMBER OF ACCELEROMETERS Note 7	COOLING WATER PIPING PLAN	
42	MOUNTING LOCATION OF ACCELEROMETERS	COOLING WATER PIPING	
43		FITTINGS	
44	VIBRATION PROBES (7.4.2.2)	COOLING WATER PIPING MATERIALS	
45	PROVISION FOR VIB. PROBES NO	COOLING WATER REQUIREMENTS:	
46	NUMBER PER RADIAL BEARING	BEARING HOUSING: m³/s	
47	NUMBER PER AXIAL BEARING	HEAT EXCHANGER: m³/s	
48	MONITORS AND CABLES SUPPLIED BY (7.4.2.4)	TOTAL COOLING WATER: m³/s	
49		HEATING MEDIUM	
50	TEMPERATURE (7.4.2.3)	OTHER:	
51	PROVISION FOR VIB. PROBES NO	HEATING PIPING:	
52	RADIAL BEARING TEMP.: °C		
53	NUMBER PER RADIAL BEARING	PIPING & APPURTENANCES	
54	THRUST BEARING TEMP.: °C	MANIFOLD PIPING FOR PURCHASER CONNECTION (7.5.1.6)	
55	NUMBER PER THRUST BEARING ACTIVE SIDE	VENT	
56	NUMBER PER THRUST BEARING INACTIVE SIDE	DRAIN YES	
57	TEMP GAGES (WITH THERMOWELLS) (9.1.3.6) NO	COOLING WATER N/A	
58	PRESSURE GAGE TYPE:	TAG ALL ORIFICES (7.5.2.4) YES	
59	Remarks	SOCKET WELD CONN ON SEAL GLAND (7.5.2.8)	
60			

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1	SURFACE PREPARATION AND PAINT	TEST	REV
2	SUPPLIER'S STANDARD YES	SHOP INSPECTION (8.1.1) YES	
3	OTHER (SEE BELOW)	PERFORMANCE CURVE & DATA APPROVAL PRIOR TO SHIPMENT YES	
4	SPECIFICATION NUMBER: _____	TEST WITH SUBSTITUTE SEAL (8.3.3.2.b) NO	
5	PUMP:	MATERIAL CERTIFICATION REQUIRED: CASING YES	
6	PUMP SURFACE PREPARATION: _____	Note 9 (6.12.1.8) IMPELLER YES	
7	PRIMER: _____	SHAFT YES	
8	FINISH COAT: _____	OTHER YES	
9	BASEPLATE:	CASTING REPAIR WELD PROCEDURE APPR. REQ'D (6.12.2.5)(6.12.3.1) YES	
10	BASEPLATE SURFACE PREPARATION: _____	INSPECTION REQUIRED FOR CONNECTION WELDS (6.12.3.4.d)	
11	PRIMER: _____	(6.12.3.4.e) MAG PARTICLE YES	
12	FINISH COAT: _____	RADIOGRAPHY YES	
13	DETAILS OF LIFTING DEVICES: _____	LIQUID PENETRANT YES	
14	SHIPMENT: (8.4.1) EXPORT	ULTRASONIC YES	
15	EXPORT BOXING REQUIRED YES	INSPECTION REQUIRED FOR CASTINGS	
16	OUTDOOR STORAGE MORE THAN 6 MONTHS YES	MAG PARTICLE YES	
17	SPARE ROTOR ASSEMBLY PACKAGED FOR:	RADIOGRAPHY YES	
18	ROTOR STORAGE ORIENTATION (9.2.8.2) YES	LIQUID PENETRANT YES	
19	SHIPPING & STORAGE CONTAINER FOR VERT. STORAGE (9.2.8.3) YES	ULTRASONIC YES	
20	N2 PURGE (9.2.8.4) YES	HARDNESS TEST REQUIRED (8.2.2.7) NO	
21	SPARE PARTS	ADDITIONAL SUBSURFACE EXAMINATION (6.12.1.5)(8.2.1.3) NO	
22	START-UP YES	FOR _____	
23	NORMAL MAINTENANCE YES	METHOD _____	
24		PMI TESTING REQUIRED (8.2.2.8) _____	
25	WEIGHTS kg	COMPONENTS TO BE TESTED: _____	
26	ITEM No. PUMP DRIVER GEAR BASE TOTAL	RESIDUAL BALANCE TEST (J.4.1.2) _____	
27		NOTIFICATION OF SUCCESSFUL SHOP PER. TEST (8.1.1.c)(8.3.3.5) YES	
28		BASEPLATE TEST (7.3.21) YES	
29		HYDROSTATIC OBSERVE	
30		HYDROSTATIC TEST OF BOWLS & COLUMN (9.3.13.2) _____	
31	OTHER PURCHASER REQUIREMENTS	PERFORMANCE TEST OBSERVE	
32	COORDINATION MEETING REQUIRED (10.1.3) YES	TEST IN COMPLIANCE WITH (8.3.3.2) _____	
33	MAXIMUM DISCHARGE PRESSURE TO INCLUDE _____	TEST DATA POINTS TO (8.3.3.3) _____	
34	MAX RELATIVE DENSITY YES	TEST TOLERANCES TO (8.3.3.4) _____	
35	OPERATION TO TRIP SPEED _____	NPSH (8.3.4.3.1)(8.3.4.3.4) OBSERVE	
36	MAX DIA. IMPELLERS AND / OR NO. OF STAGES _____	NPSH-1ST STAGE ONLY (8.3.4.3.2) _____	
37	CONNECTION DESIGN APPROVAL (9.2.1.4) _____	NPSH TESTING TO HI 1.6 OR ISO 9906 (8.3.4.3.3) _____	
38	TORSIONAL ANALYSIS / REPORT (6.9.2.10) _____	TEST NPSHA LIMITED TO 110% SITE NPSHA (8.3.3.6) _____	
39	PROGRESS REPORTS YES	RETEST ON SEAL LEAKAGE (8.3.3.2.d) _____	
40	OUTLINE OF PROC FOR OPTIONAL TESTS (10.2.5) _____	RETEST REQUIRED AFTER FINAL HEAD ADJ. (8.3.3.7.b) _____	
41	ADDITIONAL DATA REQUIRING 20 YEARS RETENTION (8.2.1.1) _____	COMPLETE UNIT TEST (8.3.4.4.1) _____	
42	LATERAL ANALYSIS REQUIRED (9.1.3.4)(9.2.4.1.3) _____	SOUND LEVEL TEST (8.3.4.5) OBSERVE	
43	MODAL ANALYSIS REQUIRED (9.3.9.2) _____	CLEANLINESS PRIOR TO FINAL ASSEMBLY (8.2.2.6) NON-WIT	
44	DYNAMIC BALANCE ROTOR (6.9.4.4) YES	LOCATION OF CLEANLINESS INSPECTION _____	
45	INSTALLATION LIST IN PROPOSAL (10.2.3.1) YES	NOZZLE LOAD TEST _____	
46	VFD STEADY STATE DAMPED RESPONSE ANALYSIS (6.9.2.3) _____	CHECK FOR CO-PLANAR MOUNTING PAD SURFACES OBSERVE	
47	TRANSIENT TORSIONAL RESPONSE (6.9.2.4) _____	MECHANICAL RUN TEST UNTIL OIL TEMP STABLE _____	
48	BEARING LIFE CALCULATIONS REQUIRED (6.10.1.6) _____	4 HR. MECH RUN TEST AFTER OIL TEMP STABLE (8.3.4.2.1) _____	
49	IGNITION HAZARD ASSMT TO EN 13463-1 (7.2.13.e) _____	4 HR. MECH RUN TEST (8.3.4.2.2) OBSERVE	
50	CASING RETIREMENT THICKNESS DRAWING (10.3.2.3) _____	BEARING HOUSING RESONANCE TEST (8.3.4.7) _____	
51	FLANGES REQ'D INPLACE OF SKT WELD UNIONS (7.5.2.8) _____	STRUCTURAL RESONANCE TEST (9.3.9.2) _____	
52	INCLUDE PLOTTED VIBRATION SPECTRA (6.9.3.3) YES	REMOVE / INSPECT HYDRODYNAMIC BRGS. AFTER TEST (9.2.7.5) _____	
53	CONNECTION BOLTING (7.5.1.7) _____	AUXILIARY EQUIPMENT TEST (8.3.4.6) _____	
54	CADIUM PLATED BOLTS PROHIBITED _____	EQUIPMENT TO BE INCLUDE IN AUX TESTS _____	
55	VENDOR TO KEEP REPAIR AND HT RCDS (8.2.1.1.C) YES	LOCATION OF AUX. EQUIPMENT TEST _____	
56	VENDOR TO SUBMIT TEST PROCEDURES (8.3.1.1) YES	_____	
57	SUBMIT INSPECTION CHECK LIST (8.1.5) YES	_____	
58		IMPACT TEST (6.12.4.3) PER EN 13445 YES	
59		PER ASME SECTION VIII YES	
60		REMOVE CASING AFTER TEST _____	



CENTRIFUGAL PUMP

DATA SHEET

Note: This data sheet has been modified for that in Annex N of API 610, 11th Edition. (Note 1)

Contract:	A6UE		
Item tag(s):	TOW0307-P-9104A/B/C		
Revision:	B	Date:	20-Mar-15
Unit:	Tower 03-07 Sweet Gas Plant		
P.O. No.:			
Inquiry No.:	A6UE-4-0607-03-07-RQ-01		
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REV

PRESSURE VESSEL DESIGN CODE REFERENCES

THESE REFERENCES MUST BE LISTED BY THE SUPPLIER:

- CASTING FACTORS USED IN DESIGN (TABLE 3)
- SOURCE OF MATERIAL PROPERTIES

WELDING AND REPAIRS (Please Refer to ECA-WELD-S01)

THESE REFERENCES MUST BE LISTED BY THE PURCHASER (DEFAULT TO TABLE 10 IF NO PURCHASER PREFERENCE IS STATED)

- ALTERNATIVE WELDING CODES AND STANDARDS
- WELDING REQUIREMENT (APPLICABLE CODE OR STANDARD)
- WELDER/OPERATOR QUALIFICATION
- WELDING PROCEDURE QUALIFICATION
- NON-PRESSURE RETAINING STRUCTURAL WELDING SUCH AS BASEPLATES OR SUPPORTS
- MAGNETIC PARTICLE OR LIQUID PENETRANT EXAMINATION OF PLATE EDGES
- POSTWELD HEAT TREATMENT
- POSTWELD HEAT TREATMENT OF CASING FABRICATION WELDS

MATERIAL INSPECTION

THESE REFERENCES MUST BE LISTED BY THE PURCHASER DEFAULT TO TABLE 15
ALTERNATIVE MATERIAL INSPECTIONS AND ACCEPTANCE CRITERIA (SEE TABLE 14) (8.2.2.5)

TYPE OF INSPECTION	METHOD	FOR FABRICATIONS	FOR CASTINGS
RADIOGRAPHY			
ULTRASONIC INSPECTION			
MAGNETIC PARTICLE INSPECTION			
LIQUID PENETRANT INSPECTION			
VISUAL INSPECTION (ALL SURFACES)			

NOTES

- 9 Material certificates shall be provided for casings, cover, impellers, shafts
- 10 Purchaser's authorized inspector shall verify the surface flatness and surface finish of the machined underside of the baseplates. This activity shall be witnessed by Purchaser's inspector during final release inspection.
- 11 Auxiliary system materials shall be low temperature carbon steel where applicable, A333-6, A350 LF2 C11, A352 - LCB/LCC, A516 Gr. 70N; Alloy Components: A352 - CA6NM



CENTRIFUGAL PUMP

DATA SHEET

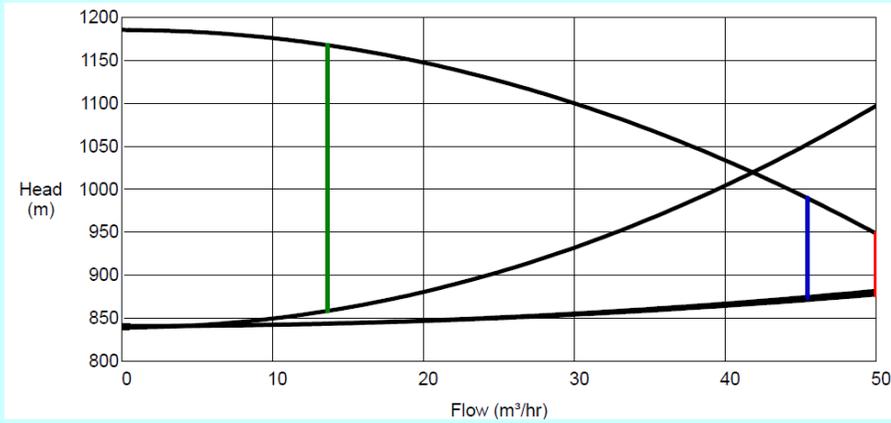
Note: This data sheet has been modified for that in Annex N of API 610, 11th Edition. (Note 1)

Contract:	A6UE		
Item tag(s):	TOW0307-P-9104A/B/C		
Revision:	B	Date:	20-Mar-15
Unit:	Tower 03-07 Sweet Gas Plant		
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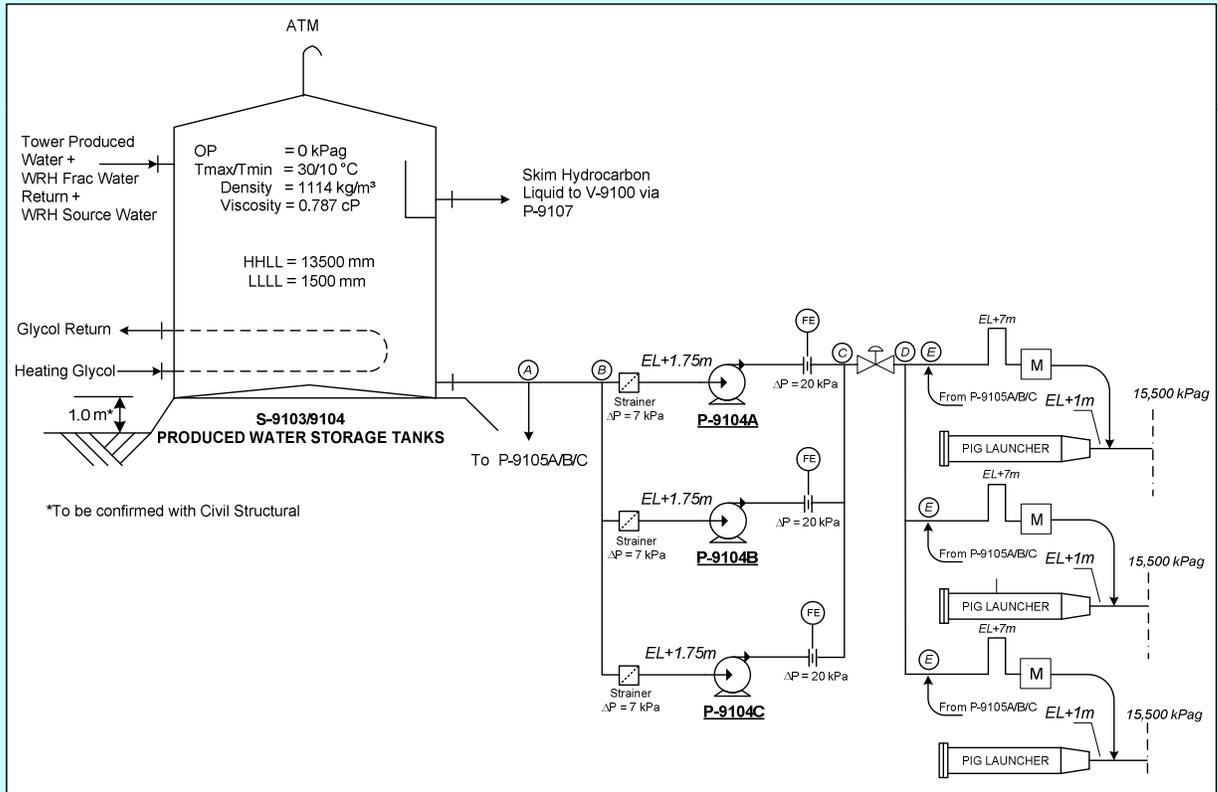
REV

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Pump and System Curves



System Sketch





MECHANICAL SEAL DATA SHEET

Note: This data sheet has been modified from that in the annex of API Standard 682, Third Edition.

Contract:	A6UE
Item No.:	TOW0307-P-9104A/B/C
Revision:	B Date: 20-Mar-15
Unit:	Tower 03-07 Sweet Gas Plant
P.O. No.:	
Inquiry No.:	A6UE-4-0607-03-07-RQ-01
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1	Client: Encana Corporation	Vendor:	
2	Service: Produced Water Disposal Pumps	Plant: Tower 03-07 Sweet Gas Plant	
3	No. Required: 3	Site: Dawson Creek, BC, Canada	
4	NOTES: Information Below to be Completed : <input type="radio"/> By Purchaser <input type="checkbox"/> By Manufacturer <input checked="" type="checkbox"/> By Manufacturer or Purchaser		
5	Seal Specification - (Ref. 4.1, Figures 1 to 6)		
6	CATEGORY	<input checked="" type="radio"/> Seal Category 1 <input type="radio"/> Seal Category 2 <input type="radio"/> Seal Category 3	<input checked="" type="checkbox"/> Seal Code (Annex D)
7	TYPE (CODE CW)	<input checked="" type="checkbox"/> Type A (3.72) <input type="checkbox"/> Type B (3.73) <input type="checkbox"/> Alternate Stationary (Type A&B)	
8		<input checked="" type="checkbox"/> Type C (3.74) <input type="checkbox"/> Alternate Rotating (Type C) <input type="checkbox"/> Single Spring (Type A)	
9	ARR'GT	Default Configuration	Alternate Design
10	1 (3.2)	<input checked="" type="checkbox"/> 1CW-FX	<input type="checkbox"/> 1CW-FL <input type="checkbox"/> Dist. Flush <input type="checkbox"/> Alternative Bush
11			<input type="checkbox"/> 01 <input type="checkbox"/> 13 <input type="checkbox"/> 23 <input type="checkbox"/> 50 <input type="checkbox"/> 62 <input type="checkbox"/> 02 <input type="checkbox"/> 14 <input type="checkbox"/> 31 <input type="checkbox"/> 51
12			<input checked="" type="checkbox"/> 11 <input type="checkbox"/> 21 <input type="checkbox"/> 32 <input type="checkbox"/> 61
13	2 (3.3)	Liquid <input type="checkbox"/> 2CW-CW	<input type="checkbox"/> FX <input type="checkbox"/> Dist. Flush Tangential LBO Connection
14		Gas <input type="checkbox"/> 2CW-CS	<input type="checkbox"/> 2NC-CS FX <input type="checkbox"/> Dist. Flush
15			<input type="checkbox"/> 01 <input type="checkbox"/> 13 <input type="checkbox"/> 23 <input type="checkbox"/> 41 <input type="checkbox"/> 62 <input type="checkbox"/> 75 <input type="checkbox"/> 02 <input type="checkbox"/> 14 <input type="checkbox"/> 31 <input type="checkbox"/> 52 <input type="checkbox"/> 71 <input type="checkbox"/> 76
16	3 (3.4)	Liquid <input type="checkbox"/> 3CW-FB	<input type="checkbox"/> 3CW-BB <input type="checkbox"/> FX <input type="checkbox"/> 3CW-FF <input type="checkbox"/> Tang. LBO Conn.
17		Gas <input type="checkbox"/> 3NC-BB	<input type="checkbox"/> 3NC-FF <input type="checkbox"/> 3NC-FB
18			<input type="checkbox"/> 01 <input type="checkbox"/> 13 <input type="checkbox"/> 53A <input type="checkbox"/> 61 <input type="checkbox"/> 54 <input type="checkbox"/> 02 <input type="checkbox"/> 14 <input type="checkbox"/> 53B <input type="checkbox"/> 62 <input type="checkbox"/> 11 <input type="checkbox"/> 32 <input type="checkbox"/> 53C <input type="checkbox"/> 74
19	SLEEVE-SHAFT DRIVE	<input checked="" type="checkbox"/> Set-Screw Onto Shaft <input type="checkbox"/> Alternative (6.1.3.13)	SPECIFY :
20			
21	MATERIALS (REFERENCE 6.1.6 & ANNEX B)		
22	SECONDARY SEALS	SEAL FACES	METAL BELLOWS
23	<input type="checkbox"/> FKM <input type="checkbox"/> FFKM	<input type="checkbox"/> CARBON vs SIC	<input type="checkbox"/> UNS N10276 (TypeB)
24	<input type="checkbox"/> Spiral Wound Gasket	<input type="checkbox"/> SIC vs SIC	or UNS N06455
25	<input type="checkbox"/> EPM / EPDM	<input type="checkbox"/> SS-SIC <input type="checkbox"/> RB-SIC	<input type="checkbox"/> UNS N08020
26	<input type="checkbox"/> NBR	_____ vs _____	<input type="checkbox"/> UNS S31600
27	<input type="checkbox"/> Other : _____		or UNS S31635
28			<input type="checkbox"/> UNS S31600 / S31635 <input type="checkbox"/> UNS N10276 <input type="checkbox"/> UNS N08020 <input type="checkbox"/> Other : _____
29	MECHANICAL SEAL DATA		
30	<input checked="" type="radio"/> Seal Vendor : John Crane	<input type="checkbox"/> Dynamic Sealing Pressure Rating (3.19) :	_____ kPa g
31	<input type="radio"/> Data Requirements Form (Annex J)	<input type="checkbox"/> Static Sealing Pressure Rating (3.69) :	_____ kPa g
32	<input type="checkbox"/> Size / Type : _____ / _____	<input type="checkbox"/> Maximum Allowable Temperature (3.40) :	_____ °C
33	<input type="checkbox"/> Seal Drawing No. : _____	<input checked="" type="radio"/> Min. Design Metal Temperature (6.1.6.11.1) :	-29 °C
34	<input type="checkbox"/> Vendor's Seal Code : _____	<input type="checkbox"/> Generated Heat at Normal Conditions :	_____ kW
35	<input type="checkbox"/> Modified Faces For Pump Performance Test	<input type="checkbox"/> Heat Soak at Normal Conditions :	_____ kW
36	<input type="checkbox"/> Alternative Seal For Pump Performance Test	<input type="checkbox"/> Total Seal Axial Thrust on Shaft :	_____ N
37			
38	SEAL CHAMBER DATA (REFERENCE 6.1.2.4)		
39	<input checked="" type="checkbox"/> ISO 13709 <input checked="" type="checkbox"/> ASME B73.1&2 <input type="checkbox"/> Cylindrical <input type="checkbox"/> Tapered <input type="checkbox"/> ISO 3069-C <input type="checkbox"/> Other : _____		
40	<input type="radio"/> Bolt-On Chamber (6.1.2.5)	<input type="checkbox"/> Seal Chamber Flush Port Req'd	<input type="checkbox"/> Seal Chamber Vent Req'd
41	<input checked="" type="checkbox"/> Floating Throat Bushing <input type="checkbox"/> Fixed Throat Bushing <input type="checkbox"/> Chamber Heating <input type="checkbox"/> Chamber Cooling		
42			
43	PUMP DATA - Refer to Sheet 2		
44	<input type="radio"/> Manufacturer : _____	Model : _____	<input type="radio"/> Size : _____ <input type="radio"/> Case Material : _____
45	Pump Operating Pressure _____	<input type="radio"/> Discharge Press. : _____ kPa g	<input type="radio"/> Suction Press. (Rated) : _____ kPa g
46	Seal Chamber Press. <input type="radio"/> Normal : _____ kPa g	<input type="radio"/> Min / Max MDSP : _____ / _____ kPa g	<input type="radio"/> MSSP (3.44) : _____ kPa g
47	Shaft <input type="radio"/> Horizontal <input type="radio"/> Vertical	Diameter : _____	<input type="radio"/> Shaft Speed : _____ RPM
48	Shaft Rotation (Viewed From Driver) : _____	<input type="radio"/> CCW <input type="radio"/> CW	
49			
50	NOTES		
51	14. Supplier to confirm the seal selection and arrangement		
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MECHANICAL SEAL DATA SHEET

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Contract:	A6UE		
Item No:	TOW0307-P-9104A/B/C		
Revision:	B	Date:	20-Mar-15
Unit:	Tower 03-07 Sweet Gas Plant		
P.O. No.:			
Inquiry No.:	A6UE-4-0607-03-07-RQ-01		
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REV	FLUID DATA
1	
2	PUMPED STREAM
3	<input type="checkbox"/> Type or Name : _____ Concentration : _____ %
4	<input type="checkbox"/> Dissolved Contaminant <input type="checkbox"/> H ₂ S _____ ppm <input type="checkbox"/> Wet
5	<input type="checkbox"/> Cl ₂ _____ ppm <input type="checkbox"/> Other : _____ @ _____ ppm
6	<input type="checkbox"/> Solid Contaminant _____
7	<input type="checkbox"/> Concentration : _____ Mass Fraction _____
8	<input type="checkbox"/> Pumping Temp. Min _____ °C Norm _____ °C Max _____ °C
9	<input type="checkbox"/> Spec. Gravity at Norm Temp: _____ at Max Temp: _____
10	<input type="checkbox"/> Vapor Pressure _____
11	<input type="checkbox"/> at Norm Temp: _____ kpaa at Max Temp: _____ kpaa
12	<input type="checkbox"/> Atmos. Boiling pt _____ Visc. At Norm Pump Temp _____ cP
13	<input type="checkbox"/> Hazardous <input type="checkbox"/> Flammable _____
14	<input type="checkbox"/> Fluid Solid at Ambient <input type="checkbox"/> Solidifies: _____ °C
15	<input type="checkbox"/> _____ <input type="checkbox"/> Pour pt: _____ °C
16	<input type="checkbox"/> Pumped Stream Solidifies Under Shear
17	<input type="checkbox"/> Pumped Stream Contains Agents That Polymerize
18	<input type="checkbox"/> Specify Agents : _____ @ Temp : _____ °C
19	<input type="checkbox"/> Pumped Stream Can Plate Out or Decompose : _____
20	<input type="checkbox"/> Specify Conditions : _____
21	<input type="checkbox"/> Pumped Stream is Regulated For Fugitive or Other Emissions
22	<input type="checkbox"/> Regulation Level : _____ ppm
23	<input type="checkbox"/> Special Pump Cleaning Procedures: _____
24	<input type="checkbox"/> Alt. Process Fluids(incl. Commissioning) Specify _____
25	<input type="checkbox"/> Vapor Pressure _____
26	<input type="checkbox"/> @ Norm Temp _____ kpaa @ Max Temp _____ kpaa
27	<input type="checkbox"/> Atmos. Boiling pt _____ °C <input type="checkbox"/> Visc. at Norm Pump Temp _____ cP
28	<input type="checkbox"/> Flow Rate Req'd Max / Min _____ / _____ m3/hr
29	<input type="checkbox"/> Pressure Req'd Max / Min _____ / _____ kpaa
30	<input checked="" type="checkbox"/> Supply Temperature Max. / Min. : _____ / _____ ppm
31	<input type="checkbox"/> Flow Rate Required Max. / Min. : _____ / _____ m3/hr
32	<input checked="" type="checkbox"/> Specific Gravity: _____
33	<input type="checkbox"/> @ Normal Temperature : _____ @ Max. Temp. : _____
34	<input checked="" type="checkbox"/> Vapor Pressure at _____
35	<input type="checkbox"/> Normal Temperature : _____ kpaa Max. Temp : _____ kpaa
36	<input checked="" type="checkbox"/> Atmospheric Boiling Point _____ °C
37	<input checked="" type="checkbox"/> Viscosity at Normal Pump Temperature : _____ cP
38	<input checked="" type="checkbox"/> Specific Heat Capacity at Const. Press.: _____ kJ/kgK
39	<input type="checkbox"/> Cooling / Heating Required _____
40	
41	FLUSH FLUID (PLAN 32) If flush is pumpage, then flush data is not req'd
42	<input type="checkbox"/> Type or Name : _____ Conc'n : _____ %
43	<input type="checkbox"/> Seal Vendor Review Required
44	<input type="checkbox"/> Fluid Temp Min _____ Norm _____ Max _____
45	<input type="checkbox"/> Spec. Gravity at Temp Indct'd @ Norm Temp _____ @ Max Temp _____
46	
47	QUENCH MEDIUM (PLAN 51, 62)
48	<input checked="" type="checkbox"/> Type or Name : _____
49	
50	BUFFER / BARRIER MEDIUM
51	<input checked="" type="checkbox"/> Type or Name : _____
52	<input type="checkbox"/> Purchaser Selection <input type="checkbox"/> Seal Vendor Selection
53	<input type="checkbox"/> Seal Vendor Review <input type="checkbox"/> Purchaser Review
54	<input type="checkbox"/> Flow Rate Required Max. / Min. : _____ / _____ m3/hr
55	<input checked="" type="checkbox"/> Supply Pressure Max. / Min. : _____ / _____ kpag
56	<input checked="" type="checkbox"/> Fluid Temperature
57	<input type="checkbox"/> Min. : _____ °C Normal : _____ °C Max. : _____ °C
58	
59	SITE AND UTILITIES
60	<input type="checkbox"/> Control Voltage V : _____ P : _____ Hz: _____
61	<input type="checkbox"/> Area Classification CL: _____ Zone: _____ Div: _____
62	<input type="checkbox"/> Design Ambient (Min. / Max.): _____ / _____ °C
63	<input type="checkbox"/> Unclassified
64	<input type="checkbox"/> Cooling Water Supply Temp _____ °C <input type="checkbox"/> Cl ₂ : _____ ppm
65	<input type="checkbox"/> Cooling Water Press. Norm/Design : _____ / _____ kpag
66	<input type="checkbox"/> ATEX (Ex Directive 94/9/EC): GR _____ CAT _____
67	TCLASS _____
68	
69	ACCESSORIES (Clauses 8 and 9)
70	
71	GENERAL
72	<input type="checkbox"/> Joint User / Vendor Layout of Equipment (8.1.4)
73	<input type="checkbox"/> Pipe Taper Threads (8.1.9) <input type="checkbox"/> ISO 7 <input type="checkbox"/> ASME B1.20.1
74	<input type="checkbox"/> Special Requirements For Hazardous Service : _____
75	<input type="checkbox"/> Define : _____
76	<input type="checkbox"/> Special Cleaning and Decontamination Requirements
77	<input type="checkbox"/> Utility Manifold Connections Required (8.4.4)
78	<input type="checkbox"/> Type and Spec. of Heat Tracing (8.6.5.8)
79	<input type="checkbox"/> _____
80	<input type="checkbox"/> Thermal Relief Valves Required (9.8.3)
81	COOLING SYSTEM (PLAN 21,22,23,41,53B,53C)
82	<input type="checkbox"/> Heat Exchanger Supplier : _____
83	<input checked="" type="checkbox"/> Water Cooled <input checked="" type="checkbox"/> Air Cooled <input type="checkbox"/> ISO 15649
84	<input checked="" type="checkbox"/> Equipment Reference / Code : _____
85	<input type="checkbox"/> Cooling Water Line Supplier : _____
86	<input type="checkbox"/> Tubing <input type="checkbox"/> Galvanized Piping (8.4.2)
87	<input checked="" type="checkbox"/> Cooling Water Flow Rate : _____ m3/hr
88	<input type="checkbox"/> Sight Flow Indicators (8.4.3) <input type="checkbox"/> Open <input type="checkbox"/> Closed
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MECHANICAL SEAL DATA SHEET

Note: This data sheet has been modified from that in the annex of API Standard 682, Third Edition.

Contract:	A6UE		
Item No.:	TOW0307-P-9104A/B/C		
Revision:	B	Date:	20-Mar-15
Unit:	Tower 03-07 Sweet Gas Plant		
P.O. No.:			
Inquiry No.:	A6UE-4-0607-03-07-RQ-01		
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REV

ACCESSORIES (Clauses 8 and 9) CONT'D

1			
2	PLAN 52 and 53 SYSTEMS		
3	<input checked="" type="checkbox"/> Standard (Fig. G27)	<input checked="" type="checkbox"/> Alternative (Fig. G28)	<input type="checkbox"/> EN 13445 or Other Code Applicable
4	<input type="checkbox"/> Dimensional Variations To Standard Figure G27		<input checked="" type="checkbox"/> Reservoir Capacity (8.5.4.3) : _____ gal
5	_____		<input checked="" type="checkbox"/> NLL to Gland Plate Height _____ ft
6	<input type="checkbox"/> Dimensional Variations To Standard Figure G28		<input type="checkbox"/> Reservoir MAWP (3.4.1) _____ psig
7	_____		<input checked="" type="checkbox"/> Set Pressure Range, Max. / Min. _____ / _____ psig
8	<input checked="" type="checkbox"/> Alternative Fabrication Standard : _____		<input checked="" type="checkbox"/> System Hold-Up Period (Plans 53B & 53C) : _____ days
9	Primary Equipment Supplier : _____		<input type="checkbox"/> Temperature Indicator (Plan 53B,53C)
10	<input type="checkbox"/> Supplier Reference / Code : _____		PRESSURE SWITCH (8.5.4.2.h) TO ACTIVATE ON :
11	Connecting Line Supplier : _____		<input checked="" type="checkbox"/> Rising Pressure (Arr 2) Set at : _____ psig
12	Tubing SCH. 80 Piping (8.5.4.4.9)		<input checked="" type="checkbox"/> Falling Pressure (Arr 3) Set at : _____ psig
13	<input type="checkbox"/> Equipment Support Supplier : _____		<input checked="" type="checkbox"/> High Level Alarm Required (8.5.4.2.i)
14	<input type="checkbox"/> Filling System Supplier : _____		<input type="checkbox"/> Test Based H / Q Curve For Internal Circulating Device
15	<input type="checkbox"/> ASME Code Stamp Required		<input type="checkbox"/> External Circulating Pump (8.6.3.1)
16			

INSTRUMENTATION

17			
18	<input checked="" type="checkbox"/> User Specification Reference For Instrument / Controls :		
19	MPSTD-A-000-GEN-00042-0000		
20	PRESSURE GAUGES (9.4)		
21	<input type="checkbox"/> Oil Filled Pressure Gauges (9.4.3)		
22	<input type="checkbox"/> Pressure Switches (9.5.2)	<input type="checkbox"/> Transmitters (9.5.2.3)	<input type="checkbox"/> Level Switches (9.5.3)
23	<input type="checkbox"/> Hydrostatic	<input type="checkbox"/> Capacitance	<input type="checkbox"/> Transmitters (9.5.3.2)
24	LEVEL INDICATORS (9.6)		
25	<input type="checkbox"/> Weld Pad		
26	<input type="checkbox"/> Flow Instruments (9.7)	<input type="checkbox"/> External, Removable (9.6.2)	
27	<input type="checkbox"/> Transmitters (9.7.3)		

INSPECTION AND TESTING

28			
29	<input type="checkbox"/> Purchaser Participation in Inspection & Test	100% Inspection of All Welds (6.1.6.10.5) Using :	
30	Specify : _____	<input type="checkbox"/> Magnetic Particle	<input type="checkbox"/> Liquid Penetrant
31	<input type="checkbox"/> Inspector's Check List (10.1.7 & Annex H)	<input type="checkbox"/> Radiographic	<input type="checkbox"/> Ultrasonic
32	<input type="checkbox"/> Purchaser Approval Req'd For Welded	Optional Qualification Testing Required (10.3.1.1.2)	
33	Connection Design (6.1.6.10.5)	<input checked="" type="checkbox"/> Mod. Faces For Pump Test (10.3.5.1) See Page 2 Line 31	
34	<input type="checkbox"/> Hardness Test (10.2.3k) Required For : _____	<input checked="" type="checkbox"/> Alternate Seal Pump Test (10.3.5.2) See Page 2 Line 32	
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NOTES

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