10 MMSCFD SOUR DEHYDRATOR

PROCESS DESIGN CONDITIONS

GAS FLOW RATE, MMscfd	10 MMscfd (283x10^3 m^3/d)
FLOW PRESSURE, psig	1530 psig (10,549 kPag)
FLOW TEMPERATURE, ^{o}F	110 ^{o}F (43 ^{o}C)
GAS GRAVITY	0.741
CONDENSATE FLOW RATE, bbl/day	nil
FREE WATER FLOW RATE, bbl/day	12 bbl/day (2 m^3/d)
INLET GAS WATER CONTENT	Saturated at Flowing T and P
OUTLET GAS WATER CONTENT	4#/MMscf
DESIGN PRESSURE, psig	2120 psig (14,617 kPag) 900# ANSI RF AT 130^{o}F/-20^{o}F
ABSORBENT	T.E.G.
SERVICE CONDITION	SOUR
FUEL GAS	SWEET (off skid)

Approved By _____ Date _____ Reviewed By _____ Date _____

B-400	1	BUILDING (SUBJOB -86) - 12'0" wide x 22'0" long x 10'0" eave gable type roof (4:12 slope) - self-framing metal building - R12 fiberglass insulation (c/w 4 mil vapour barrier) (walls and roof) - 24 gauge white interior liner - 22 gauge prepainted exterior - stone grey (QC-205) walls, heron blue (QC-330) trim - (2) - 3' x 7' insulated mandoors c/w panic hardware, 2' x 2' double glazed windows, thresholds, and weatherstripping - (2) - 36" x 36" horizontal double glazed sliding windows c/w bug screen and weatherstripping, canopies - (2) - 14" x 18 louvred vents c/w manually adjustable sliding covers and bug screens (one high, one low) - ice rakes- all openings in building walls and roof to be flashed- full length ridge vent c/w blind screen and chain operator - downspouts - (1) – Ener-Tech wall mounted exhaust fan, ET12-1, 6 ACPH, 300 CFM, 1/2 SP, 1/4 HP, explosion proof motor, 120/1/60 (Class 1, Div 1, Group D) c/w rear guard, shutter, birdscreen and storm hood **- P. Eng Stamped**
S-400	1	SKID (SUBJOB -10) - 12'0" wide x 22'0" long with W10 @ 22 lb/ft main members - 1/4" checkerplate decking (seams seal welded, perimeter stitch welded) - lifting lugs (4) - one (1) fully welded floor drain, 12"x12"x4" deep, with 1" grating cover piped to skid edge and terminated with ball valve and plug, 2" NPT skid connection - insulated with 3" thick SAFETHANE **- P. Eng Stamped**
BH-400A/B	2	CATALYTIC STYLE BUILDING HEATERS (NATURAL GAS) - Catadyne Model WX24X36 Series "X" explosion proof heater - Duty Rating: 24,000 BTU/he infra-red gas heater - SSOV, TCV, PRV's - personnel protection grill - 12 VDC c/w 30' 0" start up leads - vent hood and piping to skid edge
V-500	1	GLYCOL ACCUMULATOR BOTTLE (SUBJOB -22) - Size: 8 5/8" O.D. x 2'0" S/S (219 mm OD x 610 mm S/S) - Design: 2120 psig @ 130/-20^{o}F (14,616 kPag @ 54/-29^{o}C) - 2" NPT 6000# coupling (LC) - 2 – 3/4" NPT 6000# TOL (LG) - 3 - 1 1/2" NPT 6000# TOL (inlet, outlet, vent) - Full radiography per RT-2, PWHT - 1/8" corrosion allowance (1.5875 mm) - registered and inspected for use in Alberta

E-400	1	AIR/GLYCOL EXCHANGER (SUBJOB -70) - (6) - 5' sections of Trane Style 32 square finned tube
P-600/P-700	2	GLYCOL CIRCULATING PUMPS - Union Model SX-3 simplex pump - 1" plunger, 255 RPM, 1.84 USgpm (min) - 5 HP, explosion proof motor (1800 RPM) (460/3/60) - 1 1/2" NPT suction - 3/4" NPT discharge - Aramid fiber packing - top mounted c/w V-belt drive and belt guard - pump motors to be VFD compatible
DD-600/700	2	DISCHARGE DAMPENERS - Model 1-100-1-V - 1 gallon capacity, viton bladder, nitrogen filled - 1 1/4” NPT connection
E-410	1	GAS/GLYCOL EXCHANGER (SUBJOB -72) - Size: 4 1/2" O.D. x 8 5/8" O.D. x 10'0" long (114.3 mm OD x 219 mm OD x 3048 mm long) - Design: T/S: 2120 psig @ 130/-20^{o}F MDMT (14,617 kPag @ 54/-29^{o}C MDMT) S/S: 2120 psig @ 130/-20^{o}F MDMT (14,617 kPag @ 54/-29^{o}C) - C.A.: 1/8" T.S., 0" S/S, Radiography: Full per RT-2 - bevelled end upstream, flanged end downstream - Material: Pipe: SA-106-B Nozzle: SA-105N couplings Heads: SA-234-WPB
F-400	1	GLYCOL PARTICULATE FILTER - CUNO Model 1B2 filter housing - cast iron / steel construction - 175 psi @ 200°F design - c/w (2) Micro-kleen elements - 3/4" NPT in/out
F-401	1	GLYCOL CHARCOAL FILTER - CUNO Model 1B2 filter housing - cast iron / steel construction - 175 psi @ 200°F design - c/w (2) Fluitek Activated Carbon - 3/4" NPT in/out

V-400	1	GLYCOL CONTACTOR (SUB JOB -20) - Size: 24" O.D. x 33'0" S/S - Design: 2120 psig @ 130/-20°F MDMT - C.A.: 1/8" - Radiography: 100% - P.W.H.T.: Yes - HIC Testing Series A (CLR $\leq$ 15%) Vessel Specifics: - Service: Sour - Separator Section: 7'6", 3 phase c/w inlet deflector, float shield, 6 pass, 1" sch 160 glycol coil, 6" thick 316L SS demister (12#/ft^3) with CS supports (non-removable) - Contactor Section: ten (10) welded bubble cap trays at 24" spacing, 1" sch 160 glycol coil, 6" thick 316 SS demister (12#/ft^3) with CS supports (non-removable) - c/w 24" 900# ANSI RTJ break flanges - full diameter skirt and base plate - registered and inspected for use in Alberta Material: Shell: 24" O.D. x 1 3/8" thick SA-516-70N Heads: 24" O.D. x 1 3/8" NOM 2:1 S.E. SA-516-70N Nozzles: SA-105N Pipe: SA-106-B Bolting: SA-193-B7M/SA-194-2HM Gaskets: 1/8" thick spiral wound 304 SS Nozzles: Inlet: 4" 900# RFWN Gas Out: 4" 900# RFLWN Liquid Out: 2 - 2" 900# RFWN LC: 4" 900# RFLWN Future LC: 4" 900# RLFWN LG: (4) - 2" 900# RFWN LSHH: 4" 900# RFWN PI: 2" 900# RFWN PSV: 1 1/2" 900# RFWN TI: 2" 900# RFWN Glycol Coil: (3) – 1" 6000# NPT (backwelded connection) Glycol: (2) – 1 1/2" 6000# NPT (backwelded connection) Chimney Tray Drains: (10) - 2" 900# RFWN c/w blinds Inspection: 3" 900# RFWN c/w blinds

V-410	1	FUEL GAS SCRUBBER (SUB JOB - 21) - Size: 8 5/8" O.D. x 3'0" S/S - Design: 250 psig @ 200/-20°F MDMT - C.A.: 1/16" - Radiography: None - P.W.H.T.: None Vessel Specifics: - Service: Sweet - internals: inlet deflector - full diameter skirt and base plate - registered and inspected for use in Alberta Material: Shell: 8" sch std pipe SA-106-B Heads: 8 5/8" O.D. x 3/8" NOM 2:1 S.E. SA-516-70N Nozzles: SA-105N Pipe: SA-106-B Nozzles: Inlet: 1" NPT 3000# coupling Gas Out: 2" NPT 3000# coupling Drain: 1" NPT 3000# coupling Spare: 2” NPT 3000# coupling
H-400 T-400	1	PRESSON MODEL GR-250 GLYCOL REBOILER (SUBJOB - 60) - 250,000 BTU's/hr (based on 10,000 BTU's/ft^2) - Reboiler: 24" O.D. x 7'0" long - Accumulator: 18" O.D. x 7'0" long - Still Column Size: 8 5/8" O.D. x 7'0" long (with CS pall rings) - External Stripper Size: 8 5/8” OD x 6’0” long (c/w CS pall rings) (SA-53B ERW pipe) and 6” cleanout port, packing support and glycol distributor - Firetube: 8 5/8" O.D. 10’ lineal feet (5 piece mitre) - Accumulator Coil: 3/4" NPS x 35 turns - Flamecell: 16" O.D. x 4" thick (aluminum) (non-removable) - Smokestack: 8 5/8" O.D. x 12'4" long - Burner: PRESSON standard (Enardo housing, Eclipse burner, Natco pilot) - Insulation: 1 1/2" AF-530 fibreglass insulation (reboiler & still) - stripping gas preheated through reboiler - 2” 150# RF ANSI glycol outlet connection

FE-400	1	4" 900# RF METER RUN (NACE) - 4" 900# ANSI RF Daniel Senior style fitting - built to AGA 2000 edition - 100% radiography, hydrotest - PWHT - one 3/4" and one 1" NPT connection on downstream (6000# FS connections) - both ends flanged - one orifice plate w/ 2 1/4" orifice (316 SS) - c/w conditioner plate (316 SS) - Materials: SA-105N, SA-106B, B7M/2HM - 87" F/F
MVT-400 TE-400	1	ROSEMOUNT MULTIVARIABLE MASS FLOW TRANSMITTER - Model 3095FB24BBC13AA011CN030T34 B - RS-485 Modbus RTU 2 - 0-2.5 to 0-250 inH2O 4 - 0-36.26 to 0-3,625 psia B - Hastelloy C-276 Isolator Material B - Coplanar, SST Flange Style C - Hastelloy C Drain, Vent Material 1 - Glass-filled TFE O-ring 3 - RTD Input with 12ft of Armored, Shielded Cable A - Polyurethane-covered Aluminum Housing A - Standard Terminal Block 0 - No meter 1 - Coplanar SST Flange Bracket for 2" or Pipe or Panel Mount 1 - Austenitic 316SST bolts C - CSA Explosion-Proof Approval N - Modbus RTU Process Variable Measurement 030 - 3" U length T34 - 3/4" NPT straight thermowell - -40 to 1200°F process temperature range
5VM	1	AGCO MODEL M6AVDS-4-SG FIVE VALVE MANIFOLD - NACE construction
FQI-410	1	1 1/2" NPT ROOTS MODEL 8C175 PD FLOW METER - 175 psig MAWP @ 140EF (1206 kPag @ 60°C) - cubic meter register - non-pressure / temperature compensated - maximum capacity 10,300 scfh @ 175 psig (291.7 m^3/h @ 1206 kPag)

AD-410	1	¾” NPT ARMSTRONG AUTO DRAIN TRAP - model LD-II (stainless steel) - ¾” NPT connections - 1/8” SS orifice
LC-402	1	2" NPT FISHER L2 LEVEL CONTROLLER - 6 to 30 psi (41 to 207 kPag) snap acting - NACE wetted parts (standard) - vertical mount through 4” 900# RF x 2” NPT hub blind - direct acting - 1 7/8" x 12" PCV displacer - sweet instrument gas internals, instrument air supply
LC-600	1	2" NPT FISHER L2 LEVEL CONTROLLER - 6 to 30 psi (41 to 207 kPag) throttle acting - NACE wetted parts (standard) - Horizontal mount - direct acting - 1 7/8" x 12" PCV displacer - sweet instrument gas internals, instrument air supply
LCV-402	1	1" NPT FISHER TYPE D4 CONTROL VALVE - LCC body, NACE trim - 6 to 30 psig to open (fail closed) - snap acting
LCV-600	1	1" NPT FISHER TYPE D2 CONTROL VALVE - LCC body, NACE trim - 0 to 20 psig (0 to 138 kPag), air to open
LG-401	1	PENBERTHY 1RH9-NQ REFLEX GAUGE GLASS ASSEMBLY - 12 5/8" visible glass (3000 psig @ 100°F) - set of 330-J-NQ gauge valves (NACE)
LG-403	1	TUBULAR GAUGE GLASS ASSEMBLY - Penberthy N7A gauge valves - 5/8" diameter Redline glass - angle iron protectors (Accumulator)
LG-601	1	PENBERTHY 1RM5-NQ REFLEX GAUGE GLASS ASSEMBLY - 7 7/8" visible glass (2370 psig @ 100°F) - set of 330-J-NQ gauge valves (NACE)
LSHH-400	1	2” NPT LINC MODEL 471-12-10 ELECTRIC HIGH LEVEL SWITCH (NACE) - 316 SS body, 316 SS float - 3000 PSI SWP

LSLL-411	1	2" NPT SOR 1510B-G2A-W9-ES-CS ELECTRIC LEVEL SWITCHES - 1500 psi MAWP - 303 SS body, 316SS float - electric SPST, CSA, explosion proof

PDI-404 PDI-405	2	2 1/2” WIKA 700.01 DIFFERENTIAL PRESSURE GAUGES - 0 to 30 psid range - NACE trim, SS construction - 1/4" NPT connections
PCV-409	1	1" NPT FISHER TYPE 627 PRESSURE REGULATOR - sweet service - DI body, aluminum trim - 75 to 150 psi (517 to 1034 kPag) range - 3/16" orifice - 100 psig (690 kPag) set pressure - 1000 psig (6,895 kPag) MAWP
PCV-413	1	1/4" NPT FISHER 67CF PRESSURE REGULATORS - sweet service - 0 to 20 psig (0 to 138 kPa) spring range - pilot gas - c/w 0 to 30 psig gauge (0 to 210 kPa) - set at 5 psig
PI-400	1	4" WIKA MODEL 263.54 LIQUID FILLED PRESSURE GAUGE - sour service - dual scale - 0 to 3000 psig (0 to 20,684 kPag) range - 1/2" NPT bottom connection, K Monel bourdon tube/socket
PI-408	1	2 1/2" WIKA 233.53 LIQUID FILLED PRESSURE GAUGE - standard service - dual scale - 0 to 200 psig (0 to 1379 kPag) range - 1/4" NPT bottom connection, 316 SS bourdon tube/socket
PI-411/415/416	3	4" WIKA 233.53 LIQUID FILLED PRESSURE GAUGE - standard service - dual scale - 0 to 30 psig (0 to 200 kPag) range - 1/4" NPT bottom connection, 316 SS bourdon tube/socket
PI-600/700	2	4" WIKA MODEL 263.54 LIQUID FILLED PRESSURE GAUGE - sour service - dual scale - 0 to 3000 psig (0 to 20,684 kPag) range - 1/2" NPT bottom connection, K Monel bourdon tube/socket

PSHH-400	1	CCS DUAL SNAP MODEL 6900GZE22 HIGH PRESSURE SWITCH - U.L./CSA explosion proof, Class 1, Division 1, Groups C & D - 1/2” NPT 316 SS pressure port - stainless steel diaphragm material - 24 VDC power supply, single pole, single throw - set at 1900 psi
PSV-402	1	1 1/2" 900# RFX 2" 300# RF FARRIS 26EA14-120/S7 RELIEF VALVE - plain cap, NACE trim, inconel spring - set at 2120 psig - “E” orifice (0.196 in^2) - gas service, blocked flow
PSV-406	1	2" NORVAL CONE CHECK VALVE - Model Q-70, type CD, viton diaphragm - set at 3 to 4 psig range - mounted between 2" 150# RF flanges (reboiler) - non-ASME code
PSV-407	1	1" MNPT X 1" FNPT FARRIS 27DA23-M20 RELIEF VALVE - plain cap, NACE trim (primary zone only) - set at 165 psi -“D” orifice (0.125 in^2 orifice) - gas service (PCV-409 fail)
PSV-403	1	1" MNPT X 1" FNPT FARRIS 27DA23-M20 RELIEF VALVE - plain cap, NACE trim (primary zone only) - set at 30 psi -“D” orifice (0.125 in^2 orifice) - glycol service
PSV-601/701	2	1" MNPT X 1" FNPT FARRIS 27DA23-M20 RELIEF VALVE - plain cap, NACE trim (primary zone only) - set at 2120 psi -“D” orifice (0.125 in^2 orifice) - glycol service
I/G	4	¼” NPT FISHER MODEL 67CFR PRESSURE REGULATORS (SWEET) - Standard service - Aluminum body and spring case - 1/4" NPT inlet / outlet connections - 0 to 35 psig range (3) - 0 to 100 psig range (1)

TI-401 TI-402	2	5" TREND BIMETAL THERMOMETERS - dual scale temperature range - 1/2" x 3/4" NPT x 12" long 304 SS thermowell - 0 to 200^{o}F (TI-400) - 50 to 500^{o}F (TI-401)

PCV-411	1	1" NPT FISHER MODEL 627R-189 PRESSURE REGULATOR - Sweet service - ¼" orifice size - Ductile iron body and spring case - Aluminum seat ring - Aluminum disc holder with nitrile valve disc - ¾" tapped bonnet - Positive shut-off type regulator - Internal relief and open throat design (Internal Relief set at 54 psig) - Maximum working pressure: 1000 psig - Maximum working temperature: 180°F - Spring range: 5 to 20 psig - Set pressure: 14 psig **- Supplied in accordance with Variance No. VAR-G03.4, issued by Alberta Municipal Affairs (Safety Services) dated February 27th, 2004.** **- Vented O/S building for diaphragm breakage and internal relief with at least equal nominal pipe size of the vent outlet to prevent impedance upon the regulators internal relief capability** **- Complies with clauses A.4.2, A.6.6 of CSA/CGA B149.3-00 Code for the Field Approval of Fuel-Related Components On Appliances and Equipment**
PCV-412 PCV-404	2	1/4" NPT FISHER 67CFR-362 PRESSURE REGULATORS - sweet service - 1/8" orifice diameter - aluminum body and spring case - tapped bonnet - positive shut-off type regulator - maximum working pressure: 250 psig (1724 kPag) - maximum working temperature: 180°F (82°C) - spring range: 0 to 35 psig (0 to 241 kPag) - set pressure: 3 psig (21 kPag) (PCV-412) - set pressure: 5 psig (35 kPag) (PCV-404) - **vented O/S building for diaphragm breakage** - **complies with clauses A.3.3, A.6.6 of CSA/CGA B149.3 Code for the Field Approval of Fuel-Related Components On Appliances and Equipment**

PSH-411	1	CCS DUAL SNAP MODEL 6900GE12 HIGH PRESSURE SWITCH - U.L./CSA explosion proof, Class 1, Division 1, Groups C & D - 1/4" NPT aluminum pressure port - polyimide diaphragm material - maximum working pressure: 500 psig (3447 kPag) - maximum working temperature: 160 ^{o}F (71^{o}C) - 24 VDC power supply, single pole, double throw - spring range: 3 to 20 psig adjustable (21 to 138 kPag) - set pressure: 18 psig (124 kPag) Rising - **set in accordance with clause A.8.5.1(b), A.6.6 of CSA/CGA B149.3 Code for the Field Approval of Fuel-Related Components on Appliances and Equipment (more than 25% of highest normal operating pressure)**
PSL-411	1	CCS DUAL SNAP MODEL 6900GE12 LOW PRESSURE SWITCH - U.L./CSA explosion proof, Class 1, Division 1, Groups C & D - 1/4" NPT aluminum pressure port - polyimide diaphragm material - maximum working pressure: 500 psig (3,447 kPag) - maximum working temperature: 160 F (71 C) - 24 VDC power supply, single pole, double throw - spring range: 1 to 18 psig adjustable (7 to 124 kPag) - set pressure: 7 psig (48 kPag) Falling - **set in accordance with clause A.8.5.1(a), A.6.6 of CSA/CGA B149.3 Code for the Field Approval of Fuel-Related Components On Appliances and Equipment (50% of the lowest normal operating pressure)**
TC-404	1	KIMRAY MODEL T-12-DA TEMPERATURE BASE ASSEMBLIES - sweet service, sweet supply gas - stainless steel separable socket (SS-12-SS) - 4000 psig max working pressure (27,579 kPag) - -30 to 400°F max temperature range (-34 to 204°C) - 5 to 30 psig supply pressure (41 to 207 kPag)
TSHH-411	1	CCS DUAL SNAP MODEL 6900TUE20 HIGH TEMPERATURE SWITCH - U.L./CSA explosion proof, Class 1, Division 1, Groups C & D - Stainless steel temperature probe - 5'-0" armoured capillary - 24 VDC power supply - maximum working pressure: 1250 psig - maximum working temperature: 650°F - range: 385°F to 565°F increasing - set temperature: 410°F rising

ESDV-400 SOV-411 ZSC-411	1	1” NPT MAXON MODEL 8113 (SERIES 8000 EMERGENCY SHUT-DOWN VALVE (SWEET) - 1” FNPT inlet / outlet connection size - Standard flow capacity - Body Material: SA-216 Gr. WCB Carbon Steel - Bonnet Material: SA-216 Gr. WCB Carbon Steel - Body Seals: Buna “N” - Bumper Material: Buna “N” - Trim Package: 400 Series SS seat Cast Iron Disc Trim Package No. 1 - MAWP: 255 psig - Max. Process Temp.: -40 to 140 °F - Actuator: Pnuematic Fail Closed 60 psig supply pressure - Enclosure: NEMA 4 / IP65 - Power Supply: Integral Solenoid (SOV-101) 24 VDC (1.6 watts minimum) - c/w VOS1/VCS1 Proof of Closure Switch (ZSC- 101) - 24 VDC power supply - Factory mounted to terminal strip - Top mounted visual open/closed indication - Class IV seat leakage - CSA Class 1, Division 1 approved with isolators and barriers in power supply (Zener Diode Safety Barriers and Isolators) **- Stamped C/I for Commercial/Industrial applications** **- CSA 6.5-2000 Automatic Valves for Gas Appliances approval** **- Complies with clauses A.4.3.1 of CSA/CGA B149.3-00 Code for the Field Approval of Fuel-Related Components on Appliances**

ESDV-401	1	1/4” NPT BURKERT MODEL 6013 TWO WAY SOLENOID VALVE - part# 462463Z - Sweet service - 1/4” orifice size - 316 Stainless Steel body, 301 stainless steel spring - Viton seals - Silver shading coil - 24 VDC continuous duty coil - Maximum operating pressure: 17 psig - Maximum safe working pressure: 10 psig - Maximum working temperature: 212°F - Power consumption: 2 watts - CSA Class 1, Division 1 approval **- Stamped C/I for Commercial/Industrial applications** **- CSA 6.5-2000 Automatic Valves for Gas Appliances approval** **- Complies with clauses A.3.5.1 of CSA/CGA B149.3-00 Code for the Field Approval of Fuel-Related Components On Appliances**
TCV-404	1	1” NPT FISHER MODEL 119 TEMPERATURE CONTROL VALVE - sweet service and sweet supply gas - 9/16” orifice diameter - Cast iron body with aluminium spring case - Aluminum disc holder - Maximum working pressure: 150 psig (1,034 kPag) - Maximum working temperature: 170 F (77 C) - Spring range: 5 to 35 psig (41 to 241 kPag) - Fail closed - **Complies with clauses A.4.4 of CSA/CGA B149.3 Code for the Field Approval of Fuel-Related Components On Appliances and Equipment**
EY-404 TY-404	2	1/4" NPT SMC MODEL NAS-4000 SPEED CONTROL VALVE - 1/4" port size - quick exhaust
BA-050Z	1	1/2” NPT 1500# WATTS/CONTROMATICS MODEL C7000-SS REGULAR PORT BALL VALVE (SWEET) - SA-216-Gr. WCB body material - 316 stainless steel ball and stem material - Teflon seats and seal material - 1500 psig @ 100/-20^{o}F MAWP **- Complies with clauses A.3.2 of CSA/CGA B149.3-00 Code for the Field Approval of Fuel-Related Components On Appliances and Equipment and CSA/CGA 3.16 Lever Operated Non-lubricated Gas Shut-Off Valves (tagged)**

BA-100Z	1	1” NPT 1500# WATTS/CONTROMATICS MODEL C7000-SS REGULAR PORT BALL VALVE (SWEET) - SA-216-Gr. WCB body material - 316 stainless steel ball and stem material - Teflon seats and seal material - 1500 psig @ 100/-20^{o}F MAWP **- Complies with clauses A.3.2 of CSA/CGA B149.3-00 Code for the Field Approval of Fuel-Related Components On Appliances and Equipment and CSA/CGA 3.16 Lever Operated Non-lubricated Gas Shut-Off Valves (tagged)**
PV-100Z	1	1” NPT NORDSTROM FIGURE 142 ILS PLUG TYPE VALVE (SWEET) - Gray iron body and plug/stem material - Ductile iron cover - Buna “N” cover, gland, and stem seals - Stainless steel diaphragm - Asbestos free sheet gasket material - C/w Model SN-1 Valve Wrench - 200 psig @ 200/-20^{o}F MAWP **- Complies with clauses A.4.5 of CSA/CGA B149.3-00 Code for the Field Approval of Fuel-Related Components On Appliances and Equipment and CSA/CGA 3.11 Lever Operated Pressure Lubricated Plug Type Gas Shut-Off Valves (tagged)**

BA-050S	1	1/2" NPT 3000# REG PORT BALL VALVES (SOUR)
BAS-050S	4	1/2" SW 3000# REG PORT BALL VALVES (SOUR)
BA-075S	2	3/4" NPT 3000# REG PORT BALL VALVES (SOUR)
BA-075	1	3/4" NPT 3000# REG PORT BALL VALVES (SWEET)
BAS-075S	4	3/4" SW 3000# REG PORT BALL VALVES (SOUR)
BASN-075S	1	3/4" SW x NPT 3000# REG PORT BALL VALVES (SOUR)
BA-100	4	1" NPT 3000# REG PORT BALL VALVES
BA-100S	2	1" NPT 3000# REG PORT BALL VALVES (SOUR)
BAS-100S	9	1" SW 2500# RP WORCESTER BALL VALVES (SOUR)
BAS-150S	6	1 1/2" SW 5000# RP WORCESTER BALL VALVES (SOUR)
BA-200S	2	2" NPT 3000# REG PORT BALL VALVES (SOUR)
BAFF-201S	5	2” 150# RF FP BALL VALVES (SOUR)
CH-050	1	1/2" NPT CLASS 800 SWING CHECK VALVE
CH-100S	1	1" NPT CLASS 800 PISTON CHECK VALVE
CHS-150S	2	1 1/2" SW CLASS 1500 SWING CHECK VALVE (SOUR)
GA-050S	3	1/2” NPT CLASS 1500 GATE VALVE (SOUR)
GL-100S	1	1” NPT CLASS 1500 GLOBE VALVES (SOUR)
GLS-100S	5	1” SW CLASS 1500 GLOBE VALVES (SOUR)
NV-025	8	1/4" NPT AGCO H7VIS-2 NEEDLE VALVES (SWEET)
NV-025S	4	1/4" NPT AGCO H7VIS-2-SG NEEDLE VALVES (NACE)
NV-050	2	1/2" NPT AGCO H7VIS-4Q NEEDLE VALVES (SWEET)
NV-050S	6	1/2" NPT AGCO H7VIS-4Q-SG NEEDLE VALVES (NACE)
YSF-201S	2	2" 150# RF ALTA “Y” STRAINER (SOUR)

GENERAL

1) Vessels to be designed to ASME Section VIII, Division 1 and AU@ stamped

2) Materials:

Shells/Heads	-	SA-516-70 / SA-106B
Pipe (Nozzles)	-	SA-106B
Flanges	-	SA-105
Fittings	-	SA-234-WPB
TOL=s/Couplings	-	SA-105 (3000# FS minimum)
Gaskets	-	316 SS flexitallic
Studs/Nuts	-	B7/2H

3) 1/2" NPS minimum acceptable threaded connection

4) Manways to be 16" I.D. minimum

SOUR SERVICE

1) Select Chemistry $CE = C + \frac{Mn}{6} + \frac{(Cr+Mo+V)}{5} + \frac{(Ni+Cu)}{15} \leq 0.45$

2) Materials:

Shells/Heads	-	SA-516-70N / SA-106B
Pipe (Nozzles)	-	SA-106B
Flanges	-	SA-105N
Fittings	-	SA-234-WPB
TOL=s/Couplings	-	SA-105 (6000# FS) (restricted use)
Gaskets	-	316 SS flexitallic
Studs/Nuts	-	B7M/2HM

3) P.W.H.T. is required.

4) Radiography 100% per RT-1.

5) U.T. or MPI testing has not been allowed for.

6) Hardness: BHN $\leq$ 200

All welding procedures utilized have been qualified with hardness readings of $\leq$ 200. Additional production hardness testing has not been allowed for.

		150#
Pipe	:	SA-106B smls
Flanges	:	SA-105 (RF)
Fittings	:	SA-234-WPB
TOL=s/couplings	:	SA-105
Gaskets	:	304 SS Flexitallic
Studs/Nuts	:	B7/2H
Corrosion Allowance	:	1/16"

	150# ANSI (A1) (285 psi @ 100°F)
Schedule (Welded)	1" and 1 2" sch 80 2" - 10" sch 40
Threaded	≤ 1 2" sch 80
Fittings	3000# F.S.
Radiography	10%
P.W.H.T.	Not Required
Hardness	Not Applicable
NOTES	1) P.W.H.T.: Only required as per ASME B31.3 (i.e. > 3/4" thick)

		150# to 600#	**900#**
Pipe	:	SA-106B smls	SA-106B smls
Flanges	:	SA-105 (RF)	SA-105 (RF)
Fittings	:	SA-234-WPB	SA-234-WPB
TOL=s/couplings	:	SA-105	SA-105
Gaskets	:	304 SS Flexitallic	304 SS Flexitallic
Studs/Nuts	:	B7M/2HM	B7M/2HM
Corrosion Allowance	:	1/8"	1/8"
Select Chemistry	:	Yes	Yes

	150# ANSI (A2) (270 psi @ 120°F)	***600# ANSI (D2)*** (1440 psi @ 130°F)
Schedule (Welded)	1" - 2" sch 80 3" - 10" sch 40	1" - 2" sch 160 3" - 16" sch 80
Threaded	2" sch 160 3/4" - 1 2" sch 80	≤ 1 2" sch 160
Fittings	3000# F.S.	3000# F.S.
Radiography	100%	100%
P.W.H.T.	Yes	Yes
Hardness	HRC ≤ 22	HRC ≤ 22

	900# ANSI (E2) (2120 psi @ 130°F)
Schedule (Welded)	1" - 3" sch 160 4" - 16" sch 160
Threaded	≤ 1 2" sch XXH
Fittings	6000# F.S.
Radiography	100%
P.W.H.T.	Yes
Hardness	HRC ≤ 22

NOTES	1) C.E. = C + Mn/6 + (Cr+Mo+V)/5 + (Ni+Cu)/15 ≤ 0.45. 2) All welding procedures utilized have been qualified with hardness readings of ≤ 200. Additional production hardness testing has not been allowed for.

GENERAL NOTES

1) All piping will be designed to ASME B31.3 Piping Code.

2) All on-skid piping will be extended to skid edge and terminated with appropriate fittings.

3) All 2" and larger piping to be of welded construction with buttweld fittings and weldneck flanges.

4) All insulated piping shall be on pipe shoes.

5) P.W.H.T. of socketweld piping is NOT included.

6) Vent and drain connections shall be provided at high and low points (3/4" NPT with plug).

7) All glycol, heat medium, propane and amine piping shall be socketwelded or screwed/backwelded where practical.

SOUR SERVICE NOTES

1) For instruments mounted directly onto vessels:
   - P.I. isolation needle valves to be threaded only
   - thread and backweld on upstream (pressure side) of level gauge and level switch isolation valve, thread only on downstream side

2) For instruments mounted on a bridle:
   - connections may be threaded on both sides

PRESSURE TESTING

1) All pressure piping will be pressure tested in accordance with ASME B31.3 Pressure Piping Code.

2) All pressure piping will be either hydrotested to 1.5x the design pressure or pneumatically tested to 1.1x the design pressure per Enerflex Systems Ltd.'s standard procedures.

3) ARecording@ of the pressure during the test has NOT been included for.

4) A 100 psi air and soap bubble test will be performed on the following:
   - all non-process threaded piping
   - instrument tubing
   - low pressure flare piping (D/S of PSV)
   - low pressure drain piping (D/S of last block valve)

	Process 150# - 900#	Process 1500# - 2500#	Instruments	Vents
Size	3/8" (.035")	3/8" (.065")	1/4" (.035")	3/8" (.035")
Tubing Material	316 SS	316 SS	316 SS	316 SS
Fitting Material	316 SS	316 SS	316 SS	316 SS

NOTES

1) Swagelok compression type instrument fittings are to be provided for this project

2) Venting due to overpressure and/or diaphragm breakage is not included except when utilizing sour fuel gas.

3) All pneumatic instruments are to have individual Fisher 67CFR instrument supply regulators.

4) All venting equipment venting instrument gas during normal operation will be vented outside of building.

5) Instruments that utilize instrument air will not be vented.

6) All tubing is supported on the building wall or supported in raceway.

1) No provision is included in Enerflex Systems Ltd.'s scope of supply for fireproofing of vessel skirts, saddles or any structural steel

2) All vessels and piping operating at or lower than 50^{o}F, will be insulated using foamglass insulation with smooth aluminum jacket

3) All vessels and piping operating at or above 175^{o}F, will be insulated using semi-rigid fibreglass AF-530 insulation with smooth aluminum jacket

4) Insulation included is limited to the vessel and piping and does not include insulation of the following:

    - vessel manways or flanges
    - piping unions, flanges or valves
    - level control cages or associated piping
    - level gauges or associated piping
    - vessel skirts, saddles or bottom heads

5) Insulation thickness will be shown on the P&ID.

Equipment	Surface Preparation	Primer	Finish
Structural Steel	Commercial Sandblast SSPC-SP6	Zinc Phosphate	Valspar Warm Grey F-34
Skid Floor	Commercial Sandblast SSPC-SP6	Zinc Phosphate	Valspar Warm Grey F-34
Vessels	Commercial Sandblast SSPC-SP6	Zinc Phosphate	Valspar Warm Grey F-34
Piping	Commercial Sandblast SSPC-SP6	Zinc Phosphate	Valspar Warm Grey F-34
Reboiler Smoke Stacks (high heat areas)	Near White Sandblast SSPC-SP10	N/A	Devoe HT-8 High Heat Grey (2 shop coats)

NOTES

1) Sandblasting shall not be conducted on surfaces that are less than 3 degrees above dewpoint, or when the relative humidity of the air is greater than 80 percent.

1) All instruments, regulators, equipment, gauges, and valves to be provided are explicitly detailed, numbered and tagged in the main body of Technical Section and applicable items of Alternate and Optional Cost Items. Only items specifically described will be included in the final product.

2) This offer was prepared using Enerflex Systems Ltd.'s standard "General Specifications" as applicable to this equipment. Therefore the equipment offered may or may not meet 100% of your "General Specifications" included within the tender documents.

3) Process and instrumentation diagram and other drawings as applicable provided with the offer are for clarity only. Some equipment indicated may be at optional cost. The description found in the offer takes precedence over any and all drawings enclosed or attached.

4) Equipment offered is based on Enerflex Systems Ltd.'s in-house specifications and procedures (if applicable) for hydrotesting, welding, vessel calculations, process and mechanical calculations, pipe stress / fatigue analysis, nozzle loadings, centre of gravity, etc. These calculations are considered proprietary and are not normally provided for review, approval or information. Should these calculations be required, we would be pleased to provide an optional cost for your consideration.

5) Venting of instruments and controls are limited to those venting instrument gas during normal operations and which are provided with threaded vent ports only. Venting due to over pressure and/or diaphragm breakage are not included.

6) One (1) hardcopy and one (1) CD of Enerflex Systems Ltd.'s Standard Maintenance Manual has been included in this Offer which consists of the following:

- Equipment/Instrumentation List
- Manufacturer's Product Literature
- General Arrangement Drawing (As-Built)
- Process and Instrument Drawing (As-Built)

8) Three (3) copies of the following drawings will be "Issued for Approval":

- P&ID, Instrument List, General Arrangement, Skid

Only those drawings indicated will be submitted, **drawings of major components will not be submitted for approval**. Drawings provided will be supplied as electronic copies.

9) The following has not been provided for in this Offer:

- transportation, offloading and re-assembly
- start-up assistance
- electrical work/electrical drawings
- fireproofing of vessel skirts/saddles or structural steel
- spare parts/spare parts list
- line lists and piping registration
- instrument/equipment data sheets

10) Standard temperature (-20^{o}F) materials of construction have been included in this Offer. The use of low temperature materials (-40^{o}F) have not been provided for unless dictated by process conditions.

11) Painting has been offered to Presson's general specification.

12) A cone check valve has been offered instead of a rupture disk on the reboiler.

13) HIC results on contactor are CLR $\leq$ 15%.