CENOVUS – FOSTER CREEK

FC W06 Hot Solvent

L.S.D. 10-19-70-4-W4M

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Cenovus Project # 2016-012
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AFE # 16165217

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1.0 Scope of Project

1.1 General Description

This is a pilot project that will attempt to reduce the steam-to-oil ratio (SOR) by injecting a set amount of propane in the SAGD injection well and only injecting enough steam to heat the propane/steam mix temperature to 100 to 120°C. This project is modeled off the N-Pad Lean Propane SAP project (2014-462) and will use a templated modular pump skid, but only injecting into one well.

Propane will be injected via a modular propane injection skid installed at Foster Creek W06. This modular skid is to be designed to be relocatable to other pads.

A normal injection rate of 2.1 tonnes/hr of propane will be injected into well W06I06. Approval to inject propane as part of this this project was received from the AER in April 2016.

This project will be driven to achieve success in cost, quality and schedule. However, schedule is the primary driver of this project.

1.2 Project Summary

This project will be divided into two parts: propane injection/truck offloading skid modular skid fabrication, and field installation. The modular skids are going to be templated and designed as part of the 2014-462 N-Pad Lean SAP project.

The pump skid to be complete with piping, valves, instrumentation and electrical. The skid will contain a remote I/O rack, motor starters and VFDs, to provide ease of field installation during initial installation and future relocation.

W06 Hot Solvent scope includes:

- Installation of piping and electrical tie-ins during a W06 shutdown
- Grading area around the propane bullets and installation of a containment dike. A review of the plot plan spacing has been performed and Cenovus has determined that fireproofing of vessels and support steel is ***not*** required.
- Installation of piling for equipment and supports
- Installation of one 60,000 USWG (227 m^3) propane bullet
- Installation of two propane booster pumps and two propane injection pumps on a common skid. Design will follow the N-Pad Lean SAP (2014-462) template design.
- Propane offloading skid. Design will follow the N-Pad Lean SAP (2014-462) template design.
- Installation of equipment, pipe and cable tray supports, as required
- Installation of required piping, valves, instrumentation, and controls for propane injection
- Electric heat tracing and insulation of lines, as required

- Installation of a new pump skid Pump Skid LCP/Remote I/O Rack, motor starter, injection pump VFD and junction boxes. Design will follow the N-Pad Lean SAP (2014-462) template design.
- Installation of cabling and cable tray to connect equipment and instrumentation
- Programming of Allen Bradley W06 Pad PLC, programming the Honeywell DCS logic and Cenovus Factory Acceptance Testing (FAT)
- Site construction and pre-commissioning by Cenovus OCT
- Commissioning by Cenovus PRT

1.3 EP Scope

EP will provide the following:

- Stage 3 (+30/-15%) cost estimate at IFA
- Project schedule development and tracking for design/engineering
- Weekly reporting/status updates
- All required design/construction drawings for the installation (plot plans, P&IDs, line list, GAs, mechanical ISOs, electrical, controls and civil drawings)
- 3D model of project scope. Pump and offloading skid design will follow the N-Pad Lean SAP (2014-462) template design.
- Tie point and constructability review.
- Instrumentation data sheets
- Procurement of the following, including PO's and bid packages where required:
    - All tagged mechanical equipment and SP items
    - Structural steel supports
    - All pipe spooling, valves and fittings greater than or equal to 2"
    - All tagged instrumentation
    - Free issued electrical
    - Hot Solvent pump skid electrical panels and required DCS components
- Since design is similar to N-Pad Lean SAP (2014-462), a What-If review will be performed for the revised W06 Hot Solvent scope.
- Overpressure Risk Assessment (ORA)
- ABSA submission for piping, if volume is > 0.50 m^3. Truck offloading piping and piping upstream of the propane injection control valve is considered part of the Safety Codes Act and within the jurisdiction of ABSA.
- Review tie-point package.
- Field piping combined 30/60/90% model review meeting. Pump/offloading skid 3D model will be reviewed as part of N-Pad Lean SAP (2014-462).
- Control philosophy and shut down keys (SDK)

- Revisions to existing Operating Procedures, as required and generating new Propane Hot Solvent Operating Procedures. Operating manual is not required, as Offsites does not have operating manuals. The following Operating Procedures will be generated:
    1. Package Prepare for Maintenance
    2. Package Return from Maintenance
    3. Hot Restart
    4. Return to Operation from a Cold Start-Up
    5. Propane Truck Offloading
    6. Oil Change and Stuffing Box Replacement
- Controls system programming
- Construction support, as required
- Commissioning support, as required
- First fill of propane and pump lube oil

1.4 Cenovus Scope

Cenovus will provide the following:

- Construction contractor awards and management
- Approval of PO's
- Procurement of the following:
    - Earthworks materials
    - Dike and liner materials
    - Piling materials
    - Field run pipe, valves and fittings size less than 2"
    - All gaskets, studs and bolts
    - Field supplied cables and cable trays
- Municipal approvals are not anticipated
- Environmental Impact Assessments and legal surveys are not anticipated
- Pre-Disturbance Assessments
- Commissioning of the installation
- Contract for vendor support for commissioning and maintenance
- Ongoing propane supply

1.5 Site Requirements

- Tie-ins required for W06 Hot Solvent injection lines into the I06 steam injection line.
- Scaffolding, as required

1.6 Utility Requirements

- Instrument Air for actuators and control valves

1.7 Isolation Strategy and Sequencing

- Tie-ins to be identified on IFC drawings. Piping tie-ins need to be completed when wells W06I06 is shut down and electrical tie-ins can be completed online. The pump skid LCP/remote I/O rack and required PLC components needs to be integrated with the W06 PLC during a pad shutdown.

1.8 Construction Strategy

- Construction to managed by Cenovus OCT.

1.9 Commissioning/Turnover Strategy

- Turnover to be managed by Cenovus OCT and PRT and commissioning to be managed by Cenovus PRT.

1.10 General Information

AFE #:	16165217
Project Title:	FC W06 Hot Solvent
Project Number#:	2016-012
Pad Location:	10-19-70-4-W4M
Ownership:	100% Cenovus FCCL
Barometric Pressure:	93 kPa(a)
Seismic Data:	Sa(0.2)=0.10, Sa(0.5)=0.06, Sa(1.0) = 0.03, Sa(2.0)=0.01, PGA=0.04 (Cold Lake)
Ambient Temperature Summer Design Winter Design	 +30 °C -40 °C
Plant Elevation	670-673m ASL
Ground Snow Load	Ss=1.7kPa, Sr=0.1kPa (Cold Lake)
Project Specs	ASME B31.3-2010, CSA, CEC and applicable Cenovus Thermal Recovery (TR) Specifications

1.11 Composition and Properties

Composition data below for bitumen, produced gas and casing gas, fuel gas and produced water has been taken from the Design Basis Memorandum for Cenovus – Foster Creek Offsites, FCO 2013 Development - Pads, TSE Project # CVE11043 Rev 2Z.

1.11.1 *Bitumen Distillation Curve (ASTM D5307)*

Extracted from Foster Creek Phase 1C, Process Design Basis, Rev 1A, September 5, 2003

Volume Fraction Distilled	Temperature (°C)
Initial Boiling Point	192.4
5%	257.2
10%	308.8
15%	340.6
20%	369.3
25%	395.9
30%	421.4
35%	440.2
40%	469.6
45%	495.1
50%	520.4
55%	546.3
60%	572.8
65%	598.6
70%	625.6
75%	653.8
80%	687.6
85%	727.7
Viscosity	
30°C	63 200 cSt
40°C	13 900 cSt
50°C	4 705 cSt
Density	
Density at STP	1003 kg/m³
API	9.44

1.11.2 *Produced Gas and Casing Gas – Pad W03, W06, W05, W08, W07, W10*

Component	Mole% (based on dry GOR=15)
C1	84.22
CO2	15.04[2]
H2S	0.74[1]
TOTAL	100.00

Notes:

1. H2S is based on 0.25 kg sulphur per 1.0 m^3 of bitumen produced and a dry GOR of 15.
2. CO2 is based on 7 kg CO2 per 1.0 m^3 of bitumen produced and a dry GOR of 15.

1.11.3 *Fuel Gas*

Component	Mole Fraction
He	0.0003
N_2	0.0200
CO_2	0.0003
C_1	0.9793
H_2O	0.0001 (4 lb/MMSCF)
TOTAL	1.0000

1.11.4 *Produced Water*

Produced Water Analysis Ionic Constituents	Concentrations (mg/L as ion)
Calcium (Ca^{++})	4.7 mg/L as ion
Magnesium (Mg^{++})	0.5 mg/L as ion
Sodium (Na^{+})	886 mg/L as ion
Potassium (K^{+})	17.1 mg/L as ion
Iron (Fe^{++})	0.03 mg/L as ion
Manganese (Mn^{++})	< 0.004 mg/L as ion
Barium (Ba^{++})	3.11 mg/L as ion
Strontium (Sr^{++})	0.76 mg/L as ion
Bicarbonate (HCO_3^{-})	291 mg/L as ion
Carbonate (CO_3^{-})	39.9 mg/L as ion
Sulphate (SO_4^{--})	13 mg/L as ion *
Chloride (Cl^{-})	1230 mg/L as ion *
Hydroxyl (OH^{-})	< 0.5 mg/L as ion
Total Dissolved Solids (TDS)	2900 mg/L
PH	8.8
Total Hardness (Ca & Mg)	14 mg/L as $CaCO_3$
Total Alkalinity	305 mg/l as $CaCO_3$
Dissolved Silica (SiO_2)	223 mg/l as SiO_2

Note: Sulphate and chloride ions were estimated, not analyzed.

1.12 Design Flow Rates

Data below has been taken from the Design Basis Memorandum for Cenovus – Foster Creek Offsites, FCO 2013 Development - Pads, TSE Project # CVE11043 Rev 2Z.

1.12.1 *Design Flow Rates*

Commodity	Flow Rate Per Well	
	Pad Headers	Individual Well Piping
Steam	500 m^3/d CWE	600 m^3/d CWE
Emulsion	200 S m^3/d Bitumen (SOR = 2.5) 450 S m^3/d Produced Water 750 S m^3/d Produced Gas (Note 3)	250 S m^3/d Bitumen (SOR = 2.4) 550 S m^3/d Produced Water 937.5 S m^3/d Produced Gas (Note 3)
Casing Gas	3000 S m^3/d gas (dry) (Note 1, 2)	3750 S m^3/d gas (dry) (Note 1, 2)
Fuel Gas (Note 4)	100 S m^3/d gas – Injector Casing Blanket gas only	200 S m^3/d gas – Injector Casing Blanket gas only

NOTES:

(1) Casing gas flow is based on a dry GOR of 15 for all pads.

(2) The casing gas flow used for hydraulic calculations was made up of dry gas flowing at the tabulated rate, saturated with water vapour to the point where the overall mixture had a water content of 64 mole %. This value was selected based on a combination of measured values and calculated water saturation at expected operating conditions.

(3) For all pads, produced gas in the emulsion is based on 25% of the expected casing gas flow. Steam minimum rate calculated based on steam oil ratio (SOR)=2.5

(4) Actual bubbler panel flows of 40 Sm^3/d, confirmed by CVE Operations.

1.13 Gas Composition

1.13.1 *Propane*

Propane to be supplied by Canwest and composition to meet minimum specs of HD-5 propane.

Product Characteristics	**Propane HD-5**
Composition	Not less than 90 liquid volume percent propane; not more than 5 liquid volume percent propylene
Vapour pressure at 100°F, psig, max	208
at 37.8°C, kPa, max	1434
Volatile residue:	
Temperature at 95% evaporation,	
deg. F, max	-37
deg .C, max	-38.3
or butane and heavier, liquid volume percent max	2.5
pentane and heaiver, liquid volume percent max	-
Total sulfur, ppmw	123
Moisture content	Pass
Free water content	-

(1) Information based on GPA Liquefied Petroleum Gas Specifications.
(2) The total sulfur limits in these specifications do include sulfur compounds used for stenching purposes.
(3) Canwest confirmed that there is no max requirement for C02 to meet HD5 spec. However, lab analysis from the refinery shows there is little to zero C02 present.

1.14 Operating and Mechanical Design Conditions

1.14.1 *W06 Pad*

Data below has been taken from the Design Basis Memorandum for Cenovus – Foster Creek Offsites, FCO 2013 Development - Pads, TSE Project # CVE11043 Rev 2Z.

Description	Operating Condition				Mechanical Design Condition	
	Pressure (kPag)		Temperature (°C)		Pad Piping	
	Plant Limit	Wellhead Limit	Plant Limit	Wellhead Limit	Design Pressure (kPag)	Plant Limit (°C)
Steam	9300 – 9900	Start-up: ~ 6000 (min) Normal Op.: ~ 4000 (5)	306 – 311	–	11032	344
Emulsion	1500 (min)	2400 (max)	–	100 – 200(1)	11032	344
Casing Gas	800 (min)	1750 (max)	–	100 – 200(1)	11032	344
Test Emulsion	–	2400 (max)	–	100 – 200(1)	11032	344
Fuel Gas	5000 – 6000	3000 to 4700 (startup/normal operation)	4	10 (min)	11032	65 / 344(2)
Liquid Propane		3500 to 4000 (normal operation)	-40 – 30	-40 – 30	1750(3) / 11032	-45 / 45(4) / 344

NOTES:

(1) The maximum well head temperature of 200°C is based on future higher temperature ESPs.

(2) Tubing between the bubbler panel and the wellheads is to have a design temperature of 344°C. The remainder of the piping, both in the modules and on the pad, is to have a design temperature of 65°C.

(3) Propane bullet design pressure limits. Propane bullet must be designed to a minimum MAWP of 1750 kPag or 250 psig, as per STANDATA bulletin G-04-11-ABSA.

(4) Propane bullet, loading and injection temperature limits up to steam piping spec break.

(5) Cenovus has confirmed the West Pads current normal operating pressure is 4000 kPag.

1.14.2 *Propane Injection Design*

Description	Units	Normal Operating	Design
Propane Storage Temperature	°C	-30 to +30	-40 to +30
Propane Injection Mix Temperature	°C	110	100 to 120
Injection Rate	Tonne/hr	2.1	0.5 to 2.5 (1)
Injection Pressure @ Wellhead	kPag	4000	Max 5000

NOTES:

(1) Design flow rate to be between 0.5 to 2.5 t/h (12 to 60 t/d). The maximum design rate of 2.5 t/h (60 t/d) is for a single booster/injection pump train. Considerations provided for higher flow rates with two booster/injection pump trains operating in parallel, with a maximum injection rate of 5 t/h (120 t/d).

1.14.3 *Propane Injection Normal Operation*

During propane injection, Cenovus has confirmed that at lower propane injection flow rates, the reservoir pressure also becomes lower. The following propane flowrates and corresponding reservoir pressures (BHP) are expected:

	Units	Min Rates	Normal Rates	Max Rates
Propane Injected	Tonne/day	5	60	77
Reservoir Pressure (BHP)	kPag	3050	3100	3500

Propane is also expected to ramp up at 10 Tonne/day at a reservoir pressure at 3100 kPag. The propane injection pump discharge pressure can be reduced, as required, to place the control valve in a desired range. However, the steam flow control valve does not need to be sized for this case.

1.15 Land Requirements

Applicable to this Project ☐Yes ☒No				
Item	Required			Comments
	Yes	No	n/a	
Crown Lands	☐	☐	☒	
Private Lands	☐	☐	☒	
Existing Well-site survey plans	☐	☐	☒	
New Facility or Pipeline	☐	☐	☒	
R/W Survey	☐	☐	☒	
Title Search	☐	☐	☒	
Landowner Notifications	☐	☐	☒	

1.16 Facility Equipment

Applicable to this Project ☒Yes ☐No				
Item	Required			Comments
	Yes	No	n/a	
ESDV	☒	☐	☐	
Wellhead Choke	☐	☐	☒	
Control Valves	☒	☐	☐	New FV, PV
Flare Stack	☐	☐	☒	
Flame Arrestor	☐	☐	☒	
Flare KO Drum	☐	☐	☒	
Tanks	☐	☐	☒	
Vessels	☒	☐	☐	V-9220 (Propane Bullet)
RTU/MCC Buildings	☐	☐	☒	
SCADA / RTU	☐	☐	☒	
PLC/DCS	☒	☐	☐	New Hot Solvent I/O rack and use existing Pad PLC cabinet
Fire/Gas/H2S Detection	☒	☐	☐	
Separator Package	☐	☐	☒	
Dehydration Package	☐	☐	☒	
Cooler Package	☐	☐	☒	
Liquid Pumps	☒	☐	☐	P-9230A/B Booster and P-9240A/B Injection Pumps
Blowers	☐	☐	☒	
Above Ground Piping	☒	☐	☐	
Below Ground Piping	☐	☐	☒	
Fuel Gas	☐	☐	☒	
Heat Tracing	☒	☐	☐	EHT
Insulation	☒	☐	☐	Piping, as required
Instrument Air	☒	☐	☐	
Flow Measurement	☒	☐	☐	MARP (propane injection)
Pressure Measurement	☒	☐	☐	
A/C & D/C Power	☒	☐	☐	
Radio Tower	☐	☐	☒	
Site Fencing	☐	☐	☒	

1.17 Chemicals

Applicable to this Project ☒Yes ☐No				
Item	Required			Comments
	Yes	No	n/a	
Oils / Lubes	☒	☐	☐	Lube oil require for injection pumps
Glycol	☐	☐	☒	
Sulfa-Treat	☐	☐	☒	
Activated Carbon	☐	☐	☒	
Other	☐	☐	☒	

1.18 Regulatory Requirements

Applicable to this Project ☒Yes ☐No				
Item	Required			Comments
	Yes	No	n/a	
AER permits	☒	☐	☐	Permit received for propane injection.
Schedule 1 – General	☐	☐	☒	
Schedule 2 – Prod. Facility	☐	☐	☒	
Schedule 3 – Pipeline	☐	☐	☒	
ABSA Permits	☒	☐	☐	For vessels and piping
Municipality Approvals	☐	☐	☒	
Pipeline Crossings	☐	☐	☒	
River or Creek Crossings	☐	☐	☒	
Road Crossings	☐	☐	☒	

1.19 Engineering Drawings

Applicable to this Project ☒Yes ☐No				
Item	Required			Comments
	Yes	No	n/a	
Process Drawings				
PFD	☒	☐	☐	
P&ID's	☒	☐	☐	
Line List	☒	☐	☐	
Mechanical Drawings				
Plot Plans	☒	☐	☐	
Pipeline Location Plan	☐	☐	☒	
Isometrics	☒	☐	☐	
General Arrangement	☒	☐	☐	
Civil Drawings				
Site Grading	☒	☐	☐	Propane drainage and spill containment
Pile Layout	☒	☐	☐	
Concrete	☐	☐	☒	
Structural	☒	☐	☐	
Architectural	☐	☐	☒	
Instrumentation, Controls & Electrical Drawings				
Shutdown Key	☒	☐	☐	
Hazardous Area Drawing	☒	☐	☐	
Cable Tray Layout	☒	☐	☐	
Single Line Diagram	☒	☐	☐	
Lighting Plan	☒	☐	☐	
Grounding	☒	☐	☐	

Instrument Layouts	☒	☐	☐	
120 V Schematics	☒	☐	☐	
480 V Schematics	☒	☐	☐	
600 V Schematics	☐	☐	☒	
EHT ISOs	☒	☐	☐	
JB Layouts	☒	☐	☐	
Wiring Schematics	☒	☐	☐	
Cable and Conduit Schedules	☒	☐	☐	
Panel Layouts	☒	☐	☐	
I/O Schematics	☒	☐	☐	

2.0 Work Scope

2.1 Mechanical Scope of Work

Mechanical Engineering design will meet the applicable edition of codes and standards. The Cenovus Mechanical, Piping, General Specifications, and Procedures are intended to be used in conjunction with this document. Thermal Recovery Frozen specification index rev 90, dated Jun 15, 2016 will be used. These specifications are referenced in Appendix 4.

The Mechanical scope of work for this project includes installation of the propane bullets, pump skid and truck offloading skid. Piping will be installed from the propane bullets to the propane booster and propane injection pumps. New piping will also be installed from the propane injection pump to the tie-in on the steam injection headers to well W06I06. Propane piping will be tied to existing injection steam line outside the module. Propane will be injected into the steam header through an injection quill with spray nozzle. Injection propane piping will be designed as per Cenovus Piping Classes DLB (Low Temperature Steam service) and DVA (Steam Service). A specification waivers will be submitted to use material suitable for high temperature steam and low temperature propane.

A piping tie-in on the instrument air header will provide the required instrument air for instrumentation and actuators being installed.

All piping and piping components shall be designed, manufactured, and tested in accordance with ASME B31.3, applicable Cenovus TR specifications, and industry best practices. All new process piping shall be insulated as per the P&ID's, Line List, and construction drawings. Insulation and tracing shall be in accordance with the applicable Cenovus TR specifications.

2.1.1 *Corrosion Allowance*

Corrosion will be primarily mitigated by providing adequate corrosion allowance based on plant design life. In general, minimum corrosion allowance will be 1.6 mm for non-corrosive sweet service and 3.2 mm for corrosive sweet and sour service for carbon steel systems, as per the applicable pipe spec.

2.1.2 *Minimum Design Metal Temperature*

The MDMT of piping component is a material property which represents the coldest temperature which piping component can be pressurized to its rated pressure. Outdoor piping which is heat traced and insulated or de-pressured when not flowing warm fluid does not require design for minimum ambient temperature (-40°C).

2.1.3 *Sparing*

Due to the non-critical nature of equipment, no equipment, except for the pumps, will be spared. Only one booster/injection pump train will be required to operate. The second booster/injection pump will be a 100% spare. Also, rotating equipment will be provided with spare parts lists and required spare parts will be purchased as per Cenovus requirements.

2.1.4 *Equipment Spacing Requirements*

Equipment spacing will follow AER and other applicable code guidelines along with Cenovus specifications. A preliminary review of the equipment spacing has been completed and the IFA plot plan and estimate is based on the proposed layout. However, the equipment spacing spec cannot be met with the existing W06 equipment. Further review to be completed during detailed engineering and a spec waiver needs to be submitted.

2.1.5 *Propane Storage Bullets*

One (1) propane storage vessel having a capacity of 60,000 US gallons will be installed. Propane vessel shall be designed per ASME Boiler & Pressure Code Section VIII Division 1 latest Edition and comply with Cenovus Unfired Pressure Vessels Specification TR-43-SPC-00-005-01. The vessel will be registered with ABSA (Alberta Boilers Safety Association). For sweet service vessels, post weld heat treatment (PWHT) will be done as required by ASME Boiler & Pressure Vessel Code Section VIII Division 1. The propane vessel will be installed outside and the vessel has a MDMT of -45°C.

Cenovus has confirmed that the propane storage bullet does not need to be fireproofed and that it will remain bare.

2.1.6 *Propane Pumps*

Pumps shall be designed per Cenovus Pumps Specification and relevant codes. The pump skid will have two trains, each train with a booster and injection pump. A 300# flange rating, 7.5 HP side channel centrifugal booster pump (c/w mag drive) and a 900# flange rating, 30 HP triplex injection pump will be required to inject the propane into the injection wells. The injection pump will have forced lubrication to meet the full range of the required flows. Propane pumps will be installed outdoors on a skid, complete with SP items, instrumentation and piping to skid edge. A roof will be provided to keep snow off the pump skid. All items equipment on the skid will meet the requirement of having an MDMT of -40°C.

2.2 **Civil Scope of Work**

The Civil scope of work includes providing drainage and spill containment for the propane storage bullet, and structural supports, as required, to support all new piping, cable trays, propane storage bullets and pump skid.

2.2.1 *Earthwork and Spill Containment*

Earthwork scope includes the design of the drainage for the propane storage bullet and trenching details for the new underground pipes. A galvanized containment wall, with an HDPE liner, will be used for spill containment. Additional jersey barriers are required to protect the concrete containment wall and piping to the propane loading station.

2.2.2 *Piling Requirements*

New driven steel pipe piles will be installed to support the propane storage bullet, the pump skid, the access platform for the Truck Unloading area and new pipe supports.

2.2.3 *Structural Steel Requirements*

New structural steel will be designed and fabricated for the propane storage bullet support frames and pipe supports for the new piping, Supports will be provided for new cable tray, if required. On the pump skid, it is not anticipated that a dynamic analysis will be required as the pumps will be close to grade. These pumps are expected to be small and the moving parts are not of a significant weight. As a precaution, it is intended to place a pile directly under each pump.

The propane storage bullets will be raised up approximately 2.5 meters and placed on a structural steel base. As per API 2510, fireproofing on the structural steel is not required, since bullet is not fireproofed.

New structural steel will be provided as modifications to existing structures where required. The existing structures will be evaluated for any new loads.

2.3 Electrical and Instrumentation Scope of Work

2.3.1 *Electrical Scope of Work*

The installation shall be in accordance with the latest Cenovus design practices.

The Electrical scope of work will be to install all new MCC equipment, connect all new 480 VAC, 120 VAC and 24 VDC equipment along with all necessary grounding, cable trays, and homerun cables.

The electrical design shall be completed by TSE and based on the following accepted oil & gas electrical codes and specifications. The additions shall be designed, fabricated, installed, tested and inspected in accordance with the latest revisions of the following:

- CEC Canadian Electrical Code, Part I
- O&G Code Alberta Safety Codes Council's Code for Electrical Installation at Oil & Gas Facilities
- Cenovus Cenovus TR Specifications & Standards

All applicable provincial and local authority codes, regulations and safe practices shall be followed. In the event of technical discrepancies, the order of precedence shall be:

- Variances Approved Cenovus Variances to the CEC
- CEC Canadian Electrical Code, Part I
- Contract Contract Documents
- Drawings Engineer Stamped Drawings
- Deviations Approved Cenovus Deviations to TR Specifications
- Cenovus Cenovus TR Specifications & Standards

2.3.1.1 Electrical Equipment Requirements:

Existing Electrical Building BU-9060
A new feeder breaker will be installed at existing MCC-9066A to provide 480VAC power to equipment installed at the pump skid and truck unloading area.

Pump Skid
The pump skid will be wired by the fabricator and shipped to site. The following equipment will be installed:

- VFD panel, includes 2 VFDs for the injection pumps and 2 starters
- LCP panel with a remote I/O rack that is dedicated to the Hot Solvent project
- A lighting transformer and panel
- A main disconnect switch and power splitter
- All instrumentation, lighting and receptacles

Truck Unloading Area
All instrumentation, lighting and 120V electrical loads will be collected in local junction boxes. Home run cables from these junction boxes will be terminated at the Hot Solvent remote I/O rack located at the pump skid. A truck unloading control panel and ground check monitor will be installed on the truck unloading skid by the fabricator.

Propane Bullet Area
All instrumentation, lighting and 120V electrical loads will be wired in the field to electrical and controls equipment installed on the pump skid. Cabling to the pump skid will be run in cable tray when possible, or directed buried across the pad entrance road crossing.

Well Pair Module BU-9020
All new instrumentation being added within the module building will be terminated to existing panel IOP-9020.

UPS
Existing 120 VAC and 24 VDC UPS's have sufficient capacity to power additional loads and the existing UPS distribution panels have sufficient space for additional feeders. All associated designs shall meet Cenovus TR Specifications (TR-46-SPC-00-013-01).

The types of circuits that shall receive UPS power include:

- I/O panels
- Field instruments

Cable Trays
Cable trays, supports, expansion/couplers, and tray grounds will be installed as required. Cable trays shall be ventilated, ladder type and made of Class E aluminum.

Grounding
The grounding and bonding system shall utilize the existing skid and equipment piles as ground electrodes. The grounding conductors shall be routed via cable tray and below. All electrical equipment shall be connected to the ground grid.

Lighting
Lighting for working areas shall be designed, as required, to provide adequate illumination per Cenovus project specifications and applicable codes and standards. All lighting to be LED.

Electric Heat Tracing
EHT cables (where required) will be field installed, wired and powered from an existing EHT controller.

2.3.1.2 Electrical Cable Requirements:

Cable selections shall be based on Cenovus TR Specification TR-46-SPC-00-029-01, "Wire and Cable". Conductor sizes shall be based on the CEC.

Where specified, tray cable shall be used for instrumentation and small power cable (#2 AWG copper and smaller). Tray cable shall be CSA approved and rated for -40°C.

2.3.1.3 Hazardous Area Classification:

The area classification for this project shall be based on Classes, Zones and Groups and shall be completed in accordance with the standards listed in this Design Basis Memorandum (DBM). The intent is to classify all process modules/skids as Class I, Zone 2 hazardous areas. The design shall make use of equipment rated for use in that area. Installed cost, operability, and maintainability shall be considered when choosing equipment.

The Area Classification drawing for this project shall show the boundaries of the classified (hazardous) areas for the selection of equipment and installation procedures. All process equipment that is considered a source of hazardous gas, vapor, or liquid shall be shown on the drawing.

2.3.2 *Instrumentation Scope of Work*

Instrumentation supplied as part of this project shall be in accordance with Cenovus TR Specifications. Instruments are to be supplied and installed as shown on the IFA P&IDs. Additionally, all Coriolis meters will be HART compatible. Also, all required MARP instruments to comply with Cenovus MARP spec and AER Directive 17.

Installation of all instrumentation as part of this project shall be in accordance with Cenovus TR Standard Installation Details. Any installation specific to this project that is not already accounted for as part of the TR typicals shall be created as a controlled project document and issued with the EIC CWP's.

2.4 Controls Scope of Work

2.4.1 *System Design*

A new remote I/O rack will be installed on the pump skid, which will be attached to the W06 existing PLC by ControlNet. All the signals in the W06 propane offloading and storage, pumps area will be wired to the associated I/O cards. The program will be integrated in W06 pad PLC, and all the data will be passed into Honeywell SCADA, so the Hot Solvent process can be monitored and operated from the DCS HMI.

There is one PanelView on the pump skid for pumps local start/stop, which will be only configured with the booster and injection pumps start/stop signals. The PanelView will communicate with the W06 PLC via a fiber connection. The fiber will go through an NTron-1002MC media convertor to be connected with the Stratix-8000 switch in the W06 MCC PLC panel, so that the PanelView can also be managed by Allen-Bradley FactoryTalk AssetCentre.

The propane injection transmitters and control valves will be wired to the remote racks in the BM-9020 building. New cards will be required to be added to the spare slots on these two racks, as required. The mass flow meter current signal (4~20mA) will be wired to the existing HART Analog Input card, and a new Modbus communication MCMR card will be added on this rack for the mass flow meter diagnostics. Current hardware is HART enabled and new HART enabled Analog Input and Output modules will be used. This is to facilitate having HART infrastructure in place to provide better data for asset management tools.

Variable Frequency Drives (VFDs) will be utilized for speed control of the propane injection pumps, and the VFDs will be located on the pump skid. If the VFD is from ABB, it can communicate with the new PLC via Ethernet IP. A CAT-5 cable will be run from each VFD to the other STRATIX 2000 switch, and connect to the existing ENBT on the W06 PLC rack,, which is the Ethernet interface module for the PLC to drive all VFDs. The Ethernet link to the control system will handle all data required for troubleshooting and is configurable by the user. In addition the speed set point and speed feedback will be transferred between the VFD and control system by Ethernet communication. Start/stop control will be achieved via a local selector switch on the front of the VFD, which provides discrete inputs to the PLC. These signals will be used in the logic to start the VFD. Status (fault status, run status) will be achieved via hardwired signals. The Shutdown (YYE) and Start/Stop (YY) Output from PLC are also hard-wired to the VFD.

2.4.2 *Control Philosophy and SDK*

The reference used for the control philosophy of the well pairs will be the "Foster Creek Offsites 2013 Wellpads W03, W04, W05, W06, W07, W08 Control Philosophy", document no. FC1-47-CP-00-072-01. A new Control Philosophy will be issued to cover W06 Hot Solvent including propane unloading, storage bullet and propane injection controls. Shutdown keys for W06 Hot Solvent will also be issued.

2.4.3 *HMI Graphics and Programming*

Operator display graphics will be developed using the most recent graphic standards developed by the Foster Creek Process Control group on the Honeywell Experion host located in the control room. There will be a local HMI to allow starting the pumps locally. The program for the W06 Hot Solvent section will be integrated to the existing W06 PLC.

2.4.4 *Controls Scope of Work*

Control systems scope of work for this project includes:

- Review and/or modify required I/O allocation, PLC panel layout drawings, architecture drawings, and wiring schematics
- Support design documentation review activities
- Update control philosophy, generate W06 Hot Solvent control philosophy and create project shutdown keys with eSDK
- Prepare/support MR packages as required by project procurement strategy

- When system design has been completed and design documents have been issued for construction, start PLC configuration and program as per project scope
- The PLC configuration and program will go through Pre-FAT and FAT following Cenovus procedures, including control strategies, eSDK, HMI, SCADA and any other application required as per Cenovus standards
- PLC configuration and program will be implemented, tested and commissioned at site.

3.0 Engineering Plan

3.1 General Requirements

The project shall be designed and executed per the Project Management Plan, Foster Creek Operations Projects, Rev. 2, Category 5, unless otherwise defined in this DBM. Changes to the DBM shall be documented as Trends and receive Cenovus approval before proceeding with further work on that aspect of the project.

3.2 Stamping of Drawings

The following discipline leads will stamp the final IFC drawings and documents. No other documents shall be stamped by EP:

- P&ID's/Line List – Process Engineer / Haider Ameer
- Plot Plans – Piping Engineer / Arya Kavousian
- GA's & ISO's – Piping Engineer / Arya Kavousian
- Civil – Civil Engineer / Eamonn Mc Sweeney
- Electrical – Electrical Engineer / Ziad Akbar
- Controls eSDK – Controls Engineer / Jack Zhang

3.3 Drawing Reviews

EP will issue IFC and all vendor related drawings to Cenovus for approval prior to start of any construction.

The drawing review process will entail the following, in the order presented:

- IFA – "Issued for Approval"- For Cenovus approval (hold point for Process review)
- Control Philosophy and eSDK Review (shall be completed prior to HAZOP)
- Tie-in Review Meeting - For Cenovus approval (hold point for Tie-ins)
- IFH – "Issued for HAZOP" (hold point for HAZOP review)
- Overpressure Risk Assessment (ORA)
- 30% Model Review (hold point for Mechanical)
- 60% Model Review (hold point for Mechanical)
- 90% Model Review (hold point for Mechanical)
- IFC – "Issued for Construction"- Issued to Cenovus for construction
- OCT Project Initiation Meeting

All key Engineering drawings will be reviewed internally by EP.

3.4 Design Process

3.4.1 Process Engineering

- Process calculations
- Prepare IFA PFDs/P&IDs for Cenovus design approval
- Participate in DBM and IFA P&ID review
- Participate in IFR Control Narrative and eSDK review
- Prepare IFH PFDs/P&IDs and Line List for HAZOP
- Prepare IFH/IFC material balance
- Participate in HAZOP meeting
- Participate in Model reviews
- Prepare process input for all required datasheets
- Participate in squad checks
- Prepare IFC PFDs/P&IDs and Line List
- IFC Car Seal List
- IFI Engineered Set Point List
- Develop Operating Procedures

3.4.2 Mechanical Engineering

- Prepare IFA Plot Plans
- Prepare Bill of Materials
- Participate in DBM and IFA P&ID review
- Prepare IFA Tie-in List for Cenovus design approval
- Prepare Tie-in Packages
- Participate in Model reviews
- Prepare IFQ, IFP and as built data sheets for mechanical equipment and SP items
- Prepare mechanical equipment and SP item MR's, Technical Evaluation & required documents for purchase
- Participate in squad checks
- Provide input to Line List
- Prepare IFC Equipment List, Valve List, Tie-in List and SP Item List
- Prepare IFC GA's and ISO's
- Prepare Mechanical CWPs
- Construction support as required

3.4.3 Civil Engineering

- Prepare Bill of Materials
- Participate in DBM and IFA P&ID review
- Provide structural input into Model
- Participate in Model reviews
- Prepare IFC Civil drawings
- Prepare Civil CWPs

3.4.4 Electrical & Instrumentation Engineering

- Prepare Bill of Materials
- Participate in DBM and IFA P&ID review
- Prepare Instrument datasheets, MR packages and complete technical evaluations
- Participate in squad checks
- Participate in HAZOP review
- Participate in Model reviews
- Prepare IFC Electrical drawings
- Prepare IFC Instrumentation Index
- Prepare EIC CWP

3.4.5 Controls Engineering

- Prepare Bill of Materials
- Participate in DBM and IFA P&ID review
- Prepare DCS Equipment MR packages and complete technical evaluations
- Prepare DCS I/O allocation
- Participate in HAZOP review
- Update Control Philosophy
- Prepare eSDK
- Prepare IFC Controls drawings
- Provide input into EIC CWP
- Prepare Controls EWP
- Provide DCS programming
- Provide on-site support for commissioning
- Collect Turnover Packages 1 and 2 and create Turnover Package 3 for submission to PRT

3.5 Reporting/Document Distribution

- EP will provide weekly status reports that will be e-mailed prior to progress meeting.
- EP will provide monthly cost reporting as per the Cenovus reporting schedule
- EP will use CPW to distribute all project related documents with the following exception: IFC CWPs will be emailed to Cenovus Main Document Control (DC), OCT DC and PRT DC, in addition to being uploaded to CPW.

4.0 Procurement Plan

4.1 Cenovus Office

- Cenovus Calgary shall have final approval for all EP PO's

4.2 EP Company

- EP shall follow the Cenovus Procurement & Contracting Procedural levels matrix
- EP shall utilize internal systems for preparing PO's and for cost reporting
- EP shall utilize the standard Procurement Schedule for tracking milestones on each PO
- EP shall prepare PO's for and coordinate all shipping of EP procured material
- EP shall obtain preventative maintenance manuals and recommended spare parts lists from Vendors

4.2.1 Pre-approval of IFA documentation:

- None

4.2.2 Post-approval of IFA documentation:

- EP shall prepare POs for booster and injection pumps

4.2.3 After approval of IFH documentation:

- EP shall prepare POs for all other equipment

4.3 Cenovus OCT

- Cenovus OCT shall bid and issue all construction contracts

4.4 Site Contractors

- Site Contractors shall procure all piling material
- Site Contractors shall procure all field run bulk pipe, flanges, fittings and manual valves (less than 2"), field run.
- Site Contractors shall procure stainless steel tubing
- Site Contractors shall procure gaskets, bolt-up material
- Site Contractors shall procure all insulation material
- Site Contractors shall procure all bulk electrical and instrumentation material

4.5 Spare Parts

- As per Vendor recommended spare parts list, reviewed by CVE Maintenance and Reliability

5.0 Construction Plan

- EP shall prepare CWPs to detail the technical aspects of each proposed Contractor's scope of work (refer to Appendix 5 - CWP List)
- Cenovus OCT shall coordinate all construction activities
- EP shall provide construction and commissioning support, as requested

6.0 Appendices

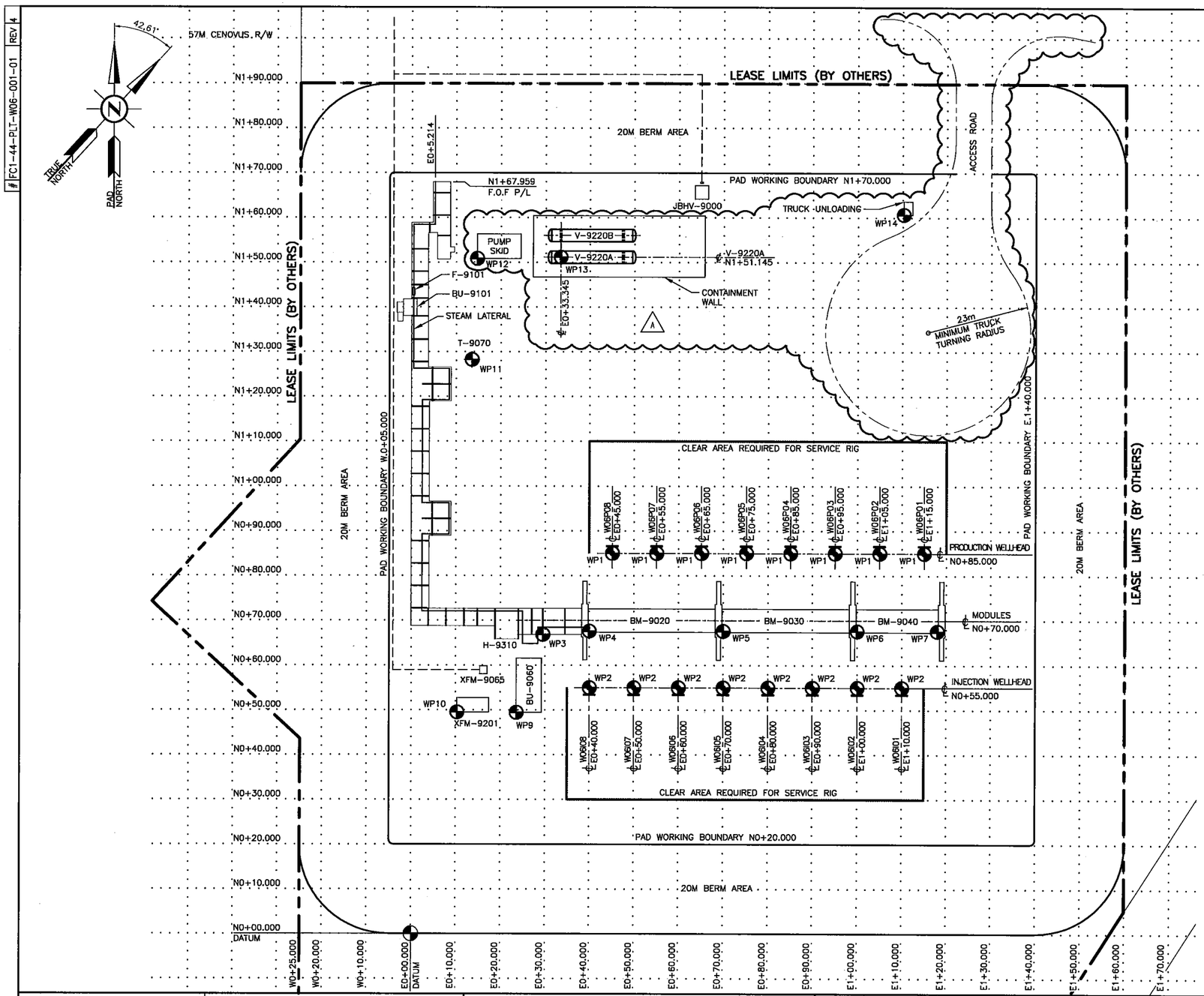
Appendix 1 – Key Project Contacts
Appendix 2 – Drawings and Lists
Appendix 3 – Vendor Information
Appendix 4 – List of Project Specifications
Appendix 5 – Construction Work Package List

APPENDIX 1 – Key Project Contacts

Contact	Position	Phone No.	E-mail:
Cenovus			
Stewart Adams	Project Sponsor	Wk: 403.766.6255	Stewart.Adams@cenovus.com
Gary Bagga	Project Manager	Wk: 403.766.6382	Gary.Bagga@cenovus.com
Erico Scachetti	Project Engineer	Wk: 403.766.4679	Erico.Scachetti@cenovus.com
Richard Maisonneuve	Process Engineer	Wk: 403.766.2506	Richard.Maisonneuve@cenovus.com
Kamlesh Parmar	Process Controls	Wk: 403.766.2398	Kamlesh.Parmar@cenovus.com
Scott Pura Jim Leibel Willie Wolfe	PRT Coordinator	Wk: 780.815.6601 Wk: 780.815.6635 Wk: 780.815.6671	Scott.Pura@cenovus.com James.Leibel@cenovus.com Willie.Wolfe@cenovus.com
Bill Brears Tom McKee	PRT Coordinator & Cross Shift	Wk: 780.815.7445 Wk: 780.815.7478	Bill.Brears@cenovus.com Tom.McKee@cenovus.com
Silas Nixon Mitchell Paquette	OCT Construction Coordinator	Wk: 780.815.6733 WK: 780.815.7173	Silas.Nixon@cenovus.com Mitchell.Paquette@cenovus.com
Three Streams Engineering			
Jack Woloszyn	Project Manager	Wk: 403.539.1708	Jack.Woloszyn@threestreams.com
Enoch Ng	Project Engineer	Wk: 403.536.4075	Enoch.Ng@threestreams.com
Haider Ameer	Process Engineer	Wk: 403.536.5018	Haider.Ameer@threestreams.com
Tom Allen	Procurement Lead	Wk: 403.539.1717	Tom.Allen@threestreams.com

APPENDIX 2 – Drawings and Lists

REV	4
#	FC1-44-PLT-W06-001-01



LEGEND

- EMULSION PRODUCER
- STEAM INJECTOR
- WPX DATUM POINT
- POWER LINE
- RIG SPACING REQUIREMENT 10m x 25m PER WELL
- NEW JERSEY BARRIER

EQUIPMENT LIST

BM-9020/9030	3 WELL PAIR MODULE 5.8m x 28m
BM-9040	2 WELL PAIR MODULE 5.8m x 28m
BU-9060	ELECTRICAL BUILDING
BU-9101	STEAM VALVE ENCLOSURE
F-9101	STRAINER (TEMPORARY)
H-9310	FUEL GAS HEATER
JBHV-9000	25KV JUNCTION BOX
T-9070	CONDENSATE TANK
XFM-9065	UTILITY TRANSFORMER
XFM-9201	ESP TRANSFORMER SKID
V-9220A/B	PROPANE STORAGE BULLETS
PUMP SKID	5.5m x 9.8m
TRUCK UNLOADING SKID	2m x 3m

WORK POINT CO-ORDINATES

NUMBER	NORTHING	EASTING	DESCRIPTION
WP1	SEE NOTE 1 BELOW		CENTER OF WELLHEAD
WP2	SEE NOTE 1 BELOW		CENTER OF WELLHEAD
WP3	N0+66.850	E0+29.500	CENTER OF COLUMN
WP4	N0+67.600	E0+40.000	CENTER OF COLUMN
WP5	N0+67.600	E0+70.000	CENTER OF COLUMN
WP6	N0+67.600	E1+00.000	CENTER OF COLUMN
WP7	N0+67.600	E1+18.000	CENTER OF COLUMN
WP9	N0+49.500	E0+23.670	SOUTHWEST CORNER OF SKID
WP10	N0+49.600	E0+10.400	CENTER OF COLUMN
WP11	N1+28.250	E0+13.500	CENTER OF TANK
WP12	N1+50.830	E0+14.640	SOUTHWEST CORNER OF SKID
WP13	N1+51.145	E0+33.345	CENTER OF FIXED SADDLE
WP14	N1+60.700	E1+10.220	SOUTHWEST CORNER OF SKID

NOTES:

1. IMPORTANT NOTE TO SURVEYOR – CONTRACTOR TO CHECK POSITION OF WELL PRIOR TO ERECTION "AS-BUILT." WELLHEAD LOCATION CAN VARY FROM THE "DESIGN" LOCATION BY 500mm IN ANY DIRECTION ON THE HORIZONTAL PLANE.
   IF ANY "AS-BUILT" WELLHEAD LOCATION DIFFERS FROM THE "DESIGN" WELLHEAD LOCATION BY MORE THAN 500mm THE CONTRACTOR SHALL CONTACT CENOVUS CMT FOR INSTRUCTIONS
2. BURIED POWER LINE LOCATIONS ARE TO BE "AS-BUILT" AND FORWARDED FOR IMPLEMENTATION INTO THIS PLOT PLAN. LOCATIONS SHOWN ARE PREFERRED AND OFFER THE LEAST AMOUNT OF INTERFERENCE WITH SUPPORT PILE LOCATIONS.
3. WELLHEAD DATUM ELEVATION 100.00m = 669.750m GEODETIC AND IS DEFINED AS THE BOTTOM OF THE WELLHEAD TUBING BOWLS.
4. WELLHEAD ROUGH GRADE IS SET AT GEODETIC ELEVATION 669.100m (ASSUMED TO BE 650mm BELOW WELLHEAD TUBING BOWLS).
5. PAD FINISHED GRADE IS DEFINED BY A 300mm DEPTH OF GRAVEL ABOVE ROUGH GRADE.
6. PAD DATUM = 6103446.238m N UTM NAD 83
   525393.485m E UTM NAD 83
7. MODULE TRANSPORT REQUIRES MINIMUM 30m TURNING RADIUS.
8. PAD HIGH POINT ROUGH GRADE IS SET AT GEODETIC ELEVATION 669.250m @ THE CENTRE OF THE PAD.
9. PAD HIGH POINT FINISHED GRADE IS SET AT GEODETIC ELEVATION 669.550m @ THE CENTRE OF THE PAD.

DRAWING NUMBER	REFERENCE DRAWINGS
FC1-43-DX-W00-001-01	BATTERY LIMITS TABLE-FCO 2013-PADS AND MODULES
FC1-44-KEY-W06-001-01	W06 DRAWING PACKAGE KEY PLAN – PIPING
FC1-44-KEY-W06-002-01	W06 GA DRAWING KEY PLAN – PIPING
FC1-44-SK-E00-901-06	FCO FIELD PIPELINES DEVELOPMENT PLAN
FC1-45-KEY-W06-0001-01	W06 DRAWING PACKAGE KEY PLAN – STRUCTURAL
FC1-46-KEY-W06-0001-001	W06 DRAWING PACKAGE KEY PLAN – ELECTRICAL
FC1-46-KEY-W06-0002-001	W06 DRAWING PACKAGE KEY PLAN – ELECTRICAL

STAMPS

REV NO	REVISION	DATE	DRN	CKD	DES	LDE	PE
3Z	AS-BUILT (FC02013/CVE11043) SUPERSEDES REV 2Z	2015.06.08	MWR	WD			MP
4	AS-BUILT (BASE CASE) SUPERSEDES REV 3Z	2015.06.08	MWR	WD			MP
4.D.A	IFA (2016-012 W06)	2016.09.09	PHH				

DESIGNED BY O. CATBAGAN
DRAWN BY O. CATBAGAN
CHECKED BY A. STARNS
LEAD DISC ENG I. LIU
PROJECT ENGINEER M. FABES
DATE 2012-12-12
SCALE 1:500
WORK PACKAGE #
CONSULTANT LOGO
CADD FILE NAME FC144PLTW0600101_4
PROJECT NO.

cenovus ENERGY

Cenovus FCCL Ltd

TITLE -

FOSTER CREEK OFFSITES
WELLPAD W06
PLOT PLAN

DRAWING FC1-44-PLT-W06-001-01

REVISION 4.D.A

Cenovus FCCL Ltd

FOSTER CREEK OFFSITES
FC W06 HOT SOLVENT

EPCM PROJECT No.: 2016-012
PROCESS FLOW DIAGRAMS
ISSUED FOR APPROVAL - 2016/09/08

amec foster wheeler

Three Streams Engineering

amec foster wheeler
Three Streams Engineering

cenovus ENERGY

Cenovus FCCL Ltd

FOSTER CREEK OFFSITES
FC W06 HOT SOLVENT

EPCM PROJECT NUMBER: 2016-012
ISSUE DATE 2016/09/08
DRAWING INDEX REV. ZA

ISSUED FOR APPROVAL

PROCESS DRAWING LIST

NO.	DRAWING NO.	TITLE	REVISION	REMARKS
1	FC1-42-PFD-W06-0001-001	PFD - PAD W06	0.B.A	ISSUED FOR APPROVAL
2	FC1-42-PFD-W06-0003-001	PFD - PAD W06 PROPANE BULLETS AND INJECTION PUMPS	0.A.A	ISSUED FOR APPROVAL
3				
4				
5				
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30				

FC1-42-PFD-W06-0001-001_0.B.A

1 2 3 4 5 6

A B C D E

W06-P-9201A
ELECTRIC SUBMERSIBLE PUMP

W06-H-9310
FUEL GAS HEATER
OP. DUTY: 2.6 kW

W06-PK-9691
MULTI-PHASE FLOW METER/SAMPLE PACKAGE
(FUTURE)

W06-PK-9691

EMULSION
FC1-42-PFD-W00-0004-001
TO CENTRAL FACILITY

W06-H-9310

FUEL GAS
FC1-42-PFD-W00-0004-001
FROM CENTRAL FACILITY

CASING GAS
FC1-42-PFD-W00-0004-001
TO CENTRAL FACILITY

PLANT MASTER RUNBACK

HIGH PRESSURE STEAM
FC1-42-PFD-W00-0004-001
FROM CENTRAL FACILITY

PROPANE
FC1-42-PFD-W06-0003-001
FROM P-9240A/B PROPANE INJECTION PUMPS

FROM WELLS #2 THROUGH #8

NOTE 1

TO BUBBLER TUBE

NOTE 1
TO WELLS #2 THROUGH #8

FROM WELLS #2 THROUGH #8

TO WELLS #2 THROUGH #8

NOTE 1

NOTE 1
TO WELLS #2 THROUGH #8

DP=11032 kPag DT=344°C/-45°C | DP=11032 kPag DT=45°C/-45°C

TO W06I06 INJECTION WELL #6

TO W06I06 INJECTION WELL #6

W06-P-9201A
ESP
(ELECTRIC SUBMERSIBLE PUMP)
C/W VFD

W06P01
PRODUCTION WELL #1
C/W DOWN HOLE ESP PUMP
(8 ON PAD W06)

W06I01
INJECTION WELL #1
(8 ON PAD W06)

NOTES:

1. BUBBLER PANEL IS SUPPLIED FOR EACH WELLPAIR. THE PRESSURE DROP FOR FUEL GAS THROUGH THE BUBBLER PANEL IS APPROXIMATELY 1800 kPag.

THIS DRAWING HAS BEEN COPIED FROM PROJECT CVE11043 AT REVISION 0Z. ALL REVISION CLOUDS AND TRIANGLES HAVE BEEN REMOVED. THE CVE11043 DESIGNS IN THIS DRAWING ARE REFERENCE ONLY FOR THIS CONCURRENT PROJECT. USERS OF THIS DRAWING MUST REFER BACK TO THE ORIGINAL DRAWING (LATEST REVISION) FOR THE MOST CURRENT CVE11043 DESIGNS AND DESIGN AUTHENTICATION.

PACKAGE NO.

REFERENCE NUMBER	REFERENCE TITLE

STAMPS

REV NO	REVISION	DATE	DRN	CKD	DES	LDE	PE
0Z	ISSUED FOR CONSTRUCTION (CVE11043)	13/04/11	HH	BP	CG	OS	MF
0.B.A	IFA (2016-012)	2016/09/08	LKW	GL	HA	HA	EN

CONSULTANT NAME AND LOGO
amec foster wheeler
Three Streams Engineering

REVISION DESCRIPTION
ISSUED FOR APPROVAL

PROJECT NO.
2016-012

LSD

ISSUE DATE
2016/09/08

SCALE
NTS

cenovus ENERGY
Cenovus FCCL Ltd

TITLE
FOSTER CREEK OFFSITES
PAD W06

PROCESS FLOW DIAGRAM

DRAWING NO.
FC1-42-PFD-W06-0001-001

REVISION NO.
0.B.A

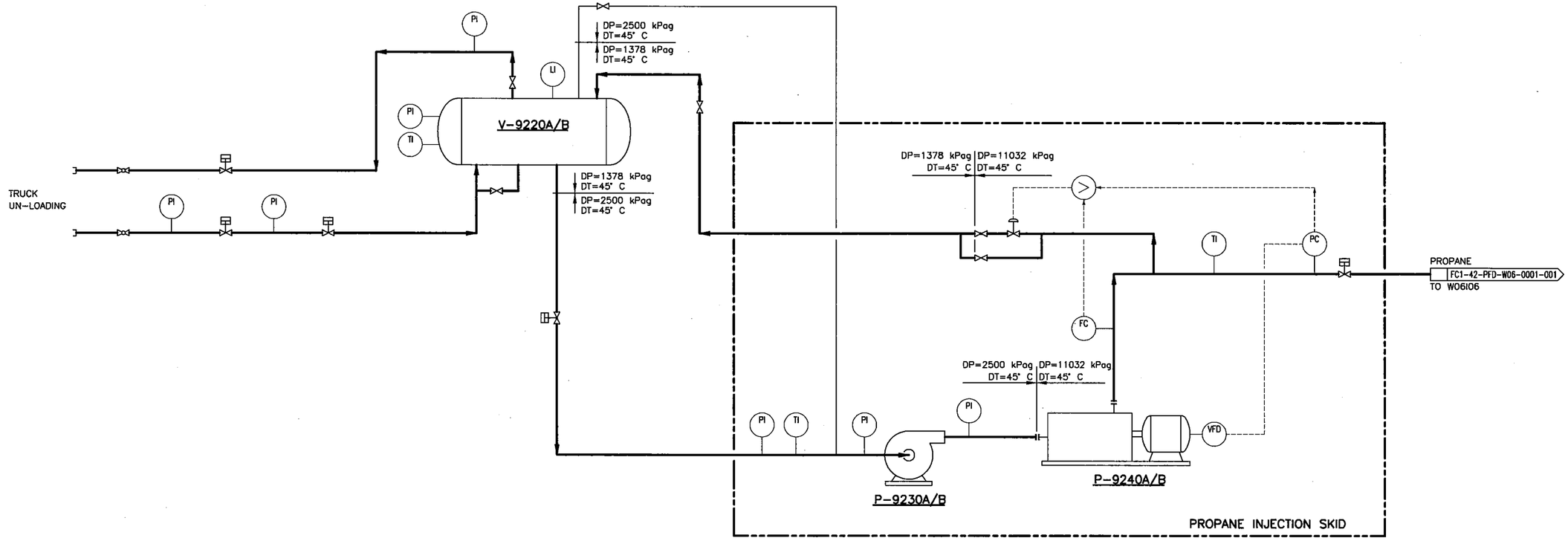
FC1-42-PFD-W06-0003-001_0.A.A

V-9220A
PROPANE STORAGE BULLET
SIZE: 2743 mm ID X 18174 mm S/S
DESIGN PRESSURE: 1378 kPag @ 46/-45 °C

V-9220B
PROPANE STORAGE BULLET
SIZE: 2743 mm ID X 18212 mm S/S
DESIGN PRESSURE: 1378 kPag @ 46/-45 °C

P-9230A/B
BOOSTER PUMPS
RATED FLOW: XXX m3/h
ΔP: XXX kPa
MOTOR POWER: XXX kW

P-9240A/B
INJECTION PUMPS
RATED FLOW: XXX m3/h
ΔP: XXX kPa
MOTOR POWER: XXX kW



REFERENCE NUMBER	REFERENCE TITLE

STAMPS

REV NO	REVISION	DATE	DRN	CKD	DES	LDE	PE
0.A.A	IFA (2016-012)	2016/09/08	LKW	GL	HA	HA	EN

CONSULTANT NAME AND LOGO
amec foster wheeler
Three Streams Engineering

REVISION DESCRIPTION
ISSUED FOR APPROVAL

PROJECT NO.
2016-012

LSD

ISSUE DATE
2016/09/08

SCALE
NTS

PACKAGE NO.

cenovus ENERGY
Cenovus FCCL Ltd

TITLE
FOSTER CREEK OFFSITES
PAD W06
PROPANE BULLETS AND INJECTION PUMPS
PROCESS FLOW DIAGRAM

DRAWING NO.
FC1-42-PFD-W06-0003-001

REVISION NO.
0.A.A

Cenovus FCCL Ltd

FOSTER CREEK OFFSITES
FC W06 HOT SOLVENT

EPCM PROJECT No.: 2016-012
PIPING AND INSTRUMENTATION DIAGRAM
ISSUED FOR APPROVAL - 2016/09/08

amec foster wheeler

Three Streams Engineering

amec foster wheeler
Three Streams Engineering

cenovus ENERGY

Cenovus FCCL Ltd
FOSTER CREEK OFFSITES
FC W06 HOT SOLVENT

EPCM PROJECT NUMBER: 2016-012
ISSUE DATE 2016/09/08
DRAWING INDEX REV. ZA

ISSUED FOR APPROVAL

PROCESS DRAWING LIST

NO.	DRAWING NO.	TITLE	REVISION	REMARKS
1	FC1-42-PID-W06-0016-001	P&ID - PAD W06 WELLHEAD FACILITIES INJECTION WELL W06106	10.C.A	ISSUED FOR APPROVAL
2	FC1-42-PID-W06-0016-001D	P&ID - PAD W06 WELLHEAD FACILITIES INJECTION WELL W06106	0.A.A	ISSUED FOR APPROVAL - DEMOLITION
3	FC1-42-PID-W06-0024-001	P&ID - PAD W06 INSTRUMENT AIR DISTRIBUTION	2.A.A	ISSUED FOR APPROVAL
4	FC1-42-PID-W06-0024-001D	P&ID - PAD W06 INSTRUMENT AIR DISTRIBUTION	0.A.A	ISSUED FOR APPROVAL - DEMOLITION
5	FC1-42-PID-W06-0025-001	P&ID - PAD W06 INSTRUMENT AIR DISTRIBUTION 3 WELL PAIR MODULE	7.B.A	ISSUED FOR APPROVAL
6	FC1-42-PID-W06-0031-001	P&ID - PAD W06 FIRE, GAS AND ESD CONTROLS	2.A.A	ISSUED FOR APPROVAL
7	FC1-42-PID-W06-0045-001	P&ID - PAD W06 WELLHEAD FACILITIES PROPANE TRUCK LOADING	0.A.A	ISSUED FOR APPROVAL
8	FC1-42-PID-W06-0046-001	P&ID - PAD W06 WELLHEAD FACILITIES PROPANE STORAGE BULLETS (V-9220A/B)	0.A.A	ISSUED FOR APPROVAL
9	FC1-42-PID-W06-0047-001	P&ID - PAD W06 WELLHEAD FACILITIES ALARM SYSTEM AT PROPANE BULLETS	0.A.A	ISSUED FOR APPROVAL
10	FC1-42-PID-W06-0048-001	P&ID - PAD W06 WELLHEAD FACILITIES PROPANE BOOSTER/INJECTION PUMPS P-9230A/9240A	0.A.A	ISSUED FOR APPROVAL
11	FC1-42-PID-W06-0048-002	P&ID - PAD W06 WELLHEAD FACILITIES PROPANE BOOSTER/INJECTION PUMPS P-9230B/9240B	0.A.A	ISSUED FOR APPROVAL
12	FC1-42-PID-W06-0049-001	P&ID - PAD W06 WELLHEAD FACILITIES INJECTION WELL W06I06	0.A.A	ISSUED FOR APPROVAL
13				
14				
15				
16				
17				
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20				
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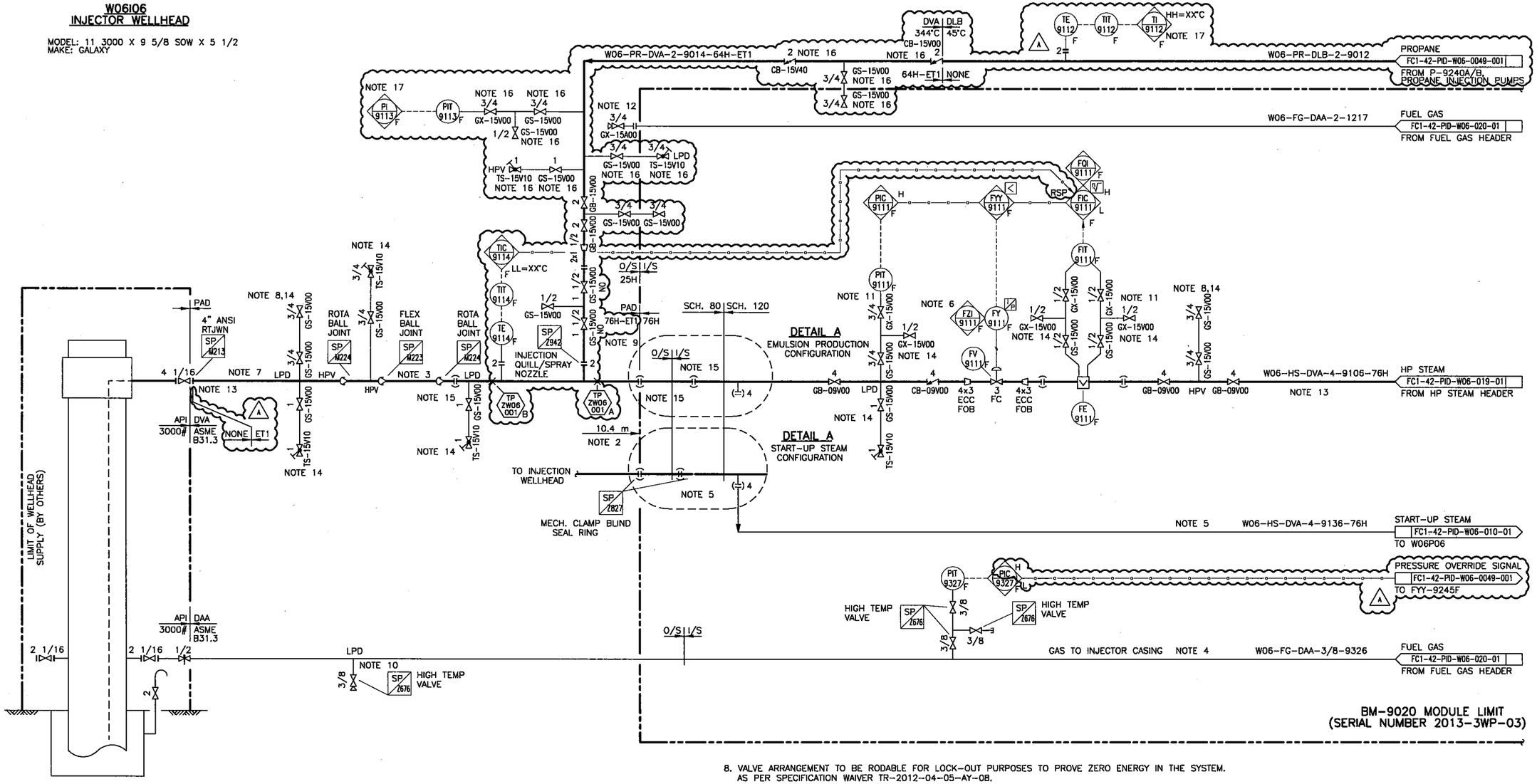
25				
26				
27				
28				
29				
30				

W06I06
INJECTOR WELLHEAD

MODEL: 11 3000 X 9 5/8 SOW X 5 1/2
MAKE: GALAXY



NOTES: W06I06

1. ALL INSTRUMENT TAG NUMBERS, SPECIALTY ITEM NUMBERS, EQUIPMENT TAGS AND BUILDING NUMBERS ARE PRECEDED BY THE PREFIX "W06-".
2. SPOOL PIECES FOR WELL WORKOVER, 10.4 m FROM CENTER LINE OF WELLHEAD TO FAR END OF SPOOL PIECE.
3. THERMAL GROWTH OF WELLHEAD IS 500mm VERTICAL (DESIGN BASIS).
4. RUN TUBING UNDER INSULATION OF STEAM PIPING TO WELLHEAD. EXPOSED TUBING ON MODULE, OUTSIDE BUILDING TO BE INSULATED. OFF MODULE, WHEN TUBING COMES OUT FROM UNDER INSULATION IT SHALL GO STRAIGHT UP AND THEN SLOPE TOWARD WELLHEAD. EXPOSED TUBING AT WELLHEAD TO BE FREE OF LIQUID TRAPS AND INSULATED.
5. FOR TEMPORARY STEAM START-UP, CONNECT START-UP SPOOL BETWEEN STEAM AND EMULSION PIPING AND INSTALL SP-Z827 (MECH. CLAMP BLIND SEAL RING) TO SUPPORT STEAM WELLHEAD PIPING. ONCE START-UP IS COMPLETED, REMOVE START-UP SPOOL AND REPLACE SP-Z827 WITH STANDARD CLAMP AND SEAL RING. USE START-UP SPOOLS PROCURED FOR PREVIOUS FCO PROJECT.
6. VALVE TRAVEL POSITION DETERMINED FROM HART DIGITAL SIGNAL.
7. USE OVERSIZED PIPING INSULATION TO SUIT COVERAGE OVER BUBBLER TUBING.
8. VALVE ARRANGEMENT TO BE RODABLE FOR LOCK-OUT PURPOSES TO PROVE ZERO ENERGY IN THE SYSTEM. AS PER SPECIFICATION WAIVER TR-2012-04-05-AY-08.
9. CALCIUM SILICATE INSULATION TO BE USED FOR PIPING BETWEEN MODULE AND WELLHEAD.
10. DRAIN VALVE TO BE LOCATED UNDER STEAM LINE INSULATION WITH ONLY VALVE HANDLE EXPOSED.
11. HEAT TRACE SENSING LINES TO BE MAINTAINED AT 60°C.
12. FUTURE FUEL GAS CONNECTION FOR CO-INJECTION.
13. NPS 4 SCH. 80 AND SCH. 120 PIPE USED AS PER APPROVED SPECIFICATION WAIVERS TR-2012-02-29-AY-02 AND TR-2012-01-30-AY-02. LINE HYDROTEST IS BASED ON ACTUAL DESIGN CONDITIONS AS PER COMMENTS MADE ON SPECIFICATION WAIVERS.
14. CAPS AND PLUGS ARE NOT NEEDED FOR VENTS, DRAINS AND INSTRUMENTATION BLEED VALVES ON STEAM LINES AS PER APPROVED SPECIFICATION WAIVER TR-2012-06-28-TS-03.
15. SEAL RING SIZE 34 TO BE USED.
16. LTCS PIPING AND FITTING, ALONG WITH THE VALVE (TRIM/BODY) USED TO MEET PROCESS CONDITIONS AS PER APPROVED SPEC WAIVER #XXXX.
17. SIGNAL WIRED TO PAD PLC.

PACKAGE NO.

REFERENCE NUMBER	REFERENCE TITLE
B-2309	INJECTOR WELLHEAD

STAMPS

REV NO	REVISION	DATE	DRN	CKD	DES	LDE	PE
8Z	AS-BUILT - PROJECT CVE11043; SUPERSEDES REV. 0Z, 2Z	2015/07/30	JE	GL	HJ	HJ	MP
9	AS-BUILT - BASE CASE; SUPERSEDES REV. 8Z	2015/07/30	JE	GL	HJ	HJ	MP
9.A.7	AS-BUILT PROJECT 2013-377; SUPERSEDES REV. 3U,4U,6U	2016/02/08	AC				KT
10	AS-BUILT BASE CASE; SUPERSEDES REV. 9, 9.A.7	2016/02/08	AC				
10.C.A	ISSUED FOR APPROVAL (2016-012)	2016/09/08	LKW	GL	HA	HA	EN

CONSULTANT NAME AND LOGO: amec foster wheeler — Three Streams Engineering

REVISION DESCRIPTION: ISSUED FOR APPROVAL

PROJECT NO.: 2016-012

LSD:

ISSUE DATE: 2016/09/08

SCALE: NTS

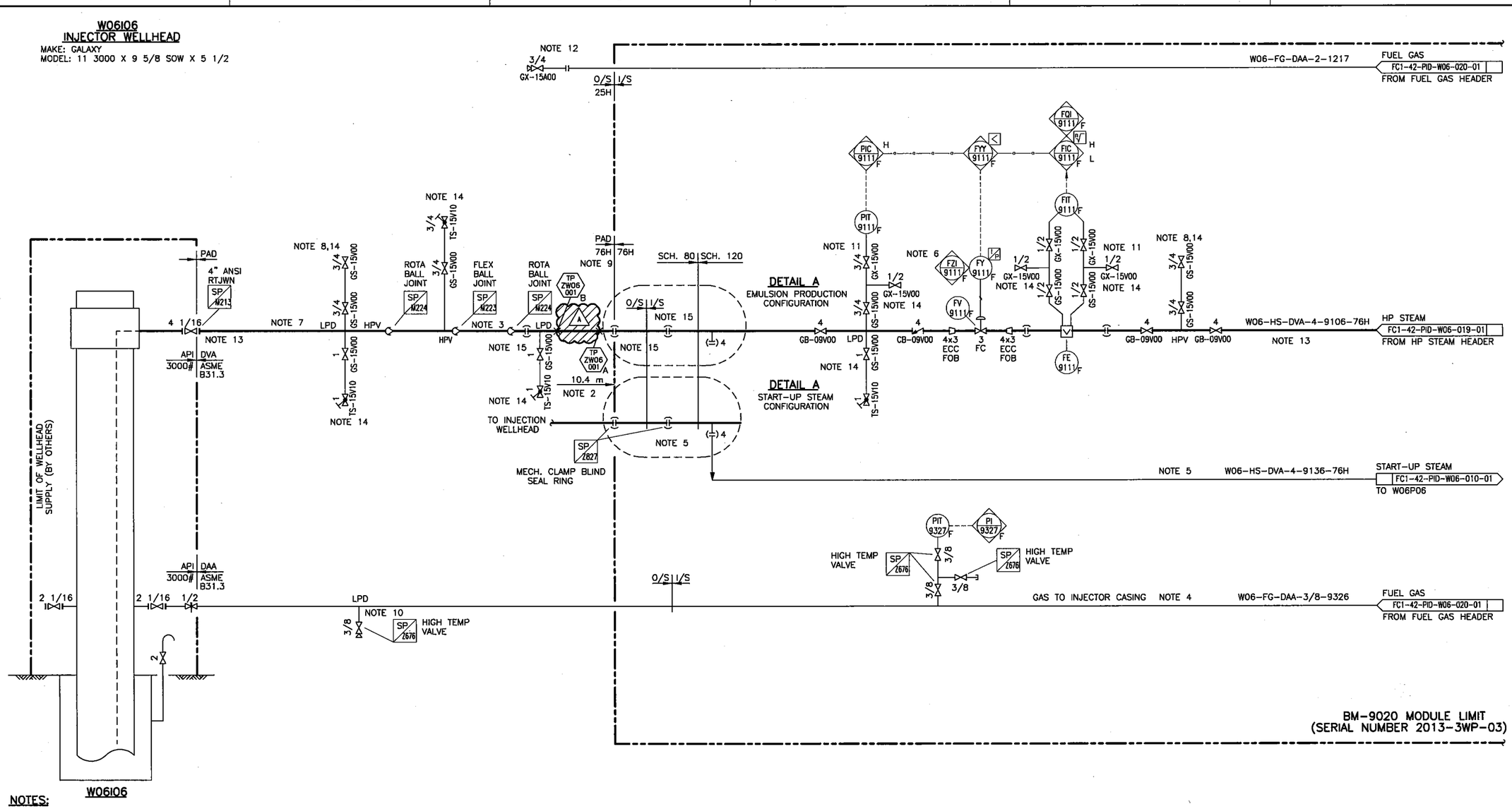
cenovus ENERGY

TITLE

FOSTER CREEK OFFSITES
PAD W06
WELLHEAD FACILITIES - INJECTION WELL W06106
PIPING AND INSTRUMENTATION DIAGRAM

DRAWING NO.: FC1-42-PID-W06-0016-001

REVISION NO.: 10.C.A



W06I06

NOTES:

1. ALL INSTRUMENT TAG NUMBERS, SPECIALTY ITEM NUMBERS, EQUIPMENT TAGS AND BUILDING NUMBERS ARE PRECEDED BY THE PREFIX "W06-".
2. SPOOL PIECES FOR WELL WORKOVER, 10.4 m FROM CENTER LINE OF WELLHEAD TO FAR END OF SPOOL PIECE.
3. THERMAL GROWTH OF WELLHEAD IS 500mm VERTICAL (DESIGN BASIS).
4. RUN TUBING UNDER INSULATION OF STEAM PIPING TO WELLHEAD. EXPOSED TUBING ON MODULE, OUTSIDE BUILDING TO BE INSULATED. OFF MODULE, WHEN TUBING COMES OUT FROM UNDER INSULATION IT SHALL GO STRAIGHT UP AND THEN SLOPE TOWARD WELLHEAD. EXPOSED TUBING AT WELLHEAD TO BE FREE OF LIQUID TRAPS AND INSULATED.
5. FOR TEMPORARY STEAM START-UP, CONNECT START-UP SPOOL BETWEEN STEAM AND EMULSION PIPING AND INSTALL SP-Z827 (MECH. CLAMP BLIND SEAL RING) TO SUPPORT STEAM WELLHEAD PIPING. ONCE START-UP IS COMPLETED, REMOVE START-UP SPOOL AND REPLACE SP-Z827 WITH STANDARD CLAMP AND SEAL RING. USE START-UP SPOOLS PROCURED FOR PREVIOUS FCO PROJECT.
6. VALVE TRAVEL POSITION DETERMINED FROM HART DIGITAL SIGNAL.
7. USE OVERSIZED PIPING INSULATION TO SUIT COVERAGE OVER BUBBLER TUBING.
8. VALVE ARRANGEMENT TO BE RODABLE FOR LOCK-OUT PURPOSES TO PROVE ZERO ENERGY IN THE SYSTEM. AS PER SPECIFICATION WAIVER TR-2012-04-05-AY-0B.
9. CALCIUM SILICATE INSULATION TO BE USED FOR PIPING BETWEEN MODULE AND WELLHEAD.
10. DRAIN VALVE TO BE LOCATED UNDER STEAM LINE INSULATION WITH ONLY VALVE HANDLE EXPOSED.
11. HEAT TRACE SENSING LINES TO BE MAINTAINED AT 60°C.
12. FUTURE FUEL GAS CONNECTION FOR CO-INJECTION.
13. NPS 4 SCH. 80 AND SCH. 120 PIPE USED AS PER APPROVED SPECIFICATION WAIVERS TR-2012-02-29-AY-02 AND TR-2012-01-30-AY-02. LINE HYDROTEST IS BASED ON ACTUAL DESIGN CONDITIONS AS PER COMMENTS MADE ON SPECIFICATION WAIVERS.
14. CAPS AND PLUGS ARE NOT NEEDED FOR VENTS, DRAINS AND INSTRUMENTATION BLEED VALVES ON STEAM LINES AS PER APPROVED SPECIFICATION WAIVER TR-2012-06-28-TS-03.
15. SEAL RING SIZE 34 TO BE USED.

DEMOLITION DRAWING CREATED FROM REV. 10

PACKAGE NO.

REFERENCE NUMBER	REFERENCE TITLE
B-2309	INJECTOR WELLHEAD

STAMPS

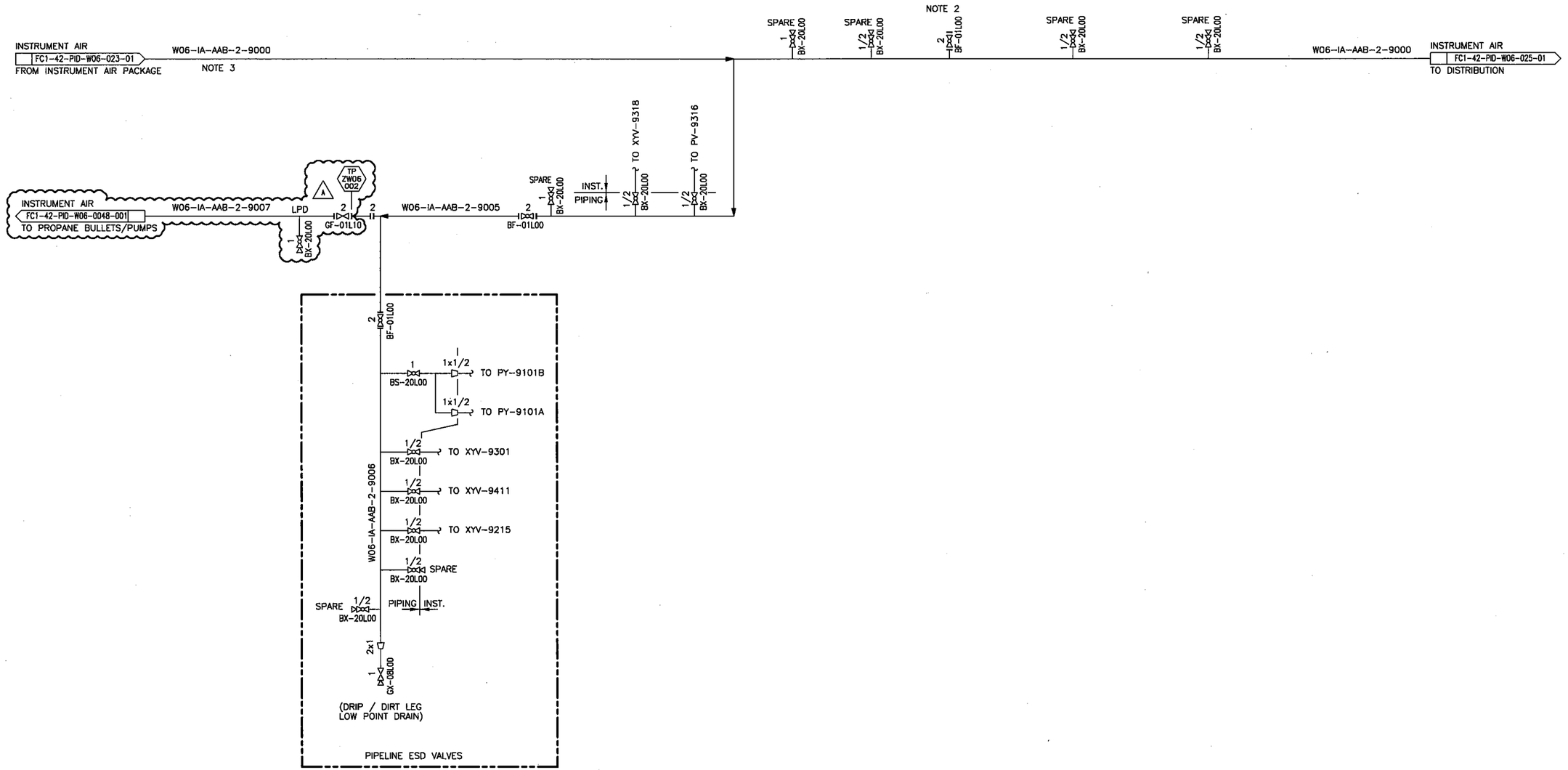
REV NO	REVISION	DATE	DRN	CKD	DES	LDE	PE
0.A.A	ISSUED FOR APPROVAL - DEMOLITION (2016-012)	2016/09/08	LKW	GL	HA	HA	EN

CONSULTANT NAME AND LOGO
amec foster wheeler
Three Streams Engineering

cenovus ENERGY

TITLE
FOSTER CREEK OFFSITES
PAD W06
WELLHEAD FACILITIES - INJECTION WELL W06106
PIPING AND INSTRUMENTATION DIAGRAM

REVISION DESCRIPTION: ISSUED FOR APPROVAL
PROJECT NO.: 2016-012
LSD:
ISSUE DATE: 2016/09/08
SCALE: NTS
DRAWING NO.: FC1-42-PID-W06-0016-001D
REVISION NO.: 0.A.A



NOTES:

1. ALL INSTRUMENT TAG NUMBERS, SPECIALTY ITEM NUMBERS, EQUIPMENT TAGS AND BUILDING NUMBERS ARE PRECEDED BY THE PREFIX "W06-".
2. FUTURE CONNECTION FOR TEST SEPARATOR.
3. BLOW THE IA PIPES TO CLEAN DUST BEFORE CONNECTING TO ANY INSTRUMENT. NO LIQUID IS ALLOWED IN PIPES.

PACKAGE NO.

REFERENCE NUMBER	REFERENCE TITLE

STAMPS

REV NO	REVISION	DATE	DRN	CKD	DES	LDE	PE
1Z	AS-BUILT - PROJECT CVE11043; SUPERSEDES REV. 0Z	2015/07/30	JE	GL	HJ	HJ	MP
2	AS-BUILT - BASE CASE; SUPERSEDES REV. 1Z	2015/07/30	JE	GL	HJ	HJ	MP
2.A.A	ISSUED FOR APPROVAL (2016-012)	2016/09/08	LKW	GL	HA	HA	EN

CONSULTANT NAME AND LOGO
amec foster wheeler
Three Streams Engineering

REVISION DESCRIPTION
ISSUED FOR APPROVAL

PROJECT NO.
2016-012

LSD

ISSUE DATE
2016/09/08

SCALE
NTS

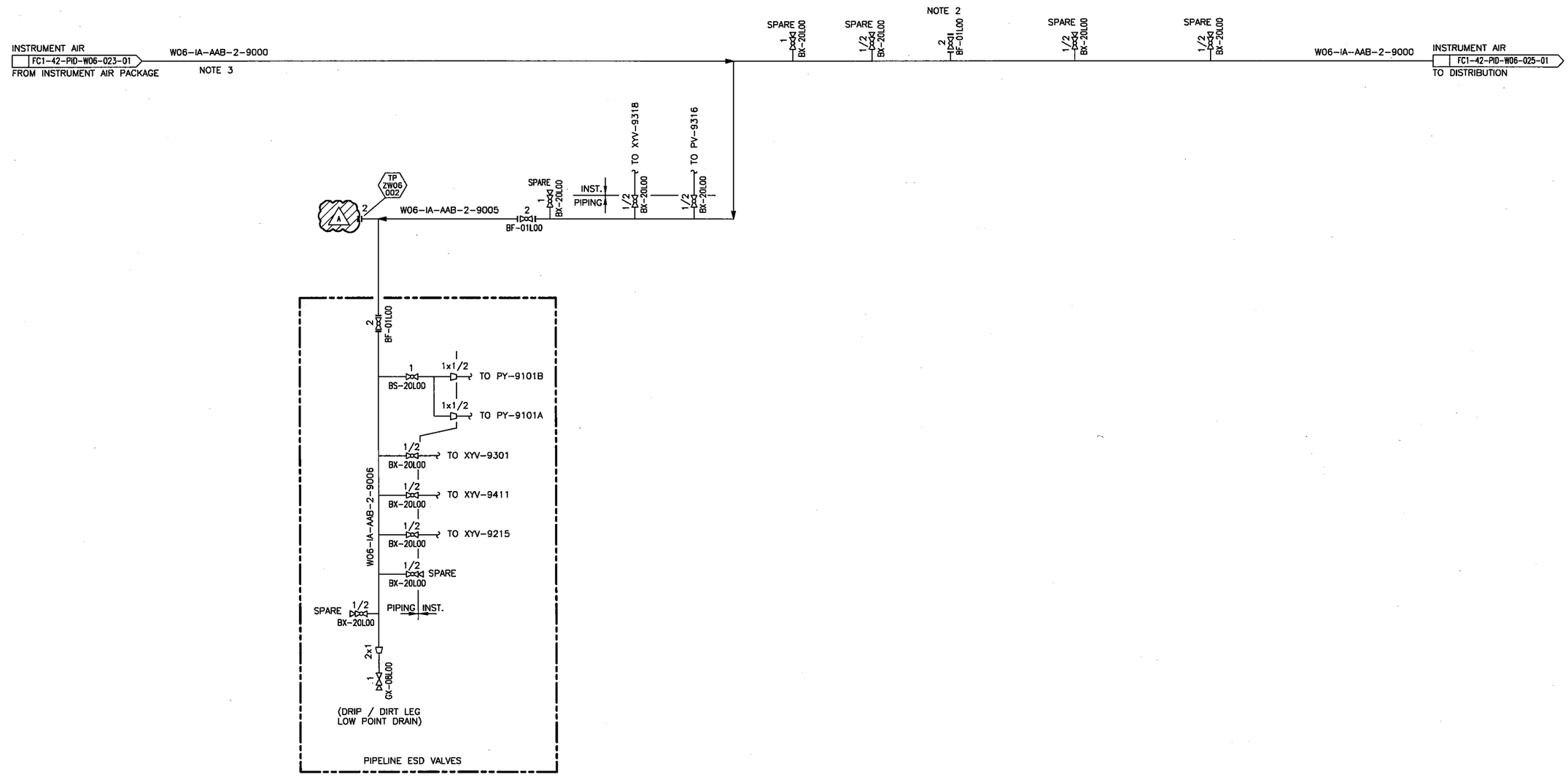
cenovus ENERGY
Cenovus FCCL Ltd

TITLE
FOSTER CREEK OFFSITES
PAD W06
INSTRUMENT AIR DISTRIBUTION
PIPING AND INSTRUMENTATION DIAGRAM

DRAWING NO.
FC1-42-PID-W06-0024-001

REVISION NO.
2.A.A

FC1-42-PID-W06-0024-001D_0AA



NOTES:

1. ALL INSTRUMENT TAG NUMBERS, SPECIALTY ITEM NUMBERS, EQUIPMENT TAGS AND BUILDING NUMBERS ARE PRECEDED BY THE PREFIX "W06-".
2. FUTURE CONNECTION FOR TEST SEPARATOR.
3. BLOW THE IA PIPES TO CLEAN DUST BEFORE CONNECTING TO ANY INSTRUMENT. NO LIQUID IS ALLOWED IN PIPES.

DEMOLITION DRAWING CREATED FROM REV. 2

PACKAGE NO.

REFERENCE NUMBER	REFERENCE TITLE

STAMPS

REV NO	REVISION	DATE	DRN	CKD	DES	LDE	PE
0.A.A	ISSUED FOR APPROVAL – DEMOLITION (2016-012)	2016/09/08	LKW	GL	HA	HA	EN

CONSULTANT NAME AND LOGO

amec foster wheeler
Three Streams Engineering

REVISION DESCRIPTION
ISSUED FOR APPROVAL

PROJECT NO.
2016-012

LSD

ISSUE DATE
2016/09/08

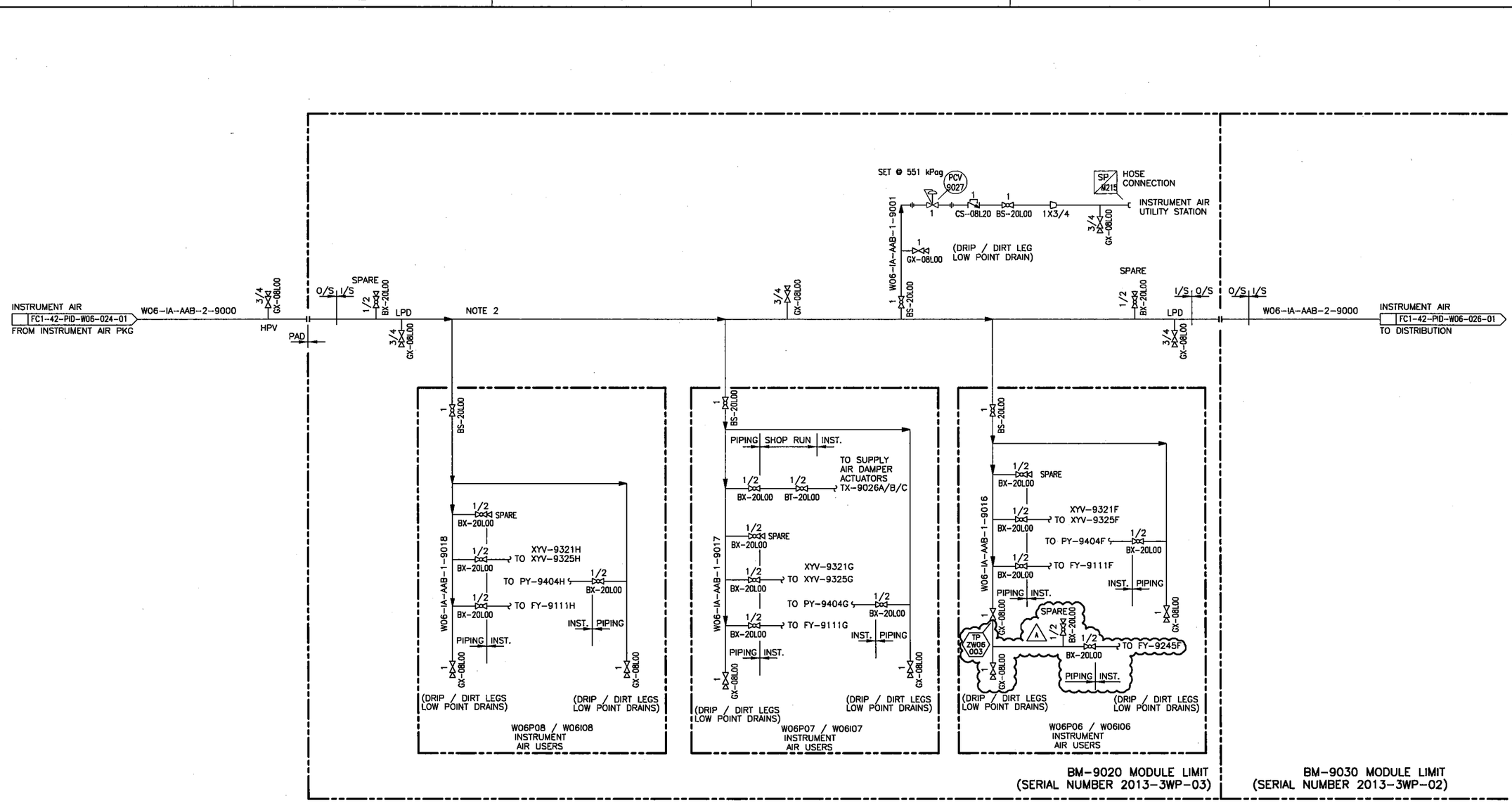
SCALE
NTS

cenovus ENERGY
Cenovus FCCL Ltd

TITLE
FOSTER CREEK OFFSITES
PAD W06
INSTRUMENT AIR DISTRIBUTION
PIPING AND INSTRUMENTATION DIAGRAM

DRAWING NO.
FC1-42-PID-W06-0024-001D

REVISION NO.
0.A.A



NOTES:

1. ALL INSTRUMENT TAG NUMBERS, SPECIALTY ITEM NUMBERS, EQUIPMENT TAGS AND BUILDING NUMBERS ARE PRECEDED BY THE PREFIX "W06-".
2. BLOW THE IA PIPES TO CLEAN DUST BEFORE CONNECTING TO ANY INSTRUMENT. NO LIQUID IS ALLOWED IN PIPES.

PACKAGE NO.

REFERENCE NUMBER	REFERENCE TITLE

STAMPS

REV NO	REVISION	DATE	DRN	CKD	DES	LDE	PE
5Z	AS-BUILT - PROJECT CVE11043; SUPERSEDES REV. 0Z	2015/07/30	JE	GL	HJ	HJ	MP
6	AS-BUILT - BASE CASE; SUPERSEDES REV. 5Z	2015/07/30	JE	GL	HJ	HJ	MP
6.A.4	AS-BUILT PROJECT 2013-377; SUPERSEDES REV. 1U, 3U	2016/02/08	AC				KT
7	AS-BUILT BASE CASE; SUPERSEDES REV. 6, 6.A.4	2016/02/08	AC				
7.B.A	ISSUED FOR APPROVAL (2016-012)	2016/09/08	LKW	GL	HA	HA	EN

CONSULTANT NAME AND LOGO

amec foster wheeler
Three Streams Engineering

REVISION DESCRIPTION: ISSUED FOR APPROVAL

PROJECT NO.: 2016-012

LSD

ISSUE DATE: 2016/09/08

SCALE: NTS

cenovus ENERGY

TITLE

FOSTER CREEK OFFSITES
PAD W06
INSTRUMENT AIR DISTRIBUTION 3 WELL PAIR MODULE
PIPING AND INSTRUMENTATION DIAGRAM

DRAWING NO.: FC1-42-PID-W06-0025-001

REVISION NO.: 7.B.A

FC1-42-PID-W06-0031-001_2.A.A

LOCATION	GAS DETECTION	FIRE / SMOKE DETECTION	H2S DETECTION	ESD2 PUSH BUTTONS	STROBES AND HORNS
ELECTRICAL BUILDING BU-9060		ELECTRICAL ROOM ASH 9062 A SMOKE — AAH 9062 A ASH 9063 A THERMAL — AAH 9063 A ASH 9062 B SMOKE — AAH 9062 B ASH 9063 B THERMAL — AAH 9063 B		ELECTRICAL ROOM ESD 9000 A — ESDA 9000 A ESD 9060 A — ESDA 9060 A	ELECTRICAL ROOM AHS 9061 C TEST — AY 9063 ALH 9063 A RED BEACON O/S ALH 9063 B RED BEACON I/S SMOKE / THERMAL DETECTION
		IA COMPRESSOR ROOM ASH 9062 C SMOKE — AAH 9062 C ASH 9063 C THERMAL — AAH 9063 C		IA COMPRESSOR ROOM ESD 9060 B — ESDA 9060 B ESD 9060 C — ESDA 9060 C	IA COMPRESSOR ROOM SIGNAL FC1-42-PID-W06-0047-001 TO AY-9014 AHS 9061 B TEST — AY 9061 IA — S — I/S O/S AYV 9061 — AAH 9061 AHS 9061 A SILENCE ALH 9063 C RED BEACON O/S ALH 9063 D RED BEACON O/S SMOKE / THERMAL DETECTION ALH 9063 E RED BEACON I/S
PAD W06 LEASE ENTRANCE				ESD 9000 B — ESDA 9000 B	AY 9000 — ALH 9000 YELLOW BEACON O/S ESD SIGNAL FC1-42-PID-W06-032-01 TO AY-9021/9023/9031/9033/9041/9043 SIGNAL FC1-42-PID-W06-0047-001 TO AY-9015 SIGNAL FC1-42-PID-W06-0047-001 TO AY-9014

NOTES:

1. ALL INSTRUMENT TAG NUMBERS, SPECIALITY ITEM NUMBERS, EQUIPMENT TAGS AND BUILDING NUMBERS ARE PRECEDED BY THE PREFIX "W06-".

PACKAGE NO.

REFERENCE NUMBER	REFERENCE TITLE

STAMPS

REV NO	REVISION	DATE	DRN	CKD	DES	LDE	PE
1Z	AS-BUILT – PROJECT CVE11043; SUPERSEDES REV. 0Z	2015/07/30	JE	GL	HJ	HJ	MP
2	AS-BUILT – BASE CASE; SUPERSEDES REV. 1Z	2015/07/30	JE	GL	HJ	HJ	MP
2.A.A	ISSUED FOR APPROVAL (2016-012)	2016/09/08	LKW	GL	HA	HA	EN

CONSULTANT NAME AND LOGO: amec foster wheeler — Three Streams Engineering

REVISION DESCRIPTION: ISSUED FOR APPROVAL

PROJECT NO.: 2016-012

LSD

ISSUE DATE: 2016/09/08

SCALE: NTS

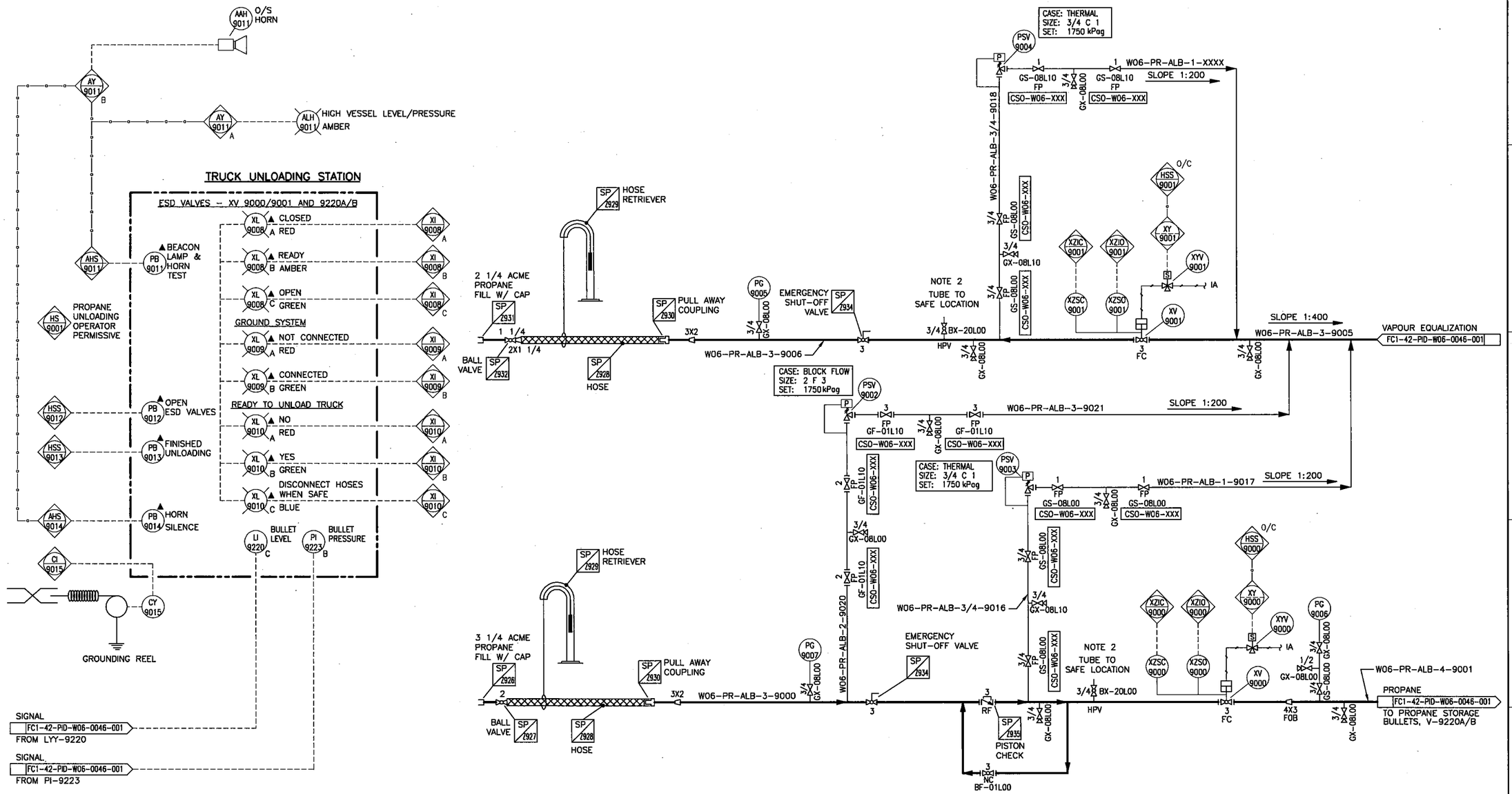
cenovus ENERGY

TITLE

FOSTER CREEK OFFSITES
PAD W06
FIRE, GAS AND ESD CONTROLS
PIPING AND INSTRUMENTATION DIAGRAM

DRAWING NO.: FC1-42-PID-W06-0031-001

REVISION NO.: 2.A.A



NOTES:

1. ALL INSTRUMENT TAG NUMBERS, SPECIALTY ITEM NUMBERS, EQUIPMENT TAGS AND BUILDING NUMBERS ARE PRECEDED BY THE PREFIX "W06–".
2. SPRING LOADED BALL VALVE.

"ALL EQUIPMENT, PIPING & INSTRUMENTS ON THIS DWG. ARE TO BE INSTALLED FOR THE W06 HOT SOLVENT PROJECT.

PACKAGE NO.

REFERENCE NUMBER	REFERENCE TITLE

STAMPS

REV NO	REVISION	DATE	DRN	CKD	DES	LDE	PE
0.A.A	ISSUED FOR APPROVAL (2016-012)	2016/09/08	LKW	GL	HA	HA	EN

CONSULTANT NAME AND LOGO

amec foster wheeler
Three Streams Engineering

REVISION DESCRIPTION: ISSUED FOR APPROVAL

PROJECT NO.: 2016-012

LSD

ISSUE DATE: 2016/09/08

SCALE: NTS

cenovus ENERGY

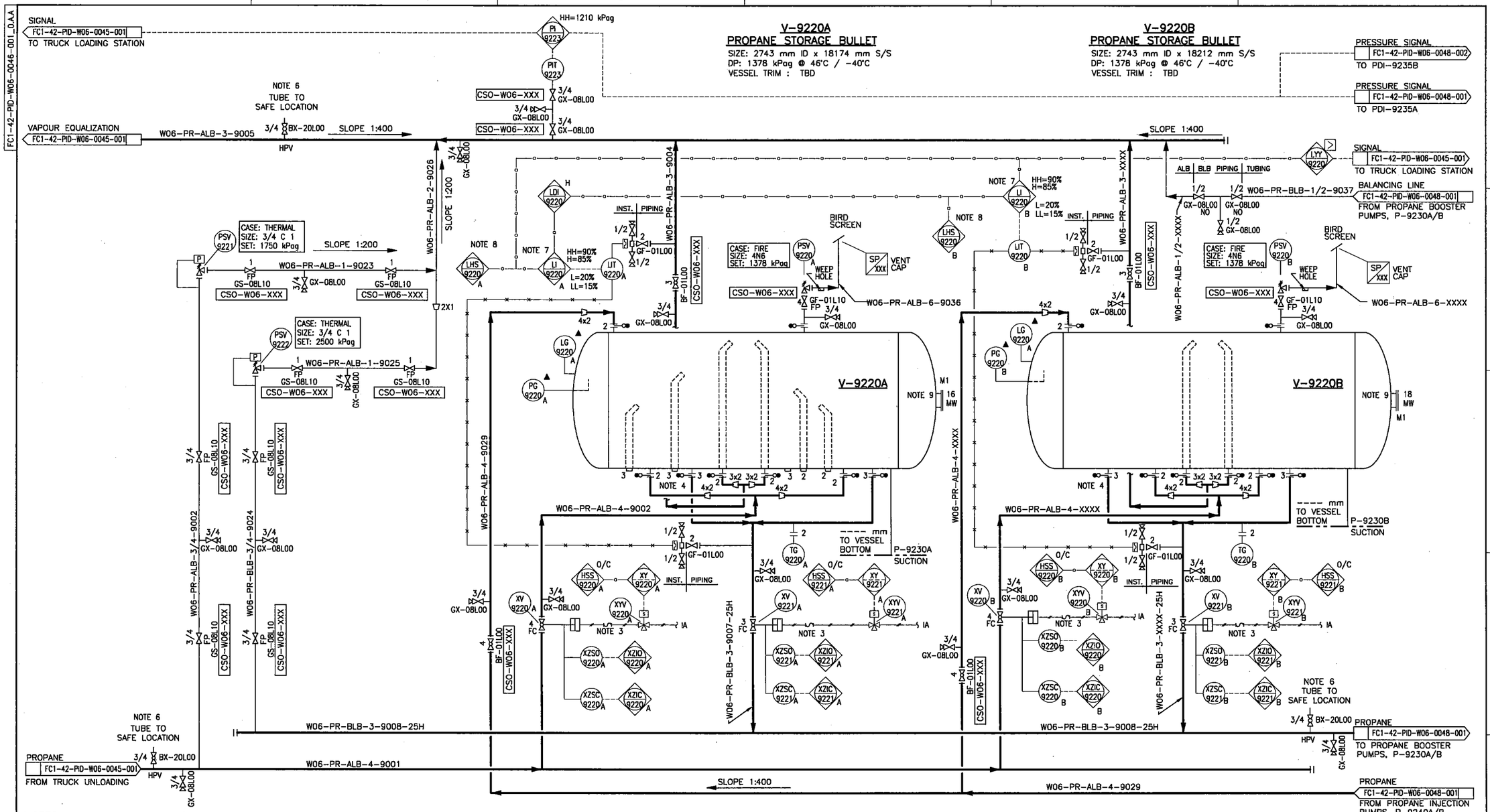
Cenovus FCCL Ltd

TITLE

FOSTER CREEK OFFSITES
PAD W06 WELLHEAD FACILITIES
PROPANE TRUCK UNLOADING
PIPING AND INSTRUMENTATION DIAGRAM

DRAWING NO.: FC1-42-PID-W06-0045-001

REVISION NO.: 0.A.A



NOTES:

1. ALL INSTRUMENT TAG NUMBERS, SPECIALTY ITEM NUMBERS, EQUIPMENT TAGS AND BUILDING NUMBERS ARE PRECEDED BY THE PREFIX "W06-".
2. MANUAL VALVE USED FOR EMPTYING OF BULLETS TO PROPANE TRUCK.
3. ACTUATION AIR CONNECTED TO ESD VALVE ACTUATOR SHALL CONTAIN A SECTION OF POLYMER AIR TUBING WHICH WILL MELT IN CASE OF FIRE AND CAUSE VALVE TO FAIL CLOSED.
4. 300# FLANGE.
5. MINIMUM DISTANCE FROM V-9220A/B.
6. SPRING LOADED BALL VALVE.
7. ALARM AND SHUTDOWN VALUES ARE VOLUME %.
8. LEVEL TRANSMITTER BYPASSED FOR SHUTDOWN IF BULLET IS NOT IN OPERATION.
9. MANWAY EQUIPPED WITH A SIGHTGLASS.

"ALL EQUIPMENT, PIPING & INSTRUMENTS ON THIS DWG. ARE TO BE INSTALLED FOR THE W06 HOT SOLVENT PROJECT.

PACKAGE NO.

REFERENCE NUMBER	REFERENCE TITLE

STAMPS

REV NO	REVISION	DATE	DRN	CKD	DES	LDE	PE
0.A.A	ISSUED FOR APPROVAL (2016-012)	2016/09/08	LKW	GL	HA	HA	EN

CONSULTANT NAME AND LOGO

amec foster wheeler
Three Streams Engineering

cenovus ENERGY
Cenovus FCCL Ltd

REVISION DESCRIPTION: ISSUED FOR APPROVAL
PROJECT NO.: 2016-012
LSD:
ISSUE DATE: 2016/09/08
SCALE: NTS

TITLE
FOSTER CREEK OFFSITES
PAD W06 WELLHEAD FACILITIES
PROPANE STORAGE BULLETS (V-9220A/B)
PIPING AND INSTRUMENTATION DIAGRAM

DRAWING NO.: FC1-42-PID-W06-0046-001
REVISION NO.: 0.A.A

FC1-42-PID-W06-0047-001_0.A.A

PROPANE BULLET, PROPANE PUMPS AND TRUCK UNLOADING

PROPANE GAS DETECTION (LEL)

SIGNAL
FC1-42-PID-W06-0031-001
FROM AHS-9061C

SIGNAL
FC1-42-PID-W06-0031-001
FROM AHS-9061B

BULLET — AE 9016 — NOTE 4 — AIT 9016 — AI 9016 (HH=40%LEL, H=20%LEL, L=FAULT) — NOTE 2: AA 9016, AHS 9016 BYPASS MODE — AAH 9016, AAHH 9016

BULLET — AE 9017 — NOTE 4 — AIT 9017 — AI 9017 (HH=40%LEL, H=20%LEL, L=FAULT) — NOTE 2: AA 9017, AHS 9017 BYPASS MODE — AAH 9017, AAHH 9017

PROPANE PUMP — AE 9018 — NOTE 4 — AIT 9018 — AI 9018 (HH=40%LEL, H=20%LEL, L=FAULT) — NOTE 2: AA 9016, AHS 9018 BYPASS MODE — AAH 9018, AAHH 9018

TRUCK LOADING — AE 9019 — NOTE 4 — AIT 9019 — AI 9019 (HH=40%LEL, H=20%LEL, L=FAULT) — NOTE 2: AA 9019, AHS 9019 BYPASS MODE — AAH 9019, AAHH 9019

AY 9015 → ALH 9015 A — O/S RED BEACON PROPANE PUMP
AY 9015 → ALH 9015 B — O/S RED BEACON TRUCK UNLOADING

AY 9014 → AYV 9014 (S) → IA → AAH 9014 — O/S HORN

FIRE DETECTION

PROPANE PUMPS
- FIRE BT 9020 A — BI 9020 A (HH=95%, L=FAULT) — BAHH 9020 A
- NOTE 3 — BA 9020 — BHS 9020 BYPASS MODE
- FIRE BT 9020 B — BI 9020 B (HH=95%, L=FAULT) — BAHH 9020 B

TRUCK LOADING
- FIRE BT 9021 A — BI 9021 A (HH=95%, L=FAULT) — BAHH 9021 A
- NOTE 3 — BA 9021 — BHS 9021 BYPASS MODE
- FIRE BT 9021 B — BI 9021 B (HH=95%, L=FAULT) — BAHH 9021 B

SIGNAL
FC1-42-PID-W06-0031-001
FROM AHS-9061A

PROPANE PUMP — ESD 9022 A — ESDA 9022 A

TRUCK LOADING — ESD 9022 B — ESDA 9022 B

SAP PLC — ESD 9022 — PAD PLC — ESDA 9022

SAP GROUPED ESD FROM SAP PLC

BAHH 9022 — BAHH 9022

SAP GROUPED FIRE TRIP FROM SAP PLC

ESD-1 9022 — ESD-0 9022

PAD GROUPED ESD FROM PAD PLC

NOTES:

1. ALL INSTRUMENT TAG NUMBERS, SPECIALTY ITEM NUMBERS, EQUIPMENT TAGS AND BUILDING NUMBERS ARE PRECEDED BY THE PREFIX "W06-".
2. TO ALARM EVERY 30 MINUTES WHEN BYPASS IS ACTIVE.
3. TO ALARM AT 6:00 AM, 1:00 PM, 6:00 PM AND 1:00 AM WHEN BYPASS IS ACTIVE.
4. MOUNTING HEIGHT FOR PROPANE DETECTORS TO BE PLACED LOW.

"ALL EQUIPMENT, PIPING & INSTRUMENTS ON THIS DWG. ARE TO BE INSTALLED FOR THE W06 HOT SOLVENT PROJECT.

PACKAGE NO.

REFERENCE NUMBER	REFERENCE TITLE

STAMPS

REV NO	REVISION	DATE	DRN	CKD	DES	LDE	PE
0.A.A	ISSUED FOR APPROVAL (2016-012)	2016/09/08	LKW	GL	HA	HA	EN

CONSULTANT NAME AND LOGO
amec foster wheeler
Three Streams Engineering

REVISION DESCRIPTION: ISSUED FOR APPROVAL
PROJECT NO.: 2016-012
LSD:
ISSUE DATE: 2016/09/08
SCALE: NTS

cenovus ENERGY
Cenovus FCCL Ltd

TITLE
FOSTER CREEK OFFSITES
PAD W06 WELLHEAD FACILITIES
ALARM SYSTEM AT PROPANE BULLETS
PIPING AND INSTRUMENTATION DIAGRAM

DRAWING NO.: FC1-42-PID-W06-0047-001
REVISION NO.: 0.A.A

FC1-42-PID-W06-0048-001_0.AA

P-9230A
PROPANE BOOSTER PUMP
RATED FLOW: --- m3/h @ ΔP = --- kPa
MOTOR: XX kW 460v/3 pH/60 HZ

P-9240A
PROPANE INJECTION PUMP
RATED FLOW: --- m3/h @ ΔP = ---- kPa
MOTOR: XX kW 460v/3 pH/60 HZ

SKID LIMIT

RELIEF FC1-42-PID-W06-0048-002 FROM P-9240B — W06-PR-ALB-4-XXXX — SLOPE 1:400

RELIEF FC1-42-PID-W06-0048-002 FROM PSV-9244B — W06-PR-ALB-2-XXXX — SLOPE 1:200

RELIEF FC1-42-PID-W06-0046-001 TO PROPANE BULLETS, V-9220A/B — W06-PR-ALB-4-9029

W06-PR-ALB-2-9035 — SLOPE 1:200

W06-PR-ALB-4-9033 — SLOPE 1:200

W06-PR-ALB-2-9028 — SLOPE 1:400

W06-PR-ALB-3-9031

CASE: THERMAL SIZE: 3/4 C 1 SET: 11032 kPag — PSV 9244 A

CASE: BLOCKED FLOW SIZE: 1 1/2 D2 SET: 11032 kPag — PSV 9242 A

CASE: CHECK VALVE FAILURE SIZE: 2 F 3 SET: 2500 kPag — PSV 9236 A

W06-PR-DLB-3/4-9034

W06-PR-DLB-3-9010

W06-PR-DLB-2-9027

W06-PR-DLB-3-9032

PRESSURE SIGNAL FC1-42-PID-W06-0046-001 FROM PI-9223

W06-PR-BLB-1/2-XXXX BALANCING LINE FC1-42-PID-W06-0048-002 FROM PROPANE BOOSTER PUMP, P-9230B

W06-PR-BLB-1/2-9037 BALANCING LINE FC1-42-PID-W06-0046-001 TO PROPANE BULLETS, V-9220A/B

W06-PR-BLB-3-9008-25H PROPANE FC1-42-PID-W06-0046-001 FROM PROPANE BULLETS, V-9220A/B

PROPANE FC1-42-PID-W06-0048-002 TO PROPANE BOOSTER PUMP, P-9230B — W06-PR-BLB-3-XXXX-25H

W06-PR-BLB-2-9030

W06-PR-BLB-3-9009-25H

W06-PR-DLB-3-XXXX

PROPANE FC1-42-PID-W06-0049-001 TO INJECTION WELLHEADS, W06I06

PROPANE FC1-42-PID-W06-0048-002 FROM PROPANE INJECTION PUMP, P-9240B

INSTRUMENT AIR FC1-42-PID-W06-0048-002 TO INSTRUMENTS

INSTRUMENT AIR FC1-42-PID-W06-0024-001 FROM INSTRUMENT AIR HEADER — W06-IA-AAB-2-9007

W06-IA-AAB-1-9009

(DRIP/DIRT LEGS LOW POINT DRAINS)

HH=9375 kPag

HH=XX kPag

HH=XX °C

LL=50 kPa

SP=XX m3/h

LL=XX m3/h

SUCTION DAMPENER

DISCHARGE DAMPENER

NOTE 4 TUBE TO SAFE LOCATION

HPV

BASKET STRAINER

ST/SP

J/O/A

AUTO

O/C

P-9230A
NOTE 2, 6

P-9240A
NOTES 3, 5

NOTES:

1. ALL INSTRUMENT TAG NUMBERS, SPECIALTY ITEM NUMBERS, EQUIPMENT TAGS AND BUILDING NUMBERS ARE PRECEDED BY THE PREFIX "W06-".
2. A STRAIGHT PIPE RUN, NO LESS THAN 20D ON THE PUMP SUCTION LINE SHOULD PRECEDE PUMP SUCTION FLANGE.
3. PUMP PACKING LUBRICATION COMPLETE WITH LUBE OIL TANK, SIGHT GLASS AND LUBRICATOR.
4. SPRING LOADED BALL VALVE.
5. PUMP HAS A POWER END FORCED LUBRICATION SYSTEM (INCLUDES LUBE PUMP AND MOTOR).
6. PUMP MOTOR SOFT START WITH RAMP UP TIME XXX.

"ALL EQUIPMENT, PIPING & INSTRUMENTS ON THIS DWG. ARE TO BE INSTALLED FOR THE W06 HOT SOLVENT PROJECT.

PACKAGE NO.

REFERENCE NUMBER	REFERENCE TITLE

STAMPS

REV NO	REVISION	DATE	DRN	CKD	DES	LDE	PE
0.A.A	ISSUED FOR APPROVAL (2016-012)	2016/09/08	FDL	GL	HA	HA	EN

CONSULTANT NAME AND LOGO: amec foster wheeler — Three Streams Engineering

cenovus ENERGY — Cenovus FCCL Ltd

REVISION DESCRIPTION: ISSUED FOR APPROVAL

PROJECT NO.: 2016-012

LSD

ISSUE DATE: 2016/09/08

SCALE: NTS

TITLE: FOSTER CREEK OFFSITES
PAD W06 WELLHEAD FACILITIES
PROPANE BOOSTER/INJECTION PUMPS P-9230A/9240A
PIPING AND INSTRUMENTATION DIAGRAM

DRAWING NO.: FC1-42-PID-W06-0048-001

REVISION NO.: 0.A.A

FC1-42-PID-W06-0048-002_0.A.A

P-9230B
PROPANE BOOSTER PUMP
RATED FLOW: --- m3/h @ ΔP = --- kPa
MOTOR: XX kW 460v/3 pH/60 HZ

P-9240B
PROPANE INJECTION PUMP
RATED FLOW: --- m3/h @ ΔP = ---- kPa
MOTOR: XX kW 460v/3 pH/60 HZ

RELIEF
FC1-42-PID-W06-0048-001
TO PROPANE BULLETS, V-9220A/B

W06-PR-ALB-2-XXXX
SLOPE 1:200
W06-PR-ALB-4-XXXX
SLOPE 1:200
W06-PR-ALB-4-XXXX
SLOPE 1:400
W06-PR-ALB-2-XXXX
W06-PR-ALB-3-XXXX

CASE: THERMAL
SIZE: 3/4 C T
SET: 11032 kPag
PSV 9244 B
GS-0BL10
CSO-W06-XXX
CASE: BLOCKED FLOW
SIZE: 1 1/2 D2
SET: 11032 kPag
PSV 9242 B
GX-0BL00
GX-15L00
GF-15L00
GS15L10

PRESSURE SIGNAL
FC1-42-PID-W06-0046-001
FROM PI-9223

PDI 9235 B
LL=50 kPa
PI 9235 B
ALB BLB
PSV 9236 B
CASE: CHECK VALVE FAILURE
SIZE: 2 F 3
SET: 2500 kPag

YI 9240 B
UA 9240 B
SI 9240 B
HIA 9240 B
HSS 9240 B
ST/SP
YS 9240 B
US 9240 B
ST 9240 B
HSA 9240 B
AUTO
YY 9240 B
YYE 9240 B
HS 9240 B
J/O/A
SY 9240 B

FV 9241 B
FZI 9241 B
FY 9241 B
FYY 9241 B
PIC 9243 BB
HH=9375 kPag
PIC 9243 BA
FIC 9241 B
SP=XX m3/h
LL=XX m3/h
FIT 9241 B
FE 9241 B
PIT 9243 B
TC 9242 B

NOTE 4
TUBE TO SAFE LOCATION
HPV
SUCTION DAMPENER
SP 2937
DISCHARGE DAMPENER
SP 2941
PG 9234 B
PDG 9232 B
PIT 9235 B
BX-20L00
BX-60L00
BX-2L00
LPD

LALL 9240 B
LSLL 9240 B
LG 9241 B
VAHH 9240 B
VSHH 9240 B
PAHH 9240 B
PSHH 9240 B
NOTE 3, 5
P-9240B

SP 2936
BASKET STRAINER
BLB DLB
25H

W06-PR-BLB-3-XXXX-25H
W06-PR-BLB-2-XXXX
W06-PR-DLB-2-XXXX
W06-PR-DLB-3-XXXX
W06-PR-DLB-3/4-XXXX
BF-09L00

PROPANE
FC1-42-PID-W06-0048-001
TO P-9240A DISCHARGE

W06-PR-BLB-1/2-XXXX
TUBING | PIPNG
BALANCING LINE
FC1-42-PID-W06-0048-001
TO PROPANE BULLETS, V-9220A/B
PG 9231 B
CF-03L00
YI 9230 B
HIA 9230 B
YS 9230 B
HSA 9230 B
HS 9230 B
J/O/A
YYE 9230 B
YY 9230 B
HSS 9230 B
ST/SP
TE 9230 B
TT 9230 B
TI 9230 B
HH = XX°C
P-9230B
NOTE 2, 6

W06-PR-BLB-3-XXXX-25H
PROPANE
FC1-42-PID-W06-0048-001
FROM PROPANE BULLETS, V-9220A/B
ECC FOT
LPD

SKID LIMIT

TO XYV-9220A
TO XYV-9220B
SPARE
TO XYV-9001
TO XYV-9000
SPARE
(DRIP/DIRT LEGS LOW POINT DRAINS)
W06-IA-AAB-1-XXXX
TO XYV-9221B
TO XYV-9221A
PIPING
INST.
LPD

TO FY-9241B
SPARE
SPARE
INST. PIPING
(DRIP/DIRT LEGS LOW POINT DRAINS)
W06-IA-AAB-1-XXXX
W06-IA-AAB-2-9007
INSTRUMENT AIR
FC1-42-PID-W06-0048-001
FROM INSTRUMENT AIR HEADER

NOTES:
1. ALL INSTRUMENT TAG NUMBERS, SPECIALTY ITEM NUMBERS, EQUIPMENT TAGS AND BUILDING NUMBERS ARE PRECEDED BY THE PREFIX "W06-".
2. A STRAIGHT PIPE RUN, NO LESS THAN 20D ON THE PUMP SUCTION LINE SHOULD PRECEDE PUMP SUCTION FLANGE.
3. PUMP PACKING LUBRICATION COMPLETE WITH LUBE OIL TANK, SIGHT GLASS, LEVEL SWITCH AND LUBRICATOR.
4. SPRING LOADED BALL VALVE.
5. PUMP HAS A POWER END FORCED LUBRICATION SYSTEM (INCLUDES LUBE PUMP AND MOTOR).
6. PUMP MOTOR SOFT START WITH RAMP UP TIME XXX.

"ALL EQUIPMENT, PIPING & INSTRUMENTS ON THIS DWG. ARE TO BE INSTALLED FOR THE W06 HOT SOLVENT PROJECT.

PACKAGE NO.

REFERENCE NUMBER	REFERENCE TITLE

STAMPS

REV NO	REVISION	DATE	DRN	CKD	DES	LDE	PE
0.A.A	ISSUED FOR APPROVAL (2016-012)	2016/09/08	FDL	GL	HA	HA	EN

CONSULTANT NAME AND LOGO
amec foster wheeler
Three Streams Engineering

REVISION DESCRIPTION
ISSUED FOR APPROVAL

PROJECT NO.
2016-012

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ISSUE DATE
2016/09/08

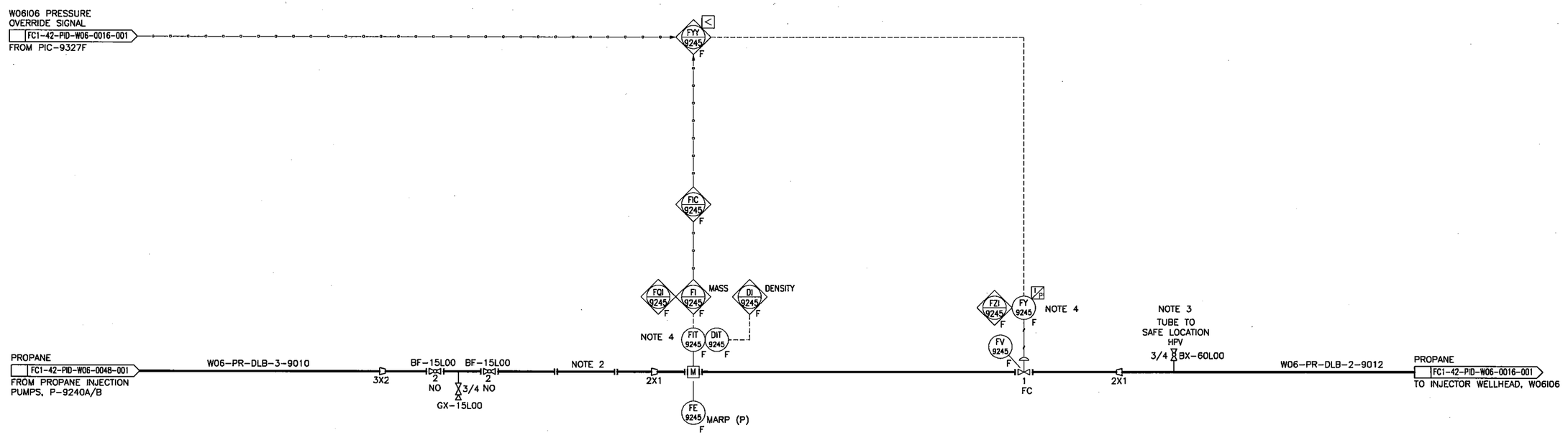
SCALE
NTS

cenovus ENERGY
Cenovus FCCL Ltd

TITLE
FOSTER CREEK OFFSITES
PAD W06 WELLHEAD FACILITIES
PROPANE BOOSTER/INJECTION PUMPS P-9230B/9240B
PIPING AND INSTRUMENTATION DIAGRAM

DRAWING NO.
FC1-42-PID-W06-0048-002

REVISION NO.
0.A.A



NOTES:

1. ALL INSTRUMENT TAG NUMBERS, SPECIALTY ITEM NUMBERS, EQUIPMENT TAGS AND BUILDING NUMBERS ARE PRECEDED BY THE PREFIX "W06-".
2. SPOOL FOR FUTURE COALESCING FILTER IF NEEDED.
3. SPRING LOADED BALL VALVE.
4. SIGNAL WIRED TO PAD PLC.

"ALL EQUIPMENT, PIPING & INSTRUMENTS ON THIS DWG. ARE TO BE INSTALLED FOR THE W06 HOT SOLVENT PROJECT.

PACKAGE NO.

REFERENCE NUMBER	REFERENCE TITLE

STAMPS

REV NO	REVISION	DATE	DRN	CKD	DES	LDE	PE
0.A.A	ISSUED FOR APPROVAL (2016-012)	2016/09/08	LKW	GL	HA	HA	EN

CONSULTANT NAME AND LOGO

amec foster wheeler
Three Streams Engineering

Cenovus FCCL Ltd

TITLE

FOSTER CREEK OFFSITES
PAD W06 WELLHEAD FACILITIES
INJECTION WELL W06I06
PIPING AND INSTRUMENTATION DIAGRAM

REVISION DESCRIPTION: ISSUED FOR APPROVAL

PROJECT NO.: 2016-012

LSD

ISSUE DATE: 2016/09/08

SCALE: NTS

DRAWING NO.: FC1-42-PID-W06-0049-001

REVISION NO.: 0.A.A

THREE STREAMS
ENGINEERING DIVISION
Foster Wheeler Canada Ltd

PROJECT		Buyer	Engineer	Sponsor
2016-012	FC W06 Hot Solvent	Tom Allen	Enoch Ng	Erico Scachetti

REQ/PO NUMBERS	PO VALUE / BUDGET	MATERIAL DESCRIPTION / TAG #.	Eng Buyer Exp QA	VENDOR		MR FOR QUOTE REC'D	BID REQUEST ISSUED	BIDS RECEIVED	MR FOR PURCHASE REC'D	BID TAB AND/OR PO TO CENOVUS	BID TAB AND/OR PO APPROVED	PO ISSUE	INITIAL DRAWINGS DUE	DWG RETURN DATE	MFG. LEAD TIME (Weeks)	MFG. START DATE / % Complete	VENDOR'S SHIP	Level of Insp.	ETA @ SITE	DATE REQUIRED	DELTA TIME (Wks)	SDDR	EXPEDITOR NOTES
1000 - Civil																							
2016-012-TSE-1001 Rev: A	$0 B $0	Structural Steel	Enoch N Tom A Curtis S Darren B	TBD	S F A	25-Dec-16 25-Dec-16	29-Dec-16 29-Dec-16	12-Jan-17 12-Jan-17	22-Jan-17 22-Jan-17	26-Jan-17 26-Jan-17	02-Feb-17 02-Feb-17	04-Feb-17 04-Feb-17	18-Feb-17 18-Feb-17	04-Mar-17 04-Mar-17	8 8	04-Mar-17 04-Mar-17 0.00%	01-Apr-17 01-Apr-17	M-2 E-0 C-0	03-Apr-17 03-Apr-17	03-Apr-17	0	N/A	
2000 - Pipe, Valves, Flanges, Fittings																							
2016-012-TSE-2001 Rev: A	$0 B $0	Manual Valves	Enoch N Tom A Curtis S Darren B	TBD	S F A	07-Nov-16 07-Nov-16	22-Oct-16 11-Nov-16	05-Nov-16 25-Nov-16	15-Nov-16 05-Dec-16	19-Nov-16 09-Dec-16	26-Nov-16 16-Dec-16	28-Nov-16 18-Dec-16	12-Dec-16 01-Jan-17	26-Dec-16 15-Jan-17	8 8	26-Dec-16 15-Jan-17 0.00%	23-Jan-17 12-Feb-17	M-1 E-0 C-0	25-Jan-17 14-Feb-17	25-Jan-17	-2	N/A	
2016-012-TSE-2002 Rev: 0 REQ_0,PO_0	$6,505 B $0	Steam Valves Ship to: TBD 2-CB-15V00, 2-CB-15V40, 2-GB-15V00	Enoch N Tom A Curtis S Asad K	Quantum Supply	S F A	14-Sep-16 14-Sep-16 01-Sep-16	18-Sep-16 05-Sep-16 01-Sep-16	02-Oct-16 15-Sep-16 01-Sep-16	12-Oct-16 11-Sep-16 01-Sep-16	16-Oct-16 06-Sep-16 06-Sep-16	23-Oct-16 13-Sep-16 06-Sep-16	25-Oct-16 08-Sep-16 06-Sep-16	08-Nov-16 29-Sep-16 04-Oct-16	22-Nov-16 18-Oct-16 18-Oct-16	28 28	22-Nov-16 23-Nov-16 0.00%	09-May-17 03-Apr-17	M-1 E-0 C-0	11-May-17 05-Apr-17	11-May-17	5	Yes	Oct 25/16 - Updated schedule received, vendor forecasts March 31 ready for inspection date. Oct 18/16 - Initial docs returned Code A&B. Oct 4/16 - Initial Outline Drawings and BOM submitted by vendor. Sept 28/16 - Requested status update/drawing submittal from vendor - 2nd request. Sept 20/16 - Requested initial drawings from vendor.
3000 - Specialty Items																							
2016-012-TSE-3001 Rev: A	$0 B $0	Injection Quills Ship to: Foster Creek OCT	Enoch N Tom A Curtis S Robert D	TBD	S F A	07-Dec-16 07-Dec-16	11-Dec-16 11-Dec-16	25-Dec-16 25-Dec-16	04-Jan-17 04-Jan-17	08-Jan-17 08-Jan-17	15-Jan-17 15-Jan-17	17-Jan-17 17-Jan-17	31-Jan-17 31-Jan-17	14-Feb-17 14-Feb-17	16 16	14-Feb-17 14-Feb-17 0.00%	09-May-17 09-May-17	M-1 E-0 C-0	11-May-17 11-May-17	11-May-17	0	N/A	
2016-012-TSE-3002 Rev: 0	$25,182 B $0	Basket Strainers Ship to: Skid Fabricator SP-Z396	Enoch N Tom A Curtis S Robert D	Radafab Oilfied & Industrial Supply	S F A	15-Nov-16 15-Nov-16 04-Nov-16	19-Nov-16 08-Nov-16 04-Nov-16	03-Dec-16 18-Nov-16 04-Nov-16	13-Dec-16 14-Nov-16 04-Nov-16	17-Dec-16 08-Nov-16	24-Dec-16 15-Nov-16	26-Dec-16 17-Nov-16	09-Jan-17 01-Dec-16	23-Jan-17 15-Dec-16	4 4	23-Jan-17 15-Dec-16 0.00%	23-Jan-17 15-Dec-16	M-0 E-0 C-0	25-Jan-17 17-Dec-16	25-Jan-17	5	Yes	Nov 4/16 - Rev 0 MRP received.
2016-012-TSE-3003 Rev: A	$0 B $0	Propane Unloading SP Items	Enoch N Tom A Curtis S Robert D	TBD	S F A	15-Nov-16 15-Nov-16	19-Nov-16 19-Nov-16	03-Dec-16 03-Dec-16	13-Dec-16 13-Dec-16	17-Dec-16 17-Dec-16	24-Dec-16 24-Dec-16	26-Dec-16 26-Dec-16	09-Jan-17 09-Jan-17	23-Jan-17 23-Jan-17	4 4	23-Jan-17 23-Jan-17 0.00%	23-Jan-17 23-Jan-17	M-0 E-0 C-0	25-Jan-17 25-Jan-17	25-Jan-17	0	N/A	
2016-012-TSE-3004 Rev: A	$0 B $0	Piston Check Valve	Enoch N Tom A Curtis S Robert D	TBD	S F A	20-Sep-16 10-Nov-16	24-Sep-16 14-Nov-16	08-Oct-16 28-Nov-16	18-Oct-16 08-Dec-16	22-Oct-16 12-Dec-16	29-Oct-16 19-Dec-16	31-Oct-16 21-Dec-16	14-Nov-16 04-Jan-17	28-Nov-16 18-Jan-17	12 12	28-Nov-16 18-Jan-17 0.00%	23-Jan-17 15-Mar-17	M-0 E-0 C-0	25-Jan-17 17-Mar-17	25-Jan-17	-7	N/A	
4000 - Mechanical																							
2016-012-TSE-4002 Rev: 0 PRE, PO_0	$205,625 B $0	Propane Storage Bullet W06-V9220	Enoch N Tom A Curtis S Darren B	Bilton Welding and Manufacturing	S F A	21-Dec-16 21-Dec-16 12-Oct-16	25-Dec-16 16-Oct-16 12-Oct-16	08-Jan-17 26-Oct-16 12-Oct-16	18-Jan-17 22-Oct-16 12-Oct-16	22-Jan-17 16-Oct-16 14-Oct-16	29-Jan-17 21-Oct-16 14-Oct-16	31-Jan-17 16-Oct-16 17-Oct-16	14-Feb-17 31-Oct-16 27-Oct-16	28-Feb-17 10-Nov-16	14 14	28-Feb-17 10-Nov-16 0.00%	09-May-17 23-Jan-17	M-2 E-0 C-2	11-May-17 25-Jan-17	11-May-17	15	Yes	Oct 27/16 - Initial Drawings received. Oct 17/16 - Intial Contact Form and SDDR for signoff sent to vendor. Oct 17/16 - PO Rev. 0 issued to Bilton Oct 12/16 - Rev 0 MRP received.
2016-012-TSE-4003 Rev: A	$0 B $0	Propane Offloading/Pump Skid Fabrication	Enoch N Tom A Curtis S Darren B	TBD	S F A	15-Dec-16 15-Dec-16	19-Dec-16 19-Dec-16	02-Jan-17 02-Jan-17	12-Jan-17 12-Jan-17	16-Jan-17 16-Jan-17	23-Jan-17 23-Jan-17	25-Jan-17 25-Jan-17	08-Feb-17 08-Feb-17	22-Feb-17 22-Feb-17	12 12	22-Feb-17 22-Feb-17 0.00%	19-Apr-17 19-Apr-17	M-2 E-0 C-0	21-Apr-17 21-Apr-17	21-Apr-17	0	Yes	
2016-012-TSE-4004 Rev: A	$0 B $0	Pipe Spooling	Enoch N Tom A Curtis S Robert D	TBD	S F A	15-Feb-17 15-Feb-17	19-Feb-17 19-Feb-17	05-Mar-17 05-Mar-17	15-Mar-17 15-Mar-17	19-Mar-17 19-Mar-17	26-Mar-17 26-Mar-17	28-Mar-17 28-Mar-17	11-Apr-17 11-Apr-17	25-Apr-17 25-Apr-17	6 6	25-Apr-17 25-Apr-17 0.00%	09-May-17 09-May-17	M-2 E-0 C-0	11-May-17 11-May-17	11-May-17	0	N/A	
4500 - Rotating Equipment																							
2016-012-TSE-4501 Rev: 0 REQ_0,PO_0	$85,920 B $0	Propane Booster Pump W06-P-9230A/B W06-P-9230A/B	Enoch N Tom A Curtis S Robert D	EC&M Electric	S F A	05-Jul-16 05-Jul-16 13-Jul-16	09-Jul-16 17-Jul-16 13-Jul-16	23-Jul-16 27-Jul-16 29-Aug-16	02-Aug-16 08-Sep-16 29-Aug-16	06-Aug-16 06-Sep-16 06-Sep-16	13-Aug-16 13-Sep-16 19-Sep-16	15-Aug-16 21-Sep-16 19-Sep-16	29-Aug-16 07-Oct-16 07-Oct-16	12-Sep-16 21-Oct-16 20-Oct-16	23 21	12-Sep-16 21-Nov-16 0.00%	23-Jan-17 30-Jan-17	M-1 E-0 C-0	25-Jan-17 01-Feb-17	25-Jan-17	-1	Yes	Nov 2/16 - Code B Drawings, Manual, received for approval. Oct 24/16 - Requested update from vendor on outstanding docs. Oct 20/16 - Drawings returned Code A&B Oct 11/16 - Drawings, DS, IOM & Pump performance Curve submitted for approval. Oct 7/16 Initial docs returned Code A,D. GA & Skid Drawings returned Code C. Oct 7/16 - Initial submittal received from vendor.
2016-012-TSE-4503 Rev: 0 REQ_0,PO_0	$142,110 B $0	Propane Injection Pump W06-P-9240A/B W06-P-9240A/B	Enoch Tom A Curtis S Robert D	Westpower	S F A	04-Oct-16 04-Oct-16 06-Sep-16	08-Oct-16 10-Sep-16 06-Sep-16	22-Oct-16 20-Sep-16 06-Sep-16	01-Nov-16 16-Sep-16 06-Sep-16	05-Nov-16 10-Sep-16 09-Sep-16	12-Nov-16 16-Sep-16 09-Sep-16	14-Nov-16 11-Sep-16 09-Sep-16	28-Nov-16 05-Oct-16 20-Oct-16	12-Dec-16 03-Nov-16 02-Nov-16	10 10	12-Dec-16 09-Nov-16 0.00%	23-Jan-17 20-Jan-17	M-1 E-0 C-0	25-Jan-17 22-Jan-17	25-Jan-17	0	Yes	Nov 2/16 - IOM returned Code B. Oct 31/16 - revised GA submitted for review Oct 28/16 - IOM submitted for review Oct 24/16 - Vendor to resubmit IOM, DS and GA drawing Oct 25th. Production schedule to be submitted once GA is Code A. Oct 21/16 - Transmittal 4 docs received.
5000 - Transportation																							
2016-012-TSE-5001 Rev: 0	$40,000 B $0	Blanket Transportation	Enoch N Tom A Curtis S Rpbert D	B&R Eckels Transport	S F A	18-Oct-16 18-Oct-16 03-Nov-16	22-Oct-16 07-Nov-16 03-Nov-16	05-Nov-16 17-Nov-16 03-Nov-16	15-Nov-16 13-Nov-16 03-Nov-16	19-Nov-16 07-Nov-16	26-Nov-16 14-Nov-16	28-Nov-16 16-Nov-16	12-Dec-16 30-Nov-16	26-Dec-16 14-Dec-16	0 0	26-Dec-16 14-Dec-16 0.00%	28-Nov-16 16-Nov-16	M-0 E-0 C-0	30-Nov-16 18-Nov-16	30-Nov-16	1	N/A	
2016-012-TSE-5002 Rev: A	$0 B $0	Heavy Transport	Enoch N Tom A Curtis S Darren B	TBD	S F A	04-Jan-17 04-Jan-17	08-Jan-17 08-Jan-17	22-Jan-17 22-Jan-17	01-Feb-17 01-Feb-17	05-Feb-17 05-Feb-17	12-Feb-17 12-Feb-17	14-Feb-17 14-Feb-17	28-Feb-17 28-Feb-17	14-Mar-17 14-Mar-17	6 6	14-Mar-17 14-Mar-17 0.00%	28-Mar-17 28-Mar-17	M-0 E-0 C-0	30-Mar-17 30-Mar-17	30-Mar-17	0	N/A	
6000 - Inspection																							
2016-012-TSE-1001M Rev: A	$0 B $0	Inspection of Structural Steel	Enoch N Tom A Curtis S Darren B	TBD	S F A	23-Dec-16 23-Dec-16	27-Dec-16 27-Dec-16	10-Jan-17 10-Jan-17	20-Jan-17 20-Jan-17	24-Jan-17 24-Jan-17	31-Jan-17 31-Jan-17	02-Feb-17 02-Feb-17	16-Feb-17 16-Feb-17	02-Mar-17 02-Mar-17	0 0	02-Mar-17 02-Mar-17 0.00%	02-Feb-17 02-Feb-17	M-0 E-0 C-0	04-Feb-17 04-Feb-17	04-Feb-17	0	N/A	
2016-012-TSE-4002M Rev: 0	$10,240 B $0	Mechanical Inspection of 60,000 USWG Propane Storage Bullet	Enoch N Tom A Curtis S Robert D	Killick Group	S F A	03-Oct-16 03-Oct-16 31-Oct-16	07-Oct-16 04-Nov-16 31-Oct-16	21-Oct-16 14-Nov-16 31-Oct-16	31-Oct-16 10-Nov-16 31-Oct-16	04-Nov-16 04-Nov-16 01-Nov-16	11-Nov-16 08-Nov-16 02-Nov-16	13-Nov-16 04-Nov-16 02-Nov-16	N/A N/A N/A	N/A N/A N/A	0 0	N/A N/A N/A 0.00%	N/A N/A N/A	M-0 E-0 C-0	N/A N/A N/A	15-Nov-16	1	N/A	Nov 2/16 - PO Rev. 0 issued to Killick Nov 1/16 - PO Rev. 0 to Cenovus for Approval Oct 31 - Rev 0 MRP received.

REQ/PO NUMBERS	PO VALUE / BUDGET	MATERIAL DESCRIPTION / TAG #.	Eng Buyer Exp QA	VENDOR		MR FOR QUOTE REC'D	BID REQUEST ISSUED	BIDS RECEIVED	MR FOR PURCHASE REC'D	BID TAB AND/OR PO TO CENOVUS	BID TAB AND/OR PO APPROVED	PO ISSUE	INITIAL DRAWING'S DUE	DWG RETURN DATE	MFG. LEAD TIME (Weeks)	MFG. START DATE / % Complete	VENDOR'S SHIP	Level of Insp.	ETA @ SITE	DATE REQUIRED	DELTA TIME (Wks)	SDDR	EXPEDITOR NOTES
2016-012-TSE-4003E Rev: A	$0 B $0	Propane Pump / Offloading Skid Elec Inspection	Enoch N Tom A Curtis S Robert D	TBD	S F A	13-Dec-16 13-Dec-16	17-Dec-16 17-Dec-16	31-Dec-16 31-Dec-16	10-Jan-17 10-Jan-17	14-Jan-17 14-Jan-17	21-Jan-17 21-Jan-17	23-Jan-17 23-Jan-17	06-Feb-17 06-Feb-17	20-Feb-17 20-Feb-17	0 0	20-Feb-17 20-Feb-17 0.00%	23-Jan-17 23-Jan-17	M-0 E-0 C-0	25-Jan-17 25-Jan-17	25-Jan-17	0	N/A	
2016-012-TSE-4003M Rev: A	$0 B $0	Propane Pump /Offloading Skid Mechanical Inspection	Enoch N Tom A Curtis S Robert D	TBD	S F A	13-Dec-16 13-Dec-16	17-Dec-16 17-Dec-16	31-Dec-16 31-Dec-16	10-Jan-17 10-Jan-17	14-Jan-17 14-Jan-17	21-Jan-17 21-Jan-17	23-Jan-17 23-Jan-17	06-Feb-17 06-Feb-17	20-Feb-17 20-Feb-17	0 0	20-Feb-17 20-Feb-17 0.00%	23-Jan-17 23-Jan-17	M-0 E-0 C-0	25-Jan-17 25-Jan-17	25-Jan-17	0	N/A	
2016-012-TSE-4004M Rev: A	$0 B $0	Pipe Spooling Mechanical Inspection	Enoch N Tom A Curtis S Robert D	TBD	S F A	18-Dec-16 18-Dec-16	22-Dec-16 22-Dec-16	05-Jan-17 05-Jan-17	15-Jan-17 15-Jan-17	19-Jan-17 19-Jan-17	26-Jan-17 26-Jan-17	28-Jan-17 28-Jan-17	11-Feb-17 11-Feb-17	25-Feb-17 25-Feb-17	0 0	25-Feb-17 25-Feb-17 0.00%	28-Jan-17 28-Jan-17	M-0 E-0 C-0	30-Jan-17 30-Jan-17	30-Jan-17	0	N/A	
2016-012-TSE-4501M Rev: A	$0 B $0	Propane Booster Pump Inspection	Enoch N Tom A Curtis S Robert D	TBD	S F A	13-Dec-16 13-Dec-16	17-Dec-16 17-Dec-16	31-Dec-16 31-Dec-16	10-Jan-17 10-Jan-17	14-Jan-17 14-Jan-17	21-Jan-17 21-Jan-17	23-Jan-17 23-Jan-17	06-Feb-17 06-Feb-17	20-Feb-17 20-Feb-17	0 0	20-Feb-17 20-Feb-17 0.00%	23-Jan-17 23-Jan-17	M-0 E-0 C-0	25-Jan-17 25-Jan-17	25-Jan-17	0	N/A	
2016-012-TSE-4503M Rev: 0	$1,440 B $0	Mechanical Inspection of Propane Injection Pumps	Enoch N Tom A Curtis S Robert D	Killick Group	S F A	21-Aug-16 21-Aug-16 26-Sep-16	25-Aug-16 30-Sep-16 26-Sep-16	08-Sep-16 10-Oct-16 26-Sep-16	18-Sep-16 06-Oct-16 26-Sep-16	22-Sep-16 28-Sep-16 28-Sep-16	29-Sep-16 04-Oct-16 29-Sep-16	01-Oct-16 05-Oct-16 29-Sep-16	N/A N/A N/A	N/A N/A N/A	0 0	N/A N/A N/A 0.00%	N/A N/A N/A	M-0 E-0 C-0	N/A N/A N/A	03-Oct-16	0	N/A	Sept 29/16 PO Rev. 0 issued
2016-012-TSE-7001E Rev: A	$0 B $0	VFD Panel Inspection	Enoch N Tom A Curtis S Robert D	TBD	S F A	20-Dec-16 20-Dec-16	24-Dec-16 24-Dec-16	07-Jan-17 07-Jan-17	17-Jan-17 17-Jan-17	21-Jan-17 21-Jan-17	28-Jan-17 28-Jan-17	30-Jan-17 30-Jan-17	13-Feb-17 13-Feb-17	27-Feb-17 27-Feb-17	0 0	27-Feb-17 27-Feb-17 0.00%	30-Jan-17 30-Jan-17	M-0 E-0 C-0	01-Feb-17 01-Feb-17	01-Feb-17	0	N/A	
2016-012-TSE-7002E Rev: A	$0 B $0	Truck Unloading Station Control Panel Inspection	Enoch N Tom A Curtis S Robert D	TBD	S F A	09-Mar-17 09-Mar-17	13-Mar-17 13-Mar-17	27-Mar-17 27-Mar-17	06-Apr-17 06-Apr-17	10-Apr-17 10-Apr-17	17-Apr-17 17-Apr-17	19-Apr-17 19-Apr-17	03-May-17 03-May-17	17-May-17 17-May-17	0 0	17-May-17 17-May-17 0.00%	19-Apr-17 19-Apr-17	M-0 E-0 C-0	21-Apr-17 21-Apr-17	21-Apr-17	0	N/A	
7000 - Electrical																							
2016-012-TSE-7001 Rev: A	$0 B $0	VFD Panel	Enoch N Tom A Curtis S Darren B	Simark	S F A	02-Feb-17 02-Feb-17	06-Feb-17 06-Feb-17	20-Feb-17 20-Feb-17	20-Feb-17 20-Feb-17	06-Mar-17 06-Mar-17	06-Mar-17 06-Mar-17	10-Mar-17 10-Mar-17	10-Mar-17 10-Mar-17	10-Mar-17 10-Mar-17	6 6	09-Apr-17 09-Apr-17 0.00%	21-Apr-17 21-Apr-17	M-0 E-1 C-0	21-Apr-17 21-Apr-17	21-Apr-17	0	N/A	
2016-012-TSE-7002 Rev: A	Unloading Station Control Panel, Ground Monitor System, Junction boxes, PLC Panel a $0 B $0		Enoch N Tom A Curtis S Robert D	Panelflex	S F A	26-Jan-17 26-Jan-17	30-Jan-17 30-Jan-17	13-Feb-17 13-Feb-17	23-Feb-17 23-Feb-17	27-Feb-17 27-Feb-17	06-Mar-17 06-Mar-17	08-Mar-17 08-Mar-17	22-Mar-17 22-Mar-17	05-Apr-17 05-Apr-17	6 6	05-Apr-17 05-Apr-17 0.00%	19-Apr-17 19-Apr-17	M-0 E-1 C-0	21-Apr-17 21-Apr-17	21-Apr-17	0	N/A	
2016-012-TSE-7003 Rev: A	$0 B $0	Heat Trace Materials	Enoch N Tom A Curtis S Darren B	Thermon	S F A	26-Jan-17 26-Jan-17	30-Jan-17 30-Jan-17	13-Feb-17 13-Feb-17	23-Feb-17 23-Feb-17	27-Feb-17 27-Feb-17	06-Mar-17 06-Mar-17	08-Mar-17 08-Mar-17	22-Mar-17 22-Mar-17	05-Apr-17 05-Apr-17	6 6	05-Apr-17 05-Apr-17 0.00%	19-Apr-17 19-Apr-17	M-0 E-1 C-0	21-Apr-17 21-Apr-17	21-Apr-17	0	N/A	
2016-012-TSE-7004 Rev: A	$0 B $0	MCC Breaker	Enoch N Tom A Curtis S Darren B	Wesco	S F A	26-Jan-17 26-Jan-17	30-Jan-17 30-Jan-17	13-Feb-17 13-Feb-17	23-Feb-17 23-Feb-17	27-Feb-17 27-Feb-17	06-Mar-17 06-Mar-17	08-Mar-17 08-Mar-17	22-Mar-17 22-Mar-17	05-Apr-17 05-Apr-17	6 6	05-Apr-17 05-Apr-17 0.00%	19-Apr-17 19-Apr-17	M-2 E-0 C-0	21-Apr-17 21-Apr-17	21-Apr-17	0	N/A	
8000 - Instrumentation																							
2016-012-TSE-8001 Rev: A	$0 B $0	On/Off Valves	Enoch N Tom A Curtis S Darren B	TBD	S F A	01-Nov-16 09-Nov-16	05-Nov-16 13-Nov-16	19-Nov-16 27-Nov-16	29-Nov-16 07-Dec-16	03-Dec-16 11-Dec-16	10-Dec-16 18-Dec-16	12-Dec-16 20-Dec-16	26-Dec-16 03-Jan-17	09-Jan-17 17-Jan-17	6 6	09-Jan-17 17-Jan-17 0.00%	23-Jan-17 31-Jan-17	M-1 E-0 C-0	25-Jan-17 02-Feb-17	25-Jan-17	-1	N/A	
2016-012-TSE-8002 Rev: 0 REQ_0, PO_0	$28,599 B $0 W06-FV-9241A/B	Control Valves	Enoch N Tom A Curti S Robert D	Dyna-Flo	S F A	20-Sep-16 20-Sep-16 18-Oct-16	24-Sep-16 22-Oct-16 18-Oct-16	08-Oct-16 01-Nov-16 18-Oct-16	18-Oct-16 28-Oct-16 18-Oct-16	22-Oct-16 22-Oct-16 20-Oct-16	29-Oct-16 27-Oct-16 20-Oct-16	31-Oct-16 22-Oct-16 21-Oct-16	14-Nov-16 04-Nov-16 02-Nov-16	28-Nov-16 16-Nov-16	12 12	28-Nov-16 16-Nov-16 0.00%	23-Jan-17 13-Jan-17	M-1 E-0 C-0	25-Jan-17 15-Jan-17	25-Jan-17	1	Yes	Oct 21/16 - PO Rev. 0 issued to Dynaflow Oct 18/16 - Rev 0 MRP received.
2016-012-TSE-8003 Rev: A	$0 B $0	PSVs	Enoch N Tom A Curti S Darren B	TBD	S F A	10-Nov-16 10-Nov-16	24-Sep-16 14-Nov-16	08-Oct-16 28-Nov-16	18-Oct-16 08-Dec-16	22-Oct-16 12-Dec-16	29-Oct-16 19-Dec-16	31-Oct-16 21-Dec-16	14-Nov-16 04-Jan-17	28-Nov-16 18-Jan-17	12 12	28-Nov-16 18-Jan-17 0.00%	23-Jan-17 15-Mar-17	M-1 E-0 C-0	25-Jan-17 17-Mar-17	25-Jan-17	-7	N/A	
2016-012-TSE-8004 Rev: 0 REQ_0, PO_0	$15,360 B $0 W06-FE-9241A/B, W06-FIT-9241A/B	Turbine Flow Meters	Enoch N Tom A Curtis S Darren B	Muis Controls	S F A	18-Oct-16 18-Oct-16 18-Oct-16	22-Oct-16 22-Oct-16 18-Oct-16	05-Nov-16 01-Nov-16 18-Oct-16	15-Nov-16 28-Oct-16 18-Oct-16	19-Nov-16 22-Oct-16 20-Oct-16	26-Nov-16 27-Oct-16 20-Oct-16	28-Nov-16 22-Oct-16 21-Oct-16	12-Dec-16 07-Nov-16 28-Oct-16	26-Dec-16 11-Nov-16	8 8	26-Dec-16 11-Nov-16 0.00%	23-Jan-17 16-Dec-16	M-0 E-0 C-0	25-Jan-17 18-Dec-16	25-Jan-17	5	Yes	Oct 28/16 - Initial Drawings received. Oct 28/16 - Initial contact and signed SDDR received from vendor. Initial Drawings due Nov.7th. Oct 24/16 - Initial contact and signed SDDR returned by vendor (SDDR mark-up deemed acceptable by Eng). Oct 21/16 - PO Rev. 0 issued to Muis Controls
2016-012-TSE-8004 Rev: 1 REQ_1, PO_1	$0 B $0	Turbine Flowmeter (No Cost Change)	Enoch N Tom A Curtis S Robert D	Muis Controls	S F A	18-Oct-16 18-Oct-16 27-Oct-16	22-Oct-16 31-Oct-16 27-Oct-16	05-Nov-16 10-Nov-16 27-Oct-16	15-Nov-16 06-Nov-16 27-Oct-16	19-Nov-16 31-Oct-16 31-Oct-16	26-Nov-16 07-Nov-16 02-Nov-16	28-Nov-16 04-Nov-16 02-Nov-16	N/A N/A N/A	N/A N/A N/A	8 8	N/A N/A N/A 0.00%	N/A N/A N/A	M-0 E-0 C-0	N/A N/A N/A	25-Jan-17	3	N/A	Nov 2/16 PO Rev. 1 issued to Muis Controls Oct 31/16 - PO Rev. 1 to Cenovus for Approval Oct 27/16 - Rev 1 MRP received (no cost change).
2016-012-TSE-8005 Rev: A	$0 B $0	Coriolis Flow Meters	Enoch N Tom A Curtis S Robert D	TBD	S F A	29-Dec-16 29-Dec-16	02-Jan-17 02-Jan-17	16-Jan-17 16-Jan-17	26-Jan-17 26-Jan-17	30-Jan-17 30-Jan-17	06-Feb-17 06-Feb-17	08-Feb-17 08-Feb-17	22-Feb-17 22-Feb-17	08-Mar-17 08-Mar-17	10 10	08-Mar-17 08-Mar-17 0.00%	19-Apr-17 19-Apr-17	M-1 E-0 C-0	21-Apr-17 21-Apr-17	21-Apr-17	0	N/A	
2016-012-TSE-8006 Rev: A	$0 B $0	PG,TG,TE,TW	Enoch N Tom A Curtis S Robert D	TBD	S F A	12-Jan-17 12-Jan-17	16-Jan-17 16-Jan-17	30-Jan-17 30-Jan-17	09-Feb-17 09-Feb-17	13-Feb-17 13-Feb-17	20-Feb-17 20-Feb-17	22-Feb-17 22-Feb-17	08-Mar-17 08-Mar-17	22-Mar-17 22-Mar-17	8 8	22-Mar-17 22-Mar-17 0.00%	19-Apr-17 19-Apr-17	M-0 E-0 C-0	21-Apr-17 21-Apr-17	21-Apr-17	0	N/A	

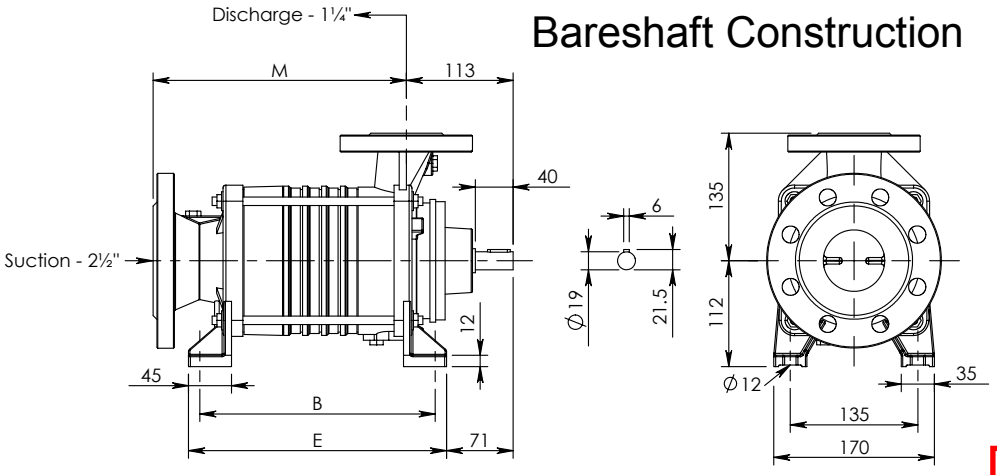
REQ/PO NUMBERS	PO VALUE / BUDGET	MATERIAL DESCRIPTION / TAG #.	Eng Buyer Exp QA	VENDOR		MR FOR QUOTE REC'D	BID REQUEST ISSUED	BIDS RECEIVED	MR FOR PURCHASE REC'D	BID TAB AND/OR PO TO CENOVUS	BID TAB AND/OR PO APPROVED	PO ISSUE	INITIAL DRAWINGS DUE	DWG RETURN DATE	MFG. LEAD TIME (Weeks)	MFG. START DATE / % Complete	VENDOR'S SHIP	Level of Insp.	ETA @ SITE	DATE REQUIRED	DELTA TIME (Wks)	SDDR	EXPEDITOR NOTES
2016-012-TSE-8007 Rev: A	$0 B $0	Transmitters	Enoch N Tom A Curtis S Darren B	TBD	S F A	29-Dec-16 29-Dec-16	02-Jan-17 02-Jan-17	16-Jan-17 16-Jan-17	26-Jan-17 26-Jan-17	30-Jan-17 30-Jan-17	06-Feb-17 06-Feb-17	08-Feb-17 08-Feb-17	22-Feb-17 22-Feb-17	08-Mar-17 08-Mar-17	10 10	08-Mar-17 08-Mar-17 0.00%	19-Apr-17 19-Apr-17	M-0 E-0 C-0	21-Apr-17 21-Apr-17	21-Apr-17	0	N/A	
2016-012-TSE-8008 Rev: A	$0 B $0	Level Transmitters	Enoch N Tom A Curtis S Darren B	TBD	S F A	07-Mar-17 07-Mar-17	11-Mar-17 11-Mar-17	25-Mar-17 25-Mar-17	04-Apr-17 04-Apr-17	08-Apr-17 08-Apr-17	15-Apr-17 15-Apr-17	17-Apr-17 17-Apr-17	01-May-17 01-May-17	15-May-17 15-May-17	12 12	15-May-17 15-May-17 0.00%	10-Jul-17 10-Jul-17	M-0 E-0 C-0	12-Jul-17 12-Jul-17	12-Jul-17	0	N/A	
2016-012-TSE-8009 Rev: A	$0 B $0	Fire and Gas Detection, Beacons and Horns	Enoch N Tom A Curtis S Darren B	TBD	S F A	26-Jan-17 26-Jan-17	30-Jan-17 30-Jan-17	13-Feb-17 13-Feb-17	23-Feb-17 23-Feb-17	27-Feb-17 27-Feb-17	06-Mar-17 06-Mar-17	08-Mar-17 08-Mar-17	22-Mar-17 22-Mar-17	05-Apr-17 05-Apr-17	6 6	05-Apr-17 05-Apr-17 0.00%	19-Apr-17 19-Apr-17	M-0 E-0 C-0	21-Apr-17 21-Apr-17	21-Apr-17	0	N/A	
2016-012-TSE-8010 Rev: A	$0 B $0	Solenoid Valves	Enoch N Tom A Curtis S Robert D	TBD	S F A	26-Jan-17 26-Jan-17	30-Jan-17 30-Jan-17	13-Feb-17 13-Feb-17	23-Feb-17 23-Feb-17	27-Feb-17 27-Feb-17	06-Mar-17 06-Mar-17	08-Mar-17 08-Mar-17	22-Mar-17 22-Mar-17	05-Apr-17 05-Apr-17	6 6	05-Apr-17 05-Apr-17 0.00%	19-Apr-17 19-Apr-17	M-0 E-0 C-0	21-Apr-17 21-Apr-17	21-Apr-17	0	N/A	

APPENDIX 3 – Vendor Information

DIMENSIONAL DRAWING
SELF-PRIMING CENTRIFUGAL PUMP
TRAVAINI PUMP MODEL

TBA 301 to 306

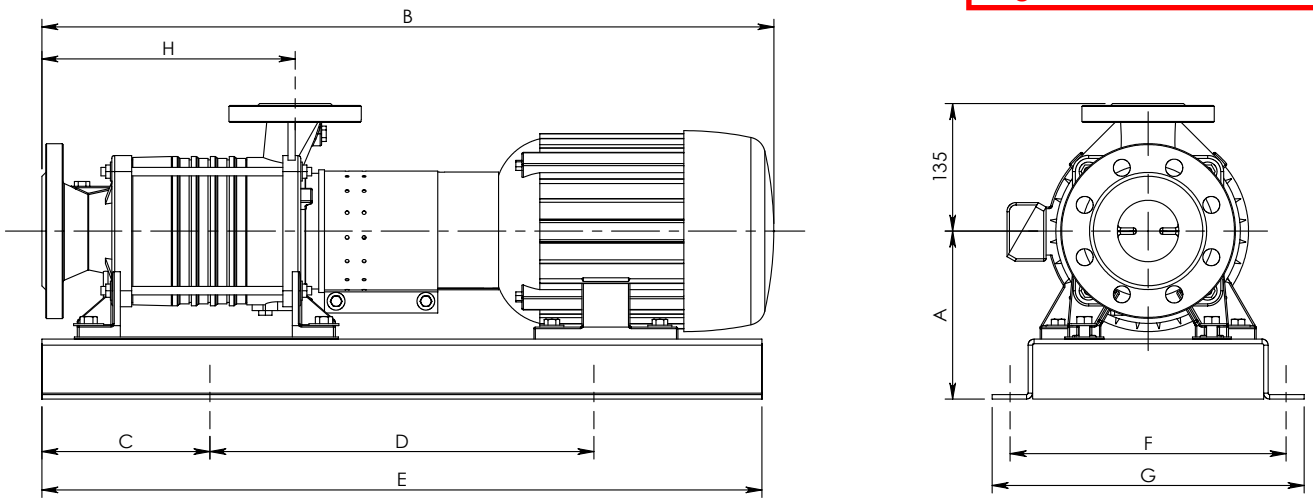
Bareshaft Construction



Model	M	B	E	Weight Kg
TBA 301	228	209	233	24
TBA 302	268	249	273	27.5
TBA 303	308	289	313	31
TBA 304	348	329	353	34.5
TBA 305	388	369	393	38
TBA 306	428	409	433	41.5

Preliminary Size for 2014-462
N-Pad Lean Propane SAP IFA
Aug 15, 2016

Base-Mounted Construction



Pump Model	Motor HP	A	B	C	D	E	F	G	H	Base Plate	Weight (Kg.)
TBA 301	1 ½	164	667	127	356	610	241	280	228	902	64
	2		692								68
TBA 302	3	176	733	178	406	762	292	330	268	901	86
	3	178	775								91
	5		800								100
	7 ½	197	864		610	965	318	356		900	136
TBA 303	3	178	813		406	762	292	330	308	901	95
	5		838								104
	7½	197	902		610	965	318	356		900	141
TBA 304	5	178	883						348		113
	7 ½	197	946								141
	10		991								150
TBA 305	5	178	921						388		118
	7 ½	197	984								145
	10		1029								154
	15	248	1092	203	762	1168	394	432		903	186
TBA 306	7 ½	197	1022	178	610	965	318	356	428	900	150
	10		1067								159
	15	248	1130	203	762	1168	394	432		903	191

Flanges are R.F. drilled for 300 lbs ANSI mating flanges

Dimensions in mm

Premier Fluid Systems
Canadian Home of Travaini Pumps
4161 Morris Dr. - Unit 5 * Burlington * Ontario * L7L 5L5 * Website: www.pfspumps.com
Tel: 1-800-461-2611 or 905-637-2611 * Fax: 905-333-4722 * email: info@pfspumps.com

DATE : MARCH 2002

N°.: 13.6

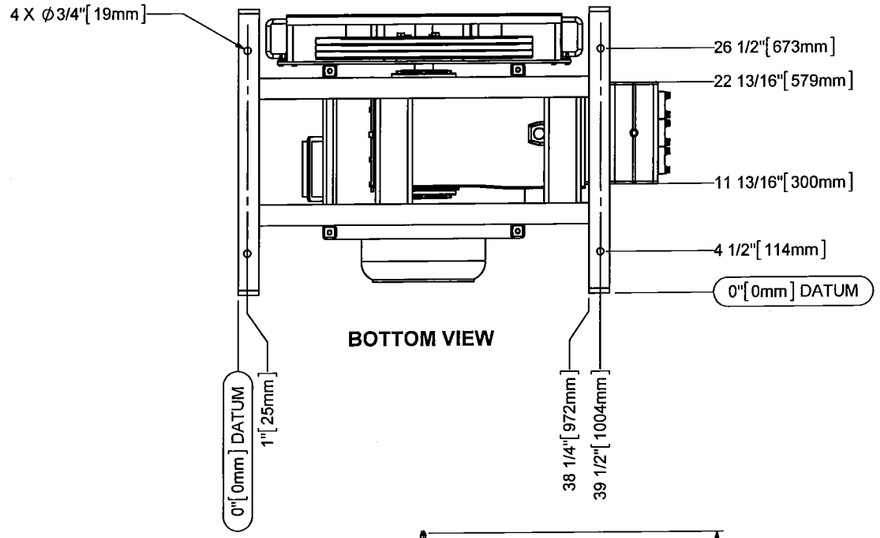
FILE LOCATION: *U:\IB-Job Reciprocating Pumps\Job Files\B7082\Design\Solidworks*

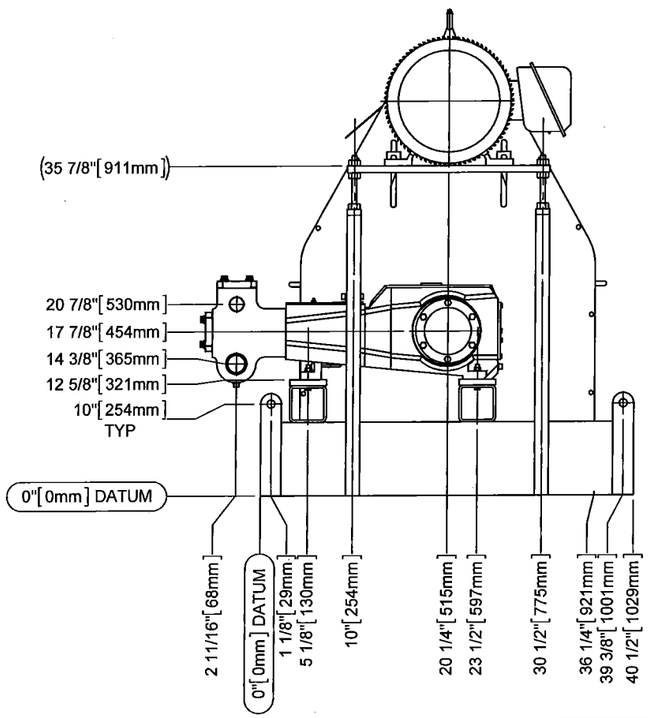
LAST SAVE DATE: *July-29-14 9:29:34 AM*

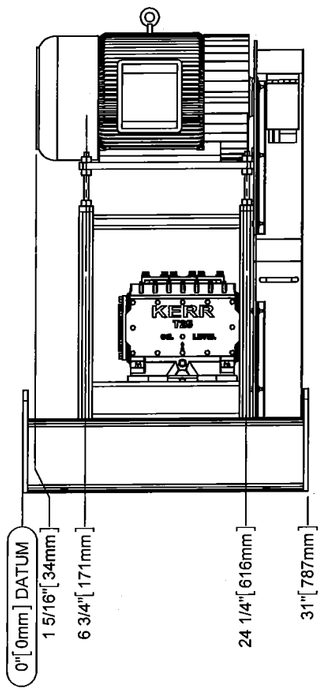
SAVED BY: *rzimmer*

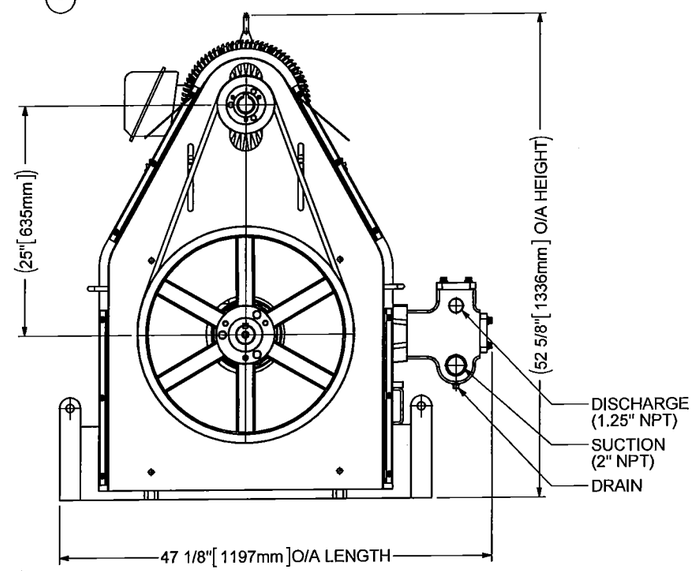
AS - BUILT
By:
Date: 12 - Aug - 2014

Preliminary Size for 2014-462
N-Pad Lean Propane SAP IFA
Aug 15, 2016









THIS VIEW ONLY: GUARD FRONT PLATE REMOVED FOR CLARITY

REVISIONS								
REV	DESCRIPTION	DATE	BY	CHK	ENG	SHOP	QCI	PM
0	INITIAL RELEASE	28JUL14	MSZ	SB				RZ

TOLERANCES (UNLESS OTHERWISE STATED) REFER TO ASME B16

FABRICATION TOLERANCES ± 1/8" [3.2]
ANGLES ± 1°

MACHINING TOLERANCES
.X ± 0.1" ±[2.5]
.XX ± 0.01" ±[0.25]
.XXX ± 0.005" ±[0.13]
ANGLES - ±0.5° or ±0°00'30s

THREADS: EXTERNAL-CLASS 2A
INTERNAL-CLASS 2B
FLATNESS &/OR STRAIGHTNESS: 0.005/IN [0.13/25.4]

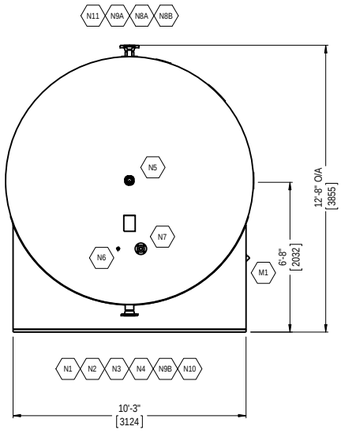
THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
ALL DIMENSIONS IN [ ] ARE mm
DO NOT SCALE DRAWING
DIMENSIONS AND TOLERANCING PER ANSI Y14.5M-1994
IF IN DOUBT - ASK

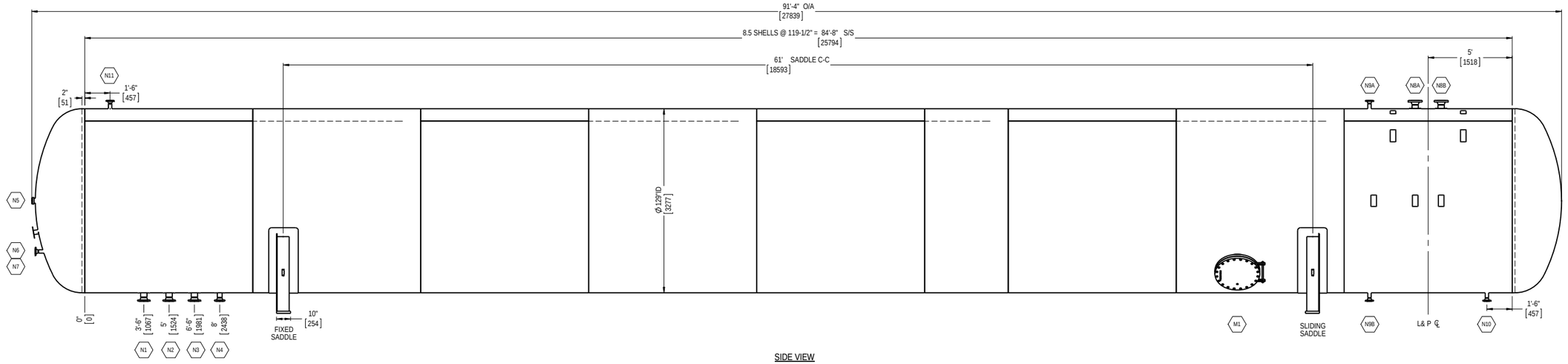
westpower

APEGGA PERMIT TO PRACTICE No: P07612 ABSA AUTH. No: AQP21428

MODELED: MSZ	DATE: 23JUL14	**B7082 GENERAL ARRANGEMENT**	
DRAWN: MSZ	DATE: 23JUL14	CLIENT:	FORTUNE ENERGY
CHECKED: SB	DATE: 23JUL14	CONSUL:	FLO-SKID MANUFACTURING
APPROVED: RZ	DATE: 28JUL14	TITLE:	RECIP. PLUNGER PUMP FRESH WATER PUMP TOP MOUNT ASSEMBLY
REF No: -			
TAG No: P-102		PO No: 2014 PD003	LOCATION: TBA
SCALE: NTS	CALC. WEIGHT: 906.9 lbs.	DWG No: B7082-402	REV: 0



ELEVATION VIEW



SIDE VIEW

NOTES:
1. MAWP INTERNAL: 250 PSI (1724 kPa)
2. MAWP EXTERNAL: 7 PSI (130 kPa). BY CALCULATION, VESSEL IS SUITABLE FOR 7 PSIG EXTERNAL PRESSURE.
3. DESIGN TEMPERATURE INT/EXT: 150°F (66°C)
4. DESIGN MDMT: -50°F @ 250 PSI (-45°C @ 1724 kPa)
5. HEAD TYPE: 2:1 SEMI-ELLIPTICAL WITH 2" STRAIGHT FLANGE.
6. MATERIAL:
   HEAD: SA516-70N IMP -50°F
   SHELL: SA516-70N IMP -50°F
   PIPE: SA333-GR6
   FLANGE/COUPLING: SA350-LF2 CL1
   STUD: SA193-B7M
   NUT: SA194-2HM
   GASKETS: SPIRALWOUND 316L-SS
7. PAINT SPECIFICATIONS:
   SANDBLAST: SSPC-SP6
   PRIMER/FINISH COAT: 2 COATS OF CLOVERDALE DTM POLYURETHANE 835
   COLOUR:
   VESSEL, BRIDLE, BULKHEAD, PUMP PKG: WHITE (1.3 - 3.5 MILS PER COAT)
   PLATFORM: BLACK (1.3 - 3.5 MILS PER COAT)
   LADDER, LADDER CAGE, HANDRAILS: SAFETY YELLOW (1.3 - 3.5 MILS PER COAT)
8. MAX ALLOWABLE FILL:

PRODUCT	SG	HEIGHT	%
NH3	0.616	102.0	85.0
LPG	0.508	102.0	85.0
H2O	1.000	62.0	47.5

9. ESTIMATED SHIPPING WEIGHT: 117300 LB (53207 KG).
10. ALL DIMENSIONS ARE APPROXIMATE AND SUBJECT TO CHANGE.
11. NOZZLE LOCATIONS ARE IN ACCORDANCE TO MAXFIELD STANDARD.
12. ALL FLANGED OPENINGS SHALL BE CLOSED WITH PLYWOOD COVERS FASTENED SECURELY TO THE FLANGE, THREADED OPENINGS SHALL BE PROTECTED WITH STEEL PLUGS.
13. UNLESS OTHERWISE NOTED LADDER AND PLATFORM TO BE INSTALLED AS SHOWN (NS). PAD ORIENTATION MAY BE AS FOLLOWS:
    OPTION 1: NEAR SIDE (NS)
    OPTION 2: FAR SIDE (FS)
14. ADDITION OF CENTRALIZED INTERNAL VACUUM RING REQUIRED FOR FULL VACUUM SERVICE

P/N:76340 - MAXFIELD STANDARD STORAGE VESSEL, 129" ID 60.1M USWG, CA: 0.0625", MDMT:-50°F(-46°C), LPG/NH3 - COST ADDERS

ITEM NO.	LOCATION	ITEM PART NO.	QTY	UOFM	CONNECTION SIZE	TYPE	MANUFACTURER	MODEL	REFERENCE DESCRIPTION
1	LIQUID OUTLET	63209	1	EA	4" CL150/CL300	EXCESS FLOW	MGM	166:M	VALVE EXCESS FLOW 4" SA350-LF2 CL1 MGM166:M
2			1	EA	4" CL150	BALL ACTUATED			
3	LIQUID INLET	70986	1	EA	4" CL150/CL300	CHECK	MGM	167:M	VALVE BACK CHECK 4" SA350-LF2 CL1 MGM167:M
4			1	EA	4" CL150	BALL ACTUATED			
5	VAPOR w/RISER	63176	1	EA	3" CL150/CL300	EXCESS FLOW	MGM	166:K	VALVE EXCESS FLOW 3" SA350-LF2 MGM 166:K
6			1	EA	3" CL150	BALL ACTUATED			
7	PUMP BYPASS RETURN	70986	1	EA	4" CL150/CL300	CHECK	MGM	167:M	VALVE BACK CHECK 4" SA350-LF2 CL1 MGM167:M
8			1	EA	4" CL150	BALL ACTUATED			
9	FLOAT GAUGE	17243002	1	EA	CUSTOM	FLOAT GAUGE	ROCHESTER	C6342-00011-129	GA FLOAT MAST VIS 8 BOLT LPG/NH3 129"
10	PRESSURE INDICATOR	17269460	1	EA	1/4" MNPT	PRES. GAUGE	WGI	WJ7860P	GAUGE PRESSURE 1/4" NPT STL 0-400 PSI BOTTOM MOUNT LIQUID FILLED
11		51116	1	EA	3/4" MNPT	BLOCK & BLEED	REGO	A2805C	VALVE GAUGE 3/4" MNPT
12	TEMPERATURE INDICATOR	16990142	1	EA	1/2" FNPT	TEMP. GAUGE	WGI	WL21302	THERMOMETER 6" STEM STL J701 WITH 2" DIAL -40°F TO 160°F
13	PRESSURE RELIEF	65133	2	EA	4" CL300	RELIEF MANIFOLD	REGO	A8574AG	VALVE RELIEF MAMIFOLD 4" CL300 FLANGE 250 PSI LPG/NH3 INCL REGO A3149G X 4
14		57983	8	EA	-	ACCESSORY	MAXFIELD INC.	DWG 8803-31B	STACK RELIEFVALVE LPG/NH3 FOR 4" MANIFOLD PRV
15	SADDLE	80107	2	EA	-	ACCESSORY	MAXFIELD INC.	DWG 14373B	SLIDE PLATE ASSEMBLY, 129" ID 30-70M USWG LPG STORAGE VESSEL
16	LIFTING LUGS	68807	2	EA	-	ACCESSORY	MAXFIELD INC.	DWG V08131A	LIFTING LUG FOR 129"ID VESSEL ON HEAD
17	VESSEL REQUIRES PWHT FOR NH3 SERVICE								

NOZZLE MARK #	SERVICE	No. REQD	SIZE	RATING	TYPE	EXTERNAL PROJ.	MIN INTERNAL PROJ. (REF.)
N1	LIQUID OUTLET	1	4"	CL150	RFWN	6"	FLUSH
N2	LIQUID INLET	1	4"	CL150	RFWN	6"	0"
N3	PUMP BYPASS RETURN	1	4"	CL150	RFWN	6"	0"
N4	VAPOR w/RISER	1	3"	CL150	RFWN	6"	0"
N5	DRAIN c/w BLIND	1	2"	CL150	RFWN	6"	FLUSH
N6	TEMPERATURE INDICATOR	1	2"	CL150	RFWN	6"	0"
N7	PRESSURE INDICATOR w/ 85% OUTAGE	1	3/4"	MAXFIELD THERMOWELL (DWG.13299A)		6"	0"
N8	FLOAT GAUGE	1	-	CUSTOM	INSERT	1-1/2"	0"
N9	VENT c/w BLIND	1	2"	CL150	RFWN	6"	0"
N10A/B	BRIDLE CONNECTION	2	2"	CL150	RFWN	6"	0"
N11A/B	PRESSURE RELIEF	2	2"	CL150	RFWN	8"	0"
M1	MANWAY c/w HINGE	1	24"	CL150	RFWN	3"	0"

DRAWING LIST

ITEM	PART NO.	DWG. NO	DESCRIPTION
Vessel	76340	13268D	MAXFIELD STANDARD STORAGE VESSEL, 129" ID 60.1M USWG, CA: 0.0625", MDMT: -50°F(-46°C), LPG/NH3
Bridle	72686	11137D	MAXFIELD STANDARD BRIDLE, MDMT: -50°F(-46°C) - ANALOGUE INSTRUMENTATION
	77339	14213D	MAXFIELD STANDARD BRIDLE, MDMT: -50°F(-46°C) - DIGITAL INSTRUMENTATION STYLE A
	75354	13316C	MAXFIELD STANDARD BRIDLE, MDMT: -50°F(-46°C) - DIGITAL INSTRUMENTATION STYLE B
Bulkhead	77408	14214D	MAXFIELD STANDARD BULKHEAD SKID, MDMT: - 20°F(-29°C), 2" CL300 LIQUID & 2"/1-1/4" CL300 VAPOR
	76327	13272D	MAXFIELD STANDARD BULKHEAD SKID, MDMT: - 40°F(-40°C), 2" CL300 LIQUID & 2"/1-1/4" CL300 VAPOR
Ladder & Platform	75353	13315D	MAXFIELD STANDARD LADDER & PLATFORM, 129" ID
Pump Package	77346	14220D	MAXFIELD STANDARD PUMP PACKAGE, 3" w/ 15 HP MOTOR, MDMT: -20°F(-29°C)
	75351	13317D	MAXFIELD STANDARD PUMP PACKAGE, 4" w/ 25 HP MOTOR, MDMT: -20°F(-29°C)
	74625	12313D	MAXFIELD STANDARD PUMP PACKAGE, 4" w/ 25 HP MOTOR, MDMT: -40°F(-40°C)

REV. NO.	DRAWN BY	DATE YY.MM.DD	CHECKED BY	APPROVED BY	DESCRIPTION
0	POB	15.04.06			ISSUED FOR REVIEW

REVISIONS

MaXfield Inc.

MAXFIELD STANDARD STORAGE VESSEL
129" ID 60.1M USWG, CA=0.0625", MDMT= -50°F(-46°C)
LPG/NH3 SALES DRAWING

THIRD ANGLE PROJECTION

TOLERANCES UNLESS NOTED

DECIMAL	FRACTIONS	ANGULAR
X.X ±0.100		±0.5°
X.XX ±0.010		
X.XXX ±0.005		

SCALE: NTS

P/N: 76340

JOB: MAXFIELD STANDARD

DRAWING NO.: SALES 60.1M

SHEET 2 OF 2

REV 0

APPENDIX 4 – List of Project Specifications

Specifications used shall be Cenovus Thermal Recovery specifications index Rev 90, dated Jun 15, 2016 and standard drawings as per TR Standard Drawings Index Rev 43, dated 2016-03-23 for all design work. If new or revised Cenovus TR specifications become available during the course of the project they will be incorporated into the project design wherever possible. New Cenovus TR specifications issued after the release of Purchase Orders or CWPs will not be incorporated except through a trend process.

If no Cenovus specifications are applicable then the appropriate Code or industry standard shall be applied. Any discrepancies found between Cenovus specifications and the appropriate Code or industry standard shall be referred to Cenovus for clarification. Overarching code requirements are the latest edition of the following:

CSA B51-03 - Boiler, Pressure Vessel, and Pressure Piping Code
ASME B31.3 – Process Piping
ASME Sec VIII Div I. – Boiler and Pressure Vessel Code
CSA C22.1 - Canadian Electrical Code
Alberta Building Code

APPENDIX 5 – CWP List

amec foster wheeler
Three Streams Engineering

CONSTRUCTION WORK PACKAGE LIST

cenovus ENERGY

Project Name: **FC W06 Hot Solvent**
Cenovus Project #: **2016-012**
EP Project # **2016-012**

Date: 12-Oct-16
Prepared by: E. Ng
Rev: 0

CWP Number	Description	Area	Date Commitment			Notes
		(Plant/Pipeline/Pad)	Original	Current	Complete	
FC1.P06.0006.1.01	Civil - Earthworks	W06	19-Oct-16	19-Oct-16		
FC1.P06.0006.1.02	Civil - Piling	W06	17-Jan-16	17-Jan-16		
FC1.P06.0006.1.04	Field Structural	W06	10-Feb-16	10-Feb-16		
FC1.P06.0006.2.01	Mechanical - Piping Tie-Ins	W06	TBD	TBD		
FC1.P06.0006.2.02	Mechanical - Field Piping	W06	1-Feb-16	1-Feb-16		
FC1.P06.0006.2.06	Mechanical - Setting of Equipment	W06	15-Feb-16	15-Feb-16		
FC1.P06.0006.3.02	Electrical and Instrumentation Installation in Field	W06	16-Mar-16	16-Mar-16		