2.0 - DESIGN CONDITIONS:

The Flare Stack design is based on the Flare Gas Composition and flow rates stipulated on the Request for quotation.

Case No.	**HP Flare**	**LP Flare**			
Minimum Purge (scfh)	120	120			
Max. Flow rate (kg/hr)	14952	2164			
Max. Smokeless flow (kg/hr)	14952	n.a.			
Min. Flow Rate (kg/hr)	124	n.a.			
Relief Temperature (°C.)	200	120			
Gas Mole. weight (kg/kgmol)	30.7	34			
Waste Gas riser nps (in)	10"	12"			
Total Stack height (m)	40	40			
Diameter of Air duct Tip (in)	27.5"	n.a.			
Radiation at grade (W/m2)	511	180	**Excluding Solar Radiation**		
Distance to maximum radiation (meters)	9.2	5.2			
Total Pressure Drop (kPag)	10.13	0.083			
Blower Horsepower	15	n.a.			
ACFM air @ 100% smokeless	14,000	n.a.			
Smokeless Design Case	Yes	n.a.			
Estimated weight (kg)	14,100	Included with HP flare			
Design Wind load (km/h)	0.44 kPa	0.44 kPa	Full Dynamic	Lac La Biche 1/100	
Wind Exposure	A	A			
Design Structural code	NBC of Canada	NBC of Canada			
Structural Support	Guyed	Per HP Flare			

UTILITIES REQUIRED:

Electrical:

-Control Panel	120 V ac, 1 Phase, 60 Hz.
-Air Assist Blower	575 V ac, 3 Phase, 60 Hz

Fuel Gas:

- LP Flare Header Purge Gas	120 scfh dry Natural gas that will not go to dew point
- HP Flare Header Purge Gas	120 scfh dry Natural gas that will not go to dew point
- Pilot and Ignition System	20 scfh per each regulated down to 15 psig

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3.0 – EQUIPMENT FURNISHED:

- HP Flare Tip - Tornado High Efficiency Air Assist Tip:

- Model: TTI SL 10-27.5-10-1-1.5-316L
- Approx. 10' - 0" overall length
- Main Waste Gas Riser Tip - 10" std SA312 Tp-316L s.s. pipe
- Air Annulus Tip - 27.5" od x ¼" wall SA-240 Tp-316L s.s. rolled plate
- Waste gas Diffusers - ten - ¼" thk 316 stainless steel plate c/w ¼" thk 310 s.s. flame tabs
- 10" Velocity Airrestor (purge reducer) - 304L stainless steel material, minimum purge gas 120 scfh
- Waste gas tip Break Flanges: 10" A105 150 Ansi RFWN flanges, SA193-B7M studs, 2HM nuts, Spiral wound gasket
- Air Annulus tip Break Flanges: 27.5" Fabricated carbon steel flanges, SA193-B7M studs, 2HM nuts, neoprene or composite gasket

- LP Flare Tip - Tornado Utility Flare Tip:

- Model: TTI UT 12-10-316L
- Approx. 10' - 0" overall length
- Main Waste Gas Riser Tip - 12" std SA312 Tp-316L s.s. pipe
- Waste gas tip Break Flanges: 12" A105 150 Ansi RFWN flanges, SA193-B7M studs, 2HM nuts, Spiral wound gasket
- 12" Velocity Airrestor (purge reducer) - 304L stainless steel material, minimum purge gas 120 scfh

- HP Waste Gas Riser and Connections plus Air Duct Riser and Blower connections:

- Internal Waste Gas Riser - 10" std A106B smls pipe c/w 10" A105 150 Ansi RFWN break flanges at the base of the flare tip, 40', and 80' elevations
- Waste Gas Inlet - 10" std A105 150 Ansi RFWN Flange on a 45 degree angle to vertical utilizing a 10" std A234 WPB 45 degree weld ell
- Air Duct riser - 30" std API-5L DSAW pipe c/w Fabricated 44W carbon steel break flanges at the base of the flare tip, 40', and 80' elevations
- Blower Connection - One (1) Fabricated carbon steel c/w mating blower flange

- LP Waste Gas Riser and Connections:

- Waste Gas Riser - 12" std A106B smls pipe c/w 12" A105 150 Ansi RFWN break flanges at the base of the flare tip, 40', and 80' elevations
- Waste Gas Inlet - 12" std A105 150 Ansi RFWN Flange on a 45 degree angle to vertical utilizing a 12" std A234 WPB 45 degree weld ell and 12" support leg to base

- Guy Wire Package - two Elevations of three typical Class A galvanized IWRC cable c/w Flemish Ends at top, cable clamps & heavy thimbles at bottom, Jaw & Jaw turnbuckles and G2130 safety anchor shackles (lug heights of 100 and 55-feet, with a piling radius of 80-feet) (five to one safety factor for cables & hardware)

- HP Flare Blower - One (1) Chicago Design 36A SQAD Size 27 Class 2 Airfoil Centrifugal Blower rated @ 14,000 acfm c/w Amca C Spark Resistance Wheel, Inlet Screen, integral mounting base, Toshiba 15 Horsepower VFD Capable (1000 to 1) TEFC motor Rated Class 1 Div 2, 1800 RPM, 575 Volt, 3 phase, 60 Hertz

- Blower Speed Control - A Kurz Thermal Mass Flow Transmitter (by Vendor) will output a 4-20 mA signal to the Clients PLC, the Clients PLC will output a proportional 4-20 mA signal to a Variable

Frequency Drive (VFD by Client). The VFD will control the speed of the blower. Normally the Blower will be operating at the minimum speed. As the velocity in the waste gas riser increases, the speed of the Blower will increase, which increases the air volume output and Static pressure output of the blower.

- **Lifting Lugs:** - to be designed for single point one piece lift

- **Baseplate -** SA516-Gr70N baseplate with Anchor holes and gusset design (Anchors by others)
  Note: Loads will be provided by Tornado to allow foundation design by others

- **Paint Specifications:**
  - sandblast to SSPC-SP6, and primed with one coat of Devoe Catha-Coat 303H 2-3 mils DFT , and finished with Devoe Devthane 389 2-3 mils DFT - Note: Supplied with Devthane 389 in lieu of Devran 224HS High Build Epoxy because 389 will not fade or chalk while 224HS will.

- **Pilot and Ignition System: (Two mounted on HP Flare & Two mounted on LP Flare)**
  - Four (4) - Tornado Retractable Pilot Model: TSI#6 (Natural Gas) c/w Complete Stainless Steel construction x 10' long, Alumina Ceramic Pilot nozzle mounted in 310 s.s., Tornado Pilot Retracting system with 2" x 1" HSS Pilot Tracking, 1/4" x 3" flat tracking supports (4' o/c), Pilot retracting winch, enclosed pulley housing with stainless steel pulley, stainless steel pilot retracting cable, Type 3 Flexible fuel supply line with fuel line stabilizers 10' o/c, Fisher 67 CFR Regulator & Gauge
  - Four (4) - Tornado Pilot Monitoring & Automatic Relight Systems
    Model - TPMR-A (24V dc or 120V ac) Flame front type ignition that mounts directly on the back of the pilot system, stainless steel construction c/w Nema 4X Junction box at the base of stack, One Nema 4X Control Panel housing all four systems, to be installed in Non-hazardous location, solenoid valve, 1/4" Type "K" 310 s.s. Thermocouple, and 1/4" pipe 310 s.s. Thermowell, NTK Ignition Transformer & Enclosure, #16-4 SOW cable from Ignition Transformer enclosure to Nema 4X junction box at base of flare. Control Panel c/w - Hand/Off/Auto switches with Digital Temperature Controller, LED display indicates alarm setpoint or operating temperature of pilot, individual pilot Dry Alarm contacts on flame failure, Nine Annuciation lights for 1 - Power On, 4 - Flame Fail & 4 - Pilot Proven