

**CONFIDENTIAL**

# **Design Code Field Approval Approval Pending for Dynamic Combustion**

**Owner / Operator: Birchill Canada Limited Partnership**

**Plant: Birchill HZ Brazr**

**Area:**

**Map Location: 13-06-43-13-W5**

**Tag Number: 7-6**

**Appliance Type: Line Heater**

**Appliance Serial No: 08562-002**



**Report / Print Date: 27 Jul 2018**

**ENEFEN Project: NFN1805019**

## **Action Required**

Proof of correction required. This appliance has minor code non-conformances and may be operated for 30 days from inspection date while corrections are made.



**ENEFEN Energy Efficiency Engineering Ltd.**

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NFN Number	NFN1805019	Product Type	Design Code Field Approval		
Design Code	302C-A5-NW002	Project Status	Approval Pending		
Inspected By	Travis Todd	Owner	Birchill Canada Limited Partnership	LOC	13-06-43-13-W5
Inspected	18 Jul 2018	Plant	Birchill HZ Brazr	Tag	7-6
Prepared By	Randy Mui	Area		Serial	08562-002
Reviewed By	Rodger Talstra, P. Eng.	Contact	Garrett Umbach	Phone	250-263-4606

## SCOPE

ENEFEN performs field inspection evaluations based on Canadian code requirements for the safety and suitability of one-of a-kind and limited run commercial and industrial gas-fired appliances and equipment that may be designed for installation at a specific site or assembled on-site. Field approvals include the application of an approval label on the appliance, an approval certificate, and a report in accordance with jurisdictional codes and requirements.

Inspection of an installed appliance includes the safety aspects of all combustion related equipment: fuel supply components; fuel train piping/components; fuel system design; fuel system and burner controls; process controls and permissives dependent on the combustion equipment. Issues found not conforming with the compulsory sections of the applicable codes given below are identified as Non-Conformances. If an issue is found that does not conform with a non-compulsory section, other codes and standards, or good engineering/industry practice, it is identified as an Observation. Such issue, although excluded from the scope of our approval, may create a potential safety hazard or affect the operation/performance of the appliance, and should be corrected. Consulting the AHJ may be necessary to meet other jurisdictional requirements that are not in the scope of the gas-fired appliance field approval. Inspection does not include other design aspects, such as detailed compliance with the project or owner specifications, and the suitability of the equipment for any specific purpose, process conditions, or performance requirements.

## ACCREDITATION

ENEFEN Energy Efficiency Engineering Ltd. is federally accredited by the Standards Council of Canada (SCC) as a Type C Inspection Body (IB) for field approvals of commercial and industrial gas fired appliances and equipment. Quality system requirements such as quality control, personnel, inspection labels, data management and record retention are in accordance with ISO 17020 and other guidelines. For our clients this is a verification of the integrity, reliability and technical competence of our inspection services.

## APPLICABLE CODES

CAN/CSA-B149.1-15 Natural Gas and Propane Installation Code

CAN/CSA-B149.3-15 Code for the Field Approval of Fuel-Related Components on Appliances and Equipment

CSA STD C22.1-15 Canadian Electrical Code, Part I Safety Standard for Electrical Installations

## EVALUATION METHODS

- Check calibration of components
- Check functionality
- Check mechanical assembly methods
- Check performance
- Check permissives
- Check setpoints
- Check tool calibration
- Check wiring methods
- Clean up evaluation site
- Close work permit and advise responsible party of departure
- Confirm advise items
- Confirm non-conformances
- Confirm observations
- Establish communication with office
- Finalize documentation / photos
- Identify applicable standards
- Identify test methods
- Identify test tools
- Incorporate proof of corrections
- Obtain work permit
- Perform initial walkdown
- Perform safety check

Report any unsafe condition to responsible party  
Report imminent danger condition to AHJ  
Return equipment to "as-found" and "safe" state  
Send final evaluation report to client  
Send initial evaluation report to client  
Take inventory of components  
Take overall photos of the evaluated product  
Take photos of components  
Travel to evaluation site

**TOOLS**

ASSET 00005 | Digital Camera | Olympus SP-620UZ | Serial Number Worn off | No calibration required  
ASSET 00027 | 4-head Monitor | Gas Clip MGC-IR | Serial Number M4SF060943 | No calibration required  
ASSET 00032 | Cell Phone | Apple iPhone MKQT2VC/A | Serial Number DNPRJ15VGRYG | No calibration required  
ASSET 00036 | Bluetooth Headset | Jabra Stealth | Serial Number N/A | No calibration required  
ASSET 00039 | Navigation System | Garmin Nuvi 265W | Serial Number 21D507110 | No calibration required  
ASSET 00049 | Hand held engraver | Dremmel 8220 | Serial Number N/A | No calibration required  
ASSET 00401 | Screw driver set | Mastercraft N/A | Serial Number N/A | No calibration required  
ASSET 00424 | Temporary Inspection Plates - Red, yellow, green, green with sticker, grey | Various | Serial Number N/A | No calibration required  
ASSET 00489 | Tape measure short | Various | Serial Number N/A | No calibration required

**OUR COMMITMENT TO QUALITY**

We are committed to and passionate about the SAFETY, COMPLIANCE, HIGH EFFICIENCY and LOW ENVIRONMENTAL IMPACT of industrial and commercial energy systems. Our mission is to provide complete and high quality FIELD INSPECTIONS, ASSESSMENTS, and DESIGNS to bring you peace of mind combined with environmental and financial gains. Accredited by the Standards Council of Canada, and with staff engineers registered in a number of the Canadian provinces and territories, ENEFEN provides qualified and dependable services to a wide range of private industries.

Quality is imperative when working with fired appliances. ENEFEN has a quality management system which explains how we operate and what is expected of staff. It demonstrates to clients the level of quality and professionalism they can expect when they work with ENEFEN.

ENEFEN uses a unique project process and proprietary project tracking software to monitor project status and to store client reports. Flowcharts are available to clients to illustrate all steps that a project must follow, where client input is needed, and expected project deliverables. It is ENEFEN's goal with this process to take a systematic approach to all projects, avoid mistakes, maintain a high level of quality, and to exceed your expectations.

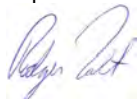
ENEFEN's inspection services are structured to ensure impartiality and to avoid any potential for external influences. Key staff undergo continuous surveillance to ensure their competency in meeting job requirements, however we have a formal resolution process to address any concerns or complaints you might have if we do not meet expectations.

We value your business. If you have any questions about our services or how we operate please contact us.

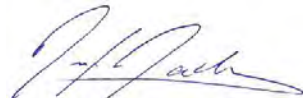
**RESPONSIBLE PERSONNEL**

These ENEFEN personnel are responsible for the results of our evaluation, and the reliability and accuracy of this report.

Report review and quality control is by: Rodger Talstra, P. Eng. Signed on: 27 Jul 2018



Technical supervision of this inspection is by a registered Professional Engineer: Jozef Jachniak, P.Eng. Signed on: 27 Jul 2018



# PROJECT INFORMATION

20180727\_1202

**ENEFEN number** NFN1805019  
**Product** Design Code Field Approval  
**Design code** 302C-A5-NW002  
**Project description**  
**Jurisdiction** Alberta Municipal Affairs

## Appliance Identification

**Process** Gas Well  
**Function** Indirect Fired Gas Heating  
**Type** Line Heater  
**Tag Number** 7-6  
**Name**  
**Map Location** 13-06-43-13-W5  
**Plant** Birchill HZ Brazr  
**Area**  
**Serial Number** 08562-002  
**Site elevation** 3953 ft | 1205 m  
**CRN number**  
**Alberta number**

## Appliance Information

**Manufacturer** NWP Industries Inc.  
**Project number**  
**Built where**  
**Date built** 2013  
**Model number**  
**Installed by** Dynamic Combustion  
**Project number** 2018-032  
**New or upgrade**  
**Date** April 2018

## Client Information

**Company name** Dynamic Combustion  
**Project number** 2018-032  
**Branch/plant** Fort St. John Office  
**Department/area**  
**Contact name** Garrett Umbach  
**Contact email** gumbach@dynamiccombustion.ca  
**Contact phone** 250-263-4606 **Extension**  
**Contact cell** 250-263-7195 **Fax**

## Owner/Operator Information

**Company name** Birchill Canada Limited Partnership  
**Project number**  
**Branch/plant** Birchill HZ Brazr  
**Department/area**  
**Contact name** Kevin Schatz  
**Contact email** kschatz@birchill.com  
**Contact phone** 403-815-3801 **Extension**  
**Contact cell** **Fax**

## Consultant Information

**Company name** N/A  
**Project number**  
**Branch/plant**  
**Department/area**  
**Contact name**  
**Contact email**  
**Contact phone** **Extension**  
**Contact cell** **Fax**

# PROJECT SUMMARY

20180727\_1202

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Prepared By	Randy Mui	Area		Serial	08562-002	
Reviewed By	Rodger Talstra, P. Eng.	Contact	Garrett Umbach	Phone	250-263-4606	

## CODE COMPLIANCE SUMMARY

Fuel train layout compliant?	Yes
Fuel train sizing compliant?	Yes
Fuel train installation compliant?	No
Burner design compliant?	Yes
Burner installation compliant?	Yes
BMS FSG design compliant?	Yes
BMS FSG installation compliant?	Yes
Permissives design compliant?	Yes
Permissives installation compliant?	Yes
Controls design compliant?	Yes
Controls installation compliant?	Yes
Appliance design compliant?	Yes
Appliance installation compliant?	Yes
Panel electrical inspection?	NA
Electrical seals installed?	Yes
Electrical installation compliant?	Yes
Flammable gas venting compliant?	Yes
Gas piping installation compliant?	Yes
Stack installation compliant?	Yes
All components certified or approved?	No
All technical documentation complete?	Yes
System compliant with current gas & electrical codes	No

## NON-CONFORMANCES Correction is required for compliance

Main Safety Shut-off Valve Make (single valve)	ACL ASSV ~ CSA 6.5-C/I ~ Class I-Div.1 ~ 60-120psi actuator ~ 300psi max inlet ~ -40°C ~ Proof of Closure ~ Discontinued   Certification is void because the SSV is CSA certified as a complete assembly (ie. valve, actuator, and solenoid) and the original solenoid valve has been replaced. Replace solenoid valve with the original part to maintain certification. The assembly appears to be discontinued and may be without manufacturer product support. Replacing the assembly with a currently supported model could reduce downtime if there is a failure.	Non-Conformance
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## OBSERVATIONS Response is not mandatory but may be provided to record in the report

Appliance Ambient Temperature Rating	-40°C to 40°C   -40°F to 104°F   Fuel gas pressure regulators are accepted to -40°C based on a letter from the manufacturer indicating there have been no reported issues from testing and/or industry field experience.	Observation
Fuel Supply Line Pressure Control Device Properly Vented	No. Owner is responsible for safe venting. Venting requirements from CSA B149.1 should be used for all venting even though it may not be within the scope of this project. Vent lines should be the same size or larger than the vent port of the component. The vent header should have an area twice the size of the combined inlet vents to meet B149.1 requirements. Alternatively, run separate vent lines for each component. Screens should be installed on all vent terminations 1/2in and larger.	Observation

## PROJECT SUMMARY

NFN1805019

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Fuel Supply Overpressure Protection Device  
Properly Vented

No. Owner is responsible for safe venting. Venting requirements from CSA B149.1 should be used for all venting even though it may not be within the scope of this project. Vent terminations should be installed away from personnel and building openings with screens and protected from water entry. Plastic cap installed on the end could be launched off.

Observation



APPLIANCE DATA						20180727_1202
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<b>128 LOCATION INFORMATION</b>						
Burner Location	Outdoor				Noted	
Fuel Train Location	Inside Enclosure mounted on uninsulated section of heater shell.				Noted	
Control Panel Location	Outdoor				Noted	
Building or Enclosure Features	Building/Enclosure heated by uninsulated vessel.				Noted	
Appliance Ambient Temperature Rating	-40°C to 40°C   -40°F to 104°F   Fuel gas pressure regulators are accepted to -40°C based on a letter from the manufacturer indicating there have been no reported issues from testing and/or industry field experience.				Observation	
<b>161 PROCESS INFORMATION</b>						
Process	Gas Well				Noted	
Process Cycle percent	100 %				Noted	
Annual Operation Percent	100 %				Noted	
Appliance Function	Indirect Fired Gas Heating				Noted	
Appliance Type	Line Heater				Noted	
Process Fluid	Natural Gas				Noted	
Bath Fluid	Glycol				Noted	
<b>162 APPLIANCE INFORMATION</b>						
Process Duty	1.94 GJ/h   1.84 MM Btuh				Noted	
Appliance Efficiency HHV	76.9 %				Noted	
Fuel Total Input (HHV)	2.52 GJ/h   2.39 MM Btuh				Noted	
Flame Safeguard System Logic Type	Single Burner FSG				Noted	
Number of Burners	2				Noted	
Burner Fuel Input (HHV)	1.261 GJ/h   1.195 MM Btuh				Noted	
Main Burner Max. Design Pressure	83 kPag   12.0 psig				Noted	
Main Burner Min. Design Pressure	6.9 kPag   1.0 psig				Noted	
Burner Turndown	3.46 : 1				Noted	
Pilot Configuration	Separate premix pilot				Noted	
Pilot Type	Intermittent / Continuous				Noted	
Pilot Fuel Input (HHV)	0.03 GJ/h   0.03 MM Btuh				Noted	
Pilot Pressure	34 kPag   5.0 psig				Noted	
Ignition Type	Electric ignition from BMS				Noted	
Instrument Control Method	Electric / Pneumatic				Noted	
Is it a Pressure Vessel	No. Process Coils are pressurized but heater shell is not.				Noted	
CRN Number	Process Coils ~ P9417.213				Noted	
Alberta A Number	Process Coils ~ 605766				Noted	

# APPLIANCE DATA

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## 163 PRIMARY FUEL SUPPLY

Primary Fuel Type	Produced Gas	Noted
Is Primary Fuel Sweet	Sweet < 5ppm H2S	Noted
Is Primary Fuel Dry	Wet	Noted
Primary Fuel Source	Well	Noted
Primary Fuel Composition Known	Unknown. Estimated to have similar heating value to standard sales gas composition.	Noted
Primary Fuel Inlet Pressure	662 kPag   96.0 psig	Noted
Primary Fuel Odorization	Not Odorized	Noted
Primary Fuel Scrubber	Mechanical Scrubber	Noted
Primary Fuel Filter	Y-Strainer installed upstream of the main fuel train PRV.	Noted
Primary Fuel Overpressure Protection	Upstream PSV protects the main PRV.	Noted
Primary Fuel Overpressure Protection Device (OPPD)	Taylor safety relief valve	Noted
Primary Fuel OPPD Setpoint	1034 kPag   150.0 psig	Noted
Primary Fuel Preheat	Preheat through bath fluid with insulation	Noted
Line Pressure Control Device	Fisher 627 ~ 1/4in. orifice ~ 70-150psi spring ~ 1100psi max inlet ~ -29°C rating approved for -40°C operation	Noted
Line Pressure Control Device Setpoint	662 kPag   96.0 psig	Noted

## 164 SECONDARY FUEL SUPPLY

Secondary Fuel Type	Not approved for secondary fuel use	Noted
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## 165 PILOT FUEL SUPPLY

Pilot Fuel Type	Produced Gas	Noted
Is Pilot Fuel Sweet	Sweet < 5ppm H2S	Noted
Is Pilot Fuel Dry	Wet	Noted
Pilot Fuel Source	Same as main fuel train	Noted
Pilot Fuel Composition Known	Unknown. Estimated to have similar heating value to standard sales gas composition.	Noted
Pilot Fuel Inlet Pressure	662 kPag   96.0 psig	Noted
Pilot Fuel Odorization	Not Odorized	Noted
Pilot Fuel Scrubber	Same as main fuel train	Noted
Pilot Fuel Filter	Y-Strainer in the main fuel train upstream of the pilot take-off.	Noted
Pilot Fuel Overpressure Protection Device (OPPD)	Upstream PSV protects the pilot PRV.	Noted
Pilot Fuel OPPD Setpoint	1034 kPag   150.0 psig	Noted
Pilot Fuel Preheat	Preheat through bath fluid with insulation	Noted

# APPLIANCE DATA

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## 170 INSTRUMENT GAS INFORMATION

Instrument Gas Type	Produced Gas	Noted
Is Instrument Gas Sweet	Sweet	Noted
Is Instrument Gas Dry	Wet	Noted
Instrument Gas Source	Upstream of main fuel train regulator.	Noted
Instrument Gas Inlet Pressure	662 kPag   96.0 psig	Noted
Instrument Gas Filter	Integral to instrument pressure regulator.	Noted
Instrument Gas Overpressure Protection Device (OPPD)	PSV integral to instrument gas PRV	Noted
Instrument Gas PRV for FCV	Fisher 67CFR ~ 0-35psi spring ~ 250psi max inlet ~ -29°C	Noted
Instrument Gas PRV for FCV Setpoint	172 kPag   25.0 psig	Noted
Instrument Gas for FCV Minimum Pressure	103 kPag   15 psig	Noted
Instrument Gas for FCV Maximum Pressure	207 kPag   30 psig	Noted
Instrument Gas PRV for SSV	Fisher 67CFR ~ 0-125psi spring ~ 250psi max inlet ~ -29°C rating approved for -40°C operation	Noted
Instrument Gas PRV for SSV Setpoint	552 kPag   80.0 psig	Noted
Instrument Gas for SSV Minimum Pressure	414 kPag   60 psig	Noted
Instrument Gas for SSV Maximum Pressure	827 kPag   120 psig	Noted

## 172 ELECTRICAL INFORMATION

Electrical Area Classification at Burner	Non-Hazardous	Noted
Electrical Area Classification at Fuel Train	Zone 1	Noted
Electrical Area Classification at Control Panel	Zone 2	Noted
Available Primary Control Power	24 VDC	Noted
Available Primary Control Power Source	TEG	Noted
Primary Control Power Amps	4.0 amps	Noted
Hazardous Area Electric Seals Installed	At the building/enclosure wall (ie. Zone 1/2 boundary), At the windbox (ie. Zone 2 / Non-hazardous boundary)	Noted
Are All Required Hazardous Area Electric Seals Installed	All Hazardous Area Electric Seals are properly installed.	Noted
Wiring Method Inside the Building \ Enclosure	Explosion-proof Junction Boxes, Rigid Conduit	Noted

## 181 APPLIANCE SHELL

Shell Type	Horizontal with expansion tank above	Noted
Shell OD	1829 mm   72.00 in	Noted
Shell Length / Height	7 m   24.00 ft	Noted
Shell Insulation Scope	Fully insulated without end plates	Noted
Shell Insulation Thickness	51 mm   2.00 in	Noted

# APPLIANCE DATA

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## 182 HEATER FIRETUBE

Number of Firetubes	1	Noted
Firetube Type	Horizontal U-tube with constant diameter.	Noted
Number of Passes	2	Noted
Firetube OD	610 mm   24.00 in	Noted
Immersed Length of Assembly	7 m   22.00 ft	Noted
Firetube Surface Area	30 m <sup>2</sup>   318 ft <sup>2</sup>	Noted
Firetube Nominal Process Rating	3.35 GJ/h   3.18 MM Btuh	Noted
Firetube Design Process Rating	1.94 GJ/h   1.84 MM Btuh	Noted
Firetube Design Heat Flux	65.69 MJh/m <sup>2</sup>   5785 Btuh/ft <sup>2</sup>	Noted
Firetube Achievable Efficiency (HHV)	77.4 %	Noted
Firetube Appliance Efficiency HHV	76.9 %	Noted
Firetube Condition	Firetube acceptable	Noted

## 183 APPLIANCE STACK

Stack Type	Same diameter as firetube	Noted
Stack OD	610 mm   24.00 in	Noted
Stack Height	5 m   18.00 ft	Noted
Stack Wind Shroud	None	Noted
Stack Cap	None	Noted
Stack Damper	None	Noted
Stack Insulation Scope	None	Noted
Drain Port Plug	Stack drain port not installed.	Noted
Stack Cleanout Port	Reduced-size horizontal port	Noted
Stack Sampling Port	Drilled hole with plug.	Noted

## 184 APPLIANCE WINDBOX

Windbox Manufacturer	Wenco Energy Corp.	Noted
Windbox Serial Number	1112-621	Noted
Windbox Material	Aluminum Welded	Noted
Windbox Type	Round hinged door w/bolts	Noted
Wind Box Gasket	All required gaskets are installed and in good condition.	Noted
Windbox ID	1067 mm   42.00 in	Noted
Windbox Depth	610 mm   24.00 in	Noted
Windbox Volume	0.545 m <sup>3</sup>   19.242 ft <sup>3</sup>	Noted
Windbox Size Factor	0.216 m <sup>3</sup> /GJh   8.05 ft <sup>3</sup> /MM Btuh	Noted
Windbox Gas CL to Liquid	102 cm   40 in	Noted
Windbox Gas CL to Burner Tip	122 cm   48 in	Noted
Burner tip insertion depth	20 cm   8 in	Noted
Burner Access	Hinged front door with bolts	Noted
Windbox Air Adjustment	None	Noted
Windbox Viewport	1 inch glass peep sight	Noted
Is the Ignition Transformer Module mounted correctly	Yes.	Noted

# APPLIANCE DATA

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## 185 APPLIANCE FLAME CELL

Number of Flame Cells Per Windbox	1	Noted
Flame Cell Material	Aluminum	Noted
Flame Cell Location	Front	Noted
Flame Cell OD	1067 mm   42.00 in	Noted
Flame Cell ID	203 mm   8.00 in	Noted
Total Flame Cell Surface Area	0.86 m <sup>2</sup>   9.27 ft <sup>2</sup>	Noted
Flame Cell Size Factor	0.34 m <sup>2</sup> /GJh   3.90 ft <sup>2</sup> /MM Btuh	Noted

## 186 MAIN BURNER

Number of Burners per Appliance	2	Noted
Are All Main Burners Identical	Yes.	Noted
Burner Make	ACL	Noted
Burner Size	2 in   51 mm	Noted
Burner Mixer	ACL M200	Noted
Main Burner Orifice Size	#2   5.61 mm   0.22 in	Noted
Burner Sleeve	ACL venturi burner barrel	Noted
Burner Nozzle	ACL Optimizer Nozzle (with air spinner)	Noted
Burner Fuel Input Capacity (HHV)	2.638 GJ/h   2.500 MM Btuh	Noted
Burner Capacity Utilization	48 %	Noted

## 187 PILOT BURNER

Pilot Make	ACL	Noted
Pilot Size	1/2 in   12.7mm   0.50in	Noted
Pilot Mixer	ACL M50	Noted
Pilot Burner Orifice Size	#65   0.8890mm   0.0350in	Noted
Pilot Sleeve	Straight Pipe Nipple	Noted
Pilot Nozzle	ACL M50 pilot assembly	Noted
Pilot Location	Between Burners at 3:00 and 9:00	Noted

## 188 COMBUSTION AIR

Combustion Air Source	Natural Draft	Noted
Combustion Air Preheat	No Preheat	Noted
Primary Air Control Type	At burner mixer with air shutter	Noted
Secondary Air Control Type	ACL spinner with adjustable louvers	Noted

# APPLIANCE DATA

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## 189 APPLIANCE PERMISSIVES

Liquid Low Level LSL Location	In external bridle.	Noted
Isolation Valves Installed on LSL	1/4 turn isolation valve locked and tagged.	Noted
Liquid Low Level LSL Type	Single point electric float	Noted
Liquid Low Level LSL Make	SOR 1510 ending with CS float switch ~ Class I-Div.1 ~ -40°C to 125°C	Noted
Level Switch Orientation	Manual override button points down (enabled).	Noted
Process TSHH Location	In the main tank	Noted
Process TSHH Type	Temperature switch to BMS.	Noted
Process TSHH Make	CCS 6900TE-series ~ Class I-Div.1 ~ -40°C	Noted
Process TSHH Setpoint	90 °C   194 °F	Noted
Process TSHH Separate From Process Controller	Yes.	Noted
Fuel Gas PSL Location	Upstream of SSVs	Noted
Fuel Gas PSL Type	Electric pressure switch	Noted
Fuel Gas PSL Make	CCS 6900GZE12 ~ 1-18psig range (2psi deadband) ~ Class I-Div.1 ~ -40°C	Noted
Fuel Gas PSL Setpoint	41.4 kPag   6.0 psig	Noted
Fuel Gas PSHH Location	Downstream of SSVs and upstream of FCV	Noted
Fuel Gas PSHH Type	Electric pressure switch	Noted
Fuel Gas PSHH Make	CCS 6900GZE12 ~ 3-20psig range ~ Class I-Div.1 ~ -40°C	Noted
Fuel Gas PSHH Setpoint	120.7 kPag   17.5 psig	Accepted
Isolation Valves Installed on High Pressure Shutdown Device	No isolation valve installed on permissive.	Noted
Isolation Valves Installed on Low Pressure Shutdown Device	No isolation valve installed on permissive.	Noted
Plant ESD Connected	Yes.	Noted

## 190 COMBUSTION SAFETY CONTROL

Combustion Safety Control Type	Prepackaged / CSA Certified.	Noted
Combustion Safety Control Make	ACL 5500 ~ CSA22.2 No.199-M89 ~ Class I-Div.2 ~ -40°C	Noted
Flame Sensor	Flame Rod	Noted
Remote BMS Connections	Interlocks to plant control system, ESD, Status	Noted
BMS Serial Number	55-12/24-082307-43	Noted
BMS Temperature Input	External temp. controller with one switch input (TSHH).	Noted
TSHH Interlocked with BMS	Yes.	Noted
BMS has a pre-purge function	Yes.	Noted
Ignition Transformer Make	ACL Ignition Module ~ CSA certified ~ Class I-Div.2 ~ -40°C	Noted

# APPLIANCE DATA

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## 192 APPLIANCE CONTROL SYSTEM

Process Control Element Location	TE in the main tank	Noted
Process Controller Type	Modulating - Pneumatic	Noted
Controller Temperature Setpoint	50 °C   122 °F	Noted
Bath Fluid Temperature	30.0 °C   86.0 °F	Noted
Process Controller Make	Kimray HT12 ~ 5-30psi pneumatic ~ -34°C to 399°C	Noted
TSH Type	Pneumatic thermostat.	Noted
Fuel FCV Make	Fisher 119 ~ 5-35psig actuation ~ 35-150psig instrument gas supply ~ 150psig max ~ -29°C ~ Fuel gas pressure may not be sufficient for actuation.	Noted
FCV 3-way Solenoid	Not installed.	Noted
FCV Speed Control Valve	SMC NAS2000-N02	Noted
Fuel Low Fire Start	Pneumatic SSV with speed control valve.	Noted
Fuel Minimum Fire Stop	Not installed.	Noted
Low Fire Start For System Over 1 MM Btuh	Yes.	Noted
Fuel Measurement Method	None	Noted

## 193 MAIN FUEL TRAIN

Main Fuel Manual Shut-off Valve	MAS G2E-series ball valve (1/4-2in. size)(SS) ~ CGA 3.16 ~ 125psig max ~ -40°C	Noted
Main Fuel Train Filter	Y-strainer installed upstream of main fuel train PRV and pilot take-off.	Noted
Is Appliance Manual Fuel Shut-off Easily Accessible	Yes.	Noted
Main Fuel Pressure Control Device Configuration	Single Pressure Regulator.	Noted
Appliance Main Fuel Pressure Control Device	Fisher 627R ~ with internal relief ~ 3/8in. orifice ~ 5-20psi spring ~ 300psi max inlet ~ -29°C rating approved for -40°C operation	Noted
Appliance Main Fuel Pressure Control Device Setpoint	82.7 kPag   12.0 psig	Noted
Appliance Fuel Overpressure Protection	PSV integral to main PRV.	Noted
Appliance Fuel OPPD Setpoint	234 kPag   34.0 psig	Noted
Main Safety Shut-off Valve Configuration	Single SSV with proof of closure switch	Noted
Main Safety Shut-off Valve Type	Electric Solenoid valve(s)	Noted
Main Safety Shut-off Valve Make (single valve)	ACL ASSV ~ CSA 6.5-C/I ~ Class I-Div.1 ~ 60-120psi actuator ~ 300psi max inlet ~ -40°C ~ Proof of Closure ~ Discontinued   Certification is void because the SSV is CSA certified as a complete assembly (ie. valve, actuator, and solenoid) and the original solenoid valve has been replaced. Replace solenoid valve with the original part to maintain certification. The assembly appears to be discontinued and may be without manufacturer product support. Replacing the assembly with a currently supported model could reduce downtime if there is a failure.	Non-conformance
Main SSV(s) Slow Opening	Yes. Using speed control valve. SMC NAS4000-N02.	Noted
Main Burner Test Firing Valve	MAS G2E-series ball valve (1/4-2in. size)(SS) ~ CGA 3.16 ~ 125psig max ~ -40°C	Noted
Are pressure indicator locations adequate	Yes.	Noted
Are pressure indicator ranges adequate	Yes.	Noted
Are pressure test points adequate	Yes.	Noted
Main Fuel Train Piping	Carbon steel piping	Noted
Sufficient unions / flanges for maintenance	Yes.	Noted
Is Piping Adequately supported	Yes.	Noted

**194**
**PILOT FUEL TRAIN**

Pilot Fuel Take-off	From upstream of main regulator.	Noted
Pilot Fuel Manual Shut-Off Valve	MAS G2E-series ball valve - 1/4-2in. (SS) ~ CGA 3.16 ~ 125psig max ~ -40°C	Noted
Pilot Pressure Control Device Configuration	Single Pressure Regulator.	Noted
Pilot Pressure Control Device	Fisher 67CFR ~ 0-35psi spring ~ 250psi max inlet ~ -29°C	Noted
Pilot Pressure Control Device Setpoint	34.5 kPag   5.0 psig	Noted
Pilot Overpressure Protection	PSV integral to pilot PRV.	Noted
Pilot OPPD Setpoint	55 kPag   8.0 psig	Noted
Pilot SSV Configuration	Single SSV	Noted
Pilot SSV Type	Electric Solenoid valve(s)	Noted
Pilot SSV Make (single valve)	ASCO HV426716002 24VDC ~ CSA 6.5-C/I ~ Class I-Div.1 ~ 50psig MOPD ~ 100psig SWP ~ -40°C	Noted
Pilot Test Firing Valve	MAS G2E-series ball valve (1/4-2in. size)(SS) ~ CGA 3.16 ~ 125psig max ~ -40°C	Noted
Are pressure indicator locations adequate	Yes.	Noted
Are pressure indicator ranges adequate	Yes.	Noted
Are pressure test points adequate	Yes.	Noted
Pilot Fuel Train Piping	Carbon steel piping and stainless steel tubing	Noted
Sufficient unions / flanges for maintenance	Yes.	Noted
Is Piping Adequately supported	Yes.	Noted

**224**
**INSTALLATION - FLAMMABLE GAS VENTING**

Vent Piping Materials	Carbon steel piping and stainless steel tubing	Noted
Is Sour Gas Vented	No	Noted
Are Vent Line Connection Sizes to Devices Maintained	Yes	Noted
Are Combined Vents Increased in Size	Combined vents are properly installed.	Noted
Are There Any Vent Lines Under The Building / Enclosure	No	Noted
Are Vent Terminations Away From Building Openings and Air Intakes	Yes	Noted
Are Any Vent Line Terminations Close to Operating Personnel	No	Noted
Are Vent Terminations Equipped With Screens	All required screens are properly installed.	Noted
Are Vent Line Terminations Protected From Water Entry	Yes	Noted
Is Piping Adequately Supported	Yes.	Noted
Fuel Supply Line Pressure Control Device Properly Vented	No. Owner is responsible for safe venting. Venting requirements from CSA B149.1 should be used for all venting even though it may not be within the scope of this project. Vent lines should be the same size or larger than the vent port of the component. The vent header should have an area twice the size of the combined inlet vents to meet B149.1 requirements. Alternatively, run separate vent lines for each component. Screens should be installed on all vent terminations 1/2in and larger.	Observation
Fuel Supply Overpressure Protection Device Properly Vented	No. Owner is responsible for safe venting. Venting requirements from CSA B149.1 should be used for all venting even though it may not be within the scope of this project. Vent terminations should be installed away from personnel and building openings with screens and protected from water entry. Plastic cap installed on the end could be launched off.	Observation



# APPLIANCE DATA

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## STACK READINGS

Source of Combustion Readings	Installer	Noted
Date of Combustion Readings	02 Apr 2018	Noted
Main Burner Pressure	83 kPag   12.0 psig	Noted
Process Temperature	45 °C   113 °F	Noted
Ambient Temperature	7 °C   44 °F	Noted
Stack Temperature	343 °C   649 °F	Noted
Stack Oxygen	5.8 %	Noted
Stack CO	0 ppm	Noted
Stack NOx	47 ppm	Noted
Excess Air	34.1 %	Noted
Draft Pressure	-0.096 in.WC	Noted
Efficiency (HHV)	76.9 %	Noted
Stack Temperature Notes	Somewhat high. Stack temp between 250-350°F/140-195°C above bath fluid temp. May result in lower efficiency	Noted
Excess Air Notes	O2 is in the high range of 5.5-8.0% and may result in lower efficiency.	Noted
Carbon Monoxide Notes	Less than 50 ppm is ideal.	Noted
NOx Notes	Acceptable concentration, in the range of 30-50 ppm (3% O2 basis).	Noted
Efficiency Notes	Efficiency is acceptable in the range of 72 to 78%.	Noted

END OF REPORT SECTION

# FIELD INSPECTION PHOTOS 20180727\_1202

## Appliance

Tag Number 7-6  
LOC 13-06-43-13-W5  
Serial No. 08562-002

## Owner

Company Birchill Canada Limited Partnership  
Plant Birchill HZ Brazr  
Area



Overall view of appliance



Overall left view of appliance



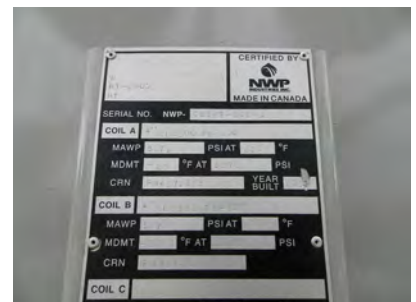
Overall right view of appliance



Lease sign



Appliance rating plate



Appliance rating plate



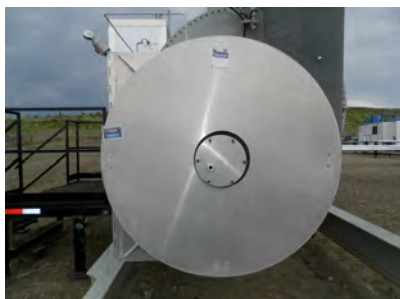
Appliance rating plate



Windbox name plate



Windbox - left view



Windbox - overall view



Windbox - right view



Burner Management System - BMS



BMS Serial Number



BMS wiring



Upstream overpressure protection - PSV



Overall view of fuel train



Manual shut-off valve and Y-strainer



Main fuel train pressure regulator - PRV



Main PRV pressure calibration tag



PSLL - Low pressure shutdown



PSLL calibration tag



Main fuel train safety shut-off valve - SSV  
(NON-CONFORMANCE)



SSV 3-way solenoid valve  
(NON-CONFORMANCE)



Instrument gas regulator (PRV) to SSV





Speed control valve for main SSV



FCV - Main flow control valve



Instrument gas regulator (PRV) to FCV



TC - pneumatic process temperature control



TC - pneumatic process temperature control calibration tag



Bath fluid temperature gauge



Speed control valve for main FCV



PSHH - High pressure shutdown



PSHH calibration tag



Main burner test firing valve



Pilot manual fuel shut-off valve



Pilot pressure regulator - PRV



Pilot PRV pressure calibration tag



Pilot safety shut-off valve - SSV



Pilot burner test firing valve



Main burners and pilot close-up



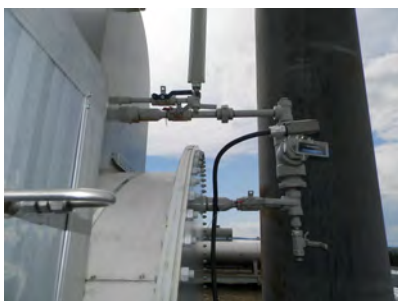
Hazardous area electric seal at the windbox



Wiring method



Hazardous area conduit seal at the wall



LSLL - Low bath fluid shutdown



Isolation valve on LSLL



TSHH - High temperature shutdown



Stack cleanout / access port



Stack sampling port





Stack



Vent lines



Vent lines



Vent lines



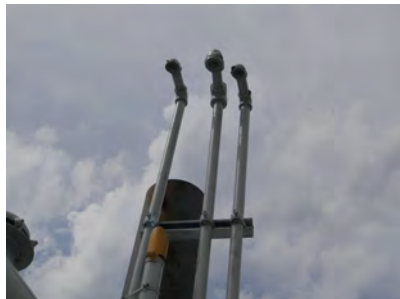
Vent lines



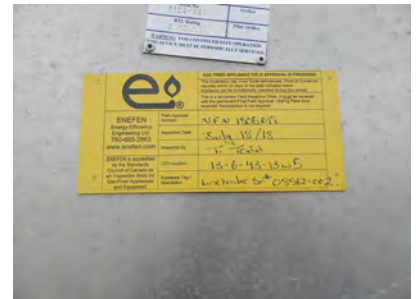
Vent line terminations



Vent line terminations



Vent line terminations



ENEFEN temporary Field Inspection Plate

# FUEL COMPOSITION REPORT 20180727\_1202

NFN Number	NFN1805019	Product Type	Design Code Field Approval		
Design Code	302C-A5-NW002	Project Status	Approval Pending		
Inspected By	Travis Todd	Owner	Birchill Canada Limited Partnership	LOC	13-06-43-13-W5
Inspected	18 Jul 2018	Plant	Birchill HZ Brazr	Tag	7-6
Prepared By	Randy Mui	Area		Serial	08562-002
Reviewed By	Rodger Talstra, P. Eng.	Contact	Garrett Umbach	Phone	250-263-4606

Fuel Usage	Pilot Fuel	Main Fuel
Fuel Type	Produced Gas	Produced Gas
Fuel Info Source	Estimated	Estimated
Reported Date		
Fuel Temperature °C/°F	15.6 / 60.1	15.6 / 60.1
C1 Methane	0.9300	0.9300
C2 Ethane	0.0600	0.0600
C3 Propane	0.0020	0.0020
C4 Butane	0.0000	0.0000
C5 Pentane	0.0000	0.0000
C6 Hexane	0.0000	0.0000
C7 heptane	0.0000	0.0000
C8 as Octane	0.0000	0.0000
C <sub>6</sub> H <sub>6</sub> Benzene	0.0000	0.0000
CO Carbon Monoxide	0.0000	0.0000
H <sub>2</sub> Hydrogen	0.0000	0.0000
S Sulfur Vapor	0.0000	0.0000
COS Carbonyl Sulfate	0.0000	0.0000
CS <sub>2</sub> Carbon Disulfide	0.0000	0.0000
C <sub>2</sub> H <sub>6</sub> S <sub>2</sub> Dimethyl Disulfide	0.0000	0.0000
CH <sub>3</sub> SH Mercaptan	0.0000	0.0000
O <sub>2</sub> Oxygen	0.0000	0.0000
N <sub>2</sub> Nitrogen & Inert	0.0050	0.0050
CO <sub>2</sub> Carbon Dioxide	0.0030	0.0030
SO <sub>2</sub> Sulfur Dioxide	0.0000	0.0000
Molecular Weight MW	17.0834	17.0834
Fuel Density lb/ft <sup>3</sup>   kg/m <sup>3</sup>	0.045   0.7245	0.045   0.7245
Specific Volume ft <sup>3</sup> /lb   m <sup>3</sup> /kg	22.109   1.3803	22.109   1.3803
Specific Gravity	0.5910	0.5910
Specific Heat Btu/lb°F   kJ/kg/°C	0.5081   2.1274	0.5081   2.1274
Sulfur Content By Weight	0.0000	0.0000
HHV English Btu/scf   Btu/lb	<b>1050   23300</b>	<b>1050   23300</b>
HHV Metric MJ/m <sup>3</sup>   MJ/kg	<b>39.2   54.2</b>	<b>39.2   54.2</b>
LHV English Btu/scf   Btu/lb	950   21000	950   21000
LHV Metric MJ/m <sup>3</sup>   MJ/kg	35.4   48.9	35.4   48.9
Combustion O <sub>2</sub> ft <sup>3</sup> /ft <sup>3</sup>	2.0800	2.0800
H <sub>2</sub> O in POC ft <sup>3</sup> /ft <sup>3</sup>	2.0480	2.0480
CO <sub>2</sub> in POC ft <sup>3</sup> /ft <sup>3</sup>	1.0590	1.0590
N <sub>2</sub> in POC ft <sup>3</sup> /ft <sup>3</sup>	7.8772	7.8772
SO <sub>2</sub> in POC ft <sup>3</sup> /ft <sup>3</sup>	0.0000	0.0000

# FINAL SETPOINTS

20180727\_1202

NFN Number	NFN1805019	Product Type	Design Code Field Approval		
Design Code	302C-A5-NW002	Project Status	Approval Pending		
Inspected By	Travis Todd	Owner	Birchill Canada Limited Partnership	LOC	13-06-43-13-W5
Inspected	18 Jul 2018	Plant	Birchill HZ Brazr	Tag	7-6
Prepared By	Randy Mui	Area		Serial	08562-002
Reviewed By	Rodger Talstra, P. Eng.	Contact	Garrett Umbach	Phone	250-263-4606

<b>Main Burner Maximum Pressure</b>	83 kPag   12.0 psig
<b>Main Burner Minimum Pressure</b>	6.9 kPag   1.0 psig
<b>Pilot Pressure</b>	34 kPag   5.0 psig
<b>Primary Fuel Inlet Pressure</b>	662 kPag   96.0 psig
<b>Primary Fuel OPPD</b>	1034 kPag   150.0 psig
<b>Line Pressure Control Device</b>	662 kPag   96.0 psig
<b>Pilot Fuel Inlet Pressure</b>	662 kPag   96.0 psig
<b>Pilot Fuel OPPD</b>	1034 kPag   150.0 psig
<b>Instrument Gas Inlet Pressure</b>	662 kPag   96.0 psig
<b>Instrument Gas PRV for FCV</b>	172 kPag   25.0 psig
<b>Instrument Gas for FCV Minimum Pressure</b>	103 kPag   15 psig
<b>Instrument Gas for FCV Maximum Pressure</b>	207 kPag   30 psig
<b>Instrument Gas PRV for SSV</b>	552 kPag   80.0 psig
<b>Instrument Gas for SSV Minimum Pressure</b>	414 kPag   60 psig
<b>Instrument Gas for SSV Maximum Pressure</b>	827 kPag   120 psig
<b>Process TSHH</b>	90 °C   194 °F
<b>Fuel Gas PSL</b>	41.4 kPag   6.0 psig
<b>Fuel Gas PSHH</b>	120.7 kPag   17.5 psig
<b>Controller Temperature</b>	50 °C   122 °F
<b>Appliance Main Fuel Pressure Control Device</b>	82.7 kPag   12.0 psig
<b>Appliance Fuel OPPD</b>	234 kPag   34.0 psig
<b>Pilot Pressure Control Device</b>	34.5 kPag   5.0 psig
<b>Pilot OPPD</b>	55 kPag   8.0 psig



# BILL OF MATERIALS

20180727\_1202

BOM: BM1805019 Design Code: 302C-A5-NW002

NFN Number	NFN1805019	Product Type	Design Code Field Approval		
Inspected By	Travis Todd	Project Status	Approval Pending		
Inspected	18 Jul 2018	Owner	Birchill Canada Limited Partnership	LOC	13-06-43-13-W5
Prepared By	Randy Mui	Plant	Birchill HZ Brazr	Tag	7-6
Reviewed By	Rodger Talstra, P. Eng.	Area		Serial	08562-002
		Contact	Garrett Umbach	Phone	250-263-4606

Tag Number	Component Function	Connection	Description	Compliance Statement	Comments
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## BMS Burner Management System

BMS101	Burner Management System	N/A	ACL 5500 Combustion Safety Controller, 12/24 VDC power input	CSA Certified C22.2-199, Class I Div 2 Certified CSA 213-92	Controls simultaneously two burners. Either burner trip will trip both
IGN306 BE306	Pilot Burner Ignitor / Flame Rod	N/A	ACL flame rod / ignitor	Accepted based on past performance	Part of the BMS supply
IGX306	Pilot Burner Ignition Transformer	N/A	ACL Ignition Transformer	Accepted based on past performance	Part of the BMS supply, mounted in controller enclosure

## CTR Control System

TC101 TE101	Temperature Controller with integral TE	1/2"MNPT	Kimray Thermostat Model HT12, steel, c/w integral bimetallic temperature sensor -34°C to 399°C, external vent	CSA non-certified, Variance applied	Acceptable based on performance testing and manufacturers specifications.
SPV202	Main Burner Safety Shutoff Valve Speed Control	1/4" FNPT	SMC NAS4000-N02, speed control valve	Accepted based on past performance and manufacturer's recommendation	Speed Control to be set to approximately 15 seconds opening time of the main shutoff valve.
PRV415	TCV Instrument Gas Pressure Regulator	1/4" FNPT	1/4" Fisher 67CFR regulator with internal relief, tapped bonnet, 0-35psig spring, NBR elastomers, 250psig max operating, -29°C to 82°C	CSA non-certified, Variance applied	Acceptable based on past performance and manufacturers specifications.
PI415	TCV Instrument Gas Regulator Pressure Gauge	1/4" MNPT	Wika Type 233.53, 2-1/2" dial, 316SS, silicone filled, CBM connection, -40°C, 0-30 PSIG	Accepted based on past performance and manufacturer's recommendation	
HV415	TCV Instrument Gas Shutoff Valve	1/4" FNPT	NEO Cat. No. 2500, 1/4"NPT ball valve, 316SS, 2000psig WOG manufacturer's rating, 125psig CSA rating, -40°C	CSA Listed CGA 3.16 Certified	

# BILL OF MATERIALS

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BOM: BM1805019 Design Code: 302C-A5-NW002

Tag Number	Component Function	Connection	Description	Compliance Statement	Comments
<b>CTR Control System</b>					
PRV412	Main SSV Instrument Gas Pressure Regulator	1/4" FNPT	1/4" Fisher 67CFR, Part No. 67CFR-601/T40F, 0-125psig spring, NBR elastomers, stainless bolting, 250psig max operating, -40°C to 82°C	CSA non-certified, Variance applied, CRN OC2302.52	Acceptable based on past performance and manufacturers specifications, setpoint 80 PSIG
PI412	Main SSV Instrument Gas Regulator Pressure Gauge	1/4" MNPT	Wika Type 233.53, 2-1/2" dial, 316SS, silicone filled, CBM connection, -40°C, 0-100 PSIG	Accepted based on past performance and manufacturer's recommendation	
HV411	Main SSV Instrument Gas Shutoff Valve	1/4" FNPT	NEO Cat. No. 2500, 1/4"NPT ball valve, 316SS, 2000psig WOG manufacturer's rating, 125psig CSA rating, -40°C	CSA Listed CGA 3.16 Compliant	
TE102 TSHH102	Temperature Switch HIHI	1/2" MNPT	CCS 6900TE-14, c/w integral capillary tube temperature sensor, AC/DC operation, SPDT, 27°C to 96°C adjustable setpoint range, 149°C max probe, -40°C ambient	CSA XP Class I Zone 1	
LSLL101	Level Switch LOLO	2" MNPT	SOR Model 1510C-G2A-C-W9-ES-CS Level Switch, SPST, 1500psig MAWP, 316SS body, 316SS float, -40°C to 204°C (manufacturer rating), 125°C (CSA rating)	CSA Approved Class I Div. 1	
TUB621	Instrument Tubing	3/8" OD	ASTM A269 316SS seamless tube, 0.035" wall thickness	ASTM A269	
<b>MBR Burner Equipment</b>					
BRN207	Main Burner	2"	ACL M200, 2" mixer with adjustable air shutter, 3/4" fuel inlet, B200 venturi burner barrel	Accepted based on past performance, testing and manufacturer	Burner fuel input shall not exceed the specified maximum flow and pressure. Gas orifice to be drilled to provide required fuel input at the maximum specified fuel pressure. Burner barrel length:
<b>MTR Main Fuel Train</b>					
HV101	Main Fuel Manual Shut-off Valve	1/4-2" FNPT	MAS G2E series ball valve, 1/4-2in, stainless steel, 1000psig WOG manufacturer's rating, 125psig CSA rating, -40°C	CSA Listed CGA 3.16 Certified	

# BILL OF MATERIALS

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BOM: BM1805019 Design Code: 302C-A5-NW002

Tag Number	Component Function	Connection	Description	Compliance Statement	Comments
<b>MTR Main Fuel Train</b>					
YS101	Main Train Y-Strainer	1" FNPT	Alta YS3000-L101, 1" Y-strainer, A350 GR. LF2, 304SS screen with 1/32" perforations, 3000psig MAWP, -45°C to 38°C, c/w plug	Accepted based on good engineering practice	
PRV103	Main Appliance Pressure Regulator	1" FNPT	1" NPT Fisher Model 627R, internal pressure relief valve, steel body, aluminum spring case, 3/8" orifice, 5-20psig spring, "Alberta sour" trim, 300psig max operating, -29°C to 82°C	CSA non-certified, Variance applied. CRN 0C8768	Accepted based on past performance and manufacturers specifications, setpoint as required per burner / orifice selection and fuel pressure availability. For effective internal relief for 100psig downstream, max inlet pressure is 180psig. For 60psig downstream, max inlet pressure is 95psig.
TP2	Main Regulator Pressure Test Point	1/4" NPT	1/4" NPT Plug	B149.3 Compliant	
PSLL104	Main Burner Gas Pressure Switch Low-Low	1/2" FNPT	CCS 6900GZE12 pressure switch, 3-20psig w/ 2psi deadband, 500psig MOP, 750psig MAWP, -40°C to 86°C	CSA C22.2 Approved Class I Zone 1	Switch setpoint 50% of maximum burner pressure. Note: switch isolating valve is not recommended but can be accepted if locked and tagged.
SSV203 SOV203 ZSC203	Main Burner Safety Shutoff Valve c/w Solenoid, Closed Position Switch	1" FNPT	1" ACL pneumatic model ACL-ASSV c/w 24VDC, 1.8 W coil electric solenoid and proof of closure switch, 300psig MOPD, -40°C to 65°C, NACE MR-0175	CSA Listed CSA 6.5-2000 C/I Listed	Valve may be mounted in any position, proof of closure switch does not meet CSA 6.5 standard Voltage project dependent
TCV205	Main Burner Input Temperature Control Valve	1" FNPT	Fisher 119, aluminum/nitrile trim, max inlet 150psig, max control pressure to diaphragm 150psig, 5-35psig spring, 1/4" FNPT vent, -29°C	CSA non-certified, Variance applied	Acceptable based on performance testing and manufacturers specifications.
PI206	Main Train Pressure Gauge	1/4" MNPT	Wika Type 233.53, 2-1/2" dial, 316SS, silicone filled, LM connection, -40°C, 0-30 PSIG	Accepted based on past performance and manufacturer's recommendation	
PSHH206	Main Burner Gas Pressure Switch HIHI	1/2" FNPT	CCS 6900GZE12 pressure switch, 3-20psig w/ 2psi deadband, 500psig MOPD, 750psig MAWP, -40°C to 86°C	CSA C22.2 Approved Class I Zone 1	Switch setpoint 25% above maximum burner pressure. Note: switch isolating valve is not recommended but can be accepted if locked and tagged.

# BILL OF MATERIALS

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BOM: BM1805019 Design Code: 302C-A5-NW002

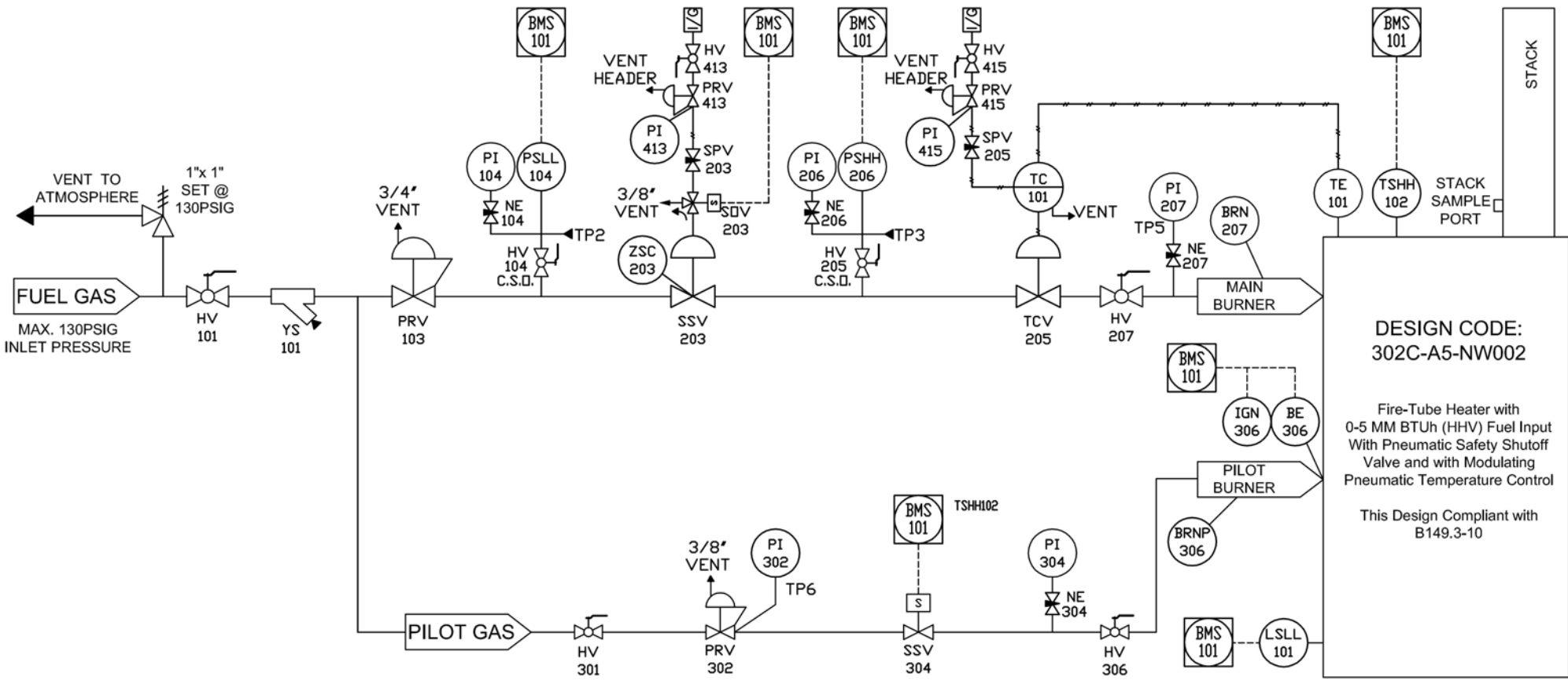

Tag Number	Component Function	Connection	Description	Compliance Statement	Comments
<b>MTR Main Fuel Train</b>					
TP4	Main FCV Pressure Test Point	1/4"NPTF	1/4" NPT Plug	Accepted based on good engineering practice	Portable test gauge / calibrator to be used on as needed basis.
HV207	Main Burner Test Firing Valve	1/4-2" FNPT	MAS G2E series ball valve, 1/4-2in, stainless steel, 1000psig WOG manufacturer's rating, 125psig CSA rating, -40°C	CSA Listed CGA 3.16 Certified	Mount as close as possible to the burner (on the burner windbox)
PI207	Main Burner Pressure Gauge	1/4" MNPT	Wika Type 233.53, 2-1/2" dial, 316SS, silicone filled, CBM connection, -40°C, 0-30 PSIG	Accepted based on past performance and manufacturer's recommendation	Mount as close as possible to the burner (on the burner windbox)
TP5	Main Burner Pressure Test Point	1/4"NPTF	1/4" NPT Plug	Accepted based on good engineering practice	Portable test gauge / calibrator to be used on as needed basis.
PIP601	Small Ø Low Temperature Piping	<=1.5"	Sweet Service, ASTM A333 Gr.6 seamless, sched 80, ANSI 150# rating @ -46°C, no short nipples	ASTM A333 Grade 6 SMLS	
FTG610	Low Temperature 3000# Fittings	all	ASTM A350 Grade LF2, 3000#, ANSI 150# rating @ -46°C	ASTM A350 Grade LF2	
TUB622	Main/Pilot Tubing	see comments	ASTM A269 316SS seamless tube, 0.049" wall thickness	ASTM A269	May be used for the main or pilot fuel train. Size according to maximum flow, minimum 3/8" for pilot and 1/2" for main.
<b>PBR Pilot Burner</b>					
BRNP306	Pilot Burner	1/2"	ACL M50 Pilot Assembly, c/w mixer and nozzle	Accepted based on past performance and testing	
<b>PTR Pilot Fuel Train</b>					
HV301	Pilot Fuel Manual Shut-off Valve	1/4-2" FNPT	MAS G2E series ball valve, 1/4-2in, stainless steel, 1000psig WOG manufacturer's rating, 125psig CSA rating, -40°C	CSA Listed CGA 3.16 Certified	

# BILL OF MATERIALS

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BOM: BM1805019 Design Code: 302C-A5-NW002

Tag Number	Component Function	Connection	Description	Compliance Statement	Comments
<b>PTR Pilot Fuel Train</b>					
PRV302	Pilot Pressure Regulator	1/4" FNPT	1/4" Fisher 67CFR regulator with internal relief, tapped bonnet, 0-35psig spring, "Alberta sour", NBR elastomers, 250psig max operating, -29°C to 82°C	CSA non-certified, Variance applied, Acceptable based on past performance	Setpoint 3 to 5 PSIG typical, must match pilot orifice drilling for approximately 30,000 BTU/hr pilot
PI302	Pilot Regulator Pressure Gauge	1/4" MNPT	Wika Type 233.53, 2-1/2" dial, 316SS, silicone filled, CBM connection, -40°C, 0-15psig	Accepted based on past performance and manufacturer's recommendations	
TP6	Pilot Regulator Pressure Test Point	1/4"NPTF	1/4" NPT Plug	B149.3 Compliant	Portable test gauge / calibrator to be used on as needed basis.
SSV304	Pilot Safety Shutoff Valve	1/4" FNPT	1/4" ASCO solenoid valve, Part No. HV426716-002, SS/FKM/PTFE, 24VDC, 10.6W coil, 50psig MOPD, 100psig MAWP, -40°C to 52°C, NACE MR-0175 compliant	CSA Listed CSA 6.5-2005 C/I Listed Class I Zone 1 CRN 0C07487.2	
TP7	Pilot SSV Pressure Test Point	1/4"NPTF	1/4" NPT Plug	B149.3 Compliant	Portable test gauge / calibrator to be used on as needed basis.
HV306	Pilot Test Firing Valve	1/4-2" FNPT	MAS G2E series ball valve, 1/4-2in, stainless steel, 1000psig WOG manufacturer's rating, 125psig CSA rating, -40°C	CSA Listed CGA 3.16 Certified	Mount as close as possible to the pilot (on the burner windbox)
PIP601	Small Ø Low Temperature Piping	<=1.5"	Sweet Service, ASTM A333 Gr.6 seamless, sched 80, ANSI 150# rating @ -46°C, no short nipples	ASTM A333 Grade 6 SMLS	
FTG610	Low Temperature 3000# Fittings	all	ASTM A350 Grade LF2, 3000#, ANSI 150# rating @ -46°C	ASTM A350 Grade LF2	
TUB622	Main/Pilot Tubing	see comments	ASTM A269 316SS seamless tube, 0.049" wall thickness	ASTM A269	May be used for the main or pilot fuel train. Size according to maximum flow, minimum 3/8" for pilot and 1/2" for main.

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SIZE: B		NFN1805019-P100		REV: 0																																																																																																											
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REVISION	REVISION DESCRIPTION	DATE
Birchill Canada Limited Partnership		
Birchill HZ Brazr -		
13-06-43-13-W5		
SYSTEM WIRING DIAGRAM		
Line Heater		
2.52 GJ/h   2.39 MM Btuh		
SIZE: B	NFN1805019-E200	REV: 0
SCALE: None	07/27/2018	SHEET 1 OF 1

DESIGN CODE: 302C-A5-NW002

NOTES

1.

All electrical work shall be performed by qualified personnel.

2.

All electrical materials and methods shall be appropriate for the specified environment and Electrical Classification Areas and in compliance with the CSA22.1 Canadian Electric Code. Wiring shall be 14Ga minimum, except for thermocouple wiring which may be 16Ga.

3.

Electrical seals and wiring methods shall be installed as required by the CSA 22.1-12 Canadian Electrical Code.

4.

PSLL and PSHH shall be mounted as close as practicable above fuel train so that they are easily accessible for calibration, are self-draining, and possibility of freezing is minimized. Quarter-turn isolating ball valve shall be in L.O. (locked open) position.

5.

Instrument tubing union shall be installed between the valve and the switch, and switch wired using flex cable to allow partial removal for calibration.

6.

Zener barriers can be used to install safety shut-off valves with a Class 1 Div 2 rating in a Class 1 Zone 1 area.