MarkWest Energy Appalachia, L.L.C.
1515 Arapahoe Street
Tower 1, Suite 1600
Denver, CO 80202-2137
(800) 730-8388
(303) 290-8700
(303) 825-0920 Fax

November 3, 2016

Mr. Fred Durham, Director
West Virginia Department of Environmental Protection
Division of Air Quality
Charleston, WV 25304

Re: MarkWest Liberty Midstream & Resources L.L.C.
Sherwood Gas Plant
Application Class II Administrative Amendment

Dear Mr. Durham:

MarkWest Liberty Midstream & Resources L.L.C. (MarkWest) submits the enclosed application for a Class II Administrative Amendment in accordance with the West Virginia Air Pollution Control Act and Title 45 Series 13 (45CSR13) for a small stabilization heater at the Sherwood Gas Plant in Doddridge County.

This package contains the required application forms, emissions calculations and supporting documentation for the referenced project. A check in the amount of $300 for the application fee is included with this submittal. The public notice for the proposed construction has been sent for publication to the *Herald Record*. MarkWest will forward the Affidavit of Publication to your attention once it is received from the publisher.

MarkWest has previously been authorized to build Sherwood I-IX plants along with a deethanizer. MarkWest is not requesting any changes be made to current permit but will be submitting a full permit application in the future to add equipment requiring a 45CSR13 NSR permit application and to update some current equipment.

If you have any questions or comments, please call me (303) 542-0686 or e-mail nwheldon@markwest.com at your earliest convenience.

Sincerely,

Nathan M. Wheldon, P.E.

RECEIVED
NOV 04 2016
WV DEP / DIV OF AIR QUALITY

RECEIVED
NOV 04 2016
WV DEP / DIV OF AIR QUALITY

Environmental Manager
Enclosures (Original + Two Copies)

MARKWEST LIBERTY MIDSTREAM & RESOURCES L.L.C.

SHERWOOD GAS PLANT

45CSR13 Class II Administrative Amendment

RECEIVED
NOV 04 2016
WV DEP / DIV OF AIR QUALITY

SUBMITTED TO WVDEP DIVISION OF AIR QUALITY
November 2016

RECEIVED
NOV 04 2016
WV DEP / DIV OF AIR QUALITY

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INTRODUCTION

MarkWest Liberty Midstream & Resources L.L.C. requests authorization to make an expansion to the Sherwood Gas Plant (R13-2914), by applying for a Class II Administrative Amendment in accordance with the West Virginia Air Pollution Control Act and Title 45 Series 13 (45CSR13).

Project Description

This administrative amendment seeks to add a heater for stabilization with a maximum heat release of 6.35 mmbtu/hr. Because the emissions from the heater are less than 6 lbs/hr and 10 tpy year the heater qualifies for a Class II Administrative Amendment. The facility is subject to the NSPS Subpart OOOO requirements for leak detection throughout.

All other equipment from the current Sherwood facility will remain as presently constituted.

Proposed Emissions

Emissions calculations for the project are presented in Attachment N. When all the equipment is installed this facility will be a Title V facility. All emissions are below the thresholds for Prevention of Significant Deterioration (PSD) analysis. Summaries of the total facility-wide emissions are presented for criteria pollutants and hazardous air pollutants (HAPs). Detailed emission calculations are also included for the new unit.

Note that additional storage tanks may be present on site (i.e., methanol, lube oil, waste oil) but are considered de minimis sources per Table 45-13B and are not addressed further in this application.

WVDEP APPLICATION FOR NSR PERMIT

WEST VIRGINIA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
VISION OF AIR QUALITY
601 57th Street, SE
Charleston, WV 25304
(304) 926-0475
www.dep.wv.gov/daq

APPLICATION FOR NSR PERMIT AND TITLE V PERMIT REVISION (OPTIONAL)

PLEASE CHECK ALL THAT APPLY TO **NSR (45CSR13)** (IF KNOWN):

☐ **CONSTRUCTION** ☐ **MODIFICATION** ☐ **RELOCATION**
☐ **CLASS I ADMINISTRATIVE UPDATE** ☐ **TEMPORARY**
☒ **CLASS II ADMINISTRATIVE UPDATE** ☐ **AFTER-THE-FACT**

PLEASE CHECK TYPE OF **45CSR30 (TITLE V)** REVISION (IF ANY):

☐ **ADMINISTRATIVE AMENDMENT** ☐ **MINOR MODIFICATION**
☐ **SIGNIFICANT MODIFICATION**

IF ANY BOX ABOVE IS CHECKED, INCLUDE TITLE V REVISION INFORMATION AS **ATTACHMENT S** TO THIS APPLICATION

FOR TITLE V FACILITIES ONLY: Please refer to "Title V Revision Guidance" in order to determine your Title V Revision options (Appendix A, "Title V Permit Revision Flowchart") and ability to operate with the changes requested in this Permit Application.

Section I. General

1. Name of applicant *(as registered with the WV Secretary of State's Office):*
MarkWest Liberty Midstream & Resources L.L.C.

2. Federal Employer ID No. ***(FEIN):***
3 0 0 5 2 8 0 5 9

3. Name of facility *(if different from above):*
Sherwood Gas Plant

4. The applicant is the:
☐ **OWNER** ☐ **OPERATOR** ☒ **BOTH**

5A. Applicant's mailing address:
1515 Arapahoe St., Tower 1, Suite 1600
Denver, CO 80202-2137

5B. Facility's present physical address:
218 Swisher Lane
West Union, WV 26456

6. **West Virginia Business Registration.** Is the applicant a resident of the State of West Virginia? ☐ **YES** ☒ **NO**

– If **YES,** provide a copy of the **Certificate of Incorporation/Organization/Limited Partnership** (one page) including any name change amendments or other Business Registration Certificate as **Attachment A.**

– If **NO,** provide a copy of the **Certificate of Authority/Authority of L.L.C./Registration** (one page) including any name change amendments or other Business Certificate as **Attachment A.**

7. If applicant is a subsidiary corporation, please provide the name of parent corporation:

8. Does the applicant own, lease, have an option to buy or otherwise have control of the *proposed site?* ☒ **YES** ☐ **NO**

– If **YES,** please explain: **Applicant has purchased this property.**

– If **NO,** you are not eligible for a permit for this source.

9. Type of plant or facility (stationary source) to be **constructed, modified, relocated, administratively updated** or **temporarily permitted** (e.g., coal preparation plant, primary crusher, etc.):
Natural gas processing plant

10. North American Industry Classification System **(NAICS)** code for the facility:
211112

11A. DAQ Plant ID No. (for existing facilities only):
017-00034

11B. List all current 45CSR13 and 45CSR30 (Title V) permit numbers associated with this process (for existing facilities only):
R13-2914

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

12A.

- For **Modifications, Administrative Updates** or **Temporary permits** at an existing facility, please provide directions to the *present location* of the facility from the nearest state road;
- For **Construction** or **Relocation permits,** please provide directions to the *proposed new site location* from the nearest state road. Include a **MAP** as **Attachment B.**
  - **From Smithburg: Take US-50 East and go 2.8 miles.**
  - **Turn right at Co. Route 50/35 and go 0.1 miles.**
  - **Take the 1st right onto Blacklick Rd/Co Route 15/Sherwood-Greenbrier Rd and continue 0.4 miles.**
  - **Site will be 0.5 miles west of Co Route 15.**

12.B. New site address (if applicable):	12C. Nearest city or town:	12D. County:
218 Swisher Lane, West Union, WV 26456	**Smithburg**	**Doddridge**
12.E. UTM Northing (KM): **4346.885**	12F. UTM Easting (KM): **526.921**	12G. UTM Zone: **17S**

13. Briefly describe the proposed change(s) at the facility:
Construction of three new natural gas processing plants with one (1) 7.86 mmbtu/hr regenerative heater each, one HMO heater and associated fugitive emissions. Two small stabilizers with heaters and a Deethanization process.

14A. Provide the date of anticipated installation or change:	14B. Date of anticipated Start-Up if a permit is granted:
June 2017 for the Stabilizaer Heater – If this is an **After-The-Fact** permit application, provide the date upon which the proposed change did happen: / /	**June 2017**

14C. Provide a **Schedule** of the planned **Installation** of/**Change** to and **Start-Up** of each of the units proposed in this permit application as **Attachment C** (if more than one unit is involved).

15. Provide maximum projected **Operating Schedule** of activity/activities outlined in this application:
Hours Per Day **24** Days Per Week **7** Weeks Per Year **52**

16. Is demolition or physical renovation at an existing facility involved? ☐ **YES** ☒ **NO**

17. **Risk Management Plans.** If this facility is subject to 112(r) of the 1990 CAAA, or will become subject due to proposed changes (for applicability help see www.epa.gov/ceppo), submit your **Risk Management Plan (RMP)** to U. S. EPA Region III.

18. **Regulatory Discussion.** List all Federal and State air pollution control regulations that you believe are applicable to the proposed process *(if known).* A list of possible applicable requirements is also included in Attachment S of this application (Title V Permit Revision Information). Discuss applicability and proposed demonstration(s) of compliance *(if known).* Provide this information as **Attachment D.**

Section II. Additional attachments and supporting documents.

19. Include a check payable to WVDEP – Division of Air Quality with the appropriate **application fee** (per 45CSR22 and 45CSR13).

20. Include a **Table of Contents** as the first page of your application package.

21. Provide a **Plot Plan,** e.g. scaled map(s) and/or sketch(es) showing the location of the property on which the stationary source(s) is or is to be located as **Attachment E** (Refer to ***Plot Plan Guidance***) **.**
– Indicate the location of the nearest occupied structure (e.g. church, school, business, residence).

22. Provide a **Detailed Process Flow Diagram(s)** showing each proposed or modified emissions unit, emission point and control device as **Attachment F.**

23. Provide a **Process Description** as **Attachment G.**
  – Also describe and quantify to the extent possible all changes made to the facility since the last permit review (if applicable).

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

24. Provide **Material Safety Data Sheets (MSDS)** for all materials processed, used or produced as **Attachment H.**
– For chemical processes, provide a MSDS for each compound emitted to the air.

25. Fill out the **Emission Units Table** and provide it as **Attachment I.**

26. Fill out the **Emission Points Data Summary Sheet (Table 1 and Table 2)** and provide it as **Attachment J.**

27. Fill out the **Fugitive Emissions Data Summary Sheet** and provide it as **Attachment K.**

28. Check all applicable **Emissions Unit Data Sheets** listed below:

☐ Bulk Liquid Transfer Operations ☐ Haul Road Emissions ☐ Quarry
☐ Chemical Processes ☐ Hot Mix Asphalt Plant ☐ Solid Materials Sizing, Handling and Storage Facilities
☐ Concrete Batch Plant ☐ Incinerator
☐ Grey Iron and Steel Foundry ☐ Indirect Heat Exchanger ☐ Storage Tanks
☒ General Emission Unit, specify: **Natural gas-fired heaters**

Fill out and provide the **Emissions Unit Data Sheet(s)** as **Attachment L.**

29. Check all applicable **Air Pollution Control Device Sheets** listed below:

☐ Absorption Systems ☐ Baghouse ☐ Flare
☐ Adsorption Systems ☐ Condenser ☐ Mechanical Collector
☐ Afterburner ☐ Electrostatic Precipitator ☐ Wet Collecting System

☐ Other Collectors, specify Fill out and provide the **Air Pollution Control Device Sheet(s)** as **Attachment M.**

30. Provide all **Supporting Emissions Calculations** as **Attachment N,** or attach the calculations directly to the forms listed in Items 28 through 31.

31. **Monitoring, Recordkeeping, Reporting and Testing Plans.** Attach proposed monitoring, recordkeeping, reporting and testing plans in order to demonstrate compliance with the proposed emissions limits and operating parameters in this permit application. Provide this information as **Attachment O.**

➢ Please be aware that all permits must be practically enforceable whether or not the applicant chooses to propose such measures. Additionally, the DAQ may not be able to accept all measures proposed by the applicant. If none of these plans are proposed by the applicant, DAQ will develop such plans and include them in the permit.

32. **Public Notice.** At the time that the application is submitted, place a **Class I Legal Advertisement** in a newspaper of general circulation in the area where the source is or will be located (See 45CSR§13-8.3 through 45CSR§13-8.5 and ***Example Legal Advertisement*** for details). Please submit the **Affidavit of Publication** as **Attachment P** immediately upon receipt.

33. **Business Confidentiality Claims.** Does this application include confidential information (per 45CSR31)?

☐ **YES** ☒ **NO**

➢ If **YES,** identify each segment of information on each page that is submitted as confidential and provide justification for each segment claimed confidential, including the criteria under 45CSR§31-4.1, and in accordance with the DAQ's ***"Precautionary Notice – Claims of Confidentiality"*** guidance found in the ***General Instructions*** as **Attachment Q.**

Section III. Certification of Information

34. **Authority/Delegation of Authority.** Only required when someone other than the responsible official signs the application. Check applicable **Authority Form** below:

☐ Authority of Corporation or Other Business Entity ☐ Authority of Partnership
☐ Authority of Governmental Agency ☐ Authority of Limited Partnership

Submit completed and signed **Authority Form** as **Attachment R.**

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

35A. **Certification of Information.** To certify this permit application, a Responsible Official (per 45CSR§13-2.22 and 45CSR§30-2.28) or Authorized Representative shall check the appropriate box and sign below.

Certification of Truth, Accuracy, and Completeness

I, the undersigned ☒ **Responsible Official** / ☐ **Authorized Representative,** hereby certify that all information contained in this application and any supporting documents appended hereto, is true, accurate, and complete based on information and belief after reasonable inquiry I further agree to assume responsibility for the construction, modification and/or relocation and operation of the stationary source described herein in accordance with this application and any amendments thereto, as well as the Department of Environmental Protection, Division of Air Quality permit issued in accordance with this application, along with all applicable rules and regulations of the West Virginia Division of Air Quality and W.Va. Code § 22-5-1 et seq. (State Air Pollution Control Act). If the business or agency changes its Responsible Official or Authorized Representative, the Director of the Division of Air Quality will be notified in writing within 30 days of the official change.

Compliance Certification

Except for requirements identified in the Title V Application for which compliance is not achieved, I, the undersigned hereby certify that, based on information and belief formed after reasonable inquiry, all air contaminant sources identified in this application are in compliance with all applicable requirements.

SIGNATURE _____ *(Please use blue ink)* DATE: 11/3/16 *(Please use blue ink)*

35B. Printed name of signee: **Leanne Meyer**		35C. Title: **Vice President EH&S**
35D. E-mail: **lmeyer**@markwest.com	36E. Phone: **(303) 925-9299**	36F. FAX: **303-290-8769**
36A. Printed name of contact person (if different from above): **Nathan Wheldon**		36B. Title: **Environmental Manager**
36C. E-mail: nwheldon@markwest.com	36D. Phone: **303-542-0686**	36E. FAX: **303-825-0920**

PLEASE CHECK ALL APPLICABLE ATTACHMENTS INCLUDED WITH THIS PERMIT APPLICATION:

- ☒ **Attachment A: Business Certificate**
- ☐ **Attachment B: Map(s)**
- ☒ **Attachment C: Installation and Start Up Schedule**
- ☒ **Attachment D: Regulatory Discussion**
- ☐ **Attachment E: Plot Plan**
- ☐ **Attachment F: Detailed Process Flow Diagram(s)**
- ☒ **Attachment G: Process Description**
- ☐ **Attachment H: Material Safety Data Sheets (MSDS)**
- ☒ **Attachment I: Emission Units Table**
- ☒ **Attachment J: Emission Points Data Summary Sheet**
- ☒ **Attachment K: Fugitive Emissions Data Summary Sheet**
- ☒ **Attachment L: Emissions Unit Data Sheet(s)**
- ☐ **Attachment M: Air Pollution Control Device Sheet(s)**
- ☒ **Attachment N: Supporting Emissions Calculations**
- ☐ **Attachment O: Monitoring/Recordkeeping/Reporting/Testing Plans**
- ☒ **Attachment P: Public Notice**
- ☐ **Attachment Q: Business Confidential Claims**
- ☐ **Attachment R: Authority Forms**
- ☐ **Attachment S: Title V Permit Revision Information**
- ☒ **Application Fee**

Please mail an original and three (3) copies of the complete permit application with the signature(s) to the DAQ, Permitting Section, at the address listed on the first page of this application. Please DO NOT fax permit applications.

FOR AGENCY USE ONLY – IF THIS IS A TITLE V SOURCE:

- ☐ ***Forward 1 copy of the application to the Title V Permitting Group and:***
- ☐ ***For Title V Administrative Amendments:***
  - ☐ ***NSR permit writer should notify Title V permit writer of draft permit,***
- ☐ ***For Title V Minor Modifications:***
  - ☐ ***Title V permit writer should send appropriate notification to EPA and affected states within 5 days of receipt,***
  - ☐ ***NSR permit writer should notify Title V permit writer of draft permit.***
- ☐ ***For Title V Significant Modifications processed in parallel with NSR Permit revision:***
  - ☐ ***NSR permit writer should notify a Title V permit writer of draft permit,***
  - ☐ ***Public notice should reference both 45CSR13 and Title V permits,***
  - ☐ ***EPA has 45 day review period of a draft permit.***

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

APPLICATION CHECKLIST

A complete application is demonstrated when all of the information required below is properly prepared, completed and attached. The items listed below are required information which must be submitted with a 45CSR13 permit application. Any submittal will be considered incomplete if the required information is not included. The applicant must submit a complete application in order to receive a 45CSR13 permit.	
☑	**Class I legal advertisement published in a newspaper certified to accept legal advertisements and original affidavit submitted.**
☑	**$1,000 application fee for construction, modification, relocation or temporary permit; $1,000 application fee for being subject to NSPS. Additional application fees:** • **$1,000 NSPS** • **$5,000 Major Modification** • **$2,500 NESHAP** • **$10,000 Major Construction** • **$2,500 45CSR27 Pollutant**
☑	**Original and three (3) copies of the application.**
☑	**File organization – application pages are numbered and in correct order, application is bound in some way, etc.**
☑	**Confidential Business Information is properly identified.**
☑	**General application forms signed by a responsible official.**
	Authority form – required if application is signed by someone other than a responsible official – one of the following: • **Authority of Corporation if application is not signed by the President or CEO;** • **Authority of Partnership if application is not signed by a general partner or proprietor;** • **Authority of Limited Partnership if application is not signed by general partner or proprietor; or** • **Authority of Governmental Agency if application is not signed by**

	principal elected officer or ranking elected official.
☑	**Copy of current Business Registration Certificate.**
☑	**Process description, including equipment and emission point identification numbers.**
☑	**Process flow diagram, including equipment and emission point identification numbers.**
☑	**Plot plan, including equipment and emission point identification numbers.**
☑	**Area map with directions and location marked.**
☑	**Applicable technical forms completed and submitted:** • **Emission Point Data Summary Sheets** • **Emission Unit Data sheets** • **Air Pollution Control Device Sheets** • **Equipment List Form**
☑	**Emission calculations – emission factors, references, source identification numbers, etc.**

ATTACHMENT C: INSTALLATION/START-UP SCHEDULE

MarkWest Liberty Midstream & Resources intends to commence earthmoving and construction activities for the proposed Sherwood Gas Plant in Winter 2016-2017

The final dates of installation and start-up of the proposed equipment are contingent upon the permit issuance and other factors. The currently planned starting dates for the stabilizer is in June 2017.

ATTACHMENT D: REGULATORY DISCUSSION

MarkWest Liberty Midstream & Resources L.L.C. has reviewed the regulatory provisions and offers the following discussion regarding applicability to the proposed construction.

STATE IMPLEMENTATION PLAN (SIP):
This application does not involve a stationary source to be located in a non-attainment area subject to a SIP.

FEDERAL IMPLEMENTATION PLAN:
No Federal Implementation Plan is in effect where this stationary source is proposed.

45 CSR 4 – OBJECTIONABLE ODORS:
Normal operations of the facility are not expected to generate objectionable odors.

45 CSR 13 - PERMITS FOR CONSTRUCTION, MODIFICATION, RELOCATION AND OPERATION OF STATIONARY SOURCES OF AIR POLLUTANTS, NOTIFICATION REQUIREMENTS, ADMINISTRATIVE UPDATES, TEMPORARY PERMITS, GENERAL PERMITS, AND PROCEDURES FOR EVALUATION:
Potential emissions associated with the proposed project are greater than the minor source construction permit thresholds of 6 pounds per hour (pph) AND 10 tons per year (tpy) of any regulated air pollutant OR 144 pounds per day (ppd) of any regulated air pollutant OR 2 pph OR 5 tpy of aggregated hazardous air pollutants (HAP) OR 45 CSR 27 toxic air pollutant (TAP) (10% increase if above BAT triggers or increase to Best Available Technology (BAT) triggers) OR subject to applicable Standard or Rule.

45 CSR 14 – PREVENTION OF SIGNIFICANT DETERIORATION (PSD):
The proposed facility will not be a major source subject to the provisions of the PSD rule.

45 CSR 19 – NONATTAINMENT NEW SOURCE REVIEW:
The proposed facility will not be located in a non-attainment area.

45 CSR 22 - AIR QUALITY MANAGEMENT FEE PROGRAM:
The facility will be required to maintain a valid Certificate to Operate on the premises.

45 CSR 28 – EMISSIONS TRADING AND BANKING:
The applicant for the facility does not voluntarily choose to participate in an emission reduction credit trading program.

45 CSR 30 - REQUIREMENTS FOR OPERATING PERMITS:
Emissions from the facility will not exceed major source thresholds; therefore, this rule does not apply.

45 CSR 30-2.6.1 – EMISSIONS CAP:
This facility will not be subject to any emissions caps as provided by this provision.

45 CSR 33 – ACID RAIN:
The facility will not be a source subject to the provision of the Acid Rain program.

FEDERAL

SECTION 112(d) MACT STANDARDS:
The facility will not be a major source of hazardous air pollutants and is not subject to the MACT provisions.

SECTION 112(g) CASE-BY-CASE MACT:
The facility will not be a major source of hazardous air pollutants and is not subject to the MACT provisions.

SECTION 112 (i) EARLY REDUCTION OF HAP:
The facility will not be a major source of hazardous air pollutants and is not subject to this provision.

SECTION 112(r) RISK MANAGEMENT PLAN (RMP):
It is anticipated that the facility will maintain hazardous substances in excess of 10,000 pounds and thus will be subject to this provision.

SECTION 129 STANDARDS/REQUIREMENTS:
Operation of this facility will not involve solid waste combustion or incineration; therefore, this standard does not apply.

SECTION 183 (e) CONSUMER/COMMERCIAL PRODUCT REQUIREMENTS:
Operation of this facility will not involve the manufacture or sale of consumer or commercial products and will not be subject to this regulatory provision.

SECTION 183 (f) TANK VESSEL REQUIREMENTS:
The facility will not employ marine tank vessels; therefore, this provision does not apply.

STRATOSPHERIC OZONE (TITLE VI):
This facility will not use Class I ozone-depleting substances (ODS) including chlorofluorocarbons (CFC) and Class II ODS, which are hydrochlorofluorocarbons (HCFC), so this provision does not apply.

40 CFR PART 60 SUBPART JJJJ - STANDARDS OF PERFORMANCE FOR STATIONARY SPARK IGNITION INTERNAL COMBUSTION ENGINES:

The existing natural gas-fired compressor engines are stationary spark ignition internal combustion engines manufactured after July 1, 2007 and are subject to this subpart.

40 CFR PART 60 SUBPART OOOO – STANDARDS OF PERFORMANCE FOR CRUDE OIL AND NATURAL GAS PRODUCTION, TRANSMISSION, AND DISTRIBUTION:

This subpart establishes emission standards and compliance schedules for the control of VOC emissions from affected facilities that commence construction, modification or reconstruction after August 23, 2011. As a natural gas processing plant constructed after the applicable date, the facility will be subject to requirements under this rule, as will the previously constructed plant. Storage tanks at the site will not be subject to this subpart because the emissions are less than 6 tpy per tank. Pneumatic controllers at the proposed facility will be air-driven devices to comply with the rule.

40 CFR PART 63 SUBPART ZZZZ - NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS FOR SOURCE CATEGORIES FROM STATIONARY RECIPROCATING INTERNAL COMBUSTION ENGINES:

The facility will be a minor (area) source of hazardous air pollutants (HAP). The proposed natural gas-fired engines are stationary reciprocating internal combustion engines (RICE) and will commence construction after the June 12, 2006 effective date for new stationary RICE at area sources and are therefore subject to this subpart. The engines will meet requirements by compliance with Subpart JJJJ. No further requirements apply for these engines under this subpart.

40 CFR PART 64 - COMPLIANCE ASSURANCE MONITORING:

The facility will is a major source but it not required to obtain a Part 70 or Part 71 permit, and therefore will not be an affected facility under this provision.

ATTACHMENT G: PROCESS DESCRIPTION

The Stabilizer at the Sherwood Gas Plant will be used to stabilize incoming natural gas liquids by removing methane and ethane from the liquids stream. The stabilization process includes introduction the liquids through a tower and adding enough heat to the tower to induce the methane and ethane into the gas phase which will rise and exit the top of the tower. The liquids continue through and exit the bottom of the tower. The remainder of the operations at the Sherwood Gas Plant will not be affected.

ATTACHMENT I: EMISSION UNITS TABLE

Attachment I

Emission Units Table

(includes all emission units and air pollution control devices that will be part of this permit application review, regardless of permitting status)

Emission Unit ID[1]	Emission Point ID[2]	Emission Unit Description	Year Installed/ Modified	Design Capacity	Type[3] and Date of Change	Control Device[4]
CM-1001	CM-1001	Caterpillar G3616 LE Engine	2012	4,735-hp	Existing	Oxid. Cat.
CM-1002	CM-1002	Caterpillar G3616 LE Engine	2012	4,735-hp	Existing	Oxid. Cat.
CM-2001	CM-2001	Caterpillar G3608 LE Engine	2012	2,370 – hp	Existing	Oxid. Cat.
H-711	H-711	Mole Sieve Regeneration Heater	2012	7.86 MMbtu/hr	Existing	None
H-771	H-771	Hot Oil Heater	2012	28.25 MMbtu/hr	Existing	None
DH-001	DH-001	TEG Dehydration Unit	2012	120 MMscfd	Existing	Flare
RB-001	RB-001	Dehydration Unit Reboiler	2012	2 MMbtu/hr	Existing	None
FL-991	FL-991	Emergency Flare	2012	68,600 scf/min	Existing	N/A
FUG-001	FUG-001	Fugitive Leaks	2012-2014	N/A	Existing	None
TNK-001	TNK-001	Storage Tank Flashing Emissions	2012	N/A	Existing	VRU
H-2711	H-2711	Mole Sieve Regeneration Heater	2013	7.86 MMbtu/hr	Existing	None
H-3711	H-3711	Mole Sieve Regeneration Heater	2013	7.86 MMbtu/hr	Existing	None
H-4711	H-4711	Mole Sieve Regeneration Heater	2014	18.00 MMbtu/hr	Existing	None
H-5711	H-5711	Mole Sieve Regeneration Heater	2014	18.00 MMbtu/hr	Existing	None
H-6711	H-6711	Mole Sieve Regeneration Heater	2015	18.00 MMbtu/hr	Existing	None
H-4712	H-4712	Hot Oil Heater	2014	6.60 MMbtu/hr	Existing	None
H-6712	H-6712	Hot Oil Heater	2015	6.60 MMbtu/hr	Existing	None
H-742	H-742	Stabilization Heater	2014	2.28 MMbtu/hr	Existing	None
H-7711	H-7711	Mole Sieve Regeneration Heater	2015	18.00 MMbtu/hr	Existing	None
H-8711	H-8711	Mole Sieve Regeneration Heater	2015	18.00 MMbtu/hr	Existing	None
H-9711	H-9711	Mole Sieve Regeneration Heater	2016	18.00 MMbtu/hr	Existing	None
H-8712	H-8712	Hot Oil Heater	2015	6.60 MMbtu/hr	Existing	None

H-2742	H-2742	Stabilization Heater	2015	2.28 MMbtu/hr	Existing	None
H-3742	H-3742	Stabilization Heater	2015	2.28 MMbtu/hr	Existing	None
D1-H-782	D1-H-782	DeEthanizer HMO Heater	2015	113.36 MMbtu/hr	Existing	None
D1-H-741	D1-H-741	DeEthanizer Regen Heater	2015	12.23 MMbtu/hr	Existing	None
H-751	H-751	Stabilization Heater II	2017	6.35 MMbtu/hr	New	None

[1] For Emission Units (or Sources) use the following numbering system:1S, 2S, 3S,... or other appropriate designation.
[2] For Emission Points use the following numbering system:1E, 2E, 3E, ... or other appropriate designation.
[3] New, modification, removal
[4] For Control Devices use the following numbering system: 1C, 2C, 3C,... or other appropriate designation.

ATTACHMENT J: EMISSION POINTS DATA SUMMARY SHEET

Attachment J
EMISSION POINTS DATA SUMMARY SHEET

Table 1: Emissions Data

Emission Point ID No. *(Must match Emission Units Table & Plot Plan)*	Emission Point Type[1]	Emission Unit Vented Through This Point *(Must match Emission Units Table & Plot Plan)*		Air Pollution Control Device *(Must match Emission Units Table & Plot Plan)*		Vent Time for Emission Unit *(chemical processes only)*		All Regulated Pollutants - Chemical Name/CAS[3] *(Speciate VOCs & HAPS)*	Maximum Potential Uncontrolled Emissions[4]		Maximum Potential Controlled Emissions[5]		Emission Form or Phase *(At exit conditions, Solid, Liquid or Gas/Vapor)*	Est. Method Used[6]	Emission Concentration[7] (ppmv or mg/m^4)
		ID No.	Source	ID No.	Device Type	Short Term[2]	Max (hr/yr)		lb/hr	ton/yr	lb/hr	ton/yr			
CM-1001	Vert St Rain CP	Same	Same	N/A	Oxid. Cat.	N/A	N/A	NOx	5.22	22.86	5.22	22.86	Gas/Vapor	O (Manufacturer Data/AP-42)	-
								CO	28.71	125.73	1.46	6.40			
								VOC	6.58	28.80	1.67	7.32			
								PM_{10}	<0.01	0.01	<0.01	0.01			
								PM Total	0.35	1.55	0.35	1.55			
								SO_2	0.02	0.09	0.02	0.09			
								Acetaldehyde	0.30	1.30	0.30	1.30			
								Acrolein	0.18	0.80	0.18	0.80			
								Benzene	0.02	0.07	0.02	0.07			
								Ethylbenzene	<0.01	0.01	<0.01	0.01			
								Formaldehyde	4.18	18.29	0.42	1.83			
								Methanol	0.09	0.39	0.09	0.39			
								Toluene	0.01	0.06	0.01	0.06			
								Xylenes	0.01	0.03	0.01	0.03			
CM-1002	Vert St Rain CP	Same	Same	N/A	Oxid. Cat.	N/A	N/A	NOx	5.22	22.86	5.22	22.86	Gas/Vapor	O (Manufacturer Data/AP-42)	-
								CO	28.71	125.73	1.46	6.40			
								VOC	6.58	28.80	1.67	7.32			
								PM_{10}	<0.01	0.01	<0.01	0.01			
								PM Total	0.35	1.55	0.35	1.55			
								SO_2	0.02	0.09	0.02	0.09			
								Acetaldehyde	0.30	1.30	0.30	1.30			
								Acrolein	0.18	0.80	0.18	0.80			
								Benzene	0.02	0.07	0.02	0.07			
								Ethylbenzene	<0.01	0.01	<0.01	0.01			
								Formaldehyde	4.18	18.29	0.42	1.83			
								Methanol	0.09	0.39	0.09	0.39			
								Toluene	0.01	0.06	0.01	0.06			
								Xylenes	0.01	0.03	0.01	0.03			

CM-2001	Vert St Rain CP	Same	Same	N/A	Oxid. Cat.	N/A	N/A	NOx CO VOC PM_{10} PM Total SO_2 Acetaldehyde Acrolein Benzene Ethylbenzene Formaldehyde Methanol Toluene Xylenes	2.61 14.37 5.75 <0.01 0.16 0.01 0.13 0.08 0.01 <0.01 1.36 0.04 0.01 <0.01	11.44 62.93 25.17 0.01 0.69 0.01 0.57 0.35 0.03 <0.01 5.95 0.17 0.03 0.01	2.61 0.73 1.46 <0.01 0.16 0.01 0.13 0.08 0.01 <0.01 0.16 0.04 0.01 <0.01	11.44 3.20 6.41 0.01 0.69 0.04 0.57 0.35 0.03 <0.01 0.69 0.17 0.03 0.01	Gas/Vapor	O (Manufacturer Data/AP-42)	-
H-711	Vert St Rain CP	Same	Same	N/A	None	N/A	N/A	NOx CO VOC PM_{10} PM Total SO_2 n-Hexane	0.24 0.47 0.04 0.01 0.05 <0.01 0.01	1.03 2.07 0.17 0.06 0.23 0.02 0.06	0.24 0.47 0.04 0.01 0.05 <0.01 0.01	1.03 2.07 0.17 0.06 0.23 0.02 0.06	Gas/Vapor	O (Manufacturer Data/AP-42)	-
H-771	Vert St Rain CP	Same	Same	N/A	None	N/A	N/A	NOx CO VOC PM_{10} PM Total SO_2 n-Hexane	0.85 1.70 0.14 0.05 0.19 0.02 0.05	3.71 7.42 0.61 0.21 0.84 0.07 0.20	0.85 1.70 0.14 0.05 0.19 0.02 0.05	3.71 7.42 0.61 0.21 0.84 0.07 0.20	Gas/Vapor	O (Manufacturer Data/AP-42)	-
DH-001	Vert St	Same	Same	N/A	Flare	N/A	N/A	Benzene Toluene Xylenes n-Hexane	0.04 0.12 0.06 0.12	0.18 0.52 0.24 0.53	0.04 0.12 0.06 0.12	0.18 0.52 0.24 0.53	Gas / Vapor	GRI-GLYCalc	-
RB-001	Vert St	Same	Same	N/A	None	N/A	N/A	NOx CO VOC PM_{10} PM Total SO_2 n-Hexane	0.18 0.15 0.01 <0.01 0.01 <0.01 <0.01	0.78 0.66 0.04 0.02 0.06 <0.01 0.01	0.18 0.15 0.01 <0.01 0.01 <0.01 <0.01	0.78 0.66 0.04 0.02 0.06 <0.01 0.01	Gas/Vapor	AP-42	-
FL-991	Vert St Rain CP	Same	Same	N/A	None	N/A	N/A	NOx CO VOC PM_{10} PM Total SO_2	0.11 0.09 0.01 0.01 0.01 <0.01	0.48 0.40 0.03 0.03 0.04 <0.01	0.11 0.09 0.01 0.01 0.01 <0.01	0.48 0.40 0.03 0.03 0.04 <0.01	Gas/Vapor	AP-42	-

TNK-001	Fugitives	Same	Same	N/A	VRU	N/A	N/A	VOC HAP	109.38 10.33	479.09 45.24	2.19 0.21	9.58 0.90	Gas/Vapor	HYSYS Run	-
FUG-001	Fugitives	Same	Same	N/A	None	N/A	N/A	VOC HAP	8.72 0.10	38.21 0.45	8.72 0.10	38.21 0.45	Gas/Vapor	EPA Protocol for Equipment Leak Emission Estimates	-
H-2711	Vert St Rain CP	Same	Same	N/A	None	N/A	N/A	NOx CO VOC PM_{10} PM Total SO_2 n-Hexane	0.24 0.47 0.04 0.01 0.05 <0.01 0.01	1.03 2.07 0.17 0.06 0.23 0.02 0.06	0.24 0.47 0.04 0.01 0.05 <0.01 0.01	1.03 2.07 0.17 0.06 0.23 0.02 0.06	Gas/Vapor	O (Manufacturer Data/AP-42)	
H-3711	Vert St Rain CP	Same	Same	N/A	None	N/A	N/A	NOx CO VOC PM_{10} PM Total SO_2 n-Hexane	0.24 0.47 0.04 0.01 0.05 <0.01 0.01	1.03 2.07 0.17 0.06 0.23 0.02 0.06	0.24 0.47 0.04 0.01 0.05 <0.01 0.01	1.03 2.07 0.17 0.06 0.23 0.02 0.06	Gas/Vapor	O (Manufacturer Data/AP-42)	
H-4711	Vert St Rain CP	Same	Same	N/A	None	N/A	N/A	NOx CO VOC PM_{10} PM Total SO_2 n-Hexane	0.72 0.72 0.34 0.03 0.23 <0.01 <0.01	3.15 3.15 1.50 0.13 1.02 0.04 0.01	0.72 0.72 0.34 0.03 0.23 <0.01 <0.01	3.15 3.15 1.50 0.13 1.02 0.04 0.01	Gas/Vapor	O (Manufacturer Data/AP-42)	
H-5711	Vert St Rain CP	Same	Same	N/A	None	N/A	N/A	NOx CO VOC PM_{10} PM Total SO_2 n-Hexane	0.72 0.72 0.34 0.03 0.23 <0.01 <0.01	3.15 3.15 1.50 0.13 1.02 0.04 0.01	0.72 0.72 0.34 0.03 0.23 <0.01 <0.01	3.15 3.15 1.50 0.13 1.02 0.04 0.01	Gas/Vapor	O (Manufacturer Data/AP-42)	
H-6711	Vert St Rain CP	Same	Same	N/A	None	N/A	N/A	NOx CO VOC PM_{10} PM Total SO_2 n-Hexane	0.72 0.72 0.34 0.03 0.23 <0.01 <0.01	3.15 3.15 1.50 0.13 1.02 0.04 0.01	0.72 0.72 0.34 0.03 0.23 <0.01 <0.01	3.15 3.15 1.50 0.13 1.02 0.04 0.01	Gas/Vapor	O (Manufacturer Data/AP-42)	

H-4712	Vert St Rain CP	Same	Same	N/A	None	N/A	N/A	NOx CO VOC PM_{10} PM Total SO_2 n-Hexane	0.26 0.26 0.12 0.09 0.09 <0.01 <0.01	1.16 1.16 0.55 0.38 0.38 0.02 <0.01	0.26 0.26 0.12 0.09 0.09 <0.01 <0.01	1.16 1.16 0.55 0.38 0.38 0.02 <0.01	Gas/Vapor	O (Manufacturer Data/AP-42)	
H-6712	Vert St Rain CP	Same	Same	N/A	None	N/A	N/A	NOx CO VOC PM_{10} PM Total SO_2 n-Hexane	0.26 0.26 0.12 0.09 0.09 <0.01 <0.01	1.16 1.16 0.55 0.38 0.38 0.02 <0.01	0.26 0.26 0.12 0.09 0.09 <0.01 <0.01	1.16 1.16 0.55 0.38 0.38 0.02 <0.01	Gas/Vapor	O (Manufacturer Data/AP-42)	
H-742	Vert St Rain CP	Same	Same	N/A	None	N/A	N/A	NOx CO VOC PM_{10} PM Total SO_2 n-Hexane	0.22 0.18 0.01 0.02 0.02 <0.01 <0.01	0.96 0.81 0.05 0.07 0.07 <0.01 <0.01	0.22 0.18 0.01 0.02 0.02 <0.01 <0.01	0.96 0.81 0.05 0.07 0.07 <0.01 <0.01	Gas/Vapor	O (Manufacturer Data/AP-42)	
H-7711	Vert St Rain CP	Same	Same	N/A	None	N/A	N/A	NOx CO VOC PM_{10} PM Total SO_2 n-Hexane	0.72 0.72 0.34 0.03 0.23 <0.01 <0.01	3.15 3.15 1.50 0.13 1.02 0.04 0.01	0.72 0.72 0.34 0.03 0.23 <0.01 <0.01	3.15 3.15 1.50 0.13 1.02 0.04 0.01	Gas/Vapor	O (Manufacturer Data/AP-42)	
H-8711	Vert St Rain CP	Same	Same	N/A	None	N/A	N/A	NOx CO VOC PM_{10} PM Total SO_2 n-Hexane	0.72 0.72 0.34 0.03 0.23 <0.01 <0.01	3.15 3.15 1.50 0.13 1.02 0.04 0.01	0.72 0.72 0.34 0.03 0.23 <0.01 <0.01	3.15 3.15 1.50 0.13 1.02 0.04 0.01	Gas/Vapor	O (Manufacturer Data/AP-42)	
H-9711	Vert St Rain CP	Same	Same	N/A	None	N/A	N/A	NOx CO VOC PM_{10} PM Total SO_2 n-Hexane	0.72 0.72 0.34 0.03 0.23 <0.01 <0.01	3.15 3.15 1.50 0.13 1.02 0.04 0.01	0.72 0.72 0.34 0.03 0.23 <0.01 <0.01	3.15 3.15 1.50 0.13 1.02 0.04 0.01	Gas/Vapor	O (Manufacturer Data/AP-42)	

H-8712	Vert St Rain CP	Same	Same	N/A	None	N/A	N/A	NOx CO VOC PM_{10} PM Total SO_2 n-Hexane	0.26 0.26 0.12 0.09 0.09 <0.01 <0.01	1.16 1.16 0.55 0.38 0.38 0.02 <0.01	0.26 0.26 0.12 0.09 0.09 <0.01 <0.01	1.16 1.16 0.55 0.38 0.38 0.02 <0.01	Gas/Vapor	O (Manufacturer Data/AP-42)	
H-2742	Vert St Rain CP	Same	Same	N/A	None	N/A	N/A	NOx CO VOC PM_{10} PM Total SO_2 n-Hexane	0.22 0.18 0.01 0.02 0.02 <0.01 <0.01	0.96 0.81 0.05 0.07 0.07 <0.01 <0.01	0.22 0.18 0.01 0.02 0.02 <0.01 <0.01	0.96 0.81 0.05 0.07 0.07 <0.01 <0.01	Gas/Vapor	O (Manufacturer Data/AP-42)	
H-3742	Vert St Rain CP	Same	Same	N/A	None	N/A	N/A	NOx CO VOC PM_{10} PM Total SO_2 n-Hexane	0.22 0.18 0.01 È.02 0.02 <0.01 <0.01	0.96 0.81 0.05 0.07 0.07 <0.01 <0.01	0.22 0.18 0.01 0.02 0.02 <0.01 <0.01	0.96 0.81 0.05 0.07 0.07 <0.01 <0.01	Gas/Vapor	O (Manufacturer Data/AP-42)	
D1-H-782	Vert St Rain CP	Same	Same	N/A	None	N/A	N/A	NOx CO VOC PM_{10} PM Total SO_2 n-Hexane	3.40 4.53 0.57 0.78 0.78 0.06 0.02	14.90 19.86 2.48 3.43 3.43 0.27 0.81	3.40 4.53 0.57 0.78 0.78 0.06 0.02	14.90 19.86 2.48 3.43 3.43 0.27 0.81	Gas/Vapor	O (Manufacturer Data/AP-42)	
D1-H-741	Vert St Rain CP	Same	Same	N/A	None	N/A	N/A	NOx CO VOC PM_{10} PM Total SO_2 n-Hexane	0.49 0.50 0.23 0.16 0.16 <0.01 <0.02	2.14 2.20 1.02 0.70 0.70 0.03 0.09	0.49 0.50 0.23 0.16 0.16 <0.01 <0.02	2.14 2.20 1.02 0.70 0.70 0.03 0.09	Gas/Vapor	O (Manufacturer Data/AP-42)	
H-751	Vert St Rain CP	Same	Same	N/A	None	N/A	N/A	NOx CO VOC PM_{10} PM Total SO_2 n-Hexane	0.25 0.25 0.12 0.08 0.08 <0.01 0.01	1.11 1.11 0.53 0.36 0.36 0.02 0.05	0.25 0.25 0.12 0.08 0.08 <0.01 0.01	1.11 1.11 0.53 0.36 0.36 0.02 0.05	Gas/Vapor	O (Manufacturer Data/AP-42)	

The EMISSION POINTS DATA SUMMARY SHEET provides a summation of emissions by emission unit. Note that uncaptured process emission unit emissions are not typically considered to be fugitive and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET. Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions). Please complete the FUGITIVE EMISSIONS DATA SUMMARY SHEET for fugitive emission activities.

[1] Please add descriptors such as upward vertical stack, downward vertical stack, horizontal stack, relief vent, rain cap, etc.

[2] Indicate by "C" if venting is continuous. Otherwise, specify the average short-term venting rate with units, for intermittent venting (ie., 15 min/hr). Indicate as many rates as needed

to clarify frequency of venting (e.g., 5 min/day, 2 days/wk).

[3] List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. **LIST** Acids, CO, CS_2, VOCs, H_2S, Inorganics, Lead, Organics, O_3, NO, NO_2, SO_2, SO_3, all applicable Greenhouse Gases (including CO_2 and methane), etc. **DO NOT LIST** H_2, H_2O, N_2, O_2, and Noble Gases.

[4] Give maximum potential emission rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

[5] Give maximum potential emission rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

[6] Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify).

[7] Provide for all pollutant emissions. Typically, the units of parts per million by volume (ppmv) are used. If the emission is a mineral acid (sulfuric, nitric, hydrochloric or phosphoric) use units of milligram per dry cubic meter (mg/m^3) at standard conditions (68 °F and 29.92 inches Hg) (see 45CSR7). If the pollutant is SO_2, use units of ppmv (See 45CSR10).

Attachment J
EMISSION POINTS DATA SUMMARY SHEET

Table 2: Release Parameter Data								
Emission Point ID No. *(Must match Emission Units Table)*	Inner Diameter (ft.)	Exit Gas			Emission Point Elevation (ft)		UTM Coordinates (km)	
		Temp. (°F)	Volumetric Flow [1] (acfm) *at operating conditions*	Velocity (fps)	Ground Level *(Height above mean sea level)*	Stack Height [2] *(Release height of emissions above ground level)*	Northing	Easting
CM-1001	1.5	856	32,100	302.7	1,235	45 (est.)	4346.885	526.921
CM-1002	1.5	856	32,100	302.7	1,235	45 (est.)	4346.885	526.921
CM-2001	1.5	857	16,098	151.8	1,235	45 (est.)	4346.885	526.921
H-711	2.5	550	115	0.4	1,235	15 (est.)	4346.885	526.921
H-771	Unknown	550	Unknown	Unknown	1,235	15 (est.)	4346.885	526.921
DH-001	Unknown	212	149 scfm	Unknown	1,235	Unknown	4346.885	526.921
RB-001	Unknown	Unknown	Unknown	Unknown	1,235	Unknown	4346.885	526.921
FL-991	4.5	Unknown	135,011 scfm	141.4	1,235	195.0	4346.885	526.921
TNK-001	N/A	Ambient	N/A	N/A	1,235	N/A	4346.885	526.921
FUG-001	N/A	Ambient	N/A	N/A	1,235	N/A	4346.885	526.921
H-2711	2.5	550	115	0.4	1,235	15 (est.)	4346.885	526.921
H-3711	2.5	550	115	0.4	1,235	15 (est.)	4346.885	526.921
H-4711	2.5	530	79.6 acfm	0.27	1,235	24	4346.885	526.921
H-5711	2.5	530	79.6 acfm	0.27	1,235	24	4346.885	526.921
H-6711	2.5	530	79.6 acfm	0.27	1,235	24	4346.885	526.921
H-4712	2.5	550	Unknown	Unknown	1,235	15 (est)	4346.885	526.921
H-6712	2.5	550	Unknown	Unknown	1,235	15 (est)	4346.885	526.921

Table 2: Release Parameter Data								
Emission Point ID No. *(Must match Emission Units Table)*	Inner Diameter (ft.)	Exit Gas			Emission Point Elevation (ft)		UTM Coordinates (km)	
		Temp. (°F)	Volumetric Flow [1] (acfm) *at operating conditions*	Velocity (fps)	Ground Level *(Height above mean sea level)*	Stack Height [2] *(Release height of emissions above ground level)*	Northing	Easting
H-742	**2.5**	**550**	**Unknown**	**Unknown**	**1,235**	**15 (est)**	**4346.885**	**526.921**
H-7711	**2.5**	**530**	**79.6 acfm**	**0.27**	**1,235**	**24**	**4346.885**	**526.921**
H-8711	**2.5**	**530**	**79.6 acfm**	**0.27**	**1,235**	**24**	**4346.885**	**526.921**
H-9711	**2.5**	**530**	**79.6 acfm**	**0.27**	**1,235**	**24**	**4346.885**	**526.921**
H-8712	**2.5**	**550**	**Unknown**	**Unknown**	**1,235**	**15 (est)**	**4346.885**	**526.921**
H-2724	**2.5**	**550**	**Unknown**	**Unknown**	**1,235**	**15 (est)**	**4346.885**	**526.921**
H-3742	**2.5**	**550**	**Unknown**	**Unknown**	**1,235**	**15 (est)**	**4346.885**	**526.921**
D1-H-782	**7.5**	**560**	**26,242**	**9.90**	**1,235**	**80**	**4346.885**	**526.921**
D1-H-741	**2.0**	**550**	**7,714**	**40.9**	**1,235**	**20**	**4346.885**	**526.921**
Note: Final equipment locations not yet determined; site UTM coordinates provided for each emission source.								

[1] Give at operating conditions. Include inerts.
[2] Release height of emissions above ground level.

ATTACHMENT K: FUGITIVE EMISSIONS DATA SUMMARY SHEET

Attachment K

FUGITIVE EMISSIONS DATA SUMMARY SHEET

The FUGITIVE EMISSIONS SUMMARY SHEET provides a summation of fugitive emissions. Fugitive emissions are those emissions which could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening. Note that uncaptured process emissions are not typically considered to be fugitive, and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET.

Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions).

APPLICATION FORMS CHECKLIST - FUGITIVE EMISSIONS
1.) Will there be haul road activities? ☐ Yes ☒ No ☐ If YES, then complete the HAUL ROAD EMISSIONS UNIT DATA SHEET.
2.) Will there be Storage Piles? ☐ Yes ☒ No ☐ If YES, complete Table 1 of the NONMETALLIC MINERALS PROCESSING EMISSIONS UNIT DATA SHEET.
3.) Will there be Liquid Loading/Unloading Operations? ☐ Yes ☒ No ☐ If YES, complete the BULK LIQUID TRANSFER OPERATIONS EMISSIONS UNIT DATA SHEET.
4.) Will there be emissions of air pollutants from Wastewater Treatment Evaporation? ☐ Yes ☒ No ☐ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.
5.) Will there be Equipment Leaks (e.g. leaks from pumps, compressors, in-line process valves, pressure relief devices, open-ended valves, sampling connections, flanges, agitators, cooling towers, etc.)? ☒ Yes ☐ No ☒ If YES, complete the LEAK SOURCE DATA SHEET section of the CHEMICAL PROCESSES EMISSIONS UNIT DATA SHEET.
6.) Will there be General Clean-up VOC Operations? ☐ Yes ☒ No ☐ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.
7.) Will there be any other activities that generate fugitive emissions? ☐ Yes ☒ No ☐ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET or the most appropriate form.
If you answered "NO" to all of the items above, it is not necessary to complete the following table, "Fugitive Emissions Summary."

FUGITIVE EMISSIONS SUMMARY	All Regulated Pollutants Chemical Name/CAS [1]	Maximum Potential Uncontrolled Emissions [2]		Maximum Potential Controlled Emissions [3]		Est. Method Used [4]
		lb/hr	ton/yr	lb/hr	ton/yr	
Haul Road/Road Dust Emissions Paved Haul Roads	**Not applicable**					
Unpaved Haul Roads	**Not applicable**					
Storage Pile Emissions	**Not applicable**					
Loading/Unloading Operations	**Not applicable**					
Wastewater Treatment Evaporation & Operations	**Not applicable**					
Equipment Leaks	**VOC HAP**	**4.33 0.051**	**18.97 0.222**	**4.33 0.051**	**18.97 0.222**	**EPA**
General Clean-up VOC Emissions	**Not applicable**					
Other	**Not applicable**					

[1] List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS_2, VOCs, H_2S, Inorganics, Lead, Organics, O_3, NO, NO_2, SO_2, SO_3, all applicable Greenhouse Gases (including CO_2 and methane), etc. DO NOT LIST H_2, H_2O, N_2, O_2, and Noble Gases.

[2] Give rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

[3] Give rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

[4] Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify).

ATTACHMENT L: EMISSION UNIT DATA SHEETS

EUDS - General: Heaters

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): H-751

1. Name or type and model of proposed affected source: Stabilization Heater II, 6.35 mmBtu/hr
2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.
3. Name(s) and maximum amount of proposed process material(s) charged per hour: Emissions provided in Question 8. Unit will operate a maximum of 8,760 hours per year.
4. Name(s) and maximum amount of proposed material(s) produced per hour: Emissions provided in Question 8.
5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants: Emissions from the combustion of natural gas.

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable):

(a) Type and amount in appropriate units of fuel(s) to be burned:

Natural gas is used for fuel (estimated maximum of 53.6 million standard cubic feet per year with fuel higher heating value of 1,037 Btu/scf)

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

Sulfur and ash are insignificant.

(c) Theoretical combustion air requirement (ACF/unit of fuel):

Unknown @ °F and psia.

(d) Percent excess air:

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

Enhanced IFGR – Ultra Low NOx, 6.35 mmBtu/hr

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

Not applicable

(g) Proposed maximum design heat input: 6.35 × 10^6 BTU/hr.

7. Projected operating schedule:

Hours/Day	24	Days/Week	7	Weeks/Year	52

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used:

@ 60 °F and 14.5 psia

a.	NO_X	0.25 lb/hr	grains/ACF
b.	SO_2	<0.01 lb/hr	grains/ACF
c.	CO	0.25 lb/hr	grains/ACF
d.	PM_{10}	0.08 lb/hr	grains/ACF
e.	Hydrocarbons	lb/hr	grains/ACF
f.	VOCs	0.12 lb/hr	grains/ACF
g.	Pb	lb/hr	grains/ACF
h.	Specify other(s)		
	Total HAPs	0.012 lb/hr	grains/ACF
	Note: Speciated HAPs are presented in attachment J.	lb/hr	grains/ACF
		lb/hr	grains/ACF
		lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
None proposed	Record operating hours
REPORTING	**TESTING**
As required	Not applicable

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

To be determined upon delivery

ATTACHMENT N: SUPPORTING EMISSIONS CALCULATIONS

EXAMPLE CALCULATIONS

g/hp-hr Emission Factors:

Emission Factor (g/hp-hr) * Engine Rating (hp) * 1 lb/453.6 g = lb/hr

lb/mmBtu Emission Factors:

Emission Factor (lb/mmBtu) * Engine Rating (hp) * Fuel Use (Btu/hp-hr) * 1 mmBtu/1000000 Btu = lb/hr

lb/mmscf Emission Factors:

Emission Factor (lb/mmscf) * Heater Rating (mmBtu/hr) * 1/Fuel Heating Value (Btu/scf) = lb/hr

Tons per Year (TPY) Conversion:

lb/hr * Hours/Year * 1 ton/2000 lb = TPY

MarkWest Liberty Midstream & Resources L.L.C.
Sherwood Gas Plant

Summary of Facility-Wide Potential Emissions

Criteria Pollutant Potential Emissions

Process/Facility	Potential Emissions (lb/hr)					
	NOx	CO	VOC	SO_2	PM[1]	HAPs
Compressor Engine #1 (CM-1001)	5.22	1.46	1.67	0.02	0.35	1.10
Compressor Engine #2 (CM-1002)	5.22	1.46	1.67	0.02	0.35	1.10
Compressor Engine (CM-2001)	2.61	0.73	1.46	0.01	0.16	0.46
Regeneration Heater (H-711)	0.24	0.47	0.038	0.0042	0.05	0.013
Regeneration Heater (H-2711)	0.24	0.47	0.038	0.0042	0.05	0.013
Regeneration Heater (H-3711)	0.24	0.47	0.038	0.0042	0.05	0.013
Regeneration Heater (H-4711)	0.72	0.72	0.342	0.0096	0.23	0.030
Regeneration Heater (H-5711)	0.72	0.72	0.342	0.0096	0.23	0.030
Regeneration Heater (H-6711)	0.72	0.72	0.342	0.0096	0.23	0.030
Regeneration Heater (H-7711)	0.72	0.72	0.342	0.0096	0.23	0.030
Regeneration Heater (H-8711)	0.72	0.72	0.342	0.0096	0.23	0.030
Regeneration Heater (H-9711)	0.72	0.72	0.342	0.0096	0.23	0.030
Hot Oil Heater (H-771)	0.85	1.70	0.138	0.0151	0.19	0.047
Hot Oil Heater (H-4712)	0.26	0.26	0.125	0.0038	0.09	0.012
Hot Oil Heater (H-6712)	0.26	0.26	0.125	0.0038	0.09	0.012
Hot Oil Heater (H-8712)	0.26	0.26	0.125	0.0038	0.09	0.012
Stabilization Heater (H-742)	0.22	0.18	0.012	0.0013	0.02	0.004
Stabilization II Heater (H-2742)	0.22	0.18	0.012	0.0013	0.02	0.004
Stabilization III Heater (H-3742)	0.22	0.18	0.012	0.0013	0.02	0.004
Stabilization Heater (H-751)	0.25	0.25	0.121	0.0037	0.08	0.012
DeEth HMO (D1-H-782)	3.40	4.53	0.567	0.0618	0.78	0.195
DeEth Regen (D1-H-741)	0.49	0.50	0.232	0.0067	0.16	0.021
TEG Dehydration Unit (DH-001)	--	--	2.017	--	--	0.336
Dehydration Unit Reboiler (RB-001)	0.18	0.15	0.010	0.0011	0.01	0.003
Storage Tanks	--	--	3.55	--	--	0.26
Emergency Flare (FL-991)	0.11	0.10	0.006	0.0007	0.01	--
Facility Blowdowns	--	--	--	--	--	--
Fugitive Emissions (FUG-001)	--	--	4.331	--	--	0.051
Site Wide Emissions (lb/hr)	**24.81**	**17.97**	**18.36**	**0.23**	**3.97**	**3.87**

[1] $PM = PM_{10} = PM_{2.5}$

MarkWest Liberty Midstream & Resources L.L.C.
Sherwood Gas Plant

Summary of Facility-Wide Potential Emissions

Criteria Pollutant Potential Emissions

Process/Facility	Potential Emissions (tpy)					
	NOx	CO	VOC	SO_2	PM[1]	HAPs
Compressor Engine #1 (CM-1001)	22.86	6.40	7.32	0.09	1.55	4.84
Compressor Engine #2 (CM-1002)	22.86	6.40	7.32	0.09	1.55	4.84
Compressor Engine (CM-2001)	11.44	3.20	6.41	0.04	0.69	2.02
Regeneration Heater (H-711)	1.03	2.07	0.17	0.018	0.23	0.058
Regeneration Heater (H-2711)	1.03	2.07	0.17	0.018	0.23	0.058
Regeneration Heater (H-3711)	1.03	2.07	0.17	0.018	0.23	0.058
Regeneration Heater (H-4711)	3.15	3.15	1.50	0.042	1.02	0.132
Regeneration Heater (H-5711)	3.15	3.15	1.50	0.042	1.02	0.132
Regeneration Heater (H-6711)	3.15	3.15	1.50	0.042	1.02	0.132
Regeneration Heater (H-7711)	3.15	3.15	1.50	0.042	1.02	0.132
Regeneration Heater (H-8711)	3.15	3.15	1.50	0.042	1.02	0.132
Regeneration Heater (H-9711)	3.15	3.15	1.50	0.042	1.02	0.132
Hot Oil Heater (H-771)	3.71	7.42	0.605	0.0661	0.84	0.208
Hot Oil Heater (H-4712)	1.16	1.16	0.549	0.0167	0.38	0.053
Hot Oil Heater (H-6712)	1.16	1.16	0.55	0.017	0.38	0.053
Hot Oil Heater (H-8712)	1.16	1.16	0.55	0.017	0.38	0.053
Stabilization Heater (H-742)	0.96	0.81	0.053	0.0058	0.07	0.018
Stabilization II Heater (H-2742)	0.96	0.81	0.053	0.0058	0.07	0.018
Stabilization III Heater (H-3742)	0.96	0.81	0.053	0.0058	0.07	0.018
Stabilization Heater (H-751)	1.11	1.11	0.528	0.0161	0.36	0.051
DeEth HMO (D1-H-782)	14.90	19.86	2.483	0.2708	3.43	0.852
DeEth Regen (D1-H-741)	2.14	2.20	1.018	0.0292	0.70	0.092
TEG Dehydration Unit (DH-001)	--	--	8.836	--	--	1.470
Dehydration Unit Reboiler (RB-001)	0.78	0.65	0.043	0.0047	0.06	0.015
Storage Tanks	--	--	9.58	--	--	0.92
Emergency Flare (FL-991)	0.50	0.42	0.028	0.0030	0.04	--
Facility Blowdowns	--	--	1.816	--	--	0.087
Fugitive Emissions (FUG-001)	--	--	18.97	--	--	0.222
Site Wide Emissions (tpy)	**108.68**	**78.69**	**76.25**	**0.99**	**17.40**	**16.80**

[1] $PM = PM_{10} = PM_{2.5}$

MarkWest Liberty Midstream & Resources L.L.C.
Sherwood Gas Plant

Summary of Facility-Wide Potential Emissions

Hazardous Air Pollutant Potential Emissions

Process/Facility	HAPs - Potential Emissions (lb/hr)					
	Benzene	Ethylbenzene	Toluene	Xylenes	n-Hexane	Formaldehyde
Compressor Engine #1 (CM-1001)	1.56E-02	1.41E-03	1.45E-02	6.52E-03	3.93E-02	4.18E-01
Compressor Engine #2 (CM-1002)	1.56E-02	1.41E-03	1.45E-02	6.52E-03	3.93E-02	4.18E-01
Compressor Engine (CM-2001)	6.91E-03	6.24E-04	6.41E-03	2.89E-03	1.74E-02	1.57E-01
Regeneration Heater (H-711)	1.47E-05	--	2.38E-05	--	1.26E-02	5.24E-04
Regeneration Heater (H-2711)	1.47E-05	--	2.38E-05	--	1.26E-02	5.24E-04
Regeneration Heater (H-3711)	1.47E-05	--	2.38E-05	--	1.26E-02	5.24E-04
Regeneration Heater (H-4711)	3.36E-05	--	5.44E-05	--	2.88E-02	1.20E-03
Regeneration Heater (H-5711)	3.36E-05	--	5.44E-05	--	2.88E-02	1.20E-03
Regeneration Heater (H-6711)	3.36E-05	--	5.44E-05	--	2.88E-02	1.20E-03
Regeneration Heater (H-7711)	3.36E-05	--	5.44E-05	--	2.88E-02	1.20E-03
Regeneration Heater (H-8711)	3.36E-05	--	5.44E-05	--	2.88E-02	1.20E-03
Regeneration Heater (H-9711)	3.36E-05	--	5.44E-05	--	2.88E-02	1.20E-03
Hot Oil Heater (H-771)	5.28E-05	--	8.55E-05	--	4.52E-02	1.89E-03
Hot Oil Heater (H-4712)	1.34E-05	--	2.16E-05	--	1.15E-02	4.77E-04
Hot Oil Heater (H-6712)	1.34E-05	--	2.16E-05	--	1.15E-02	4.77E-04
Hot Oil Heater (H-8712)	1.34E-05	--	2.16E-05	--	1.15E-02	4.77E-04
Stabilization Heater (H-742)	4.62E-06	--	7.48E-06	--	3.96E-03	1.65E-04
Stabilization II Heater (H-2742)	4.62E-06	--	7.48E-06	--	3.96E-03	1.65E-04
Stabilization III Heater (H-3742)	4.62E-06	--	7.48E-06	--	3.96E-03	1.65E-04
Stabilization Heater (H-751)	1.29E-05	--	2.08E-05	--	1.10E-02	4.59E-04
DeEth HMO (D1-H-782)	2.16E-04	--	3.50E-04	--	1.85E-01	7.73E-03
DeEth Regen (D1-H-741)	2.33E-05	--	3.78E-05	--	2.00E-02	8.34E-04
TEG Dehydration Unit (DH-001)	4.00E-02	--	1.19E-01	5.55E-02	1.21E-01	--
Dehydration Unit Reboiler (RB-001)	3.74E-06	--	6.05E-06	--	3.20E-03	1.33E-04
Storage Tanks	--	--	--	--	2.64E-01	--
Emergency Flare (FL-991)	--	--	--	--	--	--
Facility Blowdowns	--	--	--	--	--	--
Fugitive Emissions (FUG-001)	--	--	--	--	--	--
Site Wide Emissions (lb/hr)	**0.08**	**0.00**	**0.16**	**0.07**	**1.00**	**1.01**

MarkWest Liberty Midstream & Resources L.L.C.
Sherwood Gas Plant

Summary of Facility-Wide Potential Emissions

Hazardous Air Pollutant Potential Emissions

Process/Facility	HAPs - Potential Emissions (tpy)					
	Benzene	Ethylbenzene	Toluene	Xylenes	n-Hexane	Formaldehyde
Compressor Engine #1 (CM-1001)	6.83E-02	6.16E-03	6.33E-02	2.86E-02	1.72E-01	1.83E+00
Compressor Engine #2 (CM-1002)	6.83E-02	6.16E-03	6.33E-02	2.86E-02	1.72E-01	1.83E+00
Compressor Engine (CM-2001)	3.03E-02	2.73E-03	2.81E-02	1.27E-02	7.64E-02	6.87E-01
Regeneration Heater (H-711)	6.43E-05	--	1.04E-04	--	5.51E-02	2.30E-03
Regeneration Heater (H-2711)	6.43E-05	--	1.04E-04	--	5.51E-02	2.30E-03
Regeneration Heater (H-3711)	6.43E-05	--	1.04E-04	--	5.51E-02	2.30E-03
Regeneration Heater (H-4711)	1.47E-04	--	2.38E-04	--	1.26E-01	5.26E-03
Regeneration Heater (H-5711)	1.47E-04	--	2.38E-04	--	1.26E-01	5.26E-03
Regeneration Heater (H-6711)	1.47E-04	--	2.38E-04	--	1.26E-01	5.26E-03
Regeneration Heater (H-7711)	1.47E-04	--	2.38E-04	--	1.26E-01	5.26E-03
Regeneration Heater (H-8711)	1.47E-04	--	2.38E-04	--	1.26E-01	5.26E-03
Regeneration Heater (H-9711)	2.31E-04	--	3.74E-04	--	1.98E-01	8.26E-03
Hot Oil Heater (H-771)	2.31E-04	--	3.74E-04	--	1.98E-01	8.26E-03
Hot Oil Heater (H-4712)	5.85E-05	--	9.48E-05	--	5.02E-02	2.09E-03
Hot Oil Heater (H-6712)	5.85E-05	--	9.48E-05	--	5.02E-02	2.09E-03
Hot Oil Heater (H-8712)	5.85E-05	--	9.48E-05	--	5.02E-02	2.09E-03
Stabilization Heater (H-742)	2.02E-05	--	3.27E-05	--	1.73E-02	7.22E-04
Stabilization II Heater (H-2742)	2.02E-05	--	3.27E-05	--	1.73E-02	7.22E-04
Stabilization III Heater (H-3742)	2.02E-05	--	3.27E-05	--	1.73E-02	7.22E-04
Stabilization Heater (H-751)	5.63E-05	--	9.12E-05	--	4.83E-02	2.01E-03
DeEth HMO (D1-H-782)	9.48E-04	--	1.53E-03	--	8.12E-01	3.39E-02
DeEth Regen (D1-H-741)	1.02E-04	--	1.66E-04	--	8.77E-02	3.65E-03
TEG Dehydration Unit (DH-001)	1.75E-01	--	5.21E-01	2.43E-01	5.32E-01	--
Dehydration Unit Reboiler (RB-001)	1.64E-05	--	2.65E-05	--	1.40E-02	5.85E-04
Storage Tanks	--	--	--	--	9.23E-01	--
Emergency Flare (FL-991)	--	--	--	--	--	--
Facility Blowdowns	--	--	--	--	--	--
Fugitive Emissions (FUG-001)	--	--	--	--	--	--
Site Wide Emissions (tpy)	**0.34**	**0.02**	**0.68**	**0.31**	**4.23**	**4.44**

MarkWest Liberty Midstream & Resources L.L.C.
Sherwood Gas Plant

Summary of Facility-Wide Potential Emissions

GreenHouse Gas Emissions

Process/Facility	GHG $CO_2(e)$ tpy
Compressor Engines	4.54E+04
Heaters	1.81E+05
Dehydration Unit	3.05E+03
Storage Tanks	3.51E+02
Facility Blowdowns	2.97E+03
Fugitive Emissions (FUG-001)	6.22E+01
Site Wide Emissions (lb/hr)	**232512.22**

GHG Calculations
MarkWest Liberty Midstream & Resources L.L.C.
Sherwood Gas Plant

Reboiler/Heaters

Equipment	Heat Input (LHV) (mmbtu/hr)	Heat Input (HHV) (mmbtu/hr)	Emission Factors CO2 (lb/mmbtu)	CH4 (lb/mmbtu)	N20 (lb/mmbtu)	CO2(e) CO2 Emission Rate (tpy)	CO2(e) CH4 Emission Rate (tpy)	CO2(e) N2O Emission Rate (tpy)
Reboiler	2.0000	2.2000	116.887892	0.0022046	0.00022046	1126.33	0.53	0.66
Flare Pilot	0.0184	0.0203	116.887892	0.0022046	0.00022046	10.38	0.00	0.01
Heater H-711	7.86	8.6460	116.887892	0.0022046	0.00022046	4426.48	2.09	2.59
Heater H-771	28.25	31.0750	116.887892	0.0022046	0.00022046	15909.44	7.50	9.30
Heater H-2711	7.86	8.6460	116.887892	0.0022046	0.00022046	4426.48	2.09	2.59
Heater H-3711	7.86	8.6460	116.887892	0.0022046	0.00022046	4426.48	2.09	2.59
Heater H-4711	18.00	19.8000	116.887892	0.0022046	0.00022046	10136.99	4.78	5.93
Heater H-5711	18.00	19.8000	116.887892	0.0022046	0.00022046	10136.99	4.78	5.93
Heater H-6711	18.00	19.8000	116.887892	0.0022046	0.00022046	10136.99	4.78	5.93
Heater H-7711	18.00	19.8000	116.887892	0.0022046	0.00022046	10136.99	4.78	5.93
Heater H-8711	18.00	19.8000	116.887892	0.0022046	0.00022046	10136.99	4.78	5.93
Heater H-9711	18.00	19.8000	116.887892	0.0022046	0.00022046	10136.99	4.78	5.93
Heater H-4712	6.60	7.2600	116.887892	0.0022046	0.00022046	3716.89	1.75	2.17
Heater H-6712	6.60	7.2600	116.887892	0.0022046	0.00022046	3716.89	1.75	2.17
Heater H-8712	6.60	7.2600	116.887892	0.0022046	0.00022046	3716.89	1.75	2.17
Heater D1-H-782	113.36	124.6960	116.887892	0.0022046	0.00022046	63840.48	30.10	37.33
Heater D1-H-741	12.23	13.4530	116.887892	0.0022046	0.00022046	6887.52	3.25	4.03
Heater H-3742	2.28	2.5080	116.887892	0.0022046	0.00022046	1284.02	0.61	0.75
Heater H-2742	2.28	2.5080	116.887892	0.0022046	0.00022046	1284.02	0.61	0.75
Heater H-742	2.28	2.5080	116.887892	0.0022046	0.00022046	1284.02	0.61	0.75
Heater H-751	6.35	6.9850	116.887892	0.0022046	0.00022046	3576.10	1.69	2.09
Total						**180454.35**	**85.09**	**105.51**

Engines

HP	Fuel Use (HHV) (btu/bhp-hr)	Fuel Use (HHV) (mmbtu/yr)	Emission Factors CO2 (lb/mmbtu)	CH4 (lb/mmbtu)	N20 (lb/mmbtu)	CO2(e) CO2 Emission Rate (tpy)	CO2(e) CH4 Emission Rate (tpy)	CO2(e) N2O Emission Rate (tpy)
3616	7,484	310425.842	116.887892	0.0022046	0.00022046	18142.51117	8.5545602	10.6076546
3616	7,484	310425.842	116.887892	0.0022046	0.00022046	18142.51117	8.5545602	10.6076546
3608	7504	155792.045	116.887892	0.0022046	0.00022046	9105.101854	4.2932393	5.3236167
Total						**45390.12419**	**21.40235958**	**26.53892588**

MarkWest Liberty Midstream & Resources L.L.C.
Sherwood Gas Plant

Stabilizer Heater
(H-751)

Source Designation:	
Manufacturer:	Unknown
Year Installed	2017
Fuel Used:	Natural Gas
Higher Heating Value (HHV) (Btu/scf):	1,037
Heater Duty (mmbtu/hr)	5.000
Heat Input (MMBtu/hr)	6.35
Fuel Consumption (mmscf/hr):	6.12E-03
Potential Annual Hours of Operation (hr/yr):	8,760

Criteria and Manufacturer Specific Pollutant Emission Rates

Pollutant	**Emission Factor (lb/MMscf or lb/mmbtu)[a,b]**	**Potential Emissions (lb/hr)[c]**	**(tons/yr)[d]**
NO_x	0.04	0.254	1.113
CO	0.04	0.254	1.113
SO_2	0.6	0.0037	0.0161
PM Total	0.013	0.083	0.3616
PM Condensable	0.013	0.083	0.362
PM_{10} (Filterable)	0.013	0.083	0.362
$PM_{2.5}$ (Filterable)	0.013	0.083	0.362
VOC	0.019	0.121	0.528

Hazardous Air Pollutant (HAP) Potential Emissions

Pollutant	Emission Factor (lb/MMscf)[a]	Potential Emissions (lb/hr)[c]	Potential Emissions (tons/yr)[d]
HAPs:			
3-Methylchloranthrene	1.80E-06	1.10E-08	4.83E-08
7,12-Dimethylbenz(a)anthracene	1.60E-05	9.80E-08	4.29E-07
Acenaphthene	1.80E-06	1.10E-08	4.83E-08
Acenaphthylene	1.80E-06	1.10E-08	4.83E-08
Anthracene	2.40E-06	1.47E-08	6.44E-08
Benz(a)anthracene	1.80E-06	1.10E-08	4.83E-08
Benzene	2.10E-03	1.29E-05	5.63E-05
Benzo(a)pyrene	1.20E-06	7.35E-09	3.22E-08
Benzo(b)fluoranthene	1.80E-06	1.10E-08	4.83E-08
Benzo(g,h,i)perylene	1.20E-06	7.35E-09	3.22E-08
Benzo(k)fluoranthene	1.80E-06	1.10E-08	4.83E-08
Chrysene	1.80E-06	1.10E-08	4.83E-08
Dibenzo(a,h) anthracene	1.20E-06	7.35E-09	3.22E-08
Dichlorobenzene	1.20E-03	7.35E-06	3.22E-05
Fluoranthene	3.00E-06	1.84E-08	8.05E-08
Fluorene	2.80E-06	1.71E-08	7.51E-08
Formaldehyde	7.50E-02	4.59E-04	2.01E-03
Hexane	1.80E+00	1.10E-02	4.83E-02
Indo(1,2,3-cd)pyrene	1.80E-06	1.10E-08	4.83E-08
Phenanthrene	1.70E-05	1.04E-07	4.56E-07
Pyrene	5.00E-06	3.06E-08	1.34E-07
Toluene	3.40E-03	2.08E-05	9.12E-05
Arsenic	2.00E-04	1.22E-06	5.36E-06
Beryllium	1.20E-05	7.35E-08	3.22E-07
Cadmium	1.10E-03	6.74E-06	2.95E-05
Chromium	1.40E-03	8.57E-06	3.75E-05
Cobalt	8.40E-05	5.14E-07	2.25E-06
Lead	5.00E-04	3.06E-06	1.34E-05
Manganese	3.80E-04	2.33E-06	1.02E-05
Mercury	2.60E-04	1.59E-06	6.97E-06
Nickel	2.10E-03	1.29E-05	5.63E-05
Selenium	2.40E-05	1.47E-07	6.44E-07
Polycyclic Organic Matter:			
Methylnaphthalene (2-)	2.40E-05	1.47E-07	6.44E-07
Naphthalene	6.10E-04	3.74E-06	1.64E-05
Total HAP		**1.16E-02**	**5.06E-02**

[a] SO2 Emission factor from AP-42 Section 1.4 "Natural Gas Combustion" Tables 1.4-1, 1.4-2, & 1.4-3

[b] Nox, CO, PM and VOC emission factors from vendor guarantee.

[c] Emission Rate (lb/hr) = Rated Capacity (MMscf/hr) × Emission Factor (lb/MMscf).

[d] Annual Emissions $(\text{tons/yr})_{\text{Potential}} = (\text{lb/hr})_{\text{Emissions}} \times$ (Maximum Allowable Operating Hours, 8760 hr/yr) × (1 ton/2000 lb).

ATTACHMENT O: MONITORING/RECORDKEEPING/REPORTING/TESTING PLANS

MarkWest Liberty Midstream & Resources L.L.C. is not submitting any proposed plans other than those recommendations noted in Emissions Unit Data Sheets (Attachment L).

ATTACHMENT P: PUBLIC NOTICE

MarkWest Liberty Midstream & Resources L.L.C. has published a public notice in *The Herald Record* newspaper, headquartered in Doddridge County, WV. This paper serves the geographical area surrounding the proposed facility.

The affidavit issued by the paper showing the date of publication and the actual text is attached following the proposed text:

AIR QUALITY PERMIT NOTICE

Notice of Application

Notice is given that MarkWest Liberty Midstream & Resources L.L.C. has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a Class II Administrative Update for a 6.35 mmbtu/hr stabilization heater at the Sherwood Gas Plant located at 218 Swisher Lane, West Union, WV 26456 in Doddridge County, West Virginia. The latitude and longitude coordinates in decimal degrees are: 39.275987, -80.685308.

The applicant estimates the increased potential to discharge the following Regulated Air Pollutants will be:

Nitrogen Oxides (NOx)	1.11 tons/yr
Carbon Monoxide (CO)	1.11 tons/yr
Volatile Organic Compounds (VOC)	0.53 tons/yr
Particulate Matter (PM)	0.36 tons/yr
Sulfur Dioxide (SO_2)	0.01 tons/yr
Total HAPs	0.72 tons/yr

Startup of operation is planned to begin in June 2017. Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57th Street, SE, Charleston, WV 25304, for at least 30 calendar days from the date of publication of this notice.

Any questions regarding this permit application should be directed to the DAQ at (304) 926-0499, extension 1250, during normal business hours.

Dated this the 3rd day of November, 2016

By: MarkWest Liberty Midstream & Resources L.L.C.
Leanne Meyer
VP EH&S
1515 Arapahoe St.
Tower 1, Suite 1600
Denver, CO. 80202-2137

ATTACHMENT Q: CLAIMS OF CONFIDENTIALITY

MarkWest Liberty Midstream & Resources L.L.C. makes no claim of business confidentiality associated with this application.

ATTACHMENT R: AUTHORITY FORMS

Not applicable

APPLICATION FEE

Per 45CSR13 a fee of $300 must be submitted with a Class II Administrative Amendment.

APPENDIX A: SUPPORT DOCUMENTS

Heater Specification Sheets.

Owner:	**MARKWEST Liberty Midst.&Res., LLC**	Owner Ref.:	**H-751**	Ftnt
Purchaser:	EXTERRAN Energy Solutions, LP	Purchaser Ref.:	US-107340-H751	&
Manufacturer:	***TULSA HEATERS INC.***	***THI** Ref.:*	***J14-848***	Rev
Service:	Heat Medium	Unit No:	Utility	
Number:	One	Location:	West Union, West Virginia	
SHO Duty:	5.00 MMBTU/ hr	SHO Model:	SHO.750 HLX	
CMS.Release:	5.77 MMBTU/ hr	CMS Model:	CMS.1500 ULN	
SHOS Flow:	220 USgal/ min @ 200 ft TDH	SHOS.Model:	SHOS.330 Twin Pack	

PROCESS DESIGN CONDITIONS

Heater Section	---	RADIANT	CONVECTION		TOTAL
Operating Case	---	Design Case	Design Case		Design Case
Service	---	Heat Medium	Heat Medium		
Heat Absorption	MMBTU/ hr	**3.41**	**1.59**		**5.00**
Process Fluid	---	Therminol 55	Therminol 55		
Process Mass Flow Rate, Total	Lb/ hr	76,953	76,953		
Process Bulk Velocity (allow. / calc.)	ft/ s	--- / 7	--- / 5	/	
Process Mass Velocity (min./ calc.)	Lb/ s ft2	--- / 311	--- / 242	/	
Coking Allowance (dP calcs)	in				
Pressure Drop, Clean (allow. / calc.)	psi	< ------- **30**	/ **10** ------- >	/	
Pressure Drop, Fouled (allow. / calc.)	psi	< -------	/ ------- >	/	
Average Heat Flux (allowable)	BTU/ hr ft2	12,000			
Average Heat Flux (calculated)	BTU/ hr ft2	**11,380**			
Maximum Heat Flux (allowable)	BTU/ hr ft2				
Maximum Heat Flux (calculated)	BTU/ hr ft2	17,070	15,000		
Fouling Factor, Internal	hr ft2 °F/ BTU	0.002	0.002		
Max. Film Temperature (allow. / calc.)	°F	/ 463	/ 446	/	
Inlet Conditions:					
Temperature	°F	**282**	**245**		
Pressure	psig	**86**	**90**		
Mass Flow Rate, Liquid	Lb/ hr		76,953		
Mass Flow Rate, Vapor	Lb/ hr		0		
Weight Percent, Liquid / Vapor	wt%		100% / 0%	/	
Density, Liquid / Vapor	Lb/ ft3		50.30 / 0.00	/	
Molecular Weight, Liquid / Vapor	Lb/ Lbmole		/ 0.0	/	
Viscosity, Liquid / Vapor	cp		2.056 / 0.000	/	
Specific Heat, Liquid / Vapor	BTU/ Lb °F		0.540 / 0.000	/	
Thermal Conductivity, Liquid/Vapor	BTU/hr ft °F		0.068 / 0.000	/	
Surface Tension, Liquid	dyne/ cm		/	/	
Outlet Conditions:					
Temperature	°F	**360**	**282**		
Pressure	psig	**80**	**86**		
Mass Flow Rate, Liquid	Lb/ hr	76,953			
Mass Flow Rate, Vapor	Lb/ hr	0			
Weight Percent, Liquid / Vapor	wt%	100% / 0%		/	
Density, Liquid / Vapor	Lb/ ft3	47.50 / 0.00		/	
Molecular Weight, Liquid / Vapor	Lb/ Lbmole	/ 0.0		/	
Viscosity, Liquid / Vapor	cp	0.892 / 0.000		/	
Specific Heat, Liquid / Vapor	BTU/ Lb °F	0.590 / 0.000		/	
Thermal Conductivity, Liquid/Vapor	BTU/hr ft °F	0.063 / 0.000		/	
Surface Tension, Liquid	dyne/ cm	/		/	

revision	date	description	by	chk'd	appv'd
Rev.00	25-Jun-14	ISSUED w/ General Arrangement Package	MPL	TLC	JDC

MARKWEST Energy Partners, L.P. EXTERRAN THI TULSA HEATERS INC.

SHO = Superior Quality, Flexibility, Dependability & Modularity

FIRED HEATER DATA SHEET
AMERICAN ENGINEERING SYSTEM of UNITS

This document contains confidential information, and shall NOT be used, reproduced or disclosed without the prior written consent of TULSA HEATERS INC.

Owner:	**MARKWEST Liberty Midst.&Res., LLC**	Owner Ref.:	**H-751**	Ftnt
Purchaser:	EXTERRAN Energy Solutions, LP	Purch. Ref.:	US-107340-H751	&
Manufacturer:	***TULSA HEATERS INC.***	***THI*** Ref.:	***J14-848***	Rev
Service:	Heat Medium	Unit No:	Utility	
Number:	One	Location:	West Union, West Virginia	
SHO Duty:	4.37 MMBTU/ hr	SHO Model:	SHO.750 HLX	
CMS.Release:	4.97 MMBTU/ hr	CMS Model:	CMS.1500 ULN	
SHOS Flow:	220 USgal/ min @ 195 ft TDH	SHOS.Model:	SHOS.330 Twin Pack	

ADDITIONAL PROCESS OPERATING CONDITIONS

Heater Section	---	RADIANT	CONVECTION	CONVECTION	TOTAL
Operating Case	---	100% Design	100% Design	100% Design	100% Design
Service	---	Heat Medium	Heat Medium	Service "b"	
Heat Absorption	MMBTU/ hr	3.05	1.32	0.00	4.37
Process Fluid	---	Therminol 55	Therminol 55		
Process Mass Flow Rate, Total	Lb/ hr	67,275	67,275		
Process Bulk Velocity (allow. / calc.)	ft/ s	--- / 6	--- / 4	/	
Process Mass Velocity (min./ calc.)	Lb/ s ft2	--- / 272	--- / 211	/	
Coking Allowance (dP calcs)	in				
Pressure Drop, Clean (allow. / calc.)	psi	< ------- 30	/ 8 ------- >		
Pressure Drop, Fouled (allow. / calc.)	psi	< -------	/ ------- >		
Average Heat Flux (allowable)	BTU/ hr ft2	12,000			
Average Heat Flux (calculated)	BTU/ hr ft2	10,177			
Maximum Heat Flux (allowable)	BTU/ hr ft2				
Maximum Heat Flux (calculated)	BTU/ hr ft2	15,300	8,350		
Fouling Factor, Internal	hr ft2 °F/ BTU	0.004	0.004		
Max. Film Temperature (allow. / calc.)	°F	635 / 463	635 / 363	/	
Inlet Conditions:					
Temperature	°F	280	245		
Pressure	psig	85	88		
Mass Flow Rate, Liquid	Lb/ hr		67,275		
Mass Flow Rate, Vapor	Lb/ hr		0		
Weight Percent, Liquid / Vapor	wt%		100% / 0%	/	
Density, Liquid / Vapor	Lb/ ft3		50.30 / 0.00	/	
Molecular Weight, Liquid / Vapor	Lb/ Lbmole		/ 0.0	/	
Viscosity, Liquid / Vapor	cp		2.056 / 0.000	/	
Specific Heat, Liquid / Vapor	BTU/ Lb °F		0.540 / 0.000	/	
Thermal Conductivity, Liquid/Vapor	BTU/hr ft °F		0.068 / 0.000	/	
Surface Tension, Liquid	dyne/ cm		7.180 /	/	
Outlet Conditions:					
Temperature	°F	360	280		
Pressure	psig	80	85		
Mass Flow Rate, Liquid	Lb/ hr	67,275			
Mass Flow Rate, Vapor	Lb/ hr	0			
Weight Percent, Liquid / Vapor	wt%	100% / 0%		/	
Density, Liquid / Vapor	Lb/ ft3	47.50 / 0.00		/	
Molecular Weight, Liquid / Vapor	Lb/ Lbmole	/ 0.0		/	
Viscosity, Liquid / Vapor	cp	0.892 / 0.000		/	
Specific Heat, Liquid / Vapor	BTU/ Lb °F	0.590 / 0.000		/	
Thermal Conductivity, Liquid/Vapor	BTU/hr ft °F	0.063 / 0.000		/	
Surface Tension, Liquid	dyne/ cm	3.650 /		/	

revision	date	description	by	chk'd	appv'd
Rev.00	25-Jun-14	ISSUED w/ General Arrangement Package	MPL	TLC	JDC

MARKWEST Energy Partners, L.P. EXTERRAN THI TULSA HEATERS INC.

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FIRED HEATER DATA SHEET
AMERICAN ENGINEERING SYSTEM of UNITS

J14-848 -HTRds- Rev.00

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Owner:	**MARKWEST Liberty Midst.&Res., LLC**	Owner Ref.:	**H-751**
Purchaser:	EXTERRAN Energy Solutions, LP	Purch. Ref.:	US-107340-H751
Manufacturer:	***TULSA HEATERS INC.***	***THI*** Ref.:	***J14-848***
Service:	Heat Medium	Unit No:	Utility
Number:	One	Location:	West Union, West Virginia
SHO Duty:	2.75 MMBTU/ hr	SHO Model:	SHO.750 HLX
CMS.Release:	3.06 MMBTU/ hr	CMS Model:	CMS.1500 ULN

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ADDITIONAL PROCESS OPERATING CONDITIONS

Heater Section	---	RADIANT	CONVECTION	CONVECTION	TOTAL
Operating Case	---	Turndown Case	Turndown Case	Turndown Case	Turndown Case
Service	---	Heat Medium	Heat Medium	Service "b"	
Heat Absorption	MMBTU/ hr	**2.05**	**0.70**	**0.00**	
Process Fluid	---	HC	HC		
Process Mass Flow Rate, Total	Lb/ hr	42,319	42,319		
Process Bulk Velocity (allow. / calc.)	ft/ s	--- / 4	--- / 2.8	/	
Process Mass Velocity (min./ calc.)	Lb/ s ft2	--- / 171	--- / 133	/	
Coking Allowance (dP calcs)	in				
Pressure Drop, Clean (allow. / calc.)	psi	< ------- 30	/ **5** ------- >		
Pressure Drop, Fouled (allow. / calc.)	psi	< -------	/ ------- >		
Average Heat Flux (allowable)	BTU/ hr ft2	12,000			
Average Heat Flux (calculated)	BTU/ hr ft2	**6,841**			
Maximum Heat Flux (allowable)	BTU/ hr ft2				
Maximum Heat Flux (calculated)	BTU/ hr ft2	12,300	6,160		
Fouling Factor	hr ft2 °F/ BTU	0.002	0.002		
Corrosion or Erosion Characteristics	---				
Max. Film Temperature (allow. / calc.)	°F	625 / 460	625 / 355	/	
Inlet Conditions:					
Temperature	°F	**274**	**245**		
Pressure	psig	**84**	**85**		
Mass Flow Rate, Liquid	Lb/ hr		42,319		
Mass Flow Rate, Vapor	Lb/ hr		0		
Weight Percent, Liquid / Vapor	wt%		100% / 0%	/	
Density, Liquid / Vapor	Lb/ ft3		50.3 / 0.00	/	
Molecular Weight, Vapor	Lb/ Lbmole		/ 0.0	/	
Viscosity, Liquid / Vapor	cp		2.056 / 0.000	/	
Specific Heat, Liquid / Vapor	BTU/ Lb °F		0.540 / 0.000	/	
Thermal Conductivity, Liquid/Vapor	BTU/hr ft °F		0.068 / 0.000	/	
Surface Tension, Liquid	dyne/ cm		7.180 /	/	
Outlet Conditions:					
Temperature	°F	**360**	**274**		
Pressure	psig	**80**	**84**		
Mass Flow Rate, Liquid	Lb/ hr	42,319			
Mass Flow Rate, Vapor	Lb/ hr	0			
Weight Percent, Liquid / Vapor	wt%	100% / 0%		/	
Density, Liquid / Vapor	Lb/ ft3	47.5 / 0.00		/	
Molecular Weight, Liquid / Vapor	Lb/ Lbmole	/ 0.0		/	
Viscosity, Liquid / Vapor	cp	0.892 / 0.000		/	
Specific Heat, Liquid / Vapor	BTU/ Lb °F	0.590 / 0.000		/	
Thermal Conductivity, Liquid/Vapor	BTU/hr ft °F	0.063 / 0.000		/	
Surface Tension, Liquid	dyne/ cm	3.650 /		/	

revision	date	description	by	chk'd	appv'd
Rev.00	25-Jun-14	ISSUED w/ General Arrangement Package	MPL	TLC	JDC

MARKWEST Energy Partners, L.P. EXTERRAN THI TULSA HEATERS INC.

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FIRED HEATER DATA SHEET
AMERICAN ENGINEERING SYSTEM of UNITS

J14-848 -HTRds- Rev.00

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COMBUSTION DESIGN CONDITIONS

Overall Performance:		RADIANT	CONVECTION	CONVECTION	TOTAL
Operating Case	---	Design Case	Design Case	Design Case	Design Case
Service	---	Heat Medium	Heat Medium	Service "b"	
Excess Air	mol%				15.0%
Calculated Heat Release (LHV)	MMBTU/ hr				5.77
Guaranteed Efficiency	HR%				83.5%
Calculated Efficiency	HR%				86.6%
Radiation Loss	HR%				1.50%
Flow Rate, Combustion Gen./ Imported	Lb/ hr	5,625	/ 0		5,625
Flue Gas Temperature Leaving Section	°F	1,455	503		
Flue Gas Mass Velocity	Lb/ sec ft2		0.180		

Fuel(s) Data:		Design Blend	No.2 Blend		Design Fuel Oil
LHV	BTU/ scf	910	1,037		---
LHV	BTU/ Lb	21,380	20,449		
P @ Burner	psig	30	30		
T @ Burner	°F	100	100		
MW	Lb/ Lbmole	16.15	19.24		
μ @ ??? °F	cp	---	---		
μ @ ??? °F	cp	---	---		
Atomizing Media		---	---		
Atom. Media P & T		---	---		
Components:					
N	wt%	---	---		
S	wt%	---	---		
Ash	wt%	---	---		
Ni	ppm	---	---		
Va	ppm	---	---		
Na	ppm	---	---		
Fe	ppm	---	---		
H2	mol%	0.00	0.00		---
O2	mol%	0.00	0.00		---
N2 + Ar	mol%	0.22	1.49		---
CO	mol%	0.00	0.00		---
CO2	mol%	0.02	0.47		---
CH4	mol%	99.33	80.22		---
C2H6	mol%	0.41	15.26		---
C2H4	mol%	0.00	0.00		---
C3H8	mol%	0.02	2.39		---
C3H6	mol%	0.00	0.00		---
C4H10	mol%	0.00	0.17		---
C4H8	mol%	0.00	0.00		---
C5H12	mol%	0.00	0.00		---
C5H10	mol%	0.00	0.00		---
C6+	mol%	0.00	0.00		---
H2S	mol%	0.00	0.00		---
SO2	mol%	0.00	0.00		---
NH3	mol%	0.00	0.00		---
H2O	mol%	0.07	0.00		---
spare	mol%	0.00	0.00		---

Burner Design:		
OEM	---	ZEECO USA, LLC
Type	---	Enhanced IFGR — ULTRA Low NOx
Quantities	---	1 Model 1 and 0 Model 2 Burners
Model No.1	---	Free-Jet GLSF 7 — Cylindrical
Model No.2	---	None
Windbox	---	yes ... — w/ parallel blade registers
Location	---	EndWall Center ... — Horizontally Fired
Pilot Design:		
Type	---	Continuous — Self-Inspirating
Model	---	by O.E.M.
Ignition	---	Electric — requires elec.ign.system
Heat Release	--	> 90,000 BTU/ hr on ... — Design Gas

Burner Performance:		Model 1	Model 2	
Minimum Heat Release	MMBTU/ hr	1.27		[B]
Design Heat Release	MMBTU/ hr	5.77		[C]
Maximum Heat Release	MMBTU/ hr	6.35		[D]
Burner Turndown	Max:Min	5.00		[E]
Volumetric Ht. Release	BTU/ hr ft3	14,620		[F]
Pressure @ Arch	inH2O	0.70		
Pressure @ Burner	inH2O			
Combustion Air T @ Burner	°F	60		
Flue Gas T @ Burner	°F	1,460		
Emissions - Guaranteed:		<-- Combined -->		
Basis of Guarantee	---	3.0% O2, dry (LHV)		
NOx Emissions	Lb/MMBTU	0.040	30 ppm	[B]
SOx Emissions	Lb/MMBTU	no quote		
CO Emissions	Lb/MMBTU	0.040	49 ppm	[C]
UHC Emissions	Lb/MMBTU	0.007	16 ppm	[D]
VOC Emissions	Lb/MMBTU	0.019	15 ppm	[E]
SPM10 Emissions	Lb/MMBTU	0.013	15 ppm	[F]
Noise Emissions	dBA @ 3ft	85.0	------->	

Combustion System Features:	
Proposed OEM	DAIGLE Automation, Inc.
BMS Functions	Yes; THI Standard w/ EESLP Upgrades
Comb. Controls	Yes; THI Standard w/ EESLP Upgrades
Duty Controls	Yes; THI Standard w/ EESLP Upgrades
Main/ Pilot Trains	Yes; THI Standard w/ EESLP Upgrades
Local Panel	Yes; THI Standard w/ EESLP Upgrades
FD System	Yes; THI Standard w/ EESLP Upgrades
Area Class	Class I, Div. 2, Groups C&D, Temp T3

Nominal Flame Clearances: from burner CL ...		Vertical	Horizontal
to Tube CL, API	ft	4.63	3.09
to Tube CL, calc.	ft	1.33	1.33
to Refrac., calc.	ft	n / a	12.81

Net Flame Clearances:	
Est. Flame Size	approx. 10 ftL x 3.5 ftDia
Hor Clearance	1' 4" NET Tube Clearance
Vert. Clearance	1' 4" NET Tube Clearance
Axial Clearance	3 ft NET Refractory Clearance (to Arch hot face)

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COMBUSTION DESIGN CONDITIONS

Overall Performance:		RADIANT	CONVECTION	CONVECTION	TOTAL
Operating Case	---	100% Design	100% Design	100% Design	100% Design
Service	---	Heat Medium	Heat Medium	Service "b"	
Excess Air	mol%				15.0%
Calculated Heat Release (LHV)	MMBTU/hr				4.97
Guaranteed Efficiency	HR%				83.5%
Calculated Efficiency	HR%				87.9%
Radiation Loss	HR%				1.50%
Flow Rate, Combustion Gen./ Imported	Lb/hr	4,850	/ 0		4,850
Flue Gas Temperature Leaving Section	°F	1,382	453		
Flue Gas Mass Velocity	Lb/sec ft2		0.155		

Fuel(s) Data:		Design Blend	No.2 Blend		Design Fuel Oil
LHV	BTU/scf	910	1,037		---
LHV	BTU/Lb	21,380	20,449		
P @ Brnr	psig	30	30		
T @ Brnr	°F	100	100		
MW	Lb/Lbmole	16.15	19.24		
μ @ ??? °F	cp	---	---		
μ @ ??? °F	cp	---	---		
Atomizing Media		---	---		
Atom. Media P & T		---	---		
Components:					
N	wt%	---	---		
S	wt%	---	---		
Ash	wt%	---	---		
Ni	ppm	---	---		
Va	ppm	---	---		
Na	ppm	---	---		
Fe	ppm	---	---		
H2	mol%	0.00	0.00		---
O2	mol%	0.00	0.00		---
N2 + Ar	mol%	0.22	1.49		---
CO	mol%	0.00	0.00		---
CO2	mol%	0.02	0.47		---
CH4	mol%	99.33	80.22		---
C2H6	mol%	0.41	15.26		---
C2H4	mol%	0.00	0.00		---
C3H8	mol%	0.02	2.39		---
C3H6	mol%	0.00	0.00		---
C4H10	mol%	0.00	0.17		---
C4H8	mol%	0.00	0.00		---
C5H12	mol%	0.00	0.00		---
C5H10	mol%	0.00	0.00		---
C6+	mol%	0.00	0.00		---
H2S	mol%	0.00	0.00		---
SO2	mol%	0.00	0.00		---
NH3	mol%	0.00	0.00		---
H2O	mol%	0.07	0.00		---
spare	mol%	0.00	0.00		---

Burner Design:		
OEM	---	ZEECO USA, LLC
Type	---	Enhanced IFGR — ULTRA Low NOx
Quantities	---	1 Model 1 and 0 Model 2 — Burners
Model No.1	---	Free-Jet GLSF 7 — Cylindrical
Model No.2	---	None
Windbox	---	yes ... — w/ parallel blade registers
Location	---	EndWall Center ... — Horizontally Fired
Pilot Design:		
Type	---	Continuous — Self-Inspirating
Model	---	by O.E.M.
Ignition	---	Electric — requires elec.ign.system
Heat Release	--	> 90,000 BTU/hr on ... — Design Gas

Burner Performance:		Model 1	Model 2
Minimum Heat Release	MMBTU/hr	1.27	
Calculated Heat Release	MMBTU/hr	4.97	
Maximum Heat Release	MMBTU/hr	6.35	
Burner Turndown	Max:Min	5.00	
Volumetric Ht. Release	BTU/hr ft3	14,620	
Draft @ Arch	inH2O	0.70	
Draft @ Burner	inH2O	6.30	
Combustion Air T @ Burner	°F	60	
Flue Gas T @ Burner	°F	1,460	

Emissions - Guaranteed:		<-- Combined -->		
Basis of Guarantee	---	3.0% O2, dry (LHV)		
NOx Emissions	Lb/MMBTU	0.040	30 ppm	[B]
SOx Emissions	Lb/MMBTU	no quote		
CO Emissions	Lb/MMBTU	0.040	49 ppm	[C]
UHC Emissions	Lb/MMBTU	0.007	16 ppm	[D]
VOC Emissions	Lb/MMBTU	0.019	15 ppm	[E]
SPM10 Emissions	Lb/MMBTU	0.013	15 ppm	[F]
Noise Emissions	dBA @ 3ft	85.0		

Combustion System Features:	
Proposed OEM	DAIGLE Automation, Inc.
BMS Functions	Yes; THI Standard w/ EESLP Upgrades
Comb. Controls	Yes; THI Standard w/ EESLP Upgrades
Duty Controls	Yes; THI Standard w/ EESLP Upgrades
Main/ Pilot Trains	Yes; THI Standard w/ EESLP Upgrades
Local Panel	Yes; THI Standard w/ EESLP Upgrades
FD System	Yes; THI Standard w/ EESLP Upgrades
Area Class	Class I, Div. 2, Groups C&D, Temp T3

Nominal Flame Clearances: from burner CL ...		Vertical	Horizontal
to Tube CL, API	ft	4.63	3.09
to Tube CL, calc.	ft	1.33	1.33
to Refrac., calc.	ft	n / a	12.81

Net Flame Clearances:	
Est. Flame Size	approx. 10 ftL x 3.5 ftDia
Hor Clearance	1' 4" NET Tube Clearance
Vert. Clearance	1' 4" NET Tube Clearance
Axial Clearance	3 ft NET Refractory Clearance (to Arch hot face)

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COMBUSTION DESIGN CONDITIONS

Overall Performance:		RADIANT	CONVECTION	RADIANT	CONVECTION
Operating Case	---	Turndown Case	Turndown Case	Turndown Case	Turndown Case
Service	---	Heat Medium	Heat Medium	Service "b"	
Excess Air	mol%				15.0%
Calculated Heat Release	MMBTU/ hr (LHV)				3.06
Guaranteed Efficiency	HR%				**83.5%**
Calculated Efficiency	HR%				90.0%
Radiation Loss	HR%				1.50%
Flow Rate, Combustion Gen./ Imported	Lb/ hr	2,980	/ 0		
Flue Gas Temperature Leaving Section	°F	**1,169**	**343**		
Flue Gas Mass Velocity	Lb/ sec ft2		0.095		

Fuel(s) Data:		Design Blend	No.2 Blend		Design Fuel Oil
LHV	BTU/ scf	910	1,037		---
LHV	BTU/ Lb	21,380	20,449		16,995
P @ Burner	psig	30	30		80
T @ Burner	°F	100	100		100
MW	Lb/ Lbmole	16.15	19.24		---
μ @ ??? °F	cp	---	---		
μ @ ??? °F	cp	---	---		
Atomizing Media		---	---		
Atom. Media P & T		---	---		
Components:					
N	wt%	---	---		
S	wt%	---	---		
Ash	wt%	---	---		
Ni	ppm	---	---		
Va	ppm	---	---		
Na	ppm	---	---		
Fe	ppm	---	---		
H2	mol%	0.00	0.00		---
O2	mol%	0.00	0.00		---
N2 + Ar	mol%	0.22	1.49		---
CO	mol%	0.00	0.00		---
CO2	mol%	0.02	0.47		---
CH4	mol%	99.33	80.22		---
C2H6	mol%	0.41	15.26		---
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C3H6	mol%	0.00	0.00		---
C4H10	mol%	0.00	0.17		---
C4H8	mol%	0.00	0.00		---
C5H12	mol%	0.00	0.00		---
C5H10	mol%	0.00	0.00		---
C6+	mol%	0.00	0.00		---
H2S	mol%	0.00	0.00		---
SO2	mol%	0.00	0.00		---
NH3	mol%	0.00	0.00		---
H2O	mol%	0.07	0.00		---
spare	mol%	0.00	0.00		---

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UHC Emissions	Lb/MMBTU	0.007	16 ppm
VOC Emissions	Lb/MMBTU	0.019	15 ppm
SPM10 Emissions	Lb/MMBTU	0.013	15 ppm
Noise Emissions	dBA @ 3ft	85.0	

Combustion System Features:	
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Owner Ref.: **H-751** THI Ref.: **J14-848**

PRESSURE PARTS DESIGN

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Coil Design:		**RADIANT**	**SHIELD**	**CONVECTION**	**CONVECTION**		
Service	---	Heat Medium	Heat Medium	Heat Medium	Service "b"		
Design Basis for Tube Temperature	---	API Standard 530	API Standard 530	API Standard 530			
Design Basis for Tube Wall Thickness	---	ASME Sec. VIII -1	ASME Sec. VIII -1	ASME Sec. VIII -1			
Design Life	hr	100,000	100,000	100,000			
Design Pressure (elastic / rupture)	psig	**150 /**	**150 /**	**150 /**			
Design Fluid Temperature	°F	388	310	310			
Design Temperature Allowance	°F	30	30	30			
Design Corrosion Allowance (tubes/fittin	in	0.125 / 0.125	0.125 / 0.125	0.125 / 0.125	/		
Maximum Tube Temperature (clean)	°F	477					
Maximum Tube Temperature (fouled)	°F	517	410	410			
Design Tube Temperature	°F	**575**	**575**	**575**			
Inside Film Coefficient	BTU/ hr ft2 °F	187	102	102			
Weld Inspection	RT or Other	100 of 10%	100 of 10%	100 of 10%			
Weld Heat Treatment	s.rel., t.stab. or none	None	None	None			
Hydrostatic Test Pressure	psig	per API	per API	per API			
Coil Arrangement:		**Horizontal**	**Horizontal**	**Horizontal**			
Coil Type	---	Helical	Serpentine	Serpentine			
Tube Material (pipe or tube spec)	ASTM	SA106 Gr.B	SA106 Gr.B	SA106 Gr.B			
Supplementary Mfg Requirements	ASTM	None	None	None			
Tube Outside Diameter	in	4.000	4.500	4.500			
Tube Wall Thickness (aw / mw)	in	0.226 / 0.198	0.237 / 0.207	0.237 / 0.207	/		
Number of Cells (radiant or convection)	---	1	1	1			
Number of Flow Passes (total / cell)	---	1 / 1	1 / 1	1 / 1	/		
Number of Tubes per Row (total / cell)	---		4 / 4	4 / 4	/		
Overall Tube (1 turn in radiant) Length	ft	20.42	9.02	9.02			
Effective Tube Length / Helix Diameter	ft	20.42 / 6.50	7.44	7.44			
Number of Turns or Tubes (total / pass)	---	**14.0 / 14.0**	**4 / 4**	**0 / 0**	/		
Total Exposed Surface	ft2	299	35	0			
Number of Ext.Surf. Tubes (total / cell)	---	**0 / 0**	**0 / 0**	**12 / 12**	/		
Total Exposed Surface	ft2	0	0	1,087			
Tube Spacing (horizontal / tube centers)	in	--- / 10.50	8.00 / 8.00	8.00 / 8.00	/		
Tube Spacing (horizontal to refractory)	in	6.00	4.00	4.00			
Coil Fittings:		**Heat Medium**	**Heat Medium**	**Heat Medium**			
Fitting Type	---	SR 180° U-Bends	SR 180° U-Bends	SR 180° U-Bends			
Fitting Material	ASTM	SA234 WPB	SA234 WPB	SA234 WPB			
Supplementary Mfg Requirements	ASTM	None	None	None			
Fitting Outside Diameter	in	4.000	4.500	4.500			
Fitting Wall Thickness (aw / mw)	in	0.226 / 0.198	0.237 / 0.207	0.237 / 0.207	/		
Fitting Location	internal or external	Internal	External	External			
Tube Attachment	welded or rolled	Welded	Welded	Welded			
Coil Terminals:		**Outlet**		**Inlet**			[G]
Terminal Type	beveled or flanged	Flanged		Flanged			[G]
Flange Material	ASTM	SA105		SA105			[G]
Supplementary Mfg Requirements	ASTM	None		None			
Flange Size and Rating	NPS/ ASME	4" NPS / 300 #		4" NPS / 300 #			
Flange Type	RFWN or RTJ	RFWN		RFWN			
Location	---	Burner Endwall		Terminal End			
Extended Surface:			**CONVECTION**	**CONVECTION**			
Service	---		Heat Medium	Future / Ht.Med.			
Fin or Stud Row Number	starting @ bottom		No.1 / No.2	No.3 / No.4	/		
Ext. Surface Type	seg.fins, solid fins, studs		HF Seg. Fins	HF Seg. Fins			
Fin/Stud Material	---		C.S. / C.S.	--- / C.S.	/		
Fin/Stud Dimensions	H x T, in		0.75 x 0.060"	0.75 x 0.060"			
Fin/Stud Density	fin/ in or stud/ plane		3.00 fpi / 4.00 fpi	--- / 5.00 fpi	/		
Maximum Fin/Stud Temperature	°F		700 / 590	--- / 450	/		

PRESSURE PARTS DESIGN (continued)

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Crossovers:		**RADIANT**	**SHIELD**	**CONVECTION**	**CONVECTION**	
Type, location / connections	---	**External**	/ **Flanged**	**None**		[G]
Tube / Fittings Material	ASTM	SA106 Gr.B	/ SA234 WPB			[G]
Tube & Fitting OD / Thickness (aw)	in	4.000	/ 0.226			[G]
Inlet Manifold(s):	type			**NONE; n / a**		
Location	---					
Pipe Material	ASTM					
Fittings Material	ASTM					
Design Basis for Manifold Thickness	---					
Design Conditions (temp./press.)	°F/ psig					
Outside Diameters, each Branch	in					
Wall Thickness(es); aw ~~or mw~~	in					
Tube Connection Type	extrusion, olet, etc.					
End Types (terminal/ dead)	beveled or flanged					
Terminal Flange Material	ASTM					
Terminal Flange Size and Rating	NPS/ ASME					
Terminal Flange Style	RFWN or RTJ					
Outlet Manifold(s):	type	**NONE; n / a**				
Location	---					
Pipe Material	ASTM					
Fittings Material	ASTM					
Design Basis for Manifold Thickness	---					
Design Conditions (temp./press.)	°F/ psig					
Outside Diameters, each Branch	in					
Wall Thickness(es); aw ~~or mw~~	in					
Tube Connection Type	extrusion, olet, etc.					
End Types (terminal/ dead)	beveled or flanged					
Terminal Flange Material	ASTM					
Terminal Flange Size and Rating	NPS/ ASME					
Terminal Flange Style	RFWN or RTJ					

COIL & MANIFOLD SUPPORTS DESIGN

Tube Supports.		**RADIANT**	**SHIELD**	**CONVECTION**	**CONVECTION**
Service	---	Heat Medium	Heat Medium	Heat Medium	Service "b"
Location	Top, Bottom, Ends	**Bottom**	**Ends**	**Ends**	
Support Type	casting, tubesht, spring, etc.	Smls Pipe	Welded Tbsheets	Welded Tbsheets	
Support Thicknesses	in	Per Struct.Calcs	0.375	0.375	
Support Materials	ASTM	A240 T304H	A36 CS	A36 CS	
Support Temperatures (calc./ design)	°F / °F	1,030 / 1,230	575 / 730	575 / 730	/
TbSht Ferrules Thickness / Materials	in/ ASTM	--- / ---	14 ga. / 304 SS	14 ga. / 304 SS	/
Refractory & Anchor Materials & Types	---	none	per refrac. section	per refrac. section	
Intermediate Guides & Supports.		**One**	**None**	**None**	
Location	---	**Top**			
Guide/ Support Type	casting, spring, etc.	Smls Pipe			
Material	ASTM	A240 T304H			
Spacing, average	ft				
Tube Guides:	Top, Bottom, Ends	**None**	**None**	**None**	
Material	ASTM				
Manifold Supports.		**Outlet Manifold**		**Intlet Manifold**	
Material	ASTM				
Materials Design & Supply	---				
Location	Top, Bottom, Ends				
Support Type	roller, shoe, spring, etc.				
Number of Supports	---				

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CASING / REFRACTORY SYSTEMS DESIGN

		BURNER ENDWALL	BURNER FIREWALL	SHIELDED SIDEWALLS	ARCH ENDWALL
Radiant Section Design:					
Total Refractory Thickness	in	5.0	6.0	3.0	5.0
Hot Face Temperature (design)	°F	2,000°	2,600°	2,000°	2,600°
Hot Face Temperaure (calculated)	°F	1,455	1,655	1,030	1,455
Hot Face Layer	in/ - - -	1/ 8# CF Blanket	1/ 8# Cerachem	1/ 8# CF Blanket	1/ 8# Cerachem
Back-Up Layer No.1	in/ - - -	1/ 8# CF Blanket	2/ 8# CF Blanket	2/ 6# CF Blanket	1/ 8# CF Blanket
Back-Up Layer No.2	in/ - - -	3/ 6# CF Blanket	3/ 6# CF Blanket	None	3/ 6# CF Blanket
Foil Vapor Barrier	in/ - - -	None	None	None	None
Castable Reinforcement (SS Needles)	wt%	None	None	None	None
Anchors / Tie Backs:	- - -	Pins & Clips	Pins & Clips	Pins & Clips	Pins & Clips
Material	- - -	310 S.S.	310 S.S.	304 S.S.	310 S.S.
Attachment	- - -	Welded	Welded	Welded	Welded
Casing:					
Material	in/ ASTM	0.1875 / A36	0.1875 / A36	10 ga./ A36	0.1875 / A36
Internal Coating	- - -	None	None	None	None
External Temperature, Typical	°F	180	195	180	180
Comments / Clarifications	- - -	w/ cfb wraps	5 x 5 ft (centered)	w/o cfb wraps	w/ cfb wraps
		SHOP Installed	SHOP Installed	SHOP Installed	SHOP Installed

		SIDEWALLS		ENDWALLS	
Convection Section Design:		SHIELD	FINNED	TUBESHEETS	HEADER BOXES
Total Refractory Thickness	in	3.0	3.0	3.0	2.0
Hot Face Temperature (design)	°F	2,000°	2,000°	2,200°	2,000°
Hot Face Temperaure (calculated)	°F	979	979	979	507
Hot Face Layer	in/ - - -	1/ 8# CF Blanket	1/ 8# CF Blanket	3/ Sparlite 55HS	1/ 8# CF Blanket
Back-Up Layer No.1	in/ - - -	2/ 6# CF Blanket	2/ 6# CF Blanket	None	1/ 8# CF Blanket
Back-Up Layer No.2	in/ - - -	None	None		
Foil Vapor Barrier	in/ - - -	None	None	None	None
Castable Reinforcement (SS Needles)	wt%	None	None	None	None
Anchors / Tie Backs:	- - -	Pins & Clips	Pins & Clips	Bullhorns	Pins & Clips
Material	- - -	310 S.S.	304 S.S.	304 S.S.	304 S.S.
Attachment	- - -	Welded	Welded	Welded	Welded
Casing:					
Material	in/ ASTM	10 ga./ A36	10 ga./ A36		10 ga./ A36
Internal Coating	- - -	None	None	None	None
External Temperature, Typical	°F	180	180		180
Comments / Clarifications	- - -	Cleaning / Sootblowing lanes: none		of 0' - 0" height.	Bolted Assembly
	- - -	SHOP Installed	SHOP Installed	SHOP Installed	SHOP Installed

		FLUE GAS DUCTS			
Stack & Uptakes Design:		BREECHING	15° TRANSITION	DISCH. DUCT	
Quantity		One	One	One	
Type / Location	- - -	Full L / Conv	Full L / Conv	Self.Spt/ Grade	
Length / Metal Outside Diameter (top)	ft/ ft	8.00 / n/ a	8.00 / n/ a	7 / 1.50	
Discharge Elev., minimum/ calculated	ft/ ft	n/ a / n/ a	n/ a / n/ a	20 / 20	
Total Refractory Thickness	in	1.0	0.0	0.0	
Hot Face Temperature (design)	°F	2,000°			
Hot Face Temperaure (calculated)	°F	503	503	503	
Hot Face Layer	in/ - - -	1/ 8# CF Blanket	None	None	
Back-Up Layer No.1	in/ - - -	None			
Castable Reinforcement (SS Needles)		None			
Anchors / Tie Backs:	- - -	Pins & Clips			
Material	- - -	304 S.S.			
Attachment	- - -	Welded			
Casing:					
Minimum Thickness/ Material	in/ ASTM	10 ga./ A36	0.1875 / A36	0.1875 / A36	
Corrosion Allowance	in	None	None	0.0625	
Internal Coating	- - -	None	None	None	
External Temperature, Typical	°F	180	503	503	
Comments / Clarifications	- - -	SHOP Installed			

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MECHANICAL / STRUCTURAL DESIGN BASIS

Refractory & Coatings Design:

Refractory Design	**Per Std560: 180°F Avg. Casing Temperature** @ Ambient Conditions of 0 MPH & 80°F
Refractory Dryout	SHOP dryout = None // FIELD dryout is INCLUDED in SHO Commissioning Procedure
Coating, Internal	None
Coating, External	3.0- 4.0 dftmil Dimetcote 9 (flat green) IOZ Primer + 1.5- 2.0 dftmil PITT-THERM 97-724 Series Air Dry Silicone (UC59571 Gray) TopCoat on SSPC-SP6 Prepped Surfaces; continuous service to 750 °F.

Applicable Standards:

API	Standard 560, Fired Heaters for General ...	ASTM	refractories per C27, C155, C401 & C612
API	Standard 530, Calculation of Heater-tube ...	AISC	Specification for Design, ... Steel for Buildings
ASME	Boiler & Pressure Vessel Code, I thru IX	AWS	D 1.1; Structural Welding Code
ASME	B31.3, Code for Process Piping	NFPA	70; National Electrical Code
ASTM	tube/ smls pipe/ fitting spec's noted herein	NFPA	87; Recommended Practice for Fluid Heaters

Wind Design:

Spec. or Standard	ASCE 7 -05
Design Variables	100 mph, ED: C,
Design Variables	OC: III, WIF: 1.15, TF: 1.0

Seismic Design:

Spec. or Standard	ASCE 7 -05
Design Variables	Ss: 0.5, S1: 0.15, SC: D,
Design Variables	OC: III, SUG: II, SIF: 1.25

Physical Design:

Plot Limitations	None
Tube Limitations	None
Firebox Pressure	Positive; approximately +1.5 inH2O
Ambient Temp's	-20 °F Min/ 60 °F Dsn/ 100 °F Max

Site Design Basis:

Site Elevation	1300	ft AMSL	/	396	m AMSL
Stack Design Temp.	90	°F	/	32	°C
FG Discharge Elev., min.	20	ft AG	/	6.1	m AG
Area Classification	Class I, Div. 2, Groups C&D, Temp T3				

MAJOR SUBSYSTEMS & ACCESSORIES

Major Services & Subsystems

Process Design	INCLUDED in Job Scope
Mechanical Design	INCLUDED in Job Scope
Structural Design	INCLUDED in Job Scope
Radiant Section	INCLUDED in Job Scope
Convection Section	INCLUDED in Job Scope
CMS.1500 ULN	INCLUDED in Job Scope
SHOS.330 TPAK	INCLUDED in Job Scope
spare	

Major Accessories:

Casing/ Tube Seals	4	TubeSox; Radiant & Conv.
Observation Doors	1	4 in Dia. w/ H.T. glass
Observation Doors	2	2 in Dia. w/ H.T. glass
Access Doors	1	Std 24" x 24"
Access Doors	None	
Tube Pulling Doors	None	
Pressure Relief Doors	None	
Expansion Joints	None	

Casing Penetrations

Fbox Purge/ Snuff	2	2"NPS 150# RFWN
CA Temperature	None	
CA Pressure	None	
FG Temperature	2	1.5"NPS 3000# Coupling
FG Pressure	2	1.5"NPS 3000# Coupling
FG Composition	2	1.5"NPS 3000# Coupling
FG Comp. (AE - O2)	1	4"NPS 150# RFWN
FG Comp. (AE - O2)	1	FIREYE O2 Probe Flange
FG Comp. (AE - EPA)	None	
FG Comp. (AE - CEM	None	

Pressure Part Penetrations

Coil TSTC's, Radiant	None
Coil TSTC's, Convection	0
Process TI conn's	None
Process PI conn's	None
Velocity Steam conn's	None
S/A Decoking conn's	None
Vent / Drain conn's	None
spare	
spare	
spare	

Dampers:

	FD Fan (blower) qty = 0	Uptake Ducts qty = 0	Stack qty = 0
Function	Note:		Note:
Design	Fan inlet damper is inappropriate		Stack Damper (which provides draft
Materials	for forced draft SHO's where O2		control) is inappropriate for forced
Bearings	Control is provided by the CMS O2		draft SHO's where the combustion
Operator	Trim Module which controls the fan		conditions are controlled real-time
Positioner	(blower) motor's VFD/ VSD. Refer		via the CMS.
Instruments	to FDFANds for details.		

Sootblowers:

	Qty.	Type	Location	FG T	Material	Steam T & P	O.E.M. / Ref.
Lane 1:	None						
Lane 2 :	None						

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SHO.750 OPTION PACKAGES

	Package Name	Package Description
■	Artic Package A;	adds upgrades for -20 F Operations (Low T Grease & heaters for CP Motors)
☐	Artic Package B;	Package A + upgrades for -40 C/F applications (ie, to structure & coil)
■	Burner Package;	upgrades UNCLASSIFIED CMS to Class I, Division 2, Groups C&D
■	Code Stamp Package;	adds ASME Section I or Section VIII Code Stamp to coil
☐	Double Duty Package;	doubles duty and flow capabilities 'in a "double decker" or "side-by-side" configuration
☐	Efficiency Package;	adds a second module to the convection section (to boost thermal efficiency)
☐	FoodService Package;	adds upgrades for compliance with Foodservice Industry standards
☐	Go Green Package	adds New World, Ultra Low NOx & Xtra Efficienty Packages
☐	Gulf of Mexico Pckge;	adds upgrades to comply with GoM Offshore standards & expectations
☐	HealthCare Package;	adds upgrades for compliance with Healthcare Industry standards
☐	ISO 13705 Package;	adds upgrades for compliance with ISO 13705 / API STANDARD 560
☐	Jungle Package;	adds upgrades to support tropical applications (e.g., tropicalized motors)
☐	King & Queen Package;	adds upgrades to support European applications (e.g., compliance with PED)
☐	Liquid Fuels Pckge A:	adds ash-free air-atomized diesel firing capabilities (w/o sootblowers)
☐	Liquid Fuels Pckge B:	adds Package A + sootblowers (for firing "metals free" fuel oils)
☐	Liquid Fuels Pckge C:	adds Package B + upgraded supports & refractories (for oils w/ hvy metals)
☐	Mining Package;	adds upgrades for compliance with metals and Mining Industry standards
☐	Mobility Package;	adds a subframe and suspension to create a "heater on wheels" (ie, asphalt service)
☐	New World Package;	adds treatment systems to dramatically reduce NOx and/or CO emissions
☐	Oil Circulation Pckge:	adds a circulation skid - standard sizes from 330 to 4,400 USgpm
☐	Oil Filtration Package:	adds hot oil filtration module
☐	PipeLine Package;	alters design to accommodate "high mass flow / low delta T" applications
☐	Quiet Package;	reduces noise to 80 dBA @ 3 ft/ 1 m; ideal for factory applications
☐	Rocky Mtn Package;	adds upgrades to support high altitude / lower atm. pressure operations
☐	Sahara Package:	adds upgrades for operationgs in ambient temperatures upto 140 °F & sandstorm operations
☐	Two -Phase Package;	adds slug-flow resistant serpentine radiant coil (replaces helical coil)
■	Ultra Low NOx Package;	adds upgrades to support ULTRA Low NOx Burners; NOx < 30 ppmvd typical
☐	Velocity Package;	adds process "pass flow" controls to maintain uniform velocities in all passes
☐	Viscosity Package;	alters design to support high viscosity services (e.g., asphalt & hvy emulsions)
☐	West Coast Package;	upgrades structural design basis from Zone 2 to Zone 4 (per ASCE 7)
☐	Xtra Efficiency Package;	adds an economical air preheat system to boost efficiency
■	Your Specs Package;	alters / upgrades heater design to comply with Your Specifications
☐	Z06 Delivery Package;	alters manufacturing process to provide a "ZO6 fast" manufacturing schedule

Ftnt & Rev

LADDERS AND PLATFORMS

Proposal & Design Basis:

1) Construction: 100% Galvanized A36 CS per API Standard 560 / ISO 13705
2) Provisions for External Coating(s) / Painting: None, except as explicitly set forth in THI's proposa
3) Additional L&P's: can be provided per the basis set forth in Sections 8 & 9 of THI's proposal

Component	Qty	Width	Length	Arc	O.D.	Weight	Price
	(- -)	(ft)	(ft)	(°)	(ft)	(Lbm)	(US$)
Radiant Platforms							
Burner Platform	0	3.00	5.00	0	0.00	0	0
Ladder to Grade	0	3.00	6.00			0	0
Stair to Grade	0	3.00	6.00			0	0
Convection Platforms							
Conv. End Platforms	0	4.00	4.53			0	0
Conv. Side Platforms	0	3.00	18.50			0	0
Ladder to Grade	0	3.00	4.00			0	0
EPA Platform	0	3.00		270	8.50	0	0
Ladder to Grade	0	3.00	5.00			0	0
Intermediate Pltfm	0	3.00		90	8.50	0	0
Totals for Proposed Platforms						**0**	**0**

CLARIFICATIONS, FOOTNOTES & REVISIONS

Refractory Systems Abbreviations Key.

1:2:4 LHV = SHOP Mix Castable of 1:2:4 spec; Premix = FACTORY Mix castable; HD FBrick = Heavy Duty FireBrick
CFB = Ceramic Fiber Blanket; CFM = Ceramic Fiber Modules; CFBd = Ceramic Fiber Board; pcf = pounds / ft3

[A] Indicated guaranteed process pressure drop excludes process dP of Inlet and Outlet manifolds

[B] The noted Guaranteed NOx Emissions are for operations from 50% of Design through Maximum Heat Release.
[C] The noted Guaranteed CO, UHC, VOC & SPM10 Emissions are for operations from 1,100 °F BWT through Max. Heat Release. For this emissions warranty, the Bridgewall Temperature (BWT) shall be measured within 2 ft of the burner tile.
[D] During turndown operations, this heater may experience CO "breakthrough". This undesirable phenomena is a byproduct of low NOx burner design / low firebox temperatures that are unable to force the CO oxidation reaction to completion.
[E] Per [C] and [D], Emissions Gaurantees are not applicable to transient operations and/or for any and all operations at/below 50% of Desgin (NOx guarantee) and at/below 1,100 °F BWT (CO, UHC, VOC & SPM10 guarantees).
[F] Above clarifications are extracted from the burner OEM's warranty; refer to same for additioinal constraints and details.

[G] Terminals & XOver to have 3 dftmil IOZ on SP-6 surfaces.