ARCHAEA ENERGY

Malfunction Abatement and Preventative Maintenance Plan

Canton Renewables, LLC

April 2022

Prepared for:

Canton Renewables, LLC
4345 South Lilley Road
Canton Township, MI 48188

Malfunction Abatement and Preventative Maintenance Plan

Canton Renewables, LLC
Canton, Michigan

The material and data in this report were prepared under the supervision and direction of the undersigned.

Archaea Energy, Inc.
46280 Dylan Drive, Suite 200
Novi, MI 48377

Ryan Christman

Ryan Christman, EIT
Environmental Engineer

Emily Zambuto

Emily Zambuto
Director of Environmental Compli

Table of Contents

List of Tables

APPENDICES

Add the effective date of the most-recent revision to the list below. Do not overwrite or delete any dates. This is intended to be a complete record of all revisions made to this Startup, Shutdown, and Malfunction (SSM) Plan, and assists in making certain that all plan versions are retained for at least 5 years as required by §63.6(e)(3)(v).

Date of Initial Issuance
June 14, 2012
Revision Dates
March 3, 2017
March 16, 2020
February 15, 2021
April 6, 2022

1 BACKGROUND

This Malfunction Abatement and Preventative Maintenance Plan (the Plan) was prepared in accordance with Condition EULFGPLANT III.1 and EUTREATMENTSYS IX.3 of Michigan Department of Environmental Quality – Air Quality Division (MDEQ-AQD) Renewable Operating Permit (ROP) MI-ROP-P0270-2012a for Canton Renewables, LLC (Canton), a join venture managed by Aria Energy, LLC (Aria). Canton Renewables operates a landfill gas (LFG) high Btu facility at the Sauk Trail Hills Development (Sauk) landfill located in Canton, Michigan. The condition reads as follows:

> EULFGPLANT III.W "The permittee shall not operate EULFGPLANT unless a malfunction abatement plan (MAP) as described in Rule 911(2), for EULFGPLANT, the thermal oxidizer and the flare, has been submitted within 60 days of initial equipment start-up, and is implemented and maintained. If at any time the MAP fails to address or inadequately addresses an event that meets the characteristics of a malfunction, the permittee shall amend the MAP within 45 days after such an event occurs. The permittee shall also amend the MAP within 45 days if new equipment is installed or upon request from the District Supervisor. The permittee shall submit the MAP and any amendments to the MAP to the AQD District Supervisor for review and approval. If the AQD does not notify the permittee within 90 days of submittal, the MAP or amended MAP shall be considered approved. Until an amended plan is approved, the permittee shall implement corrective procedures or operational changes to achieve compliance with all applicable emission limits. (**R 336.1225, R 336.1702(a), R 336.1910, R 336.1911**)"
>
> EUTREATMENTSYS IX.E "Within 90 days after the issuance of this permit, the permittee shall have implemented a written preventative maintenance plan (PMP) for EUTREATMENTSYS. At a minimum, the plan shall include a schedule of maintenance activities consistent with manufacturer's recommendations, and the operating variables that will be monitored to detect a malfunction or failure. A copy of the PMP shall be maintained on site and available upon request. (**40 CFR 60.756(d), R 336.1911**)"

This plan has been developed to satisfy the above requirements. As such, it provides procedures and elements of inspection, inspection frequencies, back-up equipment inventories, and general information used to prevent, detect and correct malfunctions.

It is important to note that the regulations anticipated periodic shutdown or malfunction of individual control equipment. Since periodic malfunctions, unforeseen circumstances or short duration maintenance activities are anticipated by the regulations, Canton has implemented a program consistent with these requirements.

Canton understands that MDEQ-AQD expects Canton to address any temporary break down of a control device or devices. While a plan has been written suggesting preventative measures and solutions to potential malfunctions to comply with the above paragraph, it is anticipated that short duration shutdown events will continue to occur which are beyond Canton's control.

2 AFFECTED EQUIPMENT

Canton operates an LFG treatment system, regenerative thermal oxidizer (RTO), and LFG open flare that covered by this Plan. The open flare and RTO are used to combust treated LFG and a low-Btu waste gas stream from high-Btu cleanup process, respectively. These units are identified as EUTREATMENTSYS and individual stacks to EULFGPLANT in MI-ROP-P0270-2012a issued by the MDEQ-AQD.

3 RESPONSIBLE PERSONNEL

All supervisory personnel responsible for overseeing the inspection, maintenance, and repair of the plant are listed below:

Name	Title	Phone Number
Kean Flanagan	Director, RNG Operations	913-284-6971
Frank Yenchick	RNG Regional Manager	734-796-6763
Chase VanEckoute	Lead Operations Technician	734-776-9387
Ryan Christman	Environmental Engineer	863-224-4395
Emily Zambuto	Manager of Environmental Programs	585-278-4773

4 MALFUNCTION ABATEMENT AND PREVENTATIVE MAINTENANCE PLAN

The following section of this Plan describes operations to prevent malfunctions, detect malfunctions, and correct malfunctions for each piece of equipment covered by this Plan.

4.1 Description of the Equipment

Canon operates an LFG treatment system, RTO, and an open flare for treating LFG and producing high-Btu product gas that is piped into the existing natural gas transmission system for sale. The RTO controls the waste gas streams generated from this process for destruction of non-methane organic compounds (NMOC) and the remaining methane. The open flare functions as a backup control device to the RTO and high-Btu process in instances where the plant is unable to deliver product gas into the pipeline due to not meeting pipeline specifications. These devices are covered under Emission Units EULFGPLAN and EUTREATMENTSYS in the current ROP.

4.2 Equipment Inspection

Canton conducts annual inspections of the open flare and RTO. Preventative maintenance recommendations for the open flare and RTO are noted in the annual inspection reports. A copy of the most recent inspection reports for the open flare and RTO are provided in Appendix F. The LFG treatment system is inspected on a daily and weekly basis. A checklist of daily and weekly inspection parameters and preventative maintenance activities is included in the attached “Landfill Gas Treatment Plan” provided in Appendix D. Required regular maintenance activities as described in the various equipment operations and maintenance (O&M) manuals are conducted per manufacturer recommendations. O&M manuals for the open flare and RTO are provided in Appendix A and Appendix B, respectively. The treatment system equipment O&M manual is provided in Appendix C. Following the procedures prescribed in the various O&M manuals aids in the prevention of a malfunction or equipment failure. Equipment inspection and routine maintenance records are maintained in an onsite operations log.

4.3 Replacement Parts

To facilitate quick replacement, the spare or replacement parts necessary for proper operation and routine maintenance are located on site at the facility (major components or specialty parts will be ordered as needed). Inventory may vary from time to time as parts are utilized in maintenance activities and have yet to be replaced.

An inventory of spare parts is included in Appendix E.

4.4 Source Parameter Monitoring

Canton monitors multiple parameters to ensure the proper operation of the open flare, RTO, and LFG treatment system. Monitoring parameters and their associated normal operating ranges, monitoring methods, and frequencies have been established in Permit To Install (PTI) No. 98-11D dated December 15, 2020. The monitoring parameters which are utilized to detect a malfunction or failure are summarized below in Table 4-1.

Table 4-1
Monitoring Parameters

Device	Parameter	Operating Range	Monitoring Method	Frequency
RTO	Combustion Chamber Temperature	≥1,400°F	Temperature monitoring device	Continuous (at least one measurement per 15 minutes)
Open Flare	Flame presence	N/A	Heat sensing device (e.g., UV beam sensor or thermocouple	Continuous
Open Flare	Visible emissions	No visible emissions except for periods not to exceed a total of 5 minutes during any 2 consecutive hours.	EPA Method 22 (40 CFR §60.18(c)(1)	Continuous
Treatment System	All applicable[1]	Varies	Per 40 CFR §60.753(e) and (f)	Varies
Facility-Wide	All applicable	Varies	Per NSPS Subpart WWW and NESHAP Subpart AAAA	Varies

Notes:

1. Gas treatment system monitoring parameters are outlined in the attached "Landfill Gas Treatment Plan" in Appendix D and are summarized below in Table 4-2.

Table 4-2
Landfill Gas Treatment System Monitoring Plan

Equipment	Parameter	Inspection Frequency	Monitoring Device	Range of Operation
Compressor/Blower	Discharge pressure (compression)	Continuously monitored by SCADA	Pressure monitoring device	1 – 10 psi
Coalescing filter vessel/final gas filter	Differential pressure (filtration)	Continuously monitored by SCADA	Pressure monitoring device	0.0 – 4.0 psi/2 to 100 inches W.C. (differential pressure between inlet & outlet of filter)
Gas cooler (moisture removal)	Differential temperature (de-watering)	Continuously monitored by SCADA	Temperature gauges	Differential temperature of at least 10°F

4.5 Corrective Procedures

Malfunction events are distinct events where the high-Btu facility is not operating in accordance with New Source Performance Standards (NSPS) requirements and which result, or have the potential to result, in an exceedance of one or more emission limitations or operational standards under the NSP. Per 40 CFR §63.2, a malfunction is defined as:

> *"Malfunction means any sudden, infrequent, and not reasonably preventable failure of air pollution control and monitoring equipment, process equipment, or a process to operate in a normal or usual manner which causes, or has the potential to cause, the emission limitations in an applicable standard to be exceeded. Failure that are caused in part by poor maintenance or careless operation are not malfunctions."*

Canton has developed a procedure for addressing malfunction events to minimize the potential for any excess emissions. The standard operating procedure is as follows:

1. Determine if the malfunction is causing an unsafe operating condition which may harm people, the environment, or the landfill gas control equipment. If conditions are unsafe, notify supervisor immediately.
2. Determine if landfill gas is being released to the atmosphere.
3. If unsafe operating conditions exist, or if landfill gas is being released to the atmosphere, stop landfill gas flow by doing one or more of the following:
    a. Close nearest valve to source of emissions.
    b. Place a temporary cap on piping.
    c. Apply other device (e.g., duct tape).
    d. Shut down blower.
    e. Turn off main power disconnect switch to blower.

4. Determine if other personnel, resources (e.g., qualified technician, electrician, consultant, or other) are needed for malfunction diagnosis.
5. Contact qualified resource (if necessary).
6. Start malfunction diagnosis.
7. Determine of other sources are needed to fix the malfunction (e.g., qualified technician, electrician, contractor, on-site resources, manufacturer's representative, or other.
8. Contact qualified resource (if necessary).
9. Fix the malfunction.
10. Once the malfunction is fixed, restart the system in accordance with the standard operating procedure (SOP) if it had been shut down, and record startup times and dates.
11. Record date that the malfunction occurred, date that malfunction was repaired, and total time that system was out of service.

5 IMPLEMENTATION OF AND UPDATES TO PLAN

5.1 Implementation of the Plan

If the Plan fails to address or inadequately addresses an event that meets the characteristics of a malfunction at the time the plan is initially developed, the owner or operator shall revise the plan within 45 days after such an event occurs and submit the revised plan for approval to the MDEQ-AQD District Supervisor. Should the MDEQ-AQD determine the malfunction abatement/preventative maintenance plan to be inadequate, the MDEQ-AQD District Supervisor may request modification of the plan to address those inadequacies.

5.2 Updates to the Plan

This Plan will be updated within 60 days of replacing or expanding the components of the landfill gas treatment system or high-Btu plant with components not described herein. If no components of the plant are replaced or expanded with components described herein, the Plan will be reviewed and updated as needed at least once every 5 years.

APPENDIX A
OPEN FLARE O&M MANUAL

Operation and Maintenance Manual for a

16" Diameter, 45' High ELEVATED ZEF™ BIOGAS FLARE SYSTEM

JOHN ZINK
JOHN ZINK COMPANY LLC

John Zink Company
11920 East Apache Street
Tulsa, Oklahoma 74116-1300

OPERATION AND MAINTENANCE MANUAL

FOR A

16" DIAMETER, 45' HIGH

ELEVATED ZEF™

BIOGAS FLARE SYSTEM

FACILITY: Sauk Trail Development
Canton, MI

WARNING

Do not attempt flare operation without first becoming familiar with these instructions. Improper equipment operation may result in personal injury, death, or equipment damage.

Prepared for

Purchasing Company: Canton Renewables, LLC
End User: Sauk Trail Development
Purchase Order: Signed Proposal 11/14/11

Prepared by

John Zink Company
11920 East Apache Street
Tulsa, Oklahoma 74116-1300
Sales Order: 9121864
Date: Month 2012

For assistance, please contact John Zink Company as follows:

Service (918) 234-2751 Emergency (918) 234-1800
Spare Parts (918) 234-2751 Facsimile (918) 234-2700

Request field service and spare part assistance during regular office hours, from 8:00 a.m. to 4:30 p.m. (CST).

V. RECEIPT AND INSTALLATION

Receipt

Upon delivery to the site and prior to installation, carefully examine the equipment for damage. Any damage sustained during shipment will be reimbursed through the freight company and their insurance agent. To assure prompt and accurate processing of any claims, the following is recommended:

1. Inspect each item as it is unloaded or uncrated. Note any damage or shortages on the shipping documentation before signing for delivery acceptance.
2. If the shipment cannot be inspected upon arrival, sign the delivery acceptance documents with the following qualifications:

   "accepted subject to future inspection"

3. Inspect the delivery as soon as possible, and no later than 10 days after delivery.
4. If damage or shortages are apparent, notify the freight company immediately and supply an itemized damage or shortage list. In addition, notify John Zink Company to initiate prompt replacement or repair procedures.

Installation

Reference Drawings

The following list of drawings are necessary for equipment installation and are located in Section XIII, "Reference Drawings". To identify specific components or for additional information, also refer to component specification sheets located in Section XIV, "Specification Sheets".

D-F-9121864-150	Process and Instrument Diagram
D-F-9121864-301	Elevated ZEF Biogas Flare
ST-10358	KE-1B Pilot
D-F-9121864-400, Sheet 1	Panel Rack Assembly
D-F-9121864-400, Sheet 2	Panel Detail
D-F-9121864-401	Wiring Diagram
D-F-9121864-402	Wiring Diagram
D-F-9121864-403	Wiring Diagram

General

1. Installation, connection, and assembly of the stack, any remaining piping, electrical conduit, wiring, supports, and field or finish painting are not the responsibility of John Zink Company.
2. The foundation is to be level and designed for site soil conditions considering loads the equipment will produce. Required anchor bolt and support locations appear on the reference drawings.
3. Ensure equipment is grounded adequately for site soil conditions and as directed by local electric codes.

4. Review the reference drawings for electrical and process piping connections to the system.
5. Power wires, thermocouple wires, and signal wires each are to be installed in separate conduit. Wire separation is necessary to avoid electrical interference problems which may affect equipment performance.
6. The ignition rod insulators in the pilot are fragile. Verify the insulators are not damaged and the rod, insulator bracket, and insulators are secure.
7. Verify the thermocouple assemblies are not damaged.
8. Clean inside all system piping and remove sand, rocks, weld slag, or any other debris immediately prior to assembly or installation. Use high pressure air to clear piping after assembly and installation.

NOTE

EPDM gasket material is not recommended for biogas applications.

Mechanical - Stack

1. Position the flare stack on a concrete foundation by connecting a crane with spreader bar to the lifting lugs.
2. Bolt the stack to the foundation.
3. Mount the flame arrester, FA-107, directly to the stack inlet flange, connection N1, with bolts, nuts, and gasket.
4. Mount the thermocouple, TE-107, in the flame arrester body downstream of the flame arrester element.
5. Verify the drain plug at the flare inlet, connection C1, is secure.
6. Verify the pilot assembly is attached to the stack securely.
7. Mount the Ignition Panel, PNL-103, to the brackets on the stack exterior.
8. Verify the windshield and the main flame thermocouple are attached to the stack securely.

Mechanical – Panel Rack

1. Position the panel rack assembly on a concrete foundation.
2. Bolt the panel rack to the foundation.
3. Confirm all components mounted on the panel rack remained properly installed and securely attached during shipment.
4. Connect a natural gas or propane source to the pilot gas pipe spool, containing the pressure regulator, PCV-302, solenoid valve, SV-303, hand valve, HV-304, and pressure gauge, PI-305, mounted on the panel rack, PR-101.
5. Mount the panel rack canopy and fluorescent light, L-17, with the bolts and nuts provided.

Mechanical - Interconnecting Pipe

1. Install gas pipe with supports and a check valve, if necessary, to the flame arrestor, FA-107 at the flare inlet.
2. Mount the flow meter, FE-107, in the gas pipe. For proper performance, the manufacturer requires a minimum distance of ten pipe diameters of straight, undisturbed flow upstream of the flow meter, and five diameters of straight, undisturbed flow downstream of the flow meter.
3. Install pilot gas pipe with supports between the pilot gas pipe spool mounted on the panel rack, PR-101, and the pilot, connection C2, mounted on the stack.
4. Mount the pressure transmitter, PIT-100, in the gas pipe.

Electrical - Stack

1. Install conduit and connect ignition wire between the Ignition Panel, PNL-103, and the pilot, connection C3.
2. Install conduit and connect power wire between the Ignition Panel, PNL-103, and the panel rack, PR-101.
3. Install conduit and connect thermocouple wire between the thermocouples, TE-107, TE-307 (connection C5), TE-201 (connection C4A), and TE-202 (connection C4B), and the panel rack, PR-101.

CAUTION

Avoid damage from exposure to higher temperatures by connecting only rigid conduit to the pilot thermocouple rather than flexible conduit.

Electrical – Panel Rack

1. Install conduit and connect supply power wire to the panel rack, PR-101.
2. Install conduit and connect analog telephone wire to the panel rack, PR-101.
3. Confirm conduit and power wire for the fluorescent light, L-17, are connected properly.

Electrical - Interconnecting Pipe

1. Install conduit and connect power wire between the flow meter, FE-107, and the panel rack, PR-101 (allow sufficient flexible conduit for removal).

Miscellaneous

1. Confirm all filter elements, mesh screens, and mist elimination elements are installed properly, if required.
2. Verify all pipe fittings and flanges (with gaskets, if required) are secure and all threaded nuts, bolts, and fittings are tightened properly.
3. If applicable, do not seal electrical conduit connections until the system installation is verified and initial operation is complete.
4. Verify all electrical conduit fittings (with seals, if required) are secure.

5. Verify all external electrical control and power wire is sized correctly and the system contains adequate overload protection.
6. Verify all electrical wiring connections are secure and all threaded terminals are tightened properly.

NOTE

An enclosure heater is installed in the Flare Control Panel, PNL-101, to prevent internal corrosion. Individual electric motors may contain integral heaters also to prevent internal corrosion. Ensure all heaters are connected to a reliable power supply and operated continuously, especially during outside storage or when operation is discontinued for an extended duration. Consult wiring diagrams in Section XIII, "Reference Drawings" for additional details.

VI. DESIGN BASIS

Type:	landfill
Composition:	50-95% CH_4 (maximum) 50-5% CO_2, air, and inert gases
Lower Heating Value:	460 BTU/SCF
Temperature:	100 °F
Flow Rate:	4,000 SCFM (maximum)
Heat Release *:	210,000,000 BTU/hr (maximum)

* lower heating value basis

CAUTION

Flame flashback may occur if the gas stream contains an amount of oxygen within the explosive limit.

NOTE

Methane concentrations less than 30% may require the addition of enrichment fuel for stable combustion.

Process Design

Smokeless Capacity:	100%
Destruction Efficiency:	98% (minimum)
Flare Inlet Pressure:	5" H_2O (maximum)
Ambient Pressure:	14.3 psia

Mechanical Design

Wind Speed Classification:	110 mph
Seismic Classification:	zone 4
Ambient Temperature:	-20 to 120 °F
Electrical Area Classification:	non-hazardous
Site Elevation:	680

Utilities

Pilot Gas (intermittent):	22 SCFH of propane at 10 psig 45 SCFH of natural gas at 15 psig
Compressed Air or Nitrogen:	100 psig (minimum) dry
Electricity:	480 V, three phase, 60 Hz for gas blower control 120 V, single phase, 60 Hz for control components

VII. OPERATING PHILOSOPHY

The following information briefly describes the operating logic and sequence for an Elevated ZEF™ Flare System.

WARNING
Do not circumvent any flame management sequence or any other safety sequence.

Logic

A burner management system, which includes a flame safeguard package, monitors specific parameters and discontinues operation if an unsafe condition occurs. Separate thermocouples detect pilot flame and main flame. Typical shutdown scenarios include:

Pilot Flame Failure and Shutdown

Pilot Flame Failure occurs, during the ignition sequence, when the pilot thermocouple is unable to detect the presence of pilot flame. When Pilot Flame Failure occurs, system operation is interrupted momentarily. Then the entire ignition sequence is repeated automatically. A Shutdown occurs only after three consecutive Failures, or unsuccessful attempts. Once Pilot Flame Shutdown occurs, the "Flare Shutdown" light illuminates and system operation discontinues.

Main Flame Failure and Shutdown

Main Flame Failure occurs, after the ignition sequence is complete, when the main thermocouple is unable to detect the presence of main flame. When Main Flame Failure occurs, system operation is interrupted momentarily. Then the entire ignition sequence is repeated automatically. A Shutdown occurs only after four consecutive Failures, or unsuccessful attempts. Once Main Flame Shutdown occurs, the "Flare Shutdown" light illuminates and system operation discontinues.

Other safety features include:

Flame Arrester High Temperature Shutdown

Upon determining the source of an alarm condition and completing the necessary corrective action, a system reset is required to begin operation again.

Sequence

A typical operating sequence consists of:

System Control Selection

Select either local or remote system control to begin system operation. Local control requires interaction at the control panel to start and stop operation. Remote control allows starting and stopping operation without interaction at the control panel.

Operating Permissives

System operation is permitted only after confirming two safety conditions exist. The closed limit switch for the automatic block valve must be satisfied, proving a closed valve position. Additionally, the pilot and main thermocouples must not detect the presence of flame.

Ignition Sequence

The pilot gas solenoid valve opens automatically, supplying gas to the pilot, the "Flare Operating" light flashes, and the ignition transformer energizes. The ignition transformer continues for ten seconds and then the pilot thermocouple verifies flame is present. The pilot gas solenoid valve remains open.

Gas Supply

Once pilot flame is detected, the flare is ready for service. While the pilot thermocouple verifies flame is present, system continues to be ready for service.

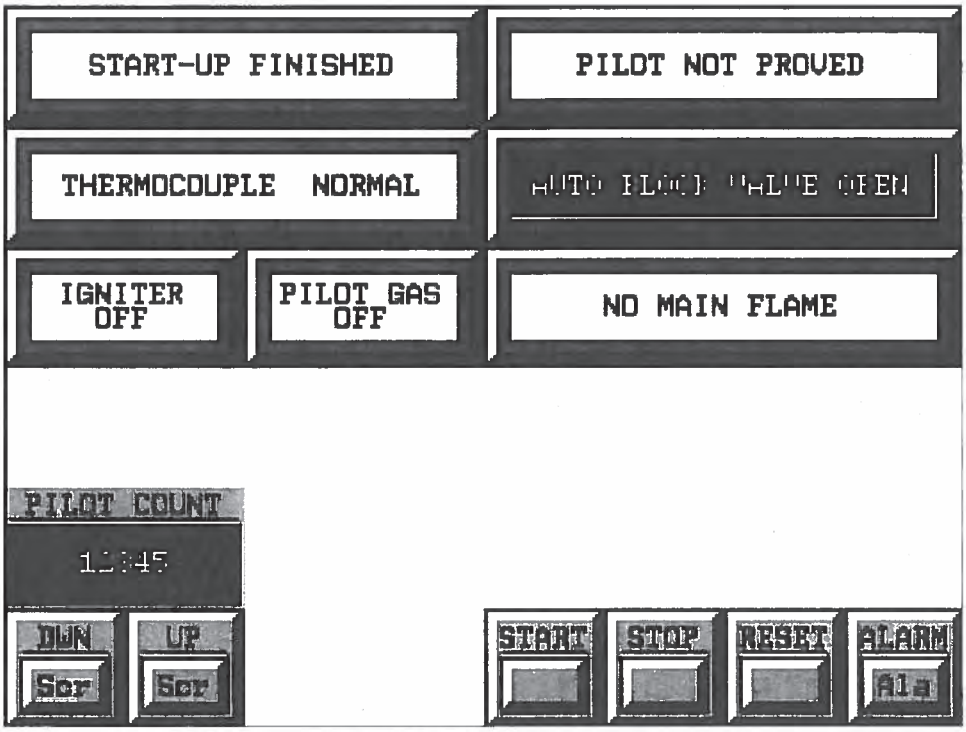
Operator Interface Panel

The Flare Control Panel contains an Operator Interface Panel (OIP), or touch screen, which replaces the usual selector switches, indicating lights, and pushbuttons utilized to control, operate, and monitor the system equipment.

Home Screen

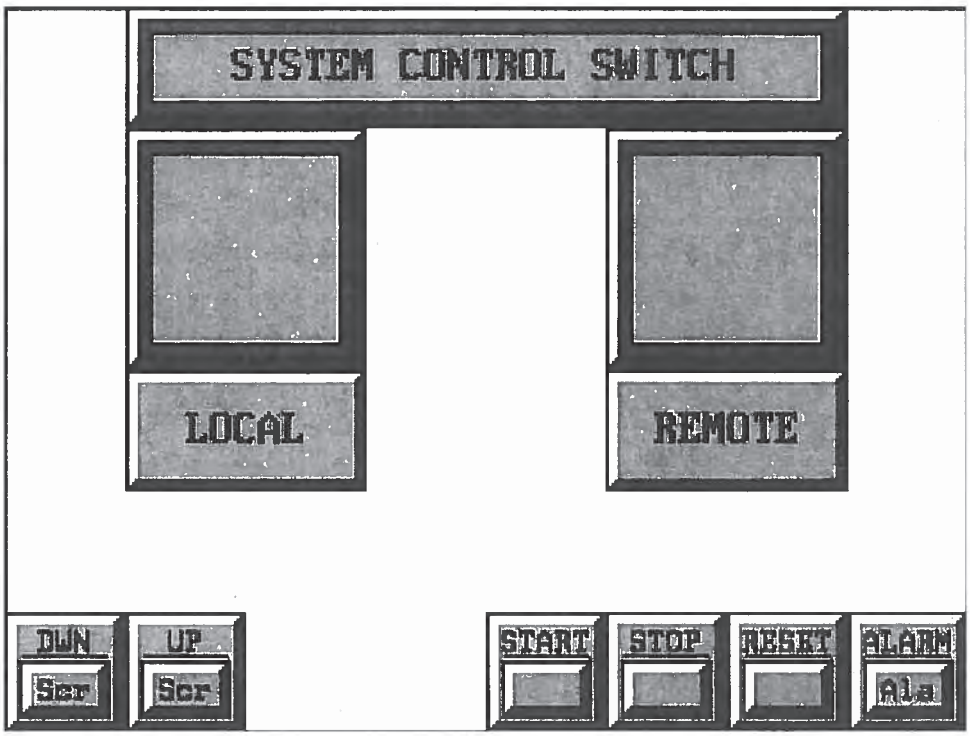
The "Home" screen displays contact information for John Zink Company and contains separate buttons for transferring to various other screens available. Buttons at the bottom left corner of the screen access a separate series of screens. Press the "Conf" button to access parameters from a separate "Configuration" screen. At the bottom right corner of the screen, press the "Alarm" button to access detailed alarm information common to all screens and press the "Lamp" button to confirm all panel indicating lights are functional.

Flare Status Screen



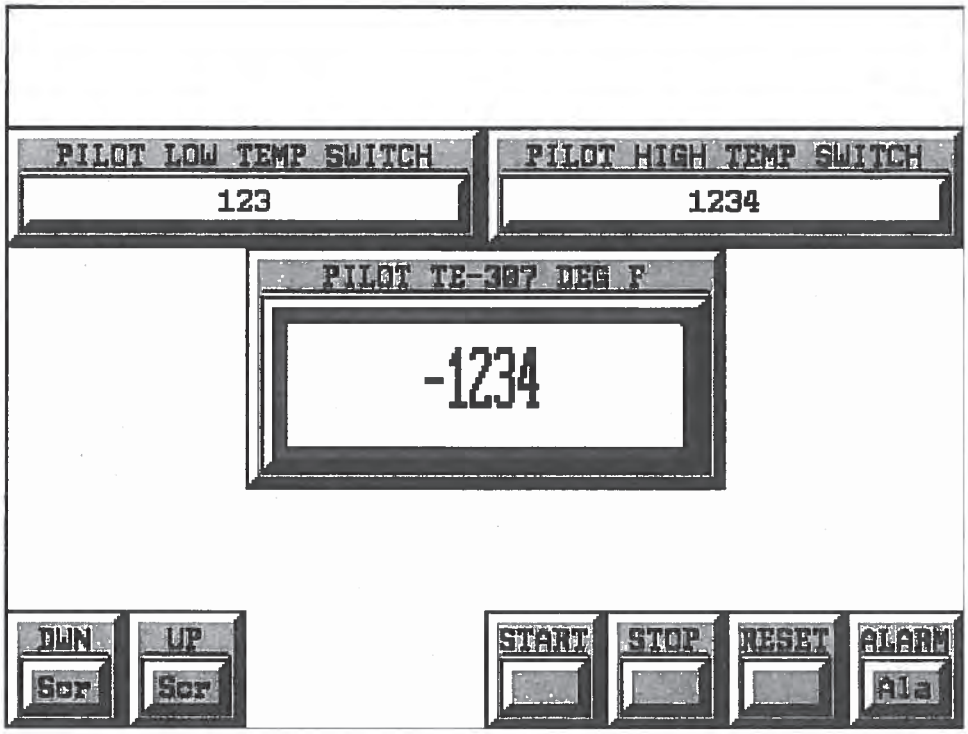
Access the "Flare Status" screen to continuously monitor progression through the flare operating sequence and the current flare operating status. Press buttons located at the bottom left corner of the screen to activate the next ("Up") or previous ("Down") screen available in the series, or return to the contact ("Home") screen. For a particular series of screens, buttons at the bottom right corner of the screen apply only for that series. Press these buttons to begin flare operation automatically ("Start"), discontinue flare operation ("Stop"), or reset a flare fault condition ("Reset").

System Control Screen



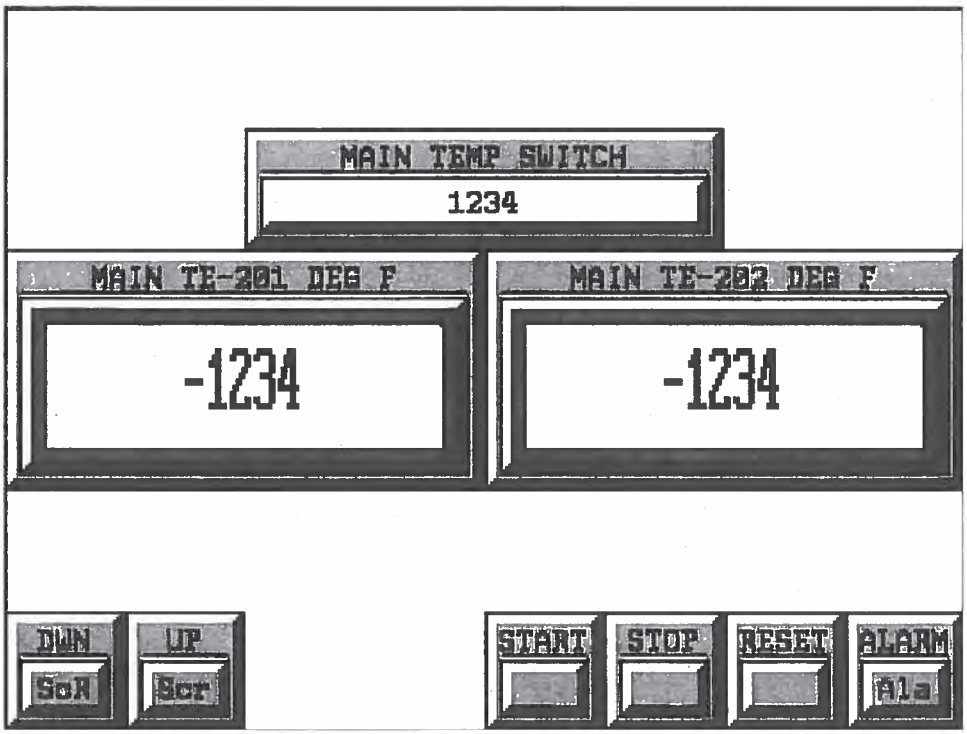
Access the "System Control" screen to select either "Local" or "Remote" system operation.

Pilot Temperature Screen



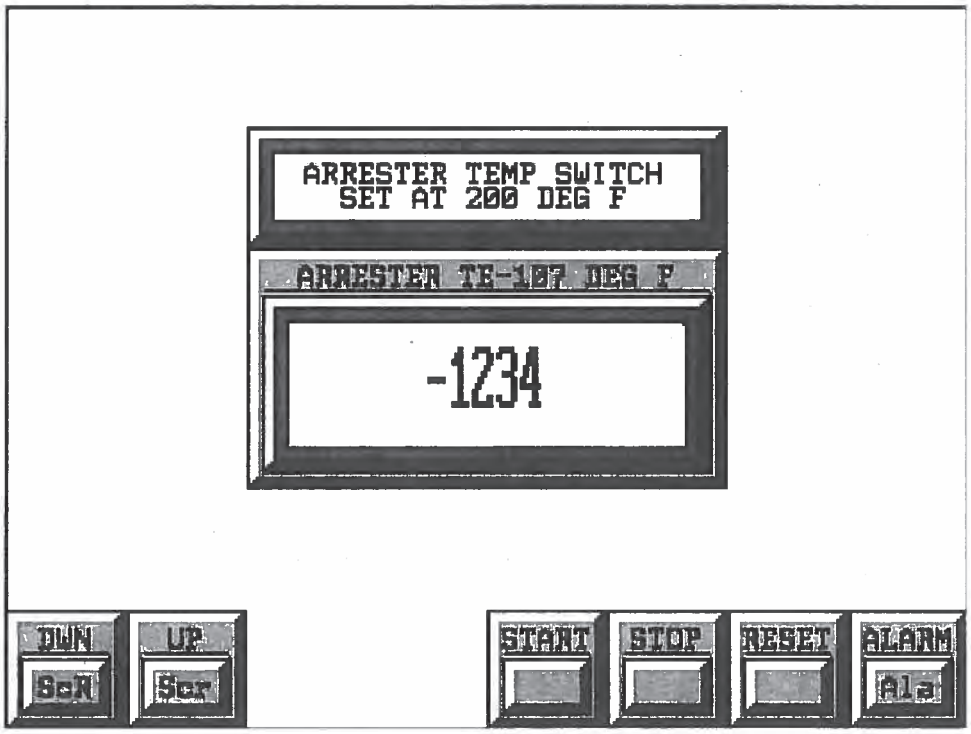
Access the "Pilot Temperature" screen to monitor the actual temperature detected by the pilot thermocouple. Press either the "Low" or "High" temperature switch value to adjust the corresponding temperature setpoint.

Main Flame Temperature Screen



Access the "Main Flame Temperature" screen to monitor the actual temperature detected by each main flame thermocouple. Press the temperature switch value to adjust the temperature setpoint.

Flame Arrester Temperature Screen



Access the "Flame Arrester Temperature" screen to monitor the actual temperature detected by the flame arrester thermocouple.

VIII. COMMISSIONING

The presence of a qualified John Zink Company representative is recommended for initial operation.

Process and Instrument Diagram Review

The equipment is fabricated according to the reference drawings. Operating personnel need to review the Process and Instrument Diagram and become familiar with the equipment.

Mechanical Review

Verify all equipment, including valves and control components, are functional prior to operation. Also, before beginning flare operation, complete the following:

1. Verify all equipment is installed according to the reference drawings.
2. Verify all electrical devices are connected to the proper power sources.
3. For the recommended chromel-alumel type K thermocouples, the red wire is negative (-) and the yellow wire is positive (+). Confirm the thermocouple extension wire is adequate for the radiation exposure and is proper for the particular thermocouple (KX wire with insulation for Type K thermocouples).

> **NOTE**
> Cross connecting the red and yellow wires anywhere in the circuit will nullify the thermocouple output.

4. All system pipe must be dry and free of dirt or foreign material, including the pilot gas pipe. Verify the pilot gas pipe is dry and unobstructed by removing the mixer orifice and strainer screen, if applicable, and blowing with clean, dry air. Replace the orifice and screen when clear flow exists.
5. Verify all drain and vent valves are closed and all drain and vent plugs are secure.
6. Close all manual and isolation valves initially.
7. Verify all disconnect handles are in the OFF position.
8. Verify all circuit breakers inside the control panels are in the OFF position.
9. Place all selector switches in the OFF or CLOSED position.
10. Verify the pilot gas pressure is adjusted properly (no pressure is displayed on the pressure gauge until the pilot gas solenoid valve opens).

11. Operating setpoint values are as follows:

Description	Parameter Tag	Default Value
Main Flame Proved Temperature	TSL-201 or TSL-202	200 °F
Pilot Flame Proved Temperature	TSL-307	300 °F and 1000 °F
Flame Arrester High Temperature	TSH-107	200 °F
Compressed Air or Nitrogen Pressure	--	100 psig minimum
Pilot Gas Operating Pressure	PCV-302	10 psig for propane 15 psig for natural gas
Enclosure Heater Thermostat	HTR-1	70 °F

NOTE

These setpoint values are recommended for initial operation and may require adjustment to satisfy specific operating conditions.

X. SYSTEM TESTING

Lamp Test

a. Press the "Lamp Test" button.
b. All panel lights illuminate.

Pilot Flame Failure and Shutdown

a. Press the "Stop" button.
b. Close the pilot gas hand valve.
c. Press the "Reset" button.
d. Press the "Start" button and the "Flare Operating" light flashes.
e. The pilot gas solenoid valve opens and the ignition transformer remains energized for ten seconds.
f. The pilot thermocouple is unable to detect flame.
g. The pilot gas solenoid valve closes and the ignition sequence is attempted again automatically.
h. After the third unsuccessful attempt to detect pilot flame, the "Flare Operating" light diminishes, the "Flare Shutdown" light illuminates, and system operation discontinues.
i. Press the "Reset" button and the "Flare Shutdown" light diminishes.
j. Open the pilot gas hand valve.

XI. TROUBLESHOOTING

Problem: The "Panel On" light does not illuminate.
Possible Causes:

a. The main circuit breaker is off.
b. The "Panel Power" switch is off.
c. The light bulb is defective.
d. Power is not connected to the panel.
e. The connecting wires are loose.

Problem: The pilot does not ignite.
Possible Causes:

a. The pilot gas hand valve is closed.
b. The pilot gas source is insufficient.
c. The pilot orifice is plugged.
d. The ignition wire is loose or broken.
e. The ignition transformer is defective.
f. The pilot electrode is defective.
g. The pilot insulators are broken.
h. The pilot gas pressure regulator requires adjustment.
i. The pilot gas solenoid valve is not functioning properly.
j. Power is not connected to the ignition transformer or pilot gas solenoid valve.

Problem: The pilot flame is not detected after igniting the pilot.
Possible Causes:

a. The thermocouple is not positioned properly.
b. The thermocouple is defective.
c. The thermocouple wires are reversed.
d. The connecting wires are loose.

XII. MAINTENANCE

The following maintenance summary is designed only as a guideline and does not identify all areas or components requiring maintenance attention. A maintenance program must be developed considering existing company policy, operational experience, and manufacturer requirements. This operating manual is to be used in conjunction with, and does not replace, any company policies.

General

1. Refer to the manufacturer literature in Section XIX, "Manufacturer Information" for specific maintenance requirements of individual components.
2. Review the calibration and operation of all instruments in Section XIX, "Manufacturer Information" as recommended by the manufacturer.
3. Inspect all flanges and connections for indications of leaking. Repair or replace if necessary.

Flare

1. Visually inspect the flare stack and windshield for damage or deterioration.
2. Inspect all thermocouple assemblies and replace at least once each year.
3. Inspect the pilot assembly, ignition rod, electrode, and insulators for damage once every three months. Repair or replace if necessary.
4. Verify pilot gas supply pressure and pilot ignition.
5. Remove the flame arrester element for cleaning every six months (measure the pressure differential).

Panel

1. Confirm the control logic is functioning properly and all input and output signals are correct.
2. Verify all safety shutdown devices every three months per Section X, "System Testing".
3. Inspect all electrical enclosures for any apparent corrosion or moisture.
4. Confirm all enclosure and actuator heaters are functioning.
5. Confirm the integrity of conduit seals, if applicable.
6. Verify the supply power voltage.
7. Verify power to motor starters.
8. During operation, measure gas blower line current and voltage.
9. Confirm chart recorder operation.

Miscellaneous

1. Remove and clean any filter elements or mesh strainers every three months.
2. Verify approximately 2" H_2O appears on the differential pressure gauge. If the value exceeds 5" H_2O, then clean the mist elimination element inside the ZMS Moisture Separator.
3. Press the "Hand" button for the gas blower to verify proper operation.
4. Verify sufficient pressure is available from the compressed air or nitrogen source.
5. Inspect any gauges and valves for deterioration.

NOTE

An enclosure heater is installed in the Flare Control Panel, PNL-101, to prevent internal corrosion. Individual electric motors may contain integral heaters also to prevent internal corrosion. Ensure all heaters are connected to a reliable power supply and operated continuously, especially during outside storage or when operation is discontinued for an extended duration. Consult wiring diagrams in Section XIII, "Reference Drawings" for additional details.

XIV. SPECIFICATION SHEETS

JOHN ZINK
JOHN ZINK COMPANY LLC

Project Spec Sheet List

Project #	9121864	**Project Site**	SAUK TRAIL DEVELOPMENT
Description	16" x 45' ELEVATED FLARE		
Customer	CANTON RENEWABLES, LLC		
Location	CANTON, MI		
Cust. PO #	LTR 11/14/11		

Spec	Page	Of	Revision	Description	Spec Name
1	1	6	0	PNL-101	FLARE CONTROL PANEL
1	2	6	0	PNL-101	FLARE CONTROL PANEL
1	3	6	0	PNL-101	FLARE CONTROL PANEL
1	4	6	0	PNL-101	FLARE CONTROL PANEL
1	5	6	0	PNL-101	AUTOMATIC TELEPHONE DIALER
1	6	6	0	PNL-101	CELLULAR TERMINAL
2	1	1	0	PNL-103	IGNITION TRANSFORMER
3	1	5	0	PR-101	PANEL RACK
3	2	5	0	PCV-302	PRESSURE CONTROL VALVES & REGULATORS
3	3	5	0	SV-303	SOLENOID VALVES
3	4	5	0	HV-304	MANUAL BALL VALVE
3	5	5	0	PI-305	PRESSURE GAGES
4	1	1	0	TE-107	THERMOCOUPLES & THERMOWELLS
5	1	1	0	SOV-100, SV-100, ZSC-100, ZSO-100	ACTUATED BUTTERFLY VALVE
6	1	1	0	FA-107	FLASH - BACK ARRESTOR
7	1	1	1	FE-107, FIT-107	MASS FLOW METER
8	1	1	0	-----	SPARE PARTS

JOHN ZINK JOHN ZINK COMPANY LLC FOR JZ PARTS: (918)234-2751	JZ SPECIFICATION SHEET FLARE CONTROL PANEL PNL-101	Spec Rev: 1 / 0 Page No.: 1 of 6 Project: 9121864

Project Name: **16" x 45' ELEVATED FLARE** | Customer Name: **CANTON RENEWABLES, LLC**

Project Site: **SAUK TRAIL DEVELOPMENT** | Customer P.O.: **LTR 11/14/11**

	Item No.	Qty	Tag Number(s)	Description	JZ Part No.
1	1	1	CE-101	HOFFMAN #C-SD363012 ENCLOSURE, NEMA 4	1084730
2				(36" H X 30" W X 12" D)	
3	2	1	-----	HOFFMAN #CMFK MOUNTING KIT	0303601
4	3	1	-----	HOFFMAN #C-P3630 SUBPANEL	1085777
5	4	1	-----	MCMASTER-CARR #1363A16 ACCESS DOOR	1128529
6					
7	5	1	HTR-1	HOFFMAN #D-AH2001A HEATER, 200 W	0300056
8	6	1	GFI-1	LEVITON #7599-I RECEPTACLE, GFCI, 15 A WITH	0401112
9				#80401-I COVER AND APPLETON #4CS1/2 BOX	
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					

25 **Notes:**

ALL ITEMS AND ENTIRE ASSEMBLY REQUIRE UL LABEL

PANEL MOUNT

Revision Date	Initials	Revision Description		Date	Name
Δ			Prepared	12/30/2011	NEWFIELS
Δ			Checked	01/06/2012	NEWFIELS
Δ			Approved	01/06/2012	NEWFIELS
Δ			Quote Attached: ☐ Yes	Copies of Vendor Literature Req'd:	1

JOHN ZINK JOHN ZINK COMPANY LLC FOR JZ PARTS: (918)234-2751	JZ SPECIFICATION SHEET FLARE CONTROL PANEL PNL-101	Spec Rev: 1 0 Page No.: 2 of 6 Project: 9121864

Project Name: **16" x 45' ELEVATED FLARE** | Customer Name: **CANTON RENEWABLES, LLC**

Project Site: **SAUK TRAIL DEVELOPMENT** | Customer P.O.: **LTR 11/14/11**

	Item No.	Qty	Tag Number(s)	Description	JZ Part No.
1	1	1	L-1	CUTLER HAMMER #10250T181NC12N PILOT LIGHT,	0029577
2				TRANSFORMER TYPE, NEMA 4X, 120 VAC, WHITE LENS	
3	2	1	L-2	CUTLER HAMMER #10250T181NC8N PILOT LIGHT,	0029575
4				TRANSFORMER TYPE, NEMA 4X, 120 VAC, GREEN LENS	
5	3	1	L-3	CUTLER HAMMER #10250T181NC7N PILOT LIGHT,	0029574
6				TRANSFORMER TYPE, NEMA 4X, 120 VAC, RED LENS	
7					
8					
9					
10					
11					
12	4	2	S-1,8	CUTLER HAMMER #10250T20KB SELECTOR SWITCH, TWO	0029572
13				POSITION , NEMA 4X, 1-N/O AND 1-N/C CONTACTS	
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					

25 **Notes:**

ALL ITEMS AND ENTIRE ASSEMBLY REQUIRE UL LABEL

PANEL MOUNT

Revision Date	Initials	Revision Description		Date	Name
Δ			Prepared	12/30/2011	NEWFIELS
Δ			Checked	01/06/2012	NEWFIELS
Δ			Approved	01/06/2012	NEWFIELS
Δ			Quote Attached: ☐ Yes	Copies of Vendor Literature Req'd:	1

JOHN ZINK JOHN ZINK COMPANY LLC FOR JZ PARTS: (918)234-2751	JZ SPECIFICATION SHEET FLARE CONTROL PANEL PNL-101	Spec Rev 1 0 Page No. 3 of 6 Project 9121864

Project Name: **16" x 45' ELEVATED FLARE**	Customer Name: **CANTON RENEWABLES, LLC**
Project Site: **SAUK TRAIL DEVELOPMENT**	Customer P.O.: **LTR 11/14/11**

	Item No.	Qty	Tag Number(s)	Description	JZ Part No.
1	1	1	PLC-1	ALLEN BRADLEY #1762-L40AWAR MICROLOGIX PROCESSOR	1157192
2				WITH DUAL RS-232 PORTS	
3	2	1	PLC-1	ALLEN BRADLEY #1762-IT4 THERMOCOUPLE INPUT MODULE	1127113
4					
5					
6					
7	3	1	COM-1	PROSOFT 5201-MNET-DFCM COMMUNICATION MODULE	1300066
8	4	1	S-101	N-TRON 708FX2 FIBER PROT/SWITCH	1300067
9					
10	5	1	OIP-1	AUTOMATION DIRECT #EA7-S6M TOUCHSCREEN, NEMA 4,	1182022
11				CAPABLE OF MEMORY MODULE EXPANSION	
12					
13	6	1	PS-1	IDEC #PS5R-E24 POWER SUPPLY, 24 V DC, 100 W,	1078418
14				120 V, 60 HZ	
15					
16	7	1	CBL-1	ALLEN BRADLEY #2711P-CBL-EX04 CABLE, ETHERNET CAT5	1183628
17				CROSSOVER, 14' LONG	
18	8	1	CBL-2	ALLEN BRADLEY #1761-CBL-PM02	1158525
19	9	1	CBL-3	AUTOMATION DIRECT #EZ-MLOGIX-CBL CABLE	1129220
20					
21					
22					
23					
24					

25 **Notes:**

ALL ITEMS AND ENTIRE ASSEMBLY REQUIRE UL LABEL

PANEL MOUNT

	Revision Date	Initials	Revision Description		Date	Name
Δ				Prepared	12/30/2011	NEWFIELS
Δ				Checked	01/06/2012	NEWFIELS
Δ				Approved	01/06/2012	NEWFIELS
Δ				Quote Attached: ☐ Yes	Copies of Vendor Literature Req'd:	1

JOHN ZINK JOHN ZINK COMPANY LLC FOR JZ PARTS: (918)234-2751	JZ SPECIFICATION SHEET FLARE CONTROL PANEL PNL-101	Spec Rev: 1 / 0 Page No.: 4 of 6 Project: 9121864

Project Name: **16" x 45' ELEVATED FLARE** | Customer Name: **CANTON RENEWABLES, LLC**

Project Site: **SAUK TRAIL DEVELOPMENT** | Customer P.O.: **LTR 11/14/11**

	Item No.	Qty	Tag Number(s)	Description	JZ Part No.
1	1	50	-----	ENTRELEC M 4/6 TERMINALS (P/N 115 116.07)	0020514
2	2	6	-----	ENTRELEC FEM6 END SECTION (P/N 118 368.16)	0020515
3	3	6	-----	ENTRELEC BAM END STOP (P/N 103 002.26)	0036813
4	4	1	-----	ENTRELEC PR4 DIN-3 MOUNTING RAIL (P/N 101 598.26)	1012629
5	5	1	-----	ENTRELEC BLANK MARKING TAGS (P/N 233 000.01)	1006764
6	6	4	-----	ENTRELEC BJM6 10 POINT JUMPERS (P/N 168 973.07)	1019660
7	7	3	-----	ENTRELEC M 10/10 TERMINALS (P/N 115 120.17)	1041301
8	8	8	-----	ENTRELEC MTC6 TERMINALS (P/N 115 206.22)	1070213
9					
10					
11	9	2	CB-2,11	SQUARE D #60110 CIRCUIT BREAKER, 10 A, ONE POLE	1140427
12	10	2	CB-8,10	SQUARE D #60106 CIRCUIT BREAKER, 5 A, ONE POLE	1140428
13	11	2	CB-79,80	SQUARE D #MG24428 CIRCUIT BREAKER, 4 A, 24 V DC	1187122
14					
15					
16					
17					
18					
19					
20	11	2	CR-63, 67	IDEC #RR3B-ULCAC120V RELAY, 3 PDT WITH INDICATING	0401314
21				LIGHT AND PUSH-TO-TEST BUTTON	
22	12	2	-----	IDEC #SR3B-05 SOCKET	0030703
23					
24					
25					

Notes:

ALL ITEMS AND ENTIRE ASSEMBLY REQUIRE UL LABEL

PANEL MOUNT

Revision Date	Initials	Revision Description		Date	Name
Δ			Prepared	12/30/2011	NEWFIELS
Δ			Checked	01/06/2012	NEWFIELS
Δ			Approved	01/06/2012	NEWFIELS
Δ			Quote Attached: ☐ Yes	Copies of Vendor Literature Req'd:	1

1

AUTOMATIC TELEPHONE DIALER

MANUFACTURER:	PHONETICS
MODEL:	SENSAPHONE 2000
QUANTITY:	ONE (1) REQUIRED
FEATURES:	8 UNIVERSALLY CONFIGURABLE INPUT CHANNELS, 10 HOUR RECHARGABLE BATTERY, LED CHANNEL INDICATION
CONFIGURATION:	CHANNEL 1: PILOT FLAME FAILURE CHANNEL 2: MAIN FLAME FAILURE CHANNEL 3: FLAME ARRESTER HIGH TEMPERATURE CHANNEL 4: SPARE CHANNEL 5: SPARE CHANNEL 6: SPARE CHANNEL 7: SPARE CHANNEL 8: GENERAL ALARM
POWER:	120 V, SINGLE PHASE, 60 HZ WITH POWER CORD
JOHN ZINK PART NUMBER:	1059898
TAG:	ATD-1

PANEL MOUNT

Project Name: **16" x 45' ELEVATED FLARE**
Customer Name: **CANTON RENEWABLES, LLC**
Project Site: **SAUK TRAIL DEVELOPMENT**
Customer P.O.: **LTR 11/14/11**

1

CELLULAR TERMINAL

MANUFACTURER:	TELULAR
MODEL:	PHONECELL SX6TE
QUANTITY:	ONE (1) REQUIRED
FREQUENCY:	850 TO 1900, 900 TO 1800 MHZ
CARRIER:	GSM (AT&T, T-MOBILE, US CELLULAR, CELLULAR ONE)
POWER:	120 V, SINGLE PHASE, 60 HZ WITH POWER CORD; INTERNAL NICKEL METAL HYDRIDE BATTERY, RECHARGEABLE
ACCESSORIES:	DUAL BAND ROOF MOUNT ANTENNA KIT FOR 3/4" DIAMETER HOLE, WITH 17' CABLE
JOHN ZINK PART NUMBER:	1291721
TAG:	ATD-2

PANEL MOUNT

Revision Date	Initials	Revision Description		Date	Name
Δ		PART NUMBER	Prepared	12/30/2011	NEWFIELS
Δ			Checked	01/06/2012	NEWFIELS
Δ			Approved	01/06/2012	NEWFIELS
Δ			Quote Attached: ☐ Yes	Copies of Vendor Literature Req'd:	1

JOHN ZINK JOHN ZINK COMPANY LLC FOR JZ PARTS: (918)234-2751	JZ SPECIFICATION SHEET IGNITION TRANSFORMER PNL-103	Spec Rev: 2 0 Page No.: 1 of 1 Project: 9121864

Project Name: **16" x 45' ELEVATED FLARE**	Customer Name: **CANTON RENEWABLES, LLC**
Project Site: **SAUK TRAIL DEVELOPMENT**	Customer P.O.: **LTR 11/14/11**

TRANSFORMER		
1	Manufacturer	DONGAN
2	Model	A06-SA6
3	Tag No.	IT-1
4	Primary	120 V AC / 60 HZ
5	Secondary	6000 V
6	JZ Part No.	-----
7		
8		
9		
10		
11		
12		

ENCLOSURE		
13	Manufacturer	HOFFMAN
14	Model	A1412NF
15	Enclosure	NEMA 4
16	Dimensions	14" H X 12" W X 6" D
17	JZ Part No.	-----
18		
19	Sub-Panel Manufacturer	HOFFMAN
20	Sub-Panel Model No	A14P12
21	JZ Part No.	-----
22		
23		
24	Mount	BELOW

25 **Notes:**

JOHN ZINK PART NUMBER: 1200432
QUANTITY: ONE (1) ASSEMBLY REQUIRED

ALL ITEMS AND ENTIRE ASSEMBLY REQUIRE UL LABEL

PANEL MOUNT, THEN SHIP LOOSE FOR FIELD INSTALLATION

Revision Date	Initials	Revision Description		Date	Name
Δ			Prepared	12/30/2011	NEWFIELS
Δ			Checked	01/06/2012	NEWFIELS
Δ			Approved	01/06/2012	NEWFIELS
Δ			Quote Attached: ☐ Yes	Copies of Vendor Literature Req'd:	1

JOHN ZINK JOHN ZINK COMPANY LLC FOR JZ PARTS: (918)234-2751	JZ SPECIFICATION SHEET PANEL RACK PR-101	Spec Rev 3 0 Page No. 1 of 5 Project 9121864

Project Name: **16" x 45' ELEVATED FLARE**	Customer Name: **CANTON RENEWABLES, LLC**
Project Site: **SAUK TRAIL DEVELOPMENT**	Customer P.O.: **LTR 11/14/11**

	Item No.	Qty	Tag Number(s)	Description	JZ Part No.
1					
2					
3					
4					
5					
6					
7	1*	1	L-17	COLUMBIA #LUN4-248HO-WL120-IPK FIXTURE,	1003919
8				FLUORESCENT, 4 FT, 120 V, WITH TWO (2) 60 W LAMPS	
9					
10					
11	2 *	50'	-----	DELCO #440 IGNITION WIRE, HIGH VOLTAGE	0002167
12	3 *	400'	-----	THERMO SENSORS #PPZS16KX THERMOCOUPLE WIRE,	0403529
13				16 GAGE SHIELDED, MOISTURE RESISTANT	
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					

25 **Notes:**

ALL ITEMS REQUIRE UL LABEL

* SHIP LOOSE FOR FIELD INSTALLATION

	Revision Date	Initials	Revision Description		Date	Name
Δ				Prepared	12/30/2011	NEWFIELS
Δ				Checked	01/06/2012	NEWFIELS
Δ				Approved	01/06/2012	NEWFIELS
Δ				Quote Attached: ☐ Yes	Copies of Vendor Literature Req'd:	1

Project Name: **16" x 45' ELEVATED FLARE**
Project Site: **SAUK TRAIL DEVELOPMENT**
Customer Name: **CANTON RENEWABLES, LLC**
Customer P.O.: **LTR 11/14/11**

LINE	1	Service		PROPANE / NATURAL GAS	
	2	Line No./Vessel No.			
	3	Line Size/Sched. No.		1/2"	
	4	Function		PILOT GAS	
BODY	5	Type of Body		REGULATOR	
	6	Body Size	Port Size		1/2"
	7	Guiding	No. of Ports		2
	8	End Conn. & Rating		1/2" NPT	
	9	Body Material		ALUMINUM	
	10	Packing Material			
	11	Lubricator	Isolating Valve		
	12	Seal Type			
	13	Trim Form			
	14	Trim Material			
	15	Seat Material		NITRILE	
	16	Required Seat Tightness			
	17	Max. Allow. Sound Level dBA			
ACTUATOR	18	Type of Actuator		SPRING DIAPHRAGM	
	19	Pilot			
	20	Supply to Pilot			
	21	Self Cont.	Ext. Conn.	X	
	22	Diaphragm Material		NITRILE	
	23	Diaphragm Rating			
	24	Spring Range		0 TO 35 PSIG	
	25	Set Point		15 PSIG	
	26				
	27				

ACCESSORIES	28	Filt. Reg.	Supply Gage	NO	NO
	29	Line Strainer			
	30	Housing Vent			
	31	Internal Relief		NO	
	32				
	33				
	34				
SERVICE	35	Flow Units		SCFH	
	36	Fluid		PROPANE / NATURAL GAS	
	37	Quant. Max		25 / 50	
	38	Quant. Oper.		22 / 45	
	39	Valve Cv	Valve 1	1.33	35.02
	40	Norm. Inlet Press.	ΔP	20 PSIG	
	41	Max. Inlet Press.		400 PSIG	
	42	Max. Shut Off ΔP			
	43	Temp. Max.	Operating	180	60
	44	Oper. sp. gr.	Mol. Wt.	1.52 / 0.65	44 / 19
	45	Oper. Visc.	% Flash		
	46	% Superheat	% Solids		
	47	Vapor Press.	Crit. Press.		
	48	Predicted Sound Level dBA			
ORDER	49				
	50	Manufacturer		FISHER	
	51	Model No.		67D-27	
	52	Mount		RACK	
	53	Tag No.		PCV-302	
	54	JZ Part No.		1260113	

55 **Notes:**

QUANTITY: ONE (1) REQUIRED

	Revision Date	Initials	Revision Description
Δ			
Δ			
Δ			
Δ			

	Date	Name
Prepared	12/30/2011	NEWFIELS
Checked	01/06/2012	NEWFIELS
Approved	01/06/2012	NEWFIELS
Quote Attached: ☐ Yes	Copies of Vendor Literature Req'd:	1

Project Name: **16" x 45' ELEVATED FLARE**
Project Site: **SAUK TRAIL DEVELOPMENT**
Customer Name: **CANTON RENEWABLES, LLC**
Customer P.O.: **LTR 11/14/11**

GENERAL	1	Tag No.		SV-303		
	2	Service		PILOT GAS		
	3					
	4	Line No. / Vessel No.				
	5	Quantity		1		
VALVE BODY	6	Type				
	7	Size: Body	Port	1/2"	3/4"	
	8	Rating	Type Conn.		NPT	
	9	Material -- Body		ALUMINUM		
	10	Material -- Seat		NITRILE		
	11	Material -- Diaphragm		NITRILE		
	12	Operation Direct/ Pilot		DIRECT		
	13	Packless or Type Packed		PACKLESS		
	14	Manual Re-Set		NO		
	15	Manual Operator				
	16					
	17					
WHEN DE-ENERGIZED	18	2-Way Valve Opens/Close			CLOSES	
	19	3-Way				
	20	Vent Port Opens/Close				
	21	Press Port Opens/Clos				
	22	4-Way				
	23	Press to Cyl.1 / Cyl.2				
	24	Exh. from Cyl.1 / Cyl.2				
	25					
	26					
	27					

SOLENOID	28	Enclosure	NEMA 4,7	
	29	Voltage / HZ	120 V 60	
	30	Style of Coil	F	
	31	Single or Double Coil		
	32			
	33			
SERVICE COND.	34	Fluid	PROPANE	NATURAL GAS
	35	Qty. Maximum	25 SCFH	50 SCFH
	36	Oper. Diff. Min / Max	0 20 PSIG	
	37	Allow. Diff. Min / Max	0 50 PSIG	
	38	Temp. Norm / Max. F	60 125	
	39	Oper. sp. gr.	1.52	0.65
	40	Oper. Viscosity		
	41	Required Cv		
	42	Valve Cv	4.4	
	43			
	44			
	45			
	46			
	47			
	48			
	49			
	50			
	51	Manufacturer	ASCO	
	52	Model No.	EF8215G20	
	53	Mount	RACK	
	54	JZ Part No.	0012004	

55 **Notes:**

	Revision Date	Initials	Revision Description
Δ			
Δ			
Δ			
Δ			

	Date	Name
Prepared	12/30/2011	NEWFIELS
Checked	01/06/2012	NEWFIELS
Approved	01/06/2012	NEWFIELS

Quote Attached: ☐ Yes
Copies of Vendor Literature Req'd: 1

JOHN ZINK
JOHN ZINK COMPANY LLC
FOR JZ PARTS: (918)234-2751

JZ SPECIFICATION SHEET
MANUAL BALL VALVE
HV-304

Spec	Rev	3	0
Page No.		4 of 5	
Project		9121864	

Project Name: **16" x 45' ELEVATED FLARE**
Project Site: **SAUK TRAIL DEVELOPMENT**
Customer Name: **CANTON RENEWABLES, LLC**
Customer P.O.: **LTR 11/14/11**

1	Manufacturer	APOLLO
2	Model No.	73-103-01
3	Process Connections	THREADED
4	Body Material	CARBON STEEL
5	Ball Material	CARBON STEEL
6	Stem Material	CARBON STEEL
7	Seal/Seat Material	TFE/TFE
8	Packing Material	TFE
9	Handle Type	LEVER
10		
11		
12		

34 **Notes:**

13	Qty	Tag No.	Size	Oper. Press. PSIG	Oper. Temp. ° F	Service	Mount	JZ Part No.
14	1	HV-304	1/2"	15	60	PILOT GAS	RACK	0501519
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								

Revision	Date	Initials	Revision Description
Δ			
Δ			
Δ			
Δ			

	Date	Name
Prepared	12/30/2011	NEWFIELS
Checked	01/06/2012	NEWFIELS
Approved	01/06/2012	NEWFIELS

Quote Attached: ☐ Yes
Copies of Vendor Literature Req'd: 1

JOHN ZINK
JOHN ZINK COMPANY LLC
FOR JZ PARTS: (918)234-2751

JZ SPECIFICATION SHEET
PRESSURE GAGES
PI-305

Spec Re	3	0
Page No.	5 of 5	
Project	9121864	

Project Name **16" x 45' ELEVATED FLARE**
Project Site **SAUK TRAIL DEVELOPMENT**
Customer Name **CANTON RENEWABLES, LLC**
Customer P.O.: **LTR 11/14/11**

1	Type		Direct	13	Process Connection	1/2" BOTTOM
2	Mount Type		Local	14	Operating Temperature	60 F
3	Dial Diamete	Color	4 1/2" WHITE	15	OPTIONS	
4	Case Material		Phenol	16		
5	Ring Type		Screwed	17		
6	Blow-Out Protection		Back	18		
7	Lens Material		Plastic	19		
8	Accuracy Required		+/- 0.5%	20		
9	Element Type		Bourdon	21		
10	Element Materia		SS	22		
11	Socket Material		Steel	23	Manufacturer	WIKA
12	Movement Material		SS	24	Model No.	222.34 4.5 30PSI 1/2L

	Quantity	Tag No	Range PSIG	Oper. Press. PSIG	Service	JZ Part No
25						
26	1	PI-305	0 TO 30	15	PILOT GAS	1209636
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						
44						

45 **Notes:**

RACK MOUNT

Revision Date	Initials	Revision Description		Date	Name
Δ			Prepare	12/30/2011	NEWFIELS
Δ			Checked	01/06/2012	NEWFIELS
Δ			Approved	01/06/2012	NEWFIELS
Δ			Quote Attached: ☐ Yes	Copies of Vendor Literature Req'd:	1

JOHN ZINK
JOHN ZINK COMPANY LLC
FOR JZ PARTS: (918)234-2751

JZ SPECIFICATION SHEET
THERMOCOUPLES & THERMOWELLS
TE-107

Spec	Rev	4	0
Page No.		1 of 1	
Project		9121864	

Project Name: **16" x 45' ELEVATED FLARE**
Project Site: **SAUK TRAIL DEVELOPMENT**
Customer Name: **CANTON RENEWABLES, LLC**
Customer P.O.: **LTR 11/14/11**

ELEMENT	1	Manufacturer		THERMO SENSORS			
	2	Model No.		6K34-U-06-SM3			
	3	ISA Type	Wire Size	K	14 AWG		
	4	Sheath O.D.	Sheath Mat'l	3/8"	304 SS		
	5	Type		Ungrounded			
HEAD	6	Material		CAST IRON			
	7	Conduit Connection		3/4"			
	8	Terminal Block		Single			
	9	Process Connection		1/2"			
	10						
WELL	11	Material					
	12	Construction					
	13	O.D. Dim.	I.D. Dim.				
	14	Process Conn.	Internal Conn.				
	15						
ASSMBY.	16	Nipple Length "N"					
	17						
	18	Manufacturer					
	19	Model					
	20						

	Tag No.	Well Dimes. "U"	Well Dimes. "T"	Element Length	Single Duplex	Type	Gage	Service	JZ Part No.
21									
22	TE-107			6"	SINGLE	K	14	FLAME ARRESTER	1091806
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									

37 **Notes:**

QUANTITY: ONE (1) ASSEMBLY REQUIRED

SHIP LOOSE FOR FIELD INSTALLATION

	Revision Date	Initials	Revision Description
Δ			
Δ			
Δ			
Δ			

	Date	Name
Prepared	12/30/2011	NEWFIELS
Checked	01/06/2012	NEWFIELS
Approved	01/06/2012	NEWFIELS

Quote Attached: ☐ Yes
Copies of Vendor Literature Req'd: 1

JOHN ZINK
JOHN ZINK COMPANY LLC
FOR JZ PARTS: (918)234-2751

JZ SPECIFICATION SHEET
ACTUATED BUTTERFLY VALVE
SOV-100, SV-100, ZSC-100, ZSO-100

Spec Rev	5	0
Page No.	1 of 1	
Project	9121864	

Project Name: **16" x 45' ELEVATED FLARE**
Project Site: **SAUK TRAIL DEVELOPMENT**
Customer Name: **CANTON RENEWABLES, LLC**
Customer P.O.: **LTR 11/14/11**

GENERAL	1	Tag No.		SOV-100	
	2	Service		LANDFILL GAS	
	3	Line No./Vessel No.			
	4	Line Size/Sched. No.		14"	
TYPE	5	Type of Body	Body Size	WAFER	14"
	6	Port Size	Valve Cv	14"	
	7	Shaft Diameter			
	8	Face to Face Dimension			
	9	End Conn. and Rating		14" 150 LB RF	
MATERIALS	10	Body		CARBON STEEL	
	11	Disc		316 STAINLESS STEEL	
	12	Shaft		17-4 PH STAINLESS STEEL	
	13	Bushing			
	14	Trim Form			
	15	Trim:	Seat	PTFE	
	16		Seal		
	17		Packing		
	18	Seat Leakage Classification			
	19				
ACTUATOR	20	Manufacturer		BETTIS	
	21	Model		CBA930SR100	
	22	Type (Pneumatic/Electrical)		PNEUMATIC	
	23	Input Signal (Max/Min)			
	24	Action (Spring Return/Double)		SPRING RETURN	
	25	Actuator/Valve Orientation			
	26	Failure Mode		CLOSED	
	27	Minimum Supply Pressure		100 PSIG	

POSITIONER	28	Manufacturer	
	29	Model	
	30	Signal Supply Requirement	
	31	Input Signal	
	32	Output Signal	
	33	Electrical Rating	
	34		
OPTIONS	35	Filter Regulator	
	36	Gage Set	
	37	Mechanical Travel Stop	
	38	Instr. Tubing Requirements	STAINLESS STEEL
	39	Position Switch ZSC/O-100	TOPWORX #DXP-M21GNEB
	40	Solenoid Valve SV-100	ASCO #EF8317G35 120V/60H
	41	Other Accessories	SPEED CONTROL VALVE
	42		
	43		
	44		
SERVICE	45	Fluid Type	LANDFILL GAS
	46	Operating Temperature Range	40 TO 100 F
	47	Operating Flow Rate Range	0 TO 4200 SCFM
	48	Operating Pressure Range	20" H2O
	49	Maximum Shut Off Δ /Pressure	
	50		
	51	Manufacturer	XOMOX
	52	Model Number	14" 801-267-ST2
	53	Mount	SHIP LOOSE
	54	JZ Part No.	1119793

55 **Notes:**

QUANTITY: ONE (1) ASSEMBLY REQUIRED

	Revision Date	Initials	Revision Description		Date	Name
Δ				Prepared	12/30/2011	NEWFIELS
Δ				Checked	01/06/2012	NEWFIELS
Δ				Approved	01/06/2012	NEWFIELS
Δ				Quote Attached: ☐ Yes	Copies of Vendor Literature Req'd:	1

JOHN ZINK JOHN ZINK COMPANY LLC FOR JZ PARTS: (918)234-2751	JZ SPECIFICATION SHEET FLASH - BACK ARRESTOR FA-107	Spec Rev 6 0 Page No. 1 of 1 Project 9121864

Project Name: **16" x 45' ELEVATED FLARE**
Customer Name: **CANTON RENEWABLES, LLC**
Project Site: **SAUK TRAIL DEVELOPMENT**
Customer P.O.: **LTR 11/14/11**

1	Manufacturer	ENARDO
2	Model No.	E72814/D-A4F-13
3	Process Connections	125 LB FF
4	Body Material	ALUMINUM
5	Element Materia	304 STAINLESS STEEL
6	Drain Connection	1/2" NPT WITH PLUG
7	Body Configuration	ECCENTRIC
8		
9		
10		
11		
12		

34 **Notes:**

TWO (2) 1/2" FNPT TAPS WITH PLUG REQUIRED, ONE ON EACH SIDE OF ELEMENT.

13	Qty	Tag No.	Size	Oper. Press. H2O	Oper. Temp. ° F	Service	Mount	JZ Part No.
14	1	FA-107	14"	20"	100	LANDFILL GAS	FIELD	1271514
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								

	Revision Date	Initials	Revision Description		Date	Name
Δ				Prepared	12/30/2011	NEWFIELS
Δ				Checked	01/06/2012	NEWFIELS
Δ				Approved	01/06/2012	NEWFIELS
Δ				Quote Attached: ☐ Yes	Copies of Vendor Literature Req'd:	1

JOHN ZINK / JOHN ZINK COMPANY LLC FOR JZ PARTS: (918)234-2751	JZ SPECIFICATION SHEET MASS FLOW METER FE-107, FIT-107	Spec Rev: 7 / 1 Page No.: 1 of 1 Project: 9121864

Project Name: **16" x 45' ELEVATED FLARE**	Customer Name: **CANTON RENEWABLES, LLC**
Project Site: **SAUK TRAIL DEVELOPMENT**	Customer P.O.: **LTR 11/14/11**

1 ⚠1

MASS FLOW METER

MANUFACTURER:	THERMAL INSTRUMENT COMPANY
MODEL:	62-9/9500-I-G-1/2-316SS-PG-120-4/20T-D/8T
QUANTITY:	ONE (1) ASSEMBLY REQUIRED
CONNECTION:	3/4" MALE NPT COMPRESSION FITTING (316 STAINLESS STEEL BODY AND FERRULE)
MOUNT:	TOP
PROBE LENGTH:	12"
TUBE MATERIAL:	316 STAINLESS STEEL
POWER:	120 V, SINGLE PHASE, 60 HZ
ENCLOSURE RATING:	NEMA 7/4X
ENCLOSURE MATERIAL:	ALUMINUM
TRANSMITTER:	INTEGRAL
OUTPUTS:	FLOW: 4 TO 20 MA TEMPERATURE: 4 TO 20 MA
DISPLAY:	INSTANTANEOUS FLOW TOTALIZED FLOW
SERVICE:	LANDFILL GAS (50% CH_4, 50% CO_2)
PIPE:	14" DIAMETER, SDR 17 HDPE (12.25" INSIDE DIAMETER)
MINIMUM FLOW RATE:	0 SCFM
DESIGN FLOW RATE:	4200 SCFM
MAXIMUM FLOW RATE:	7000 SCFM
MINIMUM PRESSURE:	0 PSIG
DESIGN PRESSURE:	10" H_2O
MAXIMUM PRESSURE:	1 PSIG
MINIMUM TEMPERATURE:	32 °F
DESIGN TEMPERATURE:	100 °F
MAXIMUM TEMPERATURE:	120 °F
JOHN ZINK PART NUMBER:	9121864A07
TAG NUMBER:	FE-107, FIT-107

SHIP LOOSE FOR FIELD INSTALLATION

	Revision Date	Initials	Revision Description
⚠1	01/10/2012	NEWFIELS	Revised Per Engineering
△			
△			
△			

	Date	Name
Prepared	12/30/2011	NEWFIELS
Checked	01/06/2012	NEWFIELS
Approved	01/06/2012	NEWFIELS
Quote Attached: ☐ Yes	Copies of Vendor Literature Req'd:	1

JOHN ZINK
JOHN ZINK COMPANY LLC
FOR JZ PARTS: (918)234-2751

JZ SPECIFICATION SHEET
SPARE PARTS

Spec	Rev	8	0
Page No.		1 of 1	
Project		9121864	

Project Name: **16" x 45' ELEVATED FLARE**
Project Site: **SAUK TRAIL DEVELOPMENT**
Customer Name: **CANTON RENEWABLES, LLC**
Customer P.O.: **LTR 11/14/11**

	Item No.	Qty	Tag Number(s)	Description	JZ Part No.
1					
2					
3	1	2	TE-201,202	THERMO SENSORS #5K30-U-96-GUAC14 THERMOCOUPLE	1060129
4	2	1	-----	PILOT ELECTRODE	0026651
5	3	1	-----	PILOT IGNITION ROD INSULATOR	0003587
6					
7	4	3	L-1,2,3	CUTLER HAMMER #755 BULB	1013634
8	5	1	PI-305	WIKA #222.34. PRESSURE GAUGE	1209636
9	6	1	PCV-302	FISHER #76D-27 PILOT PRESSURE REGULATOR	1260113
10	7	1	SV-303	ASCO #EF8215G20 SOLENOID	0012004
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					

25 **Notes:**

ALL PARTS SHIP LOOSE

Revision Date	Initials	Revision Description		Date	Name
Δ			Prepared	12/30/2011	NEWFIELS
Δ			Checked	01/06/2012	NEWFIELS
Δ			Approved	01/06/2012	NEWFIELS
Δ			Quote Attached: ☐ Yes	Copies of Vendor Literature Req'd:	1

XIX. MANUFACTURER INFORMATION

1. Allen Bradley
2. Automatic Switch (ASCO)
3. Automation Direct
4. Bettis
5. Enardo
6. Fisher
7. N-Tron
8. Pro-Soft
9. Sensaphone
10. Telular
11. Thermal Instrument
12. Thermo Sensors
13. Top Worx
14. Wika
15. Xomox

XV. CONTROL MODULE CONFIGURATION

The *Honeywell* control modules are configured and tested prior to leaving the manufacturing facility. Modifying the internal configuration likely is not required. However, if slight tuning or other modification is necessary, consult the following configuration record sheets.

NOTE

Review all *Honeywell* information in Section XIX, "Manufacturer Information" before adjusting any of the configuration settings. Improper programming of the control module may result in damage to the equipment.

XVI. PROCESSOR CONTROL LOGIC PROGRAM

L010000000 STANDARD PANEL COPYRIGHT 2004 JOHN ZINK CO. LLC
THIS PROGRAM IS WRITTEN FOR A ELEVATED FLARE WITH NO BLOWERs AND A AD OIP ALL MOUNTED IN A SINGLE PANEL

000
RESET FROM OIP
B3:7
2

RESET TIMER
TON
Timer On Delay
Timer T4:0
Time Base 1.0
Preset 3<
Accum 0<
EN
DN

001
POWERUP RESET
TON
Timer On Delay
Timer T4:1
Time Base 1.0
Preset 5<
Accum 5<
EN
DN

002
RESET FROM OIP
B3:7
2

RESET PULSE
T4:0
DN

RESET COIL
B3:0
1

003
PILOT TRY COUNTER
C5:0
DN

SHUTDOWN SUMMER
B3:0
15

RESET COIL
B3:0
1

PILOT FAIL LATCH
B3:0
2

PILOT FAIL LATCH
B3:0
2

004
TE-107
FLAME ARRESTER
TEMP > OIP STPT
TSH-107
B3:0
12

SHUTDOWN SUMMER
B3:0
15

RESET COIL
B3:0
1

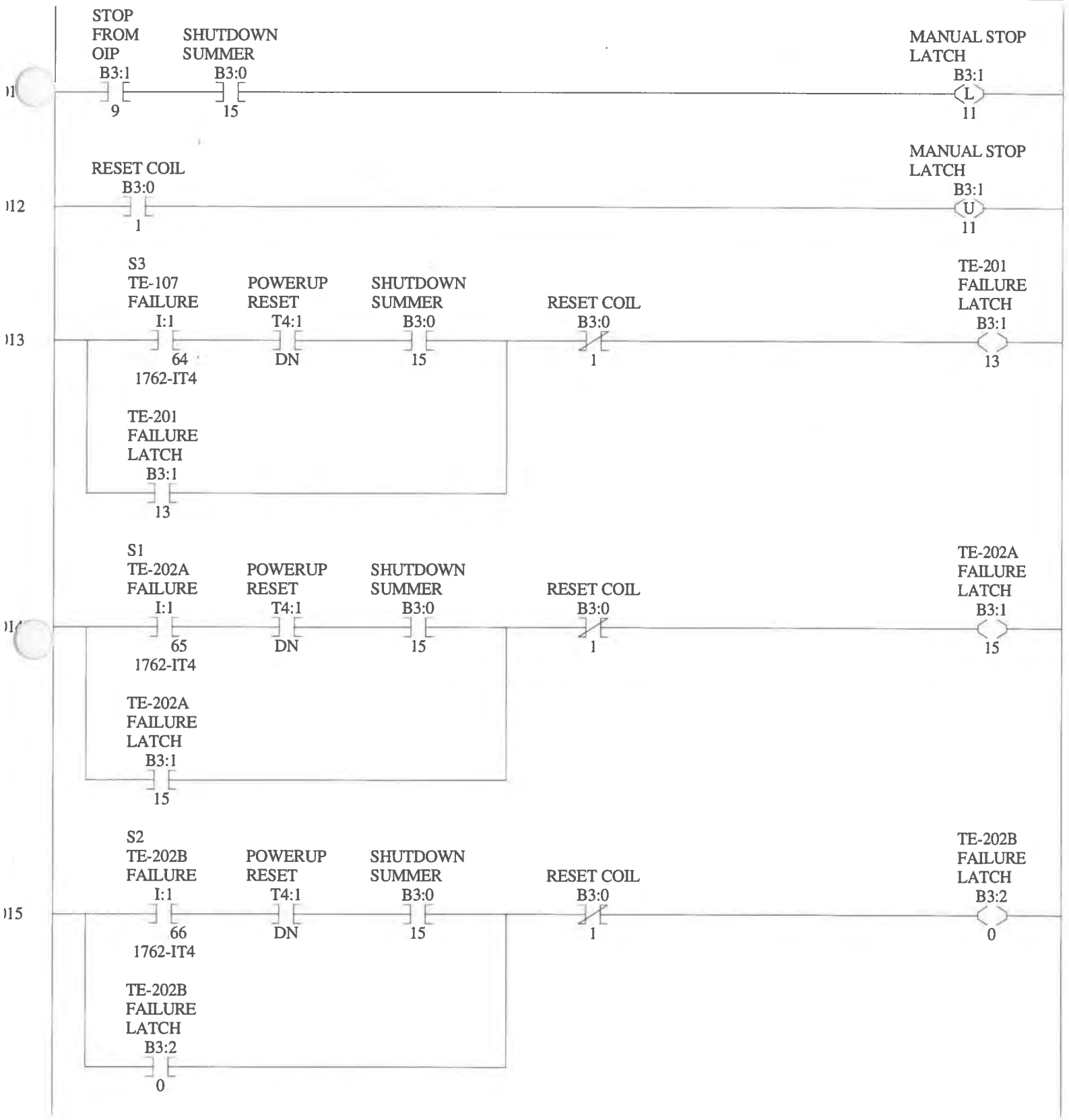
TSHH-107
FA HI TEMP LATCH
B3:0
14

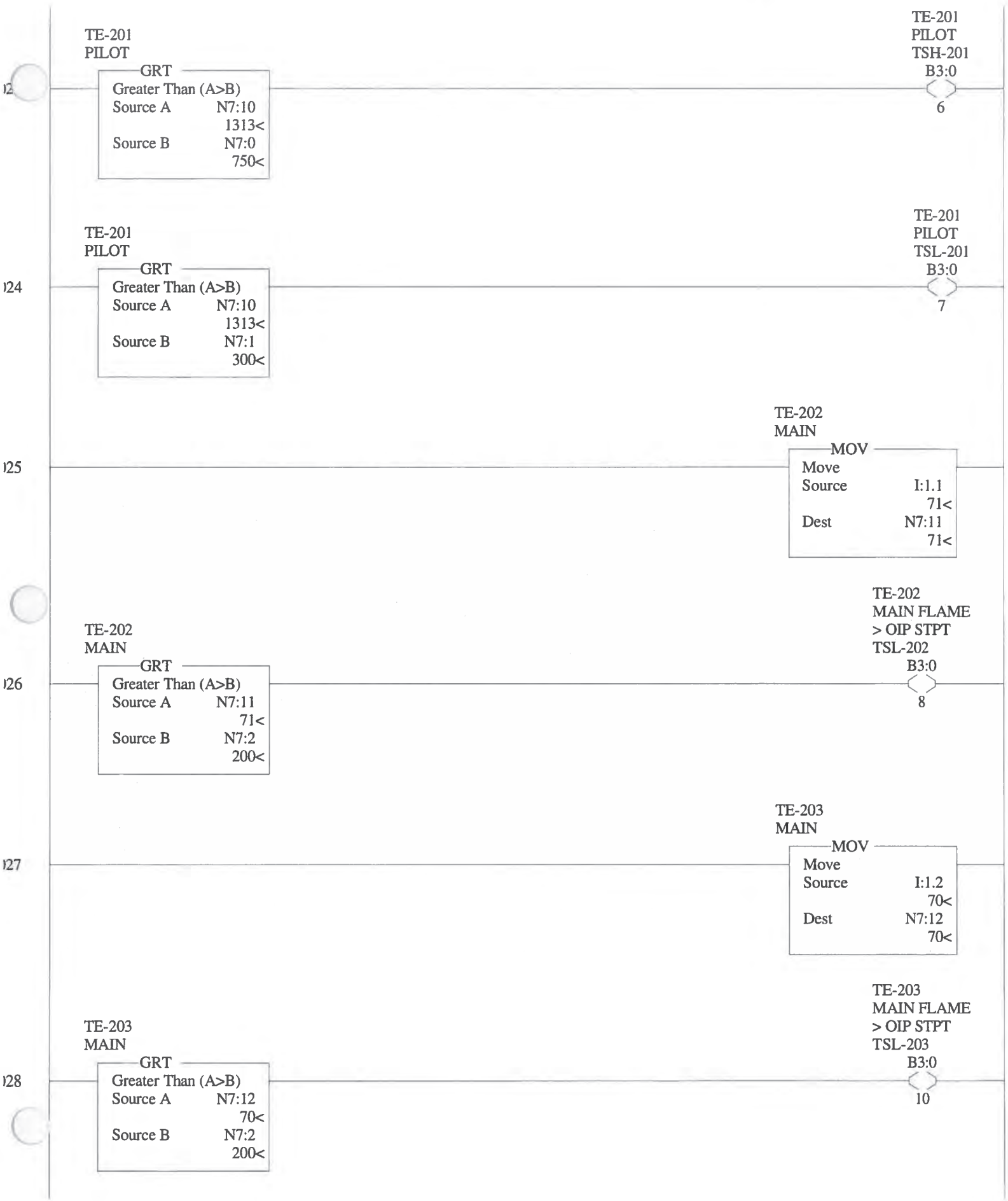
TSHH-107
FA HI TEMP LATCH
B3:0
14

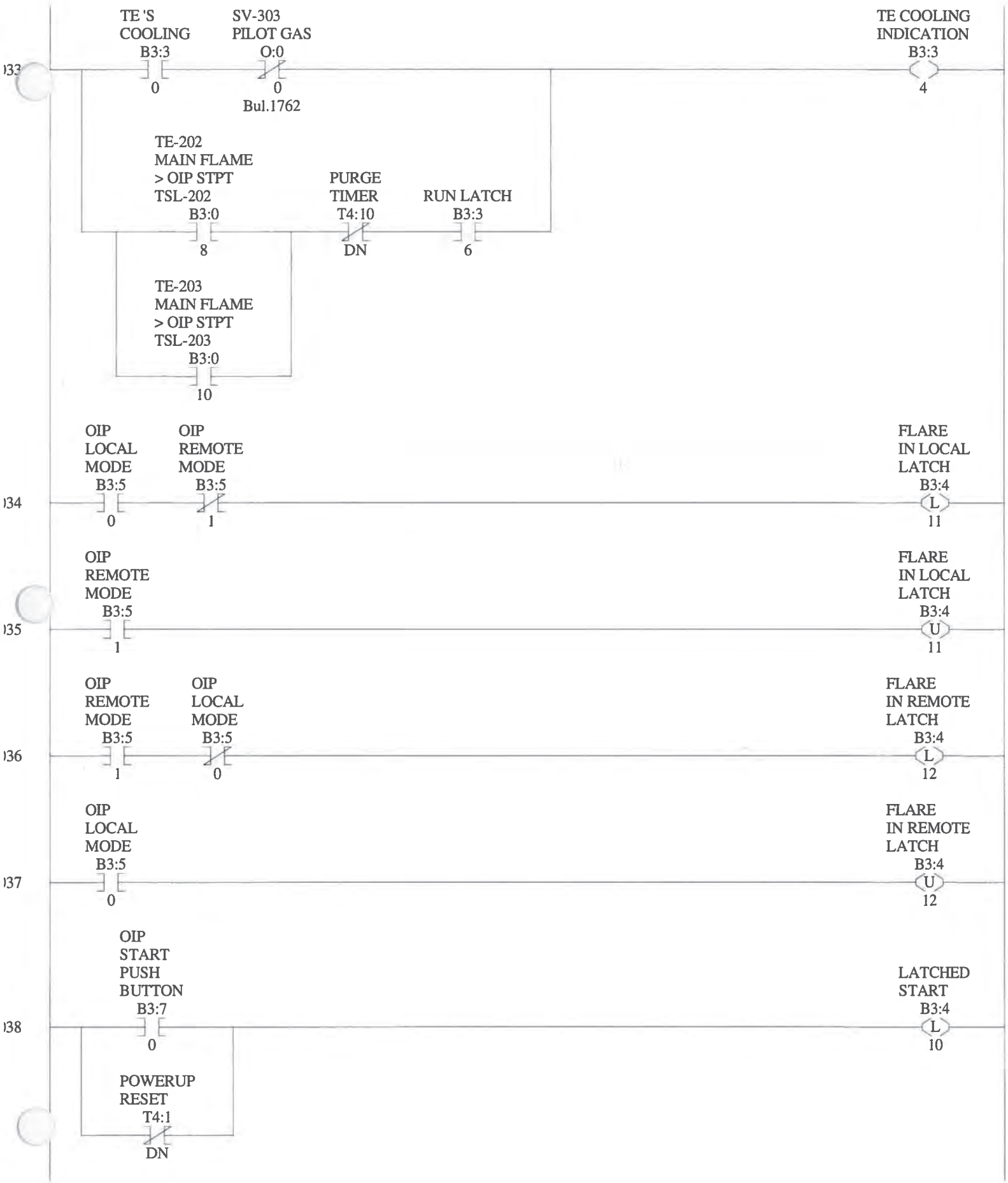
005
CR-67
AUTO VALVE
O:0
5
Bul.1762

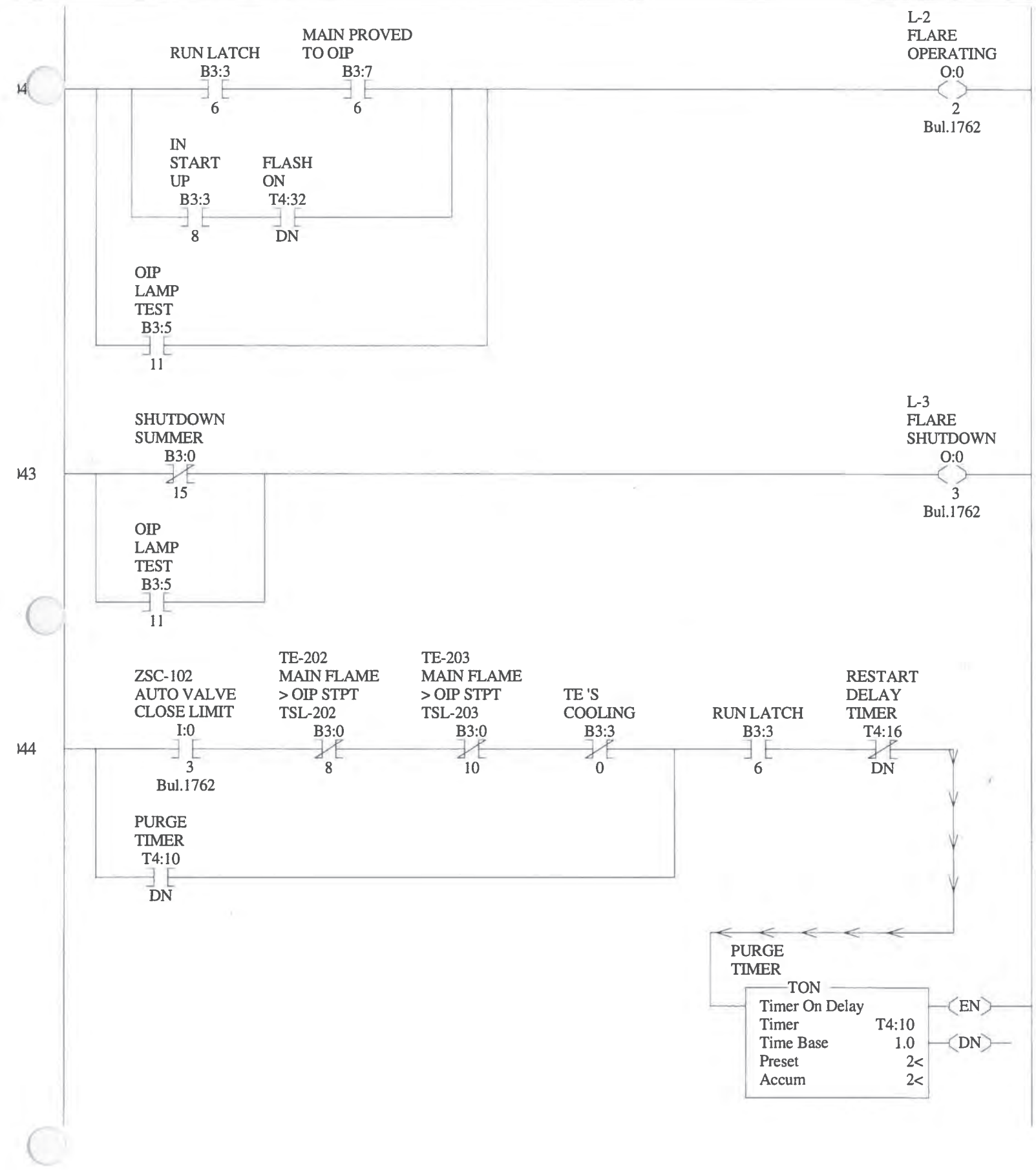
ZSO-102
AUTO VALVE
OPEN LIMIT
I:0
4
Bul.1762

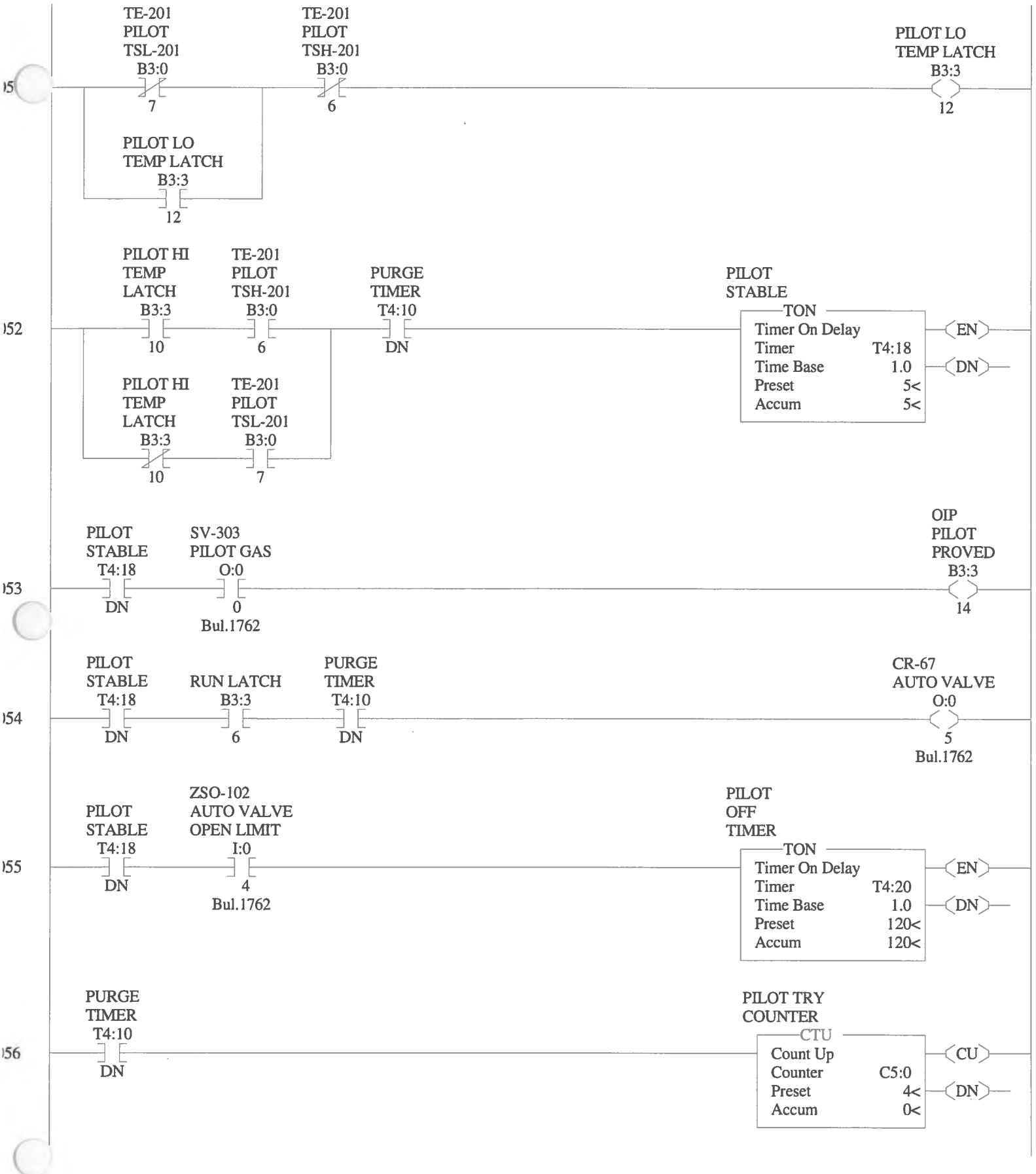
VALVE OPEN TIMER
TON
Timer On Delay
Timer T4:2
Time Base 1.0
Preset 45<
Accum 0<
EN
DN

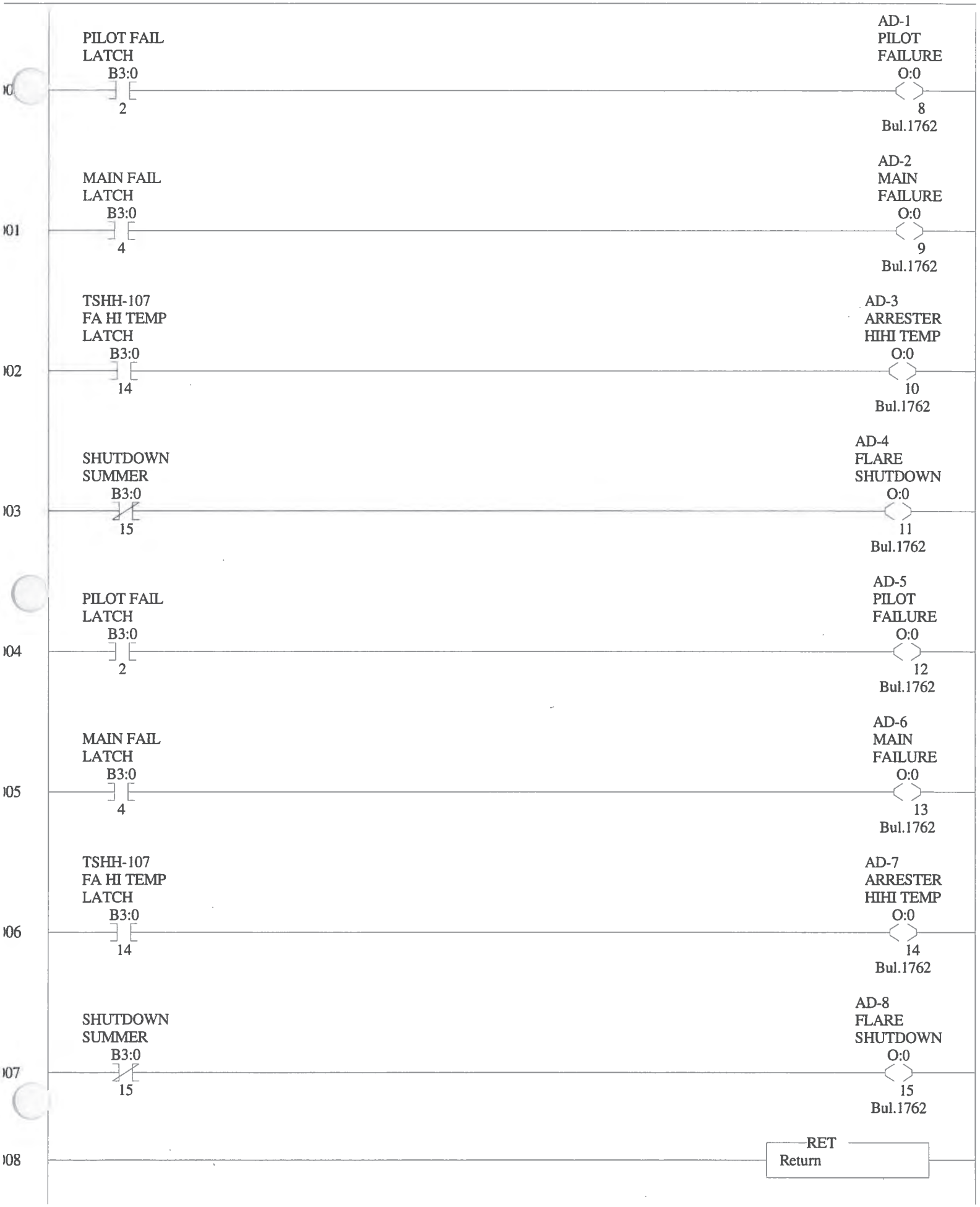

STOP FROM OIP B3:1 9
SHUTDOWN SUMMER B3:0 15
MANUAL STOP LATCH B3:1 (L) 11
RESET COIL B3:0 1
MANUAL STOP LATCH B3:1 (U) 11
S3 TE-107 FAILURE I:1 64 1762-IT4
POWERUP RESET T4:1 DN
SHUTDOWN SUMMER B3:0 15
RESET COIL B3:0 1
TE-201 FAILURE LATCH B3:1 13
TE-201 FAILURE LATCH B3:1 13
S1 TE-202A FAILURE I:1 65 1762-IT4
POWERUP RESET T4:1 DN
SHUTDOWN SUMMER B3:0 15
RESET COIL B3:0 1
TE-202A FAILURE LATCH B3:1 15
TE-202A FAILURE LATCH B3:1 15
S2 TE-202B FAILURE I:1 66 1762-IT4
POWERUP RESET T4:1 DN
SHUTDOWN SUMMER B3:0 15
RESET COIL B3:0 1
TE-202B FAILURE LATCH B3:2 0
TE-202B FAILURE LATCH B3:2 0


TE-201
PILOT
GRT
Greater Than (A>B)
Source A N7:10
1313<
Source B N7:0
750<
TE-201
PILOT
TSH-201
B3:0
6
TE-201
PILOT
GRT
Greater Than (A>B)
Source A N7:10
1313<
Source B N7:1
300<
TE-201
PILOT
TSL-201
B3:0
7
TE-202
MAIN
MOV
Move
Source I:1.1
71<
Dest N7:11
71<
TE-202
MAIN
GRT
Greater Than (A>B)
Source A N7:11
71<
Source B N7:2
200<
TE-202
MAIN FLAME
> OIP STPT
TSL-202
B3:0
8
TE-203
MAIN
MOV
Move
Source I:1.2
70<
Dest N7:12
70<
TE-203
MAIN
GRT
Greater Than (A>B)
Source A N7:12
70<
Source B N7:2
200<
TE-203
MAIN FLAME
> OIP STPT
TSL-203
B3:0
10

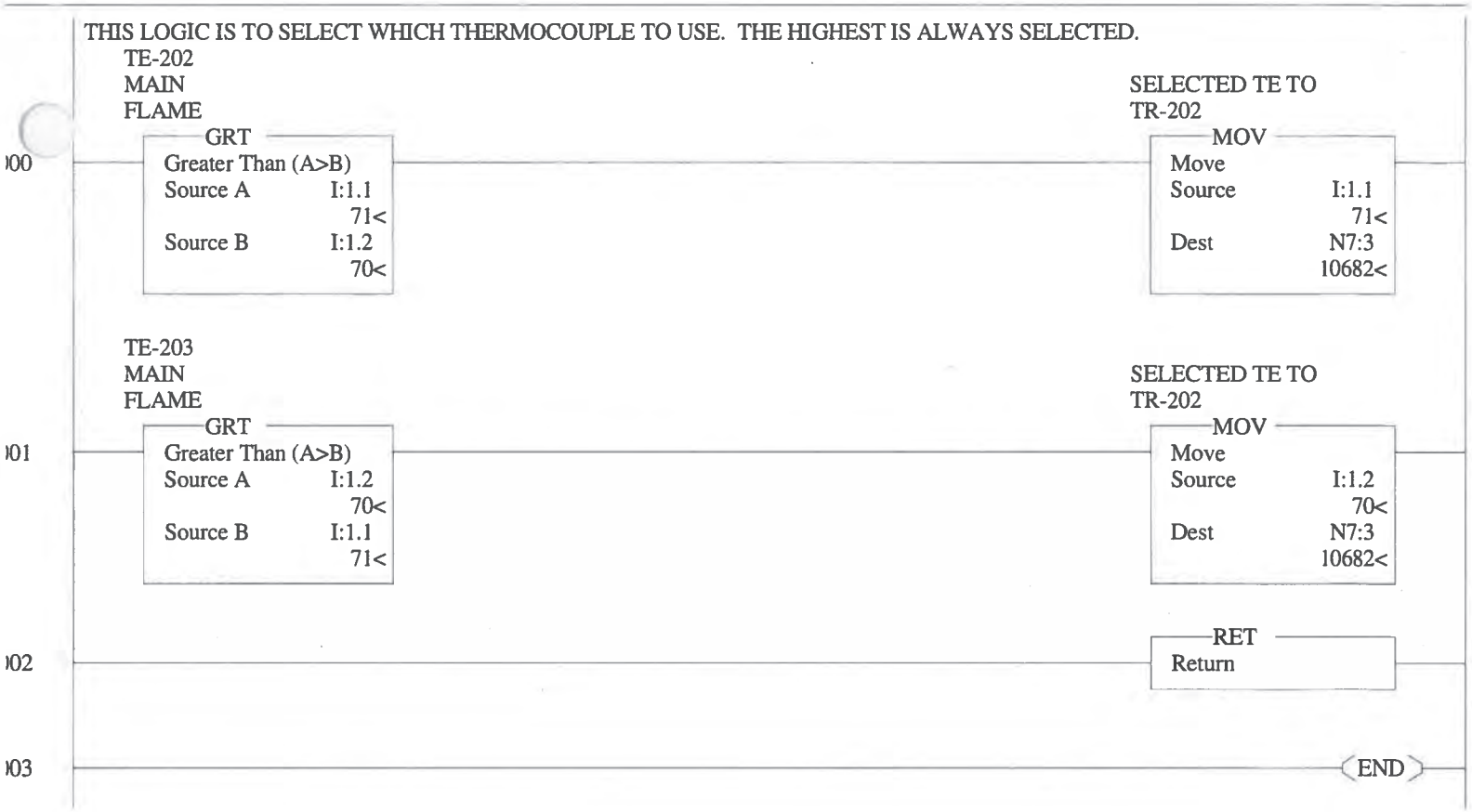

TE 'S COOLING B3:3 0
SV-303 PILOT GAS O:0 0 Bul.1762
TE COOLING INDICATION B3:3 4
TE-202 MAIN FLAME > OIP STPT TSL-202 B3:0 8
PURGE TIMER T4:10 DN
RUN LATCH B3:3 6
TE-203 MAIN FLAME > OIP STPT TSL-203 B3:0 10
OIP LOCAL MODE B3:5 0
OIP REMOTE MODE B3:5 1
FLARE IN LOCAL LATCH B3:4 L 11
OIP REMOTE MODE B3:5 1
FLARE IN LOCAL LATCH B3:4 U 11
OIP REMOTE MODE B3:5 1
OIP LOCAL MODE B3:5 0
FLARE IN REMOTE LATCH B3:4 L 12
OIP LOCAL MODE B3:5 0
FLARE IN REMOTE LATCH B3:4 U 12
OIP START PUSH BUTTON B3:7 0
POWERUP RESET T4:1 DN
LATCHED START B3:4 L 10


RUN LATCH
B3:3
6
MAIN PROVED
TO OIP
B3:7
6
L-2
FLARE
OPERATING
O:0
2
Bul.1762
IN
START
UP
B3:3
8
FLASH
ON
T4:32
DN
OIP
LAMP
TEST
B3:5
11
SHUTDOWN
SUMMER
B3:0
15
L-3
FLARE
SHUTDOWN
O:0
3
Bul.1762
OIP
LAMP
TEST
B3:5
11
ZSC-102
AUTO VALVE
CLOSE LIMIT
I:0
3
Bul.1762
TE-202
MAIN FLAME
> OIP STPT
TSL-202
B3:0
8
TE-203
MAIN FLAME
> OIP STPT
TSL-203
B3:0
10
TE 'S
COOLING
B3:3
0
RUN LATCH
B3:3
6
RESTART
DELAY
TIMER
T4:16
DN
PURGE
TIMER
T4:10
DN
PURGE
TIMER
TON
Timer On Delay
Timer T4:10
Time Base 1.0
Preset 2<
Accum 2<
EN
DN


TE-201 PILOT TSL-201 B3:0 7
TE-201 PILOT TSH-201 B3:0 6
PILOT LO TEMP LATCH B3:3 12
PILOT LO TEMP LATCH B3:3 12
PILOT HI TEMP LATCH B3:3 10
TE-201 PILOT TSH-201 B3:0 6
PURGE TIMER T4:10 DN
PILOT STABLE
TON
Timer On Delay
Timer T4:18
Time Base 1.0
Preset 5<
Accum 5<
EN
DN
PILOT HI TEMP LATCH B3:3 10
TE-201 PILOT TSL-201 B3:0 7
PILOT STABLE T4:18 DN
SV-303 PILOT GAS O:0 0 Bul.1762
OIP PILOT PROVED B3:3 14
PILOT STABLE T4:18 DN
RUN LATCH B3:3 6
PURGE TIMER T4:10 DN
CR-67 AUTO VALVE O:0 5 Bul.1762
PILOT STABLE T4:18 DN
ZSO-102 AUTO VALVE OPEN LIMIT I:0 4 Bul.1762
PILOT OFF TIMER
TON
Timer On Delay
Timer T4:20
Time Base 1.0
Preset 120<
Accum 120<
EN
DN
PURGE TIMER T4:10 DN
PILOT TRY COUNTER
CTU
Count Up
Counter C5:0
Preset 4<
Accum 0<
CU
DN


PILOT FAIL LATCH B3:0 2
AD-1 PILOT FAILURE O:0 8 Bul.1762
MAIN FAIL LATCH B3:0 4
AD-2 MAIN FAILURE O:0 9 Bul.1762
TSHH-107 FA HI TEMP LATCH B3:0 14
AD-3 ARRESTER HIHI TEMP O:0 10 Bul.1762
SHUTDOWN SUMMER B3:0 15
AD-4 FLARE SHUTDOWN O:0 11 Bul.1762
PILOT FAIL LATCH B3:0 2
AD-5 PILOT FAILURE O:0 12 Bul.1762
MAIN FAIL LATCH B3:0 4
AD-6 MAIN FAILURE O:0 13 Bul.1762
TSHH-107 FA HI TEMP LATCH B3:0 14
AD-7 ARRESTER HIHI TEMP O:0 14 Bul.1762
SHUTDOWN SUMMER B3:0 15
AD-8 FLARE SHUTDOWN O:0 15 Bul.1762
RET Return

THIS LOGIC IS TO SELECT WHICH THERMOCOUPLE TO USE. THE HIGHEST IS ALWAYS SELECTED.



```
                XIC - File #3 AUTO DIAL - 1, 5
B3:0/6        - TE-201 PILOT TSH-201
                OTE - File #2 MAIN - 23
                XIC - File #2 MAIN - 32, 50, 52
                XIO - File #2 MAIN - 51
B3:0/7        - TE-201 PILOT TSL-201
                OTE - File #2 MAIN - 24
                XIC - File #2 MAIN - 32, 50, 52
                XIO - File #2 MAIN - 51
B3:0/8        - TE-202 MAIN FLAME > OIP STPT TSL-202
                OTE - File #2 MAIN - 26
                XIC - File #2 MAIN - 31, 33
                XIO - File #2 MAIN - 44
B3:0/10       - TE-203 MAIN FLAME > OIP STPT TSL-203
                OTE - File #2 MAIN - 28
                XIC - File #2 MAIN - 31, 33
                XIO - File #2 MAIN - 44
B3:0/12       - TE-107 FLAME ARRESTER TEMP > OIP STPT TSH-107
                OTE - File #2 MAIN - 30
                XIC - File #2 MAIN - 4
B3:0/14       - TSHH-107 FA HI TEMP LATCH
                OTE - File #2 MAIN - 4
                XIC - File #2 MAIN - 4
                      File #3 AUTO DIAL - 2, 6
                XIO - File #2 MAIN - 17
B3:0/15       - SHUTDOWN SUMMER
                OTE - File #2 MAIN - 19
                XIC - File #2 MAIN - 3, 4, 6, 8, 10, 11, 13, 14, 15, 16, 40
                XIO - File #2 MAIN - 39, 43
                      File #3 AUTO DIAL - 3, 7
B3:1/1        - VALVE FAILED TO OPEN LATCH
                OTE - File #2 MAIN - 6
                XIC - File #2 MAIN - 6
                XIO - File #2 MAIN - 18
B3:1/3        - VALVE FAILED TO CLOSE LATCH
                OTE - File #2 MAIN - 8
                XIC - File #2 MAIN - 8
                XIO - File #2 MAIN - 18
B3:1/5        - VALVE FAILED IN TRANSIT LATCH
                OTE - File #2 MAIN - 10
                XIC - File #2 MAIN - 10
B3:1/9        - STOP FROM OIP
                XIC - File #2 MAIN - 11
B3:1/11       - MANUAL STOP LATCH
                OTL - File #2 MAIN - 11
                OTU - File #2 MAIN - 12
                XIC - File #2 MAIN - 39
                XIO - File #2 MAIN - 17
B3:1/13       - TE-201 FAILURE LATCH
                OTE - File #2 MAIN - 13
                XIC - File #2 MAIN - 13
                XIO - File #2 MAIN - 18
B3:1/15       - TE-202A FAILURE LATCH
                OTE - File #2 MAIN - 14
                XIC - File #2 MAIN - 14
                XIO - File #2 MAIN - 19
B3:2/0        - TE-202B FAILURE LATCH
                OTE - File #2 MAIN - 15
                XIC - File #2 MAIN - 15
                XIO - File #2 MAIN - 19
B3:2/2        - TE-107 FAILURE LATCH
                OTE - File #2 MAIN - 16
                XIC - File #2 MAIN - 16
                XIO - File #2 MAIN - 19
B3:2/14       - SD ADDER A
                OTE - File #2 MAIN - 17
                XIC - File #2 MAIN - 18
B3:2/15       - SD ADDER B
                OTE - File #2 MAIN - 18
                XIC - File #2 MAIN - 19
```

```
T4:7/DN       - XIC - File #2 MAIN - 59
T4:10         - PURGE TIMER
                TON - File #2 MAIN - 44
T4:10/DN      - PURGE TIMER
                XIC - File #2 MAIN - 44, 45, 48, 52, 54, 56
                XIO - File #2 MAIN - 33
T4:12         - IGNITION TIMER
                TON - File #2 MAIN - 46
T4:12/DN      - IGNITION TIMER
                XIO - File #2 MAIN - 47
T4:14         - WAIT FOR PILOT TIMER
                TON - File #2 MAIN - 48
T4:14/DN      - WAIT FOR PILOT TIMER
                XIC - File #2 MAIN - 49
T4:16         - RESART DELAY TIMER
                TON - File #2 MAIN - 49
T4:16/DN      - RESTART DELAY TIMER
                XIO - File #2 MAIN - 44
T4:18         - PILOT STABLE
                TON - File #2 MAIN - 52
T4:18/DN      - PILOT STABLE
                XIC - File #2 MAIN - 53, 54, 55, 57
                XIO - File #2 MAIN - 48
T4:20         - PILOT OFF TIMER
                TON - File #2 MAIN - 55
T4:20/DN      - PILOT OFF TIMER
                XIC - File #2 MAIN - 57
T4:32         - FLASH ON
                TON - File #2 MAIN - 20
T4:32/DN      - XIC - File #2 MAIN - 21, 42
T4:34         - FLASH OFF
                TON - File #2 MAIN - 21
T4:34/DN      - XIO - File #2 MAIN - 20
C5:0          - PILOT TRY COUNTER
                CTU - File #2 MAIN - 56
                RES - File #2 MAIN - 57
C5:0/DN       - XIC - File #2 MAIN - 3
N7:0          - PILOT SET POINT FROM OIP
                GRT - File #2 MAIN - 23
N7:1          - TE-202 MAIN FLAME STPT FROM OIP
                GRT - File #2 MAIN - 24
N7:2          - TE-203 MAIN FLAME STPT FROM OIP
                GRT - File #2 MAIN - 26, 28
                GEQ - File #2 MAIN - 58
N7:3          - SELECTED TE TO TR-202
                MOV - File #5 TE SELECT - 0, 1
                GEQ - File #2 MAIN - 58
N7:10         - TE-201 PILOT
                MOV - File #2 MAIN - 22
                GRT - File #2 MAIN - 23, 24
N7:11         - TE-202 MAIN
                MOV - File #2 MAIN - 25
                GRT - File #2 MAIN - 26
N7:12         - TE-203 MAIN
                MOV - File #2 MAIN - 27
                GRT - File #2 MAIN - 28
N7:13         - TE-107 ARRESTER
                MOV - File #2 MAIN - 29
                GRT - File #2 MAIN - 30
U:3           - JUMP TO AUTO DIAL
                JSR - File #2 MAIN - 60
U:5           - JUMP TO TE SELECT
                JSR - File #2 MAIN - 61
```

XVII. RECOMMENDED SPARE PARTS

	Component	Tag Number	Part Number	Quantity
1.	Pilot Thermocouple	TE-307	1022111	1
2.	Main Flame Thermocouple	TE-201 TE-202	1060129	1
3.	Pilot Electrode	for ST-10358	0026651	1
4.	Pilot Ignition Rod Insulator	for ST-10358	0003587	3
7.	Panel Light Bulb	for PNL-101	1013634	3
8.	Pilot Gas Pressure Regulator	PCV-302	1260113	1
9.	Pilot Gas Solenoid Valve	SV-303	0012004	1
10.	Pilot Gas Pressure Gauge	PI-305	1209636	1
11.	Flame Arrester Thermocouple	TE-107	1091806	1

Please call John Zink Company at (918) 234-2751 for spare part assistance.

XVIII. MATERIAL SAFETY DATA SHEETS

MATERIAL SAFETY DATA SHEET

B69VZ12
04 00

DATE OF PREPARATION
Sep 8, 2008

SECTION 1 — PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NUMBER
B69VZ12
PRODUCT NAME
ZINC-CLAD® II Plus Inorganic Zinc-Rich Coating (Part A)
MANUFACTURER'S NAME
THE SHERWIN-WILLIAMS COMPANY
101 Prospect Avenue N.W.
Cleveland, OH 44115

Telephone Numbers and Websites

Product Information	www.sherwin-williams.com
Regulatory Information	(216) 566-2902 www.paintdocs.com
Medical Emergency	(216) 566-2917
Transportation Emergency*	(800) 424-9300
*for Chemical Emergency ONLY (spill, leak, fire, exposure, or accident)	

SECTION 2 — COMPOSITION/INFORMATION ON INGREDIENTS

% by Weight	CAS Number	Ingredient	Units	Vapor Pressure
3	64742-94-5	Medium Aromatic Hydrocarbons		
		ACGIH TLV	Not Available	0.12 mm
		OSHA PEL	Not Available	
0.5	91-20-3	Naphthalene		
		ACGIH TLV	10 PPM	1 mm
		ACGIH TLV	15 PPM STEL	
		OSHA PEL	10 PPM	
		OSHA PEL	15 PPM STEL	
6	64-17-5	Ethanol		
		ACGIH TLV	1000 PPM	44 mm
		OSHA PEL	1000 PPM	
3	34590-94-8	2-Methoxymethylethoxypropanol		
		ACGIH TLV	100 ppm (Skin)	0.4 mm
		ACGIH TLV	150 ppm (Skin) STEL	
		OSHA PEL	100 ppm (Skin)	
		OSHA PEL	150 ppm (Skin) STEL	
5	110-43-0	Methyl n-Amyl Ketone		
		ACGIH TLV	50 PPM	3.855 mm
		OSHA PEL	100 PPM	
17	78-10-4	Ethyl Silicate		
		ACGIH TLV	Not Available	1 mm
		OSHA PEL	100 PPM	
21	14808-60-7	Quartz		
		ACGIH TLV	0.025 mg/m3 as Resp. Dust	
		OSHA PEL	0.1 mg/m3 as Resp. Dust	
4	7631-86-9	Amorphous Silica		
		ACGIH TLV	10 mg/m3 as Dust	
		OSHA PEL	6 mg/m3 as Dust	
6	12001-26-2	Mica		
		ACGIH TLV	3 mg/m3 as Resp. Dust	
		OSHA PEL	3 mg/m3 as Resp. Dust	

SECTION 3 — HAZARDS IDENTIFICATION

ROUTES OF EXPOSURE
INHALATION of vapor or spray mist.
EYE or SKIN contact with the product, vapor or spray mist.

VENTILATION

Local exhaust preferable. General exhaust acceptable if the exposure to materials in Section 2 is maintained below applicable exposure limits. Refer to OSHA Standards 1910.94, 1910.107, 1910.108.

RESPIRATORY PROTECTION

If personal exposure cannot be controlled below applicable limits by ventilation, wear a properly fitted organic vapor/particulate respirator approved by NIOSH/MSHA for protection against materials in Section 2.

When sanding or abrading the dried film, wear a dust/mist respirator approved by NIOSH/MSHA for dust which may be generated from this product, underlying paint, or the abrasive.

PROTECTIVE GLOVES

Wear gloves which are recommended by glove supplier for protection against materials in Section 2.

EYE PROTECTION

Wear safety spectacles with unperforated sideshields.

OTHER PRECAUTIONS

This product must be mixed with other components before use. Before opening the packages, READ AND FOLLOW WARNING LABELS ON ALL COMPONENTS.

Intentional misuse by deliberately concentrating and inhaling the contents can be harmful or fatal.

SECTION 9 — PHYSICAL AND CHEMICAL PROPERTIES

PRODUCT WEIGHT	10.70 lb/gal	1282 g/l
SPECIFIC GRAVITY	1.29	
BOILING POINT	172 - 415° F	77 - 212° C
MELTING POINT	Not Available	
VOLATILE VOLUME	50%	
EVAPORATION RATE	Slower than ether	
VAPOR DENSITY	Heavier than air	
SOLUBILITY IN WATER	N.A.	

VOLATILE ORGANIC COMPOUNDS (VOC Theoretical - As Packaged)

3.69lb/gal	442g/l	Less Water and Federally Exempt Solvents
3.69lb/gal	442g/l	Emitted VOC

SECTION 10 — STABILITY AND REACTIVITY

STABILITY — Stable

CONDITIONS TO AVOID

None known.

INCOMPATIBILITY

None known.

HAZARDOUS DECOMPOSITION PRODUCTS

By fire: Carbon Dioxide, Carbon Monoxide

HAZARDOUS POLYMERIZATION

Will not occur

SECTION 11 — TOXICOLOGICAL INFORMATION

CHRONIC HEALTH HAZARDS

Reports have associated repeated and prolonged overexposure to solvents with permanent brain and nervous system damage.

Crystalline Silica (Quartz, Cristobalite) is listed by IARC and NTP. Long term exposure to high levels of silica dust, which can occur only when sanding or abrading the dry film, may cause lung damage (silicosis) and possibly cancer.

SECTION 16 — OTHER INFORMATION

This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

The above information pertains to this product as currently formulated, and is based on the information available at this time. Addition of reducers or other additives to this product may substantially alter the composition and hazards of the product. Since conditions of use are outside our control, we make no warranties, express or implied, and assume no liability in connection with any use of this information.

APPENDIX B
REGENERATIVE THERMAL OXIDIZER O&M MANUAL

MET-PRO
Environmental Air Solutions

A Met-Pro Product Recovery/Pollution Control Technologies Business
Combining the Resources of **Duall, Flex-Kleen and Met-Pro Systems**

INSTRUCTIONS FOR OPERATION AND MAINTENANCE OF REGENERATIVE THERMAL OXIDIZER

MODEL NO. RTO-6-G
SERIAL NO. 63531
P.O. # 07-10002

SOLD TO:

CANTON RENEWABLES, LLC
3020 OLD RANCH PARKWAY, SUITE 200
SEAL BEACH, CA 90740

SHIP TO:

CANTON RENEWABLES, LLC
4345 S. LILLEY ROAD
CANTON, MI 48188

CALL: MET-PRO INDUSTRIAL SERVICES
@ 630-875-3344 to schedule SERVICE or
215-723-6751 ext 280 FOR SPARE PARTS
or email to mpisaftermarket@met-pro.com

MAY 2012

TABLE OF CONTENTS

1.0 INTRODUCTION

Thank you for purchasing equipment from Met-Pro Environmental Air Solutions (MPEAS) Systems Brand to meet your environmental needs. You can have confidence in our quality product and years of trouble-free operation. MPEAS Systems offers complete systems development, full customer and technical service to assure proper installation, smooth start-up, and reliable operation of this equipment.

MPEAS Systems, in Harleysville, Pennsylvania, provides engineering, fabrication, installation, and servicing capabilities for standard and custom designed thermal and catalytic oxidizers for the control of emissions from chemical, petrochemical, pharmaceutical processes and other solvent use operations. Additionally, we provide systems to control emissions and generate steam for corn to ethanol plants. We also engineer, manufacture, and service a wide array of systems which control the acidity/alkalinity of wastewater and reduce or remove the chemical and biological contaminants contained in industrial waste waters and landfill leachates. We also perform modifications and revamps to existing systems, offering enhanced efficiency and reduced operating cost.

This document presents the operating and maintenance instructions for your MPEAS system. These instructions presuppose the equipment has been installed and commissioned, and is ready for normal operation. Installation instructions, if appropriate, are provided elsewhere.

If the equipment has not been properly installed in accordance with the installation instructions of the manufacturers, it may not operate safely or correctly. Do not attempt to operate the system until it has been started by a Service Specialist from Met-Pro Industrial Services (MPIS).

The instructions do not propose to cover all details or variations in equipment or to provide for every possible contingency to be met about installation, operation, or maintenance. Should further information be needed or should particular problems arise which are not covered sufficiently for the purchaser's purposes, please contact us.

Field service on this equipment may be obtained at nominal rates from MPIS. Please call 630-875-3344 for **SERVICE**. Telephone support from the Service Department of MPIS Systems is also available via this number. Please contact them to determine if the problem can be solved by a telephone discussion.
For exact replacement **SPARE PARTS**, call 215-723-6751
Additionally, help is also available on line at ***mpisaftermarket@met-pro.com***.

2.0 SAFETY

CAUTION: IT IS NOT THE INTENT OF THIS MANUAL TO PROVIDE, OR FUNCTION AS A SUBSTITUTE FOR, PROPER TRAINING OF OPERATING PERSONNEL IN INDUSTRIAL SAFETY PRACTICES. ALL OPERATING AND MAINTENANCE PERSONNEL INTERFACING WITH THIS EQUIPMENT SHALL HAVE BEEN PREVIOUSLY TRAINED IN SAFETY PROCEDURES RELATED TO COMBUSTION SYSTEMS, ELECTRICAL, PNEUMATIC, HYDRAULIC AND ROTATING EQUIPMENT. UNTRAINED PERSONNEL THAT ARE NOT FAMILIAR WITH THIS EQUIPMENT SHOULD NOT ATTEMPT TO OPERATE OR PERFORM MAINTENANCE ON IT.

DANGER: THIS EQUIPMENT IS NOT INTRINSICALLY SAFE AND MAY CAUSE SERIOUS INJURY OR DEATH, OR SERIOUS PROPERTY DAMAGE, IF OPERATED OR MAINTAINED IN AN UNSAFE MANNER.

2.1 It is the Owner's responsibility to insure that only trained and qualified personnel operate and maintain this equipment. All personnel operating and / or maintaining this equipment must thoroughly read this manual and familiarize themselves with all of the equipment features and characteristics before attempting to operate or maintain it. Their knowledge and training are vital to safe and proper operation and maintenance. It is highly recommended that such personnel receive periodic retraining and testing to maintain a high level of proficiency and effectiveness.

Such personnel must have access to this manual at all times.

2.2 Personnel designated to be in the area or work with this equipment shall be supplied with, and trained (by others, in advance) in the use of all personal safety equipment necessary to perform their function as required by OSHA, state and local safety authorities having jurisdiction and plant regulations before approaching the area.

2.3 **DANGER**: This equipment uses **HIGH VOLTAGE**.

- 2.3.1 Do not attempt to defeat any of the interlocks.
- 2.3.2 Only trained and authorized personnel should be given access to interiors of electrical panels, variable frequency drives and starters and the like.
- 2.3.3 Use only the insulated tools and test equipment.

2.4 **DANGER:** This equipment may contain **STORED ENERGY** in many forms, such as, but not limited to:

- 2.4.1 Heat and high temperature materials
- 2.4.2 Ultraviolet radiation
- 2.4.3 High pressure fluids, such as compressed air, steam, natural gas or other fuels, hot water or hot oils or other heat transfer liquids, hydraulic fluid, etc
- 2.4.4 Mechanical energy storage devices, such as springs or counter weights
- 2.4.5 Electrical energy
- 2.4.6 Chemical agents such as acids or bases, or asphyxiants, or toxic gases
- 2.4.7 Explosive or flammable materials (such as fuel gas, or VOC vapors)

Before performing inspection or maintenance procedures on the equipment, all forms of stored energy must be identified and isolated and monitored with appropriate Lock out / tag out procedures conforming to the owner's safety practices and procedures.

2.5 This equipment is supplied with a Factory Mutual approved flame supervisory system (also known as a Burner Management System or BMS) for monitoring and controlling the flow of fuel to the burner(s).

2.5.1 Do not attempt to defeat any of the features of the BMS or of any field safety device associated with the BMS when attempting to light or operate the burner(s).

2.5.2 Always follow the proper purge/light off sequence when starting the burner(s).

2.6 **DANGER:** This equipment oxidizes volatile organic compounds (VOC), organic aerosols, and/or solids carried in a gas stream. It may also oxidize compounds contained in liquid streams which are injected into the oxidizer. The concentration of VOC in the gas stream entering the oxidation system must never exceed 25% of the lower explosive limit (LEL), without appropriate monitoring and safety shutdown interlocks.
FAILURE TO KEEP THE VOC CONCENTRATION ENTERING THE OXIDIZER AT A SAFE CONCENTRATION MAY RESULT IN AN EXPLOSION OR CONFLAGRATION IN THE OXIDIZER, HEAT EXCHANGER, BAGHOUSE, INLET DUCT, OUTLET DUCT, OR ANY OTHER EQUIPMENT IN WHICH THE EXPLOSIVE CONCENTRATION EXISTS. SERIOUS INJURY OR DEATH, OR SERIOUS PROPERTY DAMAGE, MAY RESULT.

2.7 **DANGER:** In addition to VOC, some process exhaust streams may contain solids and/or aerosols. These materials may accumulate in the interior of any equipment that carries the process exhaust stream, such as the process exhaust duct system, baghouses, heat exchangers, and the oxidizer. The equipment and duct must be periodically inspected for accumulation of materials. Non-flammable accumulations can add weight to equipment which may not be designed to carry such weight. Accumulations may also block drains, block instrument sensors or coat equipment surfaces that must stay clean in order to function properly (for example, heat exchange surfaces). Establishing the frequency of inspections and the development of proper cleaning procedures are the responsibility of the owner.

ANY PART OF THE OXIDATION SYSTEM THAT CAN ACCUMULATE FLAMMABLE MATERIAL MUST BE REGULARLY INSPECTED AND CLEANED IN CONFORMITY TO NFPA AND INSURANCE CARRIER STANDARDS. FAILURE TO MAINTAIN AN EXHAUST SYSTEM FREE FROM ACCUMULATED FLAMMABLE MATERIAL PROVIDES THE POTENTIAL FOR A FIRE IN SUCH A SYSTEM. IT IS THE OWNER'S RESPONSIBILITY TO CONSULT WITH HIS SAFETY DEPARTMENT, INSURANCE CARRIER, AND ANY AUTHORITIES HAVING JURISDICTION REGARDING THE ESTABLISHMENT OF APPROPRIATE MAINTENANCE PROGRAMS AND INSTALLATION OF ANY FIRE SUPPRESSION SYSTEMS.

2.8 The following safety precautions are provided as general guidance in the operation of the oxidizer system. Additional precautions are contained in the manual sections for individual components. These should be read and observed prior to operation of the equipment. Prior to performing disassembly on any component, the manufacturer's literature should be consulted for proper techniques, and safety considerations.

PRIOR TO OPERATION

- Check all guards to insure they are properly attached.
- Verify all piping connections are tight, and in good condition.
- Make sure all electrical boxes, panels, etc. are closed and properly sealed.
- Check all access doors to be sure they are closed and secure.
- Verify that no maintenance work is being performed on or around the equipment that might result in injury, or cause someone to be startled and injure themselves.

OPERATING PRECAUTIONS

- Make sure all guards remain in place during operation.
- Keep hands, feet, and loose clothing away from fan shafts or other moving parts.
- Do not open access doors or panels without shutting down sources of stored energy and executing Lock Out / Tag Out procedures with appropriate disconnects and monitoring. (For example: electrical energy, natural gas, compressed/instrument air, steam, feedwater, condensate, mechanical counterweights, process gas and liquid streams, oxygen monitoring, etc.)
- Do not attempt to service or repair moving or operating equipment
- Follow all manufacturers' recommended safety precautions listed in individual manual sections, as well as all plant safety guidelines.

3.0 APPLICABLE DRAWINGS

The following drawings are applicable to this system.

RTO General Arrangement	Met-Pro	113312-63531 sheet 1-4, RTO
Process and Instrumentation LFG Purification Equipment	Met-Pro	113313-63530 sheet 1, RTO
Process and Instrumentation	Met-Pro	113313-63531 sheet 1, RTO
Standard Process Instrumentation Symbols	Met-Pro	0010116671 sheet 1
Process Flow Diagram	Met-Pro	113311-63531 sheet 1, RTO
Schematic Diagram Elec.	Met-Pro	113314-63531 sheets 1-4, RTO
Field Wiring Diagram	Met-Pro	200063531FW sheet 1, RTO
Suggested Sub Up Locations	Met-Pro	200063531SU sheet 1, RTO
Shop Wiring Diagram	Met-Pro	200063531X sheets 1-4, RTO
Control Panel Assembly	Met-Pro	113348-63531 sheets 1-2, RTO
Junction Boxes	Met-Pro	113351-63531 sheet 1, RTO
Foundation Arrangement	Met-Pro	117151-63531 sheet 1, RTO
Field Installation Assembly	Met-Pro	113339-63531 sheet 1-4, RTO
Typ. Recycle Duct Flange	Met-Pro	STD-TO-4 sheet 1, RTO
Media Loading Diagram	Met-Pro	113320-63531 sheet 1, RTO

4.0 GENERAL DESCRIPTION

4.1 Process Description

The MPEAS Regenerative Thermal Oxidizer (RTO) controls waste gas emissions from a bioscrubber that is part of a landfill gas (LFG) to product gas separation process at the Canton Renewables plant in Canton,MI. The RTO is a two bed type. The RTO ceramic media beds capture heat from the gases exiting the combustion chamber and preheat the incoming air stream with approximately 95% energy efficiency.

4.2 Design Parameters

Process gas flow:	1,370 to 4,100 scfm
RTO inlet temperature:	40 to 80°F.
RTO inlet pressure:	-18 "wc
VOC loading:	0.5 to 0.87% vol methane

4.3 Equipment Description

The oxidation system consists of the following major components:

RTO

Poppet Valves FCV 512 and FCV513

The two 304SS poppet valves alternately direct the incoming air stream to one of the two heat recovery chambers. Each valve is driven by a pneumatic cylinder. The valves move horizontally to extend or retract the valve disk. When extended, the flow path is into the heat recovery chamber. When retracted, the flow path is out of the heat recovery chamber. The two valves are always in opposite positions when seated, so that when one is extended the other is retracted. The seal on the valves is comprised of a double metal seat for minimal leakage across the valves.

Heat Recovery Chambers

The two heat recovery chambers house the heat recovery media used during the regeneration cycles of the system. The carbon steel chambers are insulated with ceramic fiber modules. Each of the chambers is sized to handle the maximum anticipated airflow of the process and is designed based upon the required thermal efficiency and pressure drop requirements. The grating material and support structure for the ceramic media is stainless steel to insure structural stability during high temperature operation.

Ceramic media

The heat exchange media is a random packed saddles. The quantity of media and bed configuration allow for a nominal 95% thermal energy recovery efficiency at the maximum design flow conditions.

Combustion Chamber
The combustion chamber serves two purposes in the RTO. The first purpose is to input the required heat energy to bring the pre-heated air exiting the inlet heat recovery bed up to the required operating temperature with the burner firing into the chamber. The second purpose is to retain the process stream at the operating temperature for nominally one second to achieve the desired destruction efficiency. The carbon steel chamber is insulated with ceramic fiber modules.

Burner
A single Maxon Kinedizer LE low NOx nozzle mix air heating burner with refractory block fires the fuel/air mixture on ratio from 0.3 to 1.9 mm Btu/hr. The burner includes an igniter and ultra-violet flame detector. The burner is mounted on the bottom of the combustion chamber and fires upwards into the chamber. Combustion air to the burner is controlled by a 6" butterfly valve TCV508. Fuel to the burner is controlled by a 2" butterfly valve TCV210. Burner fuel is landfill gas (LFG).

Painting
RTO chamber carbon steel surfaces are coated with Flame Control Coatings No. 500 charcoal gray, which is rated to 4500°F.

Fuel Valve Train
The rack mounted natural gas train is designed to meet NFPA requirements. Shutoff valves are automatic. There is a 1-1/2" main fuel valve train and 1/2" pilot valve train.

Combustion Air Blower AB507
Chicago Blower Fan direct drive blower with carbon steel construction provides fresh air for the burner. The blower is equipped with flanged inlet and outlet, access door, drain, base, 3 hp TEFC motor and inlet filter/ silencer.

RTO Blower AB603
Twin City Fan arrangement 8 direct drive blower with carbon steel construction pushes the air stream through the RTO. The blower is rated for 500°F. The blower is equipped with flanged inlet and outlet, access door, drain, shaft seal, OSHA guard, and 75 hp TEFC high efficiency inverter duty motor. The blower speed is controlled bf a VFD.

Exhaust Stack
An exhaust stack is 35 feet high with a 20" diameter. It is made of carbon steel and coated with Flame Control Coatings No. 850 charcoal gray, which is rated to 850°F. Sample ports for testing are located at the 24' elevation. The stack is free standing.

Inlet Isolation Damper FCV601 and Fresh Air Damper FCV602
The normally open 18" fresh air damper provides air for purge and start up. When the RTO is ready for process air, the normally closed 18" isolation damper opens and the fresh air damper closes.

Recycle Air Damper TCV511
This damper adds hot air from the combustion chamber to the RTO inlet duct to raise the temperature entering the fan and RTO. This aids in preventing corrosion if H2S is present in the

waste gas after the gas passes through the bioscrubber.

Control Panel

A control panel is furnished to monitor and control the oxidizer system. This panel houses an Allen Bradley programmable logic controller (PLC), operator interface terminal, high temperature limit control and flame safety Burner Management System. The panel is rated NEMA 4 for outdoor installation. An overhead shield protects the panel from direct exposure to sun and rain. The panel is purged for the Class 1, Group D, Division 2 area.

Motor Control

The RTO blower variable frequency drive is located in the electrical room. The combustion air blower motor starter is located in the control panel.

4.4 Operational Description

The VOC laden air stream from the process is moved through the system by the RTO blower. From the process inlet duct, the process air is heated as it passes through the mix box where it is blended with hot air from the combustion chamber. The stream then moves to the poppet valves.

The poppet valves alternately direct the incoming air stream to one of two recovery chambers. Each chamber is filled with ceramic media to provide the heat transfer specified. The VOC-laden air stream travels upward through the ceramic media where it is preheated by heat previously stored in the media, to a temperature of approximately 1350°F prior to entry into the combustion chamber. In the combustion chamber, the temperature is raised to approximately 1500°F by the burner for a residence time of nominally one second. This results in destruction (oxidation) of the organic compounds.

After destruction in the combustion chamber, the clean hot air stream passes downward through the second heat recovery chamber where its heat is given up to the ceramic media. The cooled gas stream, at an average temperature of approximately 350 to 400°F, then discharges from the bed and passes through the poppet valve in "exhaust" mode, where it is directed to the exhaust stack. At regular intervals, the poppet valve positions are switched and flow through the RTO is reversed.

The exhaust blower speed is controlled by pressure loop PIC603 to maintain the draft at the outlet of the bioscrubber..

Combustion air and gas for the burner are controlled by a temperature control loop TIC 502, which modulates combustion air valve TCV508 and gas valve TCV210 on ratio. The temperature in the combustion chamber is controlled at 1500°F. Averaged signals from thermocouples TE502 and TE503 provide input to TIC502. During start-up, the temperature control ramps up the temperature set point.

Temperature control loop TIC511 modulates recycle valve TCV511 to maintain the inlet temperature at 375°F.

5.0 OPERATING INSTRUCTIONS

5.1 General Operation

The MPEAS Oxidation System is designed to be operated in automatic mode from the control panel. The system will start up and shut down automatically with minimum operator attention required during normal operation. System functions are controlled by the programmable controller and monitored at the operator terminal (HMI). The sequence of operation, timing functions, and interlocks are provided by the program. PID control loops programmed in the PLC provide control of oxidizer temperature, exhaust temperature and inlet draft. The burner flame safety relay and hardwired interlocks are located in the control panel.

System status, alarms, selected settings, damper positions, temperatures, control loops, and PLC input/output status are also displayed on the HMI.

The control panel is a NEMA 4 enclosure and powered by 460 VAC. The panel is purge for the Class 1, Division 2 area.

5.2 Operator Controls

Control Power
Turning this switch to the OFF position will shut off control power to the oxidizer system. CONTROL POWER ON is indicated by a red light.

Emergency Stop
An EMERGENCY STOP push-button is provided on the control panel. Pushing the button will remove all power from all digital outputs and stop all system operations.

HOA Selectors
The exhaust blower and combustion air blower controls are furnished with a HAND-OFF-AUTO selector switch. The AUTO position will allow the component to operate as required by the control program. The HAND position allows the component to operate without interlocks independently of the control program. The HAND position should only be used for maintenance and checkout purposes.

Burner Selector
The burner control is furnished with an OFF-AUTO selector switch. The selector must be in the AUTO position to operate the burner.

Temperature High Limit
The High Limit controls the combustion chamber high temperature shutdown.

Burner Flame Safety Display
The status of the burner is shown on the display.

5.3 Limits and Alarms

These conditions are indicated on the operator terminal (HMI) by a flashing message and by the alarm horn. Silence and reset functions are provided by specific keys on the HMI. The message on the screen will return to its normal state after reset.

Each limit or alarm event is indicated on the Alarm Banner which will appear at the top of the current HMI screen. The alarm banner remains visible until acknowledged. All limit and alarm events are listed chronologically on the Alarm History screen.

Alarm conditions are divided into two categories. They are Burner Safety Limits and Warning Alarms. When a Burner Safety Limit alarm occurs, the burner and oxidizer will shut down. A System Alarm condition will provide a warning but does not stop operation. Limit and alarm interlocks are detailed below.

5.3.1 Burner Limits

The following limits are provided for start-up and proper operation of the burners. They are shown on the Burner Limits screen.

- LOW GAS PRESSURE (PSL203)
- HIGH GAS PRESSURE (PSH207)
- COMBUSTION CHAMBER HIGH TEMPERATURE (TE504) [L1]
- LOW COMBUSTION AIR Diff. PRESSURE (PDSL505)
- LOW INLET PRESSURE (PSL604)
- COMBUSTION AIR BLOWER FAILURE (AB507)
- RTO BLOWER FAILURE (VFD603)
- FLAMEOUT (BE501)
- INLET AIR PATH NOT OPEN (Isolation, fresh air or poppet valve positions)
- LOW COMPRESSED AIR PRESSURE (PSL305)
- THERMOCOUPLE FAILURE (TE502)
- THERMOCOUPLE FAILURE (TE503)
- RECOVERY CHAMBER OUTLET HIGH TEMPERATURE (TE512/TE513)

If any limit opens, burner operation will stop and process air flow to the oxidizer will be interrupted.

[L1] The High Temperature Limit requires manual reset at the panel mounted limit controller before the limit on the HMI can be reset

5.3.2 Warning Alarms

The following alarm conditions are shown on the Oxidizer Alarm screen.

- ISOLATION DAMPER FAILURE (ZSC/O601) indicates the damper did not move to its full closed or full open position when required by the control logic. The failure to fully close condition prevents the purge cycle from starting. This alarm does not permit the Oxidizer Ready.

- FRESH AIR DAMPER FAILURE (ZSC/O602) indicates the damper did not move to its full closed or full open position when required by the control logic. The failure to fully open condition prevents the purge cycle from starting. This alarm does not permit the Oxidizer Ready.

- GAS SAFETY SHUTOFF VALVE FAILURE (FCV204, FCV206) warns that the valves are not full closed or full open as required. The failure to fully close condition prevents the purge cycle from starting.

- LOW FIRE SWITCH FAILURE (ZSL210) warns that the burner gas valve is not at minimum firing position. This condition prevents the burner from starting.

- COMBUSTION AIR VALVE FAILURE (ZSC508) warns that the burner air valve is not at minimum firing position. This condition prevents the burner from starting.

- POPPET VALVE 512 FAILURE (ZSC/512) indicates the valve did not move to its fully extended or fully retracted position as required. This condition will activate the INLET PATH FAILURE LIMIT

- POPPET VALVE 513 FAILURE (ZSC/513) indicates the valve did not move to its fully extended or fully retracted position as required. This condition will activate the INLET PATH FAILURE LIMIT

- OXIDIZER LOW TEMPERATURE (TIC502)
- OXIDIZER HIGH TEMPERATURE (TIC502)
- RECOVERY CHAMBER 512 OUTLET HIGH TEMPERATURE (TE514)
- RECOVERY CHAMBER 513 OUTLET HIGH TEMPERATURE (TE515)
- EXHAUST HIGH TEMPERATURE (TIC516)
- INLET LOW DRAFT (PIC603)
- INLET HIGH DRAFT (PIC603)
- LOSS OF COMMUNICATION indicates the RTO PLC is not receiving data from the process control PLC.

The following alarm conditions are shown on the Transmitter Alarm screen.

- DRAFT TRANSMITTER FAIL (PIT603)
- INLET THERMOCOUPLE FAIL (TE511)
- RECOVERY CHAMBER 512 THERMOCOUPLE FAIL (TE514)
- RECOVERY CHAMBER 513 THERMOCOUPLE FAIL (TE515)
- EXHAUST THERMOCOUPLE FAIL (TE516)

5.4 Operation

5.4.1 Startup / Shutdown

For operation, the following panel mounted selector switches must be in the AUTO position:

- RTO blower AB603
- Combustion air Blower AB507
- Burner

The following HMI selectors must be set to AUTO:

- Isolation damper FCV601
- Fresh air damper FCV602
- Poppet valve FCV512
- Poppet valve FCV513

System operation is initiated by pressing the START button on the System Status or System Graphic screen. The above listed HMI selectors are set to Auto when the system starts.

When the system is started, the oxidizer run control will engage and remain on until one of the following occurs:

- a shutdown cycle is completed
- power to the panel is shutoff
- RTO blower selector is switched from AUTO position
- RTO blower failure occurs,
- the Emergency Stop button is pushed
- Chamber 512 or 513 outlet high temperature
- RTO Blower Inlet path not open

The SHUTDOWN mode is initiated by going to the Shutdown screen and then pressing and holding the SHUTDOWN button for three seconds. In shutdown mode the burner is shut off, the isolation damper closes and the fresh air damper opens. The flow path continues to alternate between the two recovery chambers. When the combustion chamber temperature is below the cooldown temperature the exhaust blower stops. The combustion air blower runs for several more hours until the shutdown ends.

5.4.2 Blower Controls

<u>RTO Blower AB603</u>
To run, the blower selector must be in "Auto". The following Limits stop the blower and require reset before the blower can operate:

Exhaust blower failure
High vibration
Inlet path failure

The air flow path to the blower must be proven or the blower will not start; if the blower is already running, it will shutdown. The path requires the correct positions of the inlet dampers and the poppet valves.

One of the following inlet damper positions must be proven to run the blower:

Isolation damper full open (ZSO7101)
Fresh air full open (ZSO7102)

One of the following poppet valve position combinations must be proven to run the blower
FCV512 extend (flow in) and FCV513 retract (flow out)
FCV513 extend (flow in) and FCV512 retract (flow out)

The RTO blower will run when the system is started. The blower will continue to operate until the combustion chamber reaches the cooldown temperature during shutdown. Preset VFD speed determines the blower speed for purge and warmup. When the isolation damper is open, the draft loop controls the VFD speed.

Combustion Air Blower AB507
To run, the blower selector must be in "Auto". The following Limit stops the combustion air blower and require reset before the blower can operate:
Combustion air blower failure

The combustion air blower will run when the system is started. The blower will continue to operate until shutdown is complete. Also, the combustion air blower will run if the combustion chamber temperature rises over 600°F when the system is off. This can be caused by residual heat still on the recovery chamber media after shutdown.

Table 5.4.2 Oxidizer System Blowers

Blower	Tag Number	System Off	Purge/ Warm up	Ready	Isolation open	Shut down cooling	Shut down delay end
RTO	**AB603 VFD607**	Off	Purge Speed	Warm up Speed	Draft control PIC603	Warm up Speed	Off
Comb. Air	**AB507**	Off	On	On	On	On	On

5.4.3 System Dampers and Valves

Isolation Damper FCV601
The isolation damper is normally closed. It opens when the system is ready to run on process air and the Open Isolation signal is sent by the process control. This damper is closed during purge and warm up. Open and closed limit switches prove damper position. Speed controls on the damper actuator control the rate at which the damper moves.

The isolation damper can be operated manually from the Damper Position screen. Toggle the Auto-Manual selector to choose manual mode. Toggle the Off-On selector to change the damper position. The selectors are set to Auto and Off each time the system is started. The selector must be in Auto to permit the Oxidizer Ready state.

Fresh Air Damper FCV602
The fresh air damper is normally open. This damper is open during purge and warm up.

It closes when running on process air. Open and closed limit switches prove damper position. Speed controls on the damper actuator control the rate at which the damper moves.

The fresh air damper can be operated manually from the Damper Position screen. Toggle the Auto-Manual selector to choose manual mode. Toggle the Off-On selector to change the damper position. The selectors are set to Auto and Off each time the system is started. The selector must be in Auto to permit the Oxidizer Ready state.

Main Burner Gas Shutoff Valves FCV204 / FCV206
These valves are normally closed. They can only open when powered by the burner flame safety relay. The valves must be closed for purge before the burner can light. Open and closed limit switches prove valve position

Burner Gas Control Valve TCV210
At start up this valve is set to its minimum (low fire) position. This position is proven by the valve low fire switch ZSL210 and is required to light the burner. After the burner low fire hold delay is complete, temperature loop TIC502 controls the valve to add gas as required to maintain oxidizer temperature.

Combustion Air Control Valve TCV508
At start up this valve is set to its minimum (low fire) position. This position is proven by the valve low fire switch ZSL508 and is required to light the burner. After the burner low fire hold delay is complete, temperature loop TIC502 controls the valve to add gas as required to maintain oxidizer temperature. During shutdown the valve is partially open to allow combustion air to cool the combustion chamber.

Recycle Air Damper TCV511
This valve is normally closed. The valve is controlled by inlet temperature control TIC511.

Table 5.4.3 Oxidizer System Dampers and Valve Positions

Damper ID	Tag Number	Off	Purge	Burner Start	Warm-up	Ready	On Process	Shutdown	Power Off
Process Isolation	**FCV601**	C	C	C	C	C	O	C	C
Fresh Air	**FCV602**	O	O	O	O	O	C	O	O
Main SSOV	**FCV204 FCV206**	C	C	O	O	O	O	C	C
Fuel Gas	**TCV210**	Min	Min	Min	Mod	Mod	Mod	Min	L
Comb. Air	**TCV508**	Min	Min	Min	Mod	Mod	Mod	50% O	L
Recycle Air	**TCV511**	C	C	C	C	Mod	Mod	C	L

Legend: O=Open C=Closed Min= minimum Mod= Modulating L=Last

5.4.4 Oxidizer Operation

When the oxidizer is started, the RTO blower and combustion air blower start. The poppet valves alternate positions approximately every two minutes to reverse flow through the heat recovery chambers.

With all burner limits made, and system dampers and valves in purge positions the purge timer starts. Purge time is set at 1 minute. During purge, fresh air is circulated through the system at approximately 60 percent of maximum design flow. When the purge timer completes its cycle and with the burner fuel gas and air control valves at low fire the flame safety/burner management system BS501 is energized to initiate the burner light off sequence.

The burner flame safety ignition transformer, and the pilot gas valves (SV103 and SV104) and main gas shutoff valves FCV204 and FCV206. The flame safety will energize the pilot valves and the ignition transformer. Within 2 to 4 seconds, the ultraviolet scanner will sense the pilot flame. This allows the main gas shutoff valves open. The pilot valves shutoff 10 seconds after the main valves open. The progression of the burner start sequence can be viewed on the flame safety display.

If the flame is not sensed within 10 seconds, the flame safety will lock out the burner start circuit. After a FLAMEOUT alarm, the system must be repurged before the burner can be restarted. The burner ignition sequence is restarted by resetting the flame out alarm on the HMI Burner Limits screen.

After the fuel gas shutoff valves prove fully open, the low fire hold timer starts. After the low fire hold period, the burner temperature control loop TIC502 will modulate the burner fuel gas valve TCV210 and combustion air valve TCV508 to follow the temperature set point.

The oxidizer temperature ramps up (360 °F/hr) to slowly distribute heat to each of the recovery chambers. Ramp set points are displayed on the Burner Ramp screen

When the ramp up is complete and the oxidizer temperature has reached the minimum operating temperature (TSL504), the oxidizer will hold at temperature for about 45 minutes to insure heat is evenly distributed to both heat recovery chambers. After this hold period, the Oxidizer Ready status is given. With the Oxidizer Ready state, process air can be directed to the oxidizer.

Operation on Process Air

Process air is permitted to flow to the oxidizer when the Oxidizer Ready status is given and the Open Isolation signal is sent by the process control (selected by the owner operator). The isolation damper opens. After the isolation damper proves open (ZSO601), the fresh air damper closes. The inlet draft loop controls the exhaust blower speed.

When the Open Isolation signal is removed, the fresh air damper opens. After the fresh air damper proves open (ZSO602), the isolation damper closes. The exhaust blower returns to warm up speed.

During operation, if the heat recovery chamber outlet temperature rises above the expected outlet temperature, the normal poppet switch time is overridden and the poppet valves reverse flow through the chambers and prevent a high exhaust temperature.

When heat release from the VOC's in the air stream is high enough to maintain the combustion chamber temperature continually above burner set point for a period of time, the burner will shut off. When the chamber temperature drops due to lower VOC concentrations, the burner will relight to maintain the chamber temperature.

5.5 PID Control Loops

Each control loop is displayed on a separate HMI operator terminal screen. The screen displays process variable, set point and control output. Also displayed are manual mode select, manual set point entry, manual output value entry and related alarm and control set point entry.

5.5.1 Burner TIC502

This loop controls the fuel gas valve TCV210 and combustion air valve TCV508 based on the oxidizer temperature. The valves must be proved at low fire positions to start the burner. The loop functions after burner low fire hold is timed out and the temperature set point ramp-up starts. Before that, valves are held at low fire. Temperature ramp up settings are also provided on this screen

5.5.2 Inlet Draft PIC603

This loop controls the process blower VFD to maintain a negative pressure in the duct leading to the oxidizer. The loop functions when the isolation damper is open and the oxidizer is operating on process air.

5.5.3 Recycle Air TCV511

This loop controls recycle air valve TCV511 based on the RTO inlet temperature. Hot combustion chamber air is mixed with the incoming process air to keep the RTO blower and inlet duct hot. At start up the valve is closed. The loop functions after warm up is done.

5.6 HMI Screens

- Oxidizer Status: status messages and oxidizer start and shutdown pushbuttons are provided on this screen.
- Burner Limits: see sections 5.3 and 5.3.1
- Oxidizer Alarms: see sections 5.3 and 5.3.2
- Transmitter Alarms: see sections 5.3 and 5.3.2
- Valve Positions: This screen monitors limit switch inputs from the system valves. Valve auto-manual control modes are selected here. See section 5.4.3
- Temperatures: system temperatures are displayed on this screen.
- Shutdown: Put the oxidizer in shutdown mode.
- TIC502: see sections 5.5 and 5.5.1
- PIC603: see sections 5.5 and 5.5.2
- TIC511: see sections 5.5 and 5.5.3
- PID Loop Summary: This screen displays a summary of the control loops including process variables, set points and control output values. It is used to observe system response to changes in operation or control settings
- Interlocks: displays the status of interlocks to and from the process control.
- Alarm History: see section 5.3.
- I/O Screens: monitors input and output module status

- System Diagram: diagram of the oxidizer with current status

5.7 Process Interlocks

Interlocks from oxidizer to process control

- Oxidizer Ready: Oxidizer warm up complete, oxidizer can accept waste gas.
- Oxidizer Critical Alarm: Oxidizer has a condition that requires operator attention. The ready state cannot be reached until this condition is corrected.

Interlocks from process control to the oxidizer

- Run Permit: Allows oxidizer to start up. When signal is removed, the oxidizer is put in shutdown mode
- Open isolation Permit: Oxidizer opens isolation damper when process is ready to send air to the oxidizer.

6.0 MAINTENANCE AND SERVICE INSTRUCTIONS

Inspection Services for Oxidizer Equipment

Preventive maintenance inspection services by the manufacturer are recommended by all industrial underwriters for equipment of the complexity and type of the Met-Pro Systems equipment you now own. MPEAS recommends that the owner schedule r annual preventive maintenance inspections for times when the plant will not be operating the RTO for the duration of the inspection (one or two days). The cost of an inspection is nominal and will help assure the owner's ability to maintain the equipment at the best possible operating efficiency. Please contact the Met-Pro Industrial Services group for further information.

6.1 Owner's Preventive Maintenance and Periodic Service

DANGER: The risk of serious injury and death may exist when attempting to maintain or service this equipment. Read and understand the safety section of this manual and all relevant manufacturer's literature when attempting any service procedure.

The following preventive maintenance and periodic inspection services are in addition to any services required by your insurance carrier or insurance inspection authority:

1. Measure and record Blower vibration levels at the conclusion of start-up and every 90 days thereafter. Correct any defects found.

2. Check all pilot lights on the control panel annually and replace, as necessary. Spare pilot lights should be carried in the control cabinet (along with spare fuses) so prompt replacement may be made in the event of failure in operation.

3. Record motor running currents quarterly. Test motor insulation at least annually on any motor in the system over 5 HP in size.

4. Record the flame current quarterly, and any decrease of flame current should be noted.

5. Inspect the interior of the blowers and ducts periodically- at least monthly to start and then adjust period to suit operational specifics, such as percentage of process up-time in a month, changes in products mix, etc. Deposits of oils, resins, dust, and sludge may form in some process exhaust ducts. These may be flammable and may over time add dangerous weight to the duct system. The deposits may also plug instrument sensing lines or drains. Such deposits must be periodically removed to insure safe and reliable operation of the system.

6. A safety check of the system should be performed on a regular basis; at least quarterly. This safety test should be in addition to the tests required by the owner's safety department and insurance carrier. A copy of the NFPA 86 Standard for Ovens and Furnaces, Annex B "Example of Class A Furnace Operational and Maintenance Checklist" is attached here as an aid in the establishment of plant inspection procedures.

7. Lubrication of blower, bearings, etc. should be carried out on a regular basis following manufacturers' recommendations.

NOTE: In addition to the above steps, consult vendors' literature located elsewhere in this manual for specific maintenance required on individual components, such as blowers, switches, etc.

6.2 Maintenance of Fans and Blowers

NOTE: For additional information on this or any other component, consult vendors' literature located elsewhere in this manual.

6.2.1. Checking and Adjusting the V-Belt Drive

Fans and blowers with V-belt drives should be checked before they are connected electrically. Alignment of the drive must be checked with a straight edge. Belt tightness must be properly adjusted to assure good belt and bearing life.

Excess belt tension will cause premature failure of either the blower or motor bearings. It is normal for V-belt drives of more than 20 horsepower to squeal on start-up. Do not over tighten V-belt drives. Consult manufacturer's literature for proper tension measurement techniques. Multiple V-belt drives should be checked to make certain that only matched belts are used. The belts should tension equally.

6.2.2. Initial Checking and Lubrication of Bearings

Lubricate blower bearings immediately upon receipt of the fan or blower and also before operating. Follow manufacturer's literature regarding type and frequency of lubrication. Caution should be used to avoid over-lubrication.

6.2.3. Start-Up

After start-up and 24 hours running, blowers with bearings may have the bearings doweled in place, if desired. Recheck tightness of all bolts, belts, etc. after two (2) weeks of operation.

6.2.4. Vibration

If excess vibration is found after the blower has been in service, the blower should be shut down and examined for: deposits on the wheel and/or cracks or distortions on the rotor. A blower should not be operated in an unbalanced condition as damage to the wheel, shaft, and bearings will result.

6.2.5. Bearing Lubrication

Proper lubrication of the bearings is important and cannot be overemphasized. While performing routine lubrication maintenance, the bearings should be inspected for the presence of unusual noises, excessive heat, or vibration. These are all signs of potential trouble and should be investigated and corrected immediately. An unbalanced blower wheel may be caused by uneven accumulation of dirt or other deposits. This is readily noticed when lubricating or observing the blower in operation.

IT IS VITAL TO THE PROPER OPERATION OF THE BEARINGS AND THE MAINTENANCE OF THE WARRANTY THAT THE FAN MANUFACTURER'S SPECIFIC LUBRICATION RECOMMENDATIONS BE FOLLOWED. NOT ALL GREASES USED IN THE PLANT ARE SUITABLE FOR USE IN FAN AND MOTOR BEARINGS. ONLY APPROVED GREASES MAY BE USED.

It is preferable to lubricate the bearings while the shaft is in motion. Enough grease should be added until it starts to slowly ooze through the bearing seals. Excess grease may be carefully wiped off. Care must be used when lubricating with a high pressure grease gun or the bearing seals may be ruined. Lubricate motor bearings in accordance with the manufacturer's instructions. Lubrication frequency of blower bearings increases with higher operating temperatures and heavier duty cycles. Blowers operated 40 hours per week should be re-lubricated at the end of the first week of operation. Blowers operated 80 hours per week should be re-lubricated, for the first time, at the end of three or four days. Blowers in continuous operation should be re-lubricated within 72 hours of their initial operation.

Generally if the blower is operating in an air stream in excess of 200°F, the initial operating lubrication interval should be cut in half. Consult the manufacture's literature for the specific schedule recommended for your blower. Weekly lubrication checking under normal operation is recommended.

The driving motor will not require as frequent lubrication as the blower itself unless it is exposed to adverse operating conditions, such as heat. Whenever the motor is re-lubricated, overflow grease plugs, if any, on the motor must be removed.

NOTE: It is as important not to over-lubricate the motor as it is to lubricate the blower.

Stopping the blower when it is exposed to temperatures above 350°F can ultimately result in damage even to those blowers designed to operate at high temperatures. This should be avoided in all cases. Run the blower until it operates at lower temperatures before stopping it.

6.3 Maintenance of Specific Items

NOTE: For additional information on these or any other components, consult vendors' literature located elsewhere in this manual. All plant, local and national safety codes must be followed when servicing electrical equipment. Only trained and qualified personnel should perform maintenance on electrical and controls equipment.

6.3.1 Electrical Troubleshooting (**DANGER: The risk of serious injury or death exists when working on medium and high voltage equipment. Only qualified electricians should work on the electrical equipment in this system. Read and understand the safety section of this manual and all relevant manufacturer's literature when attempting any service procedure.)**

6.3.1.1. The fuses on the incoming main disconnect on the control panel should be removed and

tested individually as well as be tested with a test light if trouble is suspected.

6.3.1.2. Always determine if power is available. In some cases, power to the main equipment and power to the control system are supplied by separate circuits.

6.3.1.3. Shorts are often caused by broken or bare wires or defective controls.

6.3.1.4. All connections on terminal block and controls should be checked for tightness.

6.3.1.5. All safety equipment circuits, such as pressure controls, temperature controls, gas and air pressure switches, and limit switches, must be checked at start-up and at specific intervals thereafter in accordance with plant, insurance carrier, and NFPA standards.

6.3.1.6. Overload heaters on all motor starters should be checked. The screws holding heaters in place should also be checked for tightness.

6.3.1.7. Check the control circuit connections. A loud humming noise in a motor starter and/or frequent blowing of control transformer fuses indicates a low voltage probably caused by a mechanically loose connection. With the power to the control panel OFF, tighten all terminal screws.

Other conditions which cause motor starter humming are opening of the shading coils on the motor starter magnets and pitting of the starter contacts. If the smell of ozone is detected in the control panel, the contacts are probably badly pitted.

6.3.2 Solenoid Valves

There is little difficulty experienced with these valves in service, and with a moderate amount of attention, the solenoid valves will last the life of the equipment on which they are installed.

The operating voltage of solenoids on Met-Pro Systems equipment is usually 115 VAC. If there is an excessive load on supply voltage source, and the voltage drops below 110 VAC, there may be difficulty with the operation of the solenoid valve. Check for an under-voltage condition as the pilot solenoid valve pulls in before deciding to rebuild the valve.

6.4 Troubleshooting of Burner

NOTE: For additional information on this or any other component, consult vendors' literature located elsewhere in this manual.

6.4.1 DIFFICULTY IN LIGHTING OFF

PROBLEM: Limits do not close.

With the control system energized, and blowers running, find limit switch which is not closed. In some cases, excess water in the limit switch may freeze causing the limit switch to fail to close.

PROBLEM Pilot will not light.

Check scanner lead for ground at panel and at burner. Check spark plug lead for ground at panel and at spark plug. Check operation of pilot solenoid valve. When an attempt is made to light the burner, a click should be heard from the pilot solenoid.

In extremely wet conditions, such as after a driving rainstorm, the spark plug or flame rod may have shorted; particularly if the unit has not been operating during the storm. The only solution is to dry the insulation on the spark plug and flame rod, and try again for ignition.

PROBLEM: The pilot lights, but the main burner will not light.

Although rare, this may be caused by the failure of the flame safety control. The flame safety control should be checked in accordance with the manufacturer's instructions. If no difficulty is found here, the operation of the main valve train should be checked.

The failure of the motorized valve or blocking valve to operate properly is rare, but should certainly be investigated. Motorized valves may stick partially open, or "hang," in a midpoint of their opening travel, particularly when high gas flow rates are used.

6.4.2 PROBLEMS IN OPERATION

PROBLEM: The burner lights but will not go to high fire.

Occasionally, a control motor will seize or stick, but seizure will more commonly take place at a midpoint of the travel than at the low fire position. The control loop driving the control motor should also be checked for accuracy and calibration as should the thermocouples themselves.

PROBLEM: Burner Off -- Flame Present.

Pilot or main gas leakage is the cause of this, with pilot gas valve leakage being the most likely. The most common cause is chip or scale being caught under the valve seat, holding the valve open.

Flame current to the flame safety control should be checked after changing a pilot solenoid valve, pilot regulator, or pilot gas cock.

6.4.3 NORMAL AND ABNORMAL FLAME CONDITIONS

Gas Firing -- Normal

When firing with gas, the flame has a slightly blue periphery and a somewhat yellowish center at high fire. At low fire, the flame is further back in the burner and is a pale bluish color.

Gas Firing -- Abnormal

-A bright, yellow flame indicates lack of sufficient air. (Overly FUEL RICH)

-A clear, hard blue flame indicates too much air OR insufficient gas. (Overly FUEL LEAN)

7.0 Recommended Spare parts List

SEE RECOMMENDED SPARE PARTS SECTION OF THIS CD MANUAL.

8.0 Recommended Settings

8.1 Recommended Instrument Settings

Tag	Service	Range	Initial Set	Final Set
PCV102	Pilot gas regulator	6 to 14"wc	7"wc	
PCV202	Gas pressure regulator	12 to 28"wc	12"wc	
PSL203	Low gas pressure limit	2 to 20"wc	4"wc	
PSH207	High gas pressure limit	12 to 60"wc	30"wc	
FR302	Actuator air pressure regulator	5 to 125 psig	100 psig	
PSL305	Compressed air low pressure limit	10 to 150 psig	80 psig	
PCV310	Cooling air pressure regulator	5 to 125 psig	10 psig	
TSH504	High temperature limit	-100 to 2400F	1800°F	1800°F
TSL504	Low temperature	-100 to 2400F	1450F	
PDSL505	Burner comb. air low dp limit	0.4 to 1.6"wc	1"wc	
PSL506	Comb. air blower low pressure limit	0.4 to 1.6"wc	1"wc	
TE5xx	all thermocouples	-100 to 2400F	-	
PIT603	Draft transmitter	-10 to +10"wc	-	
PSL604	Low inlet pressure limit	0.4 to 1.6"wc	1"wc	

8.2 Recommended Programmable Controller Settings

Tag	Service	Range	Initial Set Point	Final Set Point
TIC502	Ramp rate	0 to 500°F/Hr	366°F	
TIC502	Ramp up end (TIC502 sp)	0 to 1600°F	1500°F	
TIC502	Ramp interval	5 to 120 sec.	10 sec.	
TIC502	Warm up end delay	1 to 120 min.	45 min.	
TIC502	Cooldown end	0 to 300°F	200°F	
TIC502	Cooldown end delay	1 to 500 min.	240 min.	
TIC502	Burner shutoff bias	0 to 200°F	50°F	
TAL502	Comb. chamber low temp alarm bias	0 to 300°F	50°F	
TAH502	Comb. chamber high temp alarm bias	0 to 300°F	200°F	
TIC511	Inlet air set point	0 to 400°F	375°F	
TIC511	TIC511 active chamber temperature	1000 to 1600°F	1475°F	
TAL511	Inlet low temperature alarm bias	0 to 100°F	40°F	
TAH511	Inlet high temperature alarm	0 to 450°F	400°F	
FCV512/513	Valve switch time	60 to 180 sec.	120 sec.	
TAH512/513	Chamber out high temp alarm	0 to 500°F	400°F	
TAH512/513	Chamber out high temp limit	0 to 500°F	450°F	
TAH516	Exhaust high temperature alarm	0 to 600°F	425°F	
PIC603	Inlet draft set point	-10 to 0"wc	-2"wc	
PIC603	VFD purge speed	0 to 100%	40%	
PIC603	VFD warm up speed	0 to 100%	10%	
PAL603	Inlet low draft bias	0 to 10"wc	2"wc	
PAH603	Inlet high draft bias	0 to 10"wc	2"wc	

Annex B Example of Class A Furnace Operational and Maintenance Checklist

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

B.1 The recommendations in this annex are prepared for the maintenance of equipment. Different types of equipment need special attention. A preventive maintenance program, including adherence to the manufacturer's recommendations, should be established and followed. This program should establish a minimum maintenance schedule that includes inspection and action on the recommendations provided in the following paragraphs. An adequate supply of spare parts should be maintained, and inoperable equipment should be cleaned, repaired, or replaced, as required.

B.2 Visual Operational Checklist. The following operational checks should be performed:

(1) Check burners for ignition and combustion characteristics.
(2) Check pilots or igniters, or both, for main burner ignition.
(3) Check air—fuel ratios.
(4) Check operating temperature.
(5) Check sight drains or gauges, or both, for cooling water-flow and water temperature.
(6) Check that burners or pilots, or both, have adequate combustion air.
(7) Check the operation of ventilating equipment.

B.3 Regular Shift Checklist. The following operational checks should be performed at the start of every shift:

(1) Check the set point of control instrumentation.
(2) Check positions of hand valves, manual dampers, secondary air openings, and adjustable bypasses.
(3) Check blowers, fans, compressors, and pumps for unusual bearing noise and shaft vibration; if V-belt driven, belt tension and belt fatigue should be checked.
(4) Perform lubrication in accordance with manufacturer's requirements.

B.4 Periodic Checklist. The following maintenance checklist should be completed at intervals based on manufacturer's recommendations and the requirements of the process:

(1) Inspect flame-sensing devices for condition, location, and cleanliness.
(2) Inspect thermocouples and lead wire for shorts and loose connections. A regular replacement program should be established for all control and safety thermocouples. The effective life of thermocouples varies, depending on the environment and temperature, and these factors should he considered in setting up a replacement schedule.
(3) Check setting and operation of low and high temperature limit devices.
(4) Test visual or audible alarm systems, or both, for proper signals.
(5) Check igniters, and verify proper gap.
(6) Check all pressure switches for proper pressure settings.
(7) Check control valves, dampers, and actuators for free, smooth action and adjustment.
(8) Test the interlock sequence of all safety equipment. If possible, the interlocks should be made to fail manually, verifying that the related equipment operates as specified by the manufacturer.
(9) Test the safety shutoff valves for operation and tightness of closure as specified by the manufacturer.
(10) Test the main fuel manual valves for operation and tightness of closure as specified by the manufacturer.
(11) Test the pressure switches for proper operation at set point.
(12) Visually inspect electrical switches, contacts, or controls for signs of arcing or contamination.
(13) Test instruments for proper response to thermocouple failure.
(14) Clean or replace the air blower filters.
(15) Clean the water, fuel, gas compressor, and pump strainers.
(16) Clean the fire-check screens and valve seats, and test for freedom of valve movement.
(17) Inspect burners and pilots for proper operation, air—fuel ratio, plugging, or deterioration. Burner refractory parts should be examined to ensure good condition.
(18) Check all orifice plates, air—gas mixers, flow indicators,

meters, gauges, and pressure indicators; if necessary, clean or repair them.

(19) Check the ignition cables and transformers.

(20) Check the operation of modulating controls.

(21) Check the integrity of and the interior of the equipment, ductwork, and ventilation systems for cleanliness and flow restrictions.

(22) Test pressure-relief valves; if necessary, repair or replace.

(23) Inspect air, water, fuel, and impulse piping for leaks.

(24) Inspect radiant tubes and heat exchanger tubes for leakage and repair if necessary.

(25) Lubricate the instrumentation, valve motors, valves, blowers, compressors, pumps, and other components.

(26) Test and recalibrate instrumentation in accordance with manufacturer's recommendations.

(27) Test flame safeguard units. A complete shutdown and restart should be made to check the components for proper operation.

(28) Check electric heating elements for contamination, distortion, cracked or broken refractory element supports, and proper position. Repair or replace if grounding or shorting can occur.

(29) Check electric heating element terminals for tightness.

MET-PRO
Environmental Air Solutions

A Met-Pro Product Recovery/Pollution Control Technologies Business
Combining the Resources of **Duall, Flex-Kleen and Met-Pro Systems**

Systems Division

Spare Parts

MET-PRO
Environmental Air Solutions

A Met-Pro Product Recovery/Pollution Control Technologies Business
Combining the Resources of Duall, Flex-Kleen, and Met-Pro Systems

SPARE PART AVAILABILITY AND ORDERING PROCEDURE

The Met-Pro Systems Thermal Oxidation equipment presently in service at your facility has been designed and constructed using the best available technology and components, which in most cases have been built or furnished in accordance with Met-Pro specifications.

We strongly suggest that only Met-Pro original equipment (OEM) spare parts be utilized when replacement components are necessary. This includes any Platinum Group Metal (PGM) catalyst where applicable. Met-Pro Systems offers catalyst testing in accordance with owner protocol or regulatory requirements.

We also offer a PGM reclamation service. After installation of the new catalyst, Systems will arrange a pick up the spent catalyst from your facility. The catalyst will be refined by a qualified refiner to recover any remaining PGM still present in the catalyst. Systems will than issue a check to the owner for the value of any recovered precious metal at current market prices, less recovery costs. The spent catalyst can be packed into the crate that the new catalyst was shipped in for convenience.

Spare parts availability and pricing is managed by our Aftermarket Sales Representatives. Contact them by Email at MPISaftermarket@met-pro.com; by telephone at (215) 723-9300 or by fax at (215) 723-8501.

When contacting Met-Pro Systems, please have as much information as possible including:

- System serial number which is located in the electrical control panel.
- Component tag number as identified with the attached metal tag. If the metal tag is missing, use the tag number shown on the Process Instrumentation Drawing (P&ID) located in the O&M Manual.

In addition, the O&M Manual includes a recommended spare parts list which is useful for identifying normally consumable items which should be kept on hand for routine replacement when necessary.

MET PRO CORPORATION

Duall
1550 Industrial Drive, Owosso, MI 48867
Tel: 989-725-8184 • Fax: 989-725-8188
info@dualldiv.com
www.dualldiv.com

Flex-Kleen
45 N. Brandon Drive, Glendale Heights, IL 60139
Tel: 630-775-0707 • Fax: 630-295-9019
info@flex-kleen.com
www.flex-kleen.com

Met-Pro Systems
P.O. Box 144, Harleysville, PA 19438
Tel: 215-723-9300 • Fax: 215-723-8501
ssales@met-prosystems.com
www.met-prosystems.com

Job #63531
Regenerative Thermal Oxidizer RTO-6-G
Canton Renewables, Canton, MI April 25, 2012

THERMAL OXIDIZER SYSTEM SPARE PARTS LIST

TAG NUMBER	DESCRIPTION	PART NUMBER	QUANTITY	VALUE (EA)	Lead Time
PCV102	PILOT REGULATOR	200063531V22	1	$220.00	2 weeks
SV103/104	PILOT SOLENOID VALVE	200063531V23	1	$1,772.00	4 weeks
PCV202	MAIN GAS REGULATOR	200063470V15	1	$1,160.00	2 weeks
PSL203/PSH207	GAS PRESSURE SWITCH	200063531V82	1	$762.00	4 weeks
A210/508	CONTROL VALVE ACTUATOR	200063531B44-02	1	$970.00	4 weeks
TY210/508	I/P TRANSDUCER	200063531B48	1	$428.00	1 week
PI212/213	GAS PRESSURE GAUGE	200063531V85	1	$110.00	2 weeks
FCV204/206	GAS SHUTOFF VALVE	200063531V14	1	$5,137.00	6 weeks
PSL305	COMP AIR LOW PRES. SWITCH.	200063380P04	1	$452.00	2 weeks
BE501	UV SCANNER	200062920E02-5	1	$1,968.00	2 weeks
BS501	FLAME SAFETY AMPLIFIER	200062920S09	1	$438.00	1 week
TE502/503/504	THERMOCOUPLE 36"	200063531I21	1	$192.00	2 weeks
TSH504	HIGH TEMPERATURE LIMIT	200063410E06	1	$456.00	1 week
TE511	THERMOCOUPLE 12"	200063531I22	1	$140.00	2 weeks
TE512/513	THERMOCOUPLE 42"	200063531I25	1	$206.00	2 weks
SV512/513	POPPET VALVE SOLENOID	200063380i75	1	$1,772.00	4 weeks
ZS512/513	POPPET POSITION SWITCH	200063380I75	1	$260.00	1 week
TE516	THERMOCOUPLE 18"	200063531I24	1	$152.00	2 weeks
PDSL505	LOW CA DP SWITCH	2000108260	1	$208.00	2 days
PIT603	DRAFT TRANSMITTER	200063380I11	1	$2,568.00	3 weeks
VFD603	RTO FAN SPEED CONTROL	200063531E32-01	1	$5,655.00	1 week
	FUSE CT PRIMARY 1A	200063531E32-02	2	$14.00	2 days
	FUSE CT SECONDARY 1-1/4A	200063531E32-03	1	$14.00	2 days
RTO CONTROL PANEL					
	FUSE CONTROL CIRCUITS 7A	200063531E82-01	5	$12.00	2 days
	FUSE CT PRIMARY 5A	200063531E82-02	2	$14.00	2 days
	FUSE CA BLOWER 8A	200063531E82-03	3	$40.00	2 days
	POWER SUPPLY, 24VDC	200092900E98	1	$265.00	2 days
	PROGRAMMABLE CONTROLLER	200063470E10	1	$3,340.00	5 days
	PLC MEMORY MODULE	200063470E11	1	$165.00	2 days
	POWER SUPPLY	200063470E12	1	$410.00	2 days
	INPUT MODULE 120VAC	200063470E13	1	$424.00	2 days
	OUTPUT MODULE 120VAC	200063470E14	1	$602.00	2 days
	INPUT MODULE ANALOG	200063470E15	1	$768.00	2 days
	INPUT MODULE T/C	200063470E16	1	$1,480.00	2 days
	OUTPUT MODULE ANALOG	200063470E17	1	$1,664.00	2 days
	OPERATOR TERMINAL	200063410E20	1	$3,600.00	5 days

Job #63531
Regenerative Thermal Oxidizer RTO-6-G
Canton Renewables, Canton, MI April 25, 2012

THERMAL OXIDIZER SYSTEM SPARE PARTS LIST

TAG NUMBER	DESCRIPTION	PART NUMBER	QUANTITY	VALUE (EA)	Lead Time
FCV601 ISOLATION DAMPER					
	BEARING CARRIER	200063531B41-01	2	$230.00	2 weeks
	BEARING	200063531B41-02	2	$56.00	2 weeks
	PACKING	200063531B41-03	2 SETS	$56.00	2 weeks
	TADPOLE SEAL	200063531B41-04	2	$250.00	2 weeks
	THRUST WASHER	200063531B41-05	2	$14.00	2 weeks
A601	OPERATOR	200063531B41-06	1	$1,195.00	2 weeks
SV601	SOLENOID	200063880B41-17	1	$244.00	2 weeks
	FLOW CONTROL	200063531B41-07	1	$40.00	2 weeks
ZS601	LIMIT SWITCH	200063880B41-19	1	$350.00	2 weeks
FCV602 FRESH AIR DAMPER, SAME AS FCV601 ABOVE EXCEPT:					
A602	OPERATOR	200063531B42-06	1	$1,195.00	2 weeks
TCV511 RECYCLE DAMPER					
	BEARING CARRIER	200063531B47-01	2	$364.00	2 weeks
	BEARING	200063531B47-02	2	$64.00	2 weeks
	PACKING	200063531B47-03	2 SETS	$64.00	2 weeks
	THRUST WASHER	200063531B47-05	2	16.00	2 weeks
A511	OPERATOR	200063531B41-06	1	1195.00	2 weeks
TY511	POSITIONER	200063531B47-08	1	2,550.00	2 weeks
AB603 RTO BLOWER					
	WHEEL	200063531B21-01	1	$5,509.00	4 weeks
	SHAFT	200063531B21-02	1	$1,276.00	4 weeks
	BEARINGS	200063531B21-03	1 PAIR	$1,802.00	2 weeks
	COUPLING	200063531B21-04	1	$963.00	2 weeks
	MOTOR	200063531b21-05	1	$4,424.00	2 weeks
FCV512/513 POPPET VALVES					
	PACKING	200063531B45-01	2 SETS	$110.00	2 weeks
	BEARING / GLAND	200063541B45-02	1	$600.00	2 weeks
	ROLLER	200063541B45-03	2	$1,740.00	2 weeks
	ROLLER BEARING	200063531B45-04	2	$1,100.00	2 weeks
AB507 COMBUSTION AIR BLOWER					
	WHEEL	200063531B22-01	1	$2,580.00	3 weeks
	MOTOR	200063531B22-05	1	$370.00	1 week

Job #63531
Regenerative Thermal Oxidizer RTO-6-G
Canton Renewables, Canton, MI April 25, 2012

THERMAL OXIDIZER SYSTEM SPARE PARTS LIST

TAG NUMBER	DESCRIPTION	PART NUMBER	QUANTITY	VALUE (EA)	Lead Time

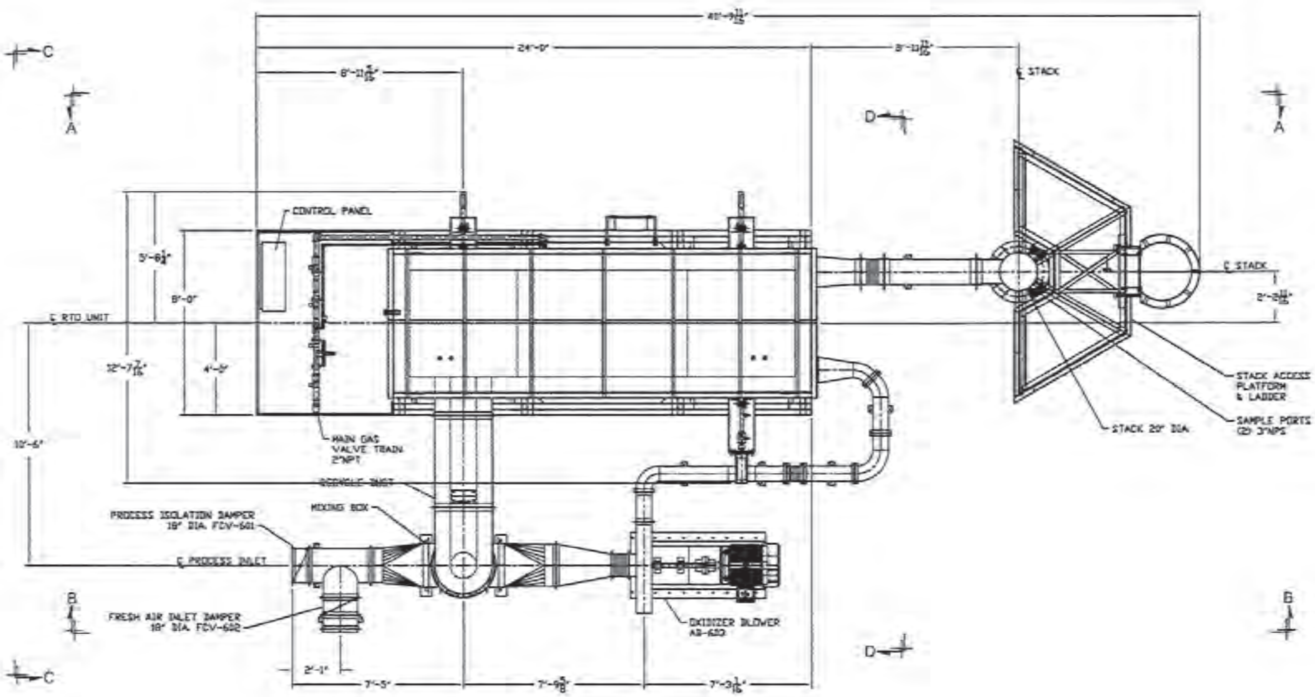
NOTE: **PRICES LISTED ARE VALID AT TIME OF PUBLICATION AND MAY CHANGE WITHOUT NOTICE. PLEASE CONTACT MET-PRO SYSTEMS' AFTERMARKET SALES REPRESENTATIVE FOR CURRENT PRICES WHEN ORDERING SPARE PARTS.**

MET-PRO
Environmental Air Solutions

A Met-Pro Product Recovery/Pollution Control Technologies Business
Combining the Resources of **Duall, Flex-Kleen and Met-Pro Systems**

Systems Division

Drawings



NOTES:

1. ALL DIMENSIONS SHOWN ARE APPROXIMATE AND SUBJECT TO FINAL ENGINEERING.
2. BURNER PIPING AND ELECTRICAL CONTROLS ARE DESIGNED TO COMPLY WITH NFPA STANDARDS FOR GAS FIRED BURNERS.
3. ALL LOCAL DISCONNECTS, POWER WIRING, AND CONDUIT SHALL BE FURNISHED AND INSTALLED BY INSTALLATION CONTRACTOR.
4. ALL GAS, COMPRESSED AIR, AND DRAIN PIPING TO RTO CONNECTIONS SHALL BE FURNISHED AND INSTALLED BY INSTALLATION CONTRACTOR.
5. CONNECTION PIPING AND DUCTWORK MAY NOT IMPART ANY MOMENTS OR LOADS ON RTO EQUIPMENT.
6. SEE FOUNDATION LOADING DIAGRAM 117151-63533 FOR B.O.S. ELEVATIONS AND EQUIPMENT LOADS AND REACTIONS.
7. EXHAUST STACK WILL BE PROVIDED WITH TWO (2) 3" DIA. NPS CONNECTIONS AT 45° FOR STACK SAMPLING.

LTR	DESCRIPTION	DATE	APPROVED
4	REMOVED QUONSET HUT	18 NOV 11	RCG
3	REVISED EQUIPMENT ARRANGEMENT, INCREASED SIZE OF QUONSET HUT	07 NOV 11	RCG
2	ALTERNATE ARRANGEMENT	03 NOV 11	RCG
1	INCREASED SIZE OF QUONSET HUT & REMOVED VFD FROM RTO SKID	10 OCT 11	RCG

REVISIONS

DRAWN	RCG	18 AUG 11
CHECKED	RCG	18 AUG 11
APPROVED	RCG	18 AUG 11

CANTON RENEWABLES, LLC
CANTON, MI

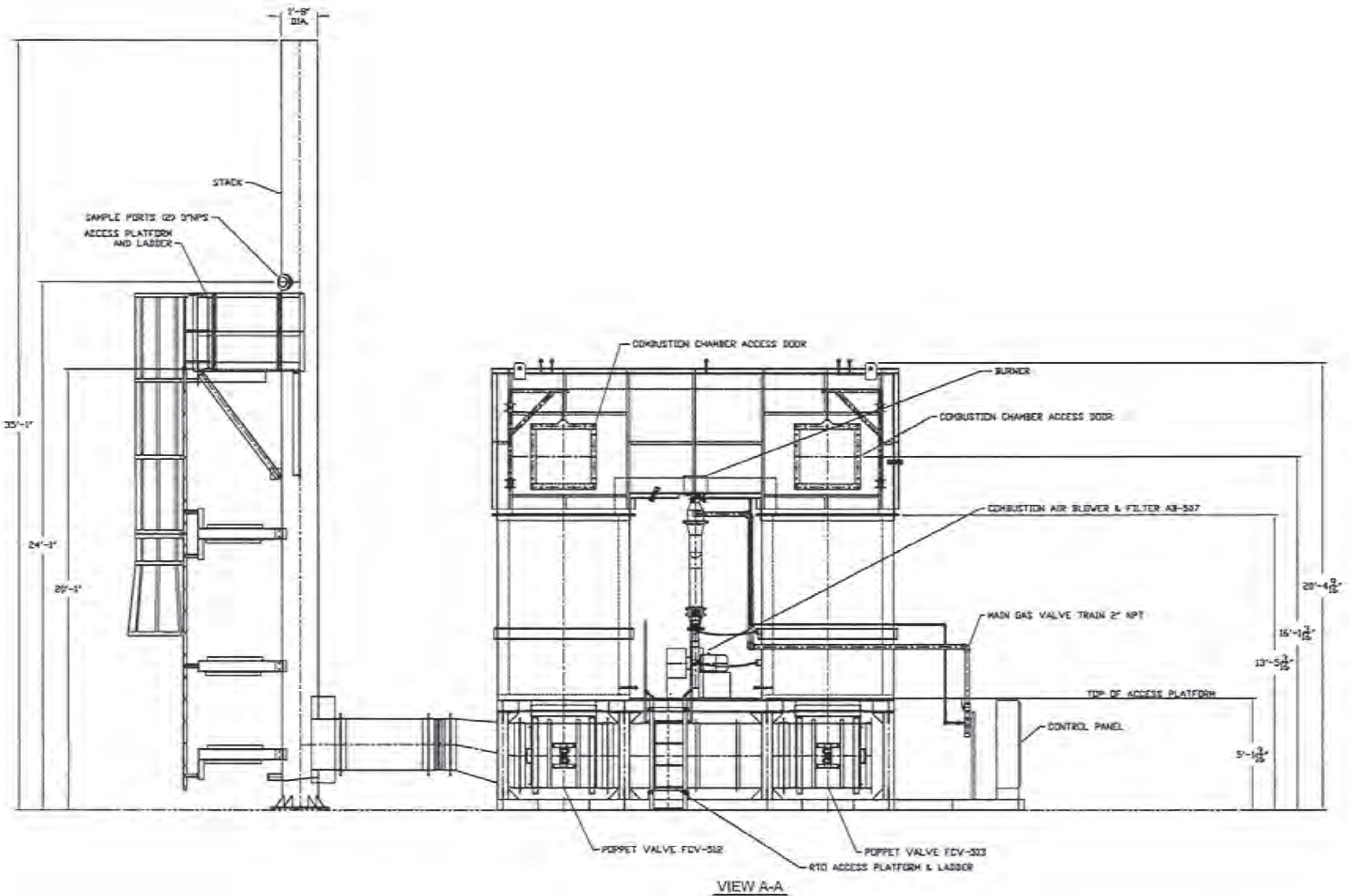
MET-PRO Environmental Air Solutions

TITLE: GENERAL ARRANGEMENT
REGENERATIVE THERMAL OXIDIZER
RTO-6-G

SIZE: D | CODE IDENT NO: 91340 | DWG NO: 113312-63531 | REV: 4

SCALE: 3/8"=1' | SHEET 1 OF 4

NEXT ASSY: - | USED ON: 63120 | APPLICATION



VIEW A-A

LTR	DESCRIPTION	DATE	APPROVED
4	REMOVED QUONSET HUT	18 NOV 11	RCG
3	REVISED EQUIPMENT ARRANGEMENT, INCREASED SIZE OF QUONSET HUT	07 NOV 11	RCG
1	REVISED SIZE OF QUONSET HUT & REMOVED VFD FROM RTO 3000	16 OCT 11	RCG

REVISIONS

© 2011 ENVIRONMENTAL AIR SOLUTIONS
MET-PRO CORPORATION

NEXT ASSY	USED ON
-	03520
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
MATERIAL

DRAWN	RCG	18 AUG 11
CHECKED	RCG	18 AUG 11
APPROVED	RCG	18 AUG 11

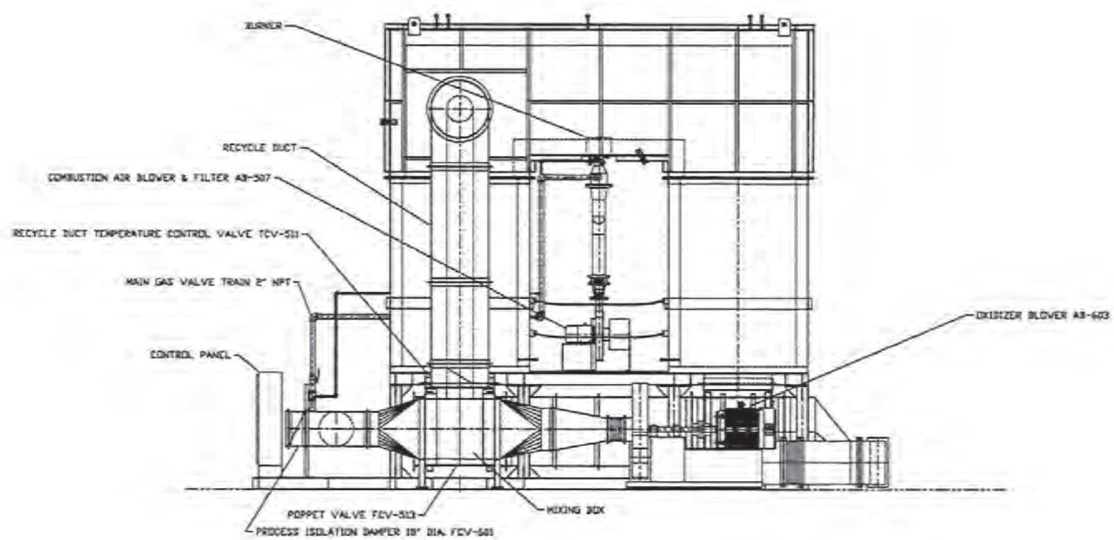
CANTON RENEWABLES, LLC
CANTON, MI

MET-PRO Environmental Air Solutions

TITLE GENERAL ARRANGEMENT
REGENERATIVE THERMAL OXIDIZER
RTO-6-G

SIZE	CODE IDENT NO	DWG NO	REV
D	91340	113312-63531	4

FILE NAME: 63531GA2.DWG | SCALE 3/32"=1' | WEIGHT - | SHEET 2 OF 4



VIEW B-B

LTR	DESCRIPTION	DATE	APPROVED
4	REMOVED QUONSET HUT	18 NOV 11	RCG
3	REVISED EQUIPMENT ARRANGEMENT, INCREASED SIZE OF QUONSET HUT	07 NOV 11	RCG
1	REVISED SIZE OF QUONSET HUT & REMOVED VFD FROM RTO SKID	10 OCT 11	RCG

REVISIONS

© 2011 ENVIRONMENTAL AIR SOLUTIONS
MET-PRO CORPORATION

NEXT ASSY	USED ON
-	83530

APPLICATION

		DATE
DRAWN	RCG	18 AUG 11
CHECKED	RCG	18 AUG 11
APPROVED	RCG	18 AUG 11

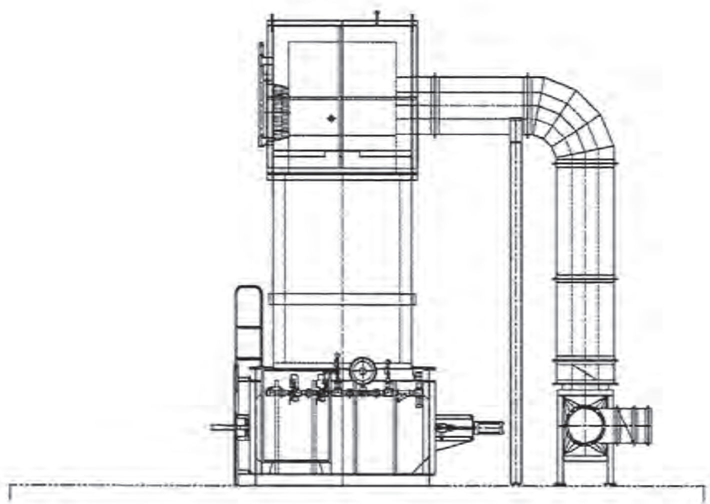
CANTON RENEWABLES, LLC
CANTON, MI

MET-PRO
Environmental Air Solutions

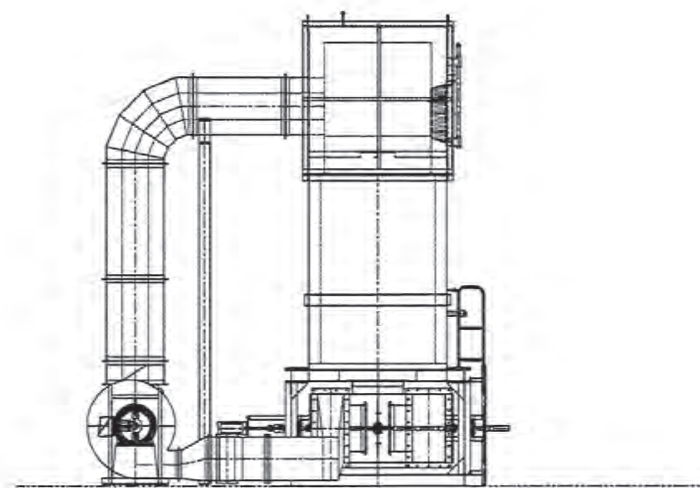
TITLE
GENERAL ARRANGEMENT
REGENERATIVE THERMAL OXIDIZER
RTO-6-G

SIZE	DOCUMENT NO.	DWG NO.	REV.
D	91340	113312-63531	4

SCALE 3/8"=1' | WEIGHT - | SHEET 3 OF 4



VIEW C-C



VIEW D-D

LTR	DESCRIPTION	DATE	APPROVED
4	REMOVED QUONSET HUT	18 NOV 11	RCG
3	REVISED EQUIPMENT ARRANGEMENT, INCREASED SIZE OF QUONSET HUT	07 NOV 11	RCG
1	REVISED SIZE OF QUONSET HUT & REMOVED VFD FROM RTO SKID	11 OCT 11	RCG

REVISIONS

© 2011 ENVIRONMENTAL AIR SOLUTIONS
MET-PRO CORPORATION

NEXT ASSY	USED ON
-	63530

APPLICATION

DRAWN	RCG	18 AUG 11
CHECKED	RCG	18 AUG 11
APPROVED	RCG	18 AUG 11

CANTON RENEWABLES, LLC
CANTON, MI

MET-PRO
Environmental Air Solutions

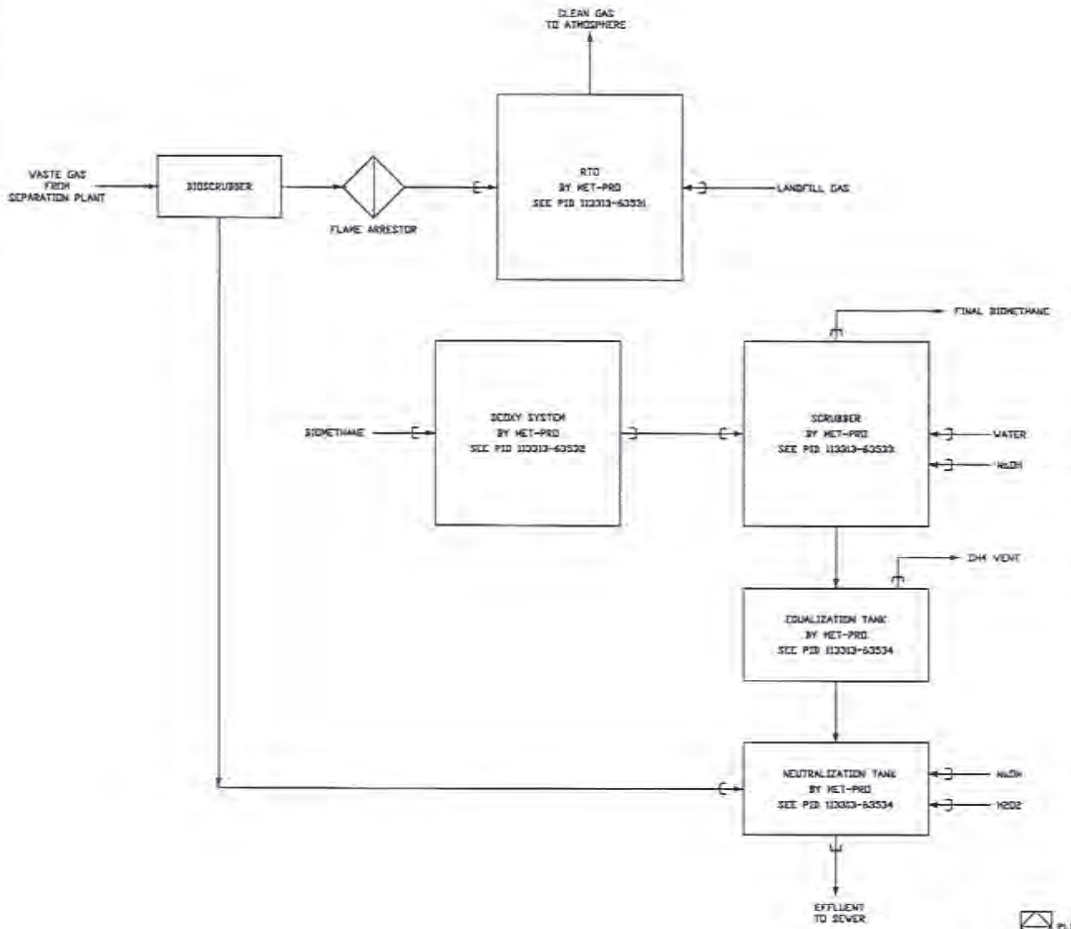
TITLE
GENERAL ARRANGEMENT
REGENERATIVE THERMAL OXIDIZER
RTO-6-G

SIZE	CODE IDENT NO	DWG NO	REV.
D	91340	113312-63531	4

SCALE 3/8"=1' WEIGHT - SHEET 4 OF 4

FILE NAME: 63531B4.DWG

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	REVISED PER SUBMITTAL COMMENTS.	9/30/11	JDC



PLC

LOCATED ON CONTROL PANEL

FIELD DEVICE

PFD NODE

NOTES
1. SCOPE OF SUPPLY DENOTED BY: BY MET PRO / BY OTHERS

CERTIFIED FOR CONSTRUCTION

UNLESS OTHERWISE SPECIFIED:	
DIMENSIONS ARE IN INCHES	
TOLERANCES ON FRACTIONS / DECIMALS / ANGLES	
BREAK SHARP EDGES TO	
ALL FILLETS TO	
MATERIAL	
NEXT ASSY	USED ON
APPLICATION	

DRAWN	JDC	8/17/11
CHECKED	JDC	8/18/11
APPROVED	EJM	8/18/11

CLEAN ENERGY
SEAL BEACH, CA
CANTON RENEWABLES, LLC
CANTON, MI

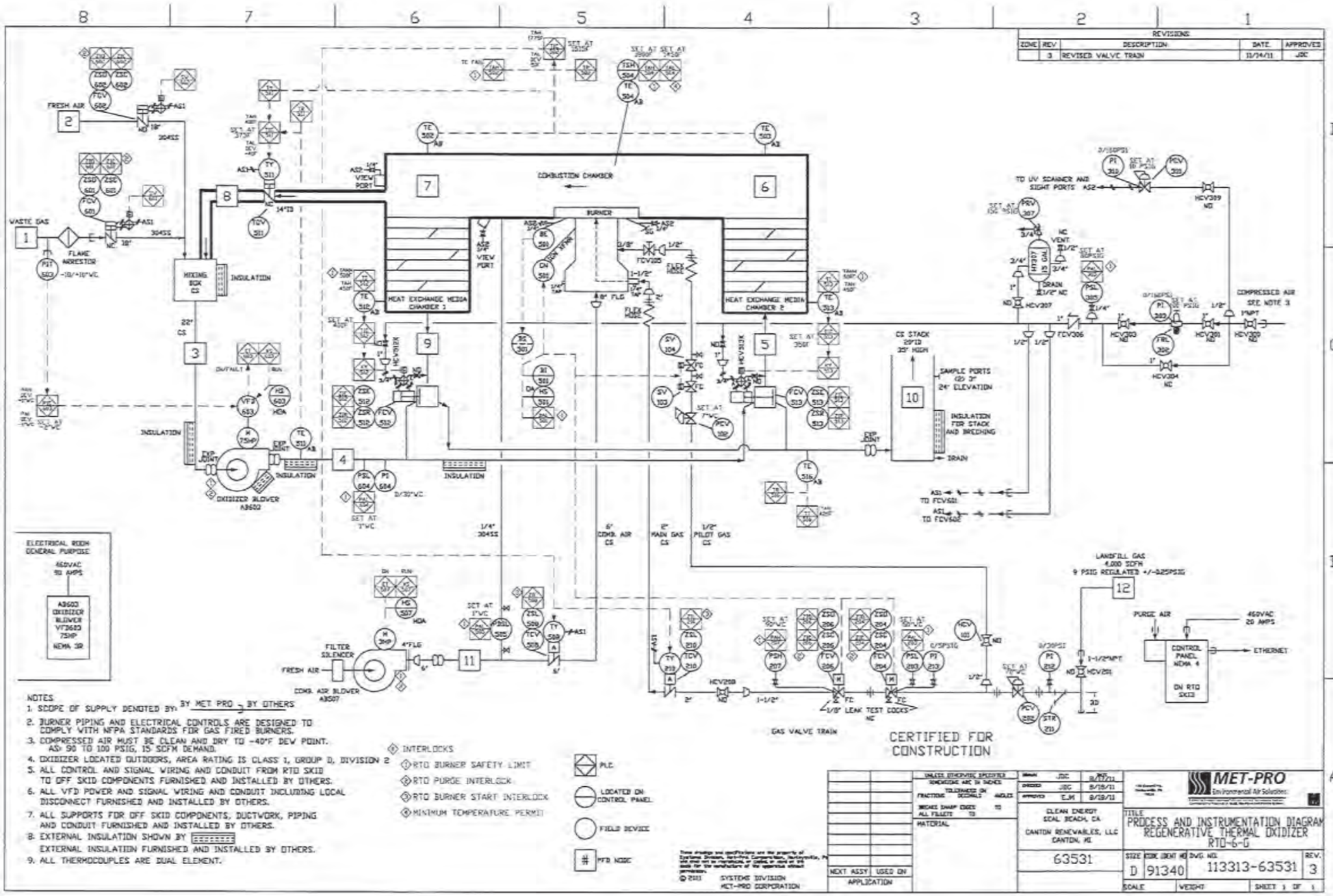
63530

MET-PRO Environmental Air Solutions

TITLE
PROCESS AND INSTRUMENTATION DIAGRAM
LFG PURIFICATION EQUIPMENT

SIZE	CODE IDENT NO	DWG NO.	REV.
D	91340	113313-63530	1

SCALE | WEIGHT | SHEET 1 OF 1


REVISIONS
ZONE | REV | DESCRIPTION | DATE | APPROVED
3 | REVISED VALVE TRAIN | 11/14/11 | JDC
COMBUSTION CHAMBER
BURNER
HEAT EXCHANGE MEDIA CHAMBER 1
HEAT EXCHANGE MEDIA CHAMBER 2
MIXING BOX CS
INSULATION
FLAME ARRESTER
WASTE GAS
FRESH AIR
OXIDIZER BLOWER A9602
COMB. AIR BLOWER A9507
FILTER SILENCER
EXP JOINT
FLEX HOSE
TO UV SCANNER AND SIGHT PORTS
COMPRESSED AIR SEE NOTE 3
CS STACK 29"ID 33' HIGH
SAMPLE PORTS (2) 2" 24" ELEVATION
INSULATION FOR STACK AND BREECHING
DRAIN
TO FCV501
TO FCV502
LANDFILL GAS 4,000 SCFM 9 PSIG REGULATED +/-0.25PSIG
PURGE AIR
460VAC 20 AMPS
CONTROL PANEL, NEMA 4
ETHERNET
ON RTO SKID
ELECTRICAL ROOM GENERAL PURPOSE
460VAC 90 AMPS
A9603 OXIDIZER BLOWER VFD600 75HP NEMA 3R
GAS VALVE TRAIN
1/8" LEAK TEST COCKS NC
CERTIFIED FOR CONSTRUCTION
NOTES:
1. SCOPE OF SUPPLY DENOTED BY: BY MET PRO / BY OTHERS
2. BURNER PIPING AND ELECTRICAL CONTROLS ARE DESIGNED TO COMPLY WITH NFPA STANDARDS FOR GAS FIRED BURNERS.
3. COMPRESSED AIR MUST BE CLEAN AND DRY TO -40°F DEW POINT. AS> 90 TO 100 PSIG, 15 SCFM DEMAND.
4. OXIDIZER LOCATED OUTDOORS, AREA RATING IS CLASS 1, GROUP D, DIVISION 2
5. ALL CONTROL AND SIGNAL WIRING AND CONDUIT FROM RTO SKID TO OFF SKID COMPONENTS FURNISHED AND INSTALLED BY OTHERS.
6. ALL VFD POWER AND SIGNAL WIRING AND CONDUIT INCLUDING LOCAL DISCONNECT FURNISHED AND INSTALLED BY OTHERS.
7. ALL SUPPORTS FOR OFF SKID COMPONENTS, DUCTWORK, PIPING AND CONDUIT FURNISHED AND INSTALLED BY OTHERS.
8. EXTERNAL INSULATION SHOWN BY
EXTERNAL INSULATION FURNISHED AND INSTALLED BY OTHERS.
9. ALL THERMOCOUPLES ARE DUAL ELEMENT.
INTERLOCKS
RTO BURNER SAFETY LIMIT
RTO PURGE INTERLOCK
RTO BURNER START INTERLOCK
MINIMUM TEMPERATURE PERMI
PLC
LOCATED ON CONTROL PANEL
FIELD DEVICE
PER NOSC
© 2011 SYSTEMS DIVISION MET-PRO CORPORATION
MET-PRO Environmental Air Solutions
TITLE
PROCESS AND INSTRUMENTATION DIAGRAM REGENERATIVE THERMAL OXIDIZER RTO-6-G
CLEAN ENERGY SOAL BEACH, CA
CANTON RENEWABLES, LLC CANTON, MI.
63531
SIZE D | CODE IDENT NO 91340 | DWG. NO. 113313-63531 | REV. 3
SCALE | WEIGHT | SHEET 1 OF 1

FUNCTIONAL DESIGNATION

	FIRST LETTER		SUCCEEDING LETTERS		
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM		
B	BURNER, COMBUSTION				
C	CONDUCTIVITY			CONTROL	
D	DENSITY	DIFFERENTIAL		DRIVE	
E	VOLTAGE		SENSOR (ELEMENT)		
F	FLOW	RATIO (FRACTION)	FREQUENCY		
G	USER'S CHOICE		GLASS (VIEWING DEVICE)		
H	HAND				HIGH
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER	SCAN			
K	TIME	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT		LOW
M	MOISTURE	MOMENTARY			MIDDLE
N	USER'S CHOICE				
O	USER'S CHOICE		ORIFICE		
P	PRESSURE, VACUUM		POINT (TEST CONN)		
Q	QUANTITY	INTEGRATE, TOTALIZE			
R	RADIATION		RECORD		
S	SPEED	SAFETY, SOLENOID		SWITCH	
T	TEMPERATURE			TRANSMITTER	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VIBRATION			VALVE, DAMPER	VARIABLE
W	WEIGHT, FORCE		WELL		
X	UNCLASSIFIED	X AXIS			
Y	EVENT, STATE	Y AXIS		RELAY, COMPUTE CONVERT	
Z	POSITION	Z AXIS		ACTUATE UNCLASSIFIED FINAL CONTROL ELEMENT	

VALVES

GATE GENERIC	
BALL	
GLOBE	
CONTROL	
PLUG	
NEEDLE	
CHECK	
BUTTERFLY	
THREE WAY	
FOUR WAY	
OPPOSED BLADE LOUVER	
FLOAT	

ACTUATED VALVES

TWO WAY SOLENOID	
THREE WAY SOLENOID	
FOUR WAY SOLENOID	
MOTORIZED	
PNEUMATIC OFF / ON	AS
PNEUMATIC MODULATING	I/P, XY, AS

PRESSURE

REDUCING SELF OPERATED	
REDUCING DOWNSTREAM CONTROL	
REDUCING PILOT OPERATED	
BACK PRESSURE SELF OPERATED	
RELIEF VALVE	
RUPTURE DISK	

GENERAL

SCOPE OF SUPPLY	(OTHERS) (MET-PRO)
FIELD DEVICE	
DEVICE MOUNTED ON CONTROL PANEL	
PLC	
PROCESS FLOW DIAGRAM NODE	#
INTERLOCK	
CONNECTION	

LINES

CONNECTION TO PROCESS	
PNEUMATIC	
ELECTRICAL	
CAPILLARY FILLED	
HYDRAULIC	
SOFTWARE OR COMM LINK	
SUPPLIED BY OTHERS	
INSULATED PIPING	
HEAT TRACED AND INSULATED PIPING	
INTERNALLY INSULATED	

UTILITIES

AS	COMPRESSED AIR
ES	ELECTRICAL POWER
NGG	NATURAL GAS
NS	NITROGEN
WS	WATER

COMPUTATIONAL

SUM	Σ
HIGH SELECT	>
LOW SELECT	<
BIAS	±
TIME	K
SQUARE ROOT	√

PIPING

ORIFICE		FLEX HOSE	
VENTURI TUBE		PULSATION DAMPENER	
ROTOMETER	FT	CHEMICAL SEAL	
FLANGED VALVE		FILTER REGULATOR	
PIPE CAP		TEMPERATURE REGULATOR	
BLIND FLANGE		DIAPHRAGM PUMP	
SPECTACLE BLIND OPEN		METERING PUMP	
SPECTACLE BLIND CLOSED		CENTRIFUGAL PUMP	
REDUCER			
TRAP	T		
STRAINER			

DUCTWORK

AIR BLOWER	
EXPANSION JOINT	
INSULATION	
FILTER	

REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	GENERAL REVISION	02/09/09	JDC
	2	REVISED VALVE SYMBOLS	06/01/09	JDC
	3	ADDED INTERNAL INSULATION SYMBOL	09/02/10	JDC
	4	ADDED FLOAT VALVE SYMBOL	06/29/11	JDC

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ON FRACTIONS DECIMALS ANGLES. BREAK SHARP EDGES TO ALL FILLETS TO. MATERIAL.

DRAWN	RCG	01/30/88
CHECKED	TPB	03/20/88
APPROVED	JDC	03/20/88

NEXT ASSY | USED ON: APPLICATION

MET-PRO Environmental Air Solutions

TITLE: STANDARD PROCESS & INSTRUMENTATION DIAGRAM SYMBOLS

SIZE	DESK ITEM NO	DWG NO.	REV.
D	91340	0010116671	4

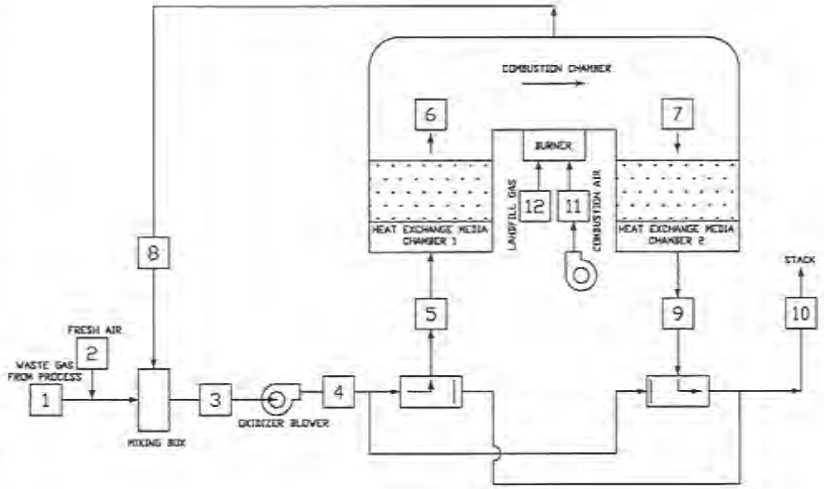
SCALE | WEIGHT | SHEET 1 OF 1

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	2	REVISED PER HAZOP COMMENTS	10/07/11	JDC

STREAM #		1	2	3	4	5	6	7	8	9	10	11	12
CASE 1 MAX FLOW / MAX VOC		PROCESS INLET	FRESH AIR	MIXING BOX OUTLET	BLOWER OUTLET	PREHEAT INLET	PREHEAT OUTLET	COMBUSTION CHAMBER	RECYCLE	RTO OUT	STACK	COMBUSTION AIR	LANDFILL GAS
TEMPERATURE	°F	55	70	346	346	346	1,320	1,515	1,515	386	386	70	70
PRESSURE	"WC	-18	0	-19.5	17.4	15.8	9.3	9.3	9.3	2.8	0.5	15"	9 PSIG
FLOW	LB/HR	21,524	0	26,181	26,181	26,181	26,181	26,307	4,658	21,649	21,649	108	18
VOLUME	SCFM	4,100	0	4,987	4,987	4,987	4,987	5015	887	4,128	4,128	24	0

STREAM #		1	2	3	4	5	6	7	8	9	10	11	12
CASE 2 MAX FLOW / MIN RECYCLE		PROCESS INLET	FRESH AIR	MIXING BOX OUTLET	BLOWER OUTLET	PREHEAT INLET	PREHEAT OUTLET	COMBUSTION CHAMBER	RECYCLE	RTO OUT	STACK	COMBUSTION AIR	LANDFILL GAS
TEMPERATURE	°F	55	70	350	350	350	1571	1,731	1,731	404	404	70	70
PRESSURE	"WC	-18	0	-19.5	17.4	15.8	9.3	9.3	9.3	2.8	0.5	15"	9 PSIG
FLOW	LB/HR	21,524	0	25,398	25,398	25,398	25,398	25,583	3,879	21,975	21,975	108	18
VOLUME	SCFM	4,100	0	4,851	4,851	4,851	4,841	4,941	741	4,200	4,200	24	0

STREAM #		1	2	3	4	5	6	7	8	9	10	11	12
CASE 3 IDLE		PROCESS INLET	FRESH AIR	MIXING BOX OUTLET	BLOWER OUTLET	PREHEAT INLET	PREHEAT OUTLET	COMBUSTION CHAMBER	RECYCLE	RTO OUT	STACK	COMBUSTION AIR	LANDFILL GAS
TEMPERATURE	°F	70	70	325	325	325	1,473	1,582	1,582	341	341	70	70
PRESSURE	"WC	0	-1	-2	7	6	4	3	3	1	0.5	25"	9 PSIG
FLOW	LB/HR	0	9,093	10,849	10,849	10,849	10,849	11,650	1,759	9,891	9,891	682	119
VOLUME	SCFM	0	2,000	2,387	2,387	2,387	2,387	2,562	387	2,175	2,175	150	25



NOTES:
1. ALL PRESSURES AND FLOWRATES ARE APPROXIMATE.
2. STANDARD CONDITIONS ARE 70F AND 14.7 PSIA.
3. LANDFILL GAS FUEL VALUE SHOWN AS 500 BTU/FT3 HHV.
   LANDFILL GAS COMPOSITION: BY VOLUME
   CH4: 57%
   CO2: 40.1%
   N2: 2.5%
   O2: 0.35%
   SULFUR BEARING COMPOUNDS: <3PPMV
   HALOGEN BEARING COMPOUNDS: <4PPMV
   SILOXANES: <61mg/m3 AS Si
   H2S: 130PPMV
   BALANCE - MISC VOC'S

CERTIFIED FOR CONSTRUCTION

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES. TOLERANCES ON: FRACTIONS ± DECIMALS ± ANGLES ± BREAK SHARP EDGES TO ALL FILLETS TO. MATERIAL

DRAWN	JDC	8/17/11
CHECKED	JDC	8/18/11
APPROVED	CJM	8/18/11

NEXT ASSY | USED ON: APPLICATION

CLEAN ENERGY SEAL BEACH, CA CANTON RENEWABLES, LLC CANTON, MI

63531

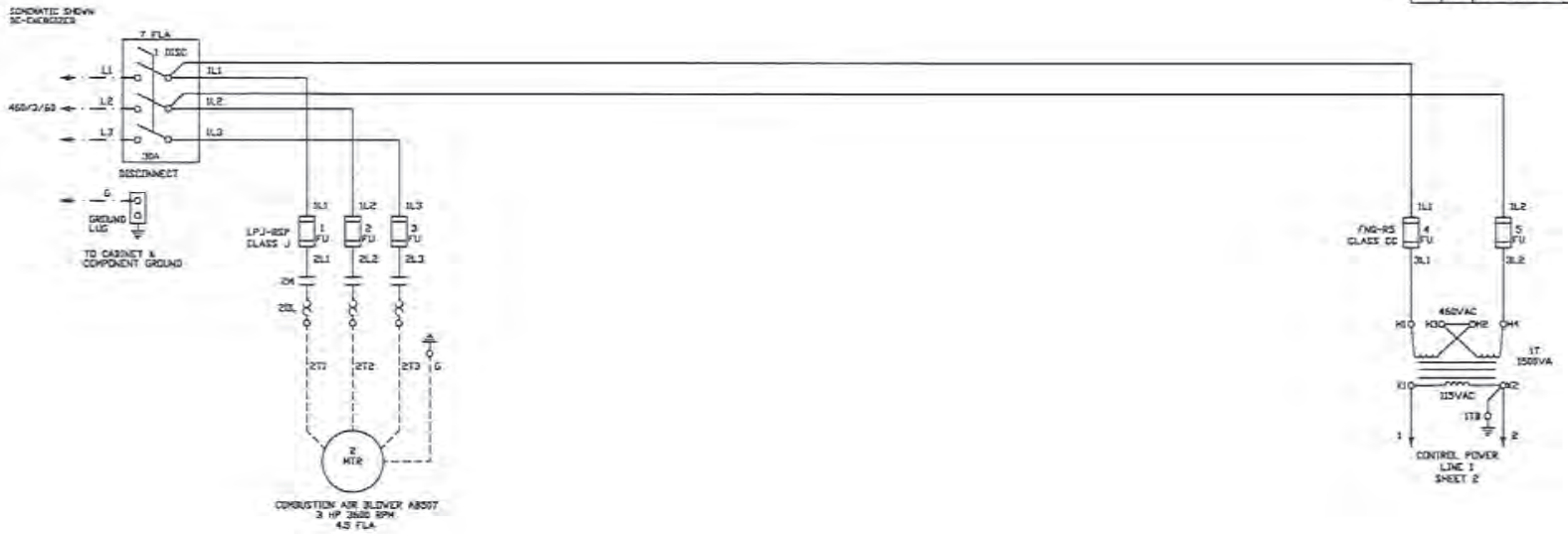
MET-PRO Environmental Air Solutions

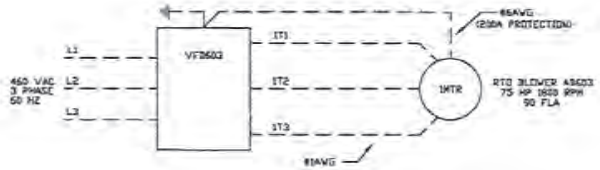
TITLE: PROCESS FLOW DIAGRAM REGENERATIVE THERMAL OXIDIZER RTO-6-G

SIZE	CODE IDENT NO.	DWG NO.	REV.
D	91340	113311-63531	2

SCALE | WEIGHT | SHEET 1 OF 1

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	2	REVISED PER REVIEW COMMENTS	12/09/11	JDC





NOTES:
1. ALL THHN/THWN CONDUCTORS TO BE IN ACCORDANCE WITH THE FOLLOWING COLOR CODE:
   - RED ——— A.C. CONTROL CIRCUITS
   - BLUE ——— D.C. CONTROL CIRCUITS
   - BLACK ——— A.C.& D.C. CIRCUITS AT LINE VOLTAGE
   - WHITE ——— CURRENT CARRYING GROUND (NEUTRAL)
   - GREEN ——— NON-CURRENT CARRYING GROUND
   - ORANGE ——— A.C. CONTROL CIRCUITS LESS THAN 90 VAC
   - PURPLE ——— INSTRUMENTS (EXCEPT POWER CONNECTIONS)
   - YELLOW ——— INTERLOCKING CIRCUITS HAVING VOLTAGE FROM OTHER SOURCES
2. CONTROL CIRCUIT CONNECTORS AND CONTROL CIRCUIT GROUND TO BE #14 AWG UNLESS OTHERWISE NOTED.
3. 460 VAC AND 230 VAC POWER, MOTOR AND GROUND CONDUCTORS TO BE #12 AWG UNLESS OTHERWISE NOTED.
4. DO NOT PUT 460 VAC OR 230 VAC POWER AND MOTOR CONDUCTORS IN THE SAME BUNDLE WITH CONTROL OR SIGNAL CONDUCTORS.
5. BONDING GROUND JUMPERS ARE REQUIRED ON METAL ENCLOSURES BETWEEN DOOR AND ENCLOSURE AND BETWEEN SUB-PANEL AND ENCLOSURE. BONDING GROUND JUMPER TO BE #14 AWG UNLESS OTHERWISE NOTED.
6. TWO CONDUCTOR SHIELDED CABLE: CLEAR=POS.(+), BLACK=NEG.(-)
7. MET-PRO SHOP PANEL WIRING SHOWN BY ———————
   MET-PRO SHOP CONDUIT WIRING SHOWN BY- - - - - - - -
   WIRING BY OTHERS SHOWN BY — — — — — — —
8. AREA RATING IS CLASS1, DIVISION 2, GROUP D.

CERTIFIED FOR CONSTRUCTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	Drawn	JDC	09/20/11
TOLERANCES ON FRACTIONS DECIMALS ANGLES	CHECKED	JDC	09/20/11
BREAK SHARP EDGES TO ALL RADII TO	APPROVED	JDC	09/20/11
MATERIAL	NEXT ASSY	USED ON	
	APPLICATION		

MET-PRO Environmental Air Solutions

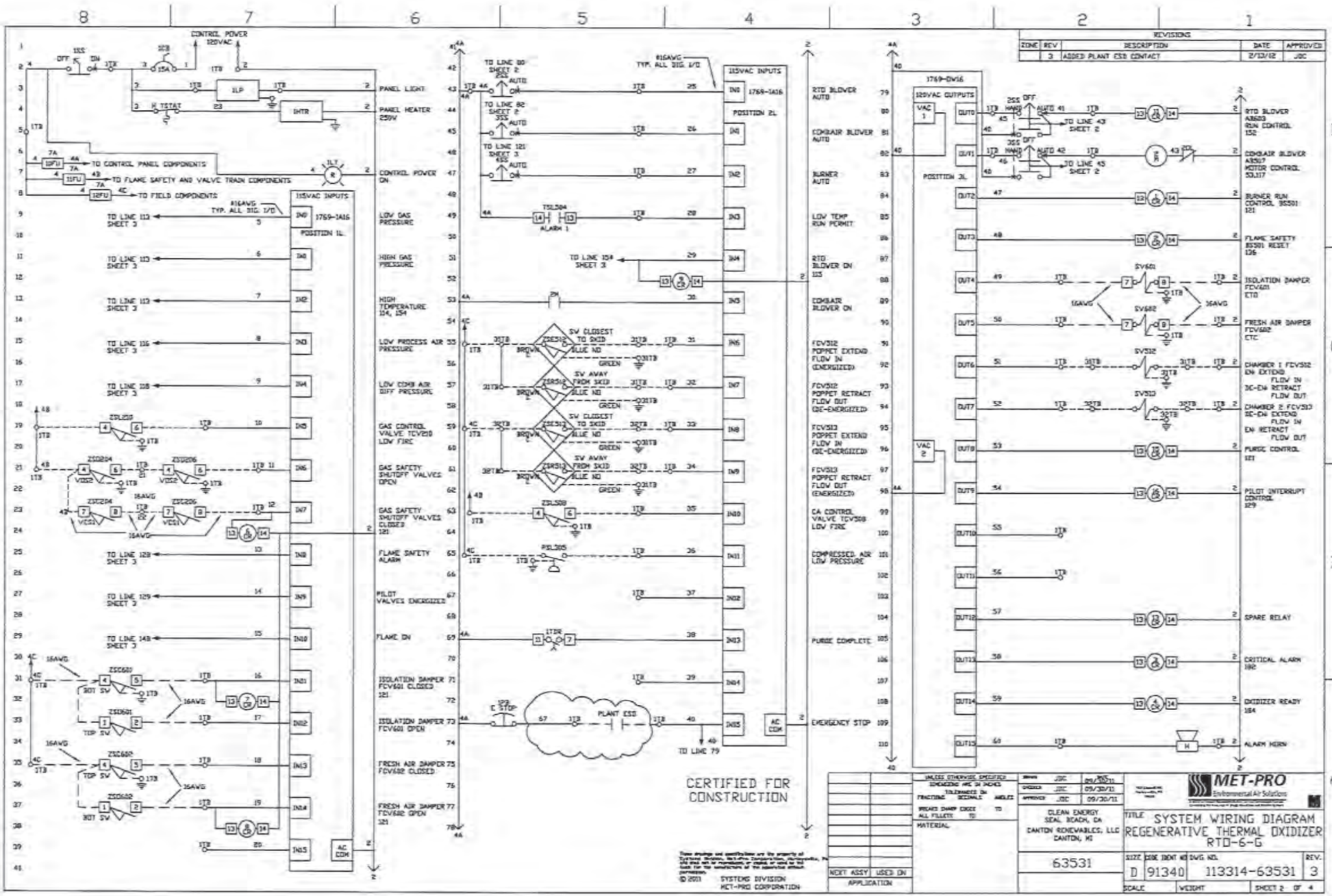
CLEAN ENERGY
SEAL BEACH, CA
CANTON RENEWABLES, LLC
CANTON, MI

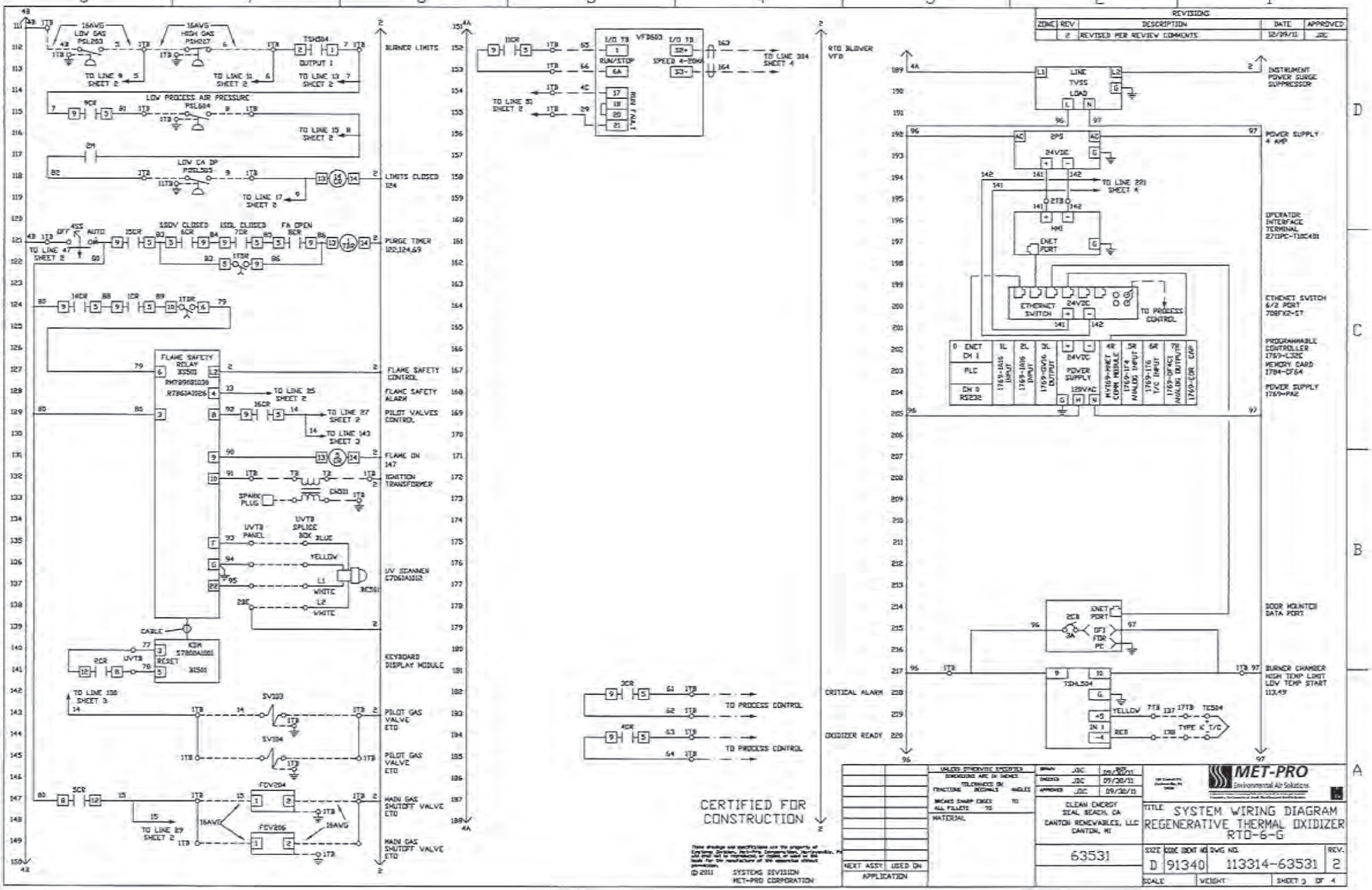
63531

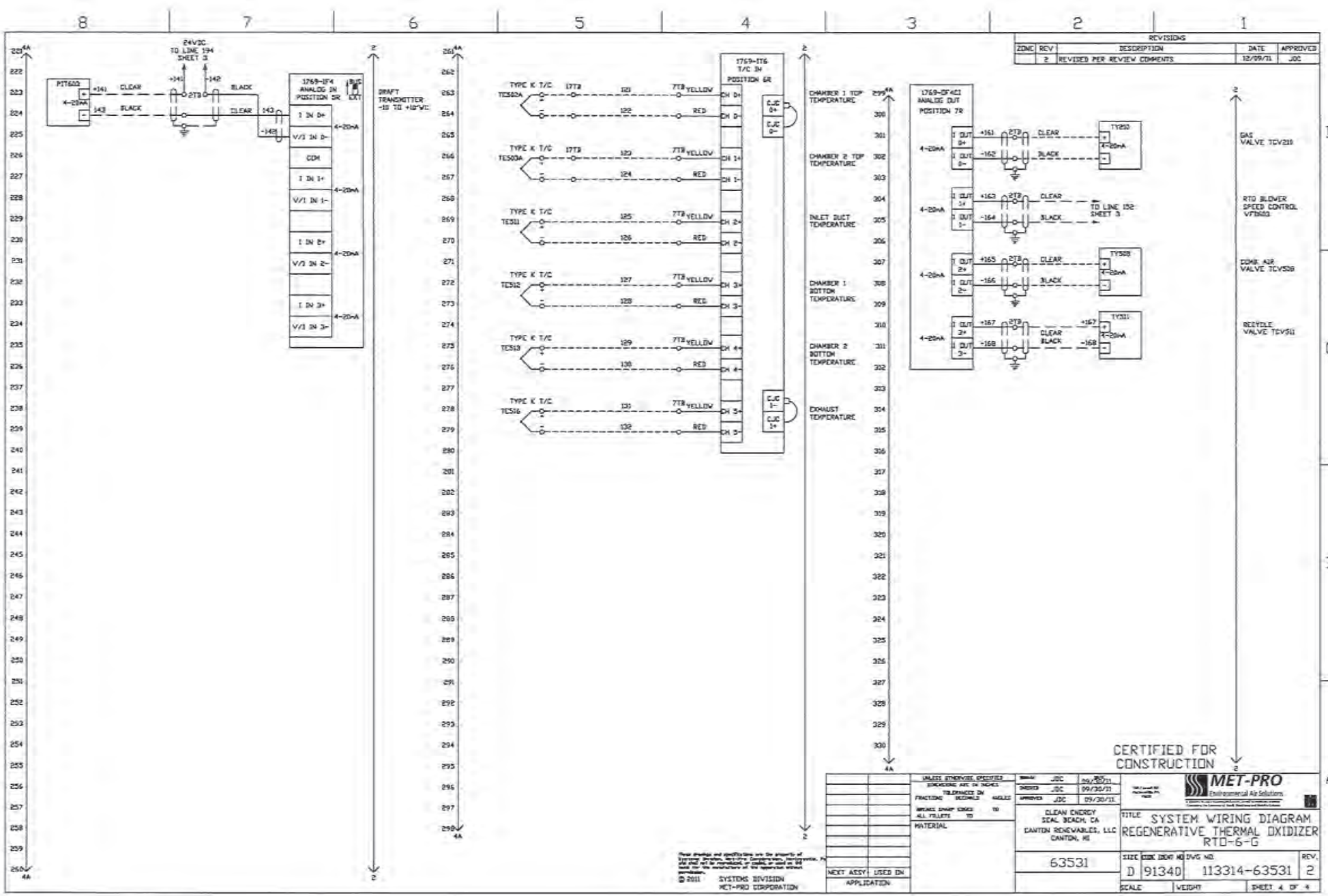
TITLE: SYSTEM WIRING DIAGRAM
REGENERATIVE THERMAL OXIDIZER
RTO-6-G

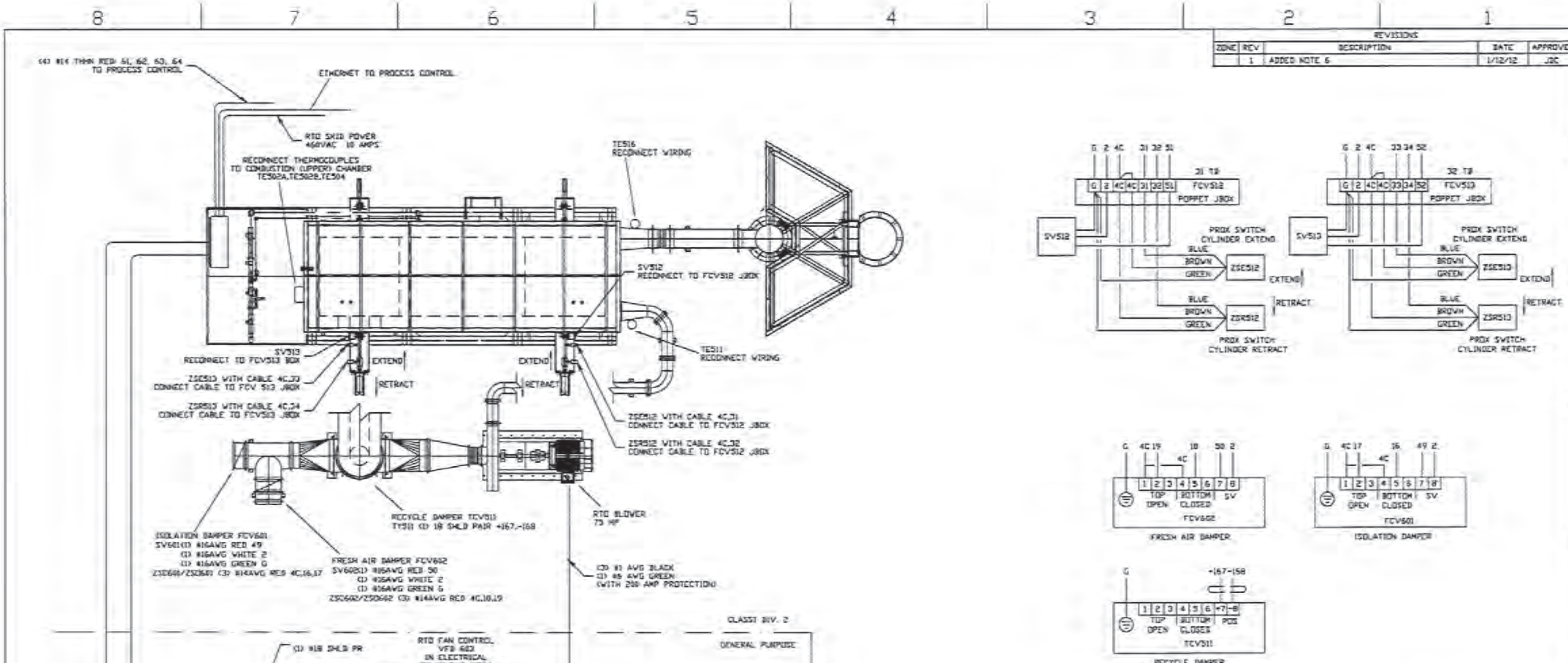
SIZE	CODE IDENT NO	DWG NO.	REV
D	91340	113314-63531	2

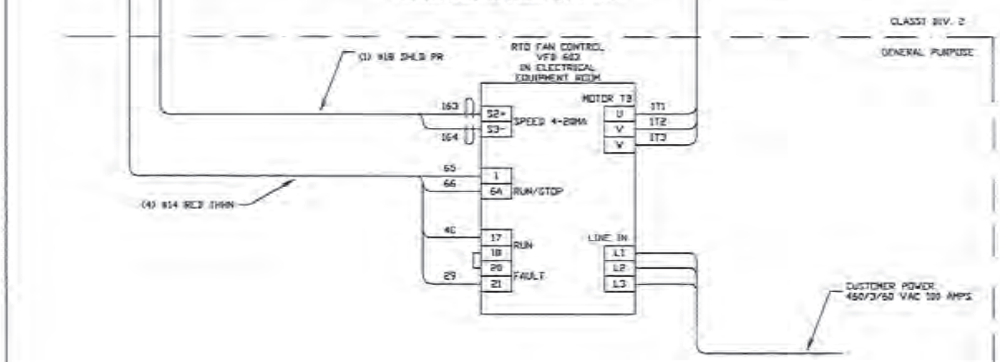
SCALE | WEIGHT | SHEET 1 OF 4


REVISIONS
ZONE | REV | DESCRIPTION | DATE | APPROVED
3 | ADDED PLANT ESD CONTACT | 2/13/12 | JDC
CONTROL POWER 120VAC
115VAC INPUTS
1769-IA16
POSITION 2L
1769-IA16
POSITION 1L
1769-OW16
120VAC OUTPUTS
PANEL LIGHT
PANEL HEATER 250W
CONTROL POWER ON
LOW GAS PRESSURE
HIGH GAS PRESSURE
HIGH TEMPERATURE 154, 154
LOW PROCESS AIR PRESSURE
LOW COMB AIR DIFF PRESSURE
GAS CONTROL VALVE TCV210 LOW FIRE
GAS SAFETY SHUTOFF VALVES OPEN
GAS SAFETY SHUTOFF VALVES CLOSED
FLAME SAFETY ALARM
PILOT VALVES ENERGIZED
FLAME ON
ISOLATION DAMPER FCV601 CLOSED
ISOLATION DAMPER FCV601 OPEN
FRESH AIR DAMPER FCV682 CLOSED
FRESH AIR DAMPER FCV682 OPEN
RTO BLOWER AUTO
COMBAIR BLOWER AUTO
BURNER AUTO
LOW TEMP RUN PERMIT
RTO BLOWER ON
COMBAIR BLOWER ON
FCV512 POPPET EXTEND FLOW IN (ENERGIZED)
FCV512 POPPET RETRACT FLOW OUT (DE-ENERGIZED)
FCV513 POPPET EXTEND FLOW IN (DE-ENERGIZED)
FCV513 POPPET RETRACT FLOW OUT (ENERGIZED)
CA CONTROL VALVE TCV308 LOW FIRE
COMPRESSED AIR LOW PRESSURE
PURGE COMPLETE
EMERGENCY STOP
RTO BLOWER A35203 RUN CONTROL 152
COMBAIR BLOWER A3507 MOTOR CONTROL 553.117
BURNER RUN CONTROL 35501 121
FLAME SAFETY 85501 RESET 126
ISOLATION DAMPER FCV601 ETO
FRESH AIR DAMPER FCV682 ETC
CHAMBER 1 FCV512 EN EXTEND FLOW IN DE-EN RETRACT FLOW OUT
CHAMBER 2 FCV513 DE-EN EXTEND FLOW IN EN RETRACT FLOW OUT
PURGE CONTROL 121
PILOT INTERRUPT CONTROL 129
SPARE RELAY
CRITICAL ALARM 182
IGNITER READY 184
ALARM HORN
CERTIFIED FOR CONSTRUCTION
MET-PRO
Environmental Air Solutions
CLEAN ENERGY SEAL BEACH, CA
DANTON RENEWABLES, LLC DANTON, MI
63531
TITLE SYSTEM WIRING DIAGRAM REGENERATIVE THERMAL OXIDIZER RTO-6-G
SIZE D | CAGE IDENT NO 91340 | DWG NO 113314-63531 | REV 3
SCALE | WEIGHT | SHEET 2 OF 4
SYSTEMS DIVISION MET-PRO CORPORATION


REVISIONS
ZONE | REV | DESCRIPTION | DATE | APPROVED
2 | REVISED PER REVIEW COMMENTS | 12/09/11 | JDC
BURNER LIMITS
LIMITS CLOSED 124
PURGE TIMER 122,124,69
FLAME SAFETY CONTROL
FLAME SAFETY ALARM
PILOT VALVES CONTROL
FLAME ON 147
IGNITION TRANSFORMER
UV SCANNER E7D61A1012
KEYBOARD DISPLAY MODULE
PILOT GAS VALVE ETD
PILOT GAS VALVE ETD
MAIN GAS SHUTOFF VALVE ETD
MAIN GAS SHUTOFF VALVE ETD
RTO BLOWER VFD
INSTRUMENT POWER SURGE SUPPRESSOR
POWER SUPPLY 4 AMP
OPERATOR INTERFACE TERMINAL 2711PC-T10C4D1
ETHERNET SWITCH 6/2 PORT 708FX2-ST
PROGRAMMABLE CONTROLLER 1769-L32E MEMORY CARD 1784-CF64 POWER SUPPLY 1769-PA2
DOOR MOUNTED DATA PORT
BURNER CHAMBER HIGH TEMP LIMIT LOW TEMP START 113,49
CRITICAL ALARM
OXIDIZER READY
TO PROCESS CONTROL
CERTIFIED FOR CONSTRUCTION
SYSTEMS DIVISION MET-PRO CORPORATION
MET-PRO Environmental Air Solutions
CLEAN ENERGY SEAL BEACH, CA CANTON RENEWABLES, LLC CANTON, MI
63531
TITLE: SYSTEM WIRING DIAGRAM REGENERATIVE THERMAL OXIDIZER RTO-6-G
SIZE D | CAGE CODE NO 91340 | DWG NO. 113314-63531 | REV. 2
SCALE | WEIGHT | SHEET 3 OF 4


REVISIONS
ZONE | REV | DESCRIPTION | DATE | APPROVED
2 | REVISED PER REVIEW COMMENTS | 12/09/11 | JDC
24VDC TO LINE 194 SHEET 3
PIT602
4-20mA
CLEAR
BLACK
1769-IF4 ANALOG IN POSITION 5R
I IN 0+
V/I IN 0-
COM
I IN 1+
V/I IN 1-
I IN 2+
V/I IN 2-
I IN 3+
V/I IN 3-
DRAFT TRANSMITTER -10 TO +10"WC
TYPE K T/C
TES02A
TES03A
TES11
TES12
TES13
TES16
YELLOW
RED
1769-IT6 T/C IN POSITION 6R
CH 0+
CH 0-
CH 1+
CH 1-
CH 2+
CH 2-
CH 3+
CH 3-
CH 4+
CH 4-
CH 5+
CH 5-
CJC 0+
CJC 0-
CJC 1-
CJC 1+
CHAMBER 1 TOP TEMPERATURE
CHAMBER 2 TOP TEMPERATURE
INLET DUCT TEMPERATURE
CHAMBER 1 BOTTOM TEMPERATURE
CHAMBER 2 BOTTOM TEMPERATURE
EXHAUST TEMPERATURE
1769-OF4CI ANALOG OUT POSITION 7R
TY250
TY308
TY311
TO LINE 152 SHEET 3
GAS VALVE TCV218
RTO BLOWER SPEED CONTROL VFD603
DOME AIR VALVE TCV308
RECYCLE VALVE TCV311
CERTIFIED FOR CONSTRUCTION
MET-PRO
Environmental Air Solutions
CLEAN ENERGY SEAL BEACH, CA
CANTON RENEWABLES, LLC CANTON, MI
63531
TITLE SYSTEM WIRING DIAGRAM REGENERATIVE THERMAL OXIDIZER RTO-6-G
SIZE D | DWG NO 113314-63531 | REV 2
SCALE | WEIGHT | SHEET 4 OF 4
© 2011 SYSTEMS DIVISION MET-PRO CORPORATION





NOTES:
1. ALL THHN/THWN CONDUCTORS TO BE IN ACCORDANCE WITH THE FOLLOWING COLOR CODE:
   - RED ---- A.C. CONTROL CIRCUITS
   - BLUE ---- D.C. CONTROL CIRCUITS
   - BLACK ---- A.C.& D.C. CIRCUITS AT LINE VOLTAGE
   - WHITE ---- CURRENT CARRYING GROUND (NEUTRAL)
   - GREEN ---- NON-CURRENT CARRYING GROUND
   - ORANGE ---- A.C. CONTROL CIRCUITS LESS THAN 50 VAC
   - PURPLE ---- INSTRUMENTS (EXCEPT POWER CONNECTIONS)
   - YELLOW ---- INTERLOCKING CIRCUITS HAVING VOLTAGE FROM OTHER SOURCES
2. CONTROL CIRCUIT CONDUCTORS AND CONTROL CIRCUIT GROUND CONDUCTORS TO BE #14 AWG UNLESS OTHERWISE NOTED.
3. 460 VAC POWER, MOTOR AND GROUND CONDUCTORS TO BE #12 AWG UNLESS OTHERWISE NOTED.
4. DO NOT PUT 460 VAC POWER AND MOTOR CONDUCTORS IN THE SAME BUNDLE WITH CONTROL OR SIGNAL CONDUCTORS.
5. BONDING GROUND JUMPERS ARE REQUIRED ON METAL ENCLOSURES BETWEEN DOOR AND ENCLOSURE AND BETWEEN SUB-PANEL AND ENCLOSURE. BONDING GROUND JUMPER TO BE #14 AWG UNLESS OTHERWISE NOTED.
6. AREA RATING IS CLASS1, DIVISION 2, GROUP D.

CERTIFIED FOR CONSTRUCTION

DRAWN	SB	1/3/12
CHECKED	JJC	1/4/12
APPROVED	JJC	1/4/12

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON: FRACTIONS DECIMALS ANGLES
MATERIAL

NEXT ASSY | USED ON
APPLICATION

MET-PRO Environmental Air Solutions

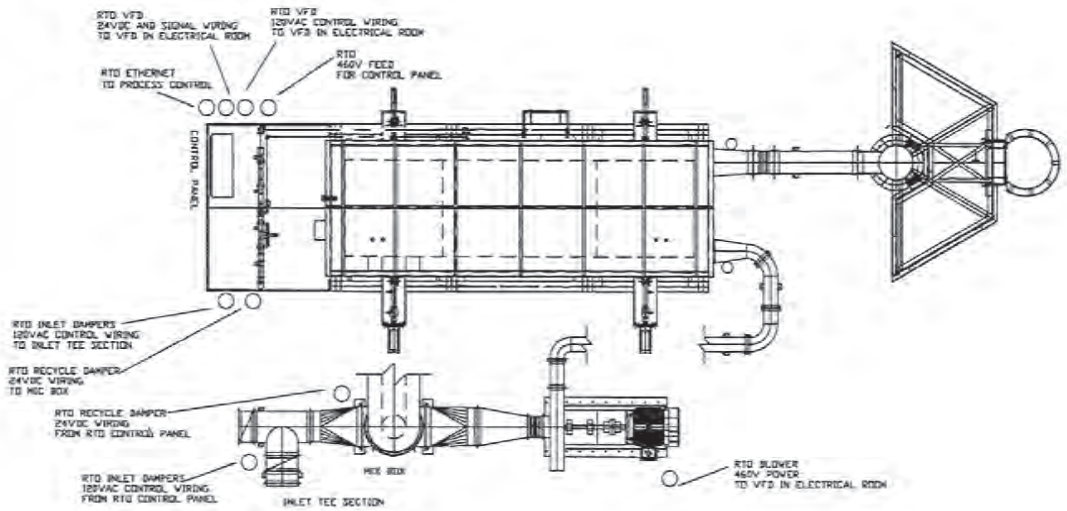
TITLE: FIELD WIRING
REGENERATIVE THERMAL OXIDIZER RTO-6-G

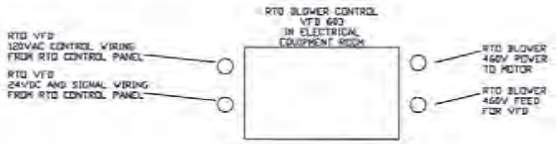
63531

SIZE	CODE IDENT NO	DWG NO.	REV.
D	91340	200063531FW	1

SCALE | WEIGHT | SHEET 1 OF 1

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED





UNLESS OTHERWISE SPECIFIED	
DIMENSIONS ARE IN INCHES	
TOLERANCES ON:	
FRACTIONS DECIMALS ANGLES	
BREAKS SHARP EDGES TO	
ALL FILLETS TO	
MATERIAL	
NEXT ASSY	USED ON
APPLICATION	

DRAWN	JDC	1/18/12
CHECKED	JDC	1/18/12
APPROVED	JDC	1/18/12

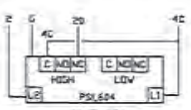
63531

MET-PRO Environmental Air Solutions

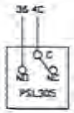
TITLE
SUGGESTED STUB UP LOCATIONS
REGENERATIVE THERMAL OXIDIZER
RTO-6-G

SIZE	CODE IDENT NO.	DWG NO.	REV.
D	91340	20006353ISU	0

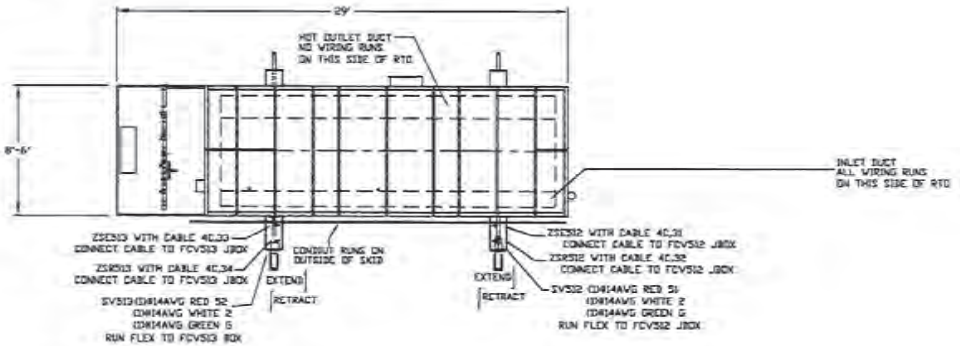
SCALE | WEIGHT | SHEET 1 OF 1

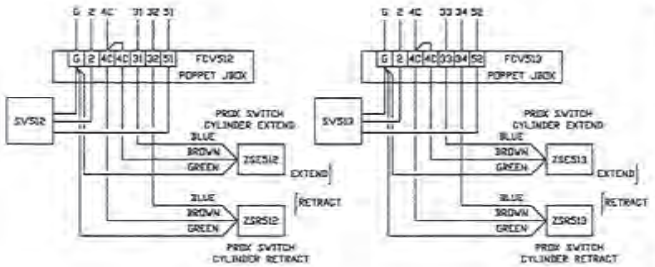


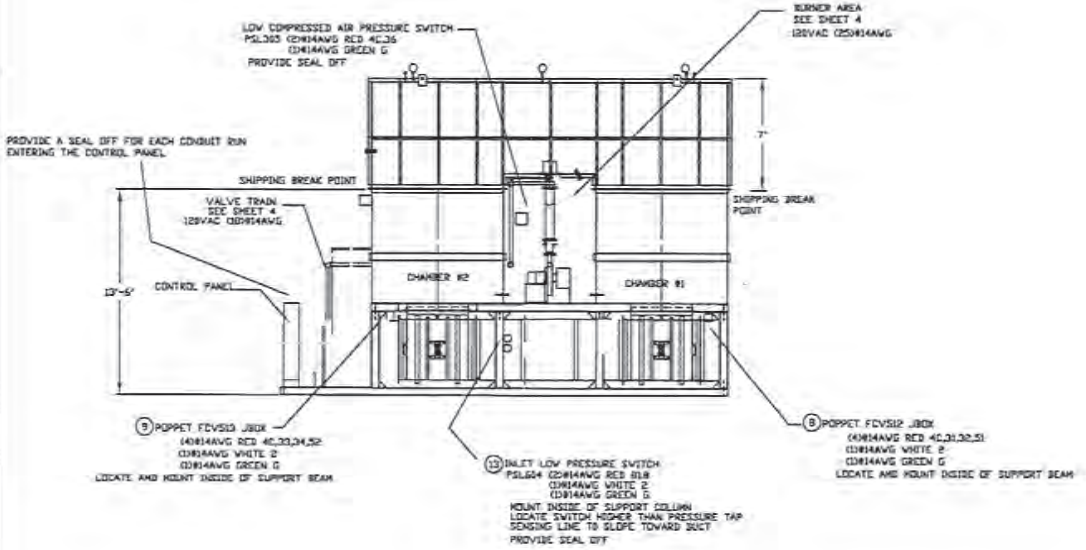
INLET LOW PRESSURE SWITCH



LOW COMPRESSED AIR PRESSURE SWITCH







REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	ADDED CLASS 1, DIVISION 2 REQUIREMENT	11/7/11	JDC

NOTES:
1. ALL THHN/THWN CONDUCTORS TO BE IN ACCORDANCE WITH THE FOLLOWING COLOR CODE:
   - RED ----- A.C. CONTROL CIRCUITS
   - BLUE ----- D.C. CONTROL CIRCUITS
   - BLACK ----- A.C.& D.C. CIRCUITS AT LINE VOLTAGE
   - WHITE ----- CURRENT CARRYING GROUND (NEUTRAL)
   - GREEN ----- NON-CURRENT CARRYING GROUND
   - ORANGE ----- A.C. CONTROL CIRCUITS LESS THAN 90 VAC
   - PURPLE ----- INSTRUMENTS (EXCEPT POWER CONNECTIONS)
   - YELLOW ----- INTERLOCKING CIRCUITS HAVING VOLTAGE FROM OTHER SOURCES
2. CONTROL CIRCUIT CONDUCTORS AND CONTROL CIRCUIT GROUND CONDUCTORS TO BE #14 AWG UNLESS OTHERWISE NOTED.
3. 460 VAC POWER, MOTOR AND GROUND CONDUCTORS TO BE #12 AWG UNLESS OTHERWISE NOTED.
4. DO NOT PUT 460 VAC POWER AND MOTOR CONDUCTORS IN THE SAME BUNDLE WITH CONTROL OR SIGNAL CONDUCTORS.
5. BONDING GROUND JUMPERS ARE REQUIRED IN METAL ENCLOSURES BETWEEN DOOR AND ENCLOSURE AND BETWEEN SUB-PANEL AND ENCLOSURE. BONDING GROUND JUMPER TO BE #14 AWG UNLESS OTHERWISE NOTED.
6. ALL FLEX CONNECTIONS TO BE 1/2" TYPE LA OR EQUAL UNLESS OTHERWISE NOTED.
7. CONDUIT TO BE RIGID GALV. FOR OUTDOOR INSTALLATION UNLESS OTHERWISE NOTED.
8. CONDUIT TO BE 3/4" DIAMETER MINIMUM UNLESS OTHERWISE NOTED.
9. AREA RATING AT OXIDIZER IS OUTDOOR, CLASS 1, DIVISION 2, GROUP D.

BILL OF MATERIAL			
	TAG	QUANTITY	DESCRIPTION
1	TE508A,TE508B TE504	3	THERMOCOUPLE, ATHENA, 2000-K, 36"LONG
2	TE512, TE513	1	THERMOCOUPLE, ATHENA, 2000-K, 42"LONG
3	TE516	1	THERMOCOUPLE, ATHENA, 2000-K, 18"LONG
4	TE511	1	THERMOCOUPLE, ATHENA, 2000-K, 12"LONG
5	BE501	1	UV SCANNER, HVL, C7061A1052
6	BE501	1	UV SCANNER SPLICE BOX BX6X3.5"
7	CN501	1	IGNITION TRANSFORMER, BONGAN A06-5AG, 12X10X5" WITH 18" IGNITION WIRE AND SPARK PLUG CONNECTOR
8	FCV512	1	POPPET JUNCTION BOX BX6X3.5"
9	FCV513	1	POPPET JUNCTION BOX BX6X3.5"
10	TE UPPER	1	THERMOCOUPLE JUNCTION BOX BX6X3.5"
11		-	
12		-	
13	PSL604	1	INLET LOW PRESSURE SWITCH, DWYER, A3060LT
14	P3DL505	1	CA LOW DP SWITCH, DWYER, 1950-0-0T
15		-	

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON: FRACTIONS DECIMALS ANGLES
BREAK SHARP EDGES TO ALL FILLETS TO
MATERIAL

DRAWN	JDC	11/7/11
CHECKED		
APPROVED		

CANTON RENEWABLES
CANTON, MI

63531

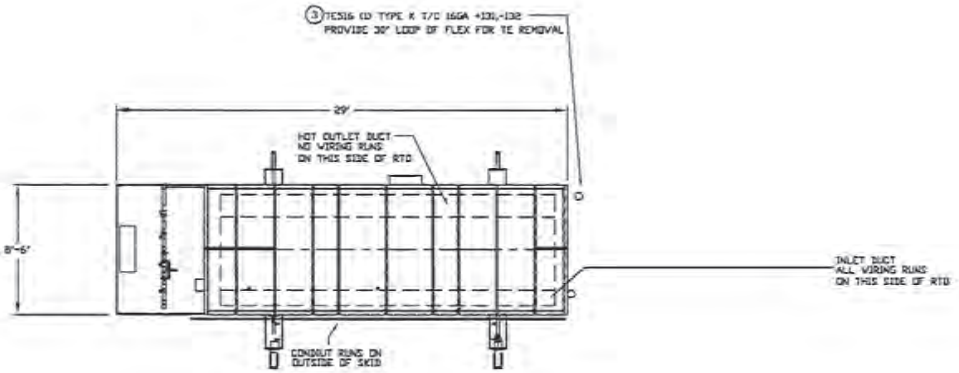
MET-PRO Environmental Air Solutions

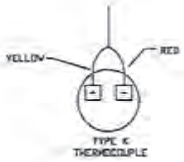
TITLE SHOP WIRING 120VAC
REGENERATIVE THERMAL OXIDIZER
RTO-6-G

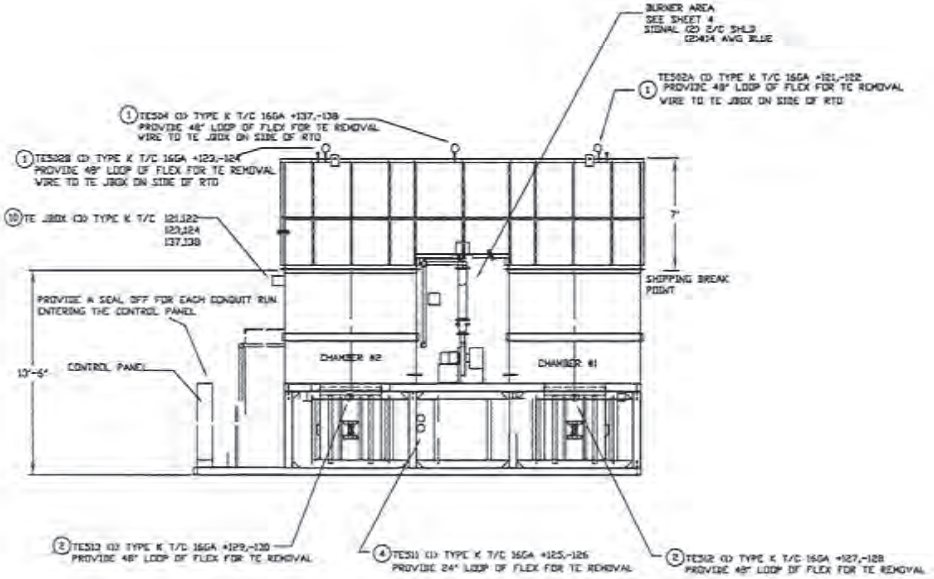
SIZE	CODE IDENT NO	DWG NO.	REV.
D	91340	200063531X	1

SCALE | WEIGHT | SHEET 1 OF 4

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	ADDED CLASS1, DIVISION 2 REQUIREMENT	11/7/11	JDC

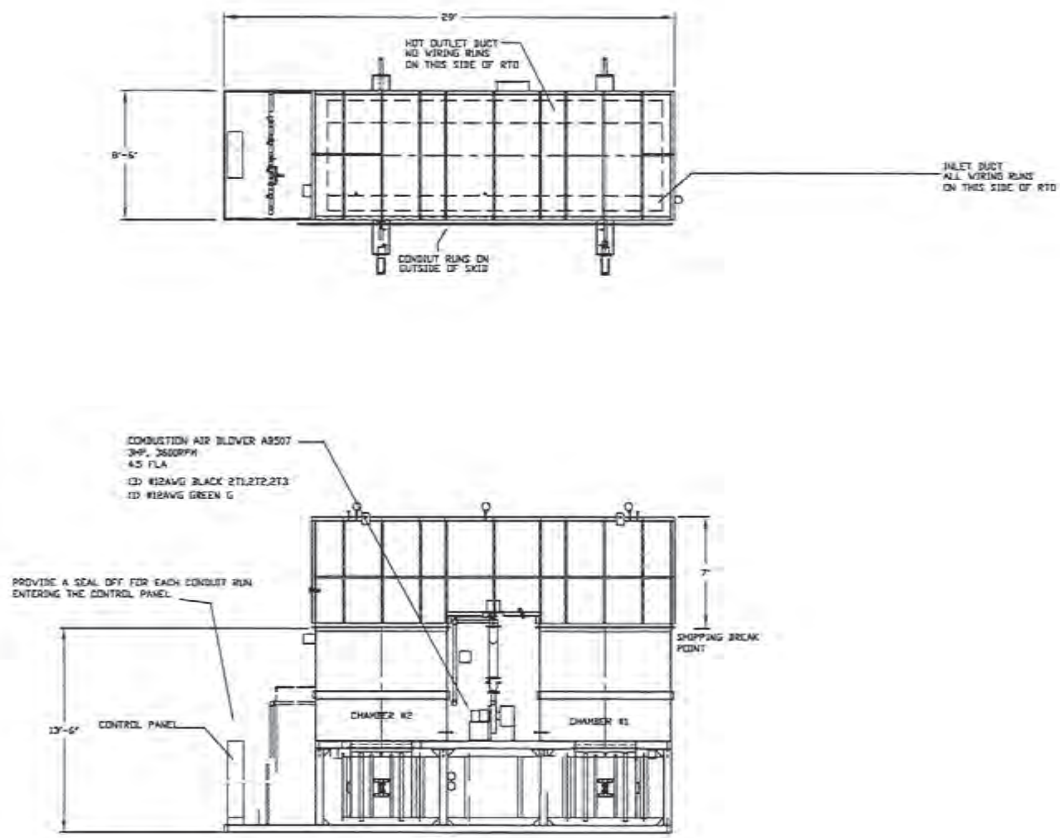






		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	DRAWN JDC 11/7/11	MET-PRO Environmental Air Solutions	
		TOLERANCE ON FRACTIONS DECIMALS ANGLES	CHECKED		
		REMOVE SHARP EDGES TO ALL FILLETS TO	APPROVED		
		MATERIAL	DANTON RENEWABLES DANTON, MI	TITLE SHOP WIRING LOW VOLTS REGENERATIVE THERMAL OXIDIZER RTO-6-G	
			63531	SIZE D / CAGE CODE 91340 / DWG NO. 200063542X	REV. 1
		NEXT ASSY USED ON APPLICATION		SCALE	WEIGHT	SHEET 2 OF 4

ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	ADDED CLASS 1, DIVISION 2 REQUIREMENT	11/7/11	JDD



SYSTEMS DIVISION
MET-PRO CORPORATION

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS DECIMALS ANGLES
BREAK SHARP EDGES TO
ALL FILLETS TO
MATERIAL

DRAWN JDD 11/7/11
CHECKED
APPROVED

CANTON RENEWABLES
CANTON, MI

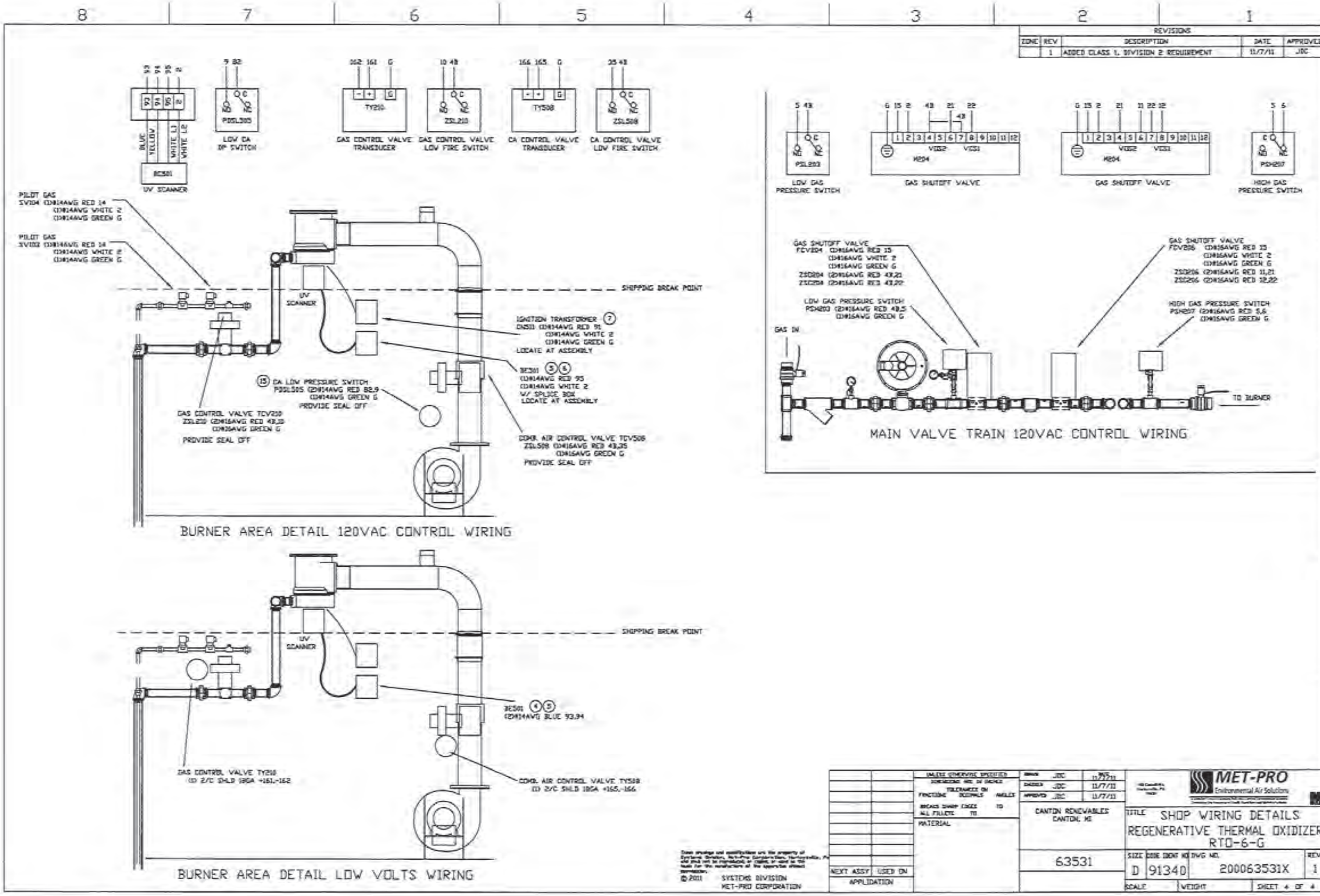
63531

MET-PRO
Environmental Air Solutions

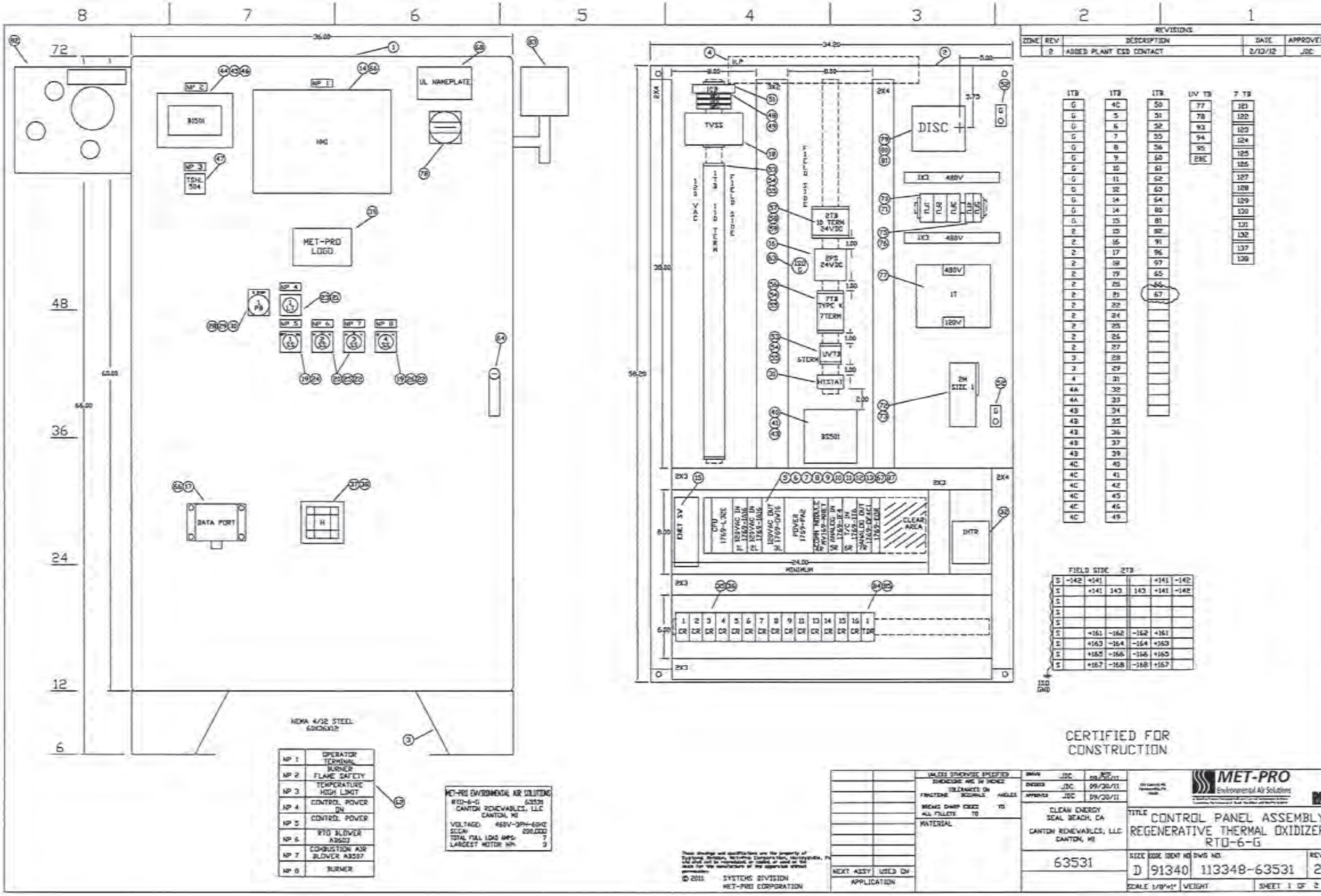
TITLE SHOP WIRING 460 VOLTS
REGENERATIVE THERMAL OXIDIZER
RTO-6-G

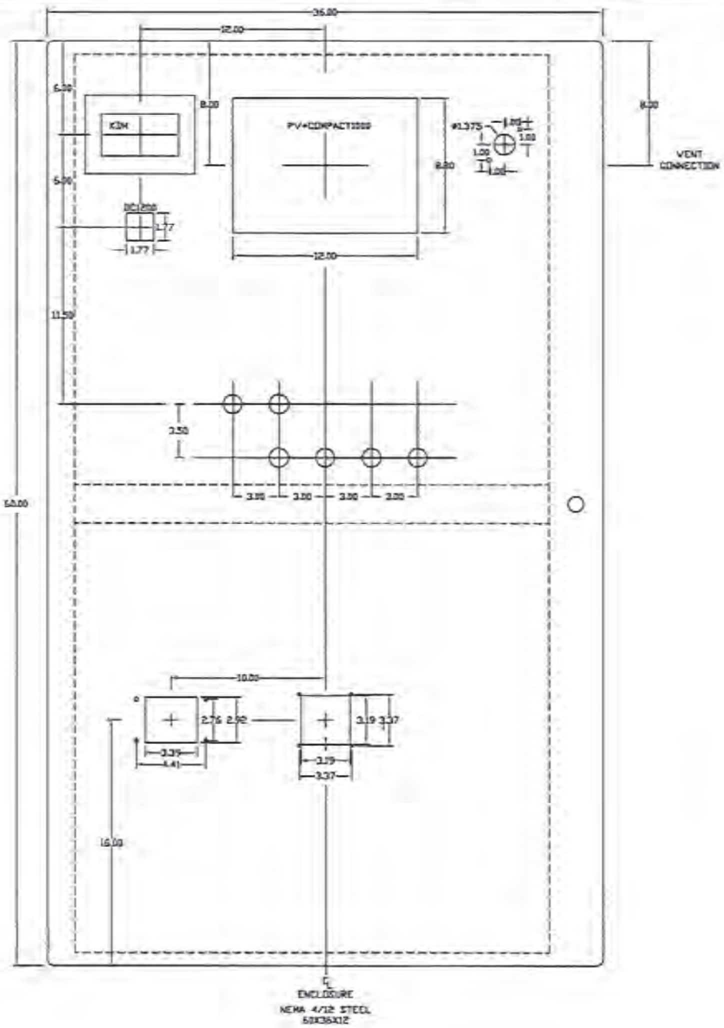
SIZE	CODE IDENT NO	DWG NO.	REV.
D	91340	200063531X	1

SCALE | WEIGHT | SHEET 3 OF 4



REVISIONS
ZONE REV DESCRIPTION DATE APPROVED
1 ADDED CLASS 1, DIVISION 2 REQUIREMENT 11/7/11 JDC
UV SCANNER
LOW CA DP SWITCH
GAS CONTROL VALVE TRANSDUCER
GAS CONTROL VALVE LOW FIRE SWITCH
CA CONTROL VALVE TRANSDUCER
CA CONTROL VALVE LOW FIRE SWITCH
LOW GAS PRESSURE SWITCH
GAS SHUTOFF VALVE
GAS SHUTOFF VALVE
HIGH GAS PRESSURE SWITCH
SHIPPING BREAK POINT
UV SCANNER
PROVIDE SEAL OFF
LOCATE AT ASSEMBLY
GAS IN
TO BURNER
MAIN VALVE TRAIN 120VAC CONTROL WIRING
BURNER AREA DETAIL 120VAC CONTROL WIRING
BURNER AREA DETAIL LOW VOLTS WIRING
SYSTEMS DIVISION
MET-PRO CORPORATION
CANTON RENEWABLES
CANTON, MI
63531
MET-PRO
Environmental Air Solutions
SHOP WIRING DETAILS
REGENERATIVE THERMAL OXIDIZER
RTO-6-G
D 91340 200063531X 1
NEXT ASSY USED ON
APPLICATION
MATERIAL


REVISIONS
ZONE | REV | DESCRIPTION | DATE | APPROVED
2 | ADDED PLANT ESD CONTACT | 2/10/12 | JDC
UL NAMEPLATE
HMI
MET-PRO LOGO
TSHL 504
DATA PORT
DISC
TVSS
2TB 10 TERM 24VDC
8PS 24VDC
7TB TYPE K 7TERM
UVTB
HTSTAT
BS501
1T
480V
120V
2M SIZE 1
1HTR
CLEAR AREA
CPU 1769-L32E
120VAC IN 1769-IA16
120VAC OUT 1769-OW16
POWER 1769-PA2
ANALOG IN 1769-IF4
T/C IN 1769-IT6
ANALOG OUT 1769-OF4CI
1769-ECR
FIELD SIDE 2TB
ISO GND
NEMA 4/12 STEEL 60X36X12
NP 1 | OPERATOR TERMINAL
NP 2 | BURNER FLAME SAFETY
NP 3 | TEMPERATURE HIGH LIMIT
NP 4 | CONTROL POWER ON
NP 5 | CONTROL POWER
NP 6 | RTO BLOWER A3603
NP 7 | COMBUSTION AIR BLOWER A3507
NP 8 | BURNER
MET-PRO ENVIRONMENTAL AIR SOLUTIONS
RTO-6-G 63531
CANTON RENEWABLES, LLC
CANTON, MI
VOLTAGE: 460V-3PH-60HZ
SCCA: 200,000
TOTAL FULL LOAD AMPS: 7
LARGEST MOTOR HP: 3
CERTIFIED FOR CONSTRUCTION
SYSTEMS DIVISION
MET-PRO CORPORATION
© 2011
NEXT ASSY | USED ON
APPLICATION
CLEAN ENERGY
SEAL BEACH, CA
CANTON RENEWABLES, LLC
CANTON, MI
63531
MET-PRO
Environmental Air Solutions
TITLE CONTROL PANEL ASSEMBLY
REGENERATIVE THERMAL OXIDIZER
RTO-6-G
SIZE D | CAGE IDENT NO 91340 | DWG NO. 113348-63531 | REV. 2
SCALE 1/8"=1" | SHEET 1 OF 2



REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	REVISED PER PANEL CHECKOUT	12/9/11	JDC

BILL OF MATERIAL

ITEM	QTY	DESCRIPTION
1	1	ENCLOSURE,HOFFMAN C-SD603612, 60x36X12, STEEL, NEMA 4/12
2	1	PANEL, HOFFMAN C-P6036
3	1	FLOOR STAND KIT, HOFFMAN, A-FK0612, 6" HIGH
4	1	PANEL LIGHT, HOFFMAN A-LF16M10R, 120VAC, WITH BULB
5	1	PROG CONTROL, AB, 1769-L32E, ETHERNET
6	1	MEMORY CARD, AB, 1784-CP64, 64MB
7	1	POWER SUPPLY, AB, 1769-PS2, 24VDC, 120AC
8	2	MODULE-INPUT, AB, 1769-IA16, 16PT, 120VAC
9	1	MODULE-OUTPUT, AB, 1769-OW16, 16PT, RELAY, 120VAC
10	1	MODULE-INPUT, AB, 1769-IF4, 4PT, ANALOG
11	1	MODULE-INPUT, AB, 1769-IT6, 6PT, T/C
12	1	MODULE-OUTPUT, AB, 1769-OF4CI, 4PT, ANALOG
13	1	RIGHT END CAP, AB, 1769-ECR
14	1	HMI, AB, 2711PC-T10C4D1, PV+COMPACT1000, COLOR, TOUCH, ETHERNET
15	1	ETHERNET SWITCH, N-TRON, 708FX, 6/2 PORT, ST CONN
16	1	POWER SUPPLY, AB, 1606-XLP100E, 24VDC, 4A
17	1	DATA PORT, GRACE, P-R2-K3RF3
18	1	SURGE SUPPRESSOR, ISLATROL IC-105, 5.0AMP, 120VAC
19	2	SELECTOR SWITCH, CONCEPT SS02-SHVE-NO/NO, 2POS, 2NO, NEMA 4X
20	2	SELECTOR SWITCH, CONCEPT SS03-SHVE-NO/NO, 3POS, 2NO, NEMA 4X
21	1	LIGHT-PILOT, CONCEPT FVLU120-PLLRD, RED, NEMA 4X
22	3	CONTACT BLOCK, CONCEPT CBNO, 1NO
23	1	LEGEND PLATE, AB 800H-W100, BLANK, GRAY
24	1	LEGEND PLATE, AB 800H-W130, OFF-ON
25	2	LEGEND PLATE, AB 800H-W151, HAND-OFF-AUTO
26	1	LEGEND PLATE, AB 800H-W100E, ENGRVD OFF AUTO
27	-	
28	1	PUSHBUTTON, AB 800H-FRXT6A4, RED, MUSHROOM, 1NC, NEMA 4X
29	1	LEGEND PLATE, AB 800H-W797A, YELLOW, LARGE, PUSH-TWIST
30	1	PUSHBUTTON GUARD, AB 800T-N310J, JUMBO
31	1	THERMOSTAT, ISC, KT-011-NC, HEATING
32	1	HEATER, ISC, EHCSL028850W1200, 250W, 120VAC
33	-	THERMOSTAT, ISC, KT-011-NO, COOLING
34	-	FILTERED FAN PACKAGE, ISC, ISC100-MFFP-125, 120VAC
35	14	RELAY, IDEC RH2BULAC120, 2PDT, W/LIGHT, 120VAC
36	14	SOCKET, IDEC SH2B05, 2P
37	1	HORN, FEDERAL, 350-120-30, 120VAC
38	1	HORN PANEL MOUNT KIT, FEDERAL, 8435666
39	1	MET-PRO LOGO
40	1	FLAME SAFETY HONEYWELL RM7890B1030
41	1	FLAME SAFETY BASE, HONYWELL Q7800A1005
42	-	PURGE CARD, HONEYWELL ST7800A1054
43	1	AMPLIFIER, HONEYWELL R7861A1026
44	1	KEYBOARD DISPLAY MODULE, HONYWELL S7800A1001
45	1	CABLE, HONYWELL 221818C, 120" LONG
46	1	COVER, HONEYWELL 204718A, NEMA 4
47	1	HIGH LIMIT, HVL, DC120L-1-1-0-0-1-0-0-0
48	3	FUSE BLOCK, AB, 1492-H5, 300V, 1/4"x1-1/4"
49	10	FUSE, BUSSMAN MDA-7, 250V, 7A (7 SPARE)
50	-	
51	1	CIRCUIT BREAKER, 250V, 15A
52	2	GROUND LUG, ILSCO TA2
53	115	TERMINAL BLOCK, AB, 1492-J4, 600V
54	4	TERMINAL BLOCK END, AB, 1492-EBJ3, 600V
55	8	TERMINAL BLOCK ANCHOR, AB, 1492-EAJ35
56	7	THERMOCOUPLE TERMINAL BLOCK, AB 1492-JTC3K, TYPE K
57	10	TERMINAL BLOCK, AB, 1492-JT3M, 300V, 3 LEVEL W/ GROUND
58	1	TERMINAL BLOCK END, AB, 1492-EBJT3M, 300V
59	2	TERMINAL BLOCK ANCHOR, AB, 1492-EAHJ35, 300V
60	3	TERMINAL MARKERS, 1492-M6X12, 120/CARD

BY MET-PRO (items 5–14)
BY MET-PRO (items 39–47)

BILL OF MATERIAL

ITEM	QTY	DESCRIPTION
61	3	TERMINAL BLOCK CENTER JUMPER, AB, 1492-CJLJ5-10, 10 POLE
62	8	NAMEPLATE, PLASTIC, 2"x3/4", WHITE w/BLACK LETTERS, SEE LIST
63	1	ISO GROUND
64	1	HANDLE, HOFFMAN, C-WHPTD, PADLOCKABLE
65	-	SHROUD PACKAGE, ISC, ISC100-FFP-3R
66	2	CAT 5 CABLE, 7' LONG
67	2	CAT 5 CABLE, 3' LONG
68	1	UL NAMEPLATE, 3"X5", WHITE w/BLACK LETTERS
69	1	FAN RECEPTACLE, SINGLE WITH BOX AND COVER PLATE
70	3	FUSE, BUSS LPJ-8SP, 600V, 8A
71	1	FUSEBLOCK, BUSS JT60030-3CR, 600V, 30A, 3 POLE, TOUCH SAFE
72	1	MOTOR STARTER, AB 309-BOD-EEC, SIZE 1, 120VAC COIL, E1 PLUS OL, OPEN
73	1	AUX CONTACT, AB 100-SB10, INO
74	-	
75	2	FUSE, BUSS CLASS CC FNQ-R5, 600V 5A
76	1	FUSEBLOCK, BUSS, CHCC2, 600V, 30A, 2 POLE, TOUCH SAFE, CLASS CC
77	1	TRANSFORMER, ACME FS-2-1500, 1500VA, 480PRI-120SEC, FINGER SAFE
78	1	HANDLE, AB, 194R-HS4E
79	1	SHAFT, AB, 194R-R2
80	1	DISCONNECT SWITCH, AB, 194R-NN030P3, 30A, 600V, NON-FUSED
81	1	COVER, TERMINAL, AB, 194R-LNC1
82	1	PURGE SYSTEM, ISC, 1002-LPS-C1-YZ-LH, LEFT HAND
83	1	VENT, ISC, EPV-2-SA-90
84	1	TIMER, AB, 700-HNC44AA12, ON DELAY, 120VAC,4PDT
85	1	SOCKET, AB, 700-HN100, TOUCH SAFE
86	1	1/4"OD SS TUBING AND (2) BULKHEAD CONNECTORS FOR PURGE SYSTEM
87	1	MODULE-COMM, PROSOFT, MVI69-MNET
88	-	
89	-	
90	-	

BY MET-PRO (items 86–87)

CERTIFIED FOR CONSTRUCTION

NEXT ASSY	USED ON
APPLICATION	

DRAWN JDC 09/30/11 · CHECKED JDC 09/30/11 · APPROVED JDC 09/30/11

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES · TOLERANCES ON FRACTIONS DECIMALS ANGLES · BREAK SHARP EDGES · ALL FILLETS · MATERIAL

CLEAN ENERGY
SEAL BEACH, CA
CANTON RENEWABLES, LLC
CANTON, MI

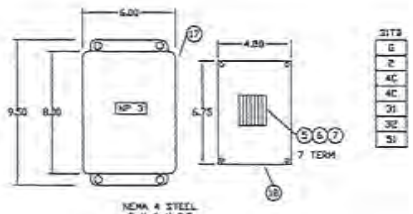
63531

MET-PRO Environmental Air Solutions

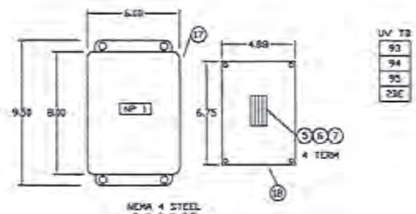
TITLE: CONTROL PANEL BM/CUTOUT
REGENERATIVE THERMAL OXIDIZER
RTO-6-G

SIZE	CODE IDENT NO	DWG NO.	REV.
D	91340	113348-63531	1

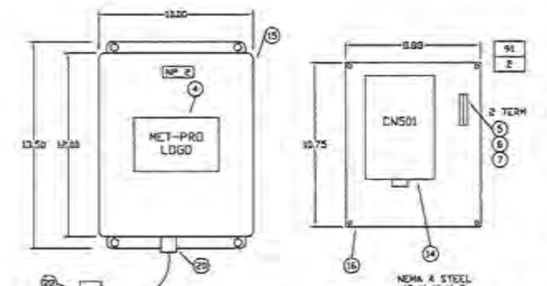
SCALE 1/8"=1" · WEIGHT · SHEET 2 OF 2



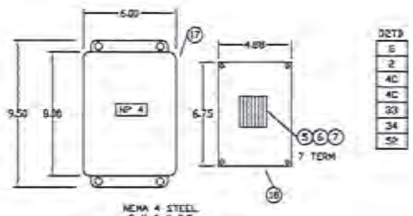
POPPET VALVE BOX
FCV512



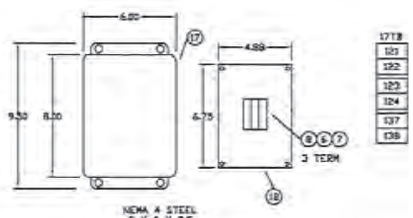
UV SCANNER SPLICE BOX
BE501



IGNITION TRANSFORMER BOX



POPPET VALVE BOX
FCV513



THERMOCOUPLE
SPLICE BOX

NP 1	BE501
NP 2	CN501
NP 3	FCV512
NP 4	FCV513

BILL OF MATERIAL

ITEM	QTY	DESCRIPTION
1	-	ENCLOSURE, HOFFMAN C-SD24208, 24x20x8, STEEL, NEMA 4
2	-	PANEL, HOFFMAN C-P2420
3	-	MOUNTING FOOT KIT, HOFFMAN C-MFK
4	1	MET-PRO LOGO (BY MET-PRO)
5	20	TERMINAL BLOCK, AB, 1492-J4
6	5	TERMINAL BLOCK END, AB, 1492-EBJ3, 600V
7	10	TERMINAL BLOCK END ANCHOR, AB, 1492-EAJ35
8	3	THERMOCOUPLE TERMINAL BLOCK, AB 1492-JTC3K, TYPE K
9	-	TERMINAL MARKERS, AB, 1492-M6X12, 120/CARD
10	-	TERMINAL BLOCK CENTER JUMPER, AB, 1492-CJLJ6-10, 10 POLE
11	-	GROUND LUG, ILSCO TA2
12	-	ENCLOSURE, HOFFMAN A-1412CHNF, 14x12x6, STEEL, NEMA 4
13	-	PANEL, HOFFMAN A-P1412
14	1	IGNITION TRANSFORMER, DONGAN A06-SA6, 120V/6000V
15	1	ENCLOSURE, HOFFMAN A-1210CHNF, 12x10x5, STEEL, NEMA 4
16	1	PANEL, HOFFMAN A-12P10
17	4	ENCLOSURE, HOFFMAN A-806CHNF, 8x6x3.5, STEEL, NEMA 4
18	4	PANEL, HOFFMAN A-8P6
19	4	NAMEPLATE, PLASTIC, 2"x3/4", WHITE w/ BLACK LETTERS, SEE LIST
20	1	CORD GRIP
21	1	IGNITION WIRE, BELDEN, 3GTO-15 OR EQUAL, 10' LONG EACH
22	1	SPARK PLUG CONNECTOR
23	-	ETHERNET SWITCH, HIRSCHMANN, 943-899-001, 3 PORT
24	-	
25	-	

DRAWN	JDC	09/2011
CHECKED	JDC	09/2011
APPROVED	JDC	09/2011

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON FRACTIONS DECIMALS ANGLES
BREAK SHARP EDGES / ALL FILLETS
MATERIAL

NEXT ASSY | USED ON
APPLICATION

CLEAN ENERGY
SEAL BEACH, CA
CANTON RENEWABLES, LLC
CANTON, MI

63531

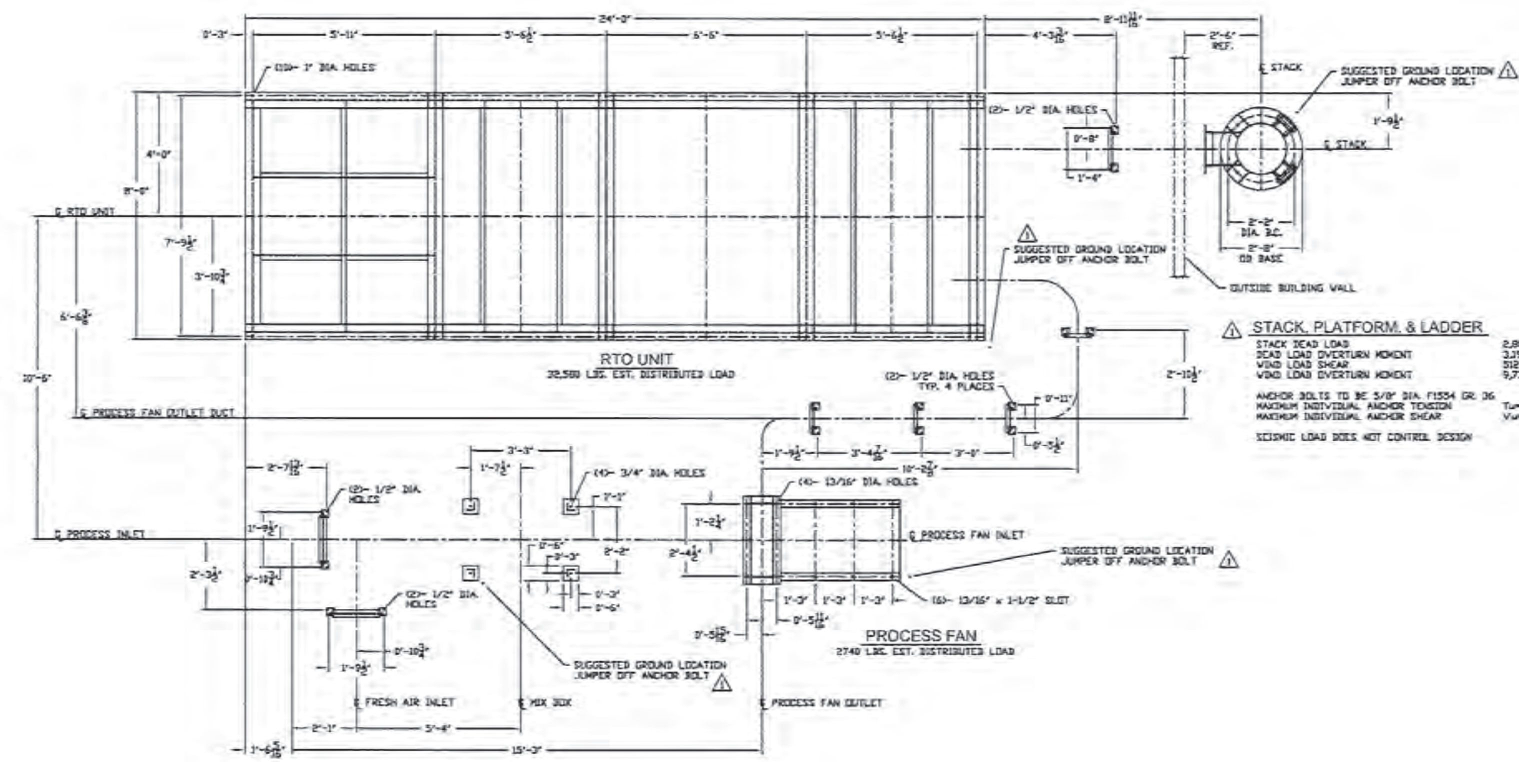
MET-PRO Environmental Air Solutions

TITLE JUNCTION BOX ASSEMBLY
REGENERATIVE THERMAL OXIDIZER

SIZE	CODE IDENT NO	DWG NO.	REV.
D	91340	113351-63531	0

SCALE | WEIGHT | SHEET 1 OF 1

REVISIONS: ZONE | REV | DESCRIPTION | DATE | APPROVED



STACK, PLATFORM, & LADDER

STACK DEAD LOAD	2,881 LBS.
DEAD LOAD OVERTURN MOMENT	3,193 FT-LBS
WIND LOAD SHEAR	512 LBS.
WIND LOAD OVERTURN MOMENT	9,734 FT-LBS

ANCHOR BOLTS TO BE 5/8" DIA. F1554 GR. 36
MAXIMUM INDIVIDUAL ANCHOR TENSION Tu= 8,957 LBS.
MAXIMUM INDIVIDUAL ANCHOR SHEAR Vu= 819 LBS.

SEISMIC LOAD DOES NOT CONTROL DESIGN

NOTES:

1. RTO UNIT SKID MOUNTING ELEVATION IS 0'-0". ALL OTHER COMPONENT ELEVATIONS ARE 0'-1" WHICH ALLOWS 1" FOR SHIMMING OR GROUTING.
2. SEE FIELD INSTALLATION DRAWING 113339-63531 FOR EQUIPMENT TAG NUMBERS.

MET-PRO Environmental Air Solutions

TITLE: FOUNDATION ARRANGEMENT
REGENERATIVE THERMAL OXIDIZER
RTO-6-G

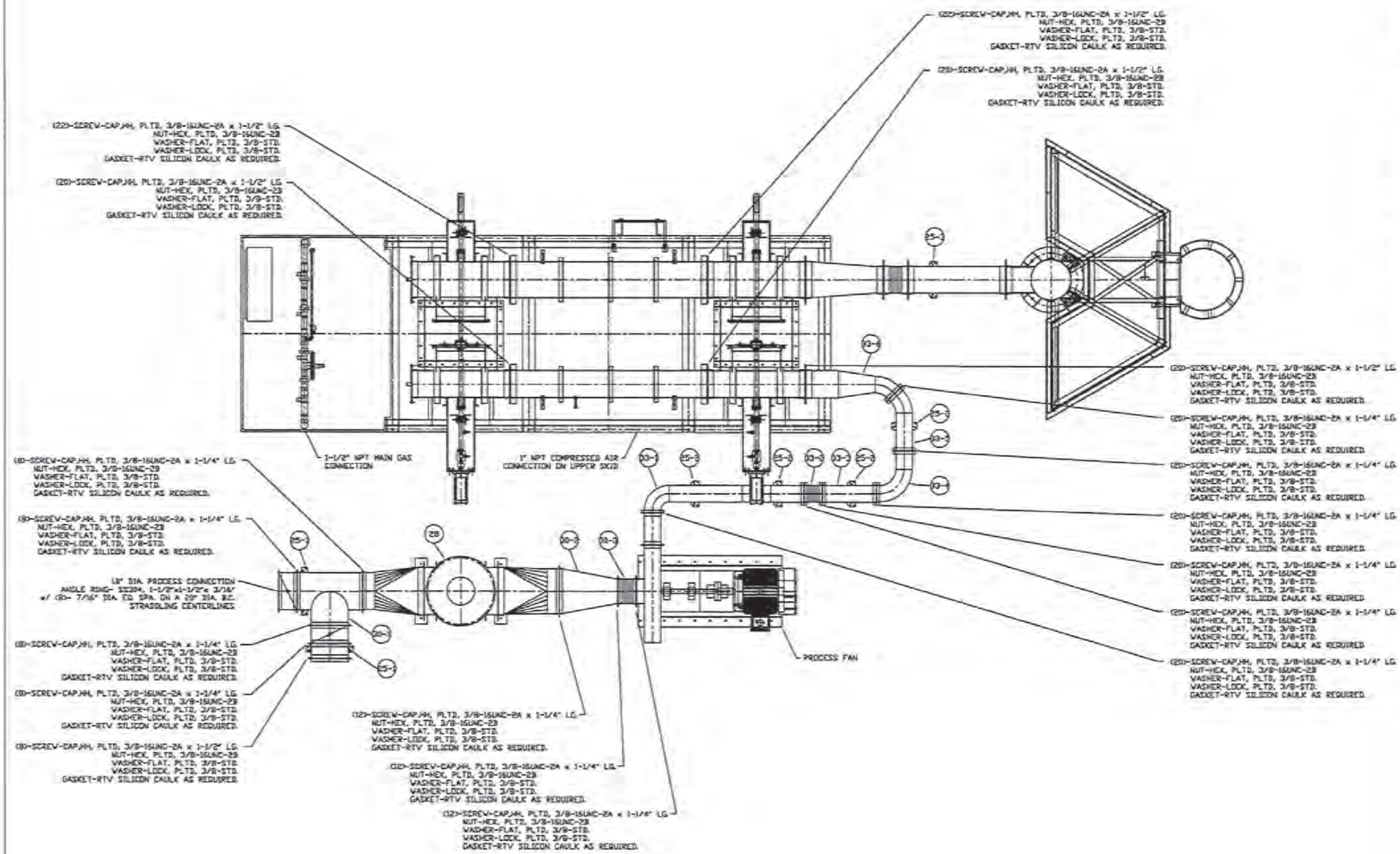
SIZE D | CODE IDENT NO 91340 | DWG NO 117151-63531 | REV. 1

CANTON RENEWABLES LLC
CANTON, MI

DRAWN RGG 20 DEC 11 | CHECKED RGG 20 DEC 11 | APPROVED RGG 20 DEC 11

REVISIONS: 1 | ADDED STACK REACTIONS AND (4) SUGGESTED GROUNDING LOCATIONS | 31 DEC 11 | RGG

HEAT ASSY | USED ON 63531 | APPLICATION



DRAWN	RCD	23 AUG 11	
CHECKED	RCD	23 AUG 11	
APPROVED	RCD	23 AUG 11	

MET-PRO Environmental Air Solutions

TITLE FIELD INSTALLATION ASSEMBLY
REGENERATIVE THERMAL OXIDIZER
RTO-6-G

SIZE	CODE IDENT NO.	DWG NO.	REV.
D	91340	113339-63531	1

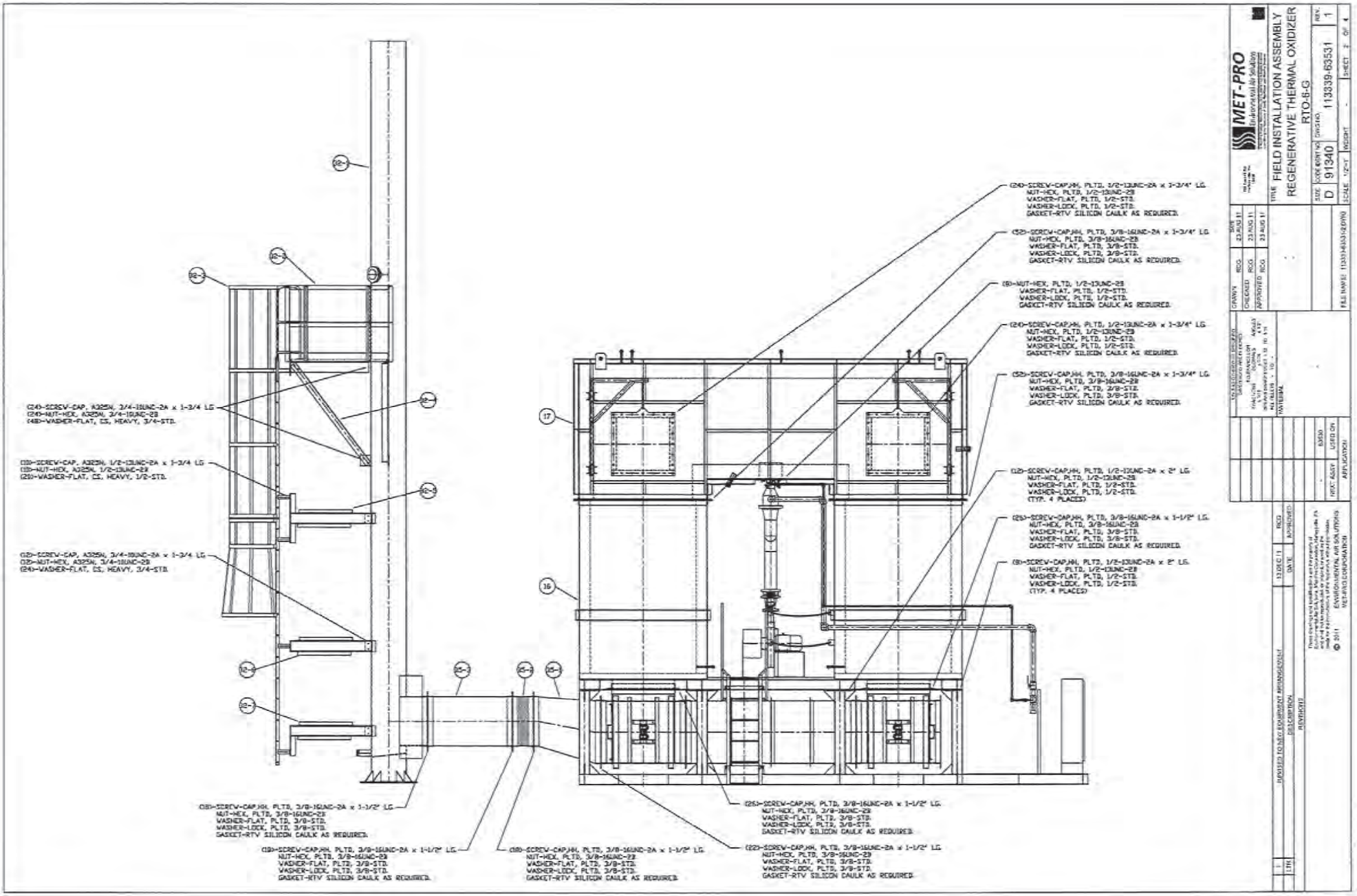
SCALE 1/2"=1' WEIGHT - SHEET 1 OF 4

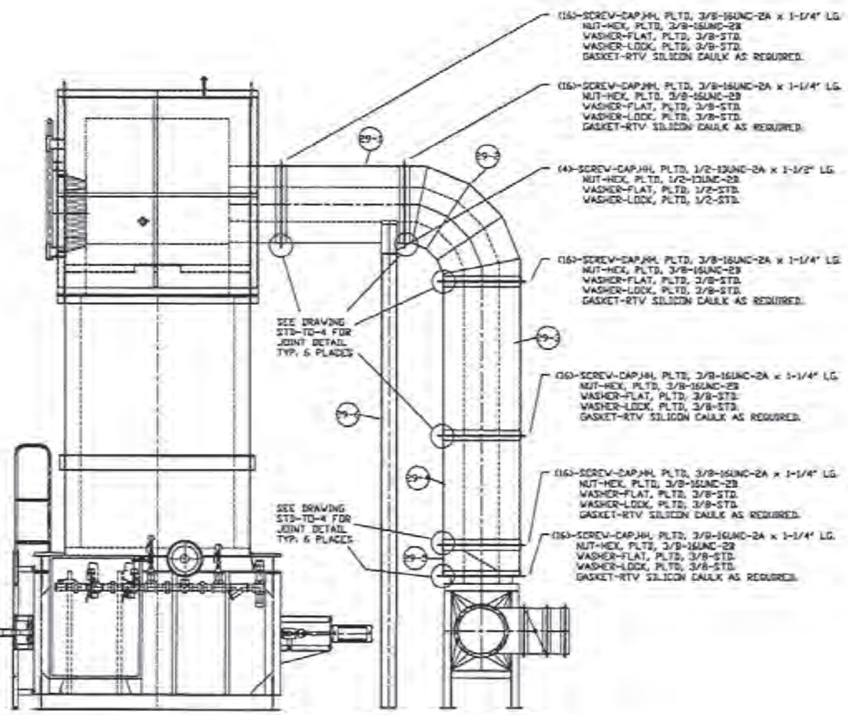
LTR	DESCRIPTION	DATE	APPROVED
1	REVISED TO NEW EQUIPMENT ARRANGEMENT	13 DEC 11	RCD

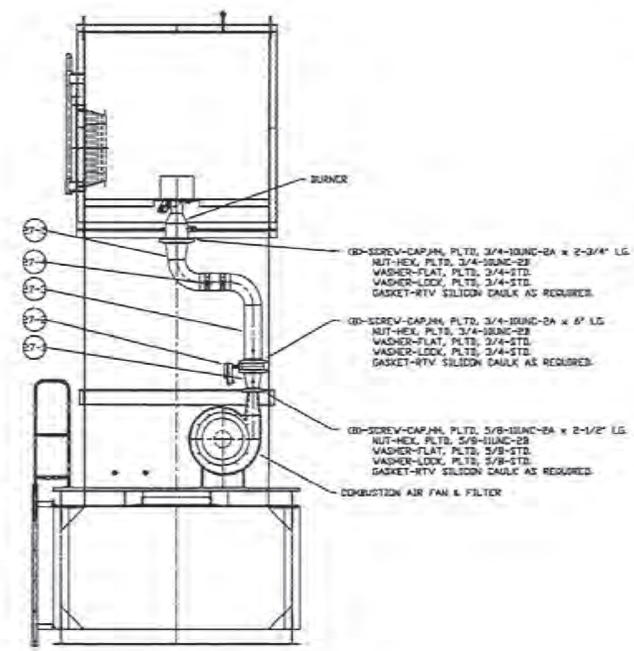
REVISIONS

NEXT ASSY	USED ON
-	93530

APPLICATION


(24)-SCREW-CAP, A325N, 3/4-10UNC-2A x 1-3/4 LG
(24)-NUT-HEX, A325N, 3/4-10UNC-2B
(48)-WASHER-FLAT, CS, HEAVY, 3/4-STD.
(12)-SCREW-CAP, A325N, 1/2-13UNC-2A x 1-3/4 LG
(12)-NUT-HEX, A325N, 1/2-13UNC-2B
(24)-WASHER-FLAT, CS, HEAVY, 1/2-STD.
(12)-SCREW-CAP, A325N, 3/4-10UNC-2A x 1-3/4 LG
(12)-NUT-HEX, A325N, 3/4-10UNC-2B
(24)-WASHER-FLAT, CS, HEAVY, 3/4-STD.
(24)-SCREW-CAP,HH, PLTD, 1/2-13UNC-2A x 1-3/4" LG.
NUT-HEX, PLTD, 1/2-13UNC-2B
WASHER-FLAT, PLTD, 1/2-STD.
WASHER-LOCK, PLTD, 1/2-STD.
GASKET-RTV SILICON CAULK AS REQUIRED.
(52)-SCREW-CAP,HH, PLTD, 3/8-16UNC-2A x 1-3/4" LG.
NUT-HEX, PLTD, 3/8-16UNC-2B
WASHER-FLAT, PLTD, 3/8-STD.
WASHER-LOCK, PLTD, 3/8-STD.
GASKET-RTV SILICON CAULK AS REQUIRED.
(8)-NUT-HEX, PLTD, 1/2-13UNC-2B
WASHER-FLAT, PLTD, 1/2-STD.
WASHER-LOCK, PLTD, 1/2-STD.
GASKET-RTV SILICON CAULK AS REQUIRED.
(24)-SCREW-CAP,HH, PLTD, 1/2-13UNC-2A x 1-3/4" LG.
NUT-HEX, PLTD, 1/2-13UNC-2B
WASHER-FLAT, PLTD, 1/2-STD.
WASHER-LOCK, PLTD, 1/2-STD.
GASKET-RTV SILICON CAULK AS REQUIRED.
(52)-SCREW-CAP,HH, PLTD, 3/8-16UNC-2A x 1-3/4" LG.
NUT-HEX, PLTD, 3/8-16UNC-2B
WASHER-FLAT, PLTD, 3/8-STD.
WASHER-LOCK, PLTD, 3/8-STD.
GASKET-RTV SILICON CAULK AS REQUIRED.
(12)-SCREW-CAP,HH, PLTD, 1/2-13UNC-2A x 2" LG.
NUT-HEX, PLTD, 1/2-13UNC-2B
WASHER-FLAT, PLTD, 1/2-STD.
WASHER-LOCK, PLTD, 1/2-STD.
(TYP. 4 PLACES)
(25)-SCREW-CAP,HH, PLTD, 3/8-16UNC-2A x 1-1/2" LG.
NUT-HEX, PLTD, 3/8-16UNC-2B
WASHER-FLAT, PLTD, 3/8-STD.
WASHER-LOCK, PLTD, 3/8-STD.
GASKET-RTV SILICON CAULK AS REQUIRED.
(8)-SCREW-CAP,HH, PLTD, 1/2-13UNC-2A x 2" LG.
NUT-HEX, PLTD, 1/2-13UNC-2B
WASHER-FLAT, PLTD, 1/2-STD.
WASHER-LOCK, PLTD, 1/2-STD.
(TYP. 4 PLACES)
(25)-SCREW-CAP,HH, PLTD, 3/8-16UNC-2A x 1-1/2" LG.
NUT-HEX, PLTD, 3/8-16UNC-2B
WASHER-FLAT, PLTD, 3/8-STD.
WASHER-LOCK, PLTD, 3/8-STD.
GASKET-RTV SILICON CAULK AS REQUIRED.
(22)-SCREW-CAP,HH, PLTD, 3/8-16UNC-2A x 1-1/2" LG.
NUT-HEX, PLTD, 3/8-16UNC-2B
WASHER-FLAT, PLTD, 3/8-STD.
WASHER-LOCK, PLTD, 3/8-STD.
GASKET-RTV SILICON CAULK AS REQUIRED.
(18)-SCREW-CAP,HH, PLTD, 3/8-16UNC-2A x 1-1/2" LG.
NUT-HEX, PLTD, 3/8-16UNC-2B
WASHER-FLAT, PLTD, 3/8-STD.
WASHER-LOCK, PLTD, 3/8-STD.
GASKET-RTV SILICON CAULK AS REQUIRED.
(18)-SCREW-CAP,HH, PLTD, 3/8-16UNC-2A x 1-1/2" LG.
NUT-HEX, PLTD, 3/8-16UNC-2B
WASHER-FLAT, PLTD, 3/8-STD.
WASHER-LOCK, PLTD, 3/8-STD.
GASKET-RTV SILICON CAULK AS REQUIRED.
MET-PRO
Environmental Air Solutions
TITLE FIELD INSTALLATION ASSEMBLY
REGENERATIVE THERMAL OXIDIZER
RTO-6-G
SIZE D
CODE IDENT NO. 91340
DWG NO. 113339-63531
REV. 1
SCALE 1/2"=1"
WEIGHT -
SHEET 2 OF 4
FILE NAME: 113339-63531.DWG
DRAWN RCG 23 AUG 11
CHECKED RCG 23 AUG 11
APPROVED RCG 23 AUG 11
NEXT ASSY
USED ON
APPLICATION
PROPOSED TO MEET EQUIPMENT ARRANGEMENT
DESCRIPTION
REVISIONS
13 DEC 11 RCG
DATE APPROVED
© 2011 ENVIRONMENTAL AIR SOLUTIONS METPRO CORPORATION





LTR	DESCRIPTION	DATE	APPROVED
2	ADDED NOTES FOR CONNECTION DETAILS DWG STD-TD-4	02 JAN 12	RCG
1	REVISED TO NEW EQUIPMENT ARRANGEMENT	13 DEC 11	RCG

REVISIONS

© 2011 ENVIRONMENTAL AIR SOLUTIONS
MET-PRO CORPORATION

NEXT ASSY	USED ON
	63530

APPLICATION

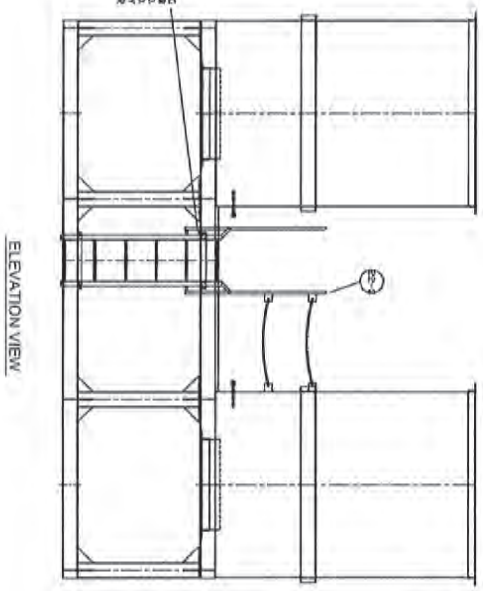
		DATE
DRAWN	RCG	23 AUG 11
CHECKED	RCH	23 AUG 11
APPROVED	RCG	23 AUG 11

MET-PRO
Environmental Air Solutions

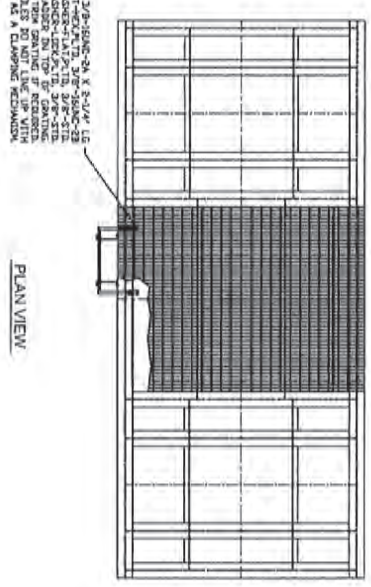
TITLE FIELD INSTALLATION ASSEMBLY
REGENERATIVE THERMAL OXIDIZER
RTO-6-G

SIZE	CODE IDENT NO	DWG NO	REV
D	91340	113339-63531	2

SCALE 1/2"=1' | WEIGHT - | SHEET 3 OF 4



ELEVATION VIEW



PLAN VIEW

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
1	REVISED TO NEW EQUIPMENT ARRANGEMENT	13 DEC 11	RCG

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS DECIMALS ANGLES
BREAK & BRAP EDGE TO
ALL FILLETS TO
MATERIAL

	DATE
DRAWN RCG	23 AUG 11
CHECKED RCG	23 AUG 11
APPROVED RCG	23 AUG 11

FILE NAME 113339-63531-4.DWG

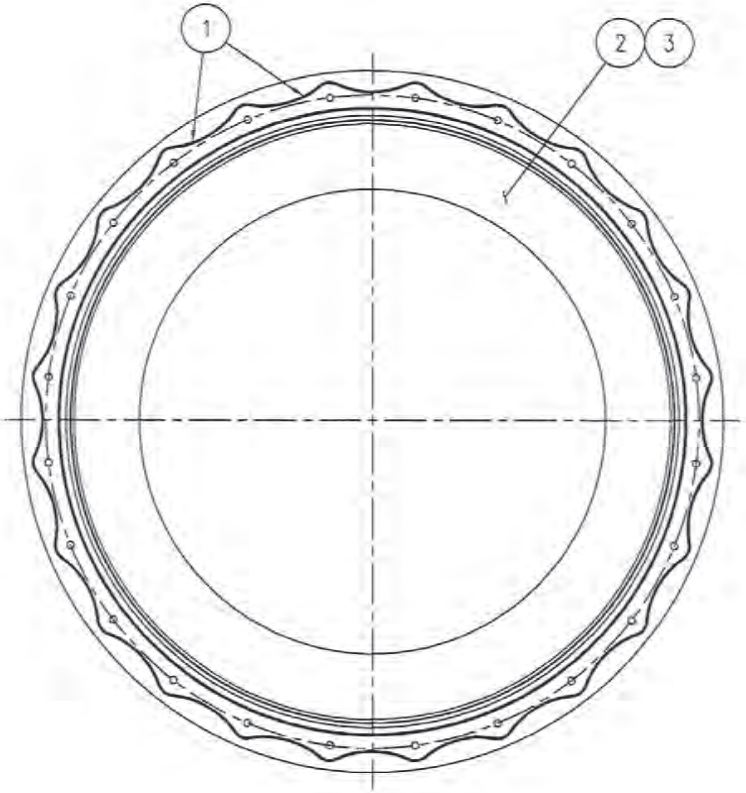
MET-PRO Environmental Air Solutions

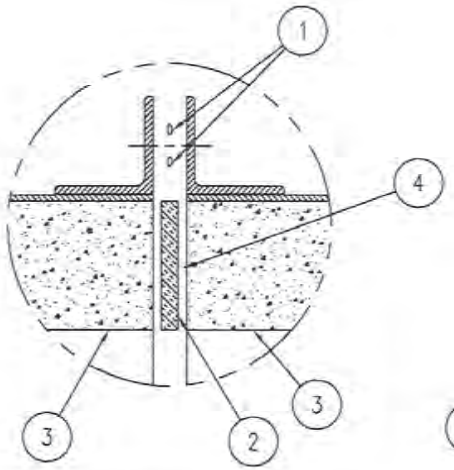
TITLE: FIELD INSTALLATION ASSEMBLY
REGENERATIVE THERMAL OXIDIZER
RTO-6-G

SIZE	CODE IDENT NO	DWG NO.	REV.
D	91340	113339-63531	1

SCALE 1/2"=1" WEIGHT - SHEET 4 OF 4

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED





TYPICAL T.O.
SECTION–TO–SECTION
GASKETING DETAIL
EXPLODED VIEW

1. TWO 3/8" DIA BEADS OF RTV HIGH TEMP CAULK (500°F RATING) PART No.: 121261–047
2. 1" THICK CERAMIIC FIBER BLANKET "GASKET" PART No.: 1000 121 561
3. CAST OR GUNNED REFRACTORY
4. RTV OR CONSTRUCTION MASTIC TO HOLD IN PLACE PRIOR TO ASSEMBLY

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON FRACTIONS DECIMALS ANGLES
BREAK SHARP EDGES TO
ALL FILLETS TO
MATERIAL

DRAWN	RCG	16FEB09
CHECKED	RCG	16FEB09
APPROVED	RCG	16FEB09

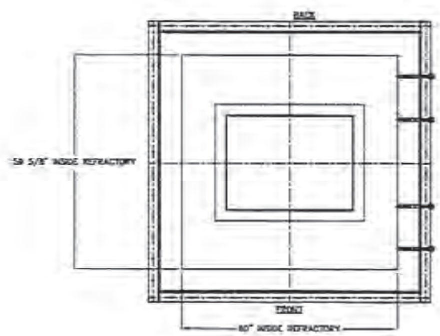
FILENAME: STD–TO–4_R0.DWG

MET PRO CORPORATION **Systems Division**
HARLEYSVILLE, PA. 19438

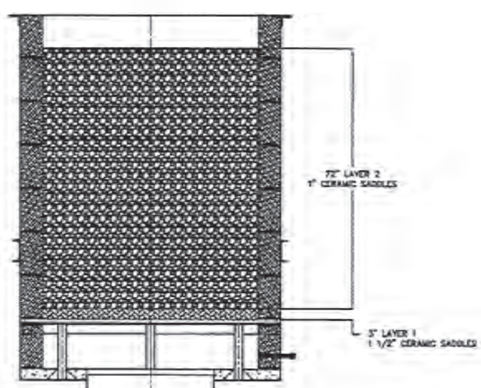
TITLE: TYPICAL T.O. ASSEMBLY DETAIL (CAST OR GUNNED LINING)

SIZE	CODE IDENT NO.	DWG. NO.	REV.
B	91340	STD–TO–4	

SCALE 3/4"=1'–0" | WEIGHT | SHEET 1 OF 1



PLAN VIEW



FRONT ELEVATION VIEW

HEAT RECOVERY CHAMBER — 2 REQUIRED

NOTES:

SUPPLIED IN 1.0 m3 "SUPERSACKS" (OR CARDBOARD BOXES). THE SADDLES ARE CERAMIC, AND THEREFORE HARD AND BRITTLE. INCORRECT HANDLING WILL RESULT IN BREAKAGE. SMALL PIECES CREATED BY BROKEN PACKING WILL INCREASE RTO PRESSURE DROP, AND MAY RESULT IN UNEVEN FLOW DISTRIBUTION, WHICH WILL ALSO AFFECT HEAT RECOVERY EFFICIENCY.

CARE MUST BE TAKEN IN INSTALLING THIS MATERIAL.

BOXES OR SUPERSACKS SHOULD BE LOWERED INTO THE HEAT RECOVERY CHAMBER USING A CRANE.

DO NOT DROP CERAMIC MEDIA INTO CHAMBERS. IMPROPER OPERATION WILL OCCUR, AND THE WARRANTEE WILL BE VOIDED.

SUPERSACKS MUST BE LOADED INTO THE CHAMBER ONE AT A TIME, UNTILL THE SACK BOTTOM RESTS ON A FIRM SUPPORT. THE SACKS CAN THEN BE CUT WITH A RAZOR KNIFE, AND THE MEDIA ALLOWED TO "FLOW" GENTLY OUT, SPREADING ACROSS THE BED. SUBSEQUENT SACKS SHOULD BE PLACED AT ANY LOW AREAS, TO MINIMIZE THE NEED TO REDISTRIBUTE THE MEDIA ONCE PLACED. THE CHAMBERS SHOULD BE FILLED TO A UNIFORM DEPTH OF ± 1/2".

MEDIA DESIGN WITH WEIGHTS

LAYER 1 – 3" THK. 1 1/2" SADDLES @ 40 LBS/FT3 x 24.843 FT2 = 6.21 FT3 = 248.4 LBS.
LAYER 2 – 72" THK. 1" SADDLES @ 43 LBS/FT3 x 24.843 FT2 = 149.06 FT3 = 6409.6 LBS.

TOTAL EACH = 6658 LBS.
TOTAL (2) = 13,316 LBS.

MET-PRO Environmental Air Solutions

TITLE: MEDIA LOADING DIAGRAM
REGENERATIVE THERMAL OXIDIZER
RTO-6-G

DRAWN	RCG	24 AUG 11
CHECKED	RCG	24 AUG 11
APPROVED	RCG	24 AUG 11

SIZE: D | CODE IDENT NO: 91340 | DWG NO: 113320-63531 | REV.

NEXT ASSY: – | USED ON: 63530 | APPLICATION

APPENDIX C
TREATMENT SYSTEM O&M MANUAL

Customer:	Canton Renewables, LLC
Project:	Michigan LFG
P.O. No.:	07-10003
Service:	Gas Compression
Vilter S. O. No.:	S123383

EMERSON Climate Technologies

GAS COMPRESSION SYSTEM OPERATING MANUAL
TABLE OF CONTENTS

BOOK 1 OF 3

GAS COMPRESSION SYSTEM OPERATING MANUAL
TABLE OF CONTENTS

BOOK 2 OF 3

GAS COMPRESSION SYSTEM OPERATING MANUAL
TABLE OF CONTENTS

BOOK 3 OF 3

APPENDIX D
LANDFILL GAS TREATMENT PLAN

Landfill Gas Treatment Plan

Canton Renewables, LLC

August 2021

Prepared for:
Canton Renewables, LLC
4345 South Lilley Road
Canton Township, MI 48188

PLAN CERTIFICATION

Landfill Gas Treatment Monitoring Plan

Canton Renewables, LLC
Canton, Michigan

The material and data in this report were prepared under the supervision and direction of the undersigned.

Aria Energy, LLC
46280 Dylan Drive, Suite 200
Novi, MI 48377

Frank Yenchick
Regional Manager

Emily Zambuto

Emily Zambuto
Manager of Environmental Programs

TABLE OF CONTENTS

Review & Revision History

Add the effective date of the most-recent revision to the list below. Do not overwrite or delete any dates. This is intended to be a complete record of all revisions made to this Plan.

Date of Initial Issuance
June 15, 2012
Review/Revision Dates
June 15, 2017 Review only
August 31, 2021 Revised for 40 CFR 62, Subpart OOO

1 INTRODUCTION

Canton Renewables, LLC (CR), an operating subsidiary of Aria Energy, LLC (Aria), operates a landfill gas to high Btu facility at the Sauk Trail Hills Development (Sauk) landfill located in Canton, Michigan. Sauk is subject to the United States Environmental Protection Agency, (USEPA) New Source Performance Standards (NSPS) and it has been modeled that the facility has the potential to emit greater than 50 megagrams per year of non-methane organic compounds (NMOC's).

This Site-Specific Treatment System Monitoring Plan is being prepared because Sauk Trail Hills Development Landfill (Site) is or will be subject to control requirements under 40 CFR 62, Subpart OOO and 40 CFR 63, Subpart AAAA. As part of the landfill gas collection and control system (GCCS) on-site, all or a portion of the landfill gas is "treated" as part of its overall management prior to sale or beneficial use. Per §62.16730/§63.1990, a treatment system is one that filters, de-waters, and compresses landfill gas for sale or beneficial use.

A treatment system is one of the acceptable "control systems" under the NSPS/NESHAP rule as set forth in §62.16714(c)(3)/§63.1959(b)(2)(iii)(C), which read that the owner may:

> *Route the collected gas to a treatment system that processes the collected gas for subsequent sale or beneficial use such as fuel for combustion, production of vehicle fuel, production of high-Btu gas for pipeline injection, or use as a raw material in a chemical manufacturing process. Venting of treated landfill gas to the ambient air is not allowed. If the treated landfill gas cannot be routed for subsequent sale or beneficial use, then the treated landfill gas must be controlled according to §62.16714 (c)(1) or (c)(2)/ §63.1959(b)(2)(iii)(A) or (B).*

Since CR receives a portion of the landfill gas collected from the Site and it processes it through a LFG pretreatment system which will act as a control system for the landfill gas subject to NSPS/NESHAP control, the monitoring requirements, specifically §62.16722(g)/ §63.1961(g) require that:

> *The treatment system must maintain and operate all monitoring systems associated with the treatment system in accordance with the site-specific treatment system monitoring plan required in §62.16726(b)(5)(ii)/§63.1983(b)(5)(ii).*

This site-specific treatment system monitoring plan satisfies the requirements of §62.16726(b)(5)(ii)/§63.1983(b)(5)(ii).

This Plan also meets the requirements of the Permit to Install (PTI) #98-11A Condition EUTREATMENTSYS VII.1 issued by the Michigan Department of Environment, Great Lakes & Energy (MI EGLE) Air Quality Division (AQD). In accordance with the PTI, all landfill gas is processed in a treatment system before it is processed further by the High Btu equipment,

RTO, and open flare. A summary of the treatment equipment which landfill gas travels through the CR plant can be found in Section 2 of this Report.

1.1 Canton Renewables Process Description

The Canton Renewables facility is designed to accept up to 3,200 scfm of landfill gas from Sauk Trail Hills Development Landfill to beneficially recover the methane portion of the gas through a series of steps: LFG Pretreatment, LFG Compressor & CO2 Removal, Product Gas Polishing and Product Gas Compression and Dehydration. The raw LFG is first collected from the Landfill's active GCCS under a vacuum created by use of positive displacement blowers.

The LFG then passes through the LFG pretreatment section which consists of gas chillers, filters and moisture separators.

After the LFG is chilled and moisture removed, the treated LFG is compressed and sent to a water-scrubbing process for CO2 removal. This gas then goes through an oxygen removal system to produce High Btu methane gas. This pipeline quality [methane gas] is then compressed and dehydrated for delivery into the existing natural gas distribution system.

The off-gas from the CO2 removal process is stripped out of the water and passed to a regenerative thermal oxidizer (RTO) for the destruction of HAP's and VOC's.

The addition of propane can be added during LFG quality upsets. This propane is injected at the front end of the plant in the LFG pretreatment section. An open backup flare is used to control process gas from the High Btu equipment and only accepts gas which has already been treated; the flare does not accept untreated LFG. LFG is routed to the flare when treated LFG/process gas does not meet pipeline quality specifications or treatment process faults occur.

1.2 SCADA

Data related to inlet landfill gas flow/methane content is monitored continuously and recorded by the facility's SCADA system. The CR responsible personnel also compile and distribute this information daily to ensure abnormalities are identified in a timely manner. Monthly Production Data is finalized and submitted for QA/QC review no later than the 15th of the following month.

2 EQUIPMENT FUNCTION AND MONITORING

CR operates a landfill gas treatment system covered by this Plan. CR also operates an open flare and RTO that are used to combust treated landfill gas and a low Btu waste gas stream from high Btu cleanup process respectively. These units are identified as EUTREATMENTSYS and individual stacks to EULFGPLANT in MI-ROP-P0270-2012a issued by the MDEQ-AQD.

The following equipment is utilized in the approved Landfill Gas Treatment System at CR:

1. Condensate/liquids knockout tank for dewatering purposes
2. 30-inch diameter vertical moisture separator
3. One of two positive displacement 200 horsepower model 400 VMC series compressors for compressing the gas to approximately 9 pounds per square inch gauge (psig)
4. 24-inch diameter vertical moisture separator
5. Shell and tube style landfill gas chiller provided by Vilter which cools the compressed gas
6. Rosemont Inlet Flow Meter Model No. 1595P140A3SC065

CR has developed a set of operating parameters to be routinely checked. These will be recorded and monitored over time and are subject to change and revision through the operation and balancing of the plant. Each piece of equipment provides a specific function in the treatment process and CR monitors various parameters at each piece of equipment on a scheduled basis to determine that the equipment is performing its intended function. The following summarizes the function of each piece of equipment and what CR monitors to determine it is operating properly.

2.1 Condensate Knockout—LFG Inlet Sump

This vessel functions very similarly to a civil engineering designed manhole/pump station. Wet gas flows via headers pipes into this sump. Due to the diameter of the sump and change in flow direction the gas slows down and as a result condensate droplets in the gas fall to the bottom of the sump. Collected condensate in the Inlet Sump is pumped pneumatically into the plant waste water system.

The CR staff observes the Inlet Sump level weekly and initiates pump down of the sump as needed into the plant waste water system.

2.2 Condensate Knockout Tank--SEP-101

The purpose of SEP-101 (30-inch diameter vessel) is liquid removal. Wet gas flows from the plant header pipe under vacuum into SEP-101. Due to the diameter of the tank, the gas slows down/hits the walls of the vessel, and as a result condensate droplets in the gas fall to the bottom of the tank. Additionally, a vane mist eliminator with drain legs helps to filter the landfill gas to 8 microns at an efficiency of 99.9%. As the wet gas flows through the vane mist eliminator droplets are forced into contact with larger droplets, and drain to the bottom of the tank through a drain leg. Condensate collected in the bottom of the separator is automatically pumped directly to the plant waste water system.

The plant SCADA system constantly monitors the differential pressure across the moisture separator. On a weekly basis, an operator observes the liquid level in the moisture separator via a sight glass.

2.3 Positive Displacement Blowers

Two positive displacement blowers move the gas, by applying a vacuum on the wellfield and providing positive pressure gas to the downstream treatment system and High Btu equipment. Each blower is powered by an explosion proof 200 hp electric motor.

CR staff observes the blower oil levels daily and records this on the daily operator checklist. Process parameters related to the blowers including pressures and temperatures are constantly monitored and recorded by the plant SCADA system. The SCADA control system will trigger an alarm to indicate an out-of-range process value. On a daily basis, an operator observes the operation of the electric motors, listens for out of the ordinary sounds and checks for significant changes in vibration or temperature. Additionally, a third party performs advanced vibration monitoring on the blowers and drive motors at regular monthly intervals.

2.4 Vertical Moisture Separator--SEP-102

This 24-inch diameter vessel operates in an identical manner to SEP-101 as described above.

The plant SCADA system constantly monitors the differential pressure across this vessel. The liquid level in SEP-102 is automatically managed by a series of level switches and actuated dump valves. There is also a sight glass on the vessel for operator verification and troubleshooting.

2.5 Landfill Gas Chiller--CH-100

The purpose of the chiller is to cool the landfill gas to lower its dew point to remove the majority of any remaining moisture. Like most cooling systems, the chiller has compressed refrigerant that needs to be operating within pressure and temperature ranges.

The plant SCADA system constantly monitors the refrigerant temperature and pressure in the chiller as well as the gas temperature and pressure prior to and after the chiller. The CR operators visually observe the refrigerant levels in the reservoir tank daily and listen to the chiller compressor for any abnormal sounds. The chiller is integrated into the plant's SCADA system and various out-of-range process values will trigger an alarm to the operator. Additionally, a third party performs advanced vibration monitoring on the chiller compressor and drive motor at regular monthly intervals.

Table 1 - Landfill Gas Treatment System Monitoring Plan

Equipment	Parameter	Inspection Frequency	Monitoring Device	Range of Operation	Basis
Compressor/ Blower	Discharge Pressure (compression)	Continuously Monitored by SCADA	pressure monitoring device	1-10 psi	Manufacturer Recommendation
Coalescing Filter Vessel / Final Gas Filter	Differential Pressure (filtration)	Continuously Monitored by SCADA	pressure monitoring device	0.0 - 4.0 psi/2 to 100 inches WC (Differential pressure between inlet & outlet of filter vessel)	Manufacturer Recommendation
Gas Cooler (moisture removal)	Differential Temperature (de-watering)	Continuously Monitored by SCADA	temperature gauges	Differential temperature of at least 10°F	Manufacturer Recommendation

Reviewed and approved by: Frank Yenchick, Regional Manager

3 MAINTENANCE & RESPONSIBLE PERSONNEL

As discussed in previous sections, CR responsible personnel observes and documents the operation of the treatment system on regular intervals. If an operator observes that the equipment is operating abnormally, or if an operator observes/documents that an operating parameter is out of its recommended/ normal range, than maintenance actions will be taken. Regular preventative maintenance and non-routine maintenance will be performed on the Landfill Gas Treatment System in accordance with the Preventative Maintenance/ Malfunction Abatement Plan which is maintained onsite. Various alarms will signal if a piece of equipment experiences a malfunction and is no longer able to function correctly.

All supervisory personnel responsible for overseeing the inspection, maintenance, and repair of the plant are listed below:

Name	Title	Phone Number
Jeremy Snyder	RNG Operations Manager	315.877.6479
Frank Yenchick	RNG Regional Manager	734.796.6763
Chase VanEckoute	Lead Operations Technician	734.776.9387
Don Franzen Greg Franzen	Operations Technicians	734.397.0715

4 REGULATORY SUMMARY

This site-specific treatment system monitoring plan satisfies the requirements of §62.16726(b)(5)(ii)/§63.1983(b)(5)(ii). Each element of the monitoring plan is listed here followed by the site-specific information related to this specific treatment system. The requirement will be shown in bold, italicized text followed by the site-specific response for the Site.

§62.16726(b)(5)(ii)(A)/§63.1983(b)(5)(ii)(A) Monitoring records of parameters that are identified in the treatment system monitoring plan and that ensure the treatment system is operating properly for each intended end use of the treated landfill gas. At a minimum, records should include records of filtration, de-watering, and compression parameters that ensure the treatment system is operating properly for each intended end use of the treated landfill gas.

Per §62.16722(g)(1)/§63.1961(g)(1), flow must be continuously (at least once every 15 minutes) monitored into the treatment system. The flow measurement device will be maintained and calibrated per manufacturer's recommendations. Also, per §62.16722(g)(2)/§63.1961(g)(2), if there is a bypass line, from the treatment system, it must be secured in the closed position and inspected at least monthly to verify that gas is not being diverted to the bypass line and circumventing appropriate NSPS control.

Per §62.16726/§63.1983 all records must be 5 years up-to-date, readily accessible, on-site. Off-site records may be maintained if they are retrievable within 4 hours. Either paper copy or electronic formats are acceptable. The person(s) performing the inspection as per the frequency listed in Table 1, will record the observed value and determine if the value is within the range of operation. If the recorded value is out of the range of operation, they will immediately take corrective action, including contacting all relevant staff, as necessary. Furthermore, collected data and a description of the actions taken will be placed into the plant file.

§62.16726 (b)(5)(ii)(B)/§63.1983(b)(5)(ii)(B) Monitoring methods, frequencies, and operating ranges for each monitored operating parameter based on manufacturer's recommendations or engineering analysis for each intended end use of the treated landfill gas.

Table 1 describes monitoring methods, frequencies, and operating ranges for each monitored treatment operating parameter.

§62.16726 (b)(5)(ii)(C)/ §63.1983(b)(5)(ii)(C) Documentation of the monitoring methods and ranges, along with justification for their use.

The justification for the monitoring methods and ranges for each monitored treatment operating parameter is based on operational experience and/or manufacturer recommendation. This section is required since the ranges of these treatment parameters are not prescribed by the NSPS rules, rather, they are to be set on a site-specific basis (since different beneficial uses and gas sales require different levels of treatment).

§62.16726 (b)(5)(ii)(D)/§63.1983(b)(5)(ii)(D) Identify who is responsible (by job title) for data collection.

The following job titles that are authorized to take these readings: Regional Manager, Lead Operator Technician, Operator Technician.

§62.16726 (b)(5)(ii)(E)/§63.1983(b)(5)(ii)(E) Processes and methods used to collect the necessary data.

Table 1 demonstrates how each type of treatment parameter (filtration, de-watering, and compression) will be monitored.

§62.16726 (b)(5)(ii)(F)/§63.1983(b)(5)(ii)(F) Description of the procedures and methods that are used for quality assurance, maintenance, and repair of all continuous monitoring systems.

The data and equipment are reviewed regularly during the month to verify accuracy and to evaluate for trends that may be characteristic of diminishing performance. Additionally, staff will perform visual inspections of the equipment and note issues as they arise. Repairs will be made as necessary. At a minimum, filters will be cleaned and or replaced as needed to maintain the listed differential pressures.

5 IMPLEMENTATION OF AND UPDATES TO PLAN

5.1 Implementation of the Plan

This Treatment System Report has been prepared by Canton Renewables to meet the MDEQ's requirements for the treatment system at the CR located at Sauk Trail Hills Development Landfill. This plan is not intended to comprehensively address every possible monitoring or maintenance activity that could be conducted on the treatment system, but rather this plan does establish the following:

1. A general understanding of the function of each piece of equipment in the treatment system.

2. Operational parameters that will be observed and documented throughout the treatment system to indicate proper performance

3. Appropriate monitoring procedures of the treatment system.

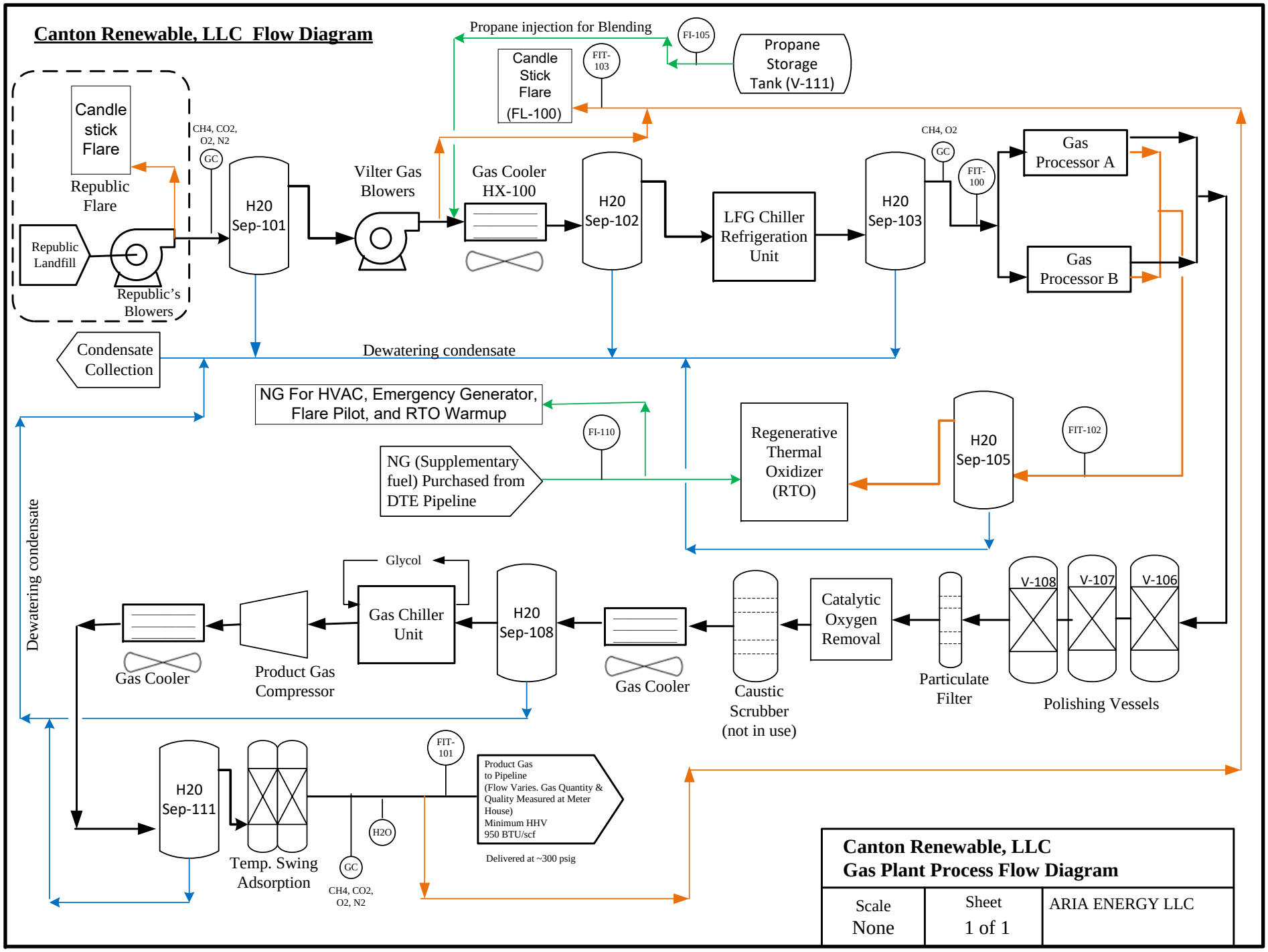
The overall goals of this plan are to provide assurance to the MI EGLE - AQD that the treatment system is being operated and maintained in a manner that complies with the NSPS while allowing CR the operational flexibility to maximize the processing of the landfill gas.

If the Plan fails to address or inadequately addresses regulatory requirements set forth by MI EGLE, or 40 CFR 62, Subpart OOO and 40 CFR 63, Subpart AAAA , the plan shall be revised within 45 days.

5.2 Updates to the Plan

This Plan will be updated within 60 days of replacing or expanding the components of the landfill gas treatment system. If no components of the plant are replaced or expanded with components described herein, the Plan will be reviewed and updated as needed at least once every 5 years.

APPENDIX A
Simplified Block Flow Diagram


Canton Renewable, LLC Flow Diagram
Propane injection for Blending
FI-105
Propane Storage Tank (V-111)
Candle Stick Flare (FL-100)
FIT-103
Candle stick Flare
Republic Flare
Republic Landfill
Republic's Blowers
CH4, CO2, O2, N2
GC
H20 Sep-101
Vilter Gas Blowers
Gas Cooler HX-100
H20 Sep-102
LFG Chiller Refrigeration Unit
H20 Sep-103
CH4, O2
GC
FIT-100
Gas Processor A
Gas Processor B
Condensate Collection
Dewatering condensate
NG For HVAC, Emergency Generator, Flare Pilot, and RTO Warmup
FI-110
NG (Supplementary fuel) Purchased from DTE Pipeline
Regenerative Thermal Oxidizer (RTO)
H20 Sep-105
FIT-102
Dewatering condensate
Glycol
Gas Chiller Unit
H20 Sep-108
Gas Cooler
Product Gas Compressor
Gas Cooler
Caustic Scrubber (not in use)
Catalytic Oxygen Removal
Particulate Filter
V-108
V-107
V-106
Polishing Vessels
H20 Sep-111
Temp. Swing Adsorption
GC
CH4, CO2, O2, N2
H2O
FIT-101
Product Gas to Pipeline (Flow Varies. Gas Quantity & Quality Measured at Meter House) Minimum HHV 950 BTU/scf
Delivered at ~300 psig
Canton Renewable, LLC
Gas Plant Process Flow Diagram
Scale
None
Sheet
1 of 1
ARIA ENERGY LLC

APPENDIX B
Inspection Checklist

CANTON PLANT DAILY OPERATOR CHECKLIST

ITEM	OPERATOR COMMENT
Record RTO delta P (normal range 4 to 15" wc)	
Record RTO flame arrestor delta P (normal range is 0 to 2" wc)	
Which air compressor is running (north or south)?	North
Is air drier on?	Yes
Record air compressor hours	
Record air compressor temp (normal range is 120 to 200 F)	
Drain chemical room sump if needed	☐
Check for level in SEP-105 and drain if needed	☐
Any leaks in chemical room?	No
Add 1 gallon of bleach to Neutralization Tank	☐
Vacuum reading at SEP-105 inlet (normal range -5 to +5" wc)	
Check/replace waste water filters if needed	☐ Not Replaced
Record LEL reading in GC cabinet (normal range 0 to 3%)	0%
Record LEL reading in gas analyzer cabinet (normal range 0 to 3%)	0%
Check booster inlet drip leg valve. Any moisture?	No
Is Booster inlet pressure between 105-115 psi? If not, adjust regulator	Yes
Booster compressor oil level ok?	Yes
Record glycol pressure at booster (normal range 10 to 30 psi)	
Which sightglass from bottom has the liquid ammonia level on the chiller HX?	3rd
Which sight glass,from the bottom has liquid ammonia level on the receiver?	2nd
Ammonia chiller compressor oil level ok?	☐
Vilter blower oil levels ok?	☐
Check north mezzanine. Any leaks?	No
Record the booster compressor inlet gas temp	
A-line oil tank level ok?	☐
Check water filters on A-line. Record if cleaned.	☐
Drain A-line IFM coalescing filters	☐
Add 1 gallon of bleach to A-line	☐
Check A-radiator for any leaks	☐
B-line oil tank level ok?	☐
Check water filters on B-line. Record if cleaned.	☐
Drain B-line IFM coalescing filters	☐
Add 1 gallon of bleach to B-line	☐
Check B-radiator for any leaks.	☐
Pump oil layer off of decant tote	☐
Does transformer dike need water drained? If oil sheen, report it.	No
Record Nitrogen tank level in inches (full is 65")	
Record Propane tank level (full is 80%)	
Today's date:	
Filled out by:	

CANTON PLANT WEEKLY OPERATOR CHECKLIST

ITEM	OPERATOR COMMENT
Open and clean ash from bottom of RTO stack.	
Add 10 gals of peroxide to each train and waste water system.	
Empty the IFM buckets.	
Remove Greenlane water filters and inspect for tears.	
Switch strainers on the neutralization system.	
Record helium pressure on product gas GC	
Drain blue dessicator in analyzer cabinet	
Record helium bottle pressure in LFG GC cabinet. (normal above 100 psi)	
Check LFG GC condensate bottle if needs to be dumped.	
Check LFG GC dP gauges. (should be within 2 psi of each other)	
Record raw gas sample cooler dewpoint. (normal is 0 to 6 degrees C)	
Record Drager tube test of H2S on the landfill gas (ppm)	
Drain SEP-108 via manual drain valve	
Activate outdoor safety shower on north wall. Run for 2 minutes.	
Check operation of chemical room safety shower and eye bath (flow >0.4gpm)	
Check operation of main room safety shower and eye bath (flow >0.4gpm)	
Any level detected in the raw gas sump to plant?	No
Any level detected in SEP-101? If so, pump down.	☐
Winter only--heat trace light ON? Cabinet heater ON?	Not Winter
Winter only--record temperture inside the RPZ enclosure	Not Winter
Record dP across polishing IFM on A-Line (normal 2-4psi)	
Record dP across polishing IFM on B-Line (normal 2-4psi)	
Record pressure in 4-gas meter calibration gas bottle	
Today's date:	
Filled out by:	

DO NOT SAVE
ONLY SIGN THIS DOCUMENT

APPENDIX E
SPARE PARTS INVENTORY

Inventory Balance

Company/Branch: 9010
User: Frank Yenchick

Date: 3/31/2022 8:15 AM

Inventory ID	Warehouse	Description	Unit Cost	On Hand	Not Available	Expired	Available
0002558	9010	Ignition Transformer 6000V	542.00000	1.00	0.00	0.00	1.00
01-047-009	9010	Booster-oil filter gasket	0.00000	2.00	0.00	0.00	2.00
0400 FE	9010	Greenlane-Sureflow 4" SS 150# wafer	1,070.00000	1.00	0.00	0.00	1.00
060G5654	9010	Pressure Trans Sensor AKS 33 1/8NPT,	274.79000	1.00	0.00	0.00	1.00
060G5655	9010	Pressure Trans, Danfoss, Sensor AKS	274.79000	1.00	0.00	0.00	1.00
0794071	9010	Watts 1-1/4 - 2 909 TOT Rep Kit	649.36000	1.00	0.00	0.00	1.00
1022111, 1060129	9010	Flare thermocouples	1,115.44000	2.00	0.00	0.00	2.00
10264826-4	9010	3.5" face glycerin filled lube oil pressure	0.00000	1.00	0.00	0.00	1.00
10SV8FH4F60	9010	City Water Booster Pump, Xylem e-SV,	2,790.00000	1.00	0.00	0.00	1.00
1105703047	9010	VFD cooling fan supply board for CFW11	0.00000	1.00	0.00	0.00	1.00
1107/211/029	9010	VT01295U Dry Cooler chiller fan	1,445.43000	3.00	0.00	0.00	3.00
11305	9010	LFG/Offgas Sample Pump Rebuild Kit,	97.00000	3.00	0.00	0.00	3.00
11488450	9010	VFD ribbon cable	0.00000	1.00	0.00	0.00	1.00
11550548	9010	VFD Profinet-05 comm card	0.00000	1.00	0.00	0.00	1.00
11818-00000-20	9010	3M Virtua Clear Frame Anti Fog 20/cs	3.23478	23.00	0.00	0.00	23.00
11882255	9010	Booster-Electric Motor, WEG, 200HP,	0.00000	1.00	0.00	0.00	1.00
12017561	9010	VFD power supply DF02B.720-4	0.00000	1.00	0.00	0.00	1.00
12295732	9010	VFD axial cooling fan 48V CC	203.27500	2.00	0.00	0.00	2.00
12301540	9010	VFD wiring harness 242-312A	0.00000	1.00	0.00	0.00	1.00
12786089	9010	VFD FCU rack CC11D1.01	0.00000	1.00	0.00	0.00	1.00
12VITON	9010	12" O-Ring Viton	0.00000	2.00	0.00	0.00	2.00
1391441	9010	Pilot Repair Kit for KE-1B	1,625.00000	1.00	0.00	0.00	1.00
13X48B-308SD	9010	drier desiccant mSORB 13X 4X8 mesh	594.99250	4.00	0.00	0.00	4.00
150W	9010	NW 50/62/75/500/650/800 (5/bag)150	69.95636	22.00	0.00	0.00	22.00
15700773	9010	LS200SS-D - F Murphy SS float switch	413.00000	1.00	0.00	0.00	1.00
15U851	9010	Universal absorbent pad medium 100/	59.32000	2.00	0.00	0.00	2.00
16-155-630-002	9010	Ro-Flo Model 19L Compressor, CCW125,	0.00000	1.00	0.00	0.00	1.00
16-155-744-102	9010	Ro-Flo Model 219M Compressor,	0.00000	1.00	0.00	0.00	1.00
16-242-090-006	9010	Ro-Flo Compressor Mechanical Seal	1,406.00000	1.00	0.00	0.00	1.00
16-630-888-031	9010	Ro-Flo Compressor Angled Lube Check	142.20000	14.00	0.00	0.00	14.00

Inventory Balance

Company/Branch: 9010
User: Frank Yenchick

Inventory ID	Warehouse	Description	Unit Cost	On Hand	Not Available	Expired	Available
16-630-888-036	9010	Ro-Flo Compressor Oil Quill 6" & Check	141.75000	1.00	0.00	0.00	1.00
16-630-888-037	9010	Ro-Flo Compressor Oil Quill 8" & Check	141.75000	2.00	0.00	0.00	2.00
169712	9010	WW Flow Meter - Siemens MAG Meter 3"	3,026.80000	1.00	0.00	0.00	1.00
1769-OF4CI	9010	Isolated Current Output Module, 4 CH	0.00000	1.00	0.00	0.00	1.00
179126	9010	Dry Cooler chiller flow switch FS254	0.00000	1.00	0.00	0.00	1.00
179595	9010	Flyght Grinder Pump MP3068.890 1.500	2,130.00000	2.00	0.00	0.00	2.00
1901067-001	9010	02 Sensor for Ultramat 23	395.00000	1.00	0.00	0.00	1.00
1901105-001	9010	Siemens IR Source for the Ultramat 23	587.66500	2.00	0.00	0.00	2.00
1CMCT11001C	9010	Ro-Flo compressor thermostatic valve	315.50000	1.00	0.00	0.00	1.00
1VJZ6	9010	3M safety glasses Virtua V4 pair -	4.42000	1.00	0.00	0.00	1.00
2051CD2A22A1AS2K5	9010	4Q8-Stripping tower level transmitter	0.00000	1.00	0.00	0.00	1.00
20A11CM273	9010	Booster o-ring	0.00000	6.00	0.00	0.00	6.00
20A11EM011	9010	Booster Dura Wear o-ring	0.00000	2.00	0.00	0.00	2.00
20A11EM028	9010	Booster Dura Wear o-ring	0.00000	12.00	0.00	0.00	12.00
20A11EM043	9010	Booster Dura Wear o-ring	0.00000	3.00	0.00	0.00	3.00
20A11EM046	9010	Booster Dura Wear o-ring	0.00000	1.00	0.00	0.00	1.00
20A11EM222	9010	Booster o-ring	0.00000	1.00	0.00	0.00	1.00
20A11EM452	9010	Booster front cover o-ring	0.00000	1.00	0.00	0.00	1.00
21NM38	9010	Pigskin Leather Work Gloves, Slip-On	7.29000	1.00	0.00	0.00	1.00
220042GV1	9010	access cover gasket	0.00000	2.00	0.00	0.00	2.00
23SH4L43A2	9010	M05 close-coupled motor/pump, 316 SS,	4,990.00000	1.00	0.00	0.00	1.00
25A13C66	9010	Rollpin 7318.29.00.00	2.00000	4.00	0.00	0.00	4.00
26651	9010	Flare ignitor spark plug	139.90000	2.00	0.00	0.00	2.00
274S2P	9010	RTO Combustion Air Blower Filter	601.00000	2.00	0.00	0.00	2.00
2HP06P184T208230/	9010	Fan motor for HX-112	634.59000	1.00	0.00	0.00	1.00
2ST1J5A4	9010	Glycol Cooling Pump, close-coupled w/	1,582.43000	1.00	0.00	0.00	1.00
3/88.9 741-743-744	9010	3" Victaulic seal for Dry Cooler radiator	0.00000	3.00	0.00	0.00	3.00
300018AK7	9010	Booster piston rod oil deflector	0.00000	1.00	0.00	0.00	1.00
3003433779-11	9010	LFG Chiller Reconditioned Motor 150	7,128.00000	1.00	0.00	0.00	1.00
300800-11010639	9010	Bray Series 8" 30 Butterfly Valve, Wafer	431.00000	2.00	0.00	0.00	2.00

Inventory Balance

Company/Branch: 9010
User: Frank Yenchick

Inventory ID	Warehouse	Description	Unit Cost	On Hand	Not Available	Expired	Available
300W	9010	50/62/75/500/650/800 (5/bag) 300 micron	96.96600	10.00	0.00	0.00	10.00
30-410-205	9010	Element Filter W132325T2 for	130.14400	5.00	0.00	0.00	5.00
318 F3W-D LPC	9010	Kimray 3" FLGD 3-way Valve, 2000 I/P	1,380.43000	1.00	0.00	0.00	1.00
321-3237N936	9010	SEP-111 Dust Filter	278.00000	3.00	0.00	0.00	3.00
345-FV-A30-PM-2510	9010	Neutral Pump Wet End, Viton o-rings/	2,789.42000	1.00	0.00	0.00	1.00
35104-6604	9010	1/16" thk style 3500 LG Fawn Color	94.87000	1.00	0.00	0.00	1.00
377P	9010	Stripper blower Air filter polyester	0.00000	0.00	0.00	0.00	8.00
3NHF2	9010	33dB Disposable Bell-Shape Ear Plugs;	31.37000	1.00	0.00	0.00	1.00
3YB70	9010	Powder Dishwasher Detergent, 10 lb.	22.03200	5.00	0.00	0.00	5.00
40102790	9010	Air handler filters 16 X 25 X 2 MERV 8	5.36000	72.00	0.00	0.00	72.00
4217172	9010	Pressure Transmitter E-10	483.00000	1.00	0.00	0.00	1.00
4261008300001	9010	scrubber sight glass	0.00000	2.00	0.00	0.00	2.00
48RU08	9010	Plastic Danger-do not operate-	1.68458	59.00	0.00	0.00	59.00
499-810874	9010	499-810874 Simtronics Sample Flow	0.00000	1.00	0.00	0.00	1.00
4SEN09-1	9010	O2 sensor, T2, trace, inert and CO2	154.00000	2.00	0.00	0.00	2.00
4SEN19	9010	O2 sensor, P5, Acid Gas, 0-500 ppm H2S	205.00000	3.00	0.00	0.00	3.00
50503022	9010	Pressure Transmitter E-11	549.50000	1.00	0.00	0.00	1.00
506	9010	Greenlane DNFT no-flow detection	0.00000	2.00	0.00	0.00	2.00
561P4003622-362	9010	Neutral Pump Magnetic Drive, 1 1/8"	820.00000	1.00	0.00	0.00	1.00
5W513	9010	Air filters 24 X 24 X 1 MERV 7 synthetic	6.90000	6.00	0.00	0.00	6.00
600189-P 104826	9010	Mobil DTE heavy circulating oil 5-gal	29.85977	43.00	0.00	0.00	43.00
606202-D 104847	9010	Mobil Rarus 427 ISO 100 Bulk/Tote	22.24841	270.00	0.00	0.00	270.00
6222202	9010	Air handler filters 16 X 20 X 2 MERV 8	4.03000	6.00	0.00	0.00	6.00
624-SS-CCSF-N	9010	5" Heat Exchanger, 316 SS W/2 micron	2,803.20000	1.00	0.00	0.00	1.00
626424	9010	Air handler filters 20 X 25 X 2 Polyester	9.62688	32.00	0.00	0.00	32.00
63245-55P	9010	Ethylene glycol 45% 55-gal drums	6.86964	55.00	0.00	0.00	55.00
708FX2-ST	9010	Ntron Ethernet Switch 708 FX2	1,021.50000	1.00	0.00	0.00	1.00
750XBXH-120A	9010	120VAC, 8-pin Octal Base Relay	97.57000	6.00	0.00	0.00	6.00
750XBXH-24D	9010	24VDC, 8-Pin Octal Base Relay	90.69000	4.00	0.00	0.00	4.00
750XCXH-120A	9010	G2086375 - Vilter Relay (6CVR9)	98.01750	8.00	0.00	0.00	8.00

Inventory Balance

Company/Branch: 9010
User: Frank Yenchick

Inventory ID	Warehouse	Description	Unit Cost	On Hand	Not Available	Expired	Available
7814635-14300	9010	iTRANS H2S analyzer 0-50 ppm H2S 0.5	0.00000	1.00	0.00	0.00	1.00
7MB2337-3CR16-	9010	Ultramat 23, NDIR Gas Analyzer for CO2,	0.00000	1.00	0.00	0.00	1.00
8101-HI-TX-02	9010	8 Channel Hart Enabled AI Module 1	982.83000	1.00	0.00	0.00	1.00
8705PSA080P	9010	Rosemount Magnetic Flow Meter	5,396.26000	1.00	0.00	0.00	1.00
9020-621	9010	Tuthill blower Model 9020-82L2	0.00000	1.00	0.00	0.00	1.00
90A11E222	9010	Booster backup o-ring	0.00000	1.00	0.00	0.00	1.00
A02311	9010	LFG/Offgas Sample Pump Bearings	42.00000	4.00	0.00	0.00	4.00
A13 2 METER	9010	Ro-Flo compressor lube oil drive belt	0.00000	1.00	0.00	0.00	1.00
A29	9010	drive belts AP29 for Exhaust Fan	6.78000	6.00	0.00	0.00	6.00
A3U501251100T3C	9010	Glycol radiator pump close-coupled with	2,280.00000	1.00	0.00	0.00	1.00
AE01	9010	Apex Oil Sample Kit w Particle Count 10/	18.59077	13.00	0.00	0.00	13.00
AE1832-N	9010	Greenlane Air vent eliminator for glycol	0.00000	1.00	0.00	0.00	1.00
AJT40	9010	40A Class J Fuse (HX-102 Equipment)	31.90000	13.00	0.00	0.00	13.00
ANKF4310C07PS1211	9010	ANSI Mag pump/motor assembly 4x3x10	0.00000	2.00	0.00	0.00	2.00
AP40	9010	drive belts AP40	11.77000	6.00	0.00	0.00	6.00
AP48	9010	drive belts AP48	6.85500	4.00	0.00	0.00	4.00
APO94A10034	9010	Apollo 3/4 94-A104 BR Ball Valve IPS	7.15167	6.00	0.00	0.00	6.00
APX450LABEL	9010	Apex Oil Samples 400 per roll	14.95000	4.00	0.00	0.00	4.00
AR-078-021-5	9010	multi-color alarm light tower AC/DC24V	0.00000	2.00	0.00	0.00	2.00
AT18-1630	9010	Thermal Dispersion Flow Switch	295.05000	3.00	0.00	0.00	3.00
AX40	9010	drive belts AX40	6.24667	3.00	0.00	0.00	3.00
B VIP S/N 5VBC156	9010	Booster Compressor	0.00000	1.00	0.00	0.00	1.00
B1428	9010	Baldwin spin-on oil filters B1428	8.76889	9.00	0.00	0.00	9.00
BOXPC-238	9010	ACP Thin Client for shelf spare	2,268.37000	1.00	0.00	0.00	1.00
BT-IAFODV-FSA-16	9010	Domed triple section burst disc, K3-	4,262.00000	1.00	0.00	0.00	1.00
BX75	9010	HV-1 drive belts BX75	30.53000	2.00	0.00	0.00	2.00
C7061F2001	9010	RTO-Honwell UV Flame Detect ExpPrf	2,353.86000	1.00	0.00	0.00	1.00
CH29101	9010	H2S Drager Tubes 100-2000 PPM 10pk	10.55733	30.00	0.00	0.00	30.00
CJB2ALU14ACX12.00	9010	Parker Air Cylinder 2A Series, 6" bore,	2,817.00000	1.00	0.00	0.00	1.00
CPX-M0FB34	9010	Greenlane FESTO Bus Node 548751	1,043.00000	1.00	0.00	0.00	1.00

Inventory Balance

Company/Branch: 9010
User: Frank Yenchick

Date: 3/31/2022 8:15 AM

Inventory ID	Warehouse	Description	Unit Cost	On Hand	Not Available	Expired	Available
DA51 S3P1A	9010	RTO Combustion air blower motor, 3 hP,	478.22000	1.00	0.00	0.00	1.00
DC120L 11121000	9010	RTO HI-HI temp switch UDC 1200 Micro-	0.00000	1.00	0.00	0.00	1.00
DCI 11701	9010	Dry Cooler chiller motor protector 115/	0.00000	1.00	0.00	0.00	1.00
DCI 12888	9010	Dry Cooler chiller coil unloader 115V, 50/	0.00000	1.00	0.00	0.00	1.00
DIX300ASS	9010	300ASS Stls Steel Type A Male X	63.24333	3.00	0.00	0.00	3.00
DS0200.B2A04K.22KC	9010	YV14 or YV15 actuator and positioner	0.00000	1.00	0.00	0.00	1.00
DYMO450	9010	Apex Oil Label Printer	75.00000	1.00	0.00	0.00	1.00
E0853M01-AL	9010	NANO Coalescing Filter Element	321.23333	9.00	0.00	0.00	9.00
ECMGT06E5SCBG	9010	Gasket, Lamons, CMGT 6" 300# 304/FG/	128.10000	4.00	0.00	0.00	4.00
EL20	9010	Cylform Standard Desiccant Element	29.50000	4.00	0.00	0.00	4.00
EP12-IS-100	9010	Dewpoint analyzer -20C to 70C	0.00000	1.00	0.00	0.00	1.00
EV8316G084V	9010	ASCO 1/2" Solenoid Valve, 3-way/2	601.00000	1.00	0.00	0.00	1.00
F08-01493-SSEZ	9010	2" 150# Flanged 316 SS ball valve (for	0.00000	1.00	0.00	0.00	1.00
FL7918A	9010	propane flowmeter	431.25000	1.00	0.00	0.00	1.00
G1058321	9010	Replacement Filter Mat, 6.81"W 5/pk	10.56667	6.00	0.00	0.00	6.00
GAF150880	9010	18" 150# Flexatallic Ring Gasket	31.84000	10.00	0.00	0.00	10.00
GD10-P00-24BC-0BH-	9010	GD10-P00-24BC-0BH-00 Infrared Gas	0.00000	1.00	0.00	0.00	1.00
GKTFBWR0001	9010	fiberglass filter felts 1"X13"dia	20.08500	12.00	0.00	0.00	12.00
GP-HEATERS	9010	Thermowell Type J Thermocouple (TSA	45.45000	1.00	0.00	0.00	1.00
H2O2	9010	Hydrogen peroxide solution tech-grade	1.90330	1,025.00	0.00	0.00	1,025.00
H59223	9010	Plate Valve 8481.90.90.85	257.91000	1.00	0.00	0.00	1.00
H59224	9010	Plate Dampening 8481.90.90.85	431.57000	1.00	0.00	0.00	1.00
HP-4A16	9010	Cincinnati Fan, RTO Comb Air Blower	2,493.00000	1.00	0.00	0.00	1.00
IAQM0010	9010	Booster Piston Rod	4,723.26000	1.00	0.00	0.00	1.00
ICFRAME32125-100-	9010	M02 power recovery turbine, Goulds	6,950.00000	1.00	0.00	0.00	1.00
ICFRAME42125-100-	9010	M02 Pump, Goulds Model IC Frame 42,	8,775.00000	1.00	0.00	0.00	1.00
IFS34F6N52G4ERJ-X	9010	Heater(TSA Heater)	5,686.20000	1.00	0.00	0.00	1.00
KAVP0923	9010	Dura Wear piston rings, 2PC A/C P/R,	232.65333	6.00	0.00	0.00	6.00
KDVK0017	9010	Booster Kit Packing Rebuild	0.00000	1.00	0.00	0.00	1.00
KEVK0001	9010	Booster Ring Set Renewal	0.00000	1.00	0.00	0.00	1.00

Inventory Balance

Company/Branch: 9010
User: Frank Yenchick

Date: 3/31/2022 8:15 AM

Inventory ID	Warehouse	Description	Unit Cost	On Hand	Not Available	Expired	Available
L-1	9010	Carbtrol drums 55-gal Type L-1	1,095.00000	3.00	0.00	0.00	3.00
M151-BT-WA1	9010	LFG GC-Single Head M-series Pump,	2,062.13500	2.00	0.00	0.00	2.00
M543	9010	M543-153/316SPEP/1 - Coalescing Filter	730.00000	20.00	0.00	0.00	20.00
M6002A	9010	Vilter blower oil cooler fan motor, 1/4 hP,	405.80000	1.00	0.00	0.00	1.00
M7285C1009/UHNWL	9010	Modutrol Motor, RTO Burner Valve	1,057.58000	1.00	0.00	0.00	1.00
M95H-3063-2627472	9010	Fisher backpressure, recycle reg.Type	5,531.43000	1.00	0.00	0.00	1.00
MLH59834CG3	9010	Scraper Oil Packing Assy	1,440.97000	1.00	0.00	0.00	1.00
MLH61693AG6	9010	Booster Inlet Valve 9.25 - G6	0.00000	1.00	0.00	0.00	1.00
MLH61693AG7	9010	Booster Inlet Valve 9.25 - G7	4,458.96500	2.00	0.00	0.00	2.00
MLH61695AG4	9010	Booster Discharge Valve 9.25	9,123.23250	4.00	0.00	0.00	4.00
MLLBVA0008G1	9010	Booster Packing Assy 4/5 VIP	5,053.14000	1.00	0.00	0.00	1.00
MM00312ET3E213T-	9010	WEG,3HPExplosion Prf,1200RPM,	460.80000	1.00	0.00	0.00	1.00
MM00518ET3E184T-	9010	WEG, 5HP Electric Motor, 1800 RPM,182/	348.13000	1.00	0.00	0.00	1.00
MR56-1008	9010	Stipper blower discharge line reducing	0.00000	1.00	0.00	0.00	1.00
NAOH	9010	Sodium hydroxide solution tech-grade	2.17963	1,340.00	0.00	0.00	1,340.00
NE7011739A1	9010	Element Assembly; 72800/D-A4,	8,033.00000	1.00	0.00	0.00	1.00
NGGC336	9010	PL-23 Element for 12CV11	0.00000	4.00	0.00	0.00	4.00
NW-01	9010	NW 50/62/75 Ref 31 Fixing Cap	14.90667	3.00	0.00	0.00	3.00
NW-02	9010	NW 50/62/75 Ref 29 Centrifugal Vane	33.83000	8.00	0.00	0.00	8.00
NW-03	9010	NW 50/62/75/ Ref 37 Drain Cock 1/2"	0.00000	3.00	0.00	0.00	3.00
NW-05	9010	NW 50/62/75 Ref 34 Cintropur,	207.40000	2.00	0.00	0.00	2.00
P425-125	9010	Gasket, Full Face, 150#, 14"	65.10000	4.00	0.00	0.00	4.00
PG1	9010	2" 150# flexatelic 304 /graphite	2.83077	13.00	0.00	0.00	13.00
PG12	9010	2" 150 Non Asbesto Ring Gask 1/8	4.15714	28.00	0.00	0.00	28.00
PG14	9010	3" 150 Non Asbesto Ring Gask 1/8	3.55083	12.00	0.00	0.00	12.00
PG16	9010	4" 150 Non Asbesto Ring Gask 1/8	10.95500	12.00	0.00	0.00	12.00
PG20	9010	8" 150 Non Asbesto Ring Gask 1/8	24.08000	12.00	0.00	0.00	12.00
PG22	9010	10" 150 Non Asbesto Ring Gask 1/8	18.10000	12.00	0.00	0.00	12.00
PG4	9010	6" 150# flexatelic 304 /graphite	4.31500	6.00	0.00	0.00	6.00
PG42	9010	16" 150# flexatelic 304 /graphite	49.66000	2.00	0.00	0.00	2.00

Inventory Balance

Company/Branch: 9010
User: Frank Yenchick

Date: 3/31/2022 8:15 AM

Inventory ID	Warehouse	Description	Unit Cost	On Hand	Not Available	Expired	Available
PG43	9010	1/2" 150# Flex atelic Gasket	0.00000	7.00	0.00	0.00	7.00
PG44	9010	3/4" 300# Flex atelic Gasket	1.92000	9.00	0.00	0.00	9.00
PG45	9010	1" 150# Flex atelic Gasket	0.00000	5.00	0.00	0.00	5.00
PG46	9010	1" 300# Flex atelic Gasket	0.00000	4.00	0.00	0.00	4.00
PG47	9010	1.5" 150# Flex atelic Gasket	0.00000	7.00	0.00	0.00	7.00
PG48	9010	1.5" 300# Flex atelic Gasket	0.00000	5.00	0.00	0.00	5.00
PG49	9010	2" 300# Flex atelic Gasket	2.66000	10.00	0.00	0.00	10.00
PG50	9010	12" 300# Flex atelic Gasket	12.00000	4.00	0.00	0.00	4.00
PG51	9010	14" 150# Flex atelic Gasket	28.87000	2.00	0.00	0.00	2.00
PG52	9010	24" 150# Flex atelic Gasket	0.00000	1.00	0.00	0.00	1.00
PG53	9010	30" 300# Flex atelic Gasket	0.00000	1.00	0.00	0.00	1.00
PG54	9010	30" 150# Flex atelic Gasket SERIES A	0.00000	1.00	0.00	0.00	1.00
PG55	9010	1" 150 Non Asbestos Ring Gasket 1/8	0.00000	7.00	0.00	0.00	7.00
PG56	9010	1.25" 150 Non Asbestos Ring Gasket 1/8	0.00000	5.00	0.00	0.00	5.00
PG57	9010	1.5" 150 Non Asbestos Ring Gasket 1/8	0.00000	6.00	0.00	0.00	6.00
PG58	9010	18" 150 Non Asbestos Ring Gasket 1/8	49.62000	12.00	0.00	0.00	12.00
PG59	9010	2" 300 Non Asbestos Ring Gasket 1/8	0.00000	11.00	0.00	0.00	11.00
PG6	9010	4" 300# flexatelic 304 /graphite	6.79000	1.00	0.00	0.00	13.00
PG60	9010	3" 300 Non Asbestos Ring Gasket 1/8	8.95000	6.00	0.00	0.00	6.00
PG62	9010	12" 150# Full Face Gasket 1/8	25.84750	4.00	0.00	0.00	4.00
PG63	9010	24" 150# Full-face 1/4" EPDM (Calgon	90.85500	2.00	0.00	0.00	2.00
PG64	9010	1/16" Graphoil ring gasket 14.2" X 17.7"	57.14750	4.00	0.00	0.00	4.00
PG65	9010	1/8" EPDM full-face gasket 24.5" X 30"	40.16600	5.00	0.00	0.00	5.00
PG66	9010	P425-062 - 1/16" Klinger gasket 28.25"	120.96000	4.00	0.00	0.00	4.00
PG67	9010	1/8" Thermiculite ring gasket 39" X	457.13000	1.00	0.00	0.00	1.00
PG68	9010	orifice gasket 4" 150# with 2.75" center	0.00000	5.00	0.00	0.00	5.00
PG69	9010	orifice gasket 6" 150# with 4.25" center	0.00000	3.00	0.00	0.00	3.00
PG70	9010	orifice gasket 10" 150# with 7.25"	0.00000	4.00	0.00	0.00	4.00
PG8	9010	8" 300# flexatelic 304 /graphite	14.21800	5.00	0.00	0.00	13.00
PG81	9010	3" 300# Flexatelic gasket	3.93000	6.00	0.00	0.00	6.00

Inventory Balance

Company/Branch: 9010
User: Frank Yenchick

Inventory ID	Warehouse	Description	Unit Cost	On Hand	Not Available	Expired	Available
PM 2183010	9010	1/4" npt in-line lube oil filter VTN-10M	22.31000	4.00	0.00	0.00	4.00
PM 90731	9010	SS 90 deg elbow lube oil check valves	0.00000	7.00	0.00	0.00	7.00
POG0.5P2P	9010	waste water filter bags Std Size 2 bag-	5.30000	320.00	0.00	0.00	320.00
PP1373NB	9010	Insert & Spring 7320.20.50.20	14.12000	12.00	0.00	0.00	12.00
R2015T 12375613	9010	Pressure Transmiter 0-174 psig Radiator	0.00000	1.00	0.00	0.00	1.00
R2015T 15356925	9010	Pressure Transmiter 0-174 psig	0.00000	1.00	0.00	0.00	1.00
R30515 15960151	9010	Pressure Transmiter -5-30psig	0.00000	1.00	0.00	0.00	1.00
R3051T 13031309	9010	Pressure Transmiter -1-5 Bar	0.00000	1.00	0.00	0.00	1.00
R5300-185-49978	9010	Scrubber Pressure Transmitter Model	3,909.59000	1.00	0.00	0.00	1.00
R7861A1026	9010	Dynamic Self-check Ultraviolet Amplifier	0.00000	1.00	0.00	0.00	1.00
R79766T11	9010	Booster threadseal washers	14.39000	12.00	0.00	0.00	12.00
RM7890 B 1030	9010	RTO flame relay 120vac with dust cover	0.00000	1.00	0.00	0.00	1.00
RP-BA-025-SR	9010	1/2" threaded automatic 316SS ball	360.00000	1.00	0.00	0.00	1.00
SB-P-P-3	9010	Greenlane compressor lube oil pump	0.00000	3.00	0.00	0.00	3.00
SS-106	9010	Electric Motor Grease - Blue Lithium	10.56000	4.00	0.00	0.00	4.00
SS-196	9010	2RV31 - Extreeme Pressure Grease 13.7	6.06000	3.00	0.00	0.00	3.00
SS4903G	9010	T304SS 150# 90 ELL	48.98000	2.00	0.00	0.00	2.00
SS4N33	9010	3X3 T304L SS Welded Nip	0.00000	3.00	0.00	0.00	3.00
SS-81A	9010	Latex/Nitrile Gloves XL - MK296XL	24.50000	3.00	0.00	0.00	3.00
SS-92S4-C	9010	Swagelok air operated valve (for YV30)	0.00000	1.00	0.00	0.00	1.00
SS-CHS4-1	9010	Swagelok check valve	0.00000	1.00	0.00	0.00	1.00
SV61-120VAC-5-STD	9010	RTO Max-air solenoid valve 120v	0.00000	1.00	0.00	0.00	1.00
SW440SR903G	9010	90 deg Elbow T304L SS S40 SR G	0.00000	3.00	0.00	0.00	3.00
TCJ-5-48SD	9010	Type J Thermocouple (TSA heater	48.50000	1.00	0.00	0.00	1.00
TJ20-CASS-14V-12-	9010	TE05 temp probe (for M02 pump disch	0.00000	1.00	0.00	0.00	1.00
TRI-PP-2	9010	2" Packing Media in 10 ft3 boxes	0.00000	1,020.00	0.00	0.00	2,520.00
TYPE 98H	9010	Flash tank pressure regulator PCV-01	0.00000	1.00	0.00	0.00	1.00
UM03HNBGL	9010	Booster crankcase breather element	0.00000	1.00	0.00	0.00	1.00
V15057	9010	Dry Cooler chiller 2-way solenoid valve	0.00000	1.00	0.00	0.00	1.00
VAMM6003	9010	Booster gasket crshd slide	0.00000	2.00	0.00	0.00	2.00

Inventory Balance

Company/Branch: 9010
User: Frank Yenchick

Inventory ID	Warehouse	Description	Unit Cost	On Hand	Not Available	Expired	Available
VMPA1-M1H-K-PI	9010	Greenlane FESTO Solenoid Valve	165.32000	2.00	0.00	0.00	2.00
VMPA2-M1H-K-PI	9010	Greenlane FESTO Solenoid Valve	181.85000	2.00	0.00	0.00	2.00
W76575A	9010	Booster Compressor hand oil pump	0.00000	1.00	0.00	0.00	1.00
WS-480	9010	4mm WS-480 Activated Carbon	0.00000	1,650.00	0.00	0.00	1,650.00
XTCE015B10A-CHGP	9010	Contactor, 3-P, N/O	152.10000	1.00	0.00	0.00	1.00
XTCEXFDC11-CHGP	9010	Aux Contact	33.87000	3.00	0.00	0.00	3.00
XTPAXFA11-CHGP	9010	Aux. Contact, Front,1NO/1NC SeqA for	21.36000	3.00	0.00	0.00	3.00
XTPR010BC1-CHGP	9010	Man.Mtr. Protect, 6.30-10.0A Class 10,	166.70000	3.00	0.00	0.00	3.00
Z12536EP3X090811	9010	M02 Electric Motor, WEG, 125KW, 3570	0.00000	1.00	0.00	0.00	1.00

APPENDIX F
FLARE AND RTO INSPECTION REPORTS

JOHN ZINK HAMWORTHY COMBUSTION®

BIOGAS FLARE SYSTEM (BF)

VAPOR CONTROL UNIT PREVENTIVE MAINTENANCE (PM)

Customer:	**Canton Renewables**	Date:	**10/19/2021**
Location (City, State):	**Canton, MI**	PM Frequency:	**1st Semi-Annual**
Manager:	**Chase VanEckoute**	Manu. Equip. SO#:	**9121864**
Manager's Phone # :	**(734)776-9387**	PM SO#:	**9323192**
Manager's Email:	**chase.vaneckoute@ariaenergy.com**	Customer Equip. #:	**0**
Technician:	**JD Davis/ jerell.davis@kes.global**	Technician Phone #:	**269-532-5865**

Provide a summary of equipment condition both before and after inspection (Discuss with Operator)
ARRIVED ONSITE AND MET WITH CHASE VANECKOUTE. CHECKED PILOT OPERATION, PILOT GAS SOLENOID/ REGULATOR. CHECKED ELECTRICAL SYSTEMS (ALL BOXES OPENED). PERFORMED (AVAILABLE) SHUTDOWN TESTING TO CHECK ALARMS AND REACTION OF FLARE. FLARE PERFORMED AS EXPECTED.

Comments and Recommendations
PER REQUEST, CHANGED PILOT THERMOCOUPLE WHICH HAD ALREADY BEEN ORDERED BY CUSTOMER. UPON REMOVAL OF THERMOCOUPLE, NOTICED THAT THE TIP OF THE THERMOCOUPLE WAS OPEN EXPOSING WIRES. TESTED NEW THERMOCOUPLE AND THE LOW PILOT TEMP OF 800DEG WAS REACHED AT 60SEC. THE HIGH PILOT TEMP WAS REACHED AT 90SEC. THIS FLARE IS CONNECTED DIRECTLY TO THE GAS PLANT AND RECEIVES WASTE GAS FROM THE PLANT. DUE TO THE PLANT UNDERGOING MAINTENANCE, THERE WAS NO GAS TO THE FLARE. PERFORMED ALL SHUTDOWNS AVAILABLE WITHOUT WASTE GAS. THE IGNITION TRANSFORMER PANEL FLOOR IS FULLY CORRODED AND HAS SOME HOLES IN IT. CHASE WAS INFORMED OF THIS ISSUE. THE FA FILTER WILL BE CLEANED THIS WEEK BY THE OPERATORS PER CHASE.

Follow-Up Items	
1.	**IGNITION TRANSFORMER PANEL FLOOR CORRODED COMPLETELY AND NEEDS TO BE ADDRESSED**
2.	
3.	
4.	
5.	

	Pass / Fail / Warning			Comments
1.	Visually check burner and stack -inside and outside (missing/degraded insulation & hot spots)		P	
		°F		Comments
	A. Measure and record highest external temperature on stack while operating.		N/A	PLANT MAINT NO WASTE GAS
	B. Note any missing/discolored paint or rust spots.		P	
				Comments
2.	Check anti-flashback burner tips for broken welds or elements		N/A	ELEVATED FLARE
				Comments
3.	Check for skid and stack anchor bolt condition		P	
	A. Any rust/corrosion, missing anchors, nuts, etc.?		P	
				Comments
4.	Inspect all electrical control enclosures for any apparent corrosion and/or moisture. Verify conduit seals are poured.		P	
				Comments
5.	Verify skid and conduit are grounded		P	
				Comments
6.	Verify voltage from N1 terminal to ground is 0.0 Volts A.C.		P	
		Volts		Comments
7.	Verify control power	120	P	
				Comments
8.	Verify panel and actuator space heaters are working		P	

9.	Gauges		Comments
	A. All gauges going to 0 when off with no pressure?	P	
	B. Gauges leaking or needing replacement?	N/A	
	C. Replacements ordered? Which ones?	N/A	

****Note: Gauges should be replaced during the PM if they are broken. This should not show up as an unresolved action item****

				Comments
10.	Check compressed air for fail-closed inlet valve.		P	
		Type of Pilot Gas	Pilot Gas Pressure	Type of Pilot
11.	Verify pilot gas pressure.	Propane	8PSI	KE-1B

·Normal operating pressure is approximately. 10 psig for propane or 15 psig for natural gas when using an enclosed combustor. (KE-1)

· Normal operating pressure is approximately 10 psig for propane or 15 psig for natural gas when using an elevated flare. (KE-1B)

			Note any Adjustments Made
12.	Verify flame scanner has proper alignment	N/A	ELEVATED FLARE
			Comments
13.	Verify proper flame scanner configuration	N/A	ELEVATED FLARE

For IRIS; Gain 9, Flame on relay 3, FFRT Option 3 sec, RATIO 20%

				Comments
14.	Verify pilot ignition		P	
		Pilot Strength		Comments
15.	Verify the pilot flame quality		N/A	No Honeywell device

					Comments
16.	Verify unit will start and run in either manual or auto mode			P	
					Comments
17.	On ZULE units, verify proper operation of combustion air section.			N/A	ELEVATED FLARE
A.	Burner(s) thermocouple set point		°F	N/A	ELEVATED FLARE
B.	Combustion air flow transmitter			N/A	ELEVATED FLARE
C.	Combustion air blower VFD operation			N/A	ELEVATED FLARE
1.	Configuration confirmed			N/A	ELEVATED FLARE
2.	Configuration written down/saved			N/A	ELEVATED FLARE
					Comments
18.	Blower AMPs and Volts			N/A	NO BLOWER

	N/A			N/A			N/A			N/A		
FLA												
	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Amps												
	L1-L2	L2-L3	L1-L3	L1-L2	L2-L3	L1-L3	L1-L2	L2-L3	L1-L3	L1-L2	L2-L3	L1-L3
Volts												
Comments												

	N/A		N/A		N/A		N/A	
FLA								
	Hz	AMPs	Hz	AMPs	Hz	AMPs	Hz	AMPs
Amps								
Volts								
Comments								

CAUTION DO NOT CONTINUE TO RUN MOTORS IN AN OVERLOADED CONDITION

					Comments
19.	Is a minimum operating temperature required?			Yes	
			°F		Comments
A.	If so, what temperature is required by customer permit?		800	P	
B.	Temperature controller set point?			N/A	
C.	System can get to minimum temperature required?			P	

							Comments
20.	Differential Pressure reading across Flame/Detonation arrestor						Comments
	NA	”w.c. @	NA	SCFM		N/A	PLANT MAINT NO WASTE GAS
				Date			
A.	Date FA or DA were last cleaned (recommended annually)					N/A	PLANT OPERS TO CLEAN THIS WEEK

21.	Check pressure drop across anti-flashback burner(s).					Comments
			”w.c. @	SCFM	N/A	ELEVATED FLARE
				Date		
	A.	Date Burners were last cleaned (recommended annually)			N/A	ELEVATED FLARE

Note: When the differential pressure on the FAs or DAs indicates that they may be plugging notify the customer. The FAs or DAs can be

					Comments
22.	Temperature Recorder In Use			No	
	A.	Temperature recording correctly		N/A	
	B.	Other Parameters (if applicable) recording correctly		N/A	
	C.	Configuration Saved		N/A	
					Comments
23.	Verify thermocouples working properly			P	CHANGED PILOT THERMOCOUPLE
			Date		Comments
	A.	Last date thermocouples were replaced	10/19/2021	P	PILOT THERMOCOUPLE
	B.	Provide comments if out of tolerance			
					Comments
34.	Inspect/lubricate louver doors at flare.			N/A	ELEVATED FLARE
	A.	Damper set point	°F	N/A	ELEVATED FLARE
	1.	Check dampers for loose/broken linkages bushings, etc.		N/A	ELEVATED FLARE
	2.	Check operation of damper		N/A	ELEVATED FLARE
	3.	Damper should fail open on loss of power, normal cycle off or high temperature		N/A	ELEVATED FLARE
					Comments
24.	Perform system shutdowns tests on all applicable items. Verify motors shutdown and that all valves position themselves properly.				
			°F		Comments
	A.	High stack temp set point	2000°F	N/A	NO OMRON SWITCH
	B.	High flame/detonation arrestor temp trip	200°F	P	
	C.	Blower failure B-103		N/A	NO BLOWER PLANT FED
	D.	Blower failure B-104		N/A	NO BLOWER PLANT FED
	E.	Blower failure B-105		N/A	NO BLOWER PLANT FED
	F.	Gas blower high bearing temperature		P	
			PSI		Comments
	G.	Pilot gas pressure low set point		N/A	NO PRESSURE SWITCH
	H.	Pilot gas pressure high set point		N/A	NO PRESSURE SWITCH
	I.	Blower Failure from Phase Monitor (loss of 480V)		N/A	NO BLOWER PLANT FED
	J.	Pilot flame failure		P	
	K.	Main flame failure		N/A	PLANT MAINT NO GAS
	L.	ZULE Burner high temp		N/A	ELEVATED FLARE
	M.	Block valve open/close		N/A	PLANT MAINT NO GAS
	N.	Thermocouple failure		P	
	O.	High oxygen level failure		N/A	
	P.	Unit stop		P	
	Q.	Auto-dialer/ Auto-notification function		P	

				Comments
	R.	Low purge air flow	N/A	**ELEVATED FLARE**
	S.	Loss of power	P	
	T.	Main block valve failure	N/A	**NO BLOCK VALVE ON FLARE**
	U.	Knock out tank high level failure	P	

			Comments
25.	Inspect gas system compound for signs of unauthorized entry and deterioration	P	
26.	Inspect system motor/blower for vibration.	N/A	**NO BLOWER PLANT FED**
27.	Check blower belt condition. Record belt model number.	N/A	**NO BLOWER PLANT FED**
28.	Inspect system blower motor insulation resistance.	N/A	**NO BLOWER PLANT FED**
29.	Tighten electrical connections on motor control panel and at motor.	N/A	**NO BLOWER PLANT FED**
30.	Inspect/lubricate blower motor bearings with correct grease annually.	N/A	**NO BLOWER PLANT FED**
31.	Clean/repack blower motor grease reservoir.	N/A	**NO BLOWER PLANT FED**
32.	Inspect/clean igniter, refractory and gas solenoids.	P	
33.	Inspect/clean flame scanner view and vent port.	N/A	**ELEVATED FLARE**
35.	Check for correct operation of blower heater thermostat.	N/A	**NO BLOWER PLANT FED**
36.	Check differential pressure across demister pad at KO pot. Maintenance required when pressure drop reaches 2" w.c.	N/A	**PLANT MAINT NO WASTE GAS**
37.	Inspect air compressor filters and change as necessary.	N/A	
38.	Inspect/clean VFD control panel filters.	N/A	**NO BLOWER PLANT FED**

System Name:	RTO	**cc:**	

GENERAL INFORMATION

Customer Name:	Aria Energy Canton Renewable	Dürr Representative:	Dave Szymanski
Original Project No.:	Met Pro 2 Tower	Title:	Field Service Tech
Current Project No.:	US04-2206852	Date/Time of Visit:	March 15th, 2021
Site Address:	4345 S. Lilley Rd.	Office Phone:	248.450.2000
	Canton, MI 48188	Mobile Phone:	734.812.9008
Contact Name:	Frank Yenchick	Email Address:	dave.szymanski@durrusa.com
Office Phone:		Fax:	734.459.5837
Mobile Phone:	734.796.6763	Contract Type:	AMS Fixed Price
Fax:		Project Manager:	Carol Glovak
Email Address:	Frank.Yenchick@ariaenergy.com	PM Mobile Phone:	248.444.5229

SYSTEM INFORMATION

System Description:	Met Pro 2 Tower RTO	Total Hours Worked:	Fixed Contract
		Travel Time to Site:	-
		Travel Time from Site:	-
Equipment Required:	PPE & Hand Tools		
		Inlet Pressure/Temp:	Information on Energy data form
		Exhaust Pressure/Temp:	
PLC Type:		C.C. Pressure/Temp:	
		Inlet Airflow:	
Personnel on Site:	Dave Szymanski	Exhaust Airflow:	
		Motor/Burner Output:	

SERVICE REPORT SUMMARY

Purpose of Visit: Perform On-line Inspection of the Met Pro 2 Tower RTO

Conclusion:

The Met Pro 2-Tower RTO is in overall good operating condition. Noteworthy issues identified during the inspection are listed below:

1. NO change from last inspection there are signs of excessive heat around the burner surface temperatures as high as 355F in some areas. No other hot spots were observed with infrared photos.

2. Customer thinks the burner PIDs set point might have been reset to all zeros when power was lost. Need to have Control Engineer have program to check burner PID. Recommend Dürr to add new PIDs screen for these to be on the screen in the future.

3. RTO differential pressure was measured at 4.25” which would indicate no excessive plugging issue with the ceramic media at this time need to monitor. Although there still was excessive ash particulate observed inside the test ports on the exhaust stack need to clean and monitor.

4. Build-up on the burner site glass indicates particulate build-up is happening on the UV scanner which needs to be cleaned often to stop burner flame fault issues.

See inspection photos and Follow-up Suggestions in this Service Report. See attached Inspection Checklist for further detail and Operating Data form.

Details of Service Visit:

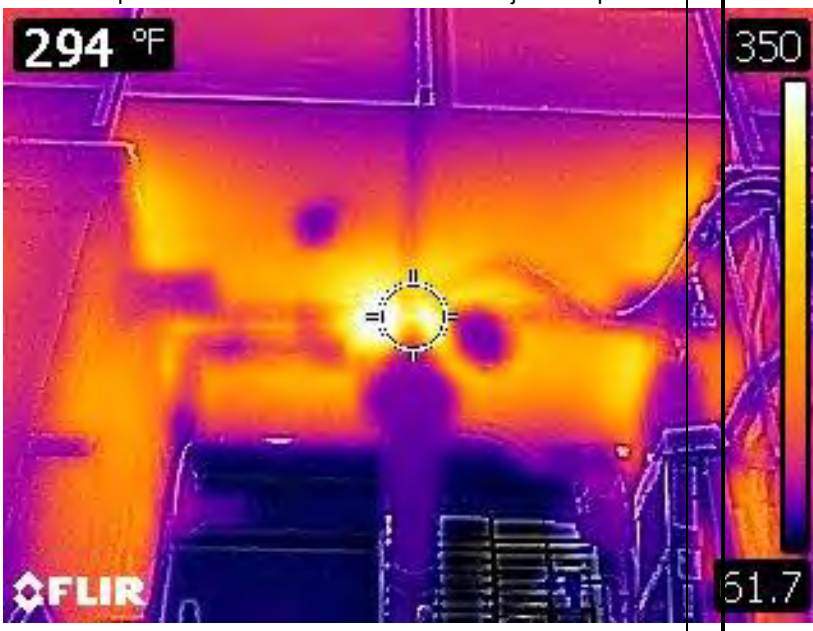
3/15/2021: Performed Online inspection.

INSPECTION PHOTOS

The Met Pro 2 Tower RTO at Aria Energy

Infrared photo of inlet side RTO online no major hot spots

Burner area is hotter than normal need to momitor



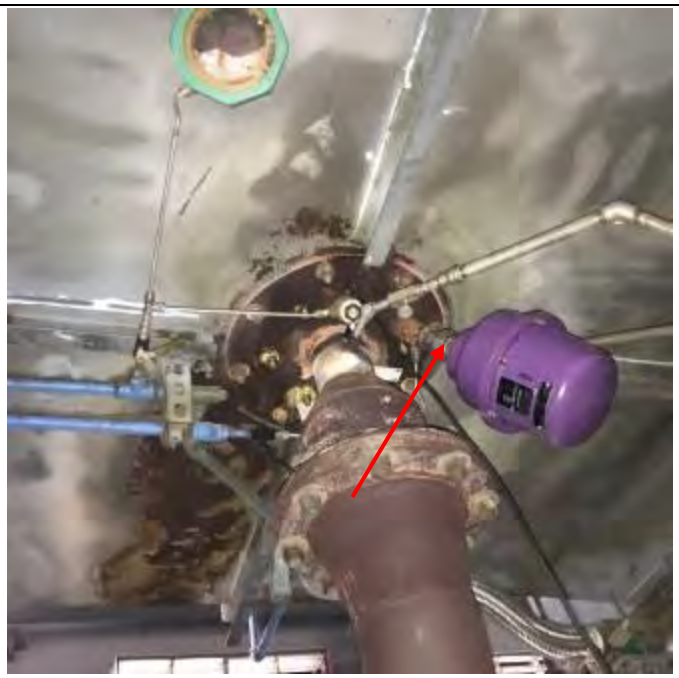
Infrared photo of burner area online

Hot spot observed on outlet side of the RTO system

Infrared photo of outlet side RTO online no major hot spots

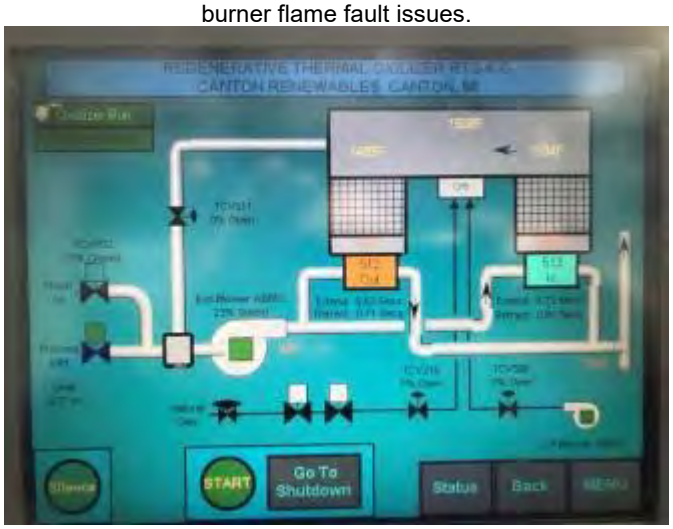
The RTO supply fan operate normal no issues observed

Flame arrestor must be
clean very little differential pressure drop



Build-up on burner site glass indicates particulate build-up is happening on UV scanner needs to be cleaned often to stop burner flame fault issues.

Close up of burner site glass.



RTO overview screen during online inspection

Burner temperature overview screen online. Customer would like to have PID setting check might need change program

Inlet static pressure for supply fan screen online

Dilution air temperature screen online

RTO differential pressure gauge 4.25" during online inspection no indication of excessive plugging at this time

No gas smell around the burner gas train

Follow-up Suggestions:

1. Review items marked "Action Required" on the Inspection Checklist.
2. Monitor surface temperature around the burner area. Next offline inspection inside the combustion chamber check burner tile and insulation around burner tile.
3. Review Spare Parts inventory and maintain stock of critical operation items (i.e. UV Detector, Amplifier card, Mod Motors, fan belts, etc.)

X **Mark an "X" if follow-up sales contact is needed.**

Customer: Clean Energy Renewables

RTO ON-LINE and OFF-LINE PM INSPECTION CHECKLIST- ON LINE ONLY THIS VISIT

GENERAL INFORMATION

SECTION I

Customer Name:	Aria Energy (fka Canton Renewables)	Customer PO No.:	CAJ-771
Original Job No.:	Met Pro-RTO	Site Representative:	Dave Szymanski
Current Job No.	US04-2206852	Service Date:	Online only 3/22/2021
Customer Address:	4345 S. Lilley Rd.	Office Phone:	248.450.2000
	Canton, MI 48188	Mobile/Pager:	734.812.9008
	USA	Fax Number:	734.459.5837
Customer Contact:	Frank Yenchick	Email Address:	dave.szymanski@durrusa.com
Mobile/Pager Number:	734.796.6763	Additional Information:	Fixed cost
		Project Manager:	Carol Glovak
Email Address:	Frank.Yenchick@ariaenergy.com	PM Mobile Phone:	248.444.5229

SYSTEM SUMMARY INFORMATION

SECTION II

System Description:	Met Pro 2-Tower RTO w/ poppets	Last Visit to Site:	June 2020, Nov. 2016
		Warranty:	N/A
Next Scheduled Shutdown:		Work Planned:	On-Line Inspection
Days Shutdown:			
Total Downtime this Period:		Work Completed:	On-Line Inspection
Total Downtime Year to Date:			

"Action Required" Legend: (NOW) Repair ASAP, (Soon) Needs repair next shutdown, (OB) A problem was observed.

ON-LINE AND OFF-LINE PM INSPECTION

SUPPLY FAN AND MOTOR PM INSPECTION

SECTION III

Item	Specific Details of Work	Action Required	Comments	Date of Repair
1	Quantity of fans on system (I.e. redundancy?) Belt Drive? Direct Drive? Forced or Induced draft? Bearing lube system? Grease? Lube unit?		Fan (1) Mfg. Twin City Fan & Blower, Size 300, type BCN-8W, Sec #11-456171-1-1: Motor Mfg. TECO Westinghouse MAX-E2, Cat#HH0752, 75Hp, 79.9amps, 460volts, 3555rpm, S.F. 1.15, frame 365TS, Ser#LU7009B712001, NEMA EFF. 94.5: Direct drive with VFD, Forced draft fan, manual grease no RTDs.	
2	Visual inspection of the fan exterior/paint/insulation/cladding		Good Condition.	
3	Housing access doors installed? Any potential leak areas?		Looks good no leaks observed.	
4	Check inlet flex connector		Looks good no leaks observed.	
5	Check outlet flex connector		Looks good no leaks observed.	
6	Check for air leaks from flanges & connecting expansion joints.		No leaks observed.	
7	Check anchor bolt for tightness, condition of base, foundation, grout.		Looks good.	
8	Check base frame: weld cracks, corrosion		Looks good.	
9	Check heat slinger for cracks, integrity, tight to shaft?		No issues observed.	
10	Listen to inboard bearing and describe sound.		Sounds good no issues observed.	
11	Listen to outboard bearing and describe sound.		Sounds good no issues observed.	
12	Record the bearing operating temperatures (if temperature monitoring is provided).		No RTDS on bearings: Measured 68F on WSB could not measure MSB safety guard in the way.	
13	Listen to shaft coupling any describe sound.		No issues observed.	
14	Check condition of shaft coupling, including lubrication		Looks good.	
15	Record last date the coupling was lubed		Maintenance said they grease once a year which is functional	
16	Check for bearing lubrication leakage.		Manual grease pillow block bearings.	
17	Confirm bearing lubrication schedule with maintenance dept.	**Note**	Same as inspection, Maintenance said they grease bearings every three months. Recommend checking with Mfg. but normally you should grease at least 2 or 3 pumps a month. Main Fan Motor might get greased once a year or less check with Mfg. Must be done properly.	
18	General check on belts condition & tension, and/or alignment		N/A direct drive.	
19	Inspect condition of sheaves: any cracks? Excessive wear?		N/A direct drive.	
20	Inspect fan internals for material deposits and corrosion		On line this visit	
21	Listen for unusual sounds emanating from the fan housing.		No abnormal sound or excessive vibration observed.	
22	Inspect shaft & rotor; check for free spinning		On line this visit	
23	Inspect rotor/wheel for cracks		On line this visit	
24	Measure rotor clearance to inlet cone and fan casing. Check set screws for tightness		On line this visit	
25	Are bearing RTDs installed? If so, condition? Operable?		N/A WSB was 68F could not measure MSB.	

26	Inspect condition of bearing safety guards.		Looks good.	
27	Inspect condition of shaft safety guards		Looks good.	
28	Inspect condition of belt safety guards		N/A	
29	Record vibration switch setpoint. Is the switch bypassed?		N/A no vibration switch.	
30	Check pressure proving switch to ensure it is/is not energized.		Operational.	
31	Check condition of tubing/piping to pressure switch		Looks good.	
32	Check motor installation		Looks good online.	
33	Check motor conduit		Looks good online.	

BURNER & GAS TRAIN PM INSPECTION

SECTION IV

Item	Specific Details of Work	Action Required	Comments	Date of Repair
1	Burner quantity on system? Integral combustion blower or separate? Flame Rod or UV Detector? Fuel: N. Gas? Propane? Fuel Oil?		(1) Maxon Kinedizer (LE) Low NOx burner, Model#SKDZERLE040-NFB, S.0.#873210, UV scanner, natural gas.	
2	Signs of excessive heat on or around burner?	**OB**	Discoloration around the burner surface temperatures measured at 355F which is hot for burner area. Note burner is normal off or at low fire. Need to monitor surface temperatures, No change from last inspection.	
3	Inspect igniter, ignition cable and ignition transformer		Looks good no issues observed.	
4	Inspect the gas train integrity, identify any leaks.		No gas smelled around the gas train check offline.	
5	Record SP and pressure at HI gas pres. Safety switch; tripped?		On line this visit	
6	Record SP and pressure LO gas press. Safety switch; tripped?		On line this visit	
7	Check and reset main gas pressure regulator.		On line this visit	
8	Check and reset the gas pressure safety switches.		On line this visit	
9	Check fuel control valve, linkage and actuator		Looks good. Note burner output only at 0% when burner is on could not verify operation at different outputs.	
10	Check Low Fire Switch and operation		Operational.	
11	Check slide wire and operation		N/A	
12	Inspect Ratio Regulator and impulse tubing		N/A	
13	Check metering orifice condition, record Plate No.,		N/A	
14	Check and verify main and pilot pressure gauges.		Main gas gauge 2 PSI, after regulator 19" when burner on and 23" burner off, no pilot gauge.	
15	Check main gas vent valves.		Looks good.	
16	Check all manual valves/lubed plug cocks, seized?		On line this visit	
17	UV scanner. Clean lens, verify self checking function		On line this visit	
18	Inspect sealing union lens and gaskets, clean or replace as needed		On line this visit	
19	Verify UV scanner internals are dry and corrosion free		On line this visit	
20	Check UV base unit condition and record hours of operation		3/22/2021 at 9:45am 21,087 Hours, 35,335 cycles: no issues observed	
21	Check operation and condition of Blocking Valve		On line this visit	
22	Check operation and condition of Safety Shutoff Valve		On line this visit	
23	Inspect the gas train integrity, identify any leaks.		On line this visit	
24	Check Y-strainer, note condition		N/A	
25	Check pilot gas regulator		Burner was off during online	
26	Confirm response of modulating fuel control	**Note**	Burner was off or at 0% online inspection. The RTO self stains most of the time because of inlet solvent loading.	
27	Confirm inlet gas supply pressure at varying burner outputs.		Looks good.	
28	Record main and pilot pressure gauges.		N/A	
29	Check pilot mixer		Burner off during online inspection. Check offline.	
30	Check for proper combustion air: gas ratios .		N/A	
31	Check zero governor		N/A	
32	Check pilot booster		Looks good.	
33	Check pilot solenoid		None observed.	
34	Inspect tubing for moisture and general condition		Burner was off during online inspection RTO self stains.	
35	Record flame signal from flame rod/UV detector		Burner was off did not observed.	

	36	Describe Flame shape & color		Unit was offline.	

COMBUSTION BLOWER AND MOTOR PM INSPECTION

SECTION V

Item	Specific Details of Work	Action Required	Comments	Date of Repair
1	Blower quantity on system? Integral combustion blower or separate?		(1) combustion blower, separate on the platform.	
2	Visual inspection of the fan condition Inspect housing for crack or impurities		Looks good no issues observed.	
3	Check the combustion air blower filter. Need cleaning?		On line this visit	
4	Check belt tension, and/or alignment (if applicable)		N/A	
5	Check anchor bolt for tightness		Looks good.	
6	Check that the blower base is anchored correctly and secure		Looks good.	
7	Check cork pad		Functional no issues observed.	
8	Check condition of blower discharge sleeve, check for leaks		No leaks looks good.	
9	Check condition of vibration isolators		Cork pad looks good.	
10	Check for excessive vibration.		No excessive vibration	
11	Check operation of combustion air pressure switch		Online operational, check offline	
12	Check condition of tubing/piping to pressure switch		Looks good.	
13	Check combustion air valve linkage		Looks good.	
14	Check combustion air valve actuator		Looks good.	
15	Check combustion air valve operation	**Note**	Burner was off or at 0% online inspection. The RTO self stains most of the time because of inlet solvent loading.	
16	Check combustion air valve condition		Looks good.	
17	Check combustion air valve Low Fire Switch		Operational.	
18	Check motor installation		On line this visit	
19	Check motor conduit		On line this visit	
20	Inspect and zero air pressure (No Suggestions)		N/A	
21	Inspect and zero gas delta pressure (No Suggestions)		N/A	
22	Check that all instrument tubing is free of debris		No issues observed.	
23	Check filter/silencer		On line this visit	

PNEUMATIC SYSTEM PM INSPECTION

SECTION VI

Item	Specific Details of Work	Action Required	Comments	Date of Repair
1	Check all filters/silencers in the system.		Looks good.	
2	Inspect fittings, valves, and actuators for integrity (adjust/tighten as required).		No issues observe.	
3	Check all pressure gauges for proper operation.		Operational.	
4	Reset air pressure as required.		On line this visit	
5	Check and verify all pneumatic system pressure, and flow switches.		Operational.	
6	Inspect and verify operation of pneumatic accumulator		On line this visit	
7	Check and adjust valve speeds and cushion as required.		Looks good. 0.62 sec to 0.81 sec open/close	
8	Record Photohelic gauge is setpoint.		No set point observed.	
9	Record receiver tank pressure regulator set point		85 PSI to tank	
9	RE-THERM air tank regulator pressure is setpoint.		Plant supply 100 PSI.	
10	Record plant-supplied air pressure/setpoint.		Looks good.	
11	Is a desiccant dryer included? Regenerative type? If so, when was desiccant last changed?		Looks good.	

ELECTRICAL CONTROLS PM INSPECTION

Item	Specific Details of Work	Action Required	Comments	Date of Repair
1	Verify chart recorder operation and programming.		Operational.	
2	Verify variable frequency drive operation and parameters.		VFD Operational no issues observe.	

RTO ON-LINE and OFF-LINE PM INSPECTION CHECKLIST- ON LINE ONLY THIS VISIT

SECTION VII

3	Inspect Burner PID settings for smooth temp. modulation. Record burner output range through a complete valve cycle.	**Note**	Burner Off/On only 0% Output, note inlet solvent load lower than normal. C.C. set point 1575F. Need to check offline. Burner Off at 130F above SP and turn On 75F SP. Average still was approx. 1607F. Customer think burner PIDs might be set at 0 when power was lost. Need to have Control Engineer have program and check burner PID.	
4	Verify fan PID loop (pressure/volume) operation and parameters.	**OB**	Inlet static SP. -2.10" ranges from -2.2" to -2.0", VFD operating 23.60Hz or 23%. No issues observe on fan or motor. PID is operational.	
5	Check air conditioner/cooling fan for dust and dirty filters		RTO control panel inside build no issues to report.	
6	Check VFD components for dust and dirty filters		Looks clean.	
7	Inspect control panel for wire jumpers and determine cause. Work w/client to fix problem and remove jumpers.		No jumpers observed.	
8	Record all temperature & pressure set points and the associated control outputs.		Look at online operating data form for all pressure and temperature recorded.	
9	Review HMI screens for missing graphics/text displays.		No issues observed.	
10	Review alarm history for repeating alarms (if applicable).		No issues to report.	
11	Check inside control panel for any anomalies.		No issues to report.	
12	Confirm operation of field instruments such as pressure transmitters, T/Cs, HTL/TISH.		Operational.	
13	Verify connection and operation of the modem (if applicable).		None observed.	
14	Record all motor RPM and amp readings.		Check operating data form.	

RTO DAMPER SYSTEM PM INSPECTION

SECTION VIII

Item	Specific Details of Work	Action Required	Comments	Date of Repair
1	Tower quantity on system? Purge System included? Butterfly valve? Air Seal? Poppet? This work applies to all inlet, outlet, purge and iso dampers		(2) Tower RTO with Poppet valves No Purge Included	
2	External Inspection		Looks good.	
3	Visually check external condition of all dampers (burnt paint? Loose hardware?		No issues observed.	
4	Check condition of all gasketing		No issues observed external.	
5	Inspect for material build up on all dampers. Clean required?		On line this visit	
6	While under pressure, measure all seating clearances. Adjust as required for best seal. Check tadpole seal gasket (if applicable)		On line this visit	
7	Check dampers are centered on damper flanges.		Dampers were centered.	
8	Examine for linkage & operator wear		On line this visit	
9	Verify failsafe positioning of dampers (if possible to determine if accumulator is operational).		On line this visit	
10	Examine for bearing & bushing wear		On line this visit	
11	Record open and close travel times; adjust as required		damper open/close 0.62 to 0.81 seconds.	
12	Verify operation of hydraulic cushions.		Poppet valves normal don't have any cushion.	
13	Confirm reliable operation of prox switches.		Operational.	

COMBUSTION CHAMBER PM INSPECTION

SECTION IX

Item	Specific Details of Work	Action Required	Comments	Date of Repair
1	Type of Media: Saddles? Blocks? Other		Approx. 160 ft3 of new 1.5" saddle media was installed in both towers.	
2	Verify condition of fiber lining on interior perimeter (along outside shell): pack with ceramic fiber as required		On line this visit	
3	Verify condition of fiber lining around chamber access door frame and door plug.		On line this visit	
4	Verify burner tile condition		On line this visit	
5	Inspect and clean the burner as required		On line this visit	
6	Verify fiber lining is tight around burner tile / firing tube		On line this visit	
7	Site ports condition including lens, surrounding fiber lining and cooling purge line.		On line this visit	
8	Examine T/C condition and shields		On line this visit	

9	Visual inspect the combustion chamber general condition - media, insulation, burner (plugging, attack, discoloration?)		On line this visit	
10	Examine condition of modules, especially roof. Any loose material? What size modules?		On line this visit	
11	Examine block face for damage or blockage		On line this visit	
12	Examine block for any non-uniform appearance such as color, cracking, etc.		On line this visit	
13	Check for excessive loose blocks. Measure min/max gaps		N/A Saddle media.	

LOWER PLENUMS AND MANIFOLDS PM INSPECTION

SECTION X

Item	Specific Details of Work	Action Required	Comments	Date of Repair
1	Check inlet manifold access doors		On line this visit	
2	Check inlet manifold for material buildup. Estimate depth.		On line this visit	
3	Check inlet manifold for interior corrosion.		On line this visit	
4	Check inlet manifold for warpage, broken welds		On line this visit	
5	Check inlet manifold thermocouple		On line this visit	
6	Check inlet manifold expansion joint		On line this visit	
7	Check inlet manifold's external insulation & cladding		On line this visit	
8	Check inlet manifold for flange leaks.		On line this visit	
9	Check outlet manifold access doors.		On line this visit	
10	Check outlet manifold for material buildup. Estimate depth		On line this visit	
11	Check outlet manifold for interior corrosion.		On line this visit	
12	Check outlet manifold for warpage, broken welds.		On line this visit	
13	Check outlet manifold thermocouple		On line this visit	
14	Check outlet manifold expansion joint.		On line this visit	
15	Check outlet manifold's external insulation & cladding.		On line this visit	
16	Check outlet manifold for flange leaks.		On line this visit	
17	Check Tower 1 plenum access doors.		On line this visit	
18	Check Tower 1 plenum interior for material buildup. Depth?		On line this visit	
19	Check Tower 1 plenum for interior corrosion		On line this visit	
20	Check Tower 1 plenum walls & floor for warpage, broken welds		On line this visit	
21	Check Tower 1 lower bed thermocouple		On line this visit	
22	Check Tower 1 cold face support grid for warpage and plugging		On line this visit	
23	Check Tower 1 cold face & media for material buildup. Depth?		On line this visit	
24	Check Tower 1 plenum internal insulation		On line this visit	
25	Check Tower 2 plenum access doors		On line this visit	
26	Check Tower 2 plenum interior for material buildup. Depth?		On line this visit	
27	Check Tower 2 plenum for interior corrosion		On line this visit	
28	Check Tower 2 plenum walls & floor for warpage, broken welds.		On line this visit	
29	Check Tower 2 lower bed thermocouple		On line this visit	
30	Check Tower 2 cold face support grid for warpage and plugging		On line this visit	
31	Check Tower 2 cold face & media for material buildup. Depth?		On line this visit	
32	Check Tower 2 plenum internal insulation		On line this visit	

GENERAL SYSTEM PM INSPECTION

SECTION XI

Item	Specific Details of Work	Action Required	Comments	Date of Repair
1	Check for external hot spots	OB	Only around the burner area 355F surface temperatures. Need to monitor no change from last year inspection.'	
2	Check condition of all expansion joints		Looks good.	
3	Check condition of all external insulation		Looks good.	
4	Check for evidence of corrosion		Looks good.	
5	Check for evidence of duct/manifold leakage		No leaks were observed.	
6	Check for leaks/hot spots at comb. Chamber access doors		Looks good.	
7	Check for leaks/hot spots at lower plenum access doors		Looks good.	
8	Check for leaks/hot spots at manifold access doors		Looks good.	

Customer: Clean Energy Renewables

RTO ON-LINE and OFF-LINE PM INSPECTION CHECKLIST- ON LINE ONLY THIS VISIT

	9	Check that all ladder, platforms, etc. are correctly anchored		Looks good.	
	10	Check that all safety gates, chains and signs are in place		Looks good.	
	11	Remove the drain plug from the stack. Any water or debris drain out? If yes, estimate how much?	**OB**	There was lot of ash material in the stack test ports which indicates particulate build-up, recommend clean RTO outlet and stack during offline inspections or next major shutdowns.	
	12	Check for evidence of duct leakage		No leaks were observed.	

SOURCE DAMPER / DUCT SYSTEM PM INSPECTION

SECTION XII

Item	Specific Details of Work	Action Required	Comments	Date of Repair
1	Inspect internal condition of source duct manifolds		On line this visit	
2	Check operation of all source dampers		Operational during online inspection.	
3	Check for material build up on dampers. Clean as required		On line this visit	
4	Check for evidence of duct leakage		No leaks observed.	
5	Check for evidence of corrosion		On line this visit	
6	Check external insulation & cladding		Good Condition.	
7	Check expansion joints & flex connectors		No issues observe.	
8	Check duct supports		Good Condition.	
9	Check for proper closure of all access doors		Good Condition.	
10	Check that all test port caps are installed		Good Condition.	

ADDITIONAL COMMENTS

1	See inspection photos in the Service Report.
2	

RTO Operating Data

Customer: Clean Energy Renewables
Location: Canton, MI
Contact Name: Frank Yenchick
Title:
Phone Number: 734.796.6763
Email: fyenchich@cleanenerfyfuels.com
Process System: Landfill
Equipment Description: 2-Tower RTO
Equipment Location: On ground inside building

DATA TYPE	DATA SOURCE	10/8/2015	3/22/2021	FUTURE	FUTURE	FUTURE
		Dürr Tech.: D.Szymanski	*Dürr Tech.:* D.Szymanski	*Dürr Tech.:*	*Dürr Tech.:*	*Dürr Tech.:*
FLOWRATES (scfm)						
Inlet to RTO (scfm) [1]	HMI	1,900 to 2,300	Not observed			
	MEASURE	No good location	NM			
Exhaust from RTO (scfm) [2]	HMI	N/A	N/A			
	MEASURE	3,090	2,768			
PRESSURES (inches W.C.)						
Inlet Setpoint (in. w.c.)	HMI	-4.5	-2.10			
	MEASURE	N/A	N/A			
Inlet before flame arrestor (in. w.c.)	HMI	-4.5	-2.10			
	MEASURE	-4.25 to -4.75	-4.25 to -4.75			
Inlet after flame arrestor before fan (in. w.c.)	HMI	N/A	N/A			
	MEASURE	-5.5	-2.20			
RTO Inlet after fan (in. w.c.)	HMI	N/A	N/A			
	MEASURE	4.75	4.5			
Combustion Chamber (in. w.c.) [1]	HMI	N/A	N/A			
	MEASURE	No test port	No test port			
Combustion Chamber Range (in. w.c.) [1]	HMI	N/A	N/A			
	MEASURE	No test port	No test port			
Exhaust from RTO (in. w.c.) [1]	HMI	N/A	N/A			
	MEASURE	0.25	0.25			
Exhaust Range from RTO (in. w.c.) [2]	HMI	N/A	N/A			
	MEASURE	0.20 to 0.30	0.20 to 0.30			
Differential Across RTO (in. w.c.) [1]	Gauge	4.75	4.25			
	MEASURE	4.50	4.25			
	CALC.	4.50	4.25			
Differential Range Across RTO (in. w.c.) [2]	HMI	N/A	N/A			
	MEASURE	-0.20	-0.25			
Exhaust Stack (in. w.c.) [3]	HMI	N/A	N/A			
	MEASURE	-0.25 to -0.15	-0.30 to -0.20			
TEMPERATURES (°F)						
Inlet to RTO (°F) [1]	HMI	62	51			
	MEASURE	62	51			
Inlet Range to RTO (°F) [1]	HMI	61 to 62	50 to 52			
	MEASURE	61 to 63	50 to 52			
Combustion Chamber (°F) [1]	HMI	1610	1607			
	MEASURE	-	-			
Combustion Chamber Range (°F) [1]	HMI	1600 to 1625	1495 to 1720			
	MEASURE	-	-			
Combustion Chamber Setpoint (°F) [1]	HMI	1575	1575			
Exhaust from RTO (°F) [1]	HMI	271	229			
	MEASURE	273	230			
Exhaust Range from RTO (°F) (over several cycles) [1]	HMI	242 to 300	206 to 251			
	MEASURE	240 to 304	200 to 260			
Differential Across RTO (°F)	CALC.	209	178			
Thermal Efficiency (measurable)	CALC.	86.5%	88.6%			
SUPPLY FAN/VFD (measured)						
Voltage (VFD output, VAC) [2]	HMI	-	-			
	MEASURE	-	-			
AC Current (VFD output, amps) [2]	HMI	-	-			
	MEASURE	-	-			
Motor Speed (RPM) [3]	HMI	-	-			
	MEASURE	-	-			
	%	31% to 33%	23%			
VFD Output Frequency (Hz) [2]	HMI	26Hz	23.6Hz			
	MEASURE	-	-			
Motor/Fan Speed Ratio [3]	HMI	-	-			

RTO Operating Data

Customer: Clean Energy Renewables
Location: Canton, MI
Contact Name: Frank Yenchick
Title:
Phone Number: 734.796.6763
Email: fyenchich@cleanenerfyfuels.com
Process System: Landfill
Equipment Description: 2-Tower RTO
Equipment Location: On ground inside building

DATA TYPE	DATA SOURCE	10/8/2015	3/22/2021	FUTURE	FUTURE	FUTURE
		Dürr Tech.: D.Szymanski	*Dürr Tech.:* D.Szymanski	*Dürr Tech.:*	*Dürr Tech.:*	*Dürr Tech.:*
~~Motor/Fan Speed Ratio~~	MEASURE	-	-			
Comment (direct drive, belts/pulleys, reducer, V		Direct drive	with VFD			
SUPPLY FAN/VFD (nameplate)						
Rated Motor Horsepower (HP) [2]		75	75			
Voltage (motor rated VAC) [2]		460	460			
AC Current (motor full load amps) [2]		79.9	79.9			
Motor Speed (RPM) [2]		3555	3555			
Volume (ACFM) [2]		No Data	No Data			
Static Pressure (inches W.C.) [2]		No Data	No Data			
SOLVENT CONCENTRATION						
Inlet to RTO (lbs/hr) [3]		No Data				
BURNER CAPACITY (mmBTU/hr) [3]	*Nameplate:*					
Burner Output	HMI	Burner off almost all the time	Burner Off/On at only 0%			
MISCELLANEOUS						
Fuel Cost ($/1000scf) [2]						
Electricity Cost ($/kWh) [2]						
Annual Operating Hours [1]						
(How often is RTO shutdown and for how long?)						
Is RTO gas consumption measured? (Y/N) [2]						
(Get any data available) [2]						
Is RTO electric consumption measured? (Y/N) [2]						
(Get any data available) [2]						
Production Schedule (1, 2 or 3 shifts, weekends						
Is RTO shutdown or idled on weekends? [3]						
RTO DIMENSIONS						
Number of Towers [1]		2				
Purge (Exhaust, Fresh Air, None?) [1]		0				
Bed Height / Tower Height [2]						
Bed Length (specify if outside or inside dimensio						
Bed Width (specify if outside tower dimension) [2]						
Combustion Chamber Height [3]						
Damper Size (Diameter) [3]						
Damper Type [3]		Poppets				
Durr Job Number		N/A				

Notes:

Superscripts:
1. High Priority
2. Medium Priority
3. Low Priority

Highlighted data can be collected off line or data can be requested from the client