Ford Motor Company – Automatic Transmission New Product Center
MI-ROP-M4734-2011
Malfunction Abatement Plan
August 21, 2014 (Updated) and November 14, 2016 (CAM)

Michigan Air Rule	ATNPC Malfunction Abatement Plan	Enclosure
R 336.1911 Malfunction abatement plans. Rule 911. (1) Upon request of the department, a person responsible for the operation of a source of an air contaminant shall prepare a malfunction abatement plan to prevent, detect, and correct malfunctions or equipment failures resulting in emissions exceeding any applicable emission limitation. (2) A malfunction abatement plan required by subrule (1) of this rule shall be in writing and shall, at a minimum, specify all of the following: (a) A complete preventative maintenance program, including identification of the supervisory personnel responsible for overseeing the inspection, maintenance, and repair of air-cleaning devices, a description of the items or conditions that shall be inspected, the frequency of the inspections or repairs, and an identification of the major replacement parts that shall be maintained in inventory for quick replacement. (b) An identification of the source and air-cleaning device operating variables that shall be monitored to detect a malfunction or failure, the normal operating range of these variables, and a description of the method of monitoring or surveillance procedures. (c) A description of the corrective procedures or operational changes that shall be taken in the event of a malfunction or failure to achieve compliance with the applicable emission limits. (3) A malfunction abatement plan required by subrule (1) of this rule shall be submitted to the department and shall be subject to review and approval by the department. If, in the opinion of the commission, the plan does not adequately carry out the objectives as set forth in subrules (1) and (2) of this rule, then the department may disapprove the plan, state its reasons for disapproval, and order the preparation of an amended plan within the time period specified in the order. If, within the time period specified in the order, an amended plan is submitted which, in the opinion of the department, fails to meet the objective, then the department, on its own initiative, may *amend the plan* to cause it to meet the objective. (4) Within 180 days after the department approves a malfunction abatement plan, a person responsible for the preparation of a malfunction abatement plan shall implement the malfunction abatement plan required by subrule (1) of this rule.	The FG-PHASE3 Dynamometer testing facility is currently comprised of engine driven dynamometer test cells ducted through an Exhaust Control System (ECS) to three regenerative thermal oxidizers (RTOs). The RTOs provide emission incineration of hydrocarbon (VOC) and carbon monoxide (CO) emissions from each test cell. Under all existing test cell operating scenarios, one RTO has the capacity to control emissions from all of the engine driven test cells simultaneously, if required. The two adjacent RTOs are operated in standby mode in the event of a primary RTO malfunction. The RTO system Programmable Logic Controller (PLC) automatically switches between RTOs, if the operating RTO system encounters abnormal operating conditions (e.g., combustion chamber temperature loss, hydraulic system damper failure, loss of ECS, etc.). The facility does not operate the engine driven test cells unless a minimum RTO chamber temperature of 1400 degrees Fahrenheit is maintained. In addition, interlocks between the test cells and the abatement equipment are in place to safely terminate all test cell operations in the event of a RTO system-wide (RTO 1, 2 & 3) malfunction or ECS failure that would jeopardize the incineration process of hydrocarbon and carbon monoxide emissions. The facility has a comprehensive abatement equipment maintenance program consisting of daily visual inspections and repairs performed by plant forces and local personnel under the supervision of Tom Masacek, ATDL facilities supervisor. Additionally, quarterly and annual inspection and repair activity is performed by an engineering firm specializing in emission control systems. A Service Report/Check List of the inspected items and recommended	Low Temperature Flowchart Diagram Inspection Report Binder

	replacement parts are included in the Vendor's inspection report binder. Items identified in the report as "critical" to the operation/performance of the system are replaced immediately by the vendor at the time of inspection, or if the parts are unavailable, the affected RTO is shut down until the hardware can be ordered and replaced. The emissions control system for the FG-PHASE3 Dynamometer testing facility is designed with built-in redundancy. There are two complete "spare" RTOs which can immediately be brought on-line in the event of primary RTO malfunction. No written list of spare parts is maintained, as the two back up RTO's are kept operational and serve as a complete set of spare parts. RTO malfunctions or other abnormal operating conditions are reported to Dynamometer Operations Management and the Plant Environmental Engineer, Adam Albright. As previously described, sensors and interlocks ensure emission control is maintained during test cell operation. Malfunctions or abnormal operating conditions that would prevent compliance with the applicable emission limits would automatically shut down test cell operations until control system repairs are completed.	

COMPLIANCE ASSURANCE MONITORING (CAM) REQUIREMENTS

The requirements of Compliance Assurance Monitoring (CAM), as promulgated under 40 CFR 64.2, apply to a pollutant-specific emissions unit at a major source that is required to obtain a part 70 or 71 permit if the unit satisfies all of the following criteria:

> (1) The unit is subject to an emission limitation or standard for the applicable regulated air pollutant (or a surrogate thereof), other than an emission limitation or standard that is exempt under 40 CFR 64.2(b)(1) of this section;
> (2) The unit uses a control device to achieve compliance with any such emission limitation or standard; and
> (3) The unit has potential pre-control device emissions of the applicable regulated air pollutant that are equal to or greater than 100 percent of the amount, in tons per year, required for a source to be classified as a major source. For purposes of this paragraph, ``potential pre-control device emissions'' shall have the same meaning as ``potential to emit,'' as defined in Sec. 64.1, except that emission reductions achieved by the applicable control device shall not be taken into account.

In accordance with 40 CFR 64.3, to provide a reasonable assurance of compliance with emission limitations or standards for the anticipated range of operations at a pollutant-specific emissions unit, monitoring under this part, the CAM Plan shall meet the following general criteria:

(1) The owner or operator shall design the monitoring to obtain data for one or more indicators of emission control performance for the control device and any associated capture system. Indicators of performance may include, but are not limited to, direct or predicted emissions, process and control device parameters that affect control device (and capture system) efficiency or emission rates, or recorded findings of inspection and maintenance activities conducted by the owner or operator.
(2) The owner or operator shall establish an appropriate range(s) or designated condition(s) for the selected indicator(s) such that operation within the ranges provides a reasonable assurance of ongoing compliance with emission limitations or standards for the anticipated range of operating conditions. In addition, unless specifically stated otherwise by an applicable requirement, the owner or operator shall monitor indicators to detect any bypass of the control device (or capture system) to the atmosphere, if such bypass can occur based on the design of the pollutant-specific emissions unit.
(3) The design of indicator ranges or designated conditions may be based on a single maximum or minimum value if appropriate, may be expressed as a function of process variables, may be expressed as maintaining the applicable parameter in a particular operational status or designated condition, or may be established as interdependent between more than one indicator.

Under 40 CFR 64.4(4)(b), for a CAM Plan, the owner or operator shall submit a justification for the proposed elements of the monitoring plan and if the proposed performance specifications include differences from manufacturer recommendations, the plan shall explain the reasons for the differences. If the CAM Plan relies on presumptively acceptable monitoring, no further justification for the appropriateness of that monitoring should be necessary.

At the Automatic Transmission New Product Center (ATNPC), the following sources are subject to CAM under the above requirements:

- FG-PHASE3 (utilizing regenerative thermal oxidizer for compliance)
- FG-PHASE3A (utilizing regenerative thermal oxidizer for compliance)

In conjunction with this Malfunction Abatement Plan, the following control device parameters and associated inspection and maintenance activities serve as presumptively acceptable monitoring based on known performance of thermal oxidizers for the emission units subject to CAM at ATNPC:

<u>Regenerative Thermal Oxidizers</u>
Combustion Chamber Temperature and Thermocouple Check: Monitor combustion chamber temperature to ensure it is operates at 1400 degrees Fahrenheit and check thermocouple for performance or replace the thermocouple a minimum of once every 12 months to ensure air stream is maintained at a temperature necessary to destroy the volatile organic compound and carbon monoxide within the regenerative thermal oxidizer. This task is performed under the annual service checklist completed by Giffin (or equivalent supplier):

- Upper Chamber Task #8
- Lower Chamber Task #5
- Burners Tasks #14 and #15

Cold Face Check / Heat Exchange-Heat Transfer Media Inspection: Perform a heat exchange/heat transfer media a minimum of once every 18 months to ensure that solvent-concentrated air may pass into the oxidizer as designed (unless tested within the prior 18 months). This task is performed under the annual service checklist completed by Giffin (or equivalent supplier):

- Upper Chamber Task #5
- Lower Chamber Task #6

Inlet/Outlet Valve Check /Valve Seals Condition Inspection: Perform an inspection of the valve seals condition and verify valve timing/synchronization a minimum of once every 18 months to ensure that the proper retention time for destruction of volatile organic compounds within the oxidizer is maintained (unless tested within the prior 18 months). This task is performed under the annual service checklist completed by Giffin (or equivalent supplier):

- Burners Task #16
- Pneumatic/Hydraulic System Tasks #3 and #8
- Oxidizer Inlet and Outlet Ducting Tasks #6 and #11

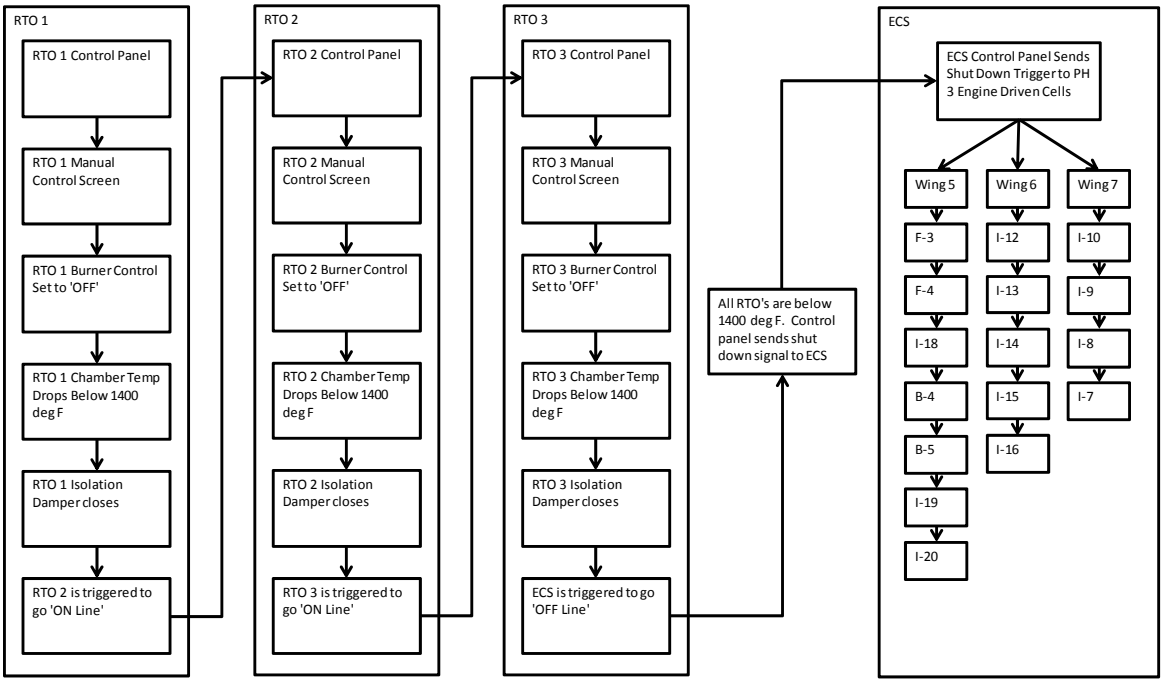
- Lower Chamber Task #4

Monitoring of these key operational parameters described in this section meet the requirements of CAM as defined in 40 CFR Part 64 for each of the affected emission units.

Ford Motor Company

Livonia ATNPC RTO-ECS Low Temp Shut Down Verification Process

Starting Condition: All RTO's at operating temp. RTO 1 in 'On Line' mode while RTO 2 and RTO 3 are in 'Stand By' mode



Annual Inspection:

GIFFIN

RTO INSPECTION CHECKSHEET

Customer:	
Address:	
Contact:	
Phone:	
E-Mail:	
Type of Unit:	
Inspection Date:	
Technical Engineers:	

Inspection Checklist		
Burners:		**Comments:**
1.	Check high and low gas pressure switches for proper operation and settings.	
2.	Check screens and valve seats, and test for freedom of valve movement.	
3.	Inspect and clean the burner as needed.	
4.	Inspect and replace igniters if required. Verify gap and cleanliness. Clean and gap if needed.	
5.	Inspect the gas train integrity and general condition.	
6.	Check and reset main gas pressure regulator.	
7.	Check and test main gas safety shut-off valves.	
8.	Check and test main gas vent valves.	
9.	Check UV detectors and its flame intensity signal; clean or replace, if defective.	
10.	Check and test pilot gas shut-off valve.	
11.	Check and verify main and pilot gas pressure gauges are operating.	
12.	Inspect combustion air blower. Filter cleanliness and lubrication.	
13.	Inspect PLC PID settings for proper operation. (Verify during start-up on trending chart.)	
14.	Inspect and recalibrate temperature transmitters.	
15.	Inspect thermocouples and replace as necessary. (Verify Type matches wire.)	
16.	Check combustion air and gas ratios. Profile Burner, Adjust actuator motors, linkage and valves as necessary. Check and set pilot gas pressure regulator. (Except Canada, CSA Certified personnel required to complete burner adjustment. See attached report.)	
17.	Ignite burners and observe proper sequencing of purge and ignition systems; correct if necessary.	
Pneumatic/Hydraulic System:		

1.	Request PM's for filter replacement schedule and replace if needed.	
2.	Check system fluids for level and condition, top off fluid as needed. Test Hydraulic level switch for proper operation.	
3.	Inspect fittings, valves, and hoses for leaks and damage.	
4.	Check and Verify all hydraulic system pressure, temperature, and flow switches. Test hydraulic low pressure switch and adjust if necessary.	
5.	Check hydraulic operating pressure.	
6.	Inspect and verify operation of the hydraulic accumulator system. Verify Charged to 50% of operating pressure.	
7.	Check Motor Amperage under load conditions.	
8.	Check and adjust valve speeds and cushions as required.	
9.	Check stand-by pump for proper operation. (If equipped.)	
System Fan(s):		
1.	Check fan controls and safeties including air flow switches, etc.	
2.	Visually inspect the bearings and shafts for any signs of damage or potential failure.	
3.	Verify fan belt tension and alignment per design.	
4.	Check motor and bearing thermocouples if equipped.	
5.	Check fan motor loads and speeds during normal operation.	
6.	Request fan lubrication system PM's for filter changes and replace filters as needed.	
7.	Verify Lubrication system operation of all temperature, pressure, and flow switches.	
8.	Check lubrication unit fluid levels and top-off as necessary.	
9.	Check the condition of the purge/burnout fan and heat return fan and make adjustment if necessary.	
10.	Check the switching operation of the purge return and bake-out dampers and make necessary adjustments if required.	

Oxidizer Inlet & Outlet Ducting & Shell:		
1.	Check the exterior of the unit for hot spots, rust, and corrosion.	
2.	Check the operation of the heat exchanger bypass and heat return system and make adjustment if necessary.	
3.	Inspect the ductwork, cladding, and access hatches.	
4.	Inspect the bypass damper for operation and lubrication.	
5.	Check the operation of the vacuum relief valve and adjust if required.	
6.	Verify all valve sequencing and valve timing.	
7.	Inspect all system thermocouple wells for general integrity and heat damage.	
8.	Inspect plenums, dampers, and damper seats. Clean seats if necessary.	
9.	Review any lubrication or part replacement required with plant maintenance.	
10.	Inspect oxidizer and fan expansion joints.	
11.	Inspect all valve actuators and linkages, adjust as necessary.	
12.	Inspect fresh air and process isolation dampers.	
13.	Inspect and relieve all pipe drain and petcocks.	
14.	Test (Leak test) safety shutoff valves for tightness of closure.	
Electrical System:		
1.	Check and prove safety limits (high temp. limit, high/low gas pressure, etc.)	
2.	Verify proper operation and programming of chart recorder.	
3.	Verify parameters and operation of variable frequency system.	
4.	Verify operation of pressure and volume control system.	
5.	Recalibrate pressure transmitters.	
6.	Check source damper operation and annunciation, adjust actuators as necessary.	
7.	Test all push buttons.	
8.	Check pressure transmitters and sampling lines.	
9.	Check all terminals for tightness.	
10.	Check high-temperature limit operation for reliability and verify alarm.	
11.	Review fault logs.	
12.	Check annunciation of faults for proper operation.	
13.	Check all safety systems.	
14.	Verify system operation as compared to original start-up data if available.	
15.	Make two back-up copies of PLC program, One-SSI, One-Customer.	
16.	Document current operating parameters.	

Upper Chamber:		
1.	Inspect the insulation, cladding and general vessel condition.	
2.	Inspect the combustion chamber general condition – media, insulation, burner.	
3.	Check for general cleanliness.	
4.	Check refractory for excessive damage/cracking. (Burner sleeve)	
5.	Check insulation (Pyro-Bloc) for separation.	
6.	Check media for excessive breakage.	
7.	Check access door gaskets for damage and leaks.	
8.	Check thermocouples for accuracy and associated wiring, Replace thermocouples if necessary.	
	Lower Chamber:	
1.	Check access door gaskets for damage and leaks.	
2.	Check ceramic media support beams for sagging. (Verify Core 10 material prior to conducting a bake-out)	
3.	Inspect the insulation, cladding and general vessel condition.	
4.	Check oxidizers canister damper seals to assure tight seals. Adjust if necessary. Tad-pole gaskets should be checked for damage and wear.	
5.	Check thermocouples for accuracy and associated wiring, Replace thermocouples if necessary.	
6.	Check insulation (Pyro-Bloc) for separation.	

Inspection Report:

Prepare a written report to provide customer with the following information:

- Details on the general internal and/or external condition of the oxidizer.
- Details on the work performed.
- Recommendation of spare/replacement parts needed.
- Recommendation will be make for any work to be done to avoid identified potential problems.
- Recommendations to be considered to bring the oxidizer into optimum operating conditions.

Quarterly Inspection:

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			June 25, 2010 Version					
Priority Level: C = Critical (Shutdown), M = Mandatory (Corrective Action Plan), A = Awareness Items								
Frequency: A = Annual, S/A = Semi-Annual, Q = Quarterly, M = Monthly								
	Site/Plant:			**Btuh Input (See Note 5)**				
	Location / Line #:			**Incoming Gas Pressure (Upstream of 1st Regulator):**				
	Equipment Number:			**BMS Manufacturer & Model #**				
	Manufacturer:			**Test Date:**				
	Zones:			**Auditor:**				
	Burner Manufacturer:			**Last Design Compliance Verification (DCV) Completed**				
	Catalyst in Use:	**Yes / No**		**Type:**			REGENERATIVE / AFTERBURNER	
Solenoid Data Collection: Send cover page only via e-mail to solenoids@combustionsafety.com (or fax to 216-398-8403)								
	Location	**Manufacturer - Model #**	**Orientation**	**Date Code**	Notes			

1.			Horz. / Vert.			
2.						
3.						
4.						
	Support documents at www.ohs.ford.com/gfe					
R / New = Updated in 2010						
Pre-Post Testing/Inspection Notes						
1	**Review "15 Minutes To Save Your Life" Pre-Test Document from Ford OHS website, Combustion Safety Pages.**					
2	**Review burner management system action matrix to define proper shut-downs and manual reset requirements. Also, obtain all proper setpoints and purge time specifications.**					
3	**Verify that all new gas equipment and/or major modifications are reviewed by your Independent Fire Protection and Property Loss Prevention Consultant. This review should be done and approvals received in the system design/specification phase if possible**					
4	**Create an ACTION PLAN by hitting the Combustion Safety logo macro button with your mouse arrow on the screen. This will expand the spreadsheet to add action plan columns.**					
5	**Review oven/control drawings to verify proper interlocks exist. This checklist is a guide, customize as needed.**					
6	**A Design Compliance Verification (DCV) review of the installed components shall only be required once every three (3) years once 100% compliant with questions contained within the DCV tab. Refer to the DCV tab within the Excel checklist for the questions.**					
7	**All items answered N/A (Not Applicable) shall be explained in a note with the question.**					
8	**Question numbers are not consecutive due to some of the questions being moved to the design compliance verification (DCV) section/tab.**					

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Interlock / Combustion Related Components - Testing

	Safety Device Name	Status/ Note	Set Value	Test Value	Pass Fail N/A	Frequency	Priority
	Equipment Condition:						
	TESTING W/UNIT NOT OPERATING						
1	Testing of automatic valves for tightness and closing time for SSOV/BV (see leak rate guidance chart at reference Item #7). Two automatic valves in series exist on the main gas train (i.e. both SSOV and BV exist).		N/A	N/A		A	M
	a. Pilot Solenoid Valve Tightness Tests.		N/A	≤ 15 BPM		A	C
	b. Safety Shut-Off and Blocking Valve test for slow closing.		N/A	1 SEC		A	C
	c. Safety Shut-Off and Blocking Valve Tightness test.		N/A	≤ 15 BPM		A	C
	d. Vent Valve Tightness Test.		N/A	No pressure loss on gauge/ Manometer		A	C

-	f. Actuator Hydraulic Fluid Leakage.		N/A	N/A		A	M
	g. Verify that no solenoid type valves exist that are more than 12 years old.			-		A	M
-	h. Test Automatic Valve Proving System for proper operation per manufacturer instructions (if it exists).					A	C
	Equipment Condition:						
	TESTING W/UNIT @ PURGING/LIGHT-OFF						
2	a. Main Gas Low Pressure Switch Functions.					Q	C
3	Verify that documentation exists to identify proper work chamber purge times (depending on the units design this could include the burner purge time and or timing of an external purge air fan).					A	M
	a. Verify that the purge timer or timers (if applicable) are set correctly to documented values and that the timers time accurately.					Q	C
4	DELETED (08).						
5	a. Main Gas High Pressure Switch Functions.					Q	C
6	Flame Supervision (Scanner/Flame Rod) Denote scanner or flame rod and type of test (Maximum 4 second shut down).						
	a. Self-Checking UV Scanner.					A	C
	b. Non Self-Checking UV Scanner.					Q	C
	c. Flame Rod.					Q	C
7	Pilot and Main Ignition Timer Proper Timing and Accuracy (Maximum 15 seconds).		N/A	N/A		Q	C
-	b. Verify that manual reset functions (Interlocks themselves can either have a manual reset or/and one on the BMS system for the unit).		N/A	N/A		Q	C

8	Verify pilot signal strength and pilot stability/location (preferrably by utilitzing the burner management system's "Run/Test" mode switch). Pilot turndown test by qualified personnel only. Do turndown test if new pilot or pilot adjustment is required.					A	C
9	Pilot Spark Pick Up.					A	C
10	Main Ignition Timer (Proper Timing and Accuracy). (Maximum 15 seconds) (See Item #7).		N/A	N/A		Q	C
11	Purge Airflow Switch functions if provided by original equipment manufacturer (this could be related to the burner or to an external purge air fan or both depending on the units design).		N/A	N/A		Q	C
12	Burner or combustion air pressure switch functions (if provided by original equipment manufacturer).		N/A	N/A		Q	C
13	Low Fire Fuel Interlock Switch Functions (if designed in by original equipment manufacturer).		N/A	N/A		A	C
Other Stops / Alarms Section - Gap Analysis							
	Equipment Condition:						
	TESTING W/UNIT@ LOW-FIRE						
14	Proof of Closure Switch.						
	a. Safety Shut-Off Valve.		N/A	N/A		A	C
	b. Blocking Valve.		N/A	N/A		A	C
15	a. Local Burner Stop/Emergency Stop Functions.		N/A	N/A		A	C
17	Work Chamber Excess Temperature High Limit Functions.					Q	C
	a. Work chamber burner set point controller functions.					Q	A
19	Fresh Air Damper Limit Switch for purging work chamber, if present functions.					Q	C

20	A differential pressure high limit switch (if required) shall be provided to measure across the catalyst bed (if required/recommended by catalyst manufacturer). Operation of this differential pressure switch shall interrupt fuel to the burner and the source of fumes.					Q	C
21	Position Switches– Air Flow Dampers, including Inlet/Outlet Dampers and dampers for chamber switching. If present, functions.		N/A	N/A		Q	C

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#	Inspection/Audit Items	Status/Note	Frequency	Priority	Further Action Required (Y/N)
General / Administrative - Gap Analysis					
31	Verify that ambient temperatures surrounding gas train and interlock components do not exceed manufacturer's recommendations.		A	M	
PLC Control Issues - Gap Analysis (Note: These apply only to all PLC's used in this service are to meet the requirements of Ford manufacturing standard EL3. (See Ford OHS website Combustion Safety Page).					

32	Verify that a document exists that states that the system was installed per the combustion safety service PLC listing or that is complies with all the requirements of NFPA 86 (2007 Edition Sections 8.33.2.1 through 8.3.3.2.3). Note: Only for equipment installed after January 1, 2007.		A	M	
34	Any changes to PLC hardware or software shall be documented, approved and maintained in a separate file at the site.		A	M	
35	Deleted.		A	M	
39	a. If a battery exists, verify it's still charged properly and functions.		A	M	
Other Control Issues - Gap Analysis					
41	A failure to provide required purge airflow shall cause the purge timer to reset.		A	C	
47	Conveyors and/or sources of flammable or combustible materials shall be interlocked to shut down on excess temperature or if either the exhaust or recirculation fans were to fail.		A	C	
48	Incinerators heated by any means, including electricity, shall have the exhaust fan motor starter and airflow switches interlocked in such a manner as to prevent operation of the heating units unless the exhaust fans are running.		A	C	
49	Check ignition spark electrodes for proper gap and operation.		A	M	

50	Flame quality observation (program exists to regularly check flame quality).		A	M	
51	Motor starters on equipment required for the combustion systems shall be interlocked into the safety circuitry.		A	M	
52	Failure of the excess temperature controller-sensing element shall cause the same response as an excess temperature condition. The excess temperature set point should be at least 100°F below the auto ignition temperature of the flammable material being processed through the oven or 50°F above the oven temperature, whichever is applicable to the material being processed.		A	C	
Fuel Systems - Gap Analysis					
53	Fuel Train Venting Issues.				
	f. Verify that no gas is coming through any of the vent line terminations that might indicate a failure. Odor (not flow) could mean normal main bleed operation. Constant flow indicates component failure such as: block/bleed valve failure, regulator diaphragm failure (pilot or main), gas relief valve leakage/failure, gas train maintenance vent or pet cocks leaking/open.		A	C	
55	Review the main and pilot gas train regulator installations.				
	d. Verify stable regulator outputs (Pilot and main).		A	M	
-	e. DELETED (08).		Every 3 yrs	C	

	f. If the regulator has a downstream sensing line with a valve in it, verify it is and can be secured open.		A	M	
56	Gas Train Shut-Offs/Blanking.				
	b. Verify that the main shut-off cock does not leak through when in the shut-off position.		A	M	
	c. Verify that one person can move the main shut-off valve (i.e. plug cock not binding).		A	M	
	e. If the main equipment shut-off (G-1) is a lubricated plug valve verify it is sealed/serviced.		A	M	
	f. Verify that handles are installed on main gas valves.		A	M	
57	a. Review for damage and/or gas train being vulnerable to traffic/material handling damage.		A	M	
58	Verify that all fuel trains have been leak tested for exterior leaks (Note: Not all gas leaks are critical. See guidance at Reference Worksheet Item #4, process to screen gas leaks for their priority).		A	As Noted	
R59j.	**j. Verify that pins/set screws on air/fuel control systems are secure (full pin, ball joints not eroded).**		**A**	**M**	
63	Separate wrenches (handles) shall remain affixed to each valve and shall be oriented such that they are properly oriented to the valve port position.		A	M	
Calibration / Preventive Maintenance - Gap Analysis					
68	Verify that gages/monitoring instruments and safety/control components operate accurately		S/A	M	

	and at proper set points.				
69	Provide evidence that burner combustion setting is done annually to adjust proper fuel/air ratios. Note that only trained personnel should perform this work.		A	M	
	g. Verify that vent valve is fused with at least the first automatic safety shutoff valve.		A	M	
72	Verify that all instrument setpoints and purge timing are as per documented proper settings and that setpoints are marked on components (Program exists).		A	M	
Firebox Internals Evaluation - Gap Analysis					
73	Conduct an internal inspection with the unit out of service. Verify that anyone entering the unit wears a hard hat and follows all confined space/lockout procedures. If an internal inspection is not possible see Item 74c.		A	M	
External Issues - Gap Analysis					
74	Carefully review exterior conditions including the following:				
	a. Identify any bulging plates and/or peeling paint.		S/A	M	
	b. Review for broken or sagging stays/supports.		S/A	M	
	c. Screen for hot spots. Document and track them if found (see Item #73 if significant hot spots exist).		A	M	
75	Review the condition of firebox latches/doors.				

	a. Verify that fasteners are tight.		A	M	
	b. Verify that fasteners/hold downs are as specified by the manufacturer.		A	A	
	c. Verify that all doors seal tight and hold firebox pressure.		S/A	M	
Electrical - Gap Analysis					
76	Verify that the panel disconnect is intact, securely mounted, closes, and functions.		A	M	
77	Verify that all the panel lights work.		A	M	
78	Verify that no safety components are electrically jumpered out or bypassed (junction boxes, switches, terminal strips, etc).		A	C	
79	Verify that wiring covers are on.		A	M	

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#	Inspection/Audit Items	Status/Note	Frequency	Priority	Further Action Required (Y/N)
General / Administrative - DCV					
1	e. Two pilot solenoid valves in series exists.		Every 3 Yrs	M	
2	Main Gas Low Pressure Switch Exists.		Every 3 Yrs	M	
3	b. If adjustable purge timers exist, consider locking covers or retrofit with new BMS system.		Every 3 Yrs	A	
5	Main Gas High Pressure Switch Exists.		Every 3 Yrs	M	
7	Verify that a manual reset is required before the unit is allowed to reset. Manual reset can occur at the interlock device and/or at the burner management system for the unit.		Every 3 Yrs	M	
14	Proof of Closure Switch – (Exists for at least one of SSOV or BV if burner is over 400,000 Btuh input).		Every 3 Yrs	M	

15	Local Burner Stop/Emergency Stop Exists.		Every 3 Yrs	M	
16	DELETED (03).				
17	Work Chamber Excess Temperature High Limit Exists.		Every 3 Yrs	M	
18	DELETED (02).				
22	ECPL (Energy Control and Power Lockout) program review.				
	a. Verify the unit has been ECPL placarded and the ECPL placarding shown is correct.		Every 3 Yrs	M	
	b. Verify that confined spaces (if they exist) are labeled.		Every 3 Yrs	M	
23	Procedures/Documentation.				
-	a. Start-up/shut down procedures exits and are readily accessible by boilerhouse personnel (See OHS Website for samples).		Every 3 Yrs	M	
	b. Start-up/shut-down procedures are in QPS format.		Every 3 Yrs	A	
-	c. Fuel switching procedures.		Every 3 Yrs	M	
-	d. Verify that piping/instrumentation drawings exist.		Every 3 Yrs	M	
-	e. Verify that manufacturer's installation/operating manual is available (or cut sheets for instruments).		Every 3 Yrs	M	
24	Verify that the unit does not contain surfaces/exposed piping over 140°F that is less than 7' above the finished floor or maintenance platform that may expose operators or those with casual access to burn hazards.		Every 3 Yrs	M	

25	A clearly worded and prominently displayed safety design data form or manufacturer's nameplate shall be provided that contains manufacturer's safe operating conditions for which the furnace or oven was designed, built, or altered for.		Every 3 Yrs	M	
26	A warning label shall be provided by the manufacturer stating that the equipment shall be operated and maintained according to instructions.		Every 3 Yrs	M	
27	Dampers that can control airflow critical to the safe purge, exhaust, or operation of the oven/furnace that can be closed off in a maximum position to an unsafe condition must be modified (cut away, limit stops, and/or limit switch interlocks) such that a safe minimum airflow can be maintained.		Every 3 Yrs	M	
28	Bursting discs, panels, mixer openings and/or other parts of the furnace/oven from which hot gases could be discharged shall be located or guarded to prevent injury from personnel (if this is impractical, warning signage must be installed).		Every 3 Yrs	M	
29	Verify that combustion air volume provided to unit meets code requirements; (if incinerator systems are outside this item is not applicable).		Every 3 Yrs	M	
30	All combustion safety circuitry contacts required shall be arranged in series with the safety shut off valve without interposing relays, a) unless connected load exceeds the		Every 3 Yrs	M	

	rating of available safety interlocks, b) interposing relay is configured to revert to safe condition upon loss of power, c) or the relay serves no more than one safety interlock device.				
PLC Control Issues - DCV (Note: These apply only to all PLC's used in this service are to meet the requirements of Ford manufacture).					
33	All PLC based control systems shall have a separate manual emergency switch independent of the programmable controller that initiates a safe shutdown.		Every 3 Yrs	M	
34	a. Verify that a security system requiring passwords/keys exists for making software changes.		Every 3 Yrs	M	
36	DELETED.		Every 3 Yrs	M	
37	Each PLC system shall have dedicated PLC output that initiates a safety shutdown for faults detected by the PLC (this is commonly done utilizing an external watchdog timer).		Every 3 Yrs	M	
38	PLC system operation shall be tested and verified for compliance with the conditions identified in this checklist and relevant codes whenever it is replaced, repaired, or updated.		Every 3 Yrs	M	
39	PLC software shall reside in some form of non-volatile memory.		Every 3 Yrs	M	
40	Deleted.		Every 3 Yrs	M	
Other Control Issues - DCV					
42	No oven/furnace can be purged into an operating fume incinerator unless it can be demonstrated that the flammable vapor concentration		Every 3 Yrs	M	

	entering the fume incinerator cannot exceed 50% of the LEL.				
43	Airflow pressure switches shall not be used to prove airflow where dampers downstream of a pressure switch can be closed to the point of reducing flow to an unsafe operating level.		Every 3 Yrs	M	
44	Air suction switches shall not be used to prove airflow where dampers upstream of the pressure switch can be closed to the point of reducing flow to an unsafe level.		Every 3 Yrs	M	
45	The operating temperature controller and its temperature sensing element shall not be used as the excess temperature controller.		Every 3 Yrs	M	
46	An additional excess temperature controller shall be located downstream from the discharge of the catalyst bed to protect the catalyst from oven temperature. Operation of the excess temperature controller shall interrupt fuel to the burner and the source of fumes.		Every 3 Yrs	M	
Fuel Systems - DCV					
53	Fuel Train Venting Issues.				
	a. Verify that each natural gas regulator and vented gas train component has a discharge piped to outside of the building. (main gas train, pilot, bleeds, maintenance vents, regulators, etc).		Every 3 Yrs	M	
	b. Verify that none of the gas line vents are run into flues or combustion air openings.		Every 3 Yrs	M	

	c. Verify that terminations are free and open (no insects/rodents/paint) and that they have vent termination protection.		Every 3 Yrs	M	
	d. Verify that the vent lines are of the proper size (full size from components and from support table on bleed lines).		Every 3 Yrs	M	
-	e. Verify that vent lines are not improperly combined (i.e. no double block and bleed vents or main regulators combined with other vents).		Every 3 Yrs	M	
54	Fuel Train Component Documentation/Screening.				
	a. Record all of the gas train component model number data using forms at the Ford OHS website, Combustion Safety Page.		Every 3 Yrs	A	
-	b. DELETED (08).		Every 3 Yrs	M	
	c. Verify that each of the components are rated for the pressure service they are in (See reference Item #8 for guidelines).		Every 3 Yrs	M	
	d. Screen to verify that all components are FM or UL listed and/or rated for gas train service. Note that reconditioned components are no longer FM or UL listed.		Every 3 Yrs	M	
	e. Verify that components are installed such that they are testable and accessible.		Every 3 Yrs	A	
	f. Screen the gas train components and their arrangement in the gas train for Ford Gas Train Specification 11575 compliance (Specification available at the Ford OHS website, Combustion		Every 3 Yrs	A	

	Safety Page).				
55	Review the main and pilot gas train regulator installations.				
	a. Verify that no bypasses are installed.		Every 3 Yrs	M	
	b. Verify that each regulator has a tag or some other indication of its operating range and capabilities.		Every 3 Yrs	A	
	c. Verify that each unit has its own regulator other than the main incoming utilities regulator.		Every 3 Yrs	M	
56	Gas Train Shut-Offs/Blanking.				
	a. Verify that each units pilot line is tapped off after the main shut-off cock.		Every 3 Yrs	M	
	d. DELETED (03).				
	g. Verify that blind/flange points exist for making the gas train safe for maintenance.		Every 3 Yrs	M	
	h. DELETED (03).				
	i. Verify that the plug cock/valves are of the indicating position type.		Every 3 Yrs	A	
	j. Verify that main gas train fuel shut off valve is within 6' of the regulator and is accessible.		Every 3 Yrs	M	
57	Verify that all gas/fuel piping is clearly marked.		Every 3 Yrs	M	
59	Gas Train Piping assembly.				
	a. Verify that no field installed retrofit bushings are used in the assembly of threaded fuel trains.		Every 3 Yrs	A	

	b. Verify that no Teflon tape is used in the assembly of threaded fuel trains (use Teflon paste).		Every 3 Yrs	A	
	c. Verify that fuel pressure gauges are installed and operating correctly (mark to show normal operating parameters).		Every 3 Yrs	M	
	d. Verify that unplugged pet cocks or openings are not installed on the fuel train.		Every 3 Yrs	M	
	e. Verify that Aluminum Tubing or Copper Tubing is not directly threaded or connected to an Iron/Steel Fitting/Pipe. Tubing must be connected through Brass/Bronze fittings or with dielectric isolation fittings to avoid corrosion. Verify that Aluminum Tubing is not used in an exterior location exposed to weather.		Every 3 Yrs	M	
	f. Verify that gate valves are not installed in the gas train piping.		Every 3 Yrs	A	
	g. Verify that gas train piping is adequately supported (mercury switches, or equivalent, level, piping is secure, supports are in place).		Every 3 Yrs	M	
	h. Verify that a drip leg exists. Drip legs are to be at least 3" long and have the same pipe diameter as the gas inlet piping.		Every 3 Yrs	A	
	i. Verify that strainers are installed.		Every 3 Yrs	A	
60	A remotely located shut-off valve should be provided to allow the fuel to be turned off in an emergency and shall be located such that fire or explosion does not prevent access to the valve.		Every 3 Yrs	A	

61	Manual fuel valves shall have permanently affixed visual indication of the valve position.		Every 3 Yrs	M	
62	Quarter turn fuel valves with removable wrenches shall not allow the wrench handle to be installed perpendicular to the fuel gas line when the valve is open.		Every 3 Yrs	M	
64	Local visual indication of safety shut off valve position shall be provided at each safety shut off valve to main burners in excess of 150,000 Btuh. Indirect position indication, such as by monitoring of voltage or pressure, shall not be permitted.		Every 3 Yrs	M	
65	Each pilot and main fuel gas burner system (unless part of a system with explosion resistant radiant tubes or open at one end) must have two safety shut off valves piped in series. Where the main or pilot fuel gas burner system capacity exceeds 400,000 Btuh, at least one of the two safety shut off valves shall prove closed and be interlocked with the pre-ignition purge interval.		Every 3 Yrs	M	
66	A permanent and ready means for making tightness checks of all safety shut off valves shall be provided.		Every 3 Yrs	A	
67	Each pilot and main burner shall be supervised independently. One flame sensor shall be permitted where an interrupted pilot (pilot on until main flame is established) or a self-piloted burner (pilot fuel issued from same ports as main burner or pilot and main flame form common flame		Every 3 Yrs	M	

	envelope/base) are used.				
	a. Verify that flame scanner is of the self-checking type whenever the equipment is routinely operated (on/burning) for over 24 hours continuously.		Every 3 Yrs	M	
Calibration / Preventive Maintenance - DCV					
69	a. Verify settings with a manometer, flue gas analyzer, or burner manufacturer recommended method.		Every 3 Yrs	A	
70	Verify that setpoint verification access has been provided in gas trains and instrument lines.		Every 3 Yrs	A	
71	Verify that if valves are installed in the gas or air switch flow sensing lines, the closed position makes for a fail safe (or tripped) condition that does not bypass or render the component incapable of operation. If instrument line valves do not meet this criteria they must be removed.		Every 3 Yrs	M	
Electrical - DCV					
80	Electrical leak test switches or automatic test systems (if installed) can improve maintenance efficiency and be used on new gas trains for safety shut-off valves and/or blocking valve testing.		Every 3 Yrs	A	
81	Verify that flame safety control circuit voltage is 120V or less, one side, grounded.		Every 3 Yrs	M	

82	Verify that the metal frames of furnaces are electrically grounded.		Every 3 Yrs	M	