

COMPANY NAME

ADDRESS

CITY

ZIP

INSPECTOR NO.

TODAY'S DATE

CERTIFICATE EXP. DATE

INS. CARRIER/SIL LEVEL

DATE INSTALLED

HEATER MFG. NAME

MODEL #

SERIAL #

FLUID

OPERATING PRESSURE (PSI)

BURNER MFG. NAME

MODEL #

SERIAL #

BTU/HR INPUT

NFPA TYPE

Heater Type Definitions: F = Fluid in Tube, Combustion Surrounding Tubes | G = Modulated Fluid in Tube, Combustion Surrounding Tubes | H = Combustion in Tube, Fluid Surrounding Tubes

POWER / MECHANICAL DRAFT

ATMOSPHERIC (NATURAL DRAFT)

NFPA-87

HEATER/BURNER

DATA SHEET

NFPA-87 Recommended Practices				POWER & MECHANICAL DRAFT BURNERS				ATMOSPHERIC (NATURAL DRAFT) BURNERS				Associated Standard Paragraph
CONTROL & SAFETY DEVICES GUIDELINES FOR AUTOMATICALLY FIRED BURNERS				INPUT in BTU/HOUR				INPUT in BTU/HOUR				
INSTALLED	NOT INSTALLED	NOT REQUIRED	SYSTEM CONTROL SPECIFICATIONS	Less than 400,000	400,000 to 2,500,000	2,500,000 to 5,000,000	5,000,000 to 12.50 MMBtu and above	Less than 400,000 <small>(Including Modular Boilers w/max input of 400,000)</small>	400,000 to 2,500,000	2,500,000 to 5,000,000	5,000,000 to 12.50 MMBtu and above	
INTERLOCKS / LIMITS / CONTROLLERS												
			Approved Operating Controllers	Required	Required	Required	Required	Required	Required	Required	Required	
			Manual E-Stop Hardwired to Safety Shutoff Valves	Required	Required	Required	Required	Required	Required	Required	Required	8.2.9, 8.4.2.4, and 8.4.2.8
			Programmable Logic Controller	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	8.2.2 and 8.4 etal
			Safety Rated Programmable Logic Solver	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	SIL-3 Applications
			High Media Temperature Recycle Limit	Required	Required	Required	Required	Required	Required	Required	Required	Temperature Controller
			High Pressure Process Media Recycle Limit	Required	Required	Required	Required	Required	Required	Required	Required	Pressure Controller
			Low Media Flow Limit	Required	Required	Required	Required	Required	Required	Required	Required	9.3.1.1 Class F Heater
			Low Media Level Interlock	Required	Required	Required	Required	Required	Required	Required	Required	9.2.5.4.2 & 9.3.1.3 Class F Heater
			Low Media Flow Interlock	Required	Required	Required	Required	Required	Required	Required	Required	9.3.1.2 Class F Heater
			High Media Temperature Interlock (Manual Reset)	Required	Required	Required	Required	Required	Required	Required	Required	8.2.2, 8.4.2.8 and 8.16 etal
			High Stack Temperature Interlock (Manual Reset)	Required	Required	Required	Required	Required	Required	Required	Required	8.2.2, 8.4.2.8 and 8.15 etal
			Open Circuit Failure of Temperature Sensing Element Interlock	Required	Required	Required	Required	Required	Required	Required	Required	8.17.2.4
			High Fuel Pressure Interlock (Manual Reset)	Required	Required	Required	Required	Required	Required	Required	Required	8.8.2
			Low Fuel Pressure Interlock (Manual Reset)	Required	Required	Required	Required	Required	Required	Required	Required	8.8.1
			High Purge Proof Switch		Required	Required	Required		Required	Required	Required	See Approved Safety Controls
			Low Fire Start Switch			Required	Required			Required	Required	8.14
			Supervised Purge Air		Required	Required	Required			Required	Required	8.6.5, 8.6.6
			Combustion Air Motor Running Interlock	Required	Required	Required	Required					8.6.4
			Proven Combustion Air Interlock	Required	Required	Required	Required					8.6.2, 8.6.3, 8.6.5
			Action on Loss of Combustion Air	Safety Shutdown	Safety Shutdown	Safety Shutdown	Safety Shutdown					8.6.2
LOW MEDIA FUEL CUTOFFS												
			Low Media Flow Limit	Required	Required	Required	Required	Required	Required	Required	Required	9.3.1.1 Class F Heater
			Low Media Level Interlock	Required	Required	Required	Required	Required	Required	Required	Required	9.2.5.4.2 & 9.3.1.3 Class F Heater
			Low Media Flow Interlock	Required	Required	Required	Required	Required	Required	Required	Required	9.3.1.2 Class F Heater
			Forced Circulation (Manual Reset)	Required	Required	Required	Required	Required	Required	Required	Required	
PILOT VALVE TRAIN (Note 12)												
			Approved Safety Shutoff Valve(s) - 2 Required	Required	Required	Required	Required	Required	Required	Required	Required	8.7.2.1
			Approved Safety Shutoff Valve(s) - 2 Required Pilots over 400,000 Btu ONLY		One Pilot w/ Proof of Closure Interlock Required	One Pilot w/ Proof of Closure Interlock Required	One Pilot w/ Proof of Closure Interlock Required		One Pilot w/ Proof of Closure Interlock Required	One Pilot w/ Proof of Closure Interlock Required	One Pilot w/ Proof of Closure Interlock Required	8.7.2.2A1 or 8.7.2.2A2
			Manual Shutoff Valve(s)	Required	Required	Required	Required	Required	Required	Required	Required	
			Gas Pressure Regulator	Required	Required	Required	Required	Required	Required	Required	Required	
MAIN VALVE TRAIN												
			Approved Safety Shutoff Valve(s)	Required	Required	Required	Required	Required	Required	Required	Required	8.7.2.1
			Valve Seal Overtravel Interlocks		Required	Required	Required		Required	Required	Required	8.7.2.2.A1
			Manually Operated Leak Test Valve(s)		(1) or (2) Required	(1) or (2) Required	(1) or (2) Required		(1) or (2) Required	(1) or (2) Required	(1) or (2) Required	8.7.2.3
			Manual Shutoff Valve(s)	(2) Required	(2) Required	(2) Required	(2) Required	(1) Required	(2) Required	(2) Required	(2) Required	
			Gas Pressure Regulator	Required	Required	Required	Required	Required	Required	Required	Required	
			Valve Proving System	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	8.7.2.2.A2 and 8.7.2.3
MULTIPLE BURNER VALVE TRAIN												
			Approved Safety Shutoff Valve at Burner	(1) Required Plus Main Fuel Shutoff as above	(1) Required Plus Main Fuel Shutoff as above	(1) Required Plus Main Fuel Shutoff as above	(1) Required Plus Main Fuel Shutoff as above	(1) Required Plus Main Fuel Shutoff as above	(1) Required Plus Main Fuel Shutoff as above	(1) Required Plus Main Fuel Shutoff as above	(1) Required Plus Main Fuel Shutoff as above	8.7.1.3
			Manually Operated Leak Test Valve(s)		(1) or (2) Required	(1) or (2) Required	(1) or (2) Required		(1) or (2) Required	(1) or (2) Required	(1) or (2) Required	8.7.2.3
			Manual Shutoff Valve(s)	(1) Required	(1) Required	(1) Required	(1) Required	(1) Required	(1) Required	(1) Required	(1) Required	8.7.2.3
			Valve Proving System	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional	8.7.2.3
APPROVED SAFETY CONTROL SPECIFICATIONS												
			Flame Safeguard / Burner Control	Required	Required	Required	Required	Required	Required	Required	Required	8.3.1.1, 8.4.2.8, 8.4.2.9, 8.9.1
			Prepurge Timing Required	Required	Required	Required	Required	Required	Required	Required	Required	Mechanical Draft 8.5.1, 8.5.1.1 Natural Draft 8.5.1.2, 8.5.1.2.1
			Safe Start Check Required	Required	Required	Required	Required	Required	Required	Required	Required	Natural Draft
			Prepurge Air Changes Required	4 Changes	4 Changes	4 Changes	4 Changes	4 Changes	4 Changes	4 Changes	4 Changes	8.5.1.1 - 8.5.1.2, 8.5.1.2.1
			High Purge Proving Circuit Required		Required	Required	Required	Required	Required	Required	Required	8.5.1.1 - 8.5.1.2, 8.5.1.2.1
			Low Fire Start Circuit Required	Optional	Optional	Required	Required	Optional	Optional	Required	Required	
			Direct Ignition	Optional	Optional	Not Permitted	Not Permitted	Optional	Optional	Not Permitted	Not Permitted	8.5.2.4
			Intermittent Pilot	Optional	Optional	Not Permitted	Not Permitted	Optional	Optional	Not Permitted	Not Permitted	
			Interrupted Pilot	Optional	Optional	Required	Required	Optional	Optional	Required	Required	
			Proved Pilot	Required	Required	Required	Required	Required	Required	Required	Required	8.91.1 or .2
			Pilot Flame Establishment Period (PFEP)	Direct Spark Ignition None	15 Seconds (Note 26)	15 Seconds (Note 26)	15 Seconds (Note 26)	Direct Spark Ignition None	15 Seconds (Note 26)	15 Seconds (Note 26)	15 Seconds (Note 26)	8.5.2
			Intermittent Pilot	15 Seconds	15 Seconds	Not Permitted	Not Permitted	15 Seconds	15 Seconds	10 Seconds	10 Seconds	
			Interrupted Pilot	15 Seconds	15 Seconds	10 Seconds	10 Seconds	15 Seconds	15 Seconds	10 Seconds	10 Seconds	
			Direct Ignition of Pilot	15 Seconds Maximum	15 Seconds Maximum	15 Seconds Maximum	15 Seconds Maximum	15 Seconds Maximum	15 Seconds Maximum	15 Seconds Maximum	15 Seconds Maximum	
			Main Flame Establishment Period (MFEPP)	15 Seconds Maximum	15 Seconds Maximum	15 Seconds Maximum	15 Seconds Maximum	15 Seconds Maximum	15 Seconds Maximum	15 Seconds Maximum	15 Seconds Maximum	
			Supervised Main Flame	Required	Required	Required	Required	Required	Required	Required	Required	8.91.1 or .2
			Flame Failure Response Time (FFRT)	4 Seconds Maximum	4 Seconds Maximum	4 Seconds Maximum	4 Seconds Maximum	4 Seconds Maximum	4 Seconds Maximum	4 Seconds Maximum	4 Seconds Maximum	
			Action on Flame Failure	Safety Shutdown	Safety Shutdown	Safety Shutdown	Safety Shutdown	Safety Shutdown	Safety Shutdown	Safety Shutdown	Safety Shutdown	8.91.1 or .2
			Action On Interlock Opening	Safety Shutdown	Safety Shutdown	Safety Shutdown	Safety Shutdown	Safety Shutdown	Safety Shutdown	Safety Shutdown	Safety Shutdown	See individual Interlock Safeties

MINIMUM ‘SAFETY INSTRUMENTED FUNCTIONS (SIF)’ REQUIRED BY NFPA-87

Deviation From Normal Operation	Cause	Consequence	Result	Recommended Safeguards	Recommendations
1.0 EXCESSIVE HIGH OR LOW PRESSURE					
1.1	High Fuel Gas Pressure	Burner Over-Fired	Overheated Furnace	*See High Temperature Interlock	
		Flame Lift-Off	Explosion	High Fuel PSI Sw or Transmitter	
		Rich Furnace	Explosion		
1.2	Low Fuel Gas Pressure	Flame Front Collapse	Explosion	Low Fuel PSI Sw or Transmitter	
		Lean Furnace	Explosion		
1.3	Excessive Process PSI	Vessel Mechanical Failure	Release of process media and secondary fire or explosion.	High Process PSI Sw or Transmitter	
		Tube Mechanical Failure			
2.0 FAILURE TO DETECT FLAME OR FLAME PRESENT DURING OFF CYCLE					
2.1	Flame Scanner Failure	Fail to detect flame during OFF cycle	Sudden ignition of any leaking fuel into furnace and explosion	a) Self-Checking Scanner and b) Listed Burner Controller	
2.2	Flame Scanner Failure	Fail to detect flame during ignition, pilot, or run cycle	Sudden ignition of any leaking fuel into furnace and explosion	a) Self-Checking Scanner and b) Listed Burner Controller	
2.3	Flame Scanner Failure	Flame detected when no flame is present in furnace	Fuel Valves open with no source of ignition resulting in fuel rich furnace and subsequent explosion.	a) Self-Checking Scanner and b) Listed Burner Controller	
3.0 FAILURE TO PURGE COMBUSTION CHAMBER PRIOR TO IGNITION TRIALS					
3.1	Draft Dampers Failed Closed	Fuel Vapor accumulates in the furnace prior to ignition	Explosion in Ignition	a) Draft Damper PROOF OPEN Sw b) Combustibles Analyzer in Stack* *(Natural Drafted Systems)	
3.2	Combustion Fan Failure <i>Mechanically Drafted System</i>	Fuel Vapor accumulates in the furnace prior to ignition	Explosion in Ignition	a) Motor Run Proof Sw b) Air Flow Proof Sw c) Air Flow Proof Trans	
Process Combustion Locks 3.3	Interruption of Fuel/Air Ratio Control Strategy	Fuel Rich Furnace	Delayed Ignition and Explosion	a) Combustibles or Oxygen Interlock Analyzer in Stack b) Cross Limited Fuel/Air Ratio Control c) Fuel Flow Meter	
4.0 FAILURE TO MAINTAIN FLUID INSIDE HEATED TUBES OR VESSELS					
4.1	Inlet Valves CLOSED during burner operation	Overheating of tubes and/or vessel	Mechanical failure of tubes and vessels and release of vessel contents	a) Inlet Valve PROOF OPEN Sw b) Minimum Flow Sw in Media Line	
4.2	Media Pump Fails	Overheating of tubes and/or vessel	Mechanical failure of tubes and vessels and release of vessel contents	a) Minimum Flow Sw in Media Line b) Minimum Flow Trans in Media Line c) Pump Motor Run Ax Sw	
4.3	Heating Surfaces Exposed	Overheating of tubes and/or vessel	Mechanical failure of tubes and vessels and release of vessel contents	a) Low Level Burner Cut-Off Sw b) Low Level Burner Cut-Off Transmitter c) Tube Skin Temp Interlock	
			Boiling Liquid Vapor Explosion		
5.0 EXCESSIVE OR HIGH TEMPERATURES					
5.1	Firing Rate Valve Hangs in OPEN Position	Overheating of process fluid	Thermal breakdown of heat transfer fluid	High Media Temperature Interlock	
5.2	Breach in process tube or vessel releasing media into furnace area and catching fire	Process media fire inside furnace	Furnace Explosion or Media Process Explosion	High Stack Temperature Interlock	
6.0 FUEL LEAK INTO FURNACE DURING OFF CYCLE					
6.1	Failed Fuel Shutoff Valve	Fuel leaking into furnace with no immediate ignition source	Furnace Explosion	a) Listed Fuel Safety Shutoff Valves b) Fuel Valve Proof of Closure Sw c) Double Block and Bleed Fuel Train d) Valve Proving System on Fuel Train	

Survey Company Name: \_\_\_\_\_

Technician Signature: \_\_\_\_\_

Customer Signature: \_\_\_\_\_

Date: \_\_\_\_\_