

STANDARD INFORMATION

Standard Number: NFPA 86
Standard Name: Standard for Ovens and Furnaces
Standard Edition and Issue Date: 2019 Edition Dated May 24, 2018
Date of Revision: May 24, 2018
Date of Previous Revision of Standard: 2015 Edition Dated May 19, 2014

EFFECTIVE DATE OF NEW/REVISED REQUIREMENTS

Effective Date: **May 24, 2020**

IMPACT, OVERVIEW, AND ACTION REQUIRED

Impact Statement: A review of all Listing Reports is necessary to determine which products comply with new/revise requirements and which products will require re-evaluation. **NOTE:** Effective immediately, this revised standard will be exclusively used for evaluation of new products unless the Applicant requests in writing that current requirements be used along with their understanding that their listings will be withdrawn on Effective Date noted above, unless the product is found to comply with new/revise requirements.

Overview of Changes:

- Requirements for radiant tubes were revised
- Changed the requirements for emergency switches
- Explosion relief exceptions were clarified

Specific details of new/revise requirements are found in table below

If the applicable requirements noted in the table are not described in your report(s), these requirements will need to be confirmed as met and added to your report(s) such as markings, instructions, test results, etc. (as required).

Client Action:

Information – To assist our Engineer with review of your Listing Reports, please submit technical information in response to the new/revise paragraphs noted in the attached or explain why these new/revise requirements do not apply to your product (s).

Current Listings Not Active? – Please immediately identify any current Listing Reports or products that are no longer active and should be removed from our records. We will do this at no charge as long as Intertek is notified in writing prior to the review of your reports.



STANDARD INFORMATION

CLAUSE	VERDICT	COMMENT
		<i>Additions to existing requirements are underlined and deletions are shown lined out below.</i>
5	Info	Location and Construction
5.2	Info	Furnace Design
		Where a cooling system is critical to continued safe operation of a furnace, the following shall be required:
5.2.12		(1) The cooling system shall continue to operate after a safety shutdown or power failure. (2) <u>The furnace manufacturer's operating instructions shall state, in effect, that the cooling system is critical for safe operation.</u>
5.3	Info	Explosion Relief
6	Info	Furnace Heating Systems
6.2	Info	Fuel Gas-Fired Units
6.2.8	Info	Overpressure Protection
		<i>New clause added;</i>
6.2.8.3		The overpressure protection device shall be set no higher than the maximum operating pressure of the downstream component having the lowest rated pressure.
6.2.10	Info	Air-Fuel Gas Mixers
6.2.10.2	Info	Proportional Mixing
6.2.10.2.2		Valves or other obstructions shall not be installed between an <u>air jet mixer, gas jet mixer, proportional mixer, or a mixing blower</u> and burners, unless otherwise permitted by 6.2.10.2.3.
6.2.12	Info	Fuel Ignition
		<i>New clause added;</i>
6.2.12.3		Handheld igniters that generate electric sparks shall be listed.
7	Info	Commissioning, Operations, Maintenance, Inspection, and Testing
7.4	Info	Inspection, Testing, and Maintenance
		<i>New clause added;</i>
7.4.4.1		Where an impulse line is used to connect a safety device, the impulse line shall be inspected for leaks at least annually.



CLAUSE	VERDICT	COMMENT
		<i>New clause added;</i>
7.4.10		The set point of the pressure relief valve, where installed, shall be verified at least annually.
8	Info	Safety Equipment and Application
8.2	Info	Safety Device Requirements
		<i>New clause added;</i>
8.2.9.1		If the mushroom-type emergency fuel stop is wired to the inputs of a safety programmable logic controller (PLC) per Section 8.4, the emergency fuel stop shall use redundant contacts to redundant safety inputs per the manufacturer's safety manual for implementing an emergency stop to safety integrity level (SIL) 3/PL e.
		<i>New clause added;</i>
8.2.9.2		Ancillary furnace functions not related to fuel shall be evaluated using the appropriate standards for their inherent hazard, and the appropriate action shall be taken to mitigate that hazard when the emergency fuel stop is activated.
8.3	Info	Burner Management System Logic
8.3.1	Info	General
		<i>New clause added;</i>
8.3.1.4		All safety function sensors and final elements shall be independent of operating sensors and final elements.
8.4	Info	Programmable Logic Controller Systems
		Where PLCs are not listed for combustion safety service or as combustion safeguard <u>and where used for combustion safety service</u> , the safety PLCs and its associated input and output (I/O) shall be as follows:
8.4.2		<p>(1) <u>PLCs and I/O shall be third-party certified to IEC 61508, Functional Safety of Electrical/Electronic/Programmable Electronic Safety-Related Systems, safety integrity level (SIL) 2 or greater</u></p> <p>(2) <u>The processor and the I/O shall be listed for control reliable service and applied to achieve at least an SIL 2 capability per the manufacturer's safety manual</u></p> <p>(3) <u>Implemented such that access to safety functions shall be separate from access to nonsafety functions.</u></p> <p>(4) <u>Implemented such that access to PLC logic dedicated to safety functions shall be restricted to prevent unauthorized changes.</u></p> <p>(5) <u>Safety PLCs shall not replace the following devices:</u></p> <p style="padding-left: 40px;">(a)* <u>Manual emergency switches</u></p> <p style="padding-left: 40px;">(b) <u>Continuous vapor concentration high-limit controllers</u></p>
8.4.2.1	Info	Software



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		<i>New clause added;</i>
8.4.2.1.4		Software shall be designed per the PLC manufacturer's instruction to achieve SIL 2 or greater capability and shall be validated by another qualified individual.
8.5	Info	Safety Control Application for Fuel-Fired Heating Systems
8.5.1	Info	Preignition (Prepurge, Purging Cycle)
		<i>New clause added;</i>
8.5.1.2.6		Air pressure switches shall not be used to prove airflow where valves downstream of the pressure switch can be closed to the point of reducing airflow below the minimum required.
		<i>New clause added;</i>
8.5.1.5		Burner ignition sequence shall be started at the completion of the preignition purge unless one safety shutoff valve required by 8.5.1.2.3 is proved closed and one of the following conditions is satisfied:
		<i>New clause added;</i>
8.5.1.5.1		The purge airflow rate is maintained and proved without interruption following the completion of the preignition purge.
		<i>New clause added;</i>
8.5.1.5.2		It is demonstrated that the flammable vapor and gas concentrations within the system volume described in 8.5.1.2.2 will not exceed 25 percent of LFL at the time of ignition.
		Repeating the preignition purge shall not be required where any one of the following conditions is satisfied:
		(1) The temperature of the chamber where combustion takes place is proved to be above 1400°F (760°C).
		(2)* For a multiburner fuel-fired system not proved to be above 1400°F (760°C) and with each burner system equipped with two safety shutoff valves that close between each burner that is not operating the fuel supply, at least one burner remains operating in the common combustion chamber of the burner to be reignited.
8.5.1.9		(3) For a multiburner fuel-fired system not proved to be above 1400°F (760°C) <u>and with each burner equipped with one safety shutoff valve, all of the following conditions are satisfied (does not apply to fuel oil systems):</u>
		<u>(a) The number of safety shutoff valves required to close in 8.8.1.3 and 8.8.2.1 will close between the burner system and the fuel gas supply when that burner system is off.</u>
		<u>(b) The burner system uses natural gas, butane, or propane fuel gas.</u>



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		<p>(c)* <u>It can be demonstrated, based on the leakage rate, that the combustible concentration in the chamber and all other passages that handle the recirculation and exhaust of products of combustion cannot exceed 25 percent of the LFL.</u></p> <p>(d) <u>The minimum airflow used in the LFL calculation in 8.5.1.9(3)(c) is proved and maintained during the period the burner(s) is off.</u></p> <p>(4)* For fuel gas-fired burner systems, and assuming that all safety shutoff valves fail in the full open position, it can be demonstrated that the combustible concentration in the chamber and all other passages that handle the recirculation and exhaust of products of combustion cannot exceed 25 percent of the LFL.</p>
8.5.3		Ignition of Main Burners — Fuel Gas or Oil. Where a <u>specified firing condition</u> is required for ignition of the burner <u>or equipment, the control element(s) shall be proved at the specified condition(s)</u> prior to each attempt at ignition.
8.8	Info	Safety Shutoff Valves (Fuel Gas or Oil)
8.8.1	Info	General
8.8.1.3	Info	Multiple Burners
		<i>New clause added;</i>
8.8.1.3.2		Closure of a single safety shutoff valve to shut off fuel to multiple burners or pilots that operate as a burner system firing into a common chamber shall be permitted as long as there is a second safety shutoff valve between the fuel supply and the burners.
		<i>New clause added;</i>
		Safety shutoff valves operated open-close more than 10 cycles per hour shall be permitted where all of the following requirements are met:
8.8.1.6		<p>(1) Safety shutoff valves shall not be open-close cycled at a rate that exceeds that specified by the manufacturer.</p> <p>(2) Safety shutoff valves shall have a published designed open-close cycle rate.</p> <p>(3) Control logic shall not result in exceeding the published open-close cycle rate of the safety shutoff valves.</p> <p>(4) Safety shutoff valves shall have a published designed lifetime number of cycles and/or time intervals.</p> <p>(5) Safety shutoff valves shall be replaced prior to exceeding the lesser of the published designed lifetime number of cycles and/or time intervals unless equipped with a proof of closure switch incorporating change-of-state logic in the burner management system.</p> <p>(6) Safety shutoff valves shall be tested in accordance with the manufacturer’s requirements for high cycle rate valves.</p>
8.10	Info	Flame Supervision



CLAUSE	VERDICT	COMMENT
		<i>New clause added;</i>
8.10.6.1		A line burner, pipe burner, or radiant burner with a pilot shall have one flame detector installed to sense pilot burner flame at the source of ignition.
10	Info	Thermal Oxidizer
10.6	Info	Safety Equipment and Application
		<i>New clause added;</i>
		Purging. A source air mixture shall not be introduced into a running thermal oxidizer unless one of the following conditions is met:
10.6.2		(1) It shall be demonstrated that the flammable vapor concentration entering the thermal oxidizer cannot exceed 50 percent of the LFL under all anticipated normal and abnormal operating conditions. (2)* Where it is not permitted to discharge the source air mixture directly to atmosphere, the source equipment, connecting ductwork, and thermal oxidizers used to oxidize the source air mixture shall have explosion prevention and explosion-protection systems designed and installed in accordance with the requirements of NFPA 69.
11	Info	Class A Ovens and Furnaces
11.6	Info	Safety Ventilation for Class A Ovens
11.6.9	Info	Batch Process Ovens
11.6.9.3	Info	Methods for Determining Safety Ventilation Rate
		Method for Modulating Safety Ventilation Rate to Control Vapor Concentration. The minimum safety ventilation rate shall be one of the following: <u>The following safety ventilation equipment and controls shall be provided and sized based on the determined maximum evaporation rate:</u>
11.6.9.3.1		<u>(1) Exhaust fans and other devices designed to prevent average concentration in the oven from exceeding 25 percent of the LFL</u> <u>(2) A continuous vapor concentration high limit controller meeting both of the following criteria:</u> <u>(a) The controller is arranged to alarm and shut down the oven heating system if the vapor concentration exceeds 50 percent of the LFL.</u> <u>(b) The controller is arranged to operate additional exhaust fans at a predetermined vapor concentration not exceeding 50 percent of the LFL.</u>
13	Info	Special Atmospheres for Class C Ovens and Furnaces
13.5	Info	Safety Equipment
13.5.7	Info	Flow Control of Special Atmospheres



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13.5.7.2		When furnace chamber door operation or workload quenching causes atmosphere contractions, the flow rates used shall restore positive internal pressure without infiltration of air during atmosphere contractions when furnace chamber doors close or workloads are quenched. <u>before air infiltration would cause a transition into the flammability range.</u>
13.5.11	Info	Design Requirements for the Introduction, Use, and Removal of Flammable and Indeterminate Special Atmospheres from Furnaces
13.5.11.1	Info	General
		<i>New clause added;</i>
13.5.11.1.7		Where a furnace uses an atmosphere oil seal, means shall be provided so that furnace pressure is maintained below the static head pressure of the seal oil.
		Flame Curtains. Where a flame curtain is used, the following features shall be provided and in service:
		(1) One or more flame curtain pilots shall be positioned to reliably ignite the flame curtain.
		(2)* At least one flame curtain pilot at a flame curtain shall have flame supervision interlocked to prevent the opening of a closed door served and interlocked to prevent initial operation of the flame curtain at the door served.
		(3) At least one safety shutoff valve upstream of all flame curtains on a furnace shall be interlocked to close upon the following conditions:
		(a) Low fuel gas pressure on the flame curtain fuel gas supply
		(b) High fuel gas pressure on the flame curtain fuel gas supply where a high gas pressure issue would create a safety concern
13.5.11.3		(4) <u>For flame curtains equipped with flame supervision independent of the flame curtain pilot flame supervision, it shall be permissible to bypass the safety shutoff valve interlocks in 13.5.11.3(3)(a) and 13.5.11.3(3)(b) once the door served is open provided that flame curtain flame is sensed by the flame curtain flame supervision system.</u>
		(5) An automatic control valve shall be provided ahead of each flame curtain arranged to open when the door served is not closed.
		(6) When the safety shutoff valve in item 13.5.11.3(3) is closed, any doors served by that safety shutoff valve shall be interlocked so they cannot open.
		(7)* A manual means of overriding the door interlock in 13.5.11.3(6) shall be provided.
13.5.11.7	Info	Burn-in Requirements
		<i>New clause added;</i>
13.5.11.7.1		For Type VIII furnaces, burn-in procedures shall not be used.



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		<i>New clause added;</i>
13.5.11.7.10		Flammable special atmosphere gases shall not be introduced unless the following conditions exist: (1) Burn-off pilots at open ends, doors, and effluent lines are ignited. (2) All required quench fluid levels are at the correct level. (3) Operation of flame curtains (where provided) is verified.
13.5.11.9	Info	Burn-Out Requirements
		<i>New clause added;</i>
13.5.11.9.2.1		For Type VIII furnaces, burn-out procedures shall not be used.
13.5.13	Info	Integral Quench Furnaces
13.5.13.7	Info	Quench Tank Protective Features
13.5.13.7.3		The quench tank shall be equipped with a low-level device that <u>actuates a visual and audible alarm</u> , prevents the start of quenching, and shuts off the heating medium in case of a low-level condition.
		<i>New section added;</i>
13.5.13.7.6		Heated quench tanks shall have an over temperature visual and audible alarm interlocked with the oil heating system.
13.5.13.7.6.1		The over temperature controller shall be independent of the quench tank's temperature controller.
13.5.13.7.6.2		The over temperature controller setting shall be at least 50°F (28°C) below the flash point of the oil.
		<i>New clause added;</i>
13.5.13.7.7		A maximum starting quenchant temperature shall be calculated to maintain a temperature at least 50°F (28°C) below the flash point of the oil and interlocked.
		<i>New section added;</i>
13.5.13.8		Quench Tank Heating Controls and Design
13.5.13.8.1		The quench tank shall be equipped with a temperature controller that maintains the quench medium at the intended temperature.
13.5.13.8.2		Heating control systems shall be interlocked with the quench medium agitation system, the recirculating system, or both to prevent localized overheating of the quench medium.
13.5.13.8.3		Fuel-fired immersion tubes shall be installed so that the entire tube within the quench tank is covered with quench medium at all times.
13.5.13.8.4		Electric immersion heaters shall be of sheath-type construction and installed so that the hot sheath is fully submerged in the quench medium at all times.



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13.5.14	Info	Open Liquid Quench Tanks
13.5.14.3	Info	Equipment
13.5.14.3.3		Low Oil Level Sensor. A low oil level sensor shall be provided to sound an <u>actuate a visual and audible</u> alarm in the event that the oil level is below the prescribed limits where any of the following conditions exist: (1) The liquid surface area exceeds 10 ft ² (1 m ²). (2) Incoming or outgoing work is handled by a conveyor. (3) The tank is equipped with a heating system.
CUSTOMERS PLEASE NOTE: This Table and column "Verdict" can be used in determining how your current or future production is or will be in compliance with new/revised requirements.		