First Revision No. 62-NFPA 87-2012 [New Section after 2.3.3]

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<th>2.3.4</th>
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<tr>
<td></td>
<td>International Electrical Commission, 3 rue de Varembé, P.O. Box 131, CH - 1211, Geneva 20, Switzerland.</td>
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Submitter Information Verification

Submitter Full Name: Derek Duval
Organization: National Fire Protection Assoc
Submittal Date: Fri Nov 30 08:54:45 EST 2012

Committee Statement and Meeting Notes

Committee Statement: Added this reference in FR-49-NFPA 87-2012.

Ballot Results

✔ This item has passed ballot
2.3.5 UL Publications.
Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

Submitter Information Verification

Submitter Full Name: [Not Specified]
Organization: [Not Specified]
Submittal Date: Thu Oct 25 12:45:00 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: Update referenced standard to most recent edition as indicated.
Response Message: FR-1-NFPA 87-2012
Committee Notes:

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<td>Duval</td>
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Public Input No. 16-NFPA 87-2012 [Section No. 2.3.4]

Ballot Results

✔ This item has passed ballot
3.3.4 **Burner Management System.**

The field devices, logic system, and final control elements dedicated to combustion safety and operator assistance in the starting and stopping of fuel preparation and burning equipment and for preventing misoperation of and damage to fuel preparation and burning equipment.

---

**Submitter Information Verification**

Submitter Full Name: [Not Specified]
Organization: [Not Specified]
Submittal Date: Thu Oct 25 20:28:08 EDT 2012

**Committee Statement and Meeting Notes**

Committee: The term Burner Management System is used to describe the Logic Systems described in section 8.3. The definition proposed is directly from NFPA 85-2011. The annex material proposed is new for NFPA 87.

Response: FR-21-NFPA 87-2012
Message:

Public Input No. 20-NFPA 87-2012 [New Section after 3.3.3]

**Ballot Results**

✔ This item has passed ballot
3.3.9 Emergency Shutoff Valve

A manual shutoff valve to allow the fuel to be turned off in an emergency.
3.3.11 Explosive Range: Flammable Limit

The range of concentration of a flammable gas in air within which a flame can be propagated, with the lowest flammable concentration known as the lower explosive limit (LEL) or flammable limit (LFL), and the highest flammable concentration known as the upper explosive limit (UEL) or flammable limit (UFL).

Submitter Information Verification

Submitter Full Name: [Not Specified]
Organization: [Not Specified]
Submittal Date: Thu Oct 25 20:28:49 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: Revised to be consistent with NFPA 86-2011.
Committee Notes:

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Public Input No. 24-NFPA 87-2012 [Section No. 3.3.8]

Ballot Results

✔ This item has passed ballot
3.3.17* Hardwired.

The method of interconnecting signals or interlocks to a logic system or between logic systems using a dedicated interconnection for each individual signal.

Submitter Information Verification

Submitter Full Name: [ Not Specified ]
Organization: [ Not Specified ]
Submittal Date: Fri Oct 26 14:54:34 EDT 2012

Committee Statement and Meeting Notes

Committee: "Hardwired" is used in NFPA 87 and not defined. Definition is from NFPA 85-2011.
Statement: New definition that is not replacing any current definition, renumber subsequent sections. See FR-63-NFPA 87-2012 for the annex material for this FR.
Response: FR-44-NFPA 87-2012
Message: Public Input No. 26-NFPA 87-2012 [New Section after 3.3.13]

Ballot Results

✔ This item has passed ballot
3.3.20 Manufacturer.

The entity that directs and controls any of the following: product design, product manufacturing, or product quality assurance; or the entity that assumes the liability for the product or provides the warranty for the product.

Submitter Information Verification

Submitter Full Name: [Not Specified]
Organization: [Not Specified]
Submittal Date: Thu Oct 25 21:11:01 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: The committee added a definition for manufacturer to clarify the usage within the context of NFPA 87. This is not replacing any current definitions, renumber subsequent sections.

Ballot Results

✔ This item has passed ballot
First Revision No. 23-NFPA 87-2012 [Section No. 3.3.15, 3.3.20]

3.3.19 Lower Explosive Limit (LEL); Flammable Limit (LFL).
See 3.3.8, 3.3.11, Explosive Range Flammable Limits.

3.3.20 Manufacturer.
The entity that directs and controls any of the following: product design, product manufacturing, or product quality assurance; or the entity that assumes the liability for the product or provides the warranty for the product.

Submitter Information Verification

Submitter Full Name: [Not Specified]
Organization: [Not Specified]
Submittal Date: Thu Oct 25 20:29:50 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: Revised to be consistent with NFPA 86-2011. Replace LEL with LFL throughout document.
Response Message: FR-23-NFPA 87-2012

Committee Notes:
Date Submitted By
Nov 28, 2012 Duval Not shown legislatively correct.

Ballot Results

✓ This item has passed ballot
3.3.35.1 Catch Tank.
A tank used to capture liquid from drains, relief valves, vents, and overflows.

Submitter Information Verification

Submitter Full Name: [ Not Specified ]
Organization: [ Not Specified ]
Submittal Date: Thu Oct 25 14:21:51 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: Text deleted because term is no longer used in the document.
Response Message: FR-3-NFPA 87-2012
Public Input No. 1-NFPA 87-2012 [Section No. 3.3.30.1]

Ballot Results

✓ This item has passed ballot
4.1.3.2
Where seal leakage or diaphragm failure in a device can result in flammable gas or flammable liquid flow through a conduit or cable to an electrical ignition source, a conduit seal or a cable type that is sealed should be installed.

Submitter Information Verification

Submitter Full Name: [ Not Specified ]
Organization: [ Not Specified ]
Submittal Date: Thu Oct 25 20:31:12 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: Revised to be consistent with NFPA 86-2011.
Response Message: FR-24-NFPA 87-2012
Public Input No. 54-NFPA 87-2012 [New Section after 4.1.3.1]

Ballot Results

✔ This item has passed ballot
5.1.4.1 Fluid heaters should be located with space provided above and on all sides for inspection and maintenance purposes.

Committee Statement and Meeting Notes

Committee Statement: The Committee believes that space required for explosion venting and sprinklers is covered by NFPA 68 and NFPA 13, respectively.
Response Message: FR-4-NFPA 87-2012
Committee Notes:

Date Submitted By
Nov 28, 2012 Duval

Public Input No. 55-NFPA 87-2012 [Section No. 5.1.4.1]

Ballot Results

✔ This item has passed ballot
5.4.3.3*
Where ducts pass through fire resistance-rated or noncombustible walls, floors, or partitions, the space around the duct should be sealed with a material that will noncombustible material to maintain the fire-resistance rating of the barrier.

Submitter Information Verification

Submitter Full Name: [Not Specified]
Organization: [Not Specified]
Submittal Date: Thu Oct 25 20:55:06 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: Revised to be consistent with NFPA 86-2011.
Response Message: FR-30-NFPA 87-2012
Committee Notes:

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Not shown legislatively correct.

Public Input No. 57-NFPA 87-2012 [Section No. 5.4.3.3]

Ballot Results

✔ This item has passed ballot
5.4.3.11
Exhaust ducts should not discharge near openings or other air intakes where effluents can enter a building; be entrained and directed to locations creating a hazard.

Submitter Information Verification

Submitter Full Name: [Not Specified]
Organization: [Not Specified]
Submittal Date: Thu Oct 25 20:31:54 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: Revise to be consistent with NFPA 86-2011.
Committee Notes:

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Public Input No. 56-NFPA 87-2012 [Section No. 5.4.3.11]

Ballot Results

✔️ This item has passed ballot
5.5.1.3*
Flanged and threaded connections in the flow circuit should be minimized. In applications where fluid leakage creates a hazard, all pipe connections should be welded.

5.5.1.3.1
Flange connections should be limited to pump, valve, boundary limit, spool, and equipment connections.

5.5.1.3.2
Threaded connections should be limited to instruments and other miscellaneous connections less than 1 in. (25 mm).

Submitter Information Verification

Submitter Full Name: [ Not Specified ]
Organization: [ Not Specified ]
Submittal Date: Thu Oct 25 15:28:58 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: This revision and the new subtext (5.5.1.3.1 and 5.5.1.3.2) clarifies the Committee's intent that welded connections should be used as often as is practical.
Response Message: FR-6-NFPA 87-2012
Public Input No. 2-NFPA 87-2012 [Section No. 5.5.1.3]
Public Input No. 3-NFPA 87-2012 [New Section after 5.5.1.3]
Public Input No. 4-NFPA 87-2012 [New Section after 5.5.1.3]

Ballot Results

✔ This item has passed ballot

First Revision No. 7-NFPA 87-2012 [ Section No. 6.2.4.1 ]
6.2.4.1*
A remotely located shutoff valve should be provided to allow the fuel to be turned off in an emergency and should be located so that fire or explosion at the fluid heater does not prevent access to the valve. An emergency shutoff valve should be provided that meets the following requirements:

1. It should be remotely located away from the fluid heater so that fire or explosion at a fluid heater does not prevent access to the valve.
2. It should be readily accessible.
3. It should have permanently affixed visual indication of the valve position.
4. A removable handle should be permitted provided all the following requirements are satisfied:
   a. The valve position is clearly indicated whether the handle is attached or detached.
   b. The valve handle is tethered to the gas main no more than 3 ft (1 m) from the valve in a manner that does not cause personnel safety issues and that allows trouble-free reattachment of the handle and operation of the valve without untethering the handle.
5. It should be able to be operated from full open to full close and return without the use of tools.

Submitter Information Verification

Submitter Full Name: [Not Specified]
Organization: [Not Specified]
Submittal Date: Thu Oct 25 15:38:14 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: Revised for consistency with NFPA 86.
Response Message: FR-7-NFPA 87-2012
Committee Notes:

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Public Input No. 48-NFPA 87-2012 [Section No. 6.2.4.1]

Ballot Results

✅ This item has passed ballot
First Revision No. 28-NFPA 87-2012 [ New Section after 6.2.4.3 ]

6.2.4.4
An equipment isolation valve should be provided.

Submitter Information Verification

Submitter Full Name: [ Not Specified ]
Organization: [ Not Specified ]
Submittal Date: Thu Oct 25 20:35:17 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: Revised to be consistent with NFPA 86-2011.
Public Input No. 51-NFPA 87-2012 [New Section after 6.2.4.3]

Ballot Results

✔ This item has passed ballot

First Revision No. 27-NFPA 87-2012 [ Section No. 6.2.5.1 ]

6.2.5.1 Equipment Isolation Valves.
Individual manual shutoff valves for equipment isolation should be provided for shutoff of the fuel to each piece of equipment. Equipment isolation valves should meet the following requirements:

1. They should be provided for each piece of equipment.
2. They should have permanently affixed visual indication of the valve position.
3. They should be quarter-turn valves with stops.
4. Wrenches or handles should remain affixed to valves and should be oriented with respect to the valve port to indicate the following:
   a. An open valve when the handle is parallel to the pipe
   b. A closed valve when the handle is perpendicular to the pipe
5. They should be readily accessible.
6. Valves with removable wrenches should not allow the wrench handle to be installed perpendicular to the fuel gas line when the valve is open.
7. They should be able to be operated from full open to full close and return without the use of tools.

(A)—
Manual shutoff valves should have permanently affixed visual indication of the valve position:
(B)—
Quarter-turn valves should not allow the wrench handle to be perpendicular to the fuel gas line when the valve is open:
(C)—
Wrenches or handles should remain affixed to valves.

Submitter Information Verification

Submitter Full Name: [ Not Specified ]
Organization: [ Not Specified ]
Submittal Date: Thu Oct 25 20:34:44 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: Revised to be consistent with NFPA 86.
Committee Notes:

  Date       Submitted       By
  Nov 28,  2012            Duval
  Not shown legislatively correct.

Public Input No. 49-NFPA 87-2012 [Section No. 6.2.5.1]

Ballot Results

✔ This item has passed ballot
6.2.8 Overpressure Protection

6.2.8.1 Overpressure protection should be provided in either of the following cases:

(1) **When the supply pressure exceeds the pressure rating of any downstream component**

(2) **When the failure of single upstream line regulator or service pressure regulator results in a supply pressure exceeding the pressure rating of any downstream component**

6.2.8.2 Overpressure protection should be provided by any one of the following:

(1) **A series regulator in combination with a line regulator or service pressure regulator**

(2) **A monitoring regulator installed in combination with a line regulator or service pressure regulator**

(3) **A full-capacity pressure relief valve**

(4) **An overpressure cutoff device, such as a slam-shut valve or a high pressure switch in combination with an adequately rated shutoff valve**

6.2.8.3* When a relief valve is used to comply with 8.7.1.10, the relief valve should be a full-capacity relief type.

6.2.8.4 Token relief valves and internal token relief valves should not be permitted to be used as an overpressure prevention device.

Submitter Information Verification

Submitter Full Name: [Not Specified]
Organization: [Not Specified]
Submittal Date: Thu Oct 25 21:08:07 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: Revised to be consistent with NFPA 86.
Response Message: FR-36-NFPA 87-2012

Ballot Results
First Revision No. 8-NFPA 87-2012 [Sections 6.2.7.7, 6.2.7.8]

6.2.7.7 Vent lines from multiple regulators and switches of a single fluid heater, where manifolded together, should be piped in such a manner that diaphragm rupture of one vent line does not backload the others.

6.2.7.7.1 Vents from systems operating at different pressure levels should not be manifolded together.

6.2.7.7.2 Vents from systems served from different pressure reducing stations should not be manifolded together.

6.2.7.7.3 Vents from systems using different fuel sources should not be manifolded together.

6.2.7.8 The size of the vent manifold specified in 6.2.7.7 should be not less than the area of the largest vent line plus 50 percent of the additional vent line area.

The cross-sectional area of the manifold line should not be less than the greater of the following:

1. The cross-sectional area of the largest vent plus 50 percent of the sum of the cross-sectional areas of the additional vent lines

2. The sum of the cross-sectional areas of the two largest vent lines

Submitter Information Verification

Submitter Full Name: [Not Specified]
Organization: [Not Specified]
Submittal Date: Thu Oct 25 15:44:39 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: NFPA 87 doesn't specifically prohibit manifolding vent lines from different pressure sources. It is good engineering practice not to do this and it is not allowed in NFPA 85. This is something that should be addressed in more specifically in NFPA 87. The proposed subparagraphs are extracted from NFPA 85 (2011), Section 4.9.3.

Response Message: FR-8-NFPA 87-2012

Committee Notes:

Date Submitted By
Nov 28, 2012 Duval
Not shown legislatively correct.
Ballot Results

✓ This item has passed ballot

First Revision No. 31-NFPA 87-2012 [New Section after 6.2.7.8]

Submitter Information Verification

Submitter Full Name: [Not Specified]
Organization: [Not Specified]

Committee Statement and Meeting Notes

Committee Statement: Revised to be consistent with NFPA 86-2011.
Response Message: FR-31-NFPA 87-2012
Public Input No. 60-NFPA 87-2012 [New Section after 6.2.7.8]

Ballot Results

✓ This item has passed ballot

First Revision No. 9-NFPA 87-2012 [Section No. 6.3.4.2]
6.3.4.2
The liquid fuel shutoff should be by either of the following:

(1) A remotely located liquid fuel shutoff valve that meets the following requirements:
   (a) It should be remotely located away from the fluid heater so that fire or explosion at a fluid heater does not prevent access to this valve.
   (b) It should be readily accessible.
   (c) It should have permanently affixed visual indication of the valve position.
   (d) A removable handle should be permitted provided all the following requirements are satisfied:
      i. The valve position is clearly indicated whether the handle is attached or detached.
      ii. The valve handle is tethered to the gas main no more than 3 ft (1 m) from the valve in a manner that does not cause personnel safety issues and that allows trouble-free reattachment of the handle and operation of the valve without untethering the handle.

(2) Means for removing power to the positive displacement liquid fuel pump

Submitter Information Verification

Submitter Full Name: [ Not Specified ]
Organization: [ Not Specified ]
Submittal Date: Thu Oct 25 15:49:41 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: Revised for consistency with NFPA 86-2011.
Committee Notes:

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Public Input No. 50-NFPA 87-2012 [Section No. 6.3.4.2]

Ballot Results

✔ This item has passed ballot
6.3.4.7
An equipment isolation valve should be provided.

Submitter Information Verification

Submitter Full Name: [ Not Specified ]
Organization: [ Not Specified ]
Submittal Date: Thu Oct 25 20:35:59 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: Revised to be consistent with NFPA 86-2011.
Response Message: FR-29-NFPA 87-2012
Public Input No. 52-NFPA 87-2012 [New Section after 6.3.4.6]

Ballot Results

✔ This item has passed ballot
6.3.5.3
Liquid fuel piping should be sized to provide flow rates and pressure to maintain a stable flame over the burner operating range.

Submitter Information Verification

Submitter Full Name: [Not Specified]
Organization: [Not Specified]
Submittal Date: Thu Oct 25 20:56:11 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: Revised to be consistent with NFPA 86-2011.
Committee Notes:

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Public Input No. 61-NFPA 87-2012 [Section No. 6.3.5.3]

Ballot Results

✔ This item has passed ballot
7.2.12*  
A confirmed source of combustible gas should be provided to the inlet to the equipment isolation valve(s) (see 6.2.5.1) each time a combustible gas supply is placed into service or restored to service.

Submitter Information Verification

Submitter Full Name: [Not Specified]
Organization: [Not Specified]
Submittal Date: Thu Oct 25 15:54:02 EDT 2012

Committee Statement and Meeting Notes

Committee: New Text added for consistency with NFPA 86 (TIA 11-3) and modifications to NFPA 54 regarding purging of natural gas lines during commissioning. See FR-64-NFPA 87-2012 for annex material.
Statement: New Text added for consistency with NFPA 86 (TIA 11-3) and modifications to NFPA 54 regarding purging of natural gas lines during commissioning. See FR-64-NFPA 87-2012 for annex material.
Response: FR-10-NFPA 87-2012
Message:

- Public Input No. 10-NFPA 87-2012 [New Section after 7.2.5]
- Public Input No. 12-NFPA 87-2012 [New Section after 7.2.5]
- Public Input No. 46-NFPA 87-2012 [New Section after 7.2.11]

Ballot Results

✔ This item has passed ballot
7.5.15*

Valve seat leakage testing of fuel gas safety shutoff valves should be performed in accordance with the manufacturer’s instructions, and testing frequency should be **Testing** of fuel gas safety shutoff valve seat leakage and valve proving systems should be performed at least annually.

Submitter Information Verification

**Submitter Full Name:** [ Not Specified ]

**Organization:** [ Not Specified ]

Submittal Date: Thu Oct 25 16:01:50 EDT 2012

Committee Statement and Meeting Notes

**Committee Statement:** Same as NFPA 86-2011.

**Response Message:** FR-11-NFPA 87-2012

**Committee Notes:**

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Not shown legislatively correct.

**Public Input No. 62-NFPA 87-2012 [Section No. 7.5.15]**

Ballot Results

✔ This item has passed ballot
First Revision No. 13-NFPA 87-2012 [New Section after 7.5.21]

7.5.22* 
Whenever combustible gas piping is placed into service or removed from service, any release of combustible gas should be vented to an approved location.

Submitter Information Verification

Submitter Full Name: [Not Specified]
Organization: [Not Specified]
Submittal Date: Thu Oct 25 16:27:59 EDT 2012

Committee Statement and Meeting Notes

Committee: Related change to charging and purging of combustible gas systems as requested of NFPA due to recent accidents. See FR-65-NFPA 87-2012 for annex to this new section.
Response: FR-13-NFPA 87-2012
Message:
Public Input No. 13-NFPA 87-2012 [New Section after 7.5.21]
Public Input No. 14-NFPA 87-2012 [New Section after A.7.5.17]
Public Input No. 47-NFPA 87-2012 [New Section after 7.5.21]

Ballot Results

✅ This item has passed ballot
8.2.1

Thermal: The recommendations of Chapter 8 should not apply to thermal liquid heaters with fuel input ratings less than 12,500,000 Btu/hr (3.7 MW) that conform with ASME CSD-1, Controls and Safety Devices for Automatically Fired Boilers, and or with UL 795, Standard for Commercial-Industrial Gas Heating Equipment, meet the recommendations of Chapter 8.

Submitter Information Verification

Submitter Full Name: [Not Specified]
Organization: [Not Specified]
Submittal Date: Fri Oct 26 10:16:12 EDT 2012

Committee Statement and Meeting Notes

Committee: The two documents cover the same scope, therefore conformance with one or the other is appropriate. Also a minor edit to conform to Manual of Style, the two documents meet the recommendations of chapter 8.
Response: FR-43-NFPA 87-2012
Message:

Ballot Results

✓ This item has passed ballot
8.2.8.2 The recommendation in 8.2.8 should not prohibit a time delay applied to the action of a pressure-proving, flow-proving, or proof-of-closure safety switch as used in accordance with 8.7.1.3 (2)(c), where the following conditions exist:

(1) There is an operational need demonstrated for the time delay.
(2) The use of a time delay is approved.
(3) The time delay feature is not adjustable beyond 5 seconds.
(4) A single time delay does not serve more than one pressure-proving or flow-proving safety device.
(5) The time from an abnormal pressure or flow condition until the holding medium is removed from the safety shutoff valves does not exceed 5 seconds.

Submitter Information Verification

Submitter Full Name: [Not Specified]
Organization: [Not Specified]
Submittal Date: Thu Oct 25 19:21:15 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: The Committee deleted 8.7.1.3 in FR-19-NFPA 87-2012.
Response Message: FR-20-NFPA 87-2012

Ballot Results

✔ This item has passed ballot
8.2.10

Shutdown of the heating system by any safety feature or safety device should require manual intervention of an operator for re-establishment of normal operation of the system.

Committee Statement and Meeting Notes

Committee Statement: The new paragraph is added to be consistent with NFPA 86.
Response Message: FR-16-NFPA 87-2012
Public Input No. 63-NFPA 87-2012 [New Section after 8.2.9]

Ballot Results

✓ This item has passed ballot
8.2.11 Where transmitters are used in place of switches for safety functions, the following should apply:

(1) The transmitter should possess a safety integrity level (SIL) rating of 2.
(2) Transmitter failure should be detected and initiate a safety shutdown.
(3) The transmitter should be dedicated to safety service unless listed for simultaneous process and safety service.

Submitter Information Verification

Submitter Full Name: [ Not Specified ]
Organization: [ Not Specified ]
Submittal Date: Fri Oct 26 15:00:01 EDT 2012

Committee Statement and Meeting Notes

Committee Relocated the transmitter requirement from PLC subsection and makes it generally applicable to all safety controls systems (including hardwired). Also see Public Comment to delete from 8.4.6.
Response FR-45-NFPA 87-2012
Message: Public Input No. 78-NFPA 87-2012 [New Section after 8.2.9]

Ballot Results

✓ This item has passed ballot
8.2.9*
A- At least one hardwired manual emergency switch should be provided to initiate a safety shutdown.

Submitter Information Verification

Submitter Full Name: [ Not Specified ]
Organization: [ Not Specified ]
Submittal Date: Thu Oct 25 16:47:12 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: The 2011 Edition implies there is to be a single manual emergency switch. Depending upon the type of fluid heater there may be multiple manual emergency switches to address the multiple “safety” hazards of the fluid heater. All of the fluid heater’s safety hazards should be evaluated and a manual emergency “system” should be designed/incorporated into the fluid heater design. The intent of the committee is to ensure that at least one emergency shutdown switch is hardwired and operational without use of a PLC or other logic.

Response Message:
FR-14-NFPA 87-2012

Committee Notes:
Date Submitted By
Nov 28, 2012 Duval
Not shown legislatively correct. "a" is replaced with "at least one"

Public Input No. 35-NFPA 87-2012 [Section No. 8.2.9]

Ballot Results

✓ This item has passed ballot

First Revision No. 49-NFPA 87-2012 [ Sections 8.3, 8.4 ]

8.3.1 General.
8.3.1.1
Purge, ignition trials, and other burner safety sequencing should be performed using either devices listed for such service or programmable controllers used in accordance with 8.4.

8.3.1.2
The activation of any safety interlock recommended in Chapter 8 should result in a safety shutdown.

8.3.1.3
Safety interlocks should meet one or more of the following:

1. Be connected to a combustion safeguard
2. Be hardwired without relays in series ahead of the controlled device
3. Be connected to an input of a programmable controller logic system complying with Section 8.4
4. Be connected to a relay that represents a single safety interlock configured to initiate safety shutdown in the event of power loss
5. Be connected to a listed safety relay that represents one or more safety interlocks and initiates safety shutdown upon power loss

8.3.1.4*
Electrical power for safety control circuits should be dc or single-phase ac, 250 volt maximum, one-side grounded, with all breaking contacts in the ungrounded, fuse-protected, or circuit breaker-protected line.

8.3.2 Hardwired Logic Systems.

8.4* Programmable Logic Controller (PLC) Systems.

8.4.1
PLC-based Programmable logic controller (PLC)-based systems listed for combustion safety service should be used in accordance with the listing requirements and the manufacturer's instructions.

8.4.2
PLCs, except those listed for combustion safety service, should be used in accordance with 8.4.2 through 8.4.4 safeguards, the PLC and its associated I/O used to perform safety functions should be certified to IEC 61508 for use in safety applications with a safety integrity level of 3 or greater.

8.4.3 General.

(A)
Before the PLC is placed in operation, documentation should be provided that confirms that all related safety devices and safety logic are functional.

(B)
All changes to hardware or software should be documented and maintained in a file that is separate from the fluid heater PLC.

(C)
System operation should be tested and verified for compliance with the design criteria when the PLC is replaced, repaired, or updated.

(D)
The control system should have at least one manual emergency switch that initiates a safety shutdown.
8.4.3.5—
The PLC should detect the following conditions:

(1) Failure to execute any program or task containing safety logic
(2) Failure to communicate with any safety input or output
(3) Changes in software set points of safety functions
(4) Failure of outputs related to safety functions
(5) Failure of timing related to safety functions

8.4.3.6—
A safety shutdown should occur within 3 seconds of detecting any condition listed in 8.4.2.5.

8.4.3.7—
A dedicated PLC output should initiate a safety shutdown for faults detected by the PLC.

8.4.3.8—
The following devices and logic should be hardwired external to the PLC as follows:

(1) Manual emergency switch
(2) Combustion safeguards
(3) Safe-start checks
(4) Ignition transformers
(5) Trial-for-ignition periods
(6) Excess-temperature controllers
(7) Valve-proving systems

8.4.3.9—
A combustion safeguard should directly control at least one safety shutoff valve between the fuel gas supply and the monitored burner.

8.4.3.10—
Where airflow-proving logic is performed in the PLC, the logic should include the following:

(1) Verification of a change of state in each airflow-proving device during the startup of the related ventilation equipment
(2) Initiation of a safety shutdown if a change of state in an airflow-proving device is not detected

8.4.4—Hardware—

8.4.4.1—
Memory that retains information on loss of system power should be provided for software.

8.4.4.2—
The PLC should have a minimum mean-time-between-failure rating of 250,000 hours.
8.4.4.3
Only one safety device should be connected to a PLC input or output.

8.4.4.4
Output checking should be provided for PLC outputs controlling fuel safety shutoff valves.

8.4.4 Software.
8.4.4.1*
Access to the PLC and its logic should be restricted to authorized personnel. Safety-related software should be logically independent from non-safety-related software.

8.4.4.2
Safety-related software should be password-protected or otherwise locked so that access is limited to the fluid heater manufacturer or the burner management system manufacturer. The following power supplies should be monitored:

- Power supplies used to power PLC inputs and outputs that control fluid heater safety functions
- Power supplies used to power pressure and flow transmitters recommended by 8.4.5

8.4.4.3
When any power supply recommended by 8.4.4.2 (1) fails, the dedicated PLC output recommended in 8.4.2.7 should be deactivated.

8.4.4.4
When the voltage of any power supply recommended by 8.4.4.2 (2) is detected outside the manufacturer's recommended range, the dedicated PLC output recommended in 8.4.2.7 8.4.3.7 should be deactivated.

8.4.4.3
Software should be documented as follows:

1. Labeled to identify elements or groups of elements containing safety software
2. Labeled to describe the function of each element containing safety software

8.4.4.4
A listing of the programs with documentation should be available.

8.4.5
PLCs that do not comply with 8.4.1 or 8.4.1.1 should comply with the following:

1. The PLC should not perform required safety functions.
2. The PLC should not interfere with or prevent the operation of the safety interlocks.
3. Only isolated PLC contacts should be used in the required safety circuits.
8.4.6—
Where PLC-based systems use flow transmitters in place of flow switches and pressure transmitters in place of pressure switches for safety functions, the following should apply:

1. The transmitter should be listed, possess a minimum mean-time-between-failure rating of 250,000 hours, or possess a safety integrity level rating of 2.

2. Upon transmitter failure, the PLC should detect the failure and initiate a safety shutdown.

3. The transmitter should be dedicated to safety service unless listed for simultaneous process and safety service.

Supplemental Information

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Submitter Information Verification

Submitter Full Name: [Not Specified]
Organization: [Not Specified]
Submittal Date: Fri Oct 26 16:10:43 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: General revisions to sections 8.3 and 8.4 to clarify Committee intent regarding logic systems and the application of PLC’s. SIL 3 was chosen because SIL 3 equipment inherently provides the separation and locking of the safety functions from other functions. The list of struck items from existing 8.4.2.5 are standard functions of SIL 3 PLCs. Therefore, listing them is redundant. The intent of the committee is to ensure that at least one emergency shutdown switch is hardwired and operational without use of a PLC or other logic.

Committee Notes:

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Public Input No. 19-NFPA 87-2012 [Section No. 8.3]
Public Input No. 37-NFPA 87-2012 [Section No. 8.3.1.1]
Ballot Results

✔ This item has passed ballot

First Revision No. 17-NFPA 87-2012 [Section No. 8.5.1.1 [Excluding any Sub-Sections]]

When a combustion air blower or exhaust blower is provided, a timed pre-ignition purge should be provided that incorporates all of the following:

1. At least 4 standard cubic feet (scf) of fresh air or inert gas per cubic foot (4 m³/m³) of system volume is introduced during the purging cycle.
2. The system volume includes the heating combustion chambers and all other passages that handle the recirculation and exhaust of products of combustion to the stack inlet.
3. All passages from the air inlet to the heater to the stack inlet should be purged.
4. To begin the timed pre-ignition purge interval, both all of the following conditions are satisfied:
   a. The minimum required pre-ignition purge airflow is proved.
   b. The safety shutoff valve(s) is proved closed. Fluid heaters with total pilot capacity over 400,000 Btu/hr should have at least one safety shutoff valve required by 8.7.2.2 proved closed between all pilot burners and the fuel supply.
   c. Fluid heaters with total capacity over 400,000 Btu/hr should have at least one safety shutoff valve proved closed between all main burners and the fuel supply.
5. The minimum required pre-ignition purge airflow is proved and maintained throughout the timed pre-ignition purge interval.
6. Failure to maintain the minimum required pre-ignition purge airflow stops the pre-ignition purge and resets the purge timer.

Submitter Information Verification

Submitter Full Name: [Not Specified]
Organization: [Not Specified]
Submittal Date: Thu Oct 25 17:22:28 EDT 2012

Committee Statement and Meeting Notes

Committee Possible conflict with 8.7.7.2 if under 400,000 Btu/h. Proved closed is not required
Statement: when under 400,000 Btu/h. The committee also clarified the purge volume requirement.

Response Message:

Committee Notes:

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Not shown legislatively correct.

Public Input No. 73-NFPA 87-2012 [Section No. 8.5.1.1 [Excluding any Sub-Sections]]

Ballot Results

✔ This item has passed ballot

First Revision No. 18-NFPA 87-2012 [Section No. 8.5.1.1.2]

8.5.1.1.2

Repeating the pre-ignition purge on any fuel-fired system can be omitted where any one of the following conditions is satisfied:

1. The heating chamber temperature is proved above 1400°F (760°C).
2. For any fuel-fired system, all of the following conditions are satisfied:
3. All of the following conditions are satisfied (does not apply to liquid fuel systems):
   - Each burner and pilot is supervised by a combustion safeguard in accordance with Section 8.9.
   - Each burner system is equipped with gas safety shutoff valves in accordance with Section 8.7.
   - It can be demonstrated that the combustible concentration in the heating chamber and all other passages that handle the recirculation and exhaust of products of combustion cannot exceed 25 percent of the LFL.

(1) Each burner and pilot is supervised by a combustion safeguard in accordance with Section 8.9.

(2) Each burner system is equipped with safety shutoff valves in accordance with Section 8.7.

(3) At least one burner remains operating in the common combustion chamber of the burner to be re-ignited.

Submitter Information Verification

Submitter Full Name: [Not Specified]
Committee Statement and Meeting Notes

Committee Statement: The committee deleted the 1400 deg threshold because it is impractical to maintain in the majority of fluid heaters. There is no guidance in NFPA 87 that explains what the interlock would be comprised of. Option (3) was deleted because it allowed re-light without purge to occur without any flame present.


Committee Notes:

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Ballot Results

☑ This item has passed ballot
8.6.5*
Combustion air minimum pressure or flow should be interlocked into combustion safety circuitry by any of the following methods:

- A low pressure switch that senses and monitors the combustion air source pressure
- A differential pressure switch that senses the differential pressure across a fixed orifice in the combustion air system
- An airflow switch

Submitter Information Verification

Submitter Full Name: [ Not Specified ]
Organization: [ Not Specified ]
Submittal Date: Fri Oct 26 16:18:17 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: There are many methods for proving minimum combustion airflow. The committee believes it should not be limited to the three previously listed. Additional annex text was added to explain other possible methods.

Response Message: FR-51-NFPA 87-2012

Ballot Results

✓ This item has passed ballot
8.7.1.2*
Each safety shutoff valve recommended in 8.7.2.1 and 8.7.3.1 should automatically shut off the fuel to the burner system after interruption of the holding medium (such as electric current or fluid pressure) by any one of the interlocking safety devices, combustion safeguards, or operating controls, unless otherwise permitted by 8.7.1.3.

Submitter Information Verification

Submitter Full Name: [Not Specified]
Organization: [Not Specified]
Submittal Date: Thu Oct 25 19:19:03 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: The Committee believes that two valves should be used on every burner.

Ballot Results

✔ This item has passed ballot
First Revision No. 34-NFPA 87-2012 [ New Section after 8.7.1.5 ]

8.7.1.5
Safety shutoff valves should not be open-close cycled at a rate that exceeds that specified by its manufacturer.

Submitter Information Verification

Submitter Full Name: [ Not Specified ]
Organization: [ Not Specified ]
Submittal Date: Thu Oct 25 20:57:12 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: Added section to be consistent with NFPA86-2011.
Response Message: FR-34-NFPA 87-2012
Committee Notes:

Date Submitted
By
Nov 30, 2012
Duval
Renumber subsequent sections.

Public Input No. 67-NFPA 87-2012 [New Section after 8.7.1.5]

Ballot Results

✔ This item has passed ballot
First Revision No. 41-NFPA 87-2012 [ Section No. 8.7.2.2(A) ]

(A)
A proved closed condition should be accomplished by either of the following means:

1. A proof-of-closure switch incorporated in a listed safety shutoff valve assembly in accordance with the terms of the listing
2. A valve-proving system

Submitter Information Verification

Submitter Full Name: [ Not Specified ]
Organization: [ Not Specified ]
Submittal Date: Fri Oct 26 09:12:44 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: Same as NFPA 86-2011.
Response Message: FR-41-NFPA 87-2012
Committee Notes:

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Public Input No. 68-NFPA 87-2012 [Section No. 8.7.2.2(A)]

Ballot Results

✓ This item has passed ballot

First Revision No. 50-NFPA 87-2012 [ Section No. 8.9 ]

8.9 Combustion Safeguards (Flame Supervision).
8.9.1
Each burner flame should have a combustion safeguard that has a maximum flame failure response time of 4 seconds or less, that performs a safe-start check, and that is interlocked into the combustion safety circuitry in accordance with the following:

- The flame supervision is not needed in the combustion safety circuitry of a fluid heater when the combustion chamber temperature is greater than 1400°F (760°C); and the following criteria are met:
  - When the combustion chamber temperature drops to less than 1400°F (760°C), the burner is interlocked to allow its operation only if flame supervision has been re-established.

- A 1400°F (760°C) bypass controller is used to meet the recommendation in 8.9.1 (1)(a).

- Burners without flame supervision are interlocked to prevent their operation when the combustion chamber temperature is less than 1400°F (760°C) by using a 1400°F (760°C) bypass controller.

8.9.2* Flame Supervision.
Each pilot and main burner flame should be equipped with flame supervision in one of the following ways:

1. Main and pilot flames supervised with independent flame sensors
2. Main and interrupted pilot flames supervised with a single flame sensor
3. Self-piloted burner supervised with a single flame sensor

Submitter Information Verification

Submitter Full Name: [ Not Specified ]
Organization: [ Not Specified ]
Submittal Date: Fri Oct 26 16:13:32 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: The committee struck (1) and (2) because 1400 deg F is impractical to maintain in most fluid heaters.
Response Message:
FR-50-NFPA 87-2012
Public Input No. 71-NFPA 87-2012 [Section No. 8.9.1]
Public Input No. 76-NFPA 87-2012 [Section No. 8.9.1]
Public Input No. 83-NFPA 87-2012 [Section No. 8.9.1]
Public Input No. 85-NFPA 87-2012 [New Section after 8.9.2]

Ballot Results

☑ This item has passed ballot
8.10.2.1

The low pressure switch used to supervise the atomizing medium should be permitted to be located upstream of atomizing media balancing orifices and balancing valves, provided balancing devices are equipped with a locking device to prevent an unintentional change in the setting.

Submitter Information Verification

Submitter Full Name: [ Not Specified ]
Organization: [ Not Specified ]
Submittal Date: Thu Oct 25 20:57:40 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: Taken from a public comment to move A.8.11.2.1 information into the mandatory text in NFPA 86-2014.

Ballot Results

✓ This item has passed ballot
First Revision No. 42-NFPA 87-2012 [New Section after 8.15.5]

8.15.6
The operating temperature controller and its temperature-sensing element should not be used as the excess temperature limit interlock.

Submitter Information Verification

Submitter Full Name: [Not Specified]
Organization: [Not Specified]
Submittal Date: Fri Oct 26 09:31:56 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: This is revised to be consistent with coverage for the excess fluid temperature interlock in 8.16.9.
Response: FR-42-NFPA 87-2012
Message: Public Input No. 81-NFPA 87-2012 [New Section after 8.15.5]

Ballot Results

✔ This item has passed ballot

First Revision No. 38-NFPA 87-2012 [Chapter 9]

Chapter 9 Class F Heaters
9.1* General.
9.1.1 Class F heaters should be designed for relatively uniform to ensure that the required minimum fluid flow is achieved through parallel all tube passes.
9.1.1.1* Equal flow distribution When multiple parallel tube passes are used, balanced flow distribution between passes should be ensured by piping geometry or fixed flow restrictions, such that each parallel pass maintains the minimum design flow rate, so that maximum fluid film temperatures and maximum allowable material temperatures are not exceeded.
9.1.1.2 Adjustable balancing trim valves should not be used in multipass Class F heaters:
9.1.2
The maximum allowable bulk fluid temperature should be determined based on the
maximum allowable fluid film temperature that will prevent rapid fluid degradation, and the
maximum allowable material temperature.

9.1.3*
The heater manufacturer should determine the minimum flow rate, taking into
consideration the maximum allowable bulk fluid temperature and the maximum
and film fluid temperature at the design flow rate and all heat input rates.

9.1.4
Where backflow into the heater presents a hazard, a means to prevent backflow should
be provided.

9.1.5
The fluid system should be designed so that fluid cannot be trapped in the heated zone.

9.1.5.1
Discharge from relief valves should be handled in accordance with 9.2.2.

9.1.5.2
Vent lines should be sized to handle 150 percent of the maximum anticipated flow.

9.1.6*
The fluid system should be designed to maintain at least the minimum required fluid flow,
as determined in 9.1.3, through the heater under all operating conditions.

9.1.7
An expansion tank should be provided for all closed-loop liquid circuits.

9.1.8
A hard-wired manual emergency switch at a remote location should be provided to
initiate a safety shutdown of the entire fluid heater system at a remote location.

9.1.9
A means of sampling for fluid contamination or degradation should be provided from the
active loop.

9.2 Auxiliary Equipment.
9.2.1 Pumps.

9.2.1.1*
Air-cooled or water-cooled pumps with mechanical seals or magnetically coupled (seal-
less) pumps Pumps that are specifically designed for fluid heater service should be used.

9.2.1.2*
The pumps should be compatible with the fluid used as well as the operating pressures
and temperatures.

9.2.1.3
The system should be designed such that there is sufficient net positive suction head
available for the pump.

9.2.1.4
Positive displacement pumping systems should incorporate features to ensure that the
minimum flow through the heater is maintained; means of pressure relief.

9.2.1.5*
If water-cooled pumps are used, a means of verifying cooling water flow should be
provided.
9.2.1.6*
Cold alignment of air- and water-cooled pumps should be done in accordance with the pump manufacturer's recommendations prior to the pump being started.

9.2.1.7*
Hot alignment of air- and water-cooled pumps should be done within the first 24 hours after operating temperature has been reached.

9.2.1.8
Cold and hot alignment should be performed during commissioning and following pump maintenance.

9.2.1.9*
Means should be provided to protect pumps from debris if required for the safe operation of the fluid heater.

9.2.2 Catch-Tank: Effluent Handling.
The all effluent from all pressure relief devices, vents from the expansion tank, and drains from the expansion tank should be directed to a closed catch tank, an approved location.

9.2.2.1
The catch tank should have a vent to atmosphere, with the vent outlet located at an approved location outside the heater room.

9.2.2.2
The vent should be adequately sized to handle 150 percent of the maximum flow from the heater relief device.

9.2.2.3
If the fluid being relieved is combustible, a flame arrester should be located in the vent line.

9.2.2.4
The contents should not be reused in the fluid heating system.

9.2.2.5
The catch tank inlets should be located to prevent siphoning of the contents back into the system.

9.2.2.6
A liquid level indicator should be provided on the tank.

9.2.2.1 Gaseous Effluent.

9.2.2.1.1
Gaseous effluents that are asphyxiants, toxic, or corrosive are outside the scope of this recommended practice, and other standards should be consulted for appropriate venting.

9.2.2.1.2
Flammable gases and oxidizers should be vented to an approved location to prevent fire or explosion hazards.
9.2.2.1.3
When gaseous effluents are vented, the vent pipe should be located in accordance with the following:

1. Gaseous effluents should not impinge on equipment, support, building, windows, or materials because the gas could ignite and create a fire hazard.

2. Gaseous effluents should not impinge on personnel at work in the area or in the vicinity of the exit of the vent pipe because the gas could ignite and create a fire hazard.

3. Gaseous effluents should not be vented in the vicinity of air intakes, compressor inlets, or other devices that utilize ambient air.

9.2.2.1.4
The vent exit should be designed in accordance with the following:

1. The pipe exit should not be subject to physical damage or foreign matter that could block the exit.

2. The vent pipe should be sized to minimize the pressure drop associated with length, fitting, and elbows at the maximum vent flow rate.

3. The vent piping should not have any shutoff valves in the line.

9.2.2.1.5
If the gas is to be vented inside the building, the following additional guidance is offered:

1. If the gaseous effluents are flammable and lighter than air, the flammable gases should be vented to a location where the gas is diluted below its LFL before coming in contact with sources of ignition.

2. The gaseous effluents should not re-enter the work area without extreme dilution.

9.2.2.2 Liquid Phase Effluent.

9.2.2.2.1*
Liquid phase effluent should be directed to a containment vessel where the fluid may be reused or discarded.

9.2.2.2
The effluent containment vessel should have a vent to atmosphere, with the vent outlet directed at an approved location.

9.2.2.2.1
If the containment vessel vent has the potential to vent gaseous effluents, the requirements of 9.2.2.1 should apply.

9.2.2.2.2
The vent from the effluent containment vessel should be adequately sized to handle 150 percent of the maximum anticipated flow.

9.2.2.2.3
The effluent containment vessel's inlets should be located to prevent siphoning of the contents back into the system.

9.2.2.2.4
Means for indicating liquid level should be provided on the effluent containment vessel.
9.2.2.2.5* 
The effluent containment vessel should be designed for the intended service.

9.2.3—Strainers:

9.2.3.1—
One strainer should be placed in the suction piping of each pump.

9.2.3.2*—
A minimum 60 mesh stainless steel strainer element should be used.

9.2.3.3—
Isolation valves should be placed in the suction and discharge piping of the pump to facilitate cleaning of the strainer.

9.2.3.4—
A means should be provided to drain the strainer prior to cleaning.

9.2.3.5—
A pressure gauge should be placed between the strainer and the pump inlet to indicate strainer blockage.

9.2.3 Valves.

9.2.3.1—
Gate valves should be used for isolation purposes.

9.2.3.2—
Globe valves or wafer valves should be used for throttling purposes.

9.2.3.1
Valves should be compatible with the fluid being used and the system operating temperatures and pressures.

9.2.3.2—
Where used, automatic process equipment bypass valves should fail open upon power loss.

9.2.3.2*—
Valves should be selected for the intended application.

9.2.4 Expansion Tanks.

9.2.4.1
The expansion tank should be connected to the fluid system piping upstream of the fluid pump.

9.2.4.2* 
The expansion tank should be compatible with the fluid being used and the system operating temperatures and pressures.

9.2.4.3* 
The expansion tank should be sized to accommodate the fluid expansion in the entire system.

9.2.4.4* 
A low level switch The expansion tank should be provided equipped with a low-level interlock.

9.2.4.4.1
The low level switch should be satisfied before the pumps and the heater can be started.

9.2.4.4.2
The low level switch should be interlocked to shut down the pump and heater if a low level occurs.
9.2.4.2.1
In situations where maintaining flow is required to protect the heater due to residual heat, an emergency pump should be used to circulate fluid through an emergency cooling system.

9.2.4.3
Indication of low-level interlock activation should be provided.

9.2.4.5
An Means of draining the expansion tank drain to an approved location should be provided.

9.2.4.6
A means for sampling for water contamination should be provided at the low point of the expansion tank. An expansion tank vent or an expansion tank pressure relief device should be provided and the effluent should be directed to an approved location, in accordance to 9.2.2.

9.2.4.7
Local or remote indication of tank level should be provided.

9.2.4.8
Expansion tanks should be vented to the catch tank.

9.2.4.8*
An expansion tank pressurized with an inert gas should be used if any of the following conditions exist:

(1) The tank is not the highest point in the system.
(2) The tank contents can be at a temperature such that exposure of the fluid to air would cause degradation of the fluid.
(3) The fluid manufacturer recommends use of an inert blanket.
(4) The fluid is operated above its atmospheric boiling point.

9.2.4.9*
All pressurized expansion tanks should be equipped with a pressure relief device piped to the catch tank.

9.2.4.9*
All expansion tanks that are pressurized over a gauge pressure of 15 psi (100 kPa) should meet the requirements of ASME Boiler and Pressure Vessel Code, Section VIII Division 1.

9.2.4.10*
Pressurized If pressurization of the expansion tank is required due to the vapor pressure of the fluid, the expansion tank should have a blanket gas, low inert gas pressure alarm set at a value determined by the fluid supplier above the vapor pressure of the fluid at the operating temperature.

9.2.4.11*
If pressurization of the expansion tank is required due to the net positive suction head (NPSH) of the pump, the expansion tank should have a blanket gas low-pressure alarm set to satisfy the NPSH required by the pump.

9.3 Safety Devices for Class F Heaters.

9.3.1 Low Fluid Flow.
9.3.1.1* Means One or more interlocks should be provided to prove minimum fluid flow through the heater at all operating conditions.

9.3.1.2 The minimum flow–proving device should be interlocked into the combustion safety circuitry.

9.3.1.3 Means should be provided to prove minimum fluid level in the expansion tank at all operating conditions. The minimum flow–proving device should be interlocked to shut down the heater if a low flow occurs.

9.3.2 Interlocks.
The combustion safety circuitry should incorporate the following interlocks:

(1) High stack temperature located upstream of the stack damper High flue gas temperature

(2) High process outlet temperature High fluid outlet temperature, measured as close as possible to exit of heating chamber

(3) Process low flow limit Minimum flow limit

(4) Low expansion tank fluid level

(5) Activation of the heater’s fire suppression system, where provided

(6) Activation of an emergency stop

Supplemental Information

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Submitter Information Verification

Submitter Full Name: [Not Specified]
Organization: [Not Specified]
Submittal Date: Thu Oct 25 21:30:43 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: Chapter 9 is deleted in its entirety to allow insertion of new Chapter 9 (complete), which is provided in the attachment to this Public Input submission. Chapter 9 has been revised in its entirety to correlate with newly added Chapter 10.

Response Message:
Public Input No. 7-NFPA 87-2012 [Chapter 9]
Public Input No. 9-NFPA 87-2012 [Section No. 9.2.5.12]

Ballot Results
Chapter 10  Class G Heaters

10.1*  General. (Reserved)

10.1.1
Class G heaters should be designed to ensure that the required minimum fluid flow is achieved through all tube passes.

10.1.1.1*
When multiple parallel tube passes are used, balanced flow distribution between passes should be ensured, such that each parallel pass maintains the minimum design flow rate, so that maximum fluid film temperatures and maximum allowable material temperatures are not exceeded.

10.1.2
The maximum allowable bulk fluid temperature should be determined based on the maximum allowable fluid film temperature and the maximum allowable material temperature.

10.1.3*
The heater manufacturer should determine the minimum designed flow rate, taking into consideration the maximum allowable bulk and film fluid temperature at all flow rates and heat input rates.

10.1.4
Means of limiting the firing rate in accordance with the actual flow should be provided so that maximum fluid film temperature and maximum material temperature is not exceeded.

10.1.5
Where backflow into the heater presents a hazard, a means to prevent backflow should be provided.

10.1.6
The installation of a pressure relief valve, of appropriate pressure and flow rating, should be installed if the fluid can be trapped in the heated zone.

10.1.6.1
Discharge from relief valves should be handled in accordance with 10.2.2.

10.1.6.2
Vent lines should be sized to handle 150 percent of the maximum anticipated flow.

10.1.7*
The fluid system should be designed to maintain at least the minimum required fluid flow (as determined in 10.1.3) through the heater under all operating conditions.

10.1.8
An expansion tank should be provided for all closed-loop liquid circuits.
10.1.9
A hard-wired manual emergency switch at a remote location should be provided to initiate a safety shutdown of the entire fluid heater system.

10.1.10
A means of sampling for fluid contamination or degradation should be provided from the active loop.

10.2 Auxiliary Equipment. (Reserved)

10.2.1 Pumps.

10.2.1.1*
Pumps that are specifically designed for fluid heater service should be used.

10.2.1.2*
The pumps should be compatible with the fluid used as well as the operating pressures and temperatures.

10.2.1.3
The system should be designed such that there is sufficient net positive suction head available for the pump.

10.2.1.4
Positive displacement pumping systems should incorporate means of pressure relief.

10.2.1.5*
If water-cooled pumps are used, a means of verifying cooling water flow should be provided.

10.2.1.6*
Cold alignment of air- and water-cooled pumps should be done in accordance with the pump manufacturer's recommendations prior to the pump being started.

10.2.1.7*
Hot alignment of air- and water-cooled pumps should be done within the first 24 hours after operating temperature has been reached.

10.2.1.8
Cold and hot alignment should be performed during commissioning and following pump maintenance.

10.2.1.9*
Means should be provided to protect pumps from debris if required for the safe operation of the fluid heater.

10.2.2 Effluent Handling.

10.2.2.1 Gaseous Effluent.

10.2.2.1.1
Gaseous effluents that are asphyxiants, toxic, or corrosive are outside the scope of this recommended practice, and other standards should be consulted for appropriate venting.

10.2.2.1.2
Flammable gases and oxidizers should be vented to an approved location to prevent fire or explosion hazards.
10.2.2.1.3 When gaseous effluents are vented, the vent pipe should be located in accordance with the following:

1. Gaseous effluents should not impinge on equipment, support, building, windows, or materials because the gas could ignite and create a fire hazard.

2. Gaseous effluents should not impinge on personnel at work in the area or in the vicinity of the exit of the vent pipe because the gas could ignite and create a fire hazard.

3. Gaseous effluents should not be vented in the vicinity of air intakes, compressor inlets, or other devices that utilize ambient air.

10.2.2.1.4 The vent exit should be designed in accordance with the following:

1. The pipe exit should not be subject to physical damage or foreign matter that could block the exit.

2. The vent pipe should be sized to minimize the pressure drop associated with length, fitting, and elbows at the maximum vent flow rate.

3. The vent piping should not have any shutoff valves in the line.

10.2.2.1.5 If the gas is to be vented inside the building, the following additional guidance is offered:

1. If the gaseous effluents are flammable and lighter than air, the flammable gases should be vented to a location where the gas is diluted below its LFL before coming in contact with sources of ignition.

2. The gaseous effluents should not re-enter the work area without extreme dilution.

10.2.2.2 Liquid Phase Effluent

10.2.2.2.1 Liquid phase effluent should be directed to a containment vessel where the fluid can be reused or discarded.

10.2.2.2.2 The effluent containment vessel should have a vent to atmosphere, with the vent outlet directed at an approved location.

10.2.2.2.2.1 If the containment vessel vent has the potential to vent gaseous effluents, the requirements of 10.2.2.1 should apply.

10.2.2.2.2.2 The vent from the effluent containment vessel should be adequately sized to handle 150 percent of the maximum anticipated flow.

10.2.2.2.3 The effluent containment vessels inlets should be located to prevent siphoning of the contents back into the system.

10.2.2.2.4 Means for indicating liquid level should be provided on the effluent containment vessel.
10.2.2.5*  
The effluent containment vessel should be designed for the intended service.

10.2.3  Valves,  
10.2.3.1  
Valves should be compatible with the fluid being used and the system operating temperatures and pressures.

10.2.3.2*  
Valves should be selected for the intended application.

10.2.4  Expansion Tanks,  
10.2.4.1  
The expansion tank should be connected to the fluid system piping upstream of the fluid pump.

10.2.4.2*  
The expansion tank should be compatible with the fluid being used and the system operating temperatures and pressures.

10.2.4.3*  
The expansion tank should be sized to accommodate the fluid expansion in the entire system.

10.2.4.4*  
The expansion tank should be equipped with a low-level interlock.

10.2.4.4.1  
The low-level interlock should be satisfied before the pumps and the heater can be started.

10.2.4.4.2  
The low-level interlock should shut down the pump and heater if a low level occurs.

10.2.4.4.2.1  
In situations where maintaining flow is required to protect the heater due to residual heat, an emergency pump should be used to circulate fluid through an emergency cooling system.

10.2.4.4.3  
Indication of low-level interlock activation should be provided.

10.2.4.5  
Means of draining the expansion tank to an approved location should be provided.

10.2.4.6  
An expansion tank vent or an expansion tank pressure relief device should be provided and the effluent should be directed to an approved location, in accordance with 10.2.2.

10.2.4.7  
Local or remote indication of expansion tank level should be provided.
10.2.4.8*  
An expansion tank pressurized with an inert gas should be used if any of the following conditions exist:

1. The tank is not the highest point in the system.
2. The tank contents can be at a temperature such that exposure of the fluid to air would cause degradation of the fluid.
3. The fluid manufacturer requires use of an inert blanket.
4. The fluid is operated at or above its atmospheric boiling point.

10.2.4.9*  
All expansion tanks that are pressurized over a gauge pressure of 15 psi (100 kPa) should meet the requirements of ASME *Boiler and Pressure Vessel Code*, Section VIII Division 1.

10.2.4.10*  
If pressurization of the expansion tank is required due to the vapor pressure of the fluid, the expansion tank should have a blanket gas low-pressure alarm set at a value above the vapor pressure of the fluid at the operating temperature.

10.2.4.11*  
If pressurization of the expansion tank is required due to the net positive suction head (NPSH) of the pump, the expansion tank should have a blanket gas low-pressure alarm set to satisfy the NPSH required by the pump.

10.3  Safety Devices for Class G Heaters. *(Reserved)*

10.3.1  Low Fluid Flow.

10.3.1.1*  
One or more interlocks should be provided to prove minimum fluid flow through the heater at all operating conditions.

10.3.1.2  
The minimum flow–proving device should be interlocked into the combustion safety circuitry.

10.3.1.3  
The minimum flow-proving device should be interlocked to shut down the heater if a low flow occurs.

10.3.2  Interlocks.

The combustion safety circuitry should incorporate the following interlocks:

1. High flue gas temperature
2. High fluid outlet temperature, measured as close as possible to exit of heating chamber
3. Minimum flow limit
4. Low expansion tank fluid level
5. Activation of the heater’s fire suppression system, where provided
6. Activation of an emergency stop
### Supplemental Information

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### Submitter Information Verification

- **Submitter Full Name:** [ Not Specified ]
- **Organization:** [ Not Specified ]
- **Submittal Date:** Thu Oct 25 21:31:49 EDT 2012

### Committee Statement and Meeting Notes

- **Committee Statement:** New required and annex text for Class G fluid heaters, generated to replace reserved space. FR-60-NFPA 87-2012, contains the new annex for this chapter.
- **Response Message:** FR-39-NFPA 87-2012

**Committee Notes:**
- **Date Submitted:** Nov 30, 2012
- **By:** Duval
- Attached is the final version for the following:
- **Public Input No. 8-NFPA 87-2012 [Chapter 10]**

### Ballot Results

- This item has passed ballot

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### First Revision No. 40-NFPA 87-2012 [ Chapter 11 ]

**Chapter 11 Class H Heaters**

**11.1** General. *(Reserved)*

**11.1.1**

Class H heaters should be designed to ensure that the required minimum fluid flow is achieved through all flow paths.

**11.1.1.1**

When multiple parallel flow paths are used, balanced flow distribution between flow paths should be ensured, such that each parallel path maintains the minimum design flow rate, so that maximum fluid film temperatures and maximum allowable material temperatures are not exceeded.
11.1.2
The maximum allowable bulk fluid temperature should be determined based on the maximum allowable fluid film temperature and the maximum allowable material temperature.

11.1.3*
The heater manufacturer should determine the minimum designed flow rate, taking into consideration the maximum allowable bulk and film fluid temperature at the design flow rate and all heat input rates.

11.1.4
The temperature of all heat transfer surfaces in contact with the fluid should be below the temperature at which fluid degradation can occur under all operating conditions.

11.1.5
Where backflow into the heater presents a hazard, a means to prevent backflow should be provided.

11.1.6
The installation of a pressure relief valve, of appropriate pressure and flow rating, should be installed if the fluid can be trapped in the heated zone.

11.1.6.1
Discharge from relief valves should be handled in accordance with 11.2.2.

11.1.6.2
Vent lines should be sized to handle 150 percent of the maximum anticipated flow.

11.1.7*
The fluid system should be designed to maintain at least the minimum required fluid flow (as determined in 11.1.3) through the heater under all operating conditions.

11.1.8
An expansion tank should be provided for all closed-loop liquid circuits.

11.1.9
A hard-wired manual emergency switch at a remote location should be provided to initiate a safety shutdown of the entire fluid heater system.

11.1.10
A means of sampling for fluid contamination or degradation should be provided from the active loop.

11.2 Auxiliary Equipment. (Reserved)

11.2.1 Pumps.

11.2.1.1*
Pumps that are specifically designed for fluid heater service should be used.

11.2.1.2*
The pumps should be compatible with the fluid used as well as the operating pressures and temperatures.

11.2.1.3
The system should be designed such that there is sufficient net positive suction head available for the pump.

11.2.1.4
Positive displacement pumping systems should incorporate means of pressure relief.

11.2.1.5*
If water-cooled pumps are used, a means of verifying cooling water flow should be provided.
11.2.1.6*  
Cold alignment of air- and water-cooled pumps should be done in accordance with the pump manufacturer's recommendations prior to the pump being started.

11.2.1.7  
Hot alignment of air- and water-cooled pumps should be done within the first 24 hours after operating temperature has been reached.

11.2.1.8  
Cold and hot alignment should be performed during commissioning and following pump maintenance.

11.2.1.9*  
Means should be provided to protect pumps from debris if required for the safe operation of the fluid heater.

11.2.2*  Effluent Handling.  
All effluent from relief valves, vents, and drains should be directed to an approved location.

11.2.2.1  Gaseous Effluent.  

11.2.2.1.1  
Gaseous effluents that are asphyxiants, toxic, or corrosive are outside the scope of this recommended practice, and other standards should be consulted for appropriate venting.

11.2.2.1.2  
Flammable gases and oxidizers should be vented to an approved location to prevent fire or explosion hazards.

11.2.2.1.3  
When gaseous effluents are vented, the vent pipe should be located in accordance with the following:

1. Gaseous effluents should not impinge on equipment, support, building, windows, or materials because the gas could ignite and create a fire hazard.

2. Gaseous effluents should not impinge on personnel at work in the area or in the vicinity of the exit of the vent pipe because the gas could ignite and create a fire hazard.

3. Gaseous effluents should not be vented in the vicinity of air intakes, compressor inlets, or other devices that utilize ambient air.

11.2.2.1.4  
The vent exit should be designed in accordance with the following:

1. The pipe exit should not be subject to physical damage or foreign matter that could block the exit.

2. The vent pipe should be sized to minimize the pressure drop associated with length, fitting, and elbows at the maximum vent flow rate.

3. The vent piping should not have any shutoff valves in the line.
11.2.2.1.5
If the gas is to be vented inside the building, the following additional guidance is offered:

1. If the gaseous effluents are flammable and lighter than air, the flammable gases should be vented to a location where the gas is diluted below its LFL before coming in contact with sources of ignition.

2. The gaseous effluents should not re-enter the work area without extreme dilution.

11.2.2.2 Liquid Phase Effluent.
11.2.2.2.1*
Liquid phase effluent should be directed to a containment vessel where the fluid can be reused or discarded.

11.2.2.2.2
The effluent containment vessel should have a vent to atmosphere, with the vent outlet directed at an approved location.

11.2.2.2.2.1
If the containment vessel vent has the potential to vent gaseous effluents, the requirements of 11.2.2.1 should apply.

11.2.2.2.2.2
The vent from the effluent containment vessel should be adequately sized to handle 150 percent of the maximum anticipated flow.

11.2.2.2.2.3
The effluent containment vessel's inlets should be located to prevent siphoning of the contents back into the system.

11.2.2.2.2.4
Means for indicating liquid level should be provided on the effluent containment vessel.

11.2.2.2.2.5*
The effluent containment vessel should be designed for the intended service.

11.2.3 Valves.
11.2.3.1
Valves should be compatible with the fluid being used and the system operating temperatures and pressures.

11.2.3.2*
Valves should be selected for the intended application.

11.2.4 Expansion Tanks.
11.2.4.1
The expansion tank should be connected to the fluid system piping upstream of the fluid pump.

11.2.4.2*
The expansion tank should be compatible with the fluid being used and the system operating temperatures and pressures.

11.2.4.3*
The expansion tank should be sized to accommodate the fluid expansion in the entire system.

11.2.4.4*
The expansion tank should be equipped with a low-level interlock.
11.2.4.4.1
The low-level interlock should be satisfied before the pumps and the heater can be
started.

11.2.4.4.2
The low-level interlock should shut down the pump and heater if a low level occurs.

11.2.4.4.2.1
In situations where maintaining flow is required to protect the heater due to residual
heat, an emergency pump should be used to circulate fluid through an emergency
cooling system.

11.2.4.4.3
Indication of low-level interlock activation should be provided.

11.2.4.5
Means of draining the expansion tank to an approved location should be provided.

11.2.4.6
An expansion tank vent or an expansion tank pressure relief device should be provided
and the effluent should be directed to an approved location, in accordance with 11.2.2.

11.2.4.7
Local or remote indication of expansion tank level should be provided.

11.2.4.8*
An expansion tank pressurized with an inert gas should be used if any of the following
conditions exist:

1. The tank is not the highest point in the system.
2. The tank contents can be at a temperature such that exposure of the fluid to air
   would cause degradation of the fluid.
3. The fluid manufacturer requires use of an inert blanket.
4. The fluid is operated at or above its atmospheric boiling point.

11.2.4.9*
All expansion tanks that are pressurized over a gauge pressure of 15 psi (100 kPa)
should meet the requirements of ASME, **Boiler and Pressure Vessel Code**, Section VIII
Division 1.

11.2.4.10*
If pressurization of the expansion tank is required due to the vapor pressure of the fluid,
the expansion tank should have a blanket gas low-pressure alarm set at a value above
the vapor pressure of the fluid at the operating temperature.

11.2.4.11*
If pressurization of the expansion tank is required due to the net positive suction head
(NPSH) of the pump, the expansion tank should have a blanket gas low-pressure alarm
set to satisfy the NPSH required by the pump.

11.3 Safety Devices for Class H Heaters. (Reserved)

11.3.1 Low Fluid Flow.

11.3.1.1*
One or more interlocks should be provided to prove minimum fluid flow through the
heater at all operating conditions.
11.3.1.2 The minimum flow–proving device should be interlocked into the combustion safety circuitry.

11.3.1.3 The minimum flow–proving device should be interlocked to shut down the heater if a low flow occurs.

11.3.2 Interlocks

The combustion safety circuitry should incorporate the following interlocks:

1. High flue gas temperature
2. High fluid outlet temperature, measured as close as possible to exit of heating chamber
3. Minimum flow limit
4. Low expansion tank fluid level
5. Activation of the heater’s fire suppression system, where provided
6. Activation of an emergency stop

Supplemental Information

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Submitter Information Verification

Submitter Full Name: [Not Specified]
Organization: [Not Specified]
Submittal Date: Thu Oct 25 21:32:41 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: The NFPA 87 Technical Committee wishes to compile a "complete" version of the Recommended Practice during the current cycle so that the public can review and get to know the RP over the next four years, and provide input to the committee on all three types of fluid heaters (Class F, G, and H) before the following edition is put up for consideration as a Standard (instead of an RP). See FR-61-NFPA 87-2012 for the added annex material.


Committee Notes:

Date Submitted By

Nov 30, 2012, Duval

Attached shows the final version as the committee intends it.

Public Input No. 18-NFPA 87-2012 [Chapter 11]
Ballot Results

✔ This item has passed ballot

First Revision No. 63-NFPA 87-2013 [ New Section after A.3.2.4 ]

A.3.3.17 Hardwired.

When the term *hardwired* is applied to the logic system itself, it refers to the method of using individual devices and interconnecting wiring to program and perform the logic functions without the use of software-based logic solvers.

Submitter Information Verification

Submitter Full Name: Derek Duval
Organization: National Fire Protection Assoc
Submittal Date: Mon Jan 07 09:44:19 EST 2013

Committee Statement and Meeting Notes

Committee Statement: Annex material for FR-44-NFPA 87-2012, the term hardwired.
Response Message: FR-63-NFPA 87-2013

Ballot Results

✔ This item has passed ballot
First Revision No. 53-NFPA 87-2012 [Section No. A.5.3]

A.5.3

For additional information regarding explosion protection of equipment and buildings, see NFPA 68, *Standard on Explosion Protection by Deflagration Venting*, and NFPA 69, *Standard on Explosion Prevention Systems*.

Where explosion relief is provided, its location is a critical concern and should be close to the ignition source. Personnel considerations and proximity to other obstructions can affect the location selected for these vents. The intent of providing explosion relief in furnaces is to limit damage to the furnace and to reduce the risk of personnel injury due to explosions. To achieve those goals, relief panels and doors should be sized so that their inertia does not preclude their ability to relieve internal explosion pressures.

Damage-limiting construction could include exterior panels that are designed to become detached under the influence of internal pressure from a deflagration. In such cases, tethering the panels is vitally important to ensure dislodged panels don't cause injury or damage. NFPA 68 provides guidance for tethering doors and walls that can become dislodged in a deflagration event.

Submitter Information Verification

Submitter Full Name: Derek Duval
Organization: National Fire Protection Assoc
Submittal Date: Wed Nov 28 23:12:01 EST 2012

Committee Statement and Meeting Notes

Committee Statement: Fluid heaters are generally not designed to withstand internal pressures developed by a deflagration. As such, containment and explosion suppression are likely not viable options. Location is not an ideal solution, because it is impossible to ensure personnel will never be working in the area of an operating fluid heater especially during start-up and shutdown. By combining tethers with a “damage limiting construction” approach, the traditional design features of many fluid heaters can be made safer.

Response Message:

Public Input No. 17-NFPA 87-2012 [New Section after A.5.3]

Ballot Results

✔ This item has passed ballot
A.5.5.1.3

Threaded connections in the flow circuit typically are not used on piping greater than 1 in. (25 mm) NPT. Flanged and threaded connections are not recommended for flammable or combustible liquids due to possible leakage. Additional guidance can be found in ASME B31.3, *Process Piping*.

Submitter Information Verification

Submitter Full Name: [Not Specified]
Organization: [Not Specified]
Submittal Date: Thu Oct 25 16:11:35 EDT 2012

Committee Statement and Meeting Notes

Committee: This explanatory input and the new text (5.5.1.3 and subsections) clarifies the committee's intent that welded connections should be used as often as is practical.
Response: FR-12-NFPA 87-2012
Message: Public Input No. 5-NFPA 87-2012 [Section No. A.5.5.1.3]

Ballot Results

✔ This item has passed ballot
A.6.2.7.9

NFPA 87 does not address vents between safety shutoff valves, but they are sometimes installed.

Submitter Information Verification

Submitter Full Name: Derek Duval
Organization: National Fire Protection Assoc
Submittal Date: Wed Nov 28 23:45:54 EST 2012

Committee Statement and Meeting Notes


Ballot Results

☑️ This item has passed ballot
A.7.2.12

The evacuation, purging, charging, and confirmation of the fuel or combustible gas supply in the piping upstream of the equipment isolation valve is governed by other codes, standards, and recommended practices. Examples are NFPA 54, National Fuel Gas Code, which requires charging to be stopped upon detection of combustible gas at the point of discharge, and NFPA 56PS, Standard for Fire and Explosion Prevention During Cleaning and Purging of Flammable Gas Piping Systems. Careful consideration should be given to the potential hazards that can be created in the surrounding area for any fuel or combustible gas discharge.

In NFPA 54, the term Appliance Shutoff Valve is analogous to the term Equipment Isolation Valve in NFPA 86 and 87.
First Revision No. 65-NFPA 87-2013 [ New Section after A.7.5.17 ]

Submitter Information Verification

Submitter Full Name: Derek Duval
Organization: National Fire Protection Assoc
Submittal Date: Mon Jan 07 11:01:33 EST 2013

Committee Statement and Meeting Notes

Response Message: FR-65-NFPA 87-2013

Ballot Results

✔ This item has passed ballot
A.8.2.9

For some applications, additional manual action might be required to bring the process to a safe condition. The actions resulting from a manual emergency switch action take into account the individual system design and the hazards (e.g., mechanical, combustion system, process fluid, thermal fluid, etc.) associated with changing the existing state to another state and initiates actions to cause the system to revert to a safe condition.

Submitter Information Verification

Submitter Full Name: [ Not Specified ]
Organization: [ Not Specified ]
Submittal Date: Thu Oct 25 16:54:02 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: Annex text was added to further clarify the document text.
Committee Notes:

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<td>Duval</td>
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Public Input No. 36-NFPA 87-2012 [Section No. A.8.2.9]

Ballot Results

✓ This item has passed ballot
First Revision No. 46-NFPA 87-2012 [ Section No. A.8.3 ]

A.8.3

Furnace controls Fluid heater controls that meet the performance-based requirements of standards such as ANSI/ISA 84.00.01, Application of Safety Instrumented Systems for the Process Industries, or IEC 61511, Functional Safety: Safety Instrumented Systems for the Process Industry Sector, can be considered equivalent. The determination of equivalency involves complete conformance to the safety life cycle, including risk analysis, safety integrity level selection, and safety integrity level verification, which should be submitted to the authority having jurisdiction.

Submitter Information Verification

Submitter Full Name: [ Not Specified ]
Organization: [ Not Specified ]
Submittal Date: Fri Oct 26 15:06:48 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: IEC61511 is exactly equivalent to ANSI/ISA84.00.01.
Committee Notes:

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<td>Duval</td>
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Public Input No. 27-NFPA 87-2012 [Section No. A.8.3]

Ballot Results

✓ This item has passed ballot
A.8.3.1.4

This control circuit and its non-furnace-mounted or furnace-mounted control and safety components should be housed in a dusttight panel or cabinet, protected by partitions or secondary barriers, or separated by sufficient spacing from electrical controls employed in the higher voltage furnace power system. Related instruments might or might not be installed in the same control cabinet. The door providing access to this control enclosure might include means for mechanical interlock with the main disconnect device required in the furnace power supply circuit.

Temperatures within this control enclosure should be limited to 125°F (52°C) for suitable operation of plastic components, thermal elements, fuses, and various mechanisms that are employed in the control circuit.

Submitter Information Verification

Submitter Full Name: Derek Duval
Organization: National Fire Protection Assoc
Submittal Date: Fri Nov 30 07:32:48 EST 2012

Committee Statement and Meeting Notes

Committee Statement: Section renumbered in FR-49-NFPA 87-2012.

Ballot Results

✔ This item has passed ballot
A.8.4.4.1

This recommended practice suggests that the signal from the safety device be directly transmitted to the safety PLC input. Once the safety PLC processes the signal the resulting data can be used for any purpose.

Submitter Information Verification

Submitter Full Name: Derek Duval
Organization: National Fire Protection Assoc
Submittal Date: Thu Nov 29 15:12:16 EST 2012

Committee Statement and Meeting Notes


Ballot Results

✓ This item has passed ballot
A.8.5.1.2.1

Consideration should be given to the proximity of operating burners when the common combustion chamber exception to repeating purges is utilized. Accumulation of localized vapors or atmospheres is possible even with an operating burner in a chamber, depending on the size of the chamber, the number of burners, and the proximity of operating burners to the accumulation. In addition to proximity, burner design and exposure of the flame can also impact the ability of the operating burner to mitigate vapor or gaseous accumulations.

Committee Statement and Meeting Notes

Committee Statement: Annex material is added to be consistent with NFPA 86-2011.
Response Message: FR-26-NFPA 87-2012
Public Input No. 40-NFPA 87-2012 [New Section after A.8.5.1.2(1)]

Ballot Results

✅ This item has passed ballot
A.8.6.5

Interlocks for combustion air minimum pressure or flow can be provided by any of the following methods:

1. A low-pressure switch that senses and monitors the combustion air source pressure. In industrial combustion applications with modulating flow control valves downstream of the combustion air blower, it is most common to interlock the constant combustion air source pressure on single-burner and multiburner systems to meet the recommendations of 8.6.3 and 8.6.5. Because the combustion airflow is proved during each purge cycle along with the combustion air source pressure, the most common convention is to prove the combustion air source pressure during burner operation following purge. In a multiburner system, the proof of combustion airflow during purge proves that any manual valves in the combustion air system are in an adequately open position. These manual air valves are provided for maintenance and combustion airflow balancing among burners in a temperature control zone. In combustion air supply systems that use either an inlet damper or a speed control, the combustion air pressure can fall below reliably repeatable levels with listed pressure switch interlocks at low fire. For these systems, the proof of minimum airflow can be a more reliable interlock.

2. A differential pressure switch that senses the differential pressure across a fixed orifice in the combustion air system. In combustion air supply systems that use either an inlet damper or a speed control, the combustion air pressure can fall below reliably repeatable levels with listed pressure switch interlocks at low fire. For these systems, the proof of minimum airflow by use of a differential pressure switch across an orifice can be a more reliable interlock.

3. An airflow switch. In combustion air supply systems that use either an inlet damper or a speed control, the combustion air pressure can fall below reliably repeatable levels with listed pressure switch interlocks at low fire. For these systems, the proof of minimum airflow by use of an airflow switch can be a more reliable interlock.

4. A pressure switch on the inlet (suction) side of an induced draft (I.D.) fan. For heaters where airflow is induced by an I.D. fan, a pressure switch on the inlet of the I.D. fan can be used to prove that the minimum required suction pressure is available, which along with proof that air and stack dampers are not closed can be used as a minimum air flow interlock.

5. For combustion systems that use high pressure gas/air to induce (inspirate) air locally at each burner or that use natural draft to induce air into the burners or combustion champer, proof that air and stack dampers are not closed/open to at least a minimum position can be used to satisfy the intent of a low air flow interlock. It is not possible to monitor and prove the availability of combustion air for fluid heaters that use natural draft or air inspiriting burners.
Committee Statement: The revision explains several methods for proving the minimum combustion airflow.


Committee Notes:

<table>
<thead>
<tr>
<th>Date</th>
<th>Submitted By</th>
<th>Notes</th>
</tr>
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<tbody>
<tr>
<td>Jan 7, 2013</td>
<td>Duval</td>
<td>This section is not shown legislatively correct. The revision adds 4 new methods.</td>
</tr>
</tbody>
</table>

Public Input No. 45-NFPA 87-2012 [Section No. A.8.6.5]

Ballot Results

✅ This item has passed ballot

First Revision No. 33-NFPA 87-2012 [New Section after A.8.7.1.2]

A.8.7.1.3

Paragraph A.8.7.1.3 addresses conditions under which only one safety shutoff valve is to close to isolate a burner from its fuel gas supply. Figure A.8.7.1.3 provides a summary of A.8.7.1.3 in the form of a decision tree. See A.5.1.1.2 for guidance regarding conditions that are needed to allow that burner to be placed back in service. The requirements of A.5.1.1.2 might not allow a burner shut off by closing a single safety shutoff valve to be placed back in service without repeating a pre-ignition purge.

The requirements of A.8.7.1.3 do not preclude opening of the safety shutoff valve located upstream of the individual burners using single safety shutoff valves during the trial for ignition for the first burner being lighted.

Figure A.8.7.1.3 Safety Shutoff Decision Tree
Submitter Information Verification

Submitter Full Name: [Not Specified]
Organization: [Not Specified]
Submittal Date: Thu Oct 25 20:56:37 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: Revised to be consistent with NFPA 86-2011.
Response Message: FR-33-NFPA 87-2012
Public Input No. 66-NFPA 87-2012 [New Section after A.8.7.1.2]

Ballot Results

✔️ This item has passed ballot
First Revision No. 47-NFPA 87-2012 [ Section No. A.8.9.2 ]

A.8.9.2

Ultraviolet detectors can fail in such a manner that the loss of flame is not detected. When these detectors are placed in continuous service, failures can be detected by use of a self-checking ultraviolet detector or by periodic testing of the detector for proper operation.

Flame detectors (scanners) with combustion safeguards that continuously operate beyond the maximum interval recommended by the combustion safeguard and flame detector manufacturer's instructions would not be compliant.

Submitter Information Verification

Submitter Full Name: [ Not Specified ]
Organization: [ Not Specified ]
Submittal Date: Fri Oct 26 15:24:26 EDT 2012

Committee Statement and Meeting Notes

Committee Statement: The statement is added to reinforce compliance with manufacturer's instructions.
Public Input No. 84-NFPA 87-2012 [New Section after A.8.7.3.3]

Ballot Results

✓ This item has passed ballot
First Revision No. 67-NFPA 87-2013 [ New Section after A.9.1 ]

A.9.1.1.1

Balanced flow is typically achieved by the piping geometry or fixed flow restrictions. If fluid flow rates fall below the designed minimum flow rate, fluid overheating and subsequent degradation can occur. Some heater designs have one flow rate for tubes in the radiant section and another flow rate for tubes in the convective section.

If balancing trim valves are used, the flow through each pass should be monitored and interlocked into the combustion safety circuitry. Manual balancing trim valves should also have provisions to lock the valve to prevent inadvertent adjustment of the valve.

Submitter Information Verification

Submitter Full Name: Derek Duval
Organization: National Fire Protection Assoc
Submittal Date: Mon Jan 07 14:14:19 EST 2013

Committee Statement and Meeting Notes

Committee Statement: Added annex material to reflect new changes in Chapter 9, from FR-38-NFPA 87-2012.
Response Message: FR-67-NFPA 87-2013

Ballot Results

✔ This item has passed ballot
A.9.1.5
The installation of a pressure relief valve between the blocking valves or of a block valve at the inlet to the heater and a check valve at the outlet can be used.

Submitter Information Verification

Submitter Full Name: Derek Duval
Organization: National Fire Protection Assoc
Submittal Date: Mon Jan 07 14:20:58 EST 2013

Committee Statement and Meeting Notes

Committee Statement: Added annex material to reflect new changes in Chapter 9, from FR-38-NFPA 87-2012.
Response: FR-68-NFPA 87-2013
Message:

Ballot Results

✔ This item has passed ballot
A.9.2.1.1

Air-cooled or water-cooled pumps with mechanical seals, canned motor pumps, seal-less pumps, and pumps that are magnetically coupled are examples of pumps that are used. If magnetically coupled pumps are used, over-temperature protection of the pump coupling location should be provided. Packing-based seals are prone to leakage and are not recommended. The pump material selection should take into account the possible thermal shock experienced under fire suppression scenarios.

Submitter Information Verification

Submitter Full Name: Derek Duval
Organization: National Fire Protection Assoc
Submittal Date: Mon Jan 07 14:21:39 EST 2013

Committee Statement and Meeting Notes

Committee Statement: Added annex material to reflect new changes in Chapter 9, from FR-38-NFPA 87-2012.
Response Message: FR-69-NFPA 87-2013

Ballot Results

✔️ This item has passed ballot
A.9.2.1.2

The fluid manufacturer and the heater manufacturer the person or company responsible for the design or supply of the fluid heater should be consulted to provide recommendations on the appropriate pump for the application.

Submitter Information Verification

Submitter Full Name: Derek Duval
Organization: National Fire Protection Assoc
Submittal Date: Mon Jan 07 14:27:47 EST 2013

Committee Statement and Meeting Notes

Committee Statement: Added annex material to reflect new changes in Chapter 9, from FR-38-NFPA 87-2012.
Response: FR-70-NFPA 87-2013

Ballot Results

✔ This item has passed ballot
A.9.2.2

If the fluid being relieved is combustible, measures should be taken to prevent ignition of the vapors or aerosols from the vent. Additional guidance can be found in NFPA 30, Flammable and Combustible Liquids Code.

Submitter Information Verification

Submitter Full Name: Derek Duval
Organization: National Fire Protection Assoc
Submittal Date: Mon Jan 07 14:29:13 EST 2013

Committee Statement and Meeting Notes

Committee Statement: Added annex material to reflect new changes in Chapter 9, from FR-38-NFPA 87-2012.
Response Message: FR-71-NFPA 87-2013

Ballot Results

✔ This item has passed ballot
First Revision No. 72-NFPA 87-2013 [Sections A.9.2.3.2, A.9.2.4.3]

A.9.2.3.2  Refer to the pump manufacturer's manual for additional instructions.

A.9.2.4.3  Cast steel or ductile iron valves with steel or stainless steel trim are typically used.

Submitter Information Verification

Submitter Full Name: Derek Duval
Organization: National Fire Protection Assoc
Submittal Date: Mon Jan 07 14:34:07 EST 2013

Committee Statement and Meeting Notes

Committee Statement: Added annex material to reflect new changes in Chapter 9, from FR-38-NFPA 87-2012.
Response Message: FR-72-NFPA 87-2013

Ballot Results

This item has passed ballot
First Revision No. 73-NFPA 87-2013 [ Section No. A.9.2.5.2 ]

A.9.2.4.2
Expansion tanks are typically fabricated from carbon and stainless steel.

Submitter Information Verification

Submitter Full Name: Derek Duval
Organization: National Fire Protection Assoc
Submittal Date: Mon Jan 07 14:37:38 EST 2013

Committee Statement and Meeting Notes

Committee Statement: Added annex material to reflect new changes in Chapter 9, from FR-38-NFPA 87-2012.
Response Message: FR-73-NFPA 87-2013

Ballot Results

✔ This item has passed ballot
A.9.2.4.3
Expansion tanks are typically 2.5 times the expansion volume of the system. The operating temperature, the expansion coefficient of the fluid, and the system volume are used to calculate the volume of the expansion tank. Some vapor space should remain in the tank when the system is at operating temperature. If the tank is located outdoors, an inert blanket should be considered to minimize moisture ingress into the system. For very large systems, where expansion tanks are elevated and working volume exceeds 1000 gallons, a secondary, ground-level catch/storage tank and refill pumps can be used to take up excess expansion volume.

A.9.2.4.4
In addition to the low-level interlock, on large volume systems, it is good practice to use dynamic leak detection (rate of change monitoring) on expansion tanks. Dynamic leak detection is encouraged because it will detect abnormal fluid loss over time whereas a low-level switch is a single set point and often located just above tank empty. In some situations, expansion tanks can be several thousand gallons in capacity. Therefore, if only low-level monitoring is provided, several thousand gallons could escape the system before the alarm is sounded. With dynamic leak detection, alarm notification of the falling oil level will be made much sooner.

Submitter Information Verification

Submitter Full Name: Derek Duval
Organization: National Fire Protection Assoc
Submittal Date: Mon Jan 07 14:38:16 EST 2013

Committee Statement and Meeting Notes

Committee Statement: Added annex material to reflect new changes in Chapter 9, from FR-38-NFPA 87-2012.
Response Message: FR-74-NFPA 87-2013

Ballot Results

✔ This item has passed ballot
First Revision No. 75-NFPA 87-2013 [Section No. A.9.2.5.9, A.9.2.4.9, A.9.2.4.10, A.9.2.4.11]

A.9.2.4.8
Nitrogen is typically used as the inert blanket. Other gases, such as carbon dioxide, can be used. In the oil and gas industry it is common to use flammable gases. If using flammable gases, other precautions should be considered, such as area classification and explosion-proof electrical devices.

Submitter Information Verification

Submitter Full Name: Derek Duval
Organization: National Fire Protection Assoc
Submittal Date: Mon Jan 07 15:10:07 EST 2013

Committee Statement and Meeting Notes

Committee Statement: Added annex material to reflect new changes in Chapter 9, from FR-38-NFPA 87-2012.
Response Message: FR-75-NFPA 87-2013

Ballot Results

✔ This item has passed ballot
A.9.3.1.1

The required minimum fluid flow rate is based on design requirements. Detecting only flow/no flow conditions might be inadequate. A pressure switch at the pump discharge, and a pump rotation switch, and a flow paddle switch are examples of proving devices that are not recommended to prove minimum flow as unexpected blockages in the heater tubes will not be detected by these devices. For example, restriction of flow will result in an increase in the fluid outlet temperature, which in turn will drive a reduction in heat input (low fire). Low flow rates under this condition could cause laminar flow in the tubes, resulting in undetected localized fluid skin overtemperature conditions. Using a vortex-shedding meter or similar flow measurement device can provide reliable minimum flow verification. However, a failure modes and effects analysis should be conducted to ensure that the implementation is sufficiently reliable for a safety function implementation. Another option is to use a combination of pressure differential measurements across a known restriction combined with low and high pressure limits. The high pressure limits will detect blockage or other abnormal flow restrictions that maintain high differential pressures at low flow conditions. Conversely, low pressure limits can detect system leaks or bypass flows.

Orifice plate(s) located at the outlet of a fluid heater and used with differential pressure interlock(s) are a reliable way of proving the minimum flow. If pressure drop across the heater is used, additional interlocks and precautions should be considered.
A.10.1

Class G heaters have fluid inside the tubes with modulated fluid flow rate (e.g., by process demand) and where the outlet temperature of the fluid is controlled by modulation of the heat input rate to the outside of the tubes.

Class G fluid heaters present the following two major hazards:

1. Uncontrolled release of the fluid, which can cause tube cracking or rupture, pump seal failure, fire, or explosion which can result in fire or explosion

2. Combustible accumulation and explosion Release and accumulation of combustible fuel gas or liquid, followed by ignition and explosion

A.10.1.1.1

 Balanced flow is typically achieved by the piping geometry or fixed flow restrictions. If fluid flow rates fall below the designed minimum flow rate, fluid overheating and subsequent degradation can occur. Some heater designs have one flow rate for tubes in the radiant section and another flow rate for tubes in the convective section.

If balancing trim valves are used, the flow through each pass should be monitored and interlocked into the combustion safety circuitry. Manual balancing trim valves should also have provisions to lock the valve to prevent inadvertent adjustment of the valve.

A.10.1.3

 The maximum bulk fluid temperature is typically measured at the outlet of the heater.

A.10.1.7

 The fluid flow control device should have mechanical stops or equivalent provisions to prevent the flow from dropping below the minimum design flow. Variable speed pumping systems should provide a minimum motor speed limit to prevent flow less than the minimum required level in both automatic and manual operation.

A.10.2.1.1

 Air-cooled or water-cooled pumps with mechanical seals, canned motor pumps, seal-less pumps, and pumps that are magnetically coupled are examples of pumps that are used. If magnetically coupled pumps are used, over-temperature protection of the pump coupling location should be provided. Packing-based seals are prone to leakage and are not recommended. The pump material selection should take into account the possible thermal shock experienced under fire suppression scenarios.

A.10.2.1.2

 The fluid manufacturer and the heater manufacturer should be consulted to provide recommendations on the appropriate pump for the application.

A.10.2.1.5

 Loss of cooling can cause seal failure and a subsequent fire hazard.

A.10.2.1.6

 Misalignment can cause seal failure and a subsequent fire hazard.

A.10.2.1.7

 The alignment of the pump can change during the transition from cold to operating temperatures.

A.10.2.1.9

 Examples of devices to protect pumps can be drip legs, strainers, filters, and screens.
A.10.2.2
If the fluid being relieved is combustible, measures should be taken to prevent ignition of the vapors or aerosols from the vent. Additional guidance can be found in NFPA 30, *Flammable and Combustible Liquids Code*.

A.10.2.2.2.1
Containment vessels for liquids include drain tanks, fill tanks, supplemental storage tanks, and catch tanks.

A.10.2.2.5
Secondary containment of effluent containment vessel should be considered if the fluid is flammable or hazardous.

A.10.2.3.2
Gate and ball valves can be used for isolation purposes, and globe or wafer-style butterfly valves can be used for throttling purposes.

A.10.2.4.2
Expansion tanks are typically fabricated from carbon and stainless steel.

A.10.2.4.3
The operating temperature, the expansion coefficient of the fluid, and the system volume are used to calculate the volume of the expansion tank. Some vapor space should remain in the tank when the system is at operating temperature. If the tank operates at atmospheric pressure and is located outdoors, an inert gas blanket should be considered to minimize moisture ingress into the system. For very large systems, where expansion tanks are elevated and working volume exceeds 1000 gallons, a secondary, ground-level catch/storage tank and refill pumps can be used to take up excess expansion volume.

A.10.2.4.4
In addition to the low-level interlock, on large-volume systems, it is good practice to use dynamic leak detection (rate of change monitoring) on expansion tanks. Dynamic leak detection is encouraged because it will detect abnormal fluid loss over time whereas a low-level switch is a single set point and often located just above tank empty. In some situations, expansion tanks can be several thousand gallons in capacity. Therefore, if only low-level monitoring is provided, several thousand gallons could escape the system before the alarm is sounded. With dynamic leak detection, alarm notification of the falling oil level will be made much sooner.

A.10.2.4.8
Nitrogen is typically used as the inert blanket. Other gases, such as carbon dioxide, can be used. In the oil and gas industry it is common to use flammable gases. If using flammable gases, other precautions can be required, such as area classification and explosion-proof electrical devices.

A.10.2.4.9
Consideration should be given to pressure surges that can occur during process upsets that can expose the expansion tank to pressures greater than 15 psi. An example of a common process upset is the rapid pressure rise due to water flashing to steam. For this reason, many users specify expansion tanks that meet the requirements of ASME *Boiler and Pressure Vessel Code*, Section VIII Division 1.

A.10.2.4.10
A blanket gas low-pressure interlock should be considered where low blanket gas pressure can create a fluid heater system hazard.

A.10.2.4.11
See A.10.2.4.10.
A.10.3.1.1

Detecting only flow/no flow conditions is not adequate. A pressure switch at the pump discharge and a pump rotation switch are examples of proving devices that are not recommended to prove minimum flow as unexpected blockages in the heater tubes will not be detected by these devices.

Orifice plate(s) located at the outlet of a fluid heater and used with differential pressure interlock(s) are a reliable way of proving the minimum flow. If pressure drop across the heater is used, additional interlocks and precautions should be considered.

Submitter Information Verification

Submitter Full Name: Derek Duval
Organization: National Fire Protection Assoc
Submittal Date: Fri Nov 30 08:17:48 EST 2012

Committee Statement and Meeting Notes

Response Message: FR-60-NFPA 87-2012

Ballot Results

✓ This item has passed ballot

First Revision No. 61-NFPA 87-2012 [ Section No. A.11.1, A.11.1.1.1, A.11.1.3, A.11.1.7, A.11.2.1.1, A.11.2.1.2, A.11.2.1.5, A.11.2.1.6, A.11.2.1.7, A.11.2.1.9, A.11.2.2, A.11.2.2.2.1, A.11.2.2.2.5, A.11.2.3.2, A.11.2.4.2, A.11.2.4.3, A.11.2.4.4, A.11.2.4.8, A.11.2.4.9, A.11.2.4.10, A.11.2.4.11, A.11.3.1.1 ]

A.11.1

Class H heaters have heat source (combustion or electricity) inside the tube(s) with fluid surrounding the tube.

Class H fluid heaters present the following two major hazards:

(1) Uncontrolled release of the fluid, which can cause tube cracking or rupture, or pump seal failure, fire, or explosion which can result in fire or explosion

(2) Combustible accumulation and explosion Release and accumulation of combustible fuel gas or liquid, followed by ignition and explosion
A.11.1.1
Balanced flow is typically achieved by the piping geometry or fixed flow restrictions. If fluid flow rates fall below the designed minimum flow rate, fluid overheating and subsequent degradation can occur.

If balancing trim valves are used, the flow through each pass should be monitored and interlocked into the combustion safety circuitry. Manual balancing trim valves should also have provisions to lock the valve to prevent inadvertent adjustment of the valve.

A.11.1.3
The maximum bulk fluid temperature is typically measured at the outlet of the heater.

A.11.1.7
Three-way 

A.11.2.1.1
Air-cooled or water-cooled pumps with mechanical seals, canned motor pumps, seal-less pumps, and pumps that are magnetically coupled are examples of pumps that are used. If magnetically coupled pumps are used, over-temperature protection of the pump coupling location should be provided. Packing-based seals are prone to leakage and are not recommended. The pump material selection should take into account the possible thermal shock experienced under fire suppression scenarios.

A.11.2.1.2
The fluid manufacturer and the heater manufacturer should be consulted to provide recommendations on the appropriate pump for the application.

A.11.2.1.5
Loss of cooling can cause seal failure and a subsequent fire hazard.

A.11.2.1.6
Misalignment can cause seal failure and a subsequent fire hazard.

A.11.2.1.7
The alignment of the pump can change during the transition from cold to operating temperatures.

A.11.2.1.9
Examples of devices to protect pumps can be drip legs, strainers, filters, and screens.

A.11.2.2
If the fluid being relieved is combustible, measures should be taken to prevent ignition of the vapors or aerosols from the vent. Additional guidance can be found in NFPA 30, Flammable and Combustible Liquids Code.

A.11.2.2.1
Containment vessels for liquids include drain tanks, fill tanks, supplemental storage tanks, and catch tanks.

A.11.2.2.5
Secondary containment of effluent containment vessel should be considered if the fluid is flammable or hazardous.

A.11.2.3.2
Gate and ball valves can be used for isolation purposes, and globe or wafer-style butterfly valves can be used for throttling purposes.

A.11.2.4.2
Expansion tanks are typically fabricated from carbon and stainless steel.
A.11.2.4.3
The operating temperature, the expansion coefficient of the fluid, and the system volume are used to calculate the volume of the expansion tank. Some vapor space should remain in the tank when the system is at operating temperature. If the tank operates at atmospheric pressure and is located outdoors, an inert gas blanket should be considered to minimize moisture ingress into the system. For very large systems, where expansion tanks are elevated and working volume exceeds 1000 gallons, a secondary, ground-level catch/storage tank and refill pumps can be used to take up excess expansion volume.

A.11.2.4.4
In addition to the low-level interlock, on large-volume systems, it is good practice to use dynamic leak detection (rate of change monitoring) on expansion tanks. Dynamic leak detection is encouraged because it will detect abnormal fluid loss over time whereas a low-level switch is a single set point and often located just above tank empty. In some situations, expansion tanks can be several thousand gallons in capacity. Therefore, if only low-level monitoring is provided, several thousand gallons could escape the system before the alarm is sounded. With dynamic leak detection, alarm notification of the falling oil level will be made much sooner.

A.11.2.4.8
Nitrogen is typically used as the inert blanket. Other gases, such as carbon dioxide, may be used. In the oil and gas industry it is common to use flammable gases. If using flammable gases, other precautions can be required, such as area classification and explosion-proof electrical devices.

A.11.2.4.9
Consideration should be given to pressure surges that can occur during process upsets that can expose the expansion tank to pressures greater than 15 psi. An example of a common process upset is the rapid pressure rise due to water flashing to steam. For this reason, many users specify expansion tanks that meet the requirements of ASME Boiler and Pressure Vessel Code, Section VIII Division 1.

A.11.2.4.10
A blanket gas low-pressure interlock should be considered where low blanket gas pressure can create a fluid heater system hazard.

A.11.2.4.11
See A.11.2.4.10.

A.11.3.1.1
Detecting only flow/no flow conditions is not adequate. A pressure switch at the pump discharge and a pump rotation switch are examples of proving devices that are not recommended to prove minimum flow as unexpected blockages in the heater tubes will not be detected by these devices.

Orifice plate(s) located at the outlet of a fluid heater and used with differential pressure interlock(s) are a reliable way of proving the minimum flow. If pressure drop across the heater is used, additional interlocks and precautions should be considered.

Submitter Information Verification

Submitter Full Name: Derek Duval
Organization: National Fire Protection Assoc
Submittal Date: Fri Nov 30 08:36:22 EST 2012
Committee Statement and Meeting Notes

Committee Statement: Revised and added annex material based on FR-40-NFPA 87-2012.
Response Message: FR-61-NFPA 87-2012

Ballot Results

✓ This item has passed ballot

First Revision No. 54-NFPA 87-2012 [ New Section after D.1.2.1 ]

D.1.2.2 ASME Publications.
American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990.

Submitter Information Verification

Submitter Full Name: Derek Duval
Organization: National Fire Protection Assoc
Submittal Date: Wed Nov 28 23:25:01 EST 2012

Committee Statement and Meeting Notes

Committee Statement: Added reference due to FR-12-NFPA 87-2012. This section is not replacing any section, renumber subsequent sections.
Response Message: FR-54-NFPA 87-2012

Ballot Results

✓ This item has passed ballot
First Revision No. 56-NFPA 87-2012 [ New Section after D.1.2.3 ]

**D.1.2.5 IEC Publications.**

International Electrical Commission, 3 rue de Varembé, P.O. Box 131, CH - 1211, Geneva 20, Switzerland.


Submitter Information Verification

**Submitter Full Name:** Derek Duval  
**Organization:** National Fire Protection Assoc  
**Submittal Date:** Thu Nov 29 00:04:24 EST 2012

Committee Statement and Meeting Notes

**Committee Statement:** Added reference in FR-46-NFPA 87-2012.  
**Response Message:** FR-56-NFPA 87-2012

Ballot Results

✔ This item has passed ballot