Technical Committee on Multiple Burner Boilers

AGENDA

Entergy Corporation
639 Loyola Avenue
New Orleans, LA 70113
February 26-27, 2013

1. Chair’s welcome, call to order, and opening remarks at 8:00 a.m. CST.
2. Self-Introduction of Committee Members and Guests
4. Staff Liaison Report
   A. Committee membership update (For the period March 5, 2010 – Feb. 5, 2013)

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(Total Voting Members – 29; M=31%, SE=34%, U=28%; I=7%)  
B. Revision Cycle Review and timeline (Attachment A)

5. Old Business (See Also Pre-FD Actions in Attachment C.)
   A. Reburn Injection Rate. The committee reviewed the relevant sections provided in the attachment to the agenda. Mr. Lance volunteered to review the materials and recommend specific revisions.
   B. Referenced Documents in Fundamentals Chapters. Mr. Switzer will review the documents referenced in mandatory text in subsection 6.6.2
C. **Consistency with Fundamentals Task Group.** NFPA staff requests that all TCs review chapter 4 to determine if specific requirements apply to their covered equipment, or if any requirements need to be superseded in the equipment-specific chapter. The task group members are D. Lee (chair); R. Eng; J. Frazier; and J. Schexnayder.

D. **Open-flow Air Path Task Group.** The scope of the task group is to review 6.5.3.2 for clarity and correctness. NFPA staff will post the original text on this topic on the NFPA 85 document information page with other committee documents. The task group members are D. May (chair); D. Evely; J. Frazier; J. O'Rourke; and H. Wong.

E. **Design Pressures Task Group.** The scope of the task group is to review section 6.5 and its subparagraphs to determine the maximum head developed by booster fans in series with ID fans. The task group members are B. Smith (chair); K. Gamble; D. King; and H. Wong.

F. **Annexes B and C (Supervised Manual Systems).** The committee discussed the use and continued need for these annexes, which are not actively maintained by the committee. NFPA Staff will work with Mr. Dressel and members of the Technical Committee on Fluid Process Heaters to determine if NFPA 87 would be a more appropriate location for this information.

G. **MFT Task Group.** The scope of the task group is to address the following questions: Should the FD fans remain on upon loss of ID’s & MFT for implosion protection? Should the FD fans remain on upon ID fan runaway? Should closing of natural gas fuel valve be delayed for implosion protection? The task group members are: S. Yates (chair); F. Bennett; D. Dressel; J. Frazier; D. King; S. Kwong; S. Matz; and T. Russell.

6. **New Business**

   A. **Create First Revision of Chapter 6.** The committee should review the Public Input (Attachment B) and revise chapter 6 of NFPA 85 as appropriate.

   B. **Review BCS-FUN actions.** The committee members are asked to review the actions of the Fundamentals committee (sent under separate cover) and bring forward any items warranting further discussion.

7. **Plasma Arc Igniter.** The committee briefly discussed the use of plasma arc igniters, indicating awareness of some installations or planned installations outside of the US. Mr. Yates agreed to research further and report to the committee at the First Draft meeting.

8. **Other Items?**

9. **Date/Location of Next Meeting.** The Second Draft meeting must take place between Nov. 15, 2013 and January 24, 2014. The BCS-FUN meeting is tentatively scheduled for Dec 4-5, 2013 in Atlanta, GA. The chair recommends Jan 14-15, 2013.

10. **Adjournment.**
Attachment A:
Fall 2014 Revision Cycle
## 2014 FALL REVISION CYCLE

*Public Input Dates may vary according to documents and schedules for Revision Cycles may change. Please check the NFPA Website for the most up-to-date information on Public Input Closing Dates and schedules at www.nfpa.org/document # (i.e. www.nfpa.org/101) and click on the Next Edition tab*

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Attachment B:
Public Input
Public Input No. 244-NFPA 85-2013 [ Global Input ]

See the uploaded file.

Additional Proposed Changes

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Statement of Problem and Substantiation for Public Input

See uploaded file.

Submitter Information Verification

Submitter Full Name: Joe Proterra
Organization: Proterra-Power LLC
Submittal Date: Mon Jan 07 09:51:35 EST 2013

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Recommendation: 1. It is recommended that NFPA drop the requirements for the structural improvements for implosion protection to the boiler and duct work on existing boilers.

2. Existing 2011 text: "1.3.1 This code shall apply to new installations and to major alterations or extensions that are contracted for subsequent to the effective date of this code."

This section says boilers with major alterations shall apply, but in the definition Section 3.3.7 it only gives a description for alteration: "3.3.7 Alteration. A change or modification that results in a deviation from the original design specifications or criteria" It is recommended that this be consistent and called major alteration in the definition section.

Also, additional information describing what a major alteration includes, and some examples would be helpful.

Also, add in this section that the determination of whether it qualifies as a major alteration or not is up to 3.2.2 *Authority Having Jurisdiction (AHJ): "An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure"

This is a very important decision by the AHJ on deciding whether the boiler modification actually qualifies as a major alteration due to the very high cost that is related to complying with NFPA.

3. Throughout Sections 4.6 and 6.5, NFPA refers to "transient design pressure" but does not define what this is. It is suggested that some sort of definition be given to help the reader know what he is dealing with. In 2006 the following was provided by Alstom Boiler Co.: It would be helpful to have a definition or an explanation to assist in determining how this should be handled, maybe get some feedback from the boiler companies on how to best describe this.

The manner in which ALSTOM applies the NFPA Standard 85, edition 2004, as it pertains to the recommended transient design pressure for the furnace, is that +/-35"w.g. (or the fan test block capability) is the yield point for the air 1 flue gas path components and not the design pressure.

ALSTOM defines the yield point as design pressure divided by 0.6. As an example, a furnace with an original design pressure of +/-16"w.g. would have a corresponding yield pressure of +/-26.5"w.g.

The design pressure for this example uses the allowable design stress for the structural steel and the yield pressure uses the yield stress for the structural steel. Upgrading the furnace to a +/-35"w.g. yield point would then correspond to a furnace design pressure of +/-21"w.g.

4. Existing 2011 title of 6.5 is" Furnace Implosion Protection"  
In 6.5.1.3.2.1 Positive Transient Design Pressure: addresses positive pressure transient design which is not reflected in the title 6.5 Furnace Implosion Protection.

Maybe change the title of 6.5 to Furnace Positive Pressure and Negative Implosion Protection

5. Existing 2011 text: "6.5.1.3.2.1 * Positive Transient Design Pressure."

(A) If the test block capability of the FD fan at ambient temperature is equal to or more positive than +8.7 kPa (+35 in. of water), the positive transient design pressure shall be at least, but shall not be required to exceed, +8.7 kPa (+35 in. of water).

(B) If the test block capability of the FD fan at ambient temperature is less positive than +8.7kPa (+35 in. of water), the positive transient design pressure shall be at least, but shall not be required to exceed, the test block capability of the FD fan."

This does not describe what part of the boiler is included in this requirement. Is it just the furnace or does it include the air supply system such as the duct work and equipment between the FD fan and boiler? I think it includes everything like it did for the flue gas removal system in the next Recommendation #6.

6. Existing 2011 text: "6.5.1.3.1 The furnace and flue gas removal system shall be designed so that the maximum head capability of the ID fan system with ambient air does not exceed the continuous design pressure of the furnace, ducts, and associated equipment."

The flue gas removal system is included here but no other sections. Recommend that this be consistent and that the flue gas removal system be included where appropriated when the word furnace is used. Also, a definition should be included for flue gas removal system and what equipment this includes which I assume is everything between the boiler outlet to the ID fan inlet: all flue gas ducts, scrubber, bag house, precipitator, etc.

7. Existing 2011 title of 6.5.2 "Furnace Pressure Control Systems (Implosion Protection)"

Consider changing this title to of 6.5.2 to "Furnace, Air Supply, & Flue Gas Removal Systems; Positive Pressure and Negative Implosion Protection"

Also, this control section is all written around monitoring the boiler furnace which protects the furnace, but does not
necessarily protect the air ducts, and flue gas removal system. Some examples are as follows:

- The pressure in the furnace could be 0”wg while the air ducts could be at +50”wg.
- The boiler back-end equipment such as the air heater, scrubber, or bag house could be plugged which could allow the suction pressure following this equipment to be -50”wg while the pressure in the furnace is operating at 0”wg.

On a past job I worked on, this was recognized and a pressure transmitter was added at the inlet to the ID fan which was capable of developing -45”wg. The controls were set to trip the ID fan at -35”wg which the preceding duct-work and equipment were designed for.

Recommend that wording be added to cover the protection of the air system and flue gas removal system.

**Substantiation:** The changes that I will be addressing are in Section 6.5 Furnace Implosion Protection.

When boilers have modifications that could fall under the definition of “major alterations” in Section 1.3.1, this requires that these existing boilers follow the latest NFPA requirements including Section 6.5 Furnace Implosion Protection.

I understand the requirements in Sections 6.5.1.3.2.1 and 6.5.1.3.2.2 that NFPA put on new units for the furnace design pressure shall be equal to the capability of the FD & ID fans or to +/-35”wg, which can be done at a reasonable cost. Did NFPA realize the ramification of placing these same requirements on existing units that qualify for “major alteration”? It is typical to have older furnaces designed for +/-7”wg with fans that far exceed these pressures. To increase the furnace design to +/-35”wg can be very expensive, and if the air and flue gas ducts are included in the structural upgrades, the engineering cost can be $100,000 to $200,000 and material and labor be $1 to $2 million per boiler. The structural upgrades to existing units can get expensive because the insulation and lagging has to be removed and stiffeners added to duct work and buckstays added to the boiler.

These older boilers have been protected for many years with their normal high and low furnace pressure monitoring and tripping systems, and by placing the increase structural design parameters on these boilers is believed to be an extreme. I feel that existing boilers with a “major alteration” should be required to follow Section 6.5.2 Furnace Pressure Control System to protect the furnace, but not be required to do the structural upgrades in Sections 4.6 and 6.5.

NFPA states (in similar words) that the furnace etc. design pressure should be designed to meet the pressure capability of the FD & ID fans or to +/-35”, and if the fans exceed +/- 35”wg then the furnace shall be protected according to 6.5.2 Furnace Pressure Control System. I wonder why NFPA allows the equipment to be protected with the use of a furnace pressure control system in this case when the fans exceed +/-35”wg, but does not allow this same control system to protect existing boilers at a lower pressure without implementing the structural upgrades.

In all my 40 years of working on boilers, I have never heard of a boiler that experienced damage from the FD and ID fans by either blowing out or sucking in the equipment to the point where damage occurred. I have also asked the boiler companies for any known examples of this occurring, and they could not come up with any. I am sure this must have occurred in the past, but the point I am trying to make, is this is not a common occurrence and NFPA should not require the structural upgrades to existing boilers when they can be protected by other means.

I don’t believe there is any mention by NFPA about protecting the boiler and duct work with relief-dampers (vacuum breakers) which have been used and still are in use on some boilers. I don’t really like using these because they usually get neglected and may not function when needed. I would like the option to use these though versus spending $2 million on structural upgrades, and would have no issue doing it as long as the boiler was protected with the recommended NFPA Furnace Pressure Control System in Section 6.5.2.

When using NFPA 85 as it relates to boilers with “major alterations” that could require structural upgrades to increase the furnace design pressure according to Sections 4.6 and 6.5, I thought the changes would be helpful to other engineers performing similar evaluations.
Statement of Problem and Substantiation for Public Input

The principal requirement of clause 6.2.4 is defined under clause 1.3.2 and thus, clause 6.2.4 is redundant. Clause 1.3.2.1 and 1.3.2.2 state the designer has the latitude and responsibility for demonstrating and documenting the validity of the proposed design. These requirements provide a more enforceable language than the requirements of a “competent judgment.”

Submitter Information Verification

Submitter Full Name: Daniel Lee
Organization: ABB Incorporated
Submittal Date: Mon Nov 12 08:10:34 EST 2012

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Public Input No. 189-NFPA 85-2013 [ New Section after 6.3.3.1 ]

6.3.3.2 Two safety shutoff valves in series shall be provided in the fuel gas line to the individual burners, and an automatic vent valve shall be provided between each set of two safety shutoff valves. When a listed automatic valve-proving system is used with two safety shutoff valves in series, each with a proof of closure switch, the automatic vent valve shall be permitted to be omitted.

Statement of Problem and Substantiation for Public Input

See related Public Input 188. Add as new 6.3.3.2 and re-number thereafter. This change is suggested to more clearly identify the current requirement for two safety shutoff valves at each individual burner as shown in Figure A.6.6.5.1.5.4(b) and allow the option of using a valve proving system in place of a vent valve, as presently allowed in 5.3.2.3.

Submitter Information Verification

Submitter Full Name: Ted Jablkowski
Organization: Fives North American Combustio
Submittal Date: Thu Jan 03 11:18:45 EST 2013

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Public Input No. 188-NFPA 85-2013 [Section No. 6.3.3.1]

6.3.3.1
A header safety shutoff valve and individual burner safety shutoff valves shall be provided.

Statement of Problem and Substantiation for Public Input

See related Public Input 188. The objective of this Public Input is to revise 6.3.3.1 to more clearly identify the current requirement for a common Header safety shutoff valve and the requirement for two safety shutoff valves for each individual burner with a vent valve between them, as shown in Figure A.6.6.5.1.5.4(b) and to provide the option of using a valve proving system in place of the vent valve as is permitted in 5.3.2.3. Related Public Input 188 was submitted to complete this suggested change.

Related Public Inputs for This Document

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Submitter Information Verification

Submitter Full Name: Ted Jablkowski
Organization: Fives North American Combustion
Submittal Date: Thu Jan 03 11:11:42 EST 2013

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6.3.3.7 Burner and igniter safety shutoff valves shall be located as close as practicable to the igniters or burners to minimize the volume of fuel downstream of the valve.

Statement of Problem and Substantiation for Public Input

The content in 6.3.3.7 is covered in 4.7.7.13

Submitter Information Verification

Submitter Full Name: Kenneth Frazier
Organization: Salt River Project
Submittal Date: Thu Dec 06 12:14:47 EST 2012

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6.4.1 *Unattended and Off-Site Operation*

Unattended operation, no operator at the operating location(s), or operation of the plant from an off-site operating location shall require a higher level of automation, safety interlocks, and reliability, which are not addressed in this code.

6.4.1.1*

In addition to operational and safety analysis, designs for off-site and unattended operations shall include risk analysis and hazard studies and shall be approved by the authority having jurisdiction.

6.4.1.2*

Jurisdictional requirements regarding operator attendance shall be met.

Statement of Problem and Substantiation for Public Input

The content in 6.4.1, 6.4.1.1, 6.4.1.2 & A.6.4.1 is covered in 4.1.4. It is proposed that the content of A.6.4.1 be added as a new comment to A.4.1.4.

Submitter Information Verification

Submitter Full Name: Kenneth Frazier
Organization: Salt River Project
Submittal Date: Thu Dec 06 12:05:47 EST 2012

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### 6.4.2.1 General

#### 6.4.2.1.1
The basic requirements of an interlock system for a unit shall accomplish the following:

1. Protect personnel from injury
2. Protect equipment from damage
3. Protect boiler operation by limiting actions to a prescribed operating sequence or by initiating trip devices when approaching an out-of-range or unstable operating condition

#### 6.4.2.1.2
The interlock system shall comply with Section 4.11.

#### 6.4.2.1.3 *
The mandatory automatic trips specified in 6.4.2.3 shall be provided.

#### 6.4.2.1.4 *
Additional automatic trips shall be permitted. (See 4.1.3 for trip function evaluation requirements.)

#### 6.4.2.1.5 *
Fuel-specific interlocks shall be provided for each design basis fuel.

#### 6.4.2.1.6 *
Operating personnel shall be made aware of the limitations of the interlock system.

---

### Statement of Problem and Substantiation for Public Input

This public input is submitted in combination with public inputs to move clause 6.4.2.1 to the Fundamental chapter. 6.4.2.1 delete clause title

6.4.2.1.1 requirement is to be moved to the Fundamental 4.11.1 (new) – see corresponding public input

6.4.2.1.2 requirement is to be move under 4.11 and thus this clause can be deleted

6.4.2.1.3 requirement only reference another clause and provides no code/design requirements. The appendix reference is to be moved to 6.4.2.3 – see corresponding public input

6.4.2.1.4 requirement is to be moved to the Fundamental 4.11.1 (new) – see corresponding public input

6.4.2.1.5 requirement is to be moved to the Fundamental 4.11.1 (new) – see corresponding public input

6.4.2.1.6 requirement is to be moved to the Fundamental 4.11.1 (new) – see corresponding public input

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### Submitter Information Verification

**Submitter Full Name:** Daniel Lee  
**Organization:** ABB Incorporated  
**Submittal Date:** Mon Nov 19 10:46:35 EST 2012

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6.4.2.2.14
The mandatory master fuel trip–sensing elements and circuits shall be independent of all other control elements and circuits.

Exception No. 1: Individual burner flame detectors also shall be permitted to be used for initiating master fuel trip systems.

Exception No. 2: Airflow measurement, auctioneered furnace draft, and drum water level signals from the boiler control system shall be permitted to be used for a master fuel trip, provided all the following conditions are met:

(1) These interlocks are hardwired into the burner management system.
(2) Tripping set points are protected from unauthorized changes.
(3) Any single component failure of these sensing elements and circuits does not prevent a mandatory master fuel trip.

This is a comment regarding the intent of 6.4.2.2.14. 6.4.2.2.14 Exception No. 2 allows Airflow, Furnace Draft, and Drum Level to originate from the boiler process control system as long as the design meets Items 1, 2, and 3. Chapter 7, Atmospheric Fluidized Bed Boilers, 7.9.2.4.9.2 concurs with 6.4.2.2.14. However, The last sentence of Annex A 7.9.2.4.9 implies where signals are shared between the master fuel trip circuit and other control systems, the signals should be input to the master fuel trip circuit/burner management system first and then retransmitted to the boiler process control system. This statement conflicts with the 6.4.2.2.14 and 7.9.2.4.9.2. All three sections should imply the same intent of the code.

Statement of Problem and Substantiation for Public Input

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Submitter Information Verification

Submitter Full Name: James Franks
Organization: XL Global Asset Protection Ser
Submittal Date: Thu Jan 03 13:28:18 EST 2013

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6.4.2.3 Required 3* Required Interlocks.

INSTRUCTIONS: Add an Appendix reference (*) to 6.4.2.3. Renumber clause A.6.4.2.1.3 to A.6.4.2.3 and move to the correct order

A.6.4.2.1.3 A.6.4.2.3 The mandatory automatic trip ........

6.4.2.3.1 * Interlock System.

Figure 6.4.2.3.1 and Table 6.4.2.3.1(a) through Table 6.4.2.3.1(c) show the minimum required system of interlocks that shall be provided for basic furnace protection for a multiple burner boiler operated in accordance with this code.

Figure 6.4.2.3.1 Interlock System for Multiple Burner Boiler.

### Table 6.4.2.3.1(a) Interlock System for Multiple Burner Boiler

<table>
<thead>
<tr>
<th>Block Number</th>
<th>Action</th>
</tr>
</thead>
</table>
| Block 1      | Loss of an individual igniter flame shall cause the following actions:  
(1) Close the individual igniter safety shutoff valves(s) and de-energize the spark(s).  
(2) Open the vent valve (fuel gas ignition only).  
(3) Signal the main flame protection system that the igniter flame has been lost. |
| Block 2a1    | High or low igniter fuel gas header pressure shall be interlocked to initiate the tripping of the igniter header and individual igniter safety shutoff valves and de-energize sparks. |
| Block 2a2    | Low igniter fuel oil header pressure shall be interlocked to initiate the tripping of the igniter header and individual igniter safety shutoff valves and de-energize sparks. |
| Block 2b     | Where fuel oil is used for ignition fuel with air or steam atomization, atomizing air or steam pressure out of range shall trip the igniter and individual igniter safety shutoff valves and de-energize sparks. |
| Blocks 3 through 13 | Where direct electric igniters are used, blocks 1 and 2 shall not apply. However, the master fuel trip system shall de-energize sparks and prevent re-energizing until all conditions for light-off have been re-established. |
|              | These blocks represent conditions that initiate the tripping of all main and ignition fuel supplies through a master fuel trip relay contact(s). The master fuel trip relay(s) shall be of the type that stays tripped until the unit purge system interlock permits it to be reset. Whenever the master fuel trip relay(s) is operated, it shall trip all fuel header, burner, and igniter safety shutoff valves and de-energize all sparks and all ignition |
devices within the unit and flue gas path through master fuel trip relay contact(s).

Master fuel trip relay contacts shall also trip the fuel oil system circulating and recirculating valves. If the design of the fuel oil supply system is such that backflow of fuel oil through the recirculating valve is inherently impossible or positively prevented, this valve shall be permitted to be manually operated and shall not be required to be interlocked to close automatically on a master fuel trip.

The master fuel trip relay contacts shall also trip primary air fans or exhausters, coal feeders, pulverizers, and coal burner line shutoff valves, or take equivalent functional action to stop coal delivery to burners.

The master fuel trip relay logic shall trip all fuel gas path auxiliary systems that introduce hazards through the addition of fuel, oxidizing agents, or ignition sources.

Block 3

The loss of all induced draft fans shall activate the master fuel trip relay.

Block 4

The loss of all forced draft fans shall activate the master fuel trip relay.

Block 5

Low combustion airflow below the permitted limits shall activate the master fuel trip relay.

Block 6

High furnace pressure, such as that resulting from a tube rupture or damper failure, shall activate the master fuel trip relay.

Block 7

Loss of all flame in the furnace shall activate the master fuel trip relay.

Block 8. *(See A.6.4.2.3.1.f.)*

A partial loss of flame that results in a hazardous condition shall activate the master fuel trip relay.

Block 9. *(See A.6.4.2.3.1.f.)*

When all fuel inputs to the furnace are shut off following a shutdown of the boiler for any reason, the master fuel trip relay shall be activated in accordance with Table 6.4.2.3.1(b) or Table 6.4.2.3.1(c).

Block 10. *(See A.6.4.2.3.1.f.)*

For drum-type boilers, a low drum water level shall activate the master fuel trip relay.

Block 11

A manual switch that actuates the master fuel trip relay directly shall be provided for use by the operator in an emergency.

Block 12

The igniter fuel trip shall activate the master fuel trip relay in accordance with Table 6.4.2.3.1(b) or Table 6.4.2.3.1(c), if igniter fuel is the only fuel in service or if it is being used to stabilize a main fuel.

Block 13a

When the fuel gas burner header fuel pressure is above the maximum or below the minimum for a stable flame, that fuel shall be tripped. If fuel gas is the only fuel in service, the master fuel trip relay shall be actuated.

Block 13b

When the fuel oil burner header fuel pressure is below the minimum for a stable flame, that fuel shall be tripped. If fuel oil is the only fuel in service, the master fuel trip relay shall be actuated.

Block 13c

This block represents operation of the fuel oil trip to prevent operation when atomizing air or steam pressure is out of range. If fuel oil is the only fuel in service, the master fuel trip relay shall be actuated.

Block 13d

This block represents the tripping/shutdown of coal-firing equipment that will cause a coal fuel trip. If coal is the only fuel in service, the master fuel trip relay shall be actuated.

Block 14a

Loss of flame at an individual fuel gas or fuel oil burner with one or more additional burners operating with stable flames that does not introduce a serious enough condition to warrant a master fuel trip as called for in block 8 shall close the individual burner safety shutoff valve(s) and associated igniter safety shutoff valve(s) and de-energize the associated igniter spark. For gang-operated burner valves, the requirements of 6.6.5.2.1.3(B)(19) and 6.7.5.2.1.3(B)(19) shall be met.

Block 14b

On loss of main coal burner flame, the tripping strategies of 6.8.4 shall be followed.

Table 6.4.2.3.1(b) Fuel Inputs Shutoff When Class 1 Igniters Are Used

<table>
<thead>
<tr>
<th>Condition</th>
<th>Action Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) First Class 1 igniter(s) fails to light after successful unit purge. <em>(See 6.6.5.2.1.3(B)(9), 6.7.5.2.1.3(B)(10), and 6.8.5.2.1.3(B)(7).)</em></td>
<td>(1) Igniter valve(s) shall be closed immediately. Master fuel trip not required, but a 1-minute delay shall be required before retrial of that or any other igniter.</td>
</tr>
</tbody>
</table>
### Table 6.4.2.3.1(c) Fuel Inputs Shutoff When Class 2 or Class 3 Igniters Are Used

<table>
<thead>
<tr>
<th>Condition</th>
<th>Action Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2) Any igniters proven on, all other fuel sources off, all igniter valves subsequently closed.</td>
<td>(2) Master fuel trip shall be actuated.</td>
</tr>
<tr>
<td>(3) Any Class 1 igniter(s) proven on, any burner valve leaves closed limit, all burner valves subsequently closed, no other main fuel in service, igniter(s) remain proven.</td>
<td>(3) Associated main fuel gas trip valve and/or fuel oil trip valve shall be closed (fuel gas trip and/or fuel oil trip), proven igniters shall be permitted to remain in service.</td>
</tr>
<tr>
<td>(4) Any Class 1 igniter(s) proven on, any pulverizer startup initiated, all pulverizers subsequently stopped, no other main fuel in service, igniter(s) remain proven.</td>
<td>(4) Proven igniters shall be permitted to remain in service.</td>
</tr>
<tr>
<td>(5) All igniter and burner valves closed and all feeders or pulverizers stopped.</td>
<td>(5) Master fuel trip shall be actuated.</td>
</tr>
</tbody>
</table>

6.4.2.3.2

Each source of operation of the master fuel trip relay shall actuate a cause-of-trip indication, which informs the operator of the initiating cause of the tripping impulse.

6.4.2.3.3

Main fuel oil–recirculating valves shall be permitted to be reset separately and opened following a trip of the master fuel trip relay only after all burner safety shutoff valves have been proven closed.

6.4.2.3.4 Purge Requirements.

6.4.2.3.4.1

A boiler enclosure purge shall be performed as part of the open register, continuous purge.
light-off procedures specified in 6.6.5.1.5.7, 6.7.5.1.5.7, and 6.8.5.1.5.7.

6.4.2.3.4.2
A boiler enclosure purge shall be completed before resetting of the master fuel trip relay shall be permitted.

6.4.2.3.4.3
A boiler enclosure purge shall be required after the occurrence of a master fuel trip or if any purge permissive, as defined in 6.4.2.3.4.5, is lost prior to the introduction of any fuel or ignition source to the boiler enclosure.

(A) On a normal shutdown, after all fuel has been removed from service, boiler enclosure purge conditions, including purge rate air flow, shall be established and a boiler enclosure purge completed.

(B) On an emergency shutdown where FD and ID fans remain in service, boiler enclosure purge conditions shall be established and a boiler enclosure purge completed. Purge rate airflow shall be established in accordance with the following procedure:

1. All fans in the combustion air and flue gas streams that are in service at the time of the trip shall be left in service. This shall not include primary air fans or pulverizer exhausters used to convey coal into the furnace.
2. The airflow shall not be changed by deliberate manual or automatic control action except as permitted in 6.4.2.3.4.3 (3) and 6.4.2.3.4.3 (4).
3. If the airflow is greater than the purge rate, it shall be permitted to be decreased gradually to the purge rate for a boiler enclosure purge.
4. If the airflow is less than the purge rate at the time of the trip, it shall be continued at the existing rate for 5 minutes and then increased gradually to the purge rate airflow and held at that value for a boiler enclosure purge. If increasing the airflow to the purge rate requires starting fans, they shall be started in accordance with Section 6.5.
5. During a master fuel trip event, the overfire air system shall remain at the same setting as when the event occurred for such time as the main combustion airflow is held.
6. Following the hold period, the overfire air shall be permitted to be gradually adjusted to overfire air purge settings or cooling flows either manually or automatically.

(C) * All Fan Trip *

1. On an emergency shutdown where no fans remain in service, no action shall be taken other than damper actions necessary to prevent positive or negative furnace pressure transients beyond design limits.
2. Once the FD and ID fan(s) have stopped, slowly open all dampers in the air and flue gas passages to the full open position.
3. This condition shall be maintained for an all fan trip hold period of at least 15 minutes prior to allowing any ID or FD fan to be restarted.
4. At the end of this 15 minute period, the fan(s) shall be started in accordance with Section 6.5.
5. The airflow shall be increased gradually to the purge rate, and a boiler enclosure purge shall be completed.

(D) After completion of the boiler enclosure purge, the unit shall be permitted to either:

1. Shut down, closing the burner air registers and shutting down the FD and ID fans; however, maintaining airflow through the unit to prevent accumulation of combustible gases is a prudent procedural step due to the potential of fuel leak-by.
2. Relight in accordance with 6.6.5, 6.7.5, or 6.8.5, as applicable, depending on the fuels being fired.

6.4.2.3.4.4 Purge Rate Air Flow.

(A) * The designer shall establish a minimum purge rate airflow. This purge rate airflow shall be in accordance with 6.4.2.3.4.4(B) and 6.4.2.3.4.4(C).
Purge rate airflow shall not be less than 25 percent of design full load mass airflow.

Purge rate airflow shall not be greater than 40 percent of design full load mass airflow for coal-fired units.

Purge rate airflow shall be maintained from the FD fan inlet through the stack.

Purge rate airflow shall be maintained from purge completion through light-off and initial loading as described in 6.6.5.1.5, 6.7.5.1.5, and 6.8.5.1.5.

6.4.2.3.4.5 * Boiler Enclosure Purge Permissives

Boiler enclosure purge permissives shall, at a minimum, include the following:

1. All igniter header and individual igniter shutoff valves are proven closed by valve position.
   
   Exception: Where the igniter capacity is 1.5 MW (5 million Btu/hr) or less, proof of closure of individual igniter safety shutoff valves by means other than valve position shall be permitted.

2. If coal is fired on the unit, all pulverizers are stopped and all coal flow to the furnace is stopped.

3. If fuel gas is fired on the unit, all main fuel gas header and individual fuel gas burner shutoff valves are proven closed by valve position.

4. If fuel oil is fired on the unit, all main fuel oil header and individual fuel oil burner shutoff valves are proven closed by valve position.

5. Any other sources of combustibles that could enter the boiler enclosure or flue gas path are proven closed by valve position or other positive means.
   
   Exception: Where the capacity of the combustible source is 1.5 MW (5 million Btu/hr) or less, proof of closure of shutoff valves by means other than valve position shall be permitted.

6. All required burner air registers are in purge position.

7. At least one FD fan and, if so equipped, one ID fan are in service.

8. Flue gas recirculation fans shall be operated as recommended by the boiler manufacturer.

9. Total boiler airflow is at purge rate airflow.

6.4.2.3.4.6 * Component Purge Permissives

Component purge permissives shall, at a minimum, include the following:

1. All sources of fuel and other combustibles into the component proven closed by valve position or other positive means.

2. All sources of ignition energy proven off.

3. Component purge flow rate at or above boiler enclosure purge rate airflow.

6.4.2.3.4.7 * Boiler Enclosure Purge

(A) * __

Completion of the boiler enclosure purge shall require a minimum of 5 minutes and at least five volume changes of the boiler enclosure while all the purge permissives are maintained.

(B) *

Accumulation of purge time and volume changes shall be permitted as soon as all the purge permissives are satisfied.

(C) *

Loss of any of the purge permissives during a boiler enclosure purge shall cancel any purge time and volume changes that have accumulated.

(D)
Completion of boiler enclosure purge shall be indicated.

After the boiler enclosure purge is complete, the master fuel trip relay(s) shall be permitted to be reset.

6.4.2.3.4.8 * Component Purge.

Prior to being placed in operation, all flue gas path components from the boiler enclosure to the stack inlet (e.g., precipitators, fired reheaters) containing sources of ignition energy shall be purged for a minimum of 5 minutes and at least five volume changes of the component while all the component purge permissives are maintained.

Components shall be purged with air or, after the unit is in service, with flue gas or inert gas that will not support combustion.

Purging of these components shall be permitted to be performed concurrently with the boiler enclosure purge.

Accumulation of purge time and volume changes shall be permitted as soon as all the component purge permissives are satisfied.

Loss of any of the purge permissives during a component purge shall cancel any purge time and volume changes that have accumulated.

After the component purge is complete, the component shall be permitted to be reset.

6.4.2.3.5 Reserved.

6.4.2.3.6 Loss of ID Fan Interlocks.

6.4.2.3.6.1 * An interlock to prove that each ID fan is running and capable of providing the required flow shall be provided. Loss of such proofs shall initiate loss of ID fan interlocks.

Associated damper(s) shall be closed on loss of an individual ID fan, unless it is the last ID fan in service.

Where an interlock system is provided to start, stop, and trip ID fans and FD fans in pairs, the associated FD fan shall be tripped on loss of an individual ID fan, and the dampers associated with both fans shall be closed, provided they are not the last fans in service. If they are the last fans in service, the dampers associated with both fans shall remain open.

On loss of all ID fans, all FD fans shall be tripped. All ID fan dampers shall be opened after a time delay to minimize high draft during fan coastdown. Dampers shall remain open and fans shall be started in accordance with 6.5.3.2 through 6.5.3.3.4. Flue gas recirculation fan system dampers shall be closed.

The master fuel trip (not necessarily automatic) shall be activated when the furnace negative pressure exceeds the value recommended by the manufacturer. If fans are operating after the trip, they shall be continued in service. The airflow shall not be increased by deliberate manual or automatic control actions.

Before the main fuel firing and following a master fuel trip, all ID fans shall be tripped if furnace negative pressure exceeds the value recommended by the manufacturer. A short time delay shall be permitted to allow for the negative pressure transients due to loss of the main flame. The value of the negative pressure at which this trip is activated shall be greater than that specified in 6.4.2.3.6.5.

6.4.2.3.7 Loss of FD Fan Interlocks.

An interlock to prove that each FD fan is running and capable of providing the required flow shall be provided. Loss of such proofs shall initiate loss of FD fan interlocks.

Associated damper(s) shall be closed on loss of an individual FD fan, unless it is the last FD fan in service.
6.4.2.3.7.3
Where an interlock system is provided to start, stop, and trip ID fans and FD fans in pairs, the associated ID fan shall be tripped on loss of an individual FD fan, and the dampers associated with both fans shall be closed, provided they are not the last fans in service. If they are the last fans in service, the ID fan shall remain in controlled operation, and the dampers associated with the FD fan shall remain open.

6.4.2.3.7.4
On loss of all FD fans, all FD fan dampers shall be opened after a time delay to minimize high duct pressure during fan coastdown. Dampers shall remain open. Flue gas recirculation fan system dampers shall be closed.

6.4.2.3.7.5
The master fuel trip shall be activated when the furnace pressure exceeds the maximum pressure value recommended by the manufacturer. If fans are operating after the trip, they shall be continued in service. The airflow shall not be increased by deliberate manual or automatic control actions.

6.4.2.3.7.6
Before main fuel firing and following a 5-minute period after a master fuel trip (furnace postpurge), FD fans shall be tripped if the furnace pressure exceeds the maximum pressure value recommended by the manufacturer.

6.4.2.3.8
Multiple and Variable-Speed Fan Interlocks.
On start of the second fan and subsequent fan(s), whether the FD or ID type, the fan shall be capable of delivering airflow before opening its damper(s).

6.4.2.3.9
Trips and Interlocks for Individual Pulverizer Subsystem on Direct-Fired Furnaces.

6.4.2.3.9.1
Mandatory Automatic Pulverizer Subsystem Trips.
A direct-fired pulverized coal system shall be interlocked so that trips are initiated in accordance with the following conditions:

(1) Failure of the primary air fan or exhauster shall trip the coal burner shutoff valve, or equivalent, and feeder. The manufacturer's requirements regarding pulverizer tripping shall apply.

(2) Failure of the pulverizer shall trip the feeder and primary airflow.

(3) Failure of the feeder shall initiate an alarm, and restarting shall be blocked until feeder start-up conditions are re-established.

6.4.2.3.9.2
Mandatory Pulverizer Subsystem Trips — Not Necessarily Automatically Initiated.
A direct-fired pulverized coal system trip shall result from any of the following conditions:

(1) Loss of igniters or ignition energy less than required to safely ignite the associated coal burners during the start-up of a pulverizer shall trip that pulverizer subsystem.

(2) Loss of individual coal burner flame shall trip that burner or its pulverizer subsystem. [See 6.8.5.2.2.8.]

(3) Loss of coal feed to the burners of a pulverizer subsystem shall trip the feeder. Feeder tripping shall not be required if the associated Class 1 igniters are in operation.

6.4.2.3.9.3
Mandatory Sequential Starting Interlocks.
Permissive sequential interlocking shall be arranged so that the pulverizer subsystem is started only in the following sequence:

(1) Igniters for all burners served by the pulverizer are in service and proven.

(2) The primary air fan or exhauster is started.

(3) The pulverizer is started.

(4) The raw coal feeder is started.

6.4.2.3.10
Interlocks and Trips for Reburn Fuel.
The following interlocks shall initiate a reburn fuel trip:

(1) Master fuel trip
(2) Operator-actuated manual trip switch
(3) Reburn fuel gas header pressure high or low
(4) Reburn fuel oil header pressure low
(5) Reburn fuel oil atomizing medium pressure outside of specified limits
(6) Failure or low flow of all reburn fuel (coal) transport equipment
(7) Failure of all reburn fuel (coal) feed or preparation equipment
(8) * Boiler load less than the minimum for reburn operation
(9) Overfire airflow, where used, less than the minimum for reburn operation as specified by the reburn system manufacturer
(10) Loss of temperature or loss of flame as specified in 6.6.3.5.2 and 6.6.3.5.3

6.4.2.3.11 * Interlocks and Trips for Selective Catalytic Reduction (SCR).
The following interlocks shall initiate a trip of or prevent the operation of the ammonia feed to the SCR system:
(1) Master fuel trip
(2) SCR isolated from flue gas stream; for an SCR with isolation and bypass dampers (See Section 6.9 )

6.4.2.3.12 Interlocks and Trips for Duct Burners.

6.4.2.3.12.1 The following interlocks shall initiate a duct burner fuel trip:
(1) Master fuel trip
(2) Operator-actuated manual trip switch
(3) Duct burner fuel header pressure out of limits
(4) Augmentation air, where used, less than the minimum for duct burner operation
(5) * Loss of flame at all duct burners
(6) Closure of all individual duct burner safety shutoff valves
(7) Duct burner discharge temperature high

6.4.2.3.12.2 All duct burner header, individual duct burner, and igniter safety shutoff valves shall be proven closed by valve position for the unit purge.
Exception: Where the igniter capacity is 1.5 MW (5 million Btu/hr) or less, proof of closure of individual igniter safety shutoff valves by means other than valve position shall be permitted.
6.4.2.3.12.3 Any augmentation air supply system for duct burners in the flue gas path shall be proven in service for the unit purge.

6.4.2.3.13 Interlocks and Trips for Flue Gas Path Auxiliary Systems.
The following interlocks shall initiate a trip of or prevent the operation of the respective flue gas path auxiliary systems that introduce hazards through addition of fuel, oxidizing agents, or ignition sources:
(1) Master fuel trip
(2) Required unit operating conditions not met (specific to flue gas path auxiliary system type and application)

Statement of Problem and Substantiation for Public Input
The appendix clause (*) should be moved to the clause being reference in the appendix text
Submitter Information Verification

Submitter Full Name: Daniel Lee
Organization: ABB Incorporated
Submittal Date: Mon Nov 12 09:34:16 EST 2012

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6.4.2.3.1* Interlock System.

Figure 6.4.2.3.1 and Table 6.4.2.3.1(a) through Table 6.4.2.3.1(c) show the minimum required system of interlocks that shall be provided for basic furnace protection for a multiple burner boiler operated in accordance with this code.

Revise Figure: Igniter fuel trip for Class 1 igniters, block 11, 12.

**Figure 6.4.2.3.1 Interlock System for Multiple Burner Boiler.**

**Table 6.4.2.3.1(a) Interlock System for Multiple Burner Boiler**

<table>
<thead>
<tr>
<th>Block Number</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block 1</td>
<td>Loss of an individual igniter flame shall cause the following actions:</td>
</tr>
<tr>
<td></td>
<td>(1) Close the individual igniter safety shutoff valve(s) and de-energize the spark(s).</td>
</tr>
<tr>
<td></td>
<td>(2) Open the vent valve (fuel gas ignition only).</td>
</tr>
<tr>
<td></td>
<td>(3) Signal the main flame protection system that the igniter flame has been lost.</td>
</tr>
<tr>
<td>Block 2a1</td>
<td>High or low igniter fuel gas header pressure shall be interlocked to initiate the tripping of the igniter header and individual igniter safety shutoff valves and de-energize sparks.</td>
</tr>
<tr>
<td>Block 2a2</td>
<td>Low igniter fuel oil header pressure shall be interlocked to initiate the tripping of the igniter header and individual igniter safety shutoff valves and de-energize sparks.</td>
</tr>
<tr>
<td>Block 2b</td>
<td>Where fuel oil is used for ignition fuel with air or steam atomization, atomizing air or steam pressure out of range shall trip the igniter and individual igniter safety shutoff valves and de-energize sparks.</td>
</tr>
<tr>
<td></td>
<td>Where direct electric igniters are used, blocks 1 and 2 shall not apply. However, the master fuel trip system shall de-energize sparks and prevent re-energizing until all conditions for light-off have been re-established.</td>
</tr>
<tr>
<td>Blocks 3 through 13</td>
<td>These blocks represent conditions that initiate the tripping of all main and ignition fuel supplies through a master fuel trip relay contact(s). The master fuel trip relay(s) shall be of the type that stays tripped until the unit purge system interlock permits it to be reset. Whenever the master fuel trip relay(s) is operated, it shall trip all fuel header, burner, and igniter safety shutoff valves and de-energize all sparks and all ignition devices within the unit and flue gas path through master fuel trip relay contact(s).</td>
</tr>
</tbody>
</table>
|              | Master fuel trip relay contacts shall also trip the fuel oil system circulating and recirculating valves. If the design of the fuel oil supply system is such that backflow of
The loss of all induced draft fans shall activate the master fuel trip relay.

Block 4
The loss of all forced draft fans shall activate the master fuel trip relay.

Block 5
Low combustion airflow below the permitted limits shall activate the master fuel trip relay.

Block 6
High furnace pressure, such as that resulting from a tube rupture or damper failure, shall activate the master fuel trip relay.

Block 7
Loss of all flame in the furnace shall activate the master fuel trip relay.

Block 8 (See A.6.4.2.3.1.)
A partial loss of flame that results in a hazardous condition shall activate the master fuel trip relay.

Block 9 (See A.6.4.2.3.1.)
When all fuel inputs to the furnace are shut off following a shutdown of the boiler for any reason, the master fuel trip relay shall be activated in accordance with Table 6.4.2.3.1(b) or Table 6.4.2.3.1(c).

Block 10 (See A.6.4.2.3.1.)
For drum-type boilers, a low drum water level shall activate the master fuel trip relay.

Block 11
A manual switch that actuates the master fuel trip relay directly shall be provided for use by the operator in an emergency.

Block 12
The igniter fuel trip shall activate the master fuel trip relay in accordance with Table 6.4.2.3.1(b) or Table 6.4.2.3.1(c), if igniter fuel is the only fuel in service or if it is being used to stabilize a main fuel.

Block 13a
When the fuel oil burner header fuel pressure is below the minimum for a stable flame, that fuel shall be tripped. If fuel oil is the only fuel in service, the master fuel trip relay shall be actuated.

Block 13b
When the fuel oil burner header fuel pressure is above the maximum or below the minimum for a stable flame, that fuel shall be tripped. If fuel oil is the only fuel in service, the master fuel trip relay shall be actuated.

Block 13c
This block represents operation of the fuel oil trip to prevent operation when atomizing air or steam pressure is out of range. If fuel oil is the only fuel in service, the master fuel trip relay shall be actuated.

Block 13d
This block represents the tripping/shutdown of coal-firing equipment that will cause a coal fuel trip. If coal is the only fuel in service, the master fuel trip relay shall be actuated.

Block 14a
Loss of flame at an individual fuel gas or fuel oil burner with one or more additional burners operating with stable flames that does not introduce a serious enough condition to warrant a master fuel trip as called for in block 8 shall close the individual burner safety shutoff valve(s) and associated igniter safety shutoff valve(s) and de-energize the associated igniter spark. For gang-operated burner valves, the requirements of 6.6.5.2.1.3(B)(19) and 6.7.5.2.1.3(B)(19) shall be met.

Block 14b
On loss of main coal burner flame, the tripping strategies of 6.8.4 shall be followed.

Table 6.4.2.3.1(b) Fuel Inputs Shutoff When Class 1 Igniters Are Used

<table>
<thead>
<tr>
<th>Condition</th>
<th>Action Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) First Class 1 igniter(s) fails to light after successful unit purge. [See 6.6.5.2.1.3(B)(9), 6.7.5.2.1.3(B)(10), and 6.8.5.2.1.3(B)(7).]</td>
<td>(1) Igniter valve(s) shall be closed immediately. Master fuel trip not required, but a 1-minute delay shall be required before retrieval of that or any other igniter.</td>
</tr>
<tr>
<td>(2) Any igniters proven on, all other fuel sources off, all igniter valves subsequently closed.</td>
<td>(2) Master fuel trip shall be actuated.</td>
</tr>
</tbody>
</table>
### Table 6.4.2.3.1(c) Fuel Inputs Shutoff When Class 2 or Class 3 Igniters Are Used

<table>
<thead>
<tr>
<th>Condition</th>
<th>Action Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>(3) Any Class 1 igniter(s) proven on, any burner valve leaves closed limit, all burner valves subsequently closed, no other main fuel in service, igniter(s) remain proven.</td>
<td>(3) Associated main fuel gas trip valve and/or fuel oil trip valve shall be closed (fuel gas trip and/or fuel oil trip), proven igniters shall be permitted to remain in service.</td>
</tr>
<tr>
<td>(4) Any Class 1 igniter(s) proven on, any pulverizer startup initiated, all pulverizers subsequently stopped, no other main fuel in service, igniter(s) remain proven.</td>
<td>(4) Proven igniters shall be permitted to remain in service.</td>
</tr>
<tr>
<td>(5) All igniter and burner valves closed and all feeders or pulverizers stopped.</td>
<td>(5) Master fuel trip shall be actuated.</td>
</tr>
</tbody>
</table>

### Table 6.4.2.3.1(c) Fuel Inputs Shutoff When Class 2 or Class 3 Igniters Are Used

<table>
<thead>
<tr>
<th>Condition</th>
<th>Action Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) First Class 2 or 3 igniter(s) fails to light after successful unit purge. [See 6.6.5.2.1.3(B)(9), 6.7.5.2.1.3(B)(10), and 6.8.5.2.1.3(B)(7).]</td>
<td>(1) Igniter valve(s) shall be closed immediately. Master fuel trip not required, but a 1-minute delay shall be required before retrial of that or any other igniter.</td>
</tr>
<tr>
<td>(2) Any igniters proven on, all other fuel sources off, all igniter valves subsequently closed.</td>
<td>(2) Master fuel trip shall be actuated.</td>
</tr>
<tr>
<td>(3a.1) Class 2 igniter(s) proven on, first main burner trial for ignition fails.</td>
<td>(3a.1) Master fuel trip shall be actuated.</td>
</tr>
<tr>
<td>(3a.2) Class 2 igniter(s) proven on, last main burner is taken out of service in a normal shutdown.</td>
<td>(3a.2) Associated main fuel gas trip valve and/or fuel oil trip valve shall be closed (fuel gas trip and/or fuel oil trip), proven igniters shall be permitted to remain in service.</td>
</tr>
<tr>
<td>(3a.3) Class 2 igniter(s) proven on, last main burner is taken out of service in an abnormal shutdown.</td>
<td>(3a.3) Master fuel trip shall be actuated.</td>
</tr>
<tr>
<td>(3b.1) Class 3 igniters proven on, first main burner trial for ignition fails.</td>
<td>(3b.1) Master fuel trip shall be actuated.</td>
</tr>
<tr>
<td>(3b.2) Class 3 igniter(s) proven on, last main burner is taken out of service in a normal shutdown.</td>
<td>(3b.2) Master fuel trip shall be actuated.</td>
</tr>
<tr>
<td>(3b.3) Class 3 igniter(s) proven on, last main burner is taken out of service in an abnormal shutdown.</td>
<td>(3b.3) Master fuel trip shall be actuated.</td>
</tr>
</tbody>
</table>
| (4) Any Class 2 igniter(s) proven on, any pulverizer startup initiated, all pulverizers subsequently stopped, no other main fuel in service, igniter(s) remain proven. | (4) (a) If first pulverizer fails to ignite as described in 6.8.5.2.1.3(B)(12), master fuel trip shall be actuated.  
(b) If last pulverizer in service is tripped, master fuel trip shall be actuated.  
(c) If last pulverizer in service is taken out of service in a normal shutdown sequence by an operator, proven igniters shall be permitted to remain in service. |
| (5) All igniter and burner valves closed and all feeders or pulverizers stopped. | (5) Master fuel trip shall be actuated. |

### Statement of Problem and Substantiation for Public Input

Reference in figure should be to Block 12. Block 11 describes requirements for manual trip switch.

### Submitter Information Verification

**Submitter Full Name:** John O'Rourke  
**Organization:** Alstom Power Inc.  
**Submittal Date:** Wed Jan 02 13:34:10 EST 2013
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Add new text to MFT logic read as follows:

1. Low BFW Flow (Once-Thru unit), 2. "or low furnace pressure" after "high furnace pressure", 3. "(drum unit)" after "Low drum water level".

6.4.2.3.1 * Interlock System.

Figure 6.4.2.3.1 and Table 6.4.2.3.1(a) through Table 6.4.2.3.1(c) show the minimum required system of interlocks that shall be provided for basic furnace protection for a multiple burner boiler operated in accordance with this code.

Figure 6.4.2.3.1 Interlock System for Multiple Burner Boiler.

Table 6.4.2.3.1(a) Interlock System for Multiple Burner Boiler

<table>
<thead>
<tr>
<th>Block Number</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block 1</td>
<td>Loss of an individual igniter flame shall cause the following actions: (1) Close the individual igniter safety shutoff valve(s) and de-energize the spark(s).</td>
</tr>
<tr>
<td></td>
<td>(2) Open the vent valve (fuel gas ignition only).</td>
</tr>
<tr>
<td></td>
<td>(3) Signal the main flame protection system that the igniter flame has been lost.</td>
</tr>
<tr>
<td>Block 2a1</td>
<td>High or low igniter fuel gas header pressure shall be interlocked to initiate the tripping of the igniter header and individual igniter safety shutoff valves and de-energize sparks.</td>
</tr>
<tr>
<td>Block 2a2</td>
<td>Low igniter fuel oil header pressure shall be interlocked to initiate the tripping of the igniter header and individual igniter safety shutoff valves and de-energize sparks.</td>
</tr>
<tr>
<td>Block 2b</td>
<td>Where fuel oil is used for ignition fuel with air or steam atomization, atomizing air or steam pressure out of range shall trip the igniter and individual igniter safety shutoff valves and de-energize sparks. Where direct electric igniters are used, blocks 1 and 2 shall not apply. However, the master fuel trip system shall de-energize sparks and prevent re-energizing until all conditions for light-off have been re-established.</td>
</tr>
<tr>
<td>Blocks 3 through 13</td>
<td>These blocks represent conditions that initiate the tripping of all main and ignition fuel supplies through a master fuel trip relay contact(s). The master fuel trip relay(s) shall be of the type that stays tripped until the unit purge system interlock permits it to be reset. Whenever the master fuel trip relay(s) is operated, it shall trip all fuel header, burner, and igniter safety shutoff valves and de-energize all sparks and all ignition devices within the unit and flue gas path through master fuel trip relay contact(s).</td>
</tr>
</tbody>
</table>
Master fuel trip relay contacts shall also trip the fuel oil system circulating and recirulating valves. If the design of the fuel oil supply system is such that backflow of fuel oil through the recirulating valve is inherently impossible or positively prevented, this valve shall be permitted to be manually operated and shall not be required to be interlocked to close automatically on a master fuel trip.

The master fuel trip relay contacts shall also trip primary air fans or exhausters, coal feeders, pulverizers, and coal burner line shutoff valves, or take equivalent functional action to stop coal delivery to burners.

The master fuel trip logic shall trip all fuel gas path auxiliary systems that introduce hazards through the addition of fuel, oxidizing agents, or ignition sources.

Block 3 The loss of all induced draft fans shall activate the master fuel trip relay.

Block 4 The loss of all forced draft fans shall activate the master fuel trip relay.

Block 5 Low combustion airflow below the permitted limits shall activate the master fuel trip relay.

Block 6 High furnace pressure, such as that resulting from a tube rupture or damper failure, shall activate the master fuel trip relay.

Block 7 Loss of all flame in the furnace shall activate the master fuel trip relay.

Block 8 (See A.6.4.2.3.1.) A partial loss of flame that results in a hazardous condition shall activate the master fuel trip relay.

Block 9 (See A.6.4.2.3.1.) When all fuel inputs to the furnace are shut off following a shutdown of the boiler for any reason, the master fuel trip relay shall be activated in accordance with Table 6.4.2.3.1(b) or Table 6.4.2.3.1(c).

Block 10 (See A.6.4.2.3.1.) For drum-type boilers, a low drum water level shall activate the master fuel trip relay.

Block 11 A manual switch that actuates the master fuel trip relay directly shall be provided for use by the operator in an emergency.

Block 12 The igniter fuel trip shall activate the master fuel trip relay in accordance with Table 6.4.2.3.1(b) or Table 6.4.2.3.1(c), if igniter fuel is the only fuel in service or if it is being used to stabilize a main fuel.

Block 13a When the fuel gas burner header fuel pressure is above the maximum or below the minimum for a stable flame, that fuel shall be tripped. If fuel gas is the only fuel in service, the master fuel trip relay shall be actuated.

Block 13b When the fuel oil burner header fuel pressure is below the minimum for a stable flame, that fuel shall be tripped. If fuel oil is the only fuel in service, the master fuel trip relay shall be actuated.

Block 13c This block represents operation of the fuel oil trip to prevent operation when atomizing air or steam pressure is out of range. If fuel oil is the only fuel in service, the master fuel trip relay shall be actuated.

Block 13d This block represents the tripping/shutdown of coal-firing equipment that will cause a coal fuel trip. If coal is the only fuel in service, the master fuel trip relay shall be actuated.

Block 14a Loss of flame at an individual fuel gas or fuel oil burner with one or more additional burners operating with stable flames that does not introduce a serious enough condition to warrant a master fuel trip as called for in block 8 shall close the individual burner safety shutoff valve(s) and associated igniter safety shutoff valve(s) and de-energize the associated igniter spark. For gang-operated burner valves, the requirements of 6.6.5.2.1.3(B)(19) and 6.7.5.2.1.3(B)(19) shall be met.

Block 14b On loss of main coal burner flame, the tripping strategies of 6.8.4 shall be followed.

Table 6.4.2.3.1(b) Fuel Inputs Shutoff When Class 1 Igniters Are Used

<table>
<thead>
<tr>
<th>Condition</th>
<th>Action Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) First Class 1 igniter(s) fails to light after successful unit purge. [See 6.6.5.2.1.3(B)(9), 6.7.5.2.1.3(B)(10), and 6.8.5.2.1.3(B)(7).]</td>
<td>(1) Igniter valve(s) shall be closed immediately. Master fuel trip not required, but a 1-minute delay shall be required before retriial of that or any other igniter.</td>
</tr>
<tr>
<td>(2) Any igniters proven on, all other fuel sources off, all igniter valves subsequently closed.</td>
<td>(2) Master fuel trip shall be actuated.</td>
</tr>
</tbody>
</table>
Condition | Action Required
--- | ---
(3) Any Class 1 igniter(s) proven on, any burner valve leaves closed limit, all burner valves subsequently closed, no other main fuel in service, igniter(s) remain proven. | (3) Associated main fuel gas trip valve and/or fuel oil trip valve shall be closed (fuel gas trip and/or fuel oil trip), proven igniters shall be permitted to remain in service.
(4) Any Class 1 igniter(s) proven on, any pulverizer startup initiated, all pulverizers subsequently stopped, no other main fuel in service, igniter(s) remain proven. | (4) Proven igniters shall be permitted to remain in service.
(5) All igniter and burner valves closed and all feeders or pulverizers stopped. | (5) Master fuel trip shall be actuated.

Table 6.4.2.3.1(c) Fuel Inputs Shutoff When Class 2 or Class 3 Igniters Are Used

Condition | Action Required
--- | ---
(1) First Class 2 or 3 igniter(s) fails to light after successful unit purge. [See 6.6.5.2.1.3(B)(9), 6.7.5.2.1.3(B)(10), and 6.8.5.2.1.3(B)(7).] | (1) Igniter valve(s) shall be closed immediately. Master fuel trip not required, but a 1-minute delay shall be required before retrial of that or any other igniter.
(2) Any igniters proven on, all other fuel sources off, all igniter valves subsequently closed. | (2) Master fuel trip shall be actuated.
(3a.1) Class 2 igniter(s) proven on, first main burner trial for ignition fails. | (3a.1) Master fuel trip shall be actuated.
(3a.2) Class 2 igniter(s) proven on, last main burner is taken out of service in a normal shutdown. | (3a.2) Associated main fuel gas trip valve and/or fuel oil trip valve shall be closed (fuel gas trip and/or fuel oil trip), proven igniters shall be permitted to remain in service.
(3a.3) Class 2 igniter(s) proven on, last main burner is taken out of service in an abnormal shutdown. | (3a.3) Master fuel trip shall be actuated.
(3b.1) Class 3 igniters proven on, first main burner trial for ignition fails. | (3b.1) Master fuel trip shall be actuated.
(3b.2) Class 3 igniter(s) proven on, last main burner is taken out of service in a normal shutdown. | (3b.2) Master fuel trip shall be actuated.
(3b.3) Class 3 igniter(s) proven on, last main burner is taken out of service in an abnormal shutdown. | (3b.3) Master fuel trip shall be actuated.
(4) Any Class 2 igniter(s) proven on, any pulverizer startup initiated, all pulverizers subsequently stopped, no other main fuel in service, igniter(s) remain proven. | (4) (a) If first pulverizer fails to ignite as described in 6.8.5.2.1.3(B)(12), master fuel trip shall be actuated.
(b) If last pulverizer in service is tripped, master fuel trip shall be actuated.
(c) If last pulverizer in service is taken out of service in a normal shutdown sequence by an operator, proven igniters shall be permitted to remain in service.
(5) All igniter and burner valves closed and all feeders or pulverizers stopped. | (5) Master fuel trip shall be actuated.

Statement of Problem and Substantiation for Public Input

1. For Once-Thru boilers, it's critical to initiate MFT on low or loss of Boiler Feedwater Flow to protect the boiler. 2. "Low furnace pressure" is just as critical as "high furnace pressure" to protect the furnace, 3. "Low drum water level" trip is only applicable to drum units.

Submitter Information Verification

Submitter Full Name: Robert Eng
Organization: Hitachi Power Systems America, Ltd
Copyright Assignment

I, Robert Eng, hereby irrevocably grant and assign to the National Fire Protection Association (NFPA) all and full rights in copyright in this Public Input (including both the Proposed Change and the Statement of Problem and Substantiation). I understand and intend that I acquire no rights, including rights as a joint author, in any publication of the NFPA in which this Public Input in this or another similar or derivative form is used. I hereby warrant that I am the author of this Public Input and that I have full power and authority to enter into this copyright assignment.

By checking this box I affirm that I am Robert Eng, and I agree to be legally bound by the above Copyright Assignment and the terms and conditions contained therein. I understand and intend that, by checking this box, I am creating an electronic signature that will, upon my submission of this form, have the same legal force and effect as a handwritten signature.
6.4.2.3.1 Interlock System.

Figure 6.4.2.3.1 and Table 6.4.2.3.1(a) through Table 6.4.2.3.1(c) show the minimum required system of interlocks that shall be provided for basic furnace protection for a multiple burner boiler operated in accordance with this code.

Add new text to read as follows to Block 7:

"Low-Low Furnace Pressure" leading to the Master Fuel Trip Logic box. Renumber subsequent boxes.

Figure 6.4.2.3.1 Interlock System for Multiple Burner Boiler.

Table 6.4.2.3.1(a) Interlock System for Multiple Burner Boiler

<table>
<thead>
<tr>
<th>Block Number</th>
<th>Action</th>
</tr>
</thead>
</table>
| Block 1      | Loss of an individual igniter flame shall cause the following actions:  
(1) Close the individual igniter safety shutoff valve(s) and de-energize the spark(s).  
(2) Open the vent valve (fuel gas ignition only).  
(3) Signal the main flame protection system that the igniter flame has been lost. |
| Block 2a1    | High or low igniter fuel gas header pressure shall be interlocked to initiate the tripping of the igniter header and individual igniter safety shutoff valves and de-energize sparks. |
| Block 2a2    | Low igniter fuel oil header pressure shall be interlocked to initiate the tripping of the igniter header and individual igniter safety shutoff valves and de-energize sparks. |
| Block 2b     | Where fuel oil is used for ignition fuel with air or steam atomization, atomizing air or steam pressure out of range shall trip the igniter and individual igniter safety shutoff valves and de-energize sparks.  
Where direct electric igniters are used, blocks 1 and 2 shall not apply. However, the master fuel trip system shall de-energize sparks and prevent re-energizing until all conditions for light-off have been re-established. |
| Blocks 3 through 13 | These blocks represent conditions that initiate the tripping of all main and ignition fuel supplies through a master fuel trip relay contact(s). The master fuel trip relay(s) shall be of the type that stays tripped until the unit purge system interlock permits it to be reset. Whenever the master fuel trip relay(s) is operated, it shall trip all fuel header, burner, and igniter safety shutoff valves and de-energize all sparks and all ignition devices within the unit and flue gas path through master fuel trip relay contact(s). |
Master fuel trip relay contacts shall also trip the fuel oil system circulating and recirculating valves. If the design of the fuel oil supply system is such that backflow of fuel oil through the recirculating valve is inherently impossible or positively prevented, this valve shall be permitted to be manually operated and shall not be required to be interlocked to close automatically on a master fuel trip.

The master fuel trip relay contacts shall also trip primary air fans or exhausters, coal feeders, pulverizers, and coal burner line shutoff valves, or take equivalent functional action to stop coal delivery to burners.

The master fuel trip logic shall trip all fuel gas path auxiliary systems that introduce hazards through the addition of fuel, oxidizing agents, or ignition sources.

<table>
<thead>
<tr>
<th>Block Number</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block 3</td>
<td>The loss of all induced draft fans shall activate the master fuel trip relay.</td>
</tr>
<tr>
<td>Block 4</td>
<td>The loss of all forced draft fans shall activate the master fuel trip relay.</td>
</tr>
<tr>
<td>Block 5</td>
<td>Low combustion airflow below the permitted limits shall activate the master fuel trip relay.</td>
</tr>
<tr>
<td>Block 6</td>
<td>High furnace pressure, such as that resulting from a tube rupture or damper failure, shall activate the master fuel trip relay.</td>
</tr>
<tr>
<td>Block 7</td>
<td>Loss of all flame in the furnace shall activate the master fuel trip relay.</td>
</tr>
</tbody>
</table>

Block 8 (See A.6.4.2.3.1.) A partial loss of flame that results in a hazardous condition shall activate the master fuel trip relay.

Block 9 (See A.6.4.2.3.1.) When all fuel inputs to the furnace are shut off following a shutdown of the boiler for any reason, the master fuel trip relay shall be activated in accordance with Table 6.4.2.3.1(b) or Table 6.4.2.3.1(c).

Block 10 (See A.6.4.2.3.1.) For drum-type boilers, a low drum water level shall activate the master fuel trip relay.

Block 11 | A manual switch that actuates the master fuel trip relay directly shall be provided for use by the operator in an emergency.

Block 12 | The igniter fuel trip shall activate the master fuel trip relay in accordance with Table 6.4.2.3.1(b) or Table 6.4.2.3.1(c), if igniter fuel is the only fuel in service or if it is being used to stabilize a main fuel.

Block 13a | When the fuel gas burner header fuel pressure is above the maximum or below the minimum for a stable flame, that fuel shall be tripped. If fuel gas is the only fuel in service, the master fuel trip relay shall be actuated.

Block 13b | When the fuel oil burner header fuel pressure is below the minimum for a stable flame, that fuel shall be tripped. If fuel oil is the only fuel in service, the master fuel trip relay shall be actuated.

Block 13c | This block represents operation of the fuel oil trip to prevent operation when atomizing air or steam pressure is out of range. If fuel oil is the only fuel in service, the master fuel trip relay shall be actuated.

Block 13d | This block represents the tripping/shutdown of coal-firing equipment that will cause a coal fuel trip. If coal is the only fuel in service, the master fuel trip relay shall be actuated.

Block 14a | Loss of flame at an individual fuel gas or fuel oil burner with one or more additional burners operating with stable flames that does not introduce a serious enough condition to warrant a master fuel trip as called for in block 8 shall close the individual burner safety shutoff valve(s) and associated igniter safety shutoff valve(s) and de-energize the associated igniter spark. For gang-operated burner valves, the requirements of 6.6.5.2.1.3(B)(19) and 6.7.5.2.1.3(B)(19) shall be met.

Block 14b | On loss of main coal burner flame, the tripping strategies of 6.8.4 shall be followed.

Table 6.4.2.3.1(b) Fuel Inputs Shutoff When Class 1 Igniters Are Used

<table>
<thead>
<tr>
<th>Condition</th>
<th>Action Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) First Class 1 igniter(s) fails to light after successful unit purge. [See 6.6.5.2.1.3(B)(9), 6.7.5.2.1.3(B)(10), and 6.8.5.2.1.3(B)(7).]</td>
<td>(1) Igniter valve(s) shall be closed immediately. Master fuel trip not required, but a 1-minute delay shall be required before retrial of that or any other igniter.</td>
</tr>
</tbody>
</table>
### Condition | Action Required
--- | ---
2. Any igniters proven on, all other fuel sources off, all igniter valves subsequently closed. | 2. Master fuel trip shall be actuated.
3. Any Class 1 igniter(s) proven on, any burner valve leaves closed limit, all burner valves subsequently closed, no other main fuel in service, igniter(s) remain proven. | 3. Associated main fuel gas trip valve and/or fuel oil trip valve shall be closed (fuel gas trip and/or fuel oil trip), proven igniters shall be permitted to remain in service.
4. Any Class 1 igniter(s) proven on, any pulverizer startup initiated, all pulverizers subsequently stopped, no other main fuel in service, igniter(s) remain proven. | 4. Proven igniters shall be permitted to remain in service.
5. All igniter and burner valves closed and all feeders or pulverizers stopped. | 5. Master fuel trip shall be actuated.

Table 6.4.2.3.1(c) Fuel Inputs Shutoff When Class 2 or Class 3 Igniters Are Used

### Condition | Action Required
--- | ---
1. First Class 2 or 3 igniter(s) fails to light after successful unit purge. [See 6.6.5.2.1.3(B)(9), 6.7.5.2.1.3(B)(10), and 6.8.5.2.1.3(B)(7).] | 1. Igniter valve(s) shall be closed immediately. Master fuel trip not required, but a 1-minute delay shall be required before retrial of that or any other igniter.
2. Any igniters proven on, all other fuel sources off, all igniter valves subsequently closed. | 2. Master fuel trip shall be actuated.
3a.1. Class 2 igniter(s) proven on, first main burner trial for ignition fails. | 3a.1. Master fuel trip shall be actuated.
3a.2. Class 2 igniter(s) proven on, last main burner is taken out of service in a normal shutdown. | 3a.2. Associated main fuel gas trip valve and/or fuel oil trip valve shall be closed (fuel gas trip and/or fuel oil trip), proven igniters shall be permitted to remain in service.
3a.3. Class 2 igniter(s) proven on, last main burner is taken out of service in an abnormal shutdown. | 3a.3. Master fuel trip shall be actuated.
3b.1. Class 3 igniters proven on, first main burner trial for ignition fails. | 3b.1. Master fuel trip shall be actuated.
3b.2. Class 3 igniter(s) proven on, last main burner is taken out of service in a normal shutdown. | 3b.2. Master fuel trip shall be actuated.
3b.3. Class 3 igniter(s) proven on, last main burner is taken out of service in an abnormal shutdown. | 3b.3. Master fuel trip shall be actuated.
4. Any Class 2 igniter(s) proven on, any pulverizer startup initiated, all pulverizers subsequently stopped, no other main fuel in service, igniter(s) remain proven. | (4) (a) If first pulverizer fails to ignite as described in 6.8.5.2.1.3(B)(12), master fuel trip shall be actuated. 
(b) If last pulverizer in service is tripped, master fuel trip shall be actuated. 
(c) If last pulverizer in service is taken out of service in a normal shutdown sequence by an operator, proven igniters shall be permitted to remain in service.
5. All igniter and burner valves closed and all feeders or pulverizers stopped. | 5. Master fuel trip shall be actuated.

### Statement of Problem and Substantiation for Public Input

Existing paragraph 6.4.2.3.6.5 requires an MFT (not necessarily automatic) when furnace negative pressure exceeds a value established by manufacturer. This interlock is not shown in the figure.

### Submitter Information Verification

Submitter Full Name: Harold Yates
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**6.4.2.3.1* Interlock System.**

Figure 6.4.2.3.1 and Table 6.4.2.3.1(a) through Table 6.4.2.3.1(c) show the minimum required system of interlocks that shall be provided for basic furnace protection for a multiple burner boiler operated in accordance with this code.

**Figure 6.4.2.3.1 Interlock System for Multiple Burner Boiler.**

<table>
<thead>
<tr>
<th>Block Number</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block 1</td>
<td>Loss of an individual igniter flame shall cause the following actions:</td>
</tr>
<tr>
<td></td>
<td>(1) Close the individual igniter safety shutoff valve(s) and de-energize the spark(s).</td>
</tr>
<tr>
<td></td>
<td>(2) Open the vent valve (fuel gas ignition only).</td>
</tr>
<tr>
<td></td>
<td>(3) Signal the main flame protection system that the igniter flame has been lost.</td>
</tr>
<tr>
<td>Block 2a1</td>
<td>High or low igniter fuel gas header pressure shall be interlocked to initiate the tripping of the igniter header and individual igniter safety shutoff valves and de-energize sparks.</td>
</tr>
<tr>
<td>Block 2a2</td>
<td>Low igniter fuel oil header pressure shall be interlocked to initiate the tripping of the igniter header and individual igniter safety shutoff valves and de-energize sparks.</td>
</tr>
<tr>
<td>Block 2b</td>
<td>Where fuel oil is used for ignition fuel with air or steam atomization, atomizing air or steam pressure out of range shall trip the igniter and individual igniter safety shutoff valves and de-energize sparks.</td>
</tr>
<tr>
<td></td>
<td>Where direct electric igniters are used, blocks 1 and 2 shall not apply. However, the master fuel trip system shall de-energize sparks and prevent re-energizing until all conditions for light-off have been re-established.</td>
</tr>
<tr>
<td>Blocks 3 through 14</td>
<td>These blocks represent conditions that initiate the tripping of all main and ignition fuel supplies through a master fuel trip relay contact(s). The master fuel trip relay(s) shall be of the type that stays tripped until the unit purge system interlock permits it to be reset. Whenever the master fuel trip relay(s) is operated, it shall trip all fuel header, burner, and igniter safety shutoff valves and de-energize all sparks and all ignition devices within the unit and flue gas path through master fuel trip relay contact(s).</td>
</tr>
<tr>
<td></td>
<td>Master fuel trip relay contacts shall also trip the fuel oil system circulating and recirculating valves. If the design of the fuel oil supply system is such that backflow of fuel oil through the recirculating valve is inherently impossible or positively prevented, this valve shall be permitted to be manually operated and shall not be required to be</td>
</tr>
</tbody>
</table>
interlocked to close automatically on a master fuel trip. The master fuel trip relay contacts shall also trip primary air fans or exhausters, coal feeders, pulverizers, and coal burner line shutoff valves, or take equivalent functional action to stop coal delivery to burners. The master fuel trip logic shall trip all fuel gas path auxiliary systems that introduce hazards through the addition of fuel, oxidizing agents, or ignition sources.

**Block 3** The loss of all induced draft fans shall activate the master fuel trip relay.

**Block 4** The loss of all forced draft fans shall activate the master fuel trip relay.

**Block 5** Low combustion airflow below the permitted limits shall activate the master fuel trip relay.

**Block 6** High furnace pressure, such as that resulting from a tube rupture or damper failure, shall activate the master fuel trip relay.

**Block 7** Loss of all flame in the furnace shall activate the master fuel trip relay.

**Block 8** (See A.6.4.2.3.1.) A partial loss of flame that results in a hazardous condition shall activate the master fuel trip relay.

**Block 9** (See A.6.4.2.3.1.) When all fuel inputs to the furnace are shut off following a shutdown of the boiler for any reason, the master fuel trip relay shall be activated in accordance with Table 6.4.2.3.1(b) or Table 6.4.2.3.1(c).

**Block 10** (See A.6.4.2.3.1.) For drum-type boilers, a low drum water level shall activate the master fuel trip relay.

**Block 11** A manual switch that actuates the master fuel trip relay directly shall be provided for use by the operator in an emergency.

**Block 12** The igniter fuel trip shall activate the master fuel trip relay in accordance with Table 6.4.2.3.1(b) or Table 6.4.2.3.1(c), if igniter fuel is the only fuel in service or if it is being used to stabilize a main fuel.

**Block 13a** When the fuel oil burner header fuel pressure is below the minimum for a stable flame, that fuel shall be tripped. If fuel oil is the only fuel in service, the master fuel trip relay shall be actuated.

**Block 13b** When the fuel oil burner header fuel pressure is below the minimum for a stable flame, that fuel shall be tripped. If fuel oil is the only fuel in service, the master fuel trip relay shall be actuated.

**Block 13c** This block represents operation of the fuel oil trip to prevent operation when atomizing air or steam pressure is out of range. If fuel oil is the only fuel in service, the master fuel trip relay shall be actuated.

**Block 13d** This block represents the tripping/shutdown of coal-firing equipment that will cause a coal fuel trip. If coal is the only fuel in service, the master fuel trip relay shall be actuated.

**Block 14a** Loss of flame at an individual fuel gas or fuel oil burner with one or more additional burners operating with stable flames that does not introduce a serious enough condition to warrant a master fuel trip as called for in block 8 shall close the individual burner safety shutoff valve(s) and associated igniter safety shutoff valve(s) and de-energize the associated igniter spark. For gang-operated burner valves, the requirements of 6.6.5.2.1.3(B)(19) and 6.7.5.2.1.3(B)(19) shall be met.

**Block 14b** On loss of main coal burner flame, the tripping strategies of 6.8.4 shall be followed.

### Table 6.4.2.3.1(b) Fuel Inputs Shutoff When Class 1 Igniters Are Used

<table>
<thead>
<tr>
<th>Condition</th>
<th>Action Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) First Class 1 igniter(s) fails to light after successful unit purge. [See 6.6.5.2.1.3(B)(9), 6.7.5.2.1.3(B)(10), and 6.8.5.2.1.3(B)(7).]</td>
<td>(1) Igniter valve(s) shall be closed immediately. Master fuel trip not required, but a 1-minute delay shall be required before retrial of that or any other igniter.</td>
</tr>
<tr>
<td>(2) Any igniters proven on, all other fuel sources off, all igniter valves subsequently closed.</td>
<td>(2) Master fuel trip shall be actuated.</td>
</tr>
<tr>
<td>(3) Any Class 1 igniter(s) proven on, any burner valve leaves closed limit, all burner valves subsequently closed, no other main fuel in service,</td>
<td>(3) Associated main fuel gas trip valve and/or fuel oil trip valve shall be closed (fuel gas trip and/or fuel oil trip), proven igniters shall be</td>
</tr>
</tbody>
</table>
Table 6.4.2.3.1(c) Fuel Inputs Shutoff When Class 2 or Class 3 Igniters Are Used

<table>
<thead>
<tr>
<th>Condition</th>
<th>Action Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>igniter(s) remain proven.</td>
<td>permitted to remain in service.</td>
</tr>
<tr>
<td>(4) Any Class 1 igniter(s) proven on, any pulverizer startup initiated,</td>
<td>(4) Proven igniters shall be permitted to remain in service.</td>
</tr>
<tr>
<td>all pulverizers subsequently stopped, no other main fuel in service,</td>
<td></td>
</tr>
<tr>
<td>igniter(s) remain proven.</td>
<td></td>
</tr>
<tr>
<td>(5) All igniter and burner valves closed and all feeders or pulverizers</td>
<td>(5) Master fuel trip shall be actuated.</td>
</tr>
<tr>
<td>stopped.</td>
<td></td>
</tr>
</tbody>
</table>

Statement of Problem and Substantiation for Public Input

This proposal complements the proposal requesting new Block 7 “Low Low Furnace Pressure” be added to Figure 6.4.2.3.1.

Submitter Information Verification

Submitter Full Name: Harold Yates
Organization: HRY, Inc.
Submittal Date: Mon Dec 10 12:57:50 EST 2012
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Public Input No. 110-NFPA 85-2012 [ Section No. 6.4.2.3.4.3(C) ]

(C) All Fan Trip.

(1) On an emergency shutdown where no fans remain in service, no action shall be taken other than damper actions necessary to prevent positive or negative furnace pressure transients beyond design limits.

(2) Except as Noted in (C) (3), Once the FD and ID fan(s) have stopped, slowly open all dampers in the air and flue gas passages to the full open position.

This condition shall be

(3) When the gas flow path is combined with the gas flow path(s) of other boilers, it shall be permissible to close the FD and ID fan dampers once the ID and FD fan(s) have stopped.

(4) The conditions in (C) (2) or (C) (3) shall be maintained for an all fan trip hold period of at least 15 minutes prior to allowing any ID or FD fan to be restarted.

(5) At the end of this 15 minute period, the fan(s) shall be started in accordance with Section 6.5.

(6) The airflow shall be increased gradually to the purge rate, and a boiler enclosure purge shall be completed.

Statement of Problem and Substantiation for Public Input

Open Air Path task group recommends these changes in coordination with the proposed changes to section 6.5.3.2.

Submitter Information Verification

Submitter Full Name: Daniel May
Organization: Burns & McDonnell Engineering
Submittal Date: Tue Dec 11 11:18:23 EST 2012

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Public Input No. 107-NFPA 85-2012 [ Section No. 6.4.2.3.4.3(D) ]

(D) After completion of the boiler enclosure purge, the unit shall be permitted to either:

1. Shut down, closing the burner air registers and shutting the FD and ID fans and open all dampers to allow an open air path through the boiler enclosure.

2. Shut down the FD and ID fans; however, maintaining airflow through the unit to prevent accumulation of combustible gases is a prudent procedural step due to the potential of fuel leak-by.

3. Close damper in the boiler gas path.

4. Relight in accordance with 6.6.5, 6.7.5, or 6.8.5, as applicable, depending on the fuels being fired.

Statement of Problem and Substantiation for Public Input

MBB committee assigned a task group to review and propose revised text to the Open Air Path requirements with regard to combining the multiple flue gas streams into a single duct. Task group was concerned about two issues; if the duct work is combined from multiple boilers it may be required to close the boiler dampers to prevent flue gas back flow into an offline unit. The task group also acknowledges the industry practice of "bottling a boiler" to prevent heat loss if the boiler will only be off for a short period of time. This code section is not inline with industry practice.

Submitter Information Verification

Submitter Full Name: Daniel May
Organization: Burns & McDonnell Engineering
Submittal Date: Tue Dec 11 10:52:12 EST 2012

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Where an interlock system is provided to start, stop, and trip ID fans and FD fans in pairs, the associated FD fan shall be tripped on loss of an individual ID, all ID fans paired to that FD fan, and the dampers associated with both those fans shall be closed, provided they are not the last fans in service. If they are the last fans in service, the dampers associated with both those fans shall remain open.

Statement of Problem and Substantiation for Public Input

Larger units typically have four ID fans and two FD fans and, if fan pairing is required, the pairing is usually such that each pair consists of two ID fans paired to one FD fan. It is not necessary to trip the FD fan if one of the ID fans in the pair remains running. This section has been interpreted to require that an FD fan be tripped anytime either of the associated ID fans is not running and that is not believed to be the intent of this Code.

Submitter Information Verification

Submitter Full Name: Dale Evely
Organization: Southern Company Services, Inc
Submittal Date: Mon Dec 10 10:15:22 EST 2012

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TITLE OF NEW CONTENT
Type your content here …6.4.2.3.6.4(A) All ID fan dampers shall remain in place, and then opened after a
time delay to minimize high draft during fan coastdown.

Statement of Problem and Substantiation for Public Input

Comply with Manual of Style allowing only one requirement per statement.

Submitter Information Verification

Submitter Full Name: Harold Yates
Organization: HRY, Inc.
Submittal Date: Tue Nov 06 07:06:18 EST 2012

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TITLE OF NEW CONTENT

Type your content here ...6.4.2.3.6.4(B) All dampers shall remain open and fans shall be started in accordance with 6.5.3.2 through 6.5.3.3.4.

Statement of Problem and Substantiation for Public Input

Comply with Manual of Style allowing one requirement per paragraph.

Submitter Information Verification

Submitter Full Name: Harold Yates
Organization: HRY, Inc.
Submittal Date: Tue Nov 06 07:12:30 EST 2012

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Public Input No. 40-NFPA 85-2012 [ New Section after 6.4.2.3.6.4 ]

TITLE OF NEW CONTENT
Type your content here ...6.4.2.3.6.4(C) Flue gas recirculation fan system dampers shall be closed.

Statement of Problem and Substantiation for Public Input

Comply with Manual of Style allowing one requirement per paragraph.

Submitter Information Verification

Submitter Full Name: Harold Yates
Organization: HRY, Inc.
Submittal Date: Thu Nov 08 06:21:10 EST 2012

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TITLE OF NEW CONTENT
Type your content here ...6.4.2.3.6.4(D) The competent transient analysis shall include effects of positive pressure rebound.

Statement of Problem and Substantiation for Public Input
Subsequent to the flame collapse, an inrush of air may create a high positive furnace pressure, which must be addressed.

Submitter Information Verification
Submitter Full Name: Harold Yates
Organization: HRY, Inc.
Submittal Date: Thu Nov 08 06:26:15 EST 2012

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6.4.2.3.6.4

On loss of all ID fans, all FD fans and any other fans in the air and flue gas passages shall be tripped. All ID fan dampers shall be opened after a time delay to minimize high draft during fan coastdown. Dampers shall remain open and fans shall, in accordance with 6.5.2.3.4.3 (C). At the end of the all fan trip hold period, fans shall be started in accordance with 6.5.3.2 through 6.5.3.3.4. Flue gas recirculation fan system dampers shall be closed operated as recommended by the boiler manufacturer.

Statement of Problem and Substantiation for Public Input

On loss of all FD and ID fans, flue gas recirculation fans and any other fans in the air and flue gas passages should be tripped. Section 6.4.2.3.4.3 (C) provides a better description for air damper positioning during an all fan trip event.

During the 15 minute all fan trip hold period, flue gas recirculation fan dampers are full open with flue gas recirculation fans off. After the all fan trip hold period, flue gas recirculation system is released to Operator to support an enclosure purge based on the boiler manufacturer recommendation. This may involve starting flue gas recirculation fans and opening associated fan dampers.

Presently, the statement relating to flue gas recirculation system appears odd with the rest of the paragraph.

Submitter Information Verification

Submitter Full Name: SINMING KWONG  
Organization: EMERSON PROCESS MANAGEMENT PWS  
Submittal Date: Thu Sep 13 11:15:27 EDT 2012

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On loss of all ID fans, all FD fans shall be tripped. All ID fan dampers shall be opened after a time delay to minimize high draft during fan coastdown. Dampers shall remain open and fans shall be started in accordance with. A delay before tripping of FD fan(s), duration of which determined by a competent transient analysis, shall be allowed to control furnace pressure within limits identified in 6.5. 3.2 through 6.5. 3.4. Flue gas recirculation fan system dampers shall be closed. 1(B).

Statement of Problem and Substantiation for Public Input

Tripping of ID fans creates a mandatory MFT, and the subsequent flame collapse, along with a decrease of incoming air created by loss of FD fans can create an excessive furnace negative pressure excursion. Maintaining an incoming airflow for a short duration may minimize the magnitude of the negative pressure excursion.

Submitter Information Verification

Submitter Full Name: Harold Yates
Organization: HRY, Inc.
Submittal Date: Thu Nov 08 06:07:27 EST 2012

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6.4.2.3.6.4
On loss of all ID fans, all FD fans shall be tripped. All ID fan dampers shall be opened after a time delay to minimize high draft during fan coastdown. Dampers shall remain open and fans shall be started in accordance with 6.5.3.2 through 6.5.3.3.4. Flue gas recirculation fan system dampers shall be closed (See Section 6.4.2.3.4.3(C) All Fan Trip).

Statement of Problem and Substantiation for Public Input

Section 6.4.2.3.6.4 is in conflict with the Section 6.4.2.3.4.3(C). All ID Fan trip sections were revised last cycle. The change to Section 6.4.2.3.6.4 will make the two sections work together in the requirements.

Submitter Information Verification

Submitter Full Name: Daniel May
Organization: Burns & McDonnell Engineering
Submittal Date: Mon Dec 10 10:25:54 EST 2012

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6.4.2.3.6.5(a) FD fans shall be allowed to remain in service to mitigate negative furnace pressure excursions after MFT and loss of ID fans provided a competent analysis has been performed and requirements of 6.5.2 are met.

Statement of Problem and Substantiation for Public Input

Maintaining FD fan(s) in service following an MFT and loss of ID fans will reduce the possibility of a furnace implosion. This is especially true with gas and fuel oil fired units.

Submitter Information Verification

Submitter Full Name: Harold Yates
Organization: HRY, Inc.
Submittal Date: Mon Dec 10 12:51:38 EST 2012

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Relocate (delete) entire paragraph to new paragraph 6.4.2.3.6.5:

The master fuel trip (not necessarily automatic) shall be activated when the furnace negative pressure exceeds the value recommended by the manufacturer. If fans are operating after the trip, they shall be continued in service. The airflow shall not be increased by deliberate manual or automatic control actions.

4. Renumber existing 6.4.2.3.4 and subsequent paragraphs.

Statement of Problem and Substantiation for Public Input

Subject matter of existing paragraph prescribes an MFT upon low-low furnace pressure, yet section 6.4.2.3.6.1 relates to actions taken upon loss of ID fan interlocks. Section 6.4.2.3 "required Interlocks" maybe more appropriate for the topic at hand.

Submitter Information Verification

Submitter Full Name: Harold Yates
Organization: HRY, Inc.
Submittal Date: Mon Dec 10 12:50:13 EST 2012

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6.4.2.3.6.6
Before the main fuel firing and following a master fuel trip, all ID fans shall be tripped if furnace negative pressure exceeds the value recommended by the manufacturer. A short time delay shall be permitted to allow for the negative pressure transients due to loss of the main flame. The value of the negative pressure at which this trip is activated shall be greater, more negative, than that specified in 6.4.2.3.6.5.

Statement of Problem and Substantiation for Public Input

The term "greater than" can be misinterpreted. "More negative" provides clarification.

Submitter Information Verification

Submitter Full Name: Harold Yates
Organization: HRY, Inc.
Submittal Date: Tue Nov 06 07:01:23 EST 2012

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6.4.2.3.6.6
Before the main fuel firing and following a master fuel trip, all ID fans shall be tripped if furnace negative pressure exceeds the value recommended by the manufacturer. A short time delay shall be permitted to allow for the negative pressure transients due to loss of the main flame. The value of the negative pressure at which this trip is activated shall be greater more negative than that specified in 6.4.2.3.6.5.

Statement of Problem and Substantiation for Public Input

The term "greater" is not specific, especially when referring to negative values.

Submitter Information Verification

Submitter Full Name: Harold Yates
Organization: HRY, Inc.
Submittal Date: Mon Dec 10 12:52:56 EST 2012

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Public Input No. 83-NFPA 85-2012 [ Section No. 6.4.2.3.7.3 ]

6.4.2.3.7.3
Where an interlock system is provided to start, stop, and trip ID fans and FD fans in pairs, the associated ID fans paired to a particular FD fan shall be tripped on loss of an individual FD fan, and the dampers associated with both those fans shall be closed, provided they are not the last fans in service. If they are the last fans in service, one of the ID fan fans shall remain in controlled operation, and the dampers associated with the FD fan shall remain open.

Statement of Problem and Substantiation for Public Input

Larger units typically have four ID fans and two FD fans and, if fan pairing is required, the pairing is usually such that each pair consists of two ID fans paired to one FD fan. The text needs to be modified to identify the fact that multiple ID fans may need to be tripped on the loss of an FD fan rather than a singular ID fan.

Submitter Information Verification

Submitter Full Name: Dale Evely
Organization: Southern Company Services, Inc
Submittal Date: Mon Dec 10 10:17:01 EST 2012

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6.4.2.3.7.4
On loss of all FD fans, all opened FD fan dampers shall be opened after remain open. Flue gas recirculation fans shall be tripped, and associated dampers shall be closed. After a time delay to minimize high duct pressure during fan coastdown, Dampers shall remain open. Flue gas recirculation fan system, all FD fan dampers shall be closed opened fully.

Statement of Problem and Substantiation for Public Input
The statement relating to flue gas recirculation fan system appears to be out of ordered. On loss of all FD fans, flue gas recirculation fans should be tripped, and then closing associated fan dampers.

Submitter Information Verification
Submitter Full Name: SINMING KWONG
Organization: EMERSON PROCESS MANAGEMENT PWS
Submittal Date: Thu Sep 13 12:04:31 EDT 2012

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Public Input No. 4-NFPA 85-2012 [ Section No. 6.4.2.3.7.6 ]

6.4.2.3.7.6*
Before the main fuel firing and following a 5-minute period after a short time after master fuel trip (furnace postpurge), all FD fans shall be tripped if the furnace pressure exceeds the maximum pressure value recommended by the manufacturer. A short time delay is permitted to allow for the execution of high furnace pressure trip as specified in 6.4.2.3.7.5.

Statement of Problem and Substantiation for Public Input

Presently, during the 5-min period following a master fuel trip, high furnace pressure condition is not properly addressed. Tripping of all FD Fans based on high furnace pressure exceeding maximum pressure value recommended by manufacturer should be armed as soon as possible following a master fuel trip.

As more equipment such as Baghouse, SCR and FGD are added to the back end of the furnace, it increases the likelihood of blockage, resulting in furnace pressure high.

Submitter Information Verification

Submitter Full Name: SINMING KWONG
Organization: EMERSON PROCESS MANAGEMENT PWS
Submittal Date: Fri May 25 00:44:37 EDT 2012

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**6.4.3.1 Functional Requirements**

6.4.3.1.1* Alarms shall be used to indicate equipment malfunction, hazardous conditions, and misoperation. For the purpose of this code, the primary concern shall be alarms that indicate conditions that pose a threat of impending or immediate hazards.

6.4.3.1.2 Alarm systems shall be designed so that, for the required alarms in 6.4.3.2, the operator receives audible and visual indication of the out-of-limits condition.

6.4.3.1.3 Means shall be permitted to silence the audible alarm after actuation, but the visual indication shall continue until the condition is within acceptable limits.

6.4.3.1.4 Where equipment malfunction makes it necessary to manually defeat an alarm, it shall be performed by authorized personnel, and the alarm shall be tagged as inoperative.

---

**Statement of Problem and Substantiation for Public Input**

This public input is submitted in combination with public inputs to move these requirements to the Fundamental chapter.

6.4.3.1.1* requirement is redundant with 4.11.4 and A.4.11.4 and can be deleted

6.4.3.1.2 requirement in part is to be moved to 4.15.7 for audible alarm – see corresponding public input

6.4.3.1.3 requirement is to be moved to 4.15.8 – see corresponding public input

6.4.3.1.4 requirement is to be moved to 4.15.9 – see corresponding public input

Instructions: Delete A.6.4.3.1.1

---

**Submitter Information Verification**

**Submitter Full Name:** Daniel Lee  
**Organization:** ABB Incorporated  
**Submittal Date:** Mon Nov 19 12:21:49 EST 2012

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6.5 Furnace Over-pressure/Implosion Protection.

6.5.1 General.
The structural design requirements of Section 4.6 shall apply to both pressure fired and balanced-draft units.

6.5.1.1 Transient Design Pressure.
6.5.1.1.1 The furnace structural design shall be such that the furnace is capable of withstanding a transient design pressure without permanent deformation due to yield or buckling of any support member.

6.5.1.2 Pressure Fired Units.
Implosion protection requirements shall not apply to units without a fan located in the flue gas path downstream of the boiler enclosure. The pressure fired furnace shall be designed in accordance with either 6.5.1.2.1 or 6.5.1.2.2.

6.5.1.2.1 The furnace and flue gas removal system shall be designed so that the maximum head capability of the FD fan system with ambient air does not exceed the continuous design pressure of the furnace, ducts, windbox, and associated equipment.

6.5.1.2.2 The furnace shall be designed for the transient design pressure in 6.5.1.2.2.1.

6.5.1.2.2.1 Positive Transient Design Pressure.
(A) If the test block capability of the FD fan at ambient temperature is equal to or more positive than +8.7 kPa (+35 in. of water), the positive transient design pressure shall be at least, but shall not be required to exceed, +8.7 kPa (+35 in. of water).

(B) If the test block capability of the FD fan at ambient temperature is less positive than +8.7 kPa (+35 in. of water), the positive transient design pressure shall be at least, but shall not be required to exceed, the test block capability of the FD fan.

6.5.1.3 Balanced Draft Units.
All boilers with a fan located in the flue gas path downstream of the boiler enclosure shall be designed in accordance with either 6.5.1.3.1 or 6.5.1.3.2.

6.5.1.3.1 The furnace and flue gas removal system shall be designed so that the maximum head capability of the ID fan system with ambient air does not exceed the continuous design pressure of the furnace, ducts, and associated equipment.

6.5.1.3.2 Where a furnace pressure control system in accordance with 6.5.2 is provided, the furnace shall be designed for the transient design pressures in 6.5.1.3.2.1 and 6.5.1.3.2.2.

6.5.1.3.2.1 Positive Transient Design Pressure.
(A) If the test block capability of the FD fan at ambient temperature is equal to or more positive than +8.7 kPa (+35 in. of water), the positive transient design pressure shall be at least, but shall not be required to exceed, +8.7 kPa (+35 in. of water).

(B) If the test block capability of the FD fan at ambient temperature is less positive than +8.7 kPa (+35 in. of water), the positive transient design pressure shall be at least, but shall not be required to exceed, the test block capability of the FD fan.

6.5.1.3.2.2 Negative Transient Design Pressure.
(A) If the test block capability of the ID fan at ambient temperature is equal to or more negative than -8.7 kPa (-35 in. of water), the negative transient design pressure shall be at least as negative as, but shall not be required to be more negative than, -8.7 kPa (-35 in. of water).

(B)
If the test block capability of the ID fan at ambient temperature is less negative than -8.7 kPa (-35 in. of water), for example, -6.72 kPa (-27 in. of water), the negative transient design pressure shall be at least as negative as, but shall not be required to be more negative than, the test block capability of the ID fan.

6.5.2 Furnace Pressure Control Systems (Implosion Protection).

6.5.2.1 Functional Requirements.

The furnace pressure control system shall control the furnace pressure at the desired set point in the combustion chamber.

6.5.2.2 System Requirements.

6.5.2.2.1 The furnace pressure control system, as shown in Figure 6.5.2.2.1, shall include the following features and functions:

1. Three furnace pressure transmitters (A) in an auctioneered median-select system, each on a separate pressure-sensing tap and with suitable monitoring (B) to minimize the possibility of operating with a faulty furnace pressure measurement
2. A feed-forward signal (C) to the furnace pressure control subsystem (D), representative of boiler airflow demand, which can be permitted to be a fuel flow signal, airflow control equipment demand signal, or other index of demand, but not a measured airflow signal
3. The furnace pressure control subsystem (D), which positions the furnace pressure regulating equipment so as to maintain furnace pressure at the desired set point
4. * The furnace pressure control protection subsystem (G), which is applied after the auto/manual transfer station (E) to minimize furnace pressure excursions under both auto and manual operation modes and which includes a feed-forward override action (F) initiated by a master fuel trip in anticipation of a furnace pressure excursion due to flame collapse and works in conjunction with logic that minimizes furnace pressure excursions
5. Axial fans, where used, operated in their stable range to prevent uncontrollable changes in airflow or flue gas flow

Figure 6.5.2.2.1 Furnace Pressure Control Systems Requirements.

6.5.2.3 Component Requirements.

The furnace pressure control element(s) [(H) in Figure 6.5.2.2.1] (fan inlet damper blade pitch control, speed control) shall meet the following criteria:

1. * The operating speed shall not exceed the control system's sensing and positioning capabilities.
The operating speed of the furnace pressure control equipment shall not be less than that of the airflow control equipment.

6.5.3 Sequence of Operations Requirements.
The purpose of sequencing shall be to ensure that the operating events occur in the order required.

6.5.3.1
Fan start-up and shutdown procedures as defined by manufacturers, engineering consultants, and operating companies shall be coordinated with the operating procedures specified in this section and in the related sections applicable to the fuel being fired as follows:

1. Fuel gas-fired systems, Section 6.6
2. Fuel oil-fired systems, Section 6.7
3. Pulverized coal–fired systems, Section 6.8

6.5.3.2* Open-Flow Air Path.

6.5.3.2.1
An open-flow air path from the inlet of the FD fans through the stack shall be ensured under all operating conditions.

6.5.3.2.2
Where the system design does not permit the use of fully open air paths, the minimum open area air paths shall be not less than that required for purge airflow requirements with fans in operation.

6.5.3.2.3*
Isolating dampers, windbox dampers, air registers, and other control dampers shall be opened as required to ensure an open-flow path from the FD fan inlet through the furnace, the ID fans, and the stack.

6.5.3.2.4
Provision of the open path shall be ensured while starting the first ID fan and the first FD fan.

6.5.3.2.4.1*
On installations with multiple ID fans or FD fans, the following shall apply:

1. Unless an alternative open-flow path is provided, all fan control devices and shutoff dampers shall be opened in preparation for starting the first ID fan except as permitted by 6.4.2.3.4.3(C) (3).

2. * Within the limitations of the fan manufacturer’s recommendations, all flow control devices and shutoff dampers on idle ID fans shall remain open until the first ID fan is in operation and all flow control devices and shutoff dampers on idle FD fans shall remain open until the first FD fan is in operation while maintaining furnace pressure conditions and indication of an open-flow path.

6.5.3.2.4.2
On installations with a single ID fan or FD fan, the following shall apply:

1. The ID fan’s associated control devices and shutoff dampers shall be permitted to be closed as required during the fan’s start-up.

2. The FD fan’s associated flow control devices and shutoff dampers shall be brought to the position that limits the starting current for the fan’s start-up and then shall be brought to the position for purge airflow during fan operation.

6.5.3.3 Starting and Stopping Fans.

6.5.3.3.1
The sequence for starting and stopping fans under all conditions shall be as follows:

1. An ID fan shall be started and followed by the start of an FD fan.

2. Succeeding ID and FD fans shall be started in accordance with 6.5.3.3.2 and 6.5.3.3.4.

3. Shutdown procedures shall be the reverse of those specified in 6.5.3.3.1 (1) and 6.5.3.3.1 (2).

6.5.3.3.2
When fans are started and stopped, the methods employed and the manipulation of the associated control elements shall minimize furnace pressure and airflow excursions.

6.5.3.3.3
The practice of operating with excess ID fan capability in relation to either FD fan capability or boiler load shall be prohibited.

6.5.3.3.4
The furnace pressure control subsystem shall be placed and maintained on automatic control as soon
6.5.3.3.5
Following shutdown of the last fan due to any cause, the opening of fan dampers shall be delayed or controlled to prevent positive or negative furnace pressure transients in excess of design limits during fan coastdown.

6.5.4 Interlock System Functional Requirements.
6.5.4.1
The functional requirements for interlock systems shall be as specified in 6.4.2.
6.5.4.2
Not all conditions conducive to a furnace implosion are detected by any of the mandatory automatic-trip devices, even though such devices are adjusted and maintained in accordance with the manufacturer's instructions and as required by this standard; therefore, operating personnel shall be made aware of the limitations of the automatic protection system.

Statement of Problem and Substantiation for Public Input

Paragraph 6.5.1.2 addresses protection of Pressure Fired Units by omitting them from 6.5.1.3, Balanced Draft Units. However, The Code never does go back and address how to protect Pressure Fired Units. In addition, the words that should be used to protect Pressure Fired Units are located in 6.5.1.3.2.1, which make them apply only to Balanced Draft Units.

In my effort to pattern the positive pressure protection after the negative pressure protection, I noticed that 6.5.1.3.1 specified how to design the "furnace, ducts and associated equipment", but 6.5.1.3.2 specifies only how to design the furnace. Is that what we want? It seems to me that if these two paragraphs are alternatives to accomplishing the same thing, then they should both address the same thing. I did the positive pressure wording (6.5.1.2.1 & 6.5.1.2.2) similarly, but not sure it actually does anything for us in that case.

Submitter Information Verification

Submitter Full Name: Bill Smith
Organization: Exothermic Engineering Company
Submittal Date: Mon Dec 10 12:45:31 EST 2012

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6.5.2.2.1
The furnace pressure control system, as shown in Figure 6.5.2.2.1, shall include the following features and functions:

1. Three furnace pressure transmitters (A) in an auctioneered median-select system, each on a separate pressure-sensing tap and with suitable monitoring (B) to minimize the possibility of operating with a faulty furnace pressure measurement.

2. A feed-forward signal (C) to the furnace pressure control subsystem (D), derived from a representative of boiler airflow demand, which can be permitted to be a fuel flow signal, an airflow control equipment demand signal, or other index of demand, but not a measured airflow signal.

3. The furnace pressure control subsystem (D), which positions the furnace pressure regulating equipment so as to maintain furnace pressure at the desired set point.

4. The furnace pressure control protection subsystem (G), which is applied after the auto/manual transfer station (E) to minimize furnace pressure excursions under both auto and manual operation modes and which includes a feed-forward override action (F) initiated by a master fuel trip in anticipation of a furnace pressure excursion due to flame collapse and works in conjunction with logic that minimizes furnace pressure excursions.

5. Axial fans, where used, operated in their stable range to prevent uncontrollable changes in airflow or flue gas flow.

Figure 6.5.2.2.1 Furnace Pressure Control Systems Requirements.

Statement of Problem and Substantiation for Public Input

1) Feedforward signal (C) is not equal to the representative of boiler airflow demand. Feedforward signal is derived from the representative of boiler airflow demand to predict or relate the furnace pressure regulating control element (H) position, usually through the use of a function generator or F(X).

2) Fuel flow is a poor choice for feedforward signal or the representative of boiler airflow demand. Upon receipt of Master Fuel Trip (MFT) signal, fuel flow will go to zero very quickly. The disappearance of the fuel flow based...
feedforward signal will create additional challenges for Furnace Pressure control.

**Submitter Information Verification**

**Submitter Full Name:** SINMING KWONG  
**Organization:** EMERSON PROCESS MANAGEMENT PWS  
**Submittal Date:** Thu May 24 22:37:23 EDT 2012

---

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6.5.3.2.1

An open-flow air path from the inlet of the FD fans through the stack shall be ensured under all operating conditions.

Statement of Problem and Substantiation for Public Input

Open air path description is not clear for units with combined flue gas paths. Added language provides direction on the special cases with combined flue gas paths prior to the stack exit.

Submitter Information Verification

Submitter Full Name: Daniel May
Organization: Burns & McDonnell Engineering
Submittal Date: Mon Dec 03 09:38:07 EST 2012

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Public Input No. 104-NFPA 85-2012 [ New Section after 6.5.3.2.2 ]

6.5.3.2.2
When the gas flow path is combined with the gas flow paths of other boilers the following requirements shall be met:

1. An open-flow air path from the inlet of the FD fans through the stack shall be ensured at any time the FD or ID fans for the unit are in operation.
2. When the fans on the idle unit are off a means shall be provided to prevent flow of the flue gas from the operating unit to the idle unit.
3. When starting an idle unit procedures shall be established to prevent backflow of flue gas from the operating unit to the idle unit.
4. Once an open air path has been established through the starting of the fans the unit startup shall be continued as described in sections 6.4.2.3.4.3 and 6.6.5, 6.7.5 or 6.8.5.

Statement of Problem and Substantiation for Public Input

MBB committee assigned a task group to review and propose revised text to the Open Air Path requirements with regard to combining the multiple flue gas streams into a single duct. Industry is requesting to combine multiple flue gas streams to reach an economy of scale for additional flue gas cleaning equipment. Task group was concerned about the possibility of such designs being under a positive pressure at the point the flue gas streams are combined. The possibility of flue gas flow into an offline unit was a concern to the task group. Proposed changes address those concerns.

Submitter Information Verification

Submitter Full Name: Daniel May
Organization: Burns & McDonnell Engineering
Submittal Date: Tue Dec 11 10:30:14 EST 2012

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6.5.3.2.2 Where the system design does not permit the use of fully open air paths, the minimum open area air paths shall be not less than that required for purge airflow requirements with fans in operation.

Statement of Problem and Substantiation for Public Input

MBB committee assigned a task group to review and propose revised text to the Open Air Path requirements with regard to combining the multiple flue gas streams into a single duct. Industry is requesting to combine multiple flue gas streams to reach an economy of scale for additional flue gas cleaning equipment. Task group was concerned about the possibility of such designs being under a positive pressure at the point the flue gas stream are combined. The possibility of flue gas flow into an offline unit was a concern to the task group. Proposed changes address those concerns.

Submitter Information Verification

Submitter Full Name: Daniel May
Organization: Burns & McDonnell Engineering
Submittal Date: Tue Dec 11 10:48:00 EST 2012

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6.5.3.2.3 *
Isolating dampers, windbox dampers, air registers, and other control dampers shall be opened as required to ensure an open-flow path from the FD fan inlet through the furnace, the ID fans, and the stack air path.

Statement of Problem and Substantiation for Public Input

MBB committee assigned a task group to review and propose revised text to the Open Air Path requirements with regard to combining the multiple flue gas streams into a single duct. Industry is requesting to combine multiple flue gas streams to reach an economy of scale for additional flue gas cleaning equipment. Task group was concerned about the possibility of such designs being under a positive pressure at the point the flue gas stream are combined. The possibility of flue gas flow into an offline unit was a concern to the task group. Proposed changes address those concerns.

Submitter Information Verification

Submitter Full Name: Daniel May
Organization: Burns & McDonnell Engineering
Submittal Date: Tue Dec 11 10:44:52 EST 2012

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**6.5.4 Interlock System Functional Requirements**

6.5.4.1 The functional requirements for interlock systems shall be as specified in 6.4.2.

6.5.4.2 Not all conditions conducive to a furnace implosion are detected by any of the mandatory automatic-trip devices, even though such devices are adjusted and maintained in accordance with the manufacturer’s instructions and as required by this standard; therefore, operating personnel shall be made aware of the limitations of the automatic protection system.

**Statement of Problem and Substantiation for Public Input**

It is believed that Clause 6.5.4 was included within the Clause 6.5 Furnace Implosion Protection to ensure that the readers do not overlook the requirements of clause 6.4.2. Interlock System. The requirements of Clause 6.5.4.2 is duplicated in 6.4.2.1.6 and the appendix A6.4.2.1.6. Thus, deleting the clause 6.5.4 does not change any of the requirements of an Interlock System but, only deleted duplications of requirements.

Instructions: Delete all references of Clause 6.5.4 in Chapter

6.6.5.2.5.2

(A) Interlocks shall be installed in accordance with 6.4.2 and 6.5.4.

6.7.5.2.5.2

(A) Interlocks shall be installed in accordance with 6.4.2 and 6.5.4.

6.8.5.2.5.2

(A) Interlocks shall be installed in accordance with 6.4.2 and 6.5.4.

**Submitter Information Verification**

**Submitter Full Name:** Daniel Lee  
**Organization:** ABB Incorporated  
**Submittal Date:** Mon Nov 19 10:36:18 EST 2012

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6.6.2 Fuel Gas Firing — Special Problems.

In addition to the common hazards involved in the combustion of solid, liquid, and gaseous fuels, the following special hazards related to the physical characteristics of fuel gas shall be addressed in the design of the firing systems:

1. Fuel gas is colorless; therefore, a leak is not visually detectable. In addition, detection of a fuel gas leak by means of odor is unreliable.

2. Leakage within buildings creates hazardous conditions, particularly where the fuel gas piping is routed through confined areas.
   a. Where the fuel gas piping is routed through confined areas, adequate ventilation shall be provided.
   b. Outdoor boilers tend to minimize confined-area problems.

3. The nature of fuel gas makes it possible to experience severe departures from design air-fuel ratios without any visible evidence at the burners, furnace, or stack that could escalate into a progressively worsening condition.
   a. Combustion control systems that respond to reduced boiler steam pressure or steam flow with an impulse for more fuel, unless protected or interlocked to prevent a fuel-rich mixture, are potentially hazardous.
   b. This hazard also applies to firing with fuel or air on manual without the previously mentioned interlocks or alarms. (See 6.4.2, 6.6.3, 6.6.4, and 6.6.5, which provide requirements, and Annex D.)

4. Special requirements as defined in NFPA 54, National Fuel Gas Code, must be taken with wet fuel gas systems.

5. Widely differing characteristics of fuel gas from either a single source or multiple sources could result in significant change in the heat input rate to the burners without a corresponding change in airflow.

6. Relief valves and atmospheric vents must discharge into areas away from building ventilation systems, sources of ignition, or other areas where the discharge fuel gases create a hazard. so that they do not present a hazard in accordance with 4.9.1.

7. Fuel gas piping must be purged prior to and after maintenance and repair, as detailed in NFPA 54, National Fuel Gas Code.

Statement of Problem and Substantiation for Public Input

Section 4.9.1 provides additional requirements related to these type of vents and should be referred to rather than repeating those requirements. Related public inputs are being submitted against sections 4.9.1, 6.6.2, 6.6.3.1.2.2, 6.6.3.1.12 and A.8.4.3.2.2.1.

Submitter Information Verification

Submitter Full Name: Dale Evely
Organization: Southern Company Services, Inc
Submittal Date: Wed Nov 28 14:40:33 EST 2012

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Public Input No. 214-NFPA 85-2013 [ Section No. 6.6.3.1.2.2 ]

6.6.3.1.2.2
The requirement in 6.6.3.1.2.1 shall be accomplished by providing full relieving capacity that is vented to a safe location or a location meeting the requirements of 4.9.1 or by providing a high fuel gas pressure trip when full relieving capacity is not installed. [See Figure A.6.6.5.1.5.4(b), which shows a typical fuel gas supply system outside the boiler room.]

Statement of Problem and Substantiation for Public Input

The objective of this suggested change is to replace "safe location" as it is unenforceable language.

Submitter Information Verification

Submitter Full Name: Ted Jablkowski
Organization: Fives North American Combustion
Affiliation: October 2012 email consensus of several NFPA 85 TC members.
Submittal Date: Thu Jan 03 16:06:05 EST 2013

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Public Input No. 61-NFPA 85-2012 [ Section No. 6.6.3.1.2.2 ]

6.6.3.1.2.2
The requirement in 6.6.3.1.2.1 shall be accomplished by providing full relieving capacity that is vented to a safe location atmosphere in accordance with 4.9.1 or by providing a high fuel gas pressure trip when full relieving capacity is not installed. [See Figure A.6.6.5.1.5.4(b), which shows a typical fuel gas supply system outside the boiler room.]

Statement of Problem and Substantiation for Public Input

The phrase “safe location” is not specific enough and thus has been determined by NFPA in the past to be unenforceable. This change would utilize language already included in NFPA 85 to provide more specifics related to the intent of this requirement. Related public inputs are being submitted against sections 4.9.1, 6.6.2, 6.6.3.1.2.2, 6.6.3.1.12 and A.8.4.3.2.2.1.

Submitter Information Verification

Submitter Full Name: Dale Evely
Organization: Southern Company Services, Inc
Submittal Date: Thu Nov 29 07:20:31 EST 2012

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6.6.3.1.12
The discharge from atmospheric vents and relief valves shall be located so that there is no possibility of the discharged fuel gas being drawn into the air intake, ventilating system, or windows of the boiler room or adjacent buildings and shall be extended above the boiler and adjacent structures so that fuel gas discharge does not present a fire hazard, in accordance with 4.9.1.

Statement of Problem and Substantiation for Public Input

Section 4.9.1 provides additional requirements related to these type of vents and should be referred to rather than repeating those requirements. Related public inputs are being submitted against sections 4.9.1, 6.6.2, 6.6.3.1.2.2, 6.6.3.1.12 and A.8.4.3.2.2.1.

Submitter Information Verification

Submitter Full Name: Dale Evely
Organization: Southern Company Services, Inc
Submittal Date: Thu Nov 29 07:25:04 EST 2012

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6.6.3.2.6* Maintenance.

6.6.3.2.6.1
The burner equipment shall be in a location that allows access for maintenance.

6.6.3.2.6.2
The requirements of housekeeping in 4.4.1.2 (8) shall be followed.

Statement of Problem and Substantiation for Public Input

Delete section 6.6.3.2.6* Maintenance

6.6.3.2.6.1 requirement to be moved to new section 4.4.1.8*
6.6.3.2.6.2 requirement provides no code/design requirement and thus is duplicated.

Submitter Information Verification

Submitter Full Name: Jimmie Schexnayder
Organization: Entergy Corporation
Submittal Date: Tue Dec 18 12:54:45 EST 2012

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6.6.3.2.7
All burner safety shutoff valves shall be located close to the burner to minimize the volume of fuel left downstream of the burner valves in the burner lines.

Statement of Problem and Substantiation for Public Input

The content in 6.6.3.2.7 is covered in 4.7.7.13

Submitter Information Verification

Submitter Full Name: Kenneth Frazier
Organization: Salt River Project
Submittal Date: Thu Dec 06 12:18:43 EST 2012

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6.6.5.1.2  Sootblowers, Sonic Horns, Air Cannons, and Pulse Detonation Devices

6.6.5.1.2.1  Sootblowers
Cleaning devices shall be operated only where heat input to the furnace is at a rate high enough to prevent a flameout during the sootblower operation.

6.6.5.1.2.2  Sootblowers
Cleaning devices shall not be operate at low load and high excess air conditions.

6.6.5.1.2.3  The use of wall sootblowers and other cleaning devices and high-temperature superheater and reheater sootblowers cleaning devices shall be permitted for cleaning during periods of unit outage if a unit purge has been completed and purge rate airflow is maintained.

6.6.5.1.2.4  The use of air heater sootblowers cleaning devices during start-up shall be permitted.

Statement of Problem and Substantiation for Public Input

NFPA 85 states specific requirements for the operation of sootblowers to prevent a hazardous condition from the re-entrainment of ash in the flue gas stream. Sonic horns, air cannons, and pulse detonation devices are being used in boilers and SCRs to supplement and/or replace sootblowers for cleaning and could possibly result in the same hazardous conditions.

Submitter Information Verification

Submitter Full Name: WILLIAM MEDEIROS
Organization: Babcock Power
Submittal Date: Wed Dec 12 09:31:32 EST 2012

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Public Input No. 90-NFPA 85-2012 [Section No. 6.6.1.2.4]

6.6.1.2.4
The use of air heater sootblowers and SCR sootblowers during start-up shall be permitted.

Statement of Problem and Substantiation for Public Input

There is no mention of SCR sootblowers. SCRs experience the same flue gas conditions as APHs. SCR's equipped with sootblowers should be used to keep oil residue from building up.

Submitter Information Verification

Submitter Full Name: Kenneth Frazier
Organization: Salt River Project
Submittal Date: Mon Dec 10 10:38:25 EST 2012

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**Public Input No. 143-NFPA 85-2013 [ Section No. 6.6.5.2.1.1 ]**

**6.6.5.2.1.1**

Preparation for starting shall include a thorough inspection that by the owner/operator that shall verify the following:

1. The furnace and fuel gas passages are free of foreign material and not in need of repair.
2. The bottom of the furnace is free of accumulations of solid or liquid fuel, fuel gases, or vapors prior to each start-up.
3. All personnel are evacuated from the unit and associated equipment, and all access and inspection doors are closed.
4. All airflow and flue gas flow control dampers have been operated through their full range to check the operating mechanism and then are set at a position that allows the fans to be started at a minimum airflow and without overpressuring any part of the unit.
5. All individual burner dampers or registers that are subject to adjustment during operations have been operated through their full range to check the operating mechanism.
6. The drum water level is established in drum-type boilers, and circulating flow is established in forced circulation boilers, or minimum water flow is established in once-through boilers.
7. The oxygen and combustibles analyzer(s), if provided, are operating as designed and a sample has been obtained. Combustible indication is at zero and oxygen indication is at maximum.
8. All safety shutoff valves are closed, and all sparks are de-energized.
9. Fuel oil ignition systems meet the requirements of Section 6.7.
10. The fuel system vents are open and venting to atmosphere outside the boiler room, and lines are drained and cleared of materials such as condensate.
11. The burner elements and igniters are positioned in accordance with the manufacturer’s specifications.
12. Energy is supplied to control systems and to interlocks.
13. The meters or gauges indicate fuel header pressure to the unit.
14. A complete functional check of the interlocks has been made after an overhaul or modification of the interlock system.
15. An operational test of each igniter has been made. The test has been integrated into the starting sequence and has followed the unit purge and preceded the admission of any main fuel.
16. Individual igniters or groups of igniters also are permitted to be tested while the unit is in service. Such tests are made with no main fuel present in the igniter’s associated burner, and the burner air register is in its start-up or light-off position as described in the established operating procedure.
17. Units with a history of igniter unreliability require additional test routines to verify the continuing operating ability of igniters and ignition system components.

**Statement of Problem and Substantiation for Public Input**

As written, this paragraph is is open to interpretation as to who should conduct the visual inspection.

Jurisdictional authorities (AHJ) have for many years been inappropriately interpreting NFPA 85 as containing in-service inspection responsibilities for the National Board Commissioned Boiler Inspectors employed by Authorized Inspection Agencies as defined by the National Board document NB-369 Qualifications and Duties for Authorized Inspection Agencies (AIAs) Performing Inservice Inspection Activities and Qualifications for Inspectors of Boilers and Pressure Vessels. This has caused significant legal issues for Authorized Inspection Agencies. The proposed change is intended to make it clear that NFPA 85 does not contain any requirements for in-service inspections for these agencies.

**Related Public Inputs for This Document**

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<th>Related Input</th>
<th>Relationship</th>
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<td>The bottom of the furnace is free of accumulations of solid or liquid fuel, fuel gases, or vapors prior to each start-up.</td>
<td></td>
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<tr>
<td>An operational test of each igniter has been made. The test has been integrated into the starting sequence and has followed the unit purge and preceded the admission of any main fuel.</td>
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</tr>
<tr>
<td>Units with a history of igniter unreliability require additional test routines to verify the continuing operating ability of igniters and ignition system components.</td>
<td></td>
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</tbody>
</table>
Public Input No. 132-NFPA 85-2013 [Section No. 3.2.2]

Submitter Information Verification

Submitter Full Name: Brian Moore
Organization: Hartford Steam Boiler Inspection
Submittal Date: Wed Jan 02 13:26:52 EST 2013

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(B) The starting sequence shall be performed in the following order:

1. An open flow path from the inlets of the FD fans through the stack shall be verified.
2. An ID fan, if provided, shall be started; an FD fan then shall be started. Additional ID fans or FD fans shall be started in accordance with 6.5.3, as necessary, to achieve purge flow rate.
3. Dampers and burner registers shall be opened to the purge position in accordance with the open register purge method objectives outlined in 6.6.5.1.5.7.
4. The airflow shall be adjusted to purge airflow rate, and a unit purge shall be performed. Special provisions shall be utilized as necessary to prevent the hazardous accumulation of volatile vapors that are heavier than air or to detect and purge accumulations in the furnace bottom.
5. The main fuel control valve shall be closed and the main safety shutoff valve(s) shall be opened, but only after the requirements of 6.6.5.1.1133 for leak test requirements and 6.4.2.3.4 for permissive conditions in the unit purge system have been satisfied.
6. It shall be determined that the main fuel control valve is closed, and the following procedures shall be performed:
   a. The main fuel bypass control valve, if provided, shall be set to maintain the necessary burner header fuel pressure for light-off.
   b. The burner headers shall be vented in order to be filled with fuel gas and to provide a flow (if necessary) so that the main fuel and bypass fuel control valves function to regulate and maintain the correct pressure for burner light-off.
   c. The main fuel control valve shall be opened when necessary.
   d. The time needed to vent for control of header pressure after header charging shall be evaluated and minimized.
7. The igniter safety shutoff valve shall be opened, and the following shall be performed:
   a. It shall be confirmed that the igniter fuel control valve is holding the manufacturer's recommended fuel pressure necessary for the igniter to operate at design capacity.
   b. The igniter headers shall be vented in order to be filled with fuel gas and to provide a flow (if necessary) so that the igniter fuel control valve functions to regulate and maintain the pressure within design limits specified by the manufacturer for lighting the igniters.
   c. The time needed to vent for control of header pressure after header charging shall be evaluated and minimized.
8. The air register or damper on the burner selected for light-off shall be adjusted to the position recommended by the manufacturer or the established operating procedure, in accordance with 6.6.5.1.5.7(C) through 6.6.5.1.5.7(F).
9. The spark or other source of ignition for the igniter(s) on the burner(s) to be lit shall be initiated, and the procedure shall continue as follows:
   a. The individual igniter safety shutoff valve(s) shall be opened, and all igniter system atmospheric vent valves shall be closed.
   b. If flame on the first igniter(s) is not established within 10 seconds, the individual igniter safety shutoff valve(s) shall be closed and the cause of failure to ignite shall be determined and corrected.
   c. With airflow maintained at purge rate, repurge shall not be required, but at least 1 minute shall elapse before a retrial of this or any other igniter is attempted.
   d. Repeated retrials of igniters without investigating and correcting the cause of the malfunction shall be prohibited.
10. Where Class 3 special electric igniters are used, the procedures described in 6.6.5.2.1.3(B) (1) through 6.6.5.2.1.3(B) (6), 6.6.5.2.1.3(B) (8), and 6.6.5.2.1.3(B) (11) through 6.6.5.2.1.3(B) (14) shall be used, consistent with the the requirements for individual main burner flame supervision.
(11) After making certain that the igniter(s) is established and is providing the required level of ignition energy for the main burner(s), the following shall be performed:

(a) The individual burner safety shutoff valve(s) shall be opened and the individual burner atmospheric vent valves shall be closed.

(b) Except where associated Class 1 igniters are in service, a master fuel trip shall be initiated when the flame detection system(s) indicates that ignition has not been obtained within 5 seconds of the time the main fuel actually begins to enter the furnace.

(c) Purging shall be repeated, and the conditions that caused the failure to ignite shall be corrected before another light-off attempt is made.

(d) For the following burner and all subsequent burners placed in operation, failure to ignite or loss of ignition for any reason on any burner(s) shall cause fuel flow to that burner(s) to stop.

(e) All conditions required by the manufacturer or by established operating procedures for light-off shall exist before restarting the burner(s).

(12) After stable flame is established, the air register(s) or damper(s) shall be adjusted slowly to its operating position, making certain that ignition is not lost in the process. With automatic burner management systems, the air register shall be permitted to be opened simultaneously with the burner safety shutoff valve.

(13) Class 3 igniters shall be shut off at the end of the time trial for proving the main flame, and the following shall be verified:

(a) The stable flame continues on the main burners after the igniters are shut off.

(b) The systems that allow the igniters to remain in service on either an intermittent or a continuous basis have been tested to meet all the requirements of Class 1 igniters or Class 2 igniters with associated interlocks in service.

(14) After stable burner header pressure control has been established, the burner header atmospheric vent valve shall be closed.

(15) The sequence shall continue as follows:

(16) The procedures in 6.6.5.2.1.3(B) (8) through 6.6.5.2.1.3(B) (13) shall be followed for placing additional burners with open registers in service, as necessary, to raise steam pressure or to carry additional load.

(17) If used, automatic control of burner fuel flow and burner airflow during the lighting and start-up sequence shall be in accordance with the requirements of 6.6.5.2.1.3(B) (17).

(18) The fuel flow to each burner (as measured by the burner fuel header pressure) shall be maintained at a controlled value that is compatible with the established airflow through the corresponding burner.

(19) The established airflow through each open register shall be permitted to be maintained by controlling the windbox-to-furnace differential.

(20) Total furnace airflow shall not be reduced below purge rate airflow and shall be at least that which is necessary for complete combustion in the furnace.

(21) If it is necessary to vary fuel header pressure to eliminate a problem of having excessive lighting off and shutting down of burners, such variations shall be limited to a predetermined range.

(22) This range shall be a function of the incremental fuel input that is added by the lighting of a single burner or gang of burners.

(23) The maximum number of burners shall be placed in service consistent with the anticipated continuous load and the operating range of fuel header pressures.

(24) The on-line metering combustion control (unless designed specifically for start-up procedures) shall not be placed into service until the following have occurred:

(a) A predetermined minimum main fuel input has been attained.

(b) All registers on nonoperating burners are closed unless compensation is provided for by the control system.

(c) The burner fuel and airflow are adjusted as necessary.

(d) Stable flame and specified furnace conditions have been established.
(25) It shall be permitted to place a multiple number of igniters in service that are served simultaneously from a single igniter safety shutoff valve, provided that the igniters are reliably supervised, so that failure of one of the group to light causes the fuel to all igniters in the group to shut off.

(26) It also shall be permitted to place in service simultaneously a multiple number of burners served by their corresponding multiple igniters from a single burner safety shutoff valve, provided that the burners are reliably supervised, so that failure of one of the group to light causes the fuel to all burners in the group to shut off.

(27) On units with an overfire air system, the overfire air control damper positions shall be permitted to be changed only when repositioning of all burner air registers or burner air dampers is permitted.

(28) On units with an overfire air system, the boiler shall be operating in a stable manner before the overfire air is introduced. The introduction of the overfire air shall not adversely affect boiler operation.

(29) On units with an overfire air system and a reburn system, the overfire air shall be placed in operation before the reburn system is started.

(30) A reburn system shall be placed in service only after the following have occurred:
   (a) The boiler shall be operating at a load that ensures the introduction of the reburn fuel will not adversely affect continued boiler operation.
   (b) The temperature in the reburn zone shall be maintained in accordance with 6.6.3.5.2.
   (c) The boiler shall be operating in a stable manner before the reburn start-up sequence is initiated.

Statement of Problem and Substantiation for Public Input

The above section describes the steps that correspond to the gas starting sequence and should reference the Operational Leak Test of the gas system described in 6.6.5.1.3. The existing text references valve leak testing which is part of the system (equipment) requirements. This also provides consistency with section 6.6.5.2.6.2 (1) and section 6.7.5.2.1.3 (B) (6) in the Oil section. This error was created in the 2007 edition of NFPA 85.

Submitter Information Verification

Submitter Full Name: John O'Rourke
Organization: Alstom Power Inc.
Submittal Date: Wed Jan 02 13:32:43 EST 2013

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6.7.2 Fuel Oil Firing — Special Problems.

In addition to the common hazards involved in the combustion of solid, liquid, and gaseous fuels, the following special hazards related to the physical characteristics of fuel oil shall be addressed in the design of the firing systems (see Section K.6):

1. Piping systems shall be designed to prevent leakage.
2. Limits to maintain atomization shall be in accordance with design parameters.
3. Fuel oil piping systems shall be designed to prevent water or sludge from plugging strainers or burner tips.
4. Combustion airflow shall follow changes in calorific content of fuel. [See Section K.3 (4).]
5. On installations designed to fire both heated and unheated fuel oils, the burner control system shall be designed to ensure that interlocks are activated for the selected fuel oil. The fuel oil piping supply to the burner as well as the fuel oil-recirculating piping to the fuel storage tanks shall be provided with interlocks, depending on the arrangement of the equipment provided.
6. Fuel oil guns shall not be inserted without a tip or sprayer plate and new gasket.
7. Pumping and atomization of fuel oils are dependent on control of viscosity. Changes in viscosity in relation to temperature vary for different fuel oils and blends of fuel oils. Viscosity control systems shall be designed for each fuel where the source or properties are variable.
8. Because clear distillate fuels have low conductivities and generate static electrical charges in the fuel stream, flowing velocities shall be limited.
9. Piping systems shall prevent flow transients caused by operation of system valves. [See Section K.3 (8).]
10. Operation of air heater sootblowers cleaning devices shall be in accordance with the requirements of the air heater manufacturer.

Statement of Problem and Substantiation for Public Input

NFPA 85 states specific requirements for the operation of sootblowers to prevent a hazardous condition from the re-entrainment of ash in the flue gas stream. Sonic horns, air cannons, and pulse detonation devices are being used in boilers and SCRs to supplement and/or replace sootblowers for cleaning and could possibly result in the same hazardous conditions.

Submitter Information Verification

Submitter Full Name: WILLIAM MEDEIROS
Organization: Babcock Power
Submittal Date: Wed Dec 12 09:38:56 EST 2012

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6.7.3.1.2.2 *
Relief valve discharge passages, vents, and telltales shall be provided with suitable piping to **allow**
**safe discharge** **allow discharge** of fuel oil, vapors, or toxic fumes to a location meeting the
requirements of 4.9.1.

**Statement of Problem and Substantiation for Public Input**

The objective of this suggested change is to replace "safe discharge" as it may be unenforceable language.

**Related Public Inputs for This Document**

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**Submitter Information Verification**

**Submitter Full Name:** Ted Jablkowski  
**Organization:** Fives North American Combustion  
**Submittal Date:** Thu Jan 03 16:26:07 EST 2013

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6.7.3.2.6* Maintenance.

6.7.3.2.6.1
The burner equipment shall be in a location that allows access for maintenance.

6.7.3.2.6.2
The requirements of housekeeping in 4.4.1.2 (8) shall be followed.

Statement of Problem and Substantiation for Public Input

DELETE Section 4.7.3.2.6* Maintenance
Wording being moved to new section 4.4.1.8*
6.7.3.2.6.1 requirement be moved to 4.4.1.8*
6.7.3.2.6.2 requirement provides no code/design requirement and this is duplicated.

Submitter Information Verification

Submitter Full Name: Jimmie Schexnayder
Organization: Entergy Corporation
Submittal Date: Tue Dec 18 13:08:16 EST 2012

Copyright Assignment

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6.7.3.2.7
All burner safety shutoff valves shall be located close to the burner to minimize the volume of fuel oil that is left downstream of the burner valves in the burner lines or that flows by gravity into the furnace on an emergency trip or burner shutdown.

Statement of Problem and Substantiation for Public Input

The content in 6.7.3.2.7 is covered in 4.7.7.13

Submitter Information Verification

Submitter Full Name: Kenneth Frazier
Organization: Salt River Project
Submittal Date: Thu Dec 06 12:22:41 EST 2012

Copyright Assignment

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6.7.5.1.2 Sootblowers, Sonic Horns, Air Cannons, and Pulse Detonation Devices

6.7.5.1.2.1 Sootblowers. Cleaning devices shall be operated only where heat input to the furnace is at a rate high enough to prevent a flameout during the sootblower cleaning devices operation.

6.7.5.1.2.2 Sootblowers. Cleaning devices shall not be operated at low load and high excess air conditions.

6.7.5.1.2.3 The use of wall sootblowers cleaning devices and high temperature superheater and reheater sootblowers shall be permitted for cleaning during periods of unit outage if a unit purge has been completed and purge rate airflow is maintained.

6.7.5.1.2.4 The use of air heater sootblowers cleaning devices during start-up shall be permitted.

6.7.5.1.2.5 Operation of air heater sootblowers cleaning devices shall be in accordance with the requirements of the air heater manufacturer.

Statement of Problem and Substantiation for Public Input

NFPA 85 states specific requirements for the operation of sootblowers to prevent a hazardous condition from the re-entrainment of ash in the flue gas stream. Sonic horns, air cannons, and pulse detonation devices are being used in boilers and SCRs to supplement and/or replace sootblowers for cleaning and could possibly result in the same hazardous conditions.

Submitter Information Verification

Submitter Full Name: WILLIAM MEDEIROS
Organization: Babcock Power
Submittal Date: Wed Dec 12 09:40:52 EST 2012

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Public Input No. 148-NFPA 85-2013 [Section No. 6.7.5.2.1.1]

6.7.5.2.1.1 Preparation for starting shall include a thorough inspection by the owner/operator that shall verify the following:

1. The furnace and flue gas passages are free of foreign material and not in need of repair.
2. The bottom of the furnace, including the ash hopper, is free of accumulations of liquid fuel, fuel gases, or vapors prior to each start-up.
3. All personnel are evacuated from the unit, and associated equipment and all access and inspection doors are closed.
4. All airflow and flue gas flow control dampers have been operated through their full range to check the operating mechanism and then are set at a position that allows the fans to be started at a minimum airflow and without overpressuring any part of the unit.
5. All individual burner dampers or registers that are subject to adjustment during operations have been operated through their full range to check the operating mechanism.
6. The drum water level is established in drum-type boilers, and circulating flow is established in forced circulation boilers or minimum water flow is established in once-through boilers.
7. The oxygen analyzer(s) and combustibles analyzer(s), if provided, are operating as designed, and a sample has been obtained. The combustibles indication is at zero, and the oxygen indication is at maximum.
8. All individual burner safety shutoff valves are proven closed, and all sparks are de-energized.
9. Fuel gas ignition systems meet the requirements of Section 6.6.
10. The circulating valve, or the fuel oil main safety shutoff valve if a circulating valve is not provided, shall be permitted to be open to provide and maintain hot oil in the burner headers.
11. The burner guns are checked to ensure that the correct burner tips or sprayer plates and gaskets are in place to provide a safe operating condition.
12. The burner elements and igniters are positioned in accordance with the manufacturer’s specification.
13. Energy is supplied to the control system and to interlocks.
14. The meters or gauges indicate fuel header pressure to the unit.
15. A complete functional check of the interlocks has been made after an overhaul or modification of the interlock system.
16† An operational test of each igniter has been made. The test shall be integrated into the starting sequence and shall follow the unit purge and precede the admission of any main fuel.
17 Individual igniters or groups of igniters also shall be permitted to be tested while the unit is in service. Such tests shall be made with no main fuel present in the igniter’s associated burner, and the burner air register shall be in its start-up or light-off position as described in the established operating procedure.
18† Units with a history of igniter unreliability shall require additional test routines to verify the continuing operating ability of igniters and ignition system components.

Statement of Problem and Substantiation for Public Input

As written, this paragraph is open to interpretation as to who should conduct the inspection.

Jurisdictional authorities (AHJ) have for many years been inappropriately interpreting NFPA 85 as containing in-service inspection responsibilities for the National Board Commissioned Boiler Inspectors employed by Authorized Inspection Agencies as defined by the National Board document NB-369 Qualifications and Duties for Authorized Inspection Agencies (AIAs) Performing Inservice Inspection Activities and Qualifications for Inspectors of Boilers and Pressure Vessels. This has caused significant legal issues for Authorized Inspection Agencies. The proposed change is intended to make it clear that NFPA 85 does not contain any requirements for in-service inspections for these agencies.
Related Public Inputs for This Document

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Submitter Information Verification

Submitter Full Name: Brian Moore  
Organization: Hartford Steam Boiler Inspecti  
Submittal Date: Wed Jan 02 13:42:46 EST 2013

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6.7.5.2.6.2
The starting sequence of the first fuel (gas or coal) shall be complete, and the starting sequence of the second fuel (oil) shall be performed in the following order:

(1) The main fuel oil control valve shall be closed and the main safety shutoff valve(s) shall be opened, but only after leak test requirements in 6.7.5.1.3 have been met.
(2) The starting sequence in 6.7.5.2.1.3(B) (7) through 6.7.5.2.1.3(B) (20) shall be followed.

Exception: For sequence 6.7.5.2.1.3(B) (12), where fuel oil is the second fuel to be placed in service, a fuel oil trip shall be initiated when the flame detection system(s) indicates that ignition has not been obtained within 5 seconds of the time the fuel actually begins to enter the furnace. A master fuel trip shall not be required.

Statement of Problem and Substantiation for Public Input

Existing text refers to a gas section requirement. The revised text provides the correct reference to the oil section.

Submitter Information Verification

Submitter Full Name: John O'Rourke
Organization: Alstom Power Inc.
Submittal Date: Wed Jan 02 13:29:24 EST 2013

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6.8.3.2.6* Maintenance.

6.8.3.2.6.1
The burner equipment shall be in a location that allows access for maintenance.

6.8.3.2.6.2
The requirements of housekeeping in 4.4.1.2 (8) shall be followed to prevent the accumulation of unburned coal.

Statement of Problem and Substantiation for Public Input

DELETE Section 6.8.3.2.6* Maintenance

6.8.3.2.6.1 requirement being moved to new section 4.4.1.8* see public input
6.8.3.2.6.2 requirement provides no code/design requirement and thus is duplicated.

Submitter Information Verification

Submitter Full Name: Jimmie Schexnayder
Organization: Entergy Corporation
Submittal Date: Tue Dec 18 13:12:08 EST 2012

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6.8.5.1.2 - Sootblowers 2 Cleaning Devices - Sootblowers, Sonic Horns, Air Cannons, and Pulse Detonation Devices.

6.8.5.1.2.1 Sootblowers Cleaning devices shall be operated only where heat input to the furnace is at a rate high enough to prevent a flameout during the sootblower operation.

6.8.5.1.2.2 Sootblowers Cleaning devices shall not be operated at low load and high excess air conditions.

6.8.5.1.2.3 The requirements of 6.8.5.1.2.1 and 6.8.5.1.2.2 shall not preclude the use of wall sootblowers, and high-temperature superheater and reheater sootblowers shall be permitted for cleaning during periods of unit outage if a unit purge has been completed and purge rate airflow is maintained.

6.8.5.1.2.4 The use of air heater sootblowers shall be permitted for cleaning during periods of unit outage if a unit purge has been completed and purge rate airflow is maintained.

Statement of Problem and Substantiation for Public Input

NFPA 85 states specific requirements for the operation of sootblowers to prevent a hazardous condition from the re-entrainment of ash in the flue gas stream. Sonic horns, air cannons, and pulse detonation devices are being used in boilers and SCRs to supplement and/or replace sootblowers for cleaning and could possibly result in the same hazardous conditions.

Submitter Information Verification

Submitter Full Name: WILLIAM MEDEIROS
Organization: Babcock Power
Submittal Date: Wed Dec 12 09:43:14 EST 2012

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6.8.5.1.2.4
The use of air heater sootblowers and SCR sootblowers during start-up shall be permitted.

Statement of Problem and Substantiation for Public Input

There is no mention of SCR sootblowers. SCRs experience the same flue gas conditions as APHs. SCR's equipped with sootblowers should be used to keep oil residue from building up.

Submitter Information Verification

Submitter Full Name: Kenneth Frazier
Organization: Salt River Project
Submittal Date: Mon Dec 10 10:40:18 EST 2012

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6.8.5.2.1.1
Preparation for starting shall include a thorough inspection by the owner/operator that shall verify the following:

1. The furnace and flue gas passages are free of foreign material and not in need of repair.
2. The bottom of the furnace, including the ash hopper, is free of accumulations of solid or liquid fuel, fuel gases, or vapors prior to each start-up.
3. All personnel are evacuated from the unit and associated equipment, and all access and inspection doors are closed.
4. All airflow and flue gas flow control dampers have been operated through their full range to check the operating mechanism and then are set at a position that allows the fans to be started at a minimum airflow and without overpressuring any part of the unit.
5. All individual burner dampers or registers that are subject to adjustment during operations have been operated through their full range to check the operating mechanism.
6. The drum water level is established in drum-type boilers, circulating flow is established in forced circulation boilers, or minimum water flow is established in once-through boilers.
7. The oxygen analyzer(s) and combustibles analyzer(s), if provided, are operating as designed, and a sample has been obtained. Combustibles indication is at zero, and oxygen indication is at maximum.
8. The igniter safety shutoff valves are closed, and sparks are de-energized. Fuel gas ignition systems shall comply with the requirements of Section 6.6. Fuel oil ignition systems shall comply with the requirements of Section 6.7.
9. The pulverizing equipment is isolated effectively to prevent inadvertent or uncontrolled leakage of coal into the furnace.
10. The pulverizers, feeders, and associated equipment are operable, not in need of repair, and adjusted to the requirements of established operating procedures that ensure their standby start-up status. All pulverizer and feeder sensor lines are clean prior to starting.
11. Energy is supplied to control system and to interlocks.
12. A complete functional check of the interlocks has been made after an overhaul or modification of the interlock system.
13. An operational test of each igniter has been made. The test has been integrated into the starting sequence and has followed the unit purge and preceded the admission of any main fuel.
14. Individual igniters or groups of igniters also have been permitted to be tested while the unit is in service. Such tests have been made with no main fuel present in the igniter's associated burner, and the burner air register has been in its start-up or light-off position as described in the established operating procedure.
15. Units with a history of igniter unreliability have gone through additional test routines to verify the continuing operating ability of igniters and ignition system components.

Statement of Problem and Substantiation for Public Input

As written, this paragraph is open to interpretation as to who should conduct the inspection.

Jurisdictional authorities (AHJ) have for many years been inappropriately interpreting NFPA 85 as containing in-service inspection responsibilities for the National Board Commissioned Boiler Inspectors employed by Authorized Inspection Agencies as defined by the National Board document NB-369 Qualifications and Duties for Authorized Inspection Agencies (AIAs) Performing Inservice Inspection Activities and Qualifications for Inspectors of Boilers and Pressure Vessels. This has caused significant legal issues for Authorized Inspection Agencies. The proposed change is intended to make it clear that NFPA 85 does not contain any requirements for in-service inspections for these agencies.

Related Public Inputs for This Document
Related Input
Public Input No. 132-NFPA 85-2013 [Section No. 3.2.2]

Submitter Information Verification

Submitter Full Name: Brian Moore
Organization: Hartford Steam Boiler Inspecti
Submittal Date: Wed Jan 02 13:55:44 EST 2013

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6.8.5.2.5.2 Mandatory Automatic Master Fuel Trips.

(A) Interlocks shall be installed in accordance with 6.4.2 and 6.5.4.

(B) A master fuel trip shall result from any of the following conditions:

1. Total airflow decreases below the minimum purge rate airflow as required in 6.4.2.3.4.4(A) by 5 percent of design full load airflow
2. Loss of either all FD fans or all ID fans
3. Loss of all flame
4. Partial loss of flame predetermined to be likely to introduce a hazardous accumulation of unburned fuel in accordance with Table 6.4.2.3.1(a), block 8
5. Furnace pressure in excess of the prescribed operating pressure by a value recommended by the manufacturer
6. All fuel inputs shut off in accordance with Table 6.4.2.3.1(a), block 9 (See 6.4.2.3.9 for a list of the required interlocks and trips for individual pulverizer subsystems.)

Insert text to match requirements of 2011 edition FIGURE 6.4.2.3.1 and TABLE 6.4.2.3.1 (a). Text to read:

7. Low Drum Water Level in accordance with Table 6.4.2.3.1(a), block 10.
6.8.5.2.5.2 Mandatory Automatic Master Fuel Trips.

(A) Interlocks shall be installed in accordance with 6.4.2 and 6.5.4.

(B) A master fuel trip shall result from any of the following conditions:

1. Total airflow decreases below the minimum purge rate airflow as required in 6.4.2.3.4.4(A) by 5 percent of design full load airflow
2. Loss of either all FD fans or all ID fans
3. Loss of all flame
4. Partial loss of flame predetermined to be likely to introduce a hazardous accumulation of unburned fuel in accordance with Table 6.4.2.3.1(a), block 8
5. Furnace pressure in excess of the prescribed operating pressure by a value recommended by the manufacturer
6. All fuel inputs shut off in accordance with Table 6.4.2.3.1(a), block 9 (See 6.4.2.3.9 for a list of the required interlocks and trips for individual pulverizer subsystems.)

Insert text to match requirements of 2011 edition FIGURE 6.4.2.3.1 and TABLE 6.4.2.3.1 (a). Text to read:

(8) Low Drum Water Level in accordance with Table 6.4.2.3.1(a), block 10.

Statement of Problem and Substantiation for Public Input

Subsequent text does not include a requirement previously included in the text.

Submitter Information Verification

Submitter Full Name: Steven Graf
Organization: Emerson Process Management
Submittal Date: Mon Dec 10 10:34:19 EST 2012

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Public Input No. 89-NFPA 85-2012 [ Section No. 6.8.5.2.5.2 ]

6.8.5.2.5.2 Mandatory Automatic Master Fuel Trips.

(A) Interlocks shall be installed in accordance with 6.4.2 and 6.5.4.

(B) A master fuel trip shall result from any of the following conditions:

1. Total airflow decreases below the minimum purge rate airflow as required in 6.4.2.3.4.4(A) by 5 percent of design full load airflow
2. Loss of either all FD fans or all ID fans
3. Loss of all flame
4. Partial loss of flame predetermined to be likely to introduce a hazardous accumulation of unburned fuel in accordance with Table 6.4.2.3.1(a), block 8
5. Furnace pressure in excess of the prescribed operating pressure by a value recommended by the manufacturer
6. All fuel inputs shut off in accordance with Table 6.4.2.3.1(a), block 9 (See 6.4.2.3.9 for a list of the required interlocks and trips for individual pulverizer subsystems.)

Insert text to match requirements of 2011 edition FIGURE 6.4.2.3.1 and TABLE 6.4.2.3.1(a). Text to read:

(9) Low Drum Water Level in accordance with Table 6.4.2.3.1(a), block 10.

Statement of Problem and Substantiation for Public Input

Subsequent text does not include a requirement previously included in the text.

Submitter Information Verification

Submitter Full Name: Steven Graf
Organization: Emerson Process Management
Submittal Date: Mon Dec 10 10:35:07 EST 2012

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**Public Input No. 8-NFPA 85-2012 [ Section No. A.6.4.2.3.1 ]**

**A.6.4.2.3.1**

In block 8 of Table 6.4.2.3.1(a), the partial loss of flame described is potentially more hazardous at lower load levels. The decision regarding specific requirements or implementation of this trip should be a design decision based on furnace configuration, total number of burners, number of burners affected as a percentage of burners in service, arrangement of burners affected, interlock system, and load level. This trip is interlocked through flame supervisory equipment.

In block 9 of Table 6.4.2.3.1(a), the tables referenced describe the allowable differences in operating procedures based on the classification of igniter being used. The following descriptions of conditions are typical for both Table 6.4.2.3.1(b) and Table 6.4.2.3.1(c).

1. **Condition 1:** An event in which, after a successful boiler purge, an attempt(s) to place the first igniter in service fails

2. **Condition 2:** An event in which an igniter(s) has been proven in service and subsequently all igniters are shut down without the attempt ever having been made to place a burner or pulverizer in service

3. **Condition 3:** An event in which gas and/or oil fuel burners were started or attempted to be started and all burner valves were subsequently closed while igniters remain proven in service

4. **Condition 4:** An event in which a pulverizer system(s) was started up or attempted to be started up and subsequently all pulverizer systems were shut down while igniters remain proven in service

5. **Condition 5:** An event in which any fuel has been placed in service and all fuel subsequently shut off

In the event that any main fuel is shut down while any other main fuel remains proven in service, the all-fuel-off master fuel trip requirements do not apply.

In block 10 of Table 6.4.2.3.1(a), low drum water level has been included as a master fuel trip. Although low drum water level is not a combustion-related hazard, NFPA 85 is the primary resource for identifying BMS requirements, and not including a low drum level trip in Figure 6.4.2.3.1 has created confusion with users of this code. A master fuel trip based on low drum water level for drum-type boilers is commonly recognized good engineering practice. Drum level measurement should take into account of liquid density changes due to pressure variations.

**Statement of Problem and Substantiation for Public Input**

There are many methods to measure actual drum level. A common method is to measure dP and perform density compensation using drum pressure via smart transmitter or in PLC (DCS).

A general statement is included to remind User that the chosen level measurement method should take into account of liquid density changes due to pressure and temperature variations.

**Submitter Information Verification**

Submitter Full Name: SINMING KWONG
Organization: EMERSON PROCESS MANAGEMENT PWS
Submittal Date: Fri May 25 09:38:44 EDT 2012

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A6.4.2.3.4.2 (D) (1)
When shutting down a unit for maintenance it is preferable to open all dampers and allow an open air path through the boiler enclosure.

Statement of Problem and Substantiation for Public Input

Open Air Path Task group - Addition of annex material to state the preferential state of the open air path by the committee.

Submitter Information Verification

Submitter Full Name: Daniel May
Organization: Burns & McDonnell Engineering
Submittal Date: Tue Dec 11 11:01:12 EST 2012

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A.6.4.2.3.4.2 (D) (2)
In some operating conditions it may be preferable to close all boiler enclosure dampers (retain heat within the boiler). Additional provisions should be considered when closing all dampers to prevent fuel in leakage to the boiler enclosure.

Statement of Problem and Substantiation for Public Input

Open Air Path task group - Additional annex material to warn the designer that closing the boiler dampers may create an additional hazard. Additional operational and safety interlocks should be considered when the boiler enclosure is closed off.

Submitter Information Verification

Submitter Full Name: Daniel May
Organization: Burns & McDonnell Engineering
Submittal Date: Tue Dec 11 11:04:56 EST 2012

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A.6.4.2.3.4.6(2)

Analyzers could contain heated elements that exceed the autoignition temperature of some fuels. Zirconium oxide analyzers, commonly used for oxygen analysis, contain an element heated to 1300°F (704°C). This high temperature element presents a potential ignition source to unburned fuel that could be present at startup. Some analyzers are designed to protect the sampled space from the ignition source by providing flashback protection (such as flame arresters in sample gas path). Analyzers with that protection or that are not heated to autoignition temperature do not present an ignition hazard. It should be noted, however, that flame arrestors may only work below a certain temperature which is usually not quantified, may not quench a flame as well once it becomes corroded and may induce a speed of response delay that could be detrimental to the control or protection strategy. Consideration should be given to powering down analyzers during boiler or fuel trip situations if they can exceed the autoignition temperature of the fuel being fired.

Statement of Problem and Substantiation for Public Input

Discussions with a major supplier of zirconium oxide based oxygen analyzers revealed the stated limitations of flame arrestors and those limitations need to be understood by users of the Code. This same change is being proposed against identical annex material in A.5.3.4.6.3, A.6.4.2.3.4.6(2) and A.7.6.2.1.1(10).

Submitter Information Verification

Submitter Full Name: Dale Evely
Organization: Southern Company Services, Inc
Submittal Date: Thu Nov 29 09:24:53 EST 2012

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A.6.4.2.3.6.4 FD fans are typically not used to control furnace pressure. However, loss of ID fans requires an MFT, and the subsequent flame collapse, along with the loss of FD fans, can create a severe negative furnace draft excursion. Delayed tripping of the FD fan(s) may result in reducing the severity of negative pressure excursion, thus aiding in maintaining furnace pressure within limits. The transient analysis also needs to consider the potential for positive pressure rebound during this scenario.
A.6.4.3.2
It is recommended that provisions be made in the design for possible future conversion to automatic trips in the interlock system. Additional alarms and monitors are recommended. In addition to the required alarms, the following alarms are recommended to indicate abnormal conditions and, where applicable, to alarm in advance of an emergency shutdown:

1. **Burner register closed.** This alarm provides control room indication or alarm for the condition that all secondary air burner dampers are closed on an operating burner.

2. **Combustibles or carbon monoxide (high).** This alarm warns the operator of a possible hazardous condition by alarming when measurable combustibles are indicated and by providing a second alarm when combustibles reach a dangerous level.

3. **Oxygen (low).** This alarm warns the operator of a possible hazardous condition.

4. **Flue gas analyzer failure.** This alarm warns the operator that some failure has occurred in the detection or sampling system and that the associated reading or alarms cannot be trusted.

5. **Change in calorific content of the fuel gas.** In the event that the gas supply is subject to heating value fluctuations in excess of 1863 kJ/m³ (50 Btu/ft³), a meter in the gas supply or an oxygen meter on the flue gas should be provided.

6. **Air-fuel ratio (high and low).** If proper metering is installed, this alarm can be used to indicate a potentially hazardous air-fuel ratio with an alarm indicating approach to a fuel-rich condition and a second alarm indicating approach to a hazardous fuel-rich condition.

7. **Flame detector trouble.** This alarm warns the operator of a flame detector malfunction.

8. **Main oil viscosity (high).** If the viscosity of the fuel supply is variable, it is recommended that a viscosity meter be used to provide the alarm. Interlocking to trip on high viscosity also should be considered in such cases.

9. **Ignition fuel supply pressure (low).** The ignition fuel supply pressure should be monitored at a point as far upstream of the control and safety shutoff valves as practicable.

10. **Main oil temperature (high).** This alarm is used for heated oils only.

11. **No load on pulverizer.** This alarm warns when the pulverizer-indicated coal load is substantially below normal and the feeder is running.

12. **Pulverizer overload.** This alarm warns when the pulverizer-indicated coal load is above the normal range.

Monitors of furnace conditions include the following:

1. **Furnace television.** A properly designed and installed furnace television can be of significant value as a supplementary indication of flame and other conditions in some furnace designs. It is of particular value during start-up in viewing igniters and individual burners for proper ignition. This is an aid to, but not a substitute for, visual inspection by the owner/operator.

2. **Flame detector indication.** This television monitor provides a means for operator observation of flame detector output signal strength.

**Statement of Problem and Substantiation for Public Input**

As written, this paragraph is open to misinterpretation as to who should do the inspection.

Jurisdictional authorities (AHJ) have for many years been inappropriately interpreting NFPA 85 as containing in-service inspection responsibilities for the National Board Commissioned Boiler Inspectors employed by Authorized Inspection Agencies as defined by the National Board document NB-369 Qualifications and Duties for Authorized Inspection Agencies (AIAs) Performing Inservice Inspection Activities and Qualifications for Inspectors of Boilers and Pressure Vessels. This has caused significant legal issues for Authorized Inspection Agencies. The proposed change is intended to make it clear that NFPA 85 does not contain any requirements for in-service inspections for these agencies.

**Related Public Inputs for This Document**
**Related Input**

Public Input No. 132-NFPA 85-2013 [Section No. 3.2.2]

**Submitter Information Verification**

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<tr>
<th>Submitter Full Name:</th>
<th>Brian Moore</th>
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<tbody>
<tr>
<td>Organization:</td>
<td>Hartford Steam Boiler Inspecti</td>
</tr>
<tr>
<td>Submittal Date:</td>
<td>Wed Jan 02 15:11:53 EST 2013</td>
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A.6.5.1.3.2.2

The ID fan head capability increases due to significant draft losses beyond the air heater or for other reasons, such as excessive ID fan test block margins. Where the ID fan test block capability is more negative than -8.7 kPa (-35 in. of water), consideration should be given to an increased negative design pressure. Examples: If the test block capability of the ID fan at ambient temperature is -3.7 kPa (-15 in. of water), then the minimum negative design pressure is -3.7 kPa (-15 in. of water). If the test block capability of the ID fan at ambient temperature is -9.9 kPa of water (-40 in. of water), then the minimum negative design pressure is -8.7 kPa (-35 in. of water).

Negative pressure transients associated to an MFT, both normal and abnormal, should be analyzed. Methods, such as designing the appropriate closing time of the individual burner safety shutoff valves and the main fuel safety shutoff valve, can be utilized to help minimize excessive negative furnace pressure transients. The generally recommended closure time is 3 to 5 seconds which is expected to mitigate negative pressure transients. Such designs must comply with 6.4.2.3.1 (A) and 6.6.5.2.5.4 (D).

Statement of Problem and Substantiation for Public Input

Adds clarification to A. 6.5.1.3.2.2 by identifying typical closure times of fuel safety shutoff valves, and that designing the closure times of fuel safety shutoff valves can have a positive impact on furnace negative pressure transients.

Submitter Information Verification

Submitter Full Name: Harold Yates
Organization: HRY, Inc.
Submittal Date: Wed Nov 07 06:59:17 EST 2012

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A.6.6.3.2.6
Special recognition should be given to the fire hazards imposed by leakage or rupture of piping at the burner.

Statement of Problem and Substantiation for Public Input

DELETE Appendix A.6.6.3.2.6

Appendix text has been moved to new A.4.4.1.8

Submitter Information Verification

Submitter Full Name: Jimmie Schexnayder
Organization: Entergy Corporation
Submittal Date: Tue Dec 18 13:03:43 EST 2012

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Statement of Problem and Substantiation for Public Input

As written, this paragraph is open to interpretation as to who should conduct the inspection.

Jurisdictional authorities (AHJ) have for many years been inappropriately interpreting NFPA 85 as containing in-service inspection responsibilities for the National Board Commissioned Boiler Inspectors employed by Authorized Inspection Agencies as defined by the National Board document NB-369 Qualifications and Duties for Authorized Inspection Agencies (AIAs) Performing Inservice Inspection Activities and Qualifications for Inspectors of Boilers and Pressure Vessels. This has caused significant legal issues for Authorized Inspection Agencies. The proposed change is intended to make it clear that NFPA 85 does not contain any requirements for in-service inspections for these agencies.

Related Public Inputs for This Document

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<th>Related Input</th>
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<td>Public Input No. 132-NFPA 85-2013 [Section No. 3.2.2]</td>
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Submitter Information Verification

Submitter Full Name: Brian Moore
Organization: Hartford Steam Boiler Inspecti
Submittal Date: Wed Jan 02 13:36:52 EST 2013

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Public Input No. 126-NFPA 85-2012 [ Section No. A.6.7.3.2.6 ]

A.6.7.3.2.6
Special recognition should be given to the fire hazards imposed by leakage or rupture of piping at the burner. Particular attention should be given to the integrity of flexible hoses and swivel joints.

Statement of Problem and Substantiation for Public Input

DELETE appendix A.6.7.3.2.6

Wording has been moved to new A.4.4.1.8; see public input.

Submitter Information Verification

Submitter Full Name: Jimmie Schexnayder
Organization: Entergy Corporation
Submittal Date: Tue Dec 18 13:16:10 EST 2012

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A.6.7.5.2.1.1(2)
Such an owner/operator inspection is particularly important for a cold start where the fuel burned prior to shutdown contained volatile vapors heavier than air.

Statement of Problem and Substantiation for Public Input

As written, this paragraph is open to interpretation as to who should conduct the inspection.

Jurisdictional authorities (AHJ) have for many years been inappropriately interpreting NFPA 85 as containing in-service inspection responsibilities for the National Board Commissioned Boiler Inspectors employed by Authorized Inspection Agencies as defined by the National Board document NB-369Qualifications and Duties for Authorized Inspection Agencies (AIAs) Performing Inservice Inspection Activities and Qualifications for Inspectors of Boilers and Pressure Vessels. This has caused significant legal issues for Authorized Inspection Agencies. The proposed change is intended to make it clear that NFPA 85 does not contain any requirements for in-service inspections for these agencies.

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Submitter Information Verification

Submitter Full Name: Brian Moore
Organization: Hartford Steam Boiler Inspecti
Submittal Date: Wed Jan 02 13:51:11 EST 2013

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**Public Input No. 170-NFPA 85-2013 [Section No. A.6.8.2.1(4)]**

| A.6.8.2.1(4) |
Pulverizer system explosions have resulted from the accumulation of pulverized coal in the hot air, tempering air, and coal pipe seal air supply system that are shared by a group of pulverizers. Provisions are to be made in the design of the system to prevent these occurrences and to allow periodic inspections by the owner/operator.

---

**Statement of Problem and Substantiation for Public Input**

As written, this paragraph is open to misinterpretation as to who should do the inspection.

Jurisdictional authorities (AHJ) have for many years been inappropriately interpreting NFPA 85 as containing in-service inspection responsibilities for the National Board Commissioned Boiler Inspectors employed by Authorized Inspection Agencies as defined by the National Board document NB-369 Qualifications and Duties for Authorized Inspection Agencies (AIAs) Performing Inservice Inspection Activities and Qualifications for Inspectors of Boilers and Pressure Vessels. This has caused significant legal issues for Authorized Inspection Agencies. The proposed change is intended to make it clear that NFPA 85 does not contain any requirements for in-service inspections for these agencies.

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Organization: Hartford Steam Boiler Inspector  
Submittal Date: Wed Jan 02 15:25:43 EST 2013

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A.6.8.3.2.6
Special attention should be given to the fire hazards imposed by leakage or rupture of piping near the burner.

Statement of Problem and Substantiation for Public Input
DELETE Appendix A.6.8.3.2.6
Appendix wording has been moved to new appendix A.4.4.1.8, see public input.

Submitter Information Verification
Submitter Full Name: Jimmie Schexnayder
Organization: Entergy Corporation
Submittal Date: Tue Dec 18 13:17:47 EST 2012

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Public Input No. 173-NFPA 85-2013 [Section No. B.3.4.1]

B.3.4.1 Prefiring Cycle.

The operator should take the steps listed in Table B.3.4.1 when starting a supervised manual unit and satisfy the interlocks at each step. Control system energy, power and water levels, fuel supply, and atomizing medium should be established, if used. Furnace and gas passages should be inspected by the owner/operator to determine whether they are in good repair. Prior to start-up, it should be determined that the unit and its associated systems are evacuated of all personnel and all access and inspection doors are closed.

Table B.3.4.1 Operator Actions, Prefiring Cycle

<table>
<thead>
<tr>
<th>Operator Actions*</th>
<th>Interlock Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Inspect furnace for unburned oil accumulations.</td>
<td>(1) None.</td>
</tr>
<tr>
<td>(2) Confirm burner guns have proper tips and sprayer plates.</td>
<td>(2) None.</td>
</tr>
<tr>
<td>(3) Confirm individual burner safety shutoff valve is closed.</td>
<td>(3) Proved.</td>
</tr>
<tr>
<td>(4) Confirm supervisory shutoff valves are closed.</td>
<td>(4) Proved.</td>
</tr>
<tr>
<td>(5) Confirm burner gun is in proper position.</td>
<td>(5) None.</td>
</tr>
<tr>
<td>(6) Confirm main fuel control valve is in light-off position.</td>
<td>(6) Proved.</td>
</tr>
<tr>
<td>(7) Confirm atomizing medium header has been blown free of condensate and header trap is functioning.</td>
<td>(7) None.</td>
</tr>
<tr>
<td>(8) Start fan(s).</td>
<td>(8) Prove fans are operating.</td>
</tr>
<tr>
<td>(9) Open main safety shutoff valve and recirculation valve to circulate heated oil through main fuel bypass control valve and the burner header.</td>
<td>(9) Prove all interlocks are satisfied.</td>
</tr>
<tr>
<td>(10) Open main damper(s) to purge position.</td>
<td>(10) Prove purge airflow rate. <em>[See B.3.1(1) and B.3.1(2).]</em></td>
</tr>
<tr>
<td>(11) Open all burner registers to purge position.</td>
<td>(11) None.</td>
</tr>
<tr>
<td>(12) Start purge timer and purge.</td>
<td>(12) None.</td>
</tr>
<tr>
<td>(13) Open atomizing medium individual burner shutoff valve to the burner gun to be lighted. Blow free of condensate. Confirm atomizing pressure has been established.</td>
<td>(13) Prove atomizing medium is available.</td>
</tr>
<tr>
<td>(14) Immediately proceed with light-off cycle after completion of purge.</td>
<td>(14) Repurge if airflow rate drops below purge rate prior to initiation of light-off cycle.</td>
</tr>
</tbody>
</table>

Note: See Figure B.1.1(c) through Figure B.1.1(e).

*Actions are not necessarily performed in the order shown.

Statement of Problem and Substantiation for Public Input

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<td><strong>Organization:</strong></td>
<td>Hartford Steam Boiler Inspection</td>
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C.1.5.1 Prefiring Cycle — Gas.

The operator should take the steps in Table C.1.5.1 when starting a manual system and satisfy the required interlocks at each step. [See Figure C.1.5.1(a) and Figure C.1.5.1(b).] Control system energy, power and water levels, and fuel supply should be established. Prior to start-up, furnace and gas passages should be inspected by the owner/operator to determine whether they are in good repair. It should be determined that the unit and its associated systems are evacuated of all personnel and that all access and inspection doors are closed.

Table C.1.5.1 Operator Actions, Prefiring Cycle

<table>
<thead>
<tr>
<th>Operator Actions*</th>
<th>Interlock Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Confirm individual burner and igniter supervisory shutoff valves are closed.</td>
<td>(1) Prove burner and igniter supervisory shutoff valves closed.</td>
</tr>
<tr>
<td>(2) Confirm main and igniter safety shutoff valves are closed.</td>
<td>(2) None.</td>
</tr>
<tr>
<td>(3) Confirm main fuel control valves are closed.</td>
<td>(3) None.</td>
</tr>
<tr>
<td>(4) Open all burner registers to firing position.</td>
<td>(4) None.</td>
</tr>
<tr>
<td>(5) Start fans.</td>
<td>(5) None.</td>
</tr>
<tr>
<td>(6) Open damper(s) to purge position.</td>
<td>(6) Prove purge airflow rate.</td>
</tr>
<tr>
<td>(7) Start purge timer and purge boiler per operating instructions.</td>
<td>(7) None.</td>
</tr>
<tr>
<td>(8) Immediately proceed with light-off cycle after completion of purge.</td>
<td>(8) None.</td>
</tr>
</tbody>
</table>

Note: See Figure C.1.5.1(a) and Figure C.1.5.1(b).

*Actions are not necessarily performed in the order shown.

Figure C.1.5.1(a) Typical Ignition System — Manual.

Figure C.1.5.1(b) Typical Fuel Supply System for Natural Gas-Fired Multiple Burner Boiler — Manual.

Statement of Problem and Substantiation for Public Input

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C.2.5.1 Prefiring Cycle — Oil (Steam Atomized, Heated Oil).

The operator should follow the steps given in Table C.2.5.1 when starting a manual system and satisfy the required interlocks at each step. [See Figure C.2.5.1(a) through Figure C.2.5.1(c).] Control system energy, power and water levels, fuel supply, and atomizing medium, if used, should be established. Prior to start-up, furnace and gas passages should be inspected by the owner/operator to determine whether they are in good repair. It should be determined that the unit and its associated systems are evacuated by all personnel and that all access and inspection doors are closed.

Table C.2.5.1 Operator Actions, Prefiring Cycle

<table>
<thead>
<tr>
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<th>Interlock Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Inspect furnace for unburned oil accumulations.</td>
<td>(1) None.</td>
</tr>
<tr>
<td>(2) Confirm burner gun for proper tips or sprayer plates and place gun in proper position.</td>
<td>(2) None.</td>
</tr>
<tr>
<td>(3) Confirm individual burner and igniter supervisory shutoff valves are closed.</td>
<td>(3) Prove burner and igniter supervisory shutoff valves closed.</td>
</tr>
<tr>
<td>(4) Confirm main and igniter safety shutoff valves are closed.</td>
<td>(4) None.</td>
</tr>
<tr>
<td>(5) Confirm main fuel control valve is closed.</td>
<td>(5) None.</td>
</tr>
<tr>
<td>(6) Confirm that atomizing steam header has been blown free of condensate and header trap is functioning.</td>
<td>(6) None.</td>
</tr>
<tr>
<td>(7) Open all burner registers to firing position.</td>
<td>(7) None.</td>
</tr>
<tr>
<td>(8) Start fans.</td>
<td>(8) None.</td>
</tr>
<tr>
<td>(9) Open main damper(s) to purge position.</td>
<td>(9) Prove purge airflow rate.</td>
</tr>
<tr>
<td>(10) Open main fuel bypass control valve, main safety shutoff valve, and recirculating valve to circulate heated oil through the main fuel bypass control valve and burner header.</td>
<td>(10) Prove all required interlocks satisfied except burner header low fuel pressure switch, which is bypassed by a circuit completed only when all individual burner supervisory valves are closed.</td>
</tr>
<tr>
<td>(11) Start purge timer and purge boiler per operating instructions.</td>
<td>(11) None.</td>
</tr>
<tr>
<td>(12) Open atomizing medium valve to the burner gun to be lighted. Blow free of condensate. Confirm atomizing pressure has been established.</td>
<td>(12) None.</td>
</tr>
<tr>
<td>(13) Immediately proceed with light-off cycle after completion of purge.</td>
<td>(13) None.</td>
</tr>
</tbody>
</table>

Note: See Figure C.2.5.1(a) through Figure C.2.5.1(c).

*Actions are not necessarily performed in the order shown.

Figure C.2.5.1(a) Typical Ignition System — Manual.

Figure C.2.5.1(b) Typical Mechanical Atomizing Light Oil Igniter System — Manual.
Statement of Problem and Substantiation for Public Input

As written, this paragraph is open to misinterpretation as to who should do the inspection.

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Submittal Date: Wed Jan 02 15:46:52 EST 2013

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K.2 Gas Firing.

The following items should be considered in the design of the fuel gas firing systems:

(1) Gas is colorless; therefore, a leak usually cannot be detected visually. Also, reliance cannot be placed on detection of a gas leak by the presence of odor.

(2) Potentially hazardous conditions are most likely to occur within buildings, particularly where the gas piping is routed through confined areas. In the latter instance, adequate ventilation should be provided. Outdoor steam generators tend to minimize confined area problems.

(3) Natural gas can be either “wet” or “dry.” A wet gas usually implies the presence of distillate, which could be characteristic of a particular source. In the case of such a wet gas, the carryover of distillate into the burners could result in a momentary flameout and possible reignition. Reignition could result in an explosion. Therefore, special precautions should be taken with wet gas supply systems. (See NFPA 54, National Fuel Gas Code.)

(4) Discharges from relief valves or from any other form of atmospheric vents can become hazardous unless special precautions are taken.

(5) Maintenance and repair of gas piping can be hazardous unless proper methods are used for purging and recharging the line before and after making the repairs. (See NFPA 54, National Fuel Gas Code.)

(6) Most natural gas that is supplied to boilers typically or HRSGs typically is lighter than air and presents no special problems in the atmosphere over and above those addressed in this code. Because of developing energy cost considerations, many boilers are using a gas or a mixture of gases with heavier-than-air characteristics. These heavier-than-air gases, such as propane-air mixtures, refinery gases, and so forth, require special consideration in storing, handling, and venting to prevent accumulations in depressions or in confined areas.

(7) The nature of gas fuel creates the possibility of severe departures from design air-fuel ratios, without any visible evidence at the burners, furnace, or stack, that could escalate into a progressively worsening condition. Therefore, combustion control systems that respond to reduced boiler steam pressure or steam flow with an impulse for more fuel, unless protected or interlocked to prevent a fuel-rich mixture, are potentially hazardous. This hazard would also apply to firing with fuel or air on manual without the aforementioned interlocks or alarms.

(8) Widely different characteristics of gas from either single or multiple sources could result in a significant change in heat input rate to the burners without a corresponding change in airflow.

(9) Relief valves and atmospheric vents should discharge into areas away from building ventilation systems, sources of ignition, or other areas where the discharge gases create a hazard.

(10) Gas piping should be purged before and after maintenance and repair as defined in NFPA 54, National Fuel Gas Code.

Statement of Problem and Substantiation for Public Input

The hazards of natural gas also apply to HRSGs.

This comment is the result of work by a Task Group created by the HRSG Technical Committee to review chapters 3 & 4 for inconsistencies relative to chapter 8.

Submitter Information Verification

Submitter Full Name: Gordon Gaetke
Organization: The Dow Chemical Company
Affiliation: NFPA 85 HRSG Technical Committee
Submittal Date: Thu Jan 03 11:55:32 EST 2013
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K.3 Oil Firing.

The following items should be considered in the design of the fuel oil–firing systems:

1. Firing of oil fuel into a HRSG can create a special hazard by causing soot accumulations in low temperature sections.

2. Small oil leaks can result in serious fire damage.

3. Water or sludge in fuel oil storage tanks or improperly located suction takeoffs from the storage tank can result in hazardous interruptions or pulsations of the fuel supply to the burners. A flameout, either immediately or at a later time, can result because of plugged strainers or burner tips.

4. Widely different characteristics of fuel oil from either a single source or multiple sources can result in a significant change in heat input rate to the burner(s) without an equivalent change in airflow or without an appropriate change in fuel oil temperature to restore the flowing viscosity to the proper value. Different shipments of fuel oil with dissimilar characteristics can cause a precipitation of sludge that can lead to hazards.

5. Inserting an oil gun in the burner assembly without a tip, new gaskets, or a sprayer plate is a constant hazard and can result in an unsafe operating condition.

6. Clear distillate fuels have low rates of conductivity and generate static electrical charges in the fuel stream that can be dangerous unless flowing velocities are limited. (See NFPA 77, Recommended Practice on Static Electricity, and API RP 2003, Recommended Practice for Protection Against Ignitions Arising out of Static, Lightning, and Stray Currents.)

7. Maintenance and repair of oil piping can be hazardous unless correct methods are used for purging and recharging the line before and after making repairs. (See NFPA 31, Standard for the Installation of Oil-Burning Equipment.)

8. The incompressibility of fuel oil can create very rapid transients in oil flow through operating burners when the following occur:

   a. Rapid operation of the oil supply valve
   b. Rapid operation of individual burner shutoff valves
   c. Rapid operation of the regulating valve in the return oil line from the burner header (on systems using this type of control)

9. Where oils that need preheating are fired, the viscosity of oil flowing to the burners should be held within limits to maintain proper atomization.

10. On installations designed to fire both heated and unheated fuel oils, consideration should be given to the design of the burner control system to ensure that proper interlocks are activated for the selected fuel oil. Similar considerations should also be given to the fuel oil piping supply to the burner as well as the oil recirculating piping to the fuel storage tanks, depending on the arrangement of the equipment provided.

11. Proper pumping and atomization of fuel oils are dependent on control of viscosity. Changes in viscosity in relation to temperature vary for different oils and blends of oils. Close attention should be given to the design and operation of viscosity control systems for each fuel where its source or properties are variable.

12. The operation of air heater sootblowers, cleaning devices, should be in accordance with the recommendations of the air heater manufacturer. Initial firing of oil fuel in a cold boiler can create a special hazard by causing fires in air heaters.

Statement of Problem and Substantiation for Public Input

NFPA 85 states specific requirements for the operation of sootblowers to prevent a hazardous condition from the re-entrainment of ash in the flue gas stream. Sonic horns, air cannons, and pulse detonation devices are being used in boilers and SCRs to supplement and/or replace sootblowers for cleaning and could possibly result in the same hazardous conditions.

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<th><strong>Submitter Full Name:</strong></th>
<th>WILLIAM MEDEIROS</th>
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</thead>
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<td><strong>Organization:</strong></td>
<td>Babcock Power</td>
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<tr>
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Attachment C:
Pre-FD Meeting Actions
(D)—

After completion of the boiler enclosure purge, the unit shall be permitted to either:

Shut down, closing the burner air registers and shutting down the FD and ID fans; however, maintaining airflow through the unit to prevent accumulation of combustible gases is a prudent procedural step due to the potential of fuel leak-by.

Relight in accordance with 6.6.5, 6.7.5, or 6.8.5, as applicable, depending on the fuels being fired.

Submitter Information Verification

Submitter Full Name: Kimberly Shea
Organization: National Fire Protection Assoc
Submittal Date: Fri Jan 11 12:06:54 EST 2013

Committee Statement and Meeting Notes

Committee Statement: The committee deleted sub-paragraph (D) because shutting down or relighting are the only options. There is no reason to state them in the code.
6.4.3.2.27 Axial Flow Fan Nearing Stall Line. This condition shall be sensed and alarmed in accordance with the manufacturer's recommendations.

Submitter Information Verification

Submitter Full Name: Kimberly Shea  
Organization: National Fire Protection Assoc  
Submittal Date: Fri Jan 11 12:08:42 EST 2013

Committee Statement and Meeting Notes

Committee Statement: The committee added a requirement for consistency with other subparagraphs in this section.  
Response Message: FR-21-NFPA 85-2013
6.4.3.2.30 Reburn Fuel Oil Supply Pressure Low. This alarm shall apply to units with a reburn system.

Submitter Information Verification

Submitter Full Name: Kimberly Shea
Organization: National Fire Protection Assoc
Submittal Date: Fri Jan 11 12:09:57 EST 2013

Committee Statement and Meeting Notes

Committee Statement: The committee added a requirement for consistency with other sub-paragraphs in this section.
Response: FR-22-NFPA 85-2013
6.6.5.2.3.9
After completion of the unit purge, closing the burner air registers and forced and induced draft fans shall be permitted to be shut down.

6.6.5.2.3.10*. After shutting down the forced draft fans and induced draft fans, dampers in the flue gas path shall be permitted to be optional; however, maintaining airflow through the unit to prevent accumulation of combustible gases is a prudent procedural step due to the potential of fuel leak-by closed.
First Revision No. 27-NFPA 85-2013 [Section No. 6.6.5.2.3.10]

6.6.5.2.3.10
Leakage of main or igniter fuel into the furnace or windbox shall be prevented.

Submitter Information Verification

Submitter Full Name: Kimberly Shea
Organization: National Fire Protection Assoc
Submittal Date: Fri Jan 11 12:22:57 EST 2013

Committee Statement and Meeting Notes

Committee Statement: The committee deleted the subparagraph because it contains unenforceable language. In addition, there are already several steps in the normal shutdown procedure that should prevent leakage of fuel.
6.7.5.2.3.10
After completion of the unit purge, closing the burner air registers and forced and induced draft fans shall be permitted to be shut down.

6.7.5.2.3.11* After shutting down the
FD fans forced and
ID fans induced draft fans, dampers in the flue gas path shall be permitted to be optional; however, maintaining airflow through the unit to prevent accumulation of combustible gases is a prudent procedural step due to the potential of fuel leak-by closed.
Leakage of main or igniter fuel into the furnace or windbox shall be prevented.

Submitter Information Verification

Submitter Full Name: Kimberly Shea
Organization: National Fire Protection Assoc
Submittal Date: Fri Jan 11 13:48:15 EST 2013

Committee Statement and Meeting Notes

Committee Statement: The committee deleted the subparagraph because it contains unenforceable language. In addition, there are already several steps in the normal shutdown procedure that should prevent leakage of fuel.
Response Message: FR-32-NFPA 85-2013
6.8.5.2.3.6
After completion of the unit purge, closing the burner air registers and forced and induced draft fans shall be permitted to be shut down.

6.8.5.2.3.7* After shutting down the
forced and
induced draft fans, dampers in the flue gas path shall be permitted to be optional; however, maintaining airflow through the unit to prevent accumulation of combustible gases is a prudent procedural step due to the potential of fuel leak-by closed.

Submitter Information Verification

Submitter Full Name: Kimberly Shea
Organization: National Fire Protection Assoc
Submittal Date: Fri Jan 11 13:46:24 EST 2013

Committee Statement and Meeting Notes

Committee Statement: The committee separated the requirements into new paragraphs, revised the language for clarity, and moved the unenforceable language to the annex.
Response Message: FR-31-NFPA 85-2013
## 6.8.5.2.3.7

Leakage of main or igniter fuels into the unit shall be prevented.

### Submitter Information Verification

<table>
<thead>
<tr>
<th>Submitter Full Name</th>
<th>Kimberly Shea</th>
</tr>
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### Committee Statement and Meeting Notes

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<th>The committee deleted the subparagraph because it contains unenforceable language. In addition, there are already several steps in the normal shutdown procedure that should prevent leakage of fuel.</th>
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<tr>
<td>Response Message</td>
<td>FR-33-NFPA 85-2013</td>
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</table>
A.6.6.5.2.10
Maintaining airflow through the unit to prevent accumulation of combustible gases is a prudent procedural step due to the potential of fuel leak-by.

Submitter Information Verification

Submitter Full Name: Kimberly Shea
Organization: National Fire Protection Assoc
Submittal Date: Fri Jan 11 12:18:04 EST 2013

Committee Statement and Meeting Notes

Committee Statement: Unenforceable language is moved from the body of the code to the annex.
Response Message: FR-26-NFPA 85-2013
A.6.7.5.2.1.3
Maintaining airflow through the unit to prevent accumulation of combustible gases is a prudent procedural step due to the potential of fuel leak-by.

Submitter Information Verification

Submitter Full Name: Kimberly Shea
Organization: National Fire Protection Assoc
Submittal Date: Fri Jan 11 12:27:19 EST 2013

Committee Statement and Meeting Notes

Committee Statement: The committee moved unenforceable language from 6.7.5.2.3.10 to the annex.
Response Message: FR-29-NFPA 85-2013
When the boiler is operating with pulverized coal for an extended time at reduced loads, incomplete combustion can cause large quantities of unburned combustible dust to settle in hoppers and on horizontal surfaces. If this dust is disturbed by a rapid increase in airflow or by sootblowing, an explosive mixture can result. This condition has been the cause of several explosions.

Submitter Information Verification

Submitter Full Name: Jenny Depew
Organization: NFPA
Submittal Date: Mon Jan 14 11:26:34 EST 2013

Committee Statement and Meeting Notes

Committee Statement: The committee deleted the annex material because it is redundant to the CAUTION statement in the mandatory text.
Response Message: FR-49-NFPA 85-2013
**First Revision No. 34-NFPA 85-2013 [ New Section after A.6.8.5.2.1.3 (B)(19) ]**

**A.6.8.5.2.3.7**
Maintaining airflow through the unit to prevent accumulation of combustible gases is a prudent procedural step due to the potential of fuel leak-by.

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**Submitter Information Verification**

Submitter Full Name: Kimberly Shea  
Organization: National Fire Protection Assoc  
Submittal Date: Fri Jan 11 13:52:46 EST 2013

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**Committee Statement and Meeting Notes**

Committee Statement: Unenforceable language has been moved to the annex.  
Response Message: FR-34-NFPA 85-2013