First Draft Meeting Agenda (F2022)

NFPA Technical Committee on Multiple Burner Boilers (BCS-MBB)

NFPA 85: Boiler and Combustion Systems Hazards Code

Web/Teleconference

Monday, March 22, 2021 and Tuesday, March 23, 2021

10:00am – 2:00pm (ET)

To Join the Meeting: Contact Yiu Lee at ylee@nfpa.org

1. Call to Order. Daniel May, Chair.

2. Introductions.

3. Approval of Meeting Minutes from Tuesday, September 15, 2020. (**Attachment A**)

4. Staff Updates. Heath Dehn, NFPA Staff
   - Staff Liaison Presentation
   - Committee Membership Roster (BCS-MBB) – Technical Committee on Multiple Burner Boilers (**Attachment B**)

5. Business.
   - Public Input(s) (**Attachment C**)

6. Other Business.
   - Component Purge Discussion – Mark Faurot, guest
     - Section 6.4.1.2.4.8(F) states that it is permissible to reset a component and place it back in service after a component purge is complete. Section 6.6.5.2.5.4(F) requires electrostatic precipitators to be tripped with a MFT. It may be interpreted that Figure 6.4.1.2.1 shows that this trip should be hardwired from the MFT relays. The requirement to trip the ESP from the MFT relays will prevent the ESP from being reset and placed back into service when a component purge is completed. Additionally, this requires the MFT relays be reset to remove the trip signal to the ESP. After a MFT event, it is common industry practice to place the ESP back into service after completing a component purge without resetting the MFT relays.
   - Task Groups

     Valve Proving Systems
     - Scope: Develop PIs for a vale proving system as it affects Ch 6.
     - Membership: Kevin Carlisle (chair), John C. Browning, Gail J. Lance, Roy Reeves, Franklin R. Switzer, Jr., and Donald Zissa

Interlock Functional Test

- Scope: Consider and submit Public Inputs on Interlock Functional Tests requirements.
- Membership: David King (chair), Jimmie Schexnayder, James Franks, Franklin R. Switzer, Jr., and Marc Cropp

7. Next Meeting.

8. Adjournment.

NATIONAL FIRE PROTECTION ASSOCIATION
The leading information and knowledge resource on fire, electrical and related hazards

NFPA 85 Technical Committee on Multiple Buner Boilers
Pre-First Draft Meeting Minutes

web/teleconference
9/15/2020

ATTENDANCE

Chair	Daniel R. May	Burns & McDonnell Engineering Company	SE
Staff Liaison	Heath Dehn	NFPA	Staff
Principals	Barry J. Basile	Leonardo Technologies, Inc.	U
	Denise Beach	FM Global	I
	Frank J. Bennett	NRG Energy	U
	John C. Browning	Georgia Pacific, LLC	U
	David E. Dexter	Dow Corning Corporation	U
	Kazuhiro Domoto	Mitsubishi Hitachi Power Systems, Ltd.	M
	Joseph E. Fehr	Power Engineers, Inc.	U
	Ronald J. Fleming	ABB Incorporated	M
	Kenneth Joe Frazier	Salt River Project	U
	Gail J. Lance	Babcock & Wilcox Company	M
	Roy Reeves	Emerson Automation Solutions	M
	Carlos Santos, Jr.	Schneider Electric	M
	Franklin R. Switzer, Jr.	S-afe, Inc.	SE
	James P. Walawender	Black & Veatch Corporation	SE
	Donald Zissa	SIS-TECH	SE
Voting Alternates	Marcus Cropp	Southern Company	U
Alternates	Brent Diley	Babcock & Wilcox	M
	Steven V. Graf	Emerson Automation Solutions	M
	Roger Lesaca	Mitsubishi Hitachi Power Systems Americas, Inc.	M
	J Douglas Thompson	The Dow Chemical Company	U
	Karen Whitehead	Black & Veatch Corporation	SE
	Tanesua Williams	NRG Energy	U
Guests	David King (BCS-AAC Chair)	Electric Power Research Institute (EPRI)	R/T
	Kevin Carlisle (BCS-SBB Member)	Karl Dungs, Inc.	M

NATIONAL FIRE PROTECTION ASSOCIATION

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1. **Call to Order.** Daniel May, Chair
   a. 11:01 am (ET)

2. **Approval of Second Draft Meeting Minutes form Jan 24, 2018.**
   a. Approved as written.

3. **Chairman's Remarks.**
   a. Welcome to new and existing TC members and guests
   b. Request to TC members to participate and contribute freely
   c.

4. **Remaining Key Dates of NFPA 85 Revision Cycle.**

Process Stage	Process Step	Dates for TC	Dates for TC with CC
Public Input Stage (First Draft)	Public Input Closing Date*	1/06/2021	1/06/2021
	Final Date for TC First Draft Meeting	6/16/2021	3/17/2021
	Posting of First Draft and TC Ballot	9/08/2021	6/09/2021
	Final date for Receipt of TC First Draft ballot	9/29/2021	6/30/2021
	Final date for Receipt of TC First Draft ballot - recirc	10/13/2021	7/07/2021
	Posting of First Draft for CC Meeting		7/21/2021
	Final date for CC First Draft Meeting		9/01/2021
	Posting of First Draft and CC Ballot		9/22/2021
	Final date for Receipt of CC First Draft ballot		10/13/2021
	Final date for Receipt of CC First Draft ballot - recirc		10/20/2021
	Post First Draft Report for Public Comment	10/27/2021	10/27/2021
Comment Stage (Second Draft)	Public Comment Closing Date*	1/05/2022	1/05/2022
	Notice Published on Consent Standards (Standards that received no Comments) Note: Date varies and determined via TC ballot.		
	Appeal Closing Date for Consent Standards (Standards that received no Comments)		
	Final date for TC Second Draft Meeting	6/29/2022	3/30/2022
	Posting of Second Draft and TC Ballot	8/24/2022	5/11/2022
	Final date for Receipt of TC Second Draft ballot	9/14/2022	6/01/2022
	Final date for receipt of TC Second Draft ballot - recirc	9/21/2022	6/08/2022
	Posting of Second Draft for CC Meeting		6/22/2022
	Final date for CC Second Draft Meeting		8/03/2022
	Posting of Second Draft for CC Ballot		8/24/2022
	Final date for Receipt of CC Second Draft ballot		9/14/2022
	Final date for Receipt of CC Second Draft ballot - recirc		9/21/2022
	Post Second Draft Report for NITMAM Review	10/05/2022	10/05/2022
Tech Session Preparation (& Issuance)	**Notice of Intent to Make a Motion (NITMAM) Closing Date**	11/02/2022	11/02/2022
	Posting of Certified Amending Motions (CAMs) and Consent Standards	12/14/2022	12/14/2022
	Appeal Closing Date for Consent Standards	12/29/2022	12/29/2022
	SC Issuance Date for Consent Standards	1/09/2023	1/09/2023
Tech Session	Association Meeting for Standards with CAMs		
Appeals and Issuance	Appeal Closing Date for Standards with CAMs		
	SC Issuance Date for Standards with CAMs		

5. **Business.**
   a. Task Groups
      - Appointment to an NFPA Task Group is open to all committee members and members of the public. If you are interested in becoming an active member in any of the following task groups please contact Yiu Lee at ylee@nfpa.org.

      i. **Valve Proving Systems**
         1. Kevin Carlisle provided a presentation to the committee which resulted in the creation of this task group. (**Attachment A**)
         2. Scope – Develop PIs for a vale proving system as it affects Ch 6.
         3. Members - Kevin Carlisle (chair), John C. Browning, Gail J. Lance, Roy Reeves, Franklin R. Switzer, Jr., and Donald Zissa

      ii. Interlock Functional Test Task Group
         1. Scope – Consider and submit Public Inputs on Interlock Functional Tests requirements.
         2. Members – David King (Chair), Jimmie Schexnayder, James Franks, Franklin Switzer, and Marc Cropp
         3. An update on this task group was not provided but an update and public inputs are still expected to be provided for the committee's review at the First Draft meeting.

      iii. **Plasma Arc Igniters** - Disbanded
         1. Several TG members are no longer active on the TG or currently members on the TC. Prior to the meeting the previous TG chair, Skip Yates, updated the TC chair with the current status of the TG. During the pre-FD meeting, the TC decided to disband the task group with no further actions. The committee will be interested in re-establishing the task group when further industry participation and interest is received. Until that time, the information found in Annex B, *Concentrated Flame Igniter Supplemental Information*, will continue to be the supplemental information offered by the committee.

6. **Other Business.**
   a. Public Inputs were reviewed and discussed with no action taken.

7. **Next Meeting.**
   a. The next committee meeting will be the First Draft meeting after the public input closing date.

8. **Adjourn.**
   a. The meeting was adjourned at 12:31 pm (ET).

Respectfully Submitted By:
Daniel R. May – Technical Committee Chair
Heath Dehn – NFPA Staff

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Valve Proving Systems & PI #12 of NFPA 85 (2018)

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PI #12 of NFPA 85 (2018)

6.6.3.1.10 A double block and vent valve arrangement shall be provided in the fuel line to each burner and each igniter. A valve proving system may be used as an alternative to a vent valve if the valve proving system has a leak detection limit of 1.0 cubic feet per hour and the valve proving system is proving only two valves in series per burner.

The committee's justification for rejecting PI 141: "MBB's have significantly higher risks and are more complex than SBB, and valve proving systems should not be accepted in place of double block can vent systems. In addition, the valving is larger and more complex".

Response:
1) By adding a detection limit 1.0 CFH, a VPS reduces the amount of leakage to the furnace more than the vent valve. So, within this case, a VPS should be permitted at an alternative.
2) If each burner has two valves in series, then installing a VPS is no less complex on a MBB than on a SBB, and this should not preclude the use of a VPS. In fact, installing a VPS in such a system would be less complex than installing a vent valve and running vent lines from each double block per burner.
3) A VPS can be used with large valves, and since a leakage rate has now been added to the paragraph, the use of large valves should not preclude the use of a VPS as an alternative.

Valve Proving Systems

Vent valves for gas fired equipment

- My understanding : Due to the loss history of explosions of equipment using fuel gas, Ford Motor Company and IRI Insurance (ca.1950s) introduced a safety design known as the “double block and vent”.
- Idea was to add a normally open vent valve between two blocking valves to relieve gas pressure that could build up due to failure of the first (upstream) shutoff valve.
- NFPA 85 had the vent valve requirement since the beginning (1st of NPFA 85B, which covered fuel gases) in the 1964-1966 timeframe.

Valve Proving Systems

Valve Proving Systems (VPS) for gas fired equipment

- In the 1950s and ’60s, as the gasification of Europe began, Europe adopted the “double block and vent” and “valve switch” concepts. As Europeans gained experience with fuel-fired equipment, incidences occurred that illustrated the shortcomings of proof-of-closure valve switches and vent valves.

- This provided the impetus for European manufacturers to look for other solutions, and the concept of a valve-proving system (VPS) was introduced in Germany in the early 1970s as an alternative to the normally open vent valve.

Valve Proving Systems

Valve Proving Systems (VPS) for gas fired equipment

- In the late 1980's, the EPA started to look at vent valves installed on large boilers (12.5 million and up). The EPA was going to charge the utility each time the boiler vented gas out the vent valve. IRI, who knew of the European method of VPS, introduced the VPS concept into the USA as an alternative to the vent valve where venting was illegal. Since then, the use of the VPS has expanded.
- First codes or standards inclusion of the VPS in the USA was NFPA 85 (1997). Then followed:
  - NFPA 86 (2003),
  - UL 795 (2006), &
  - NFPA 37 (2014).

Valve Proving Systems

Valve Proving Systems (VPS) for gas fired equipment

- DUNGS introduced the VPS in the USA in 1993.
- Siemens also introduced the VPS around that same time
- Honeywell and Kromschroder have since followed.

Valve Proving Systems

Definition per NFPA 85:

3.3.135 Valve-Proving System. In a gaseous or liquid fuel system, a system that proves the leak tightness of all safety shut-off valves and prevents main burner or igniter light-off if the test is not satisfied.

Definition per NFPA 86:

3.3.83* Valve Proving System. A system used to check the closure of safety shutoff valves by detecting leakage.

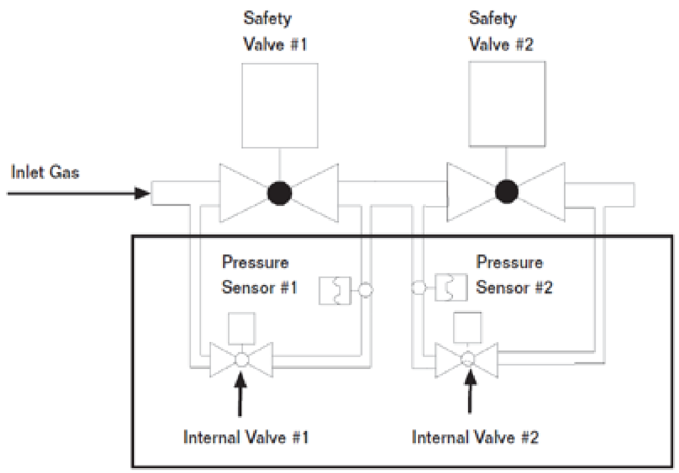
Definition per draft ANSI 23551-4 *Valve-proving systems for automatic shut-off valves*

System to check the closure of automatic shut-off valves by detecting leakage, that often consists of a programming unit, a measuring device, valves and other functional assemblies

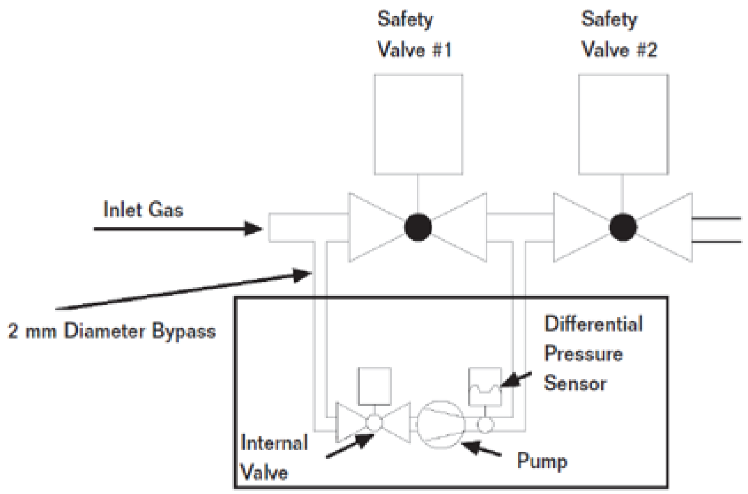
Valve Proving Systems

Valve Proving Systems (VPS) Pressure Decay or Mass Flow

Pressure Decay

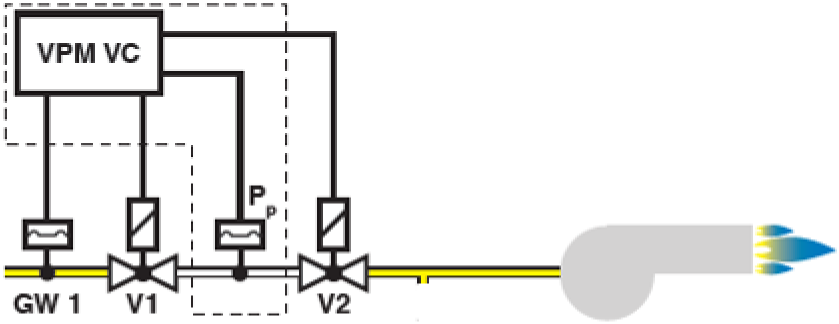


Mass Flow



Valve Proving Systems

VPS on single burner



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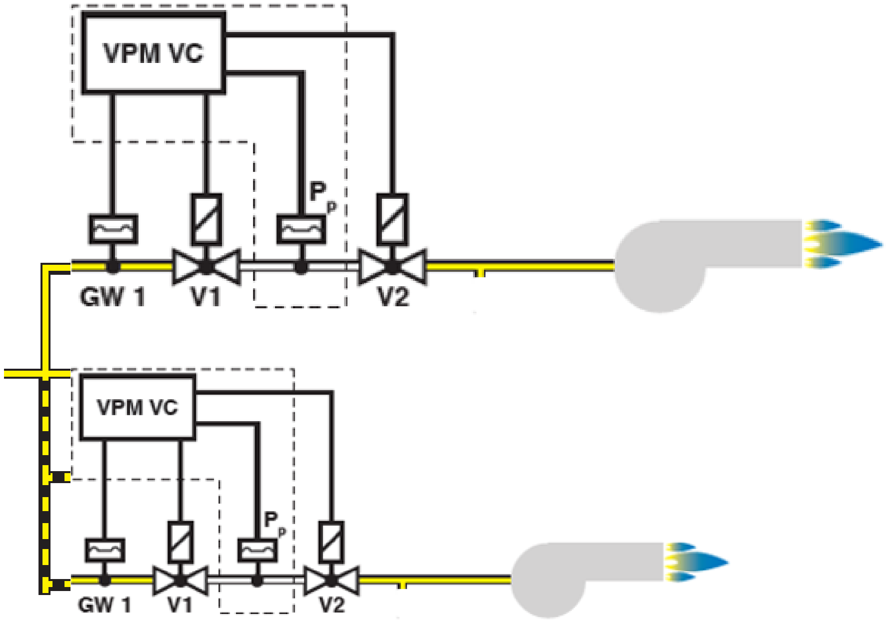
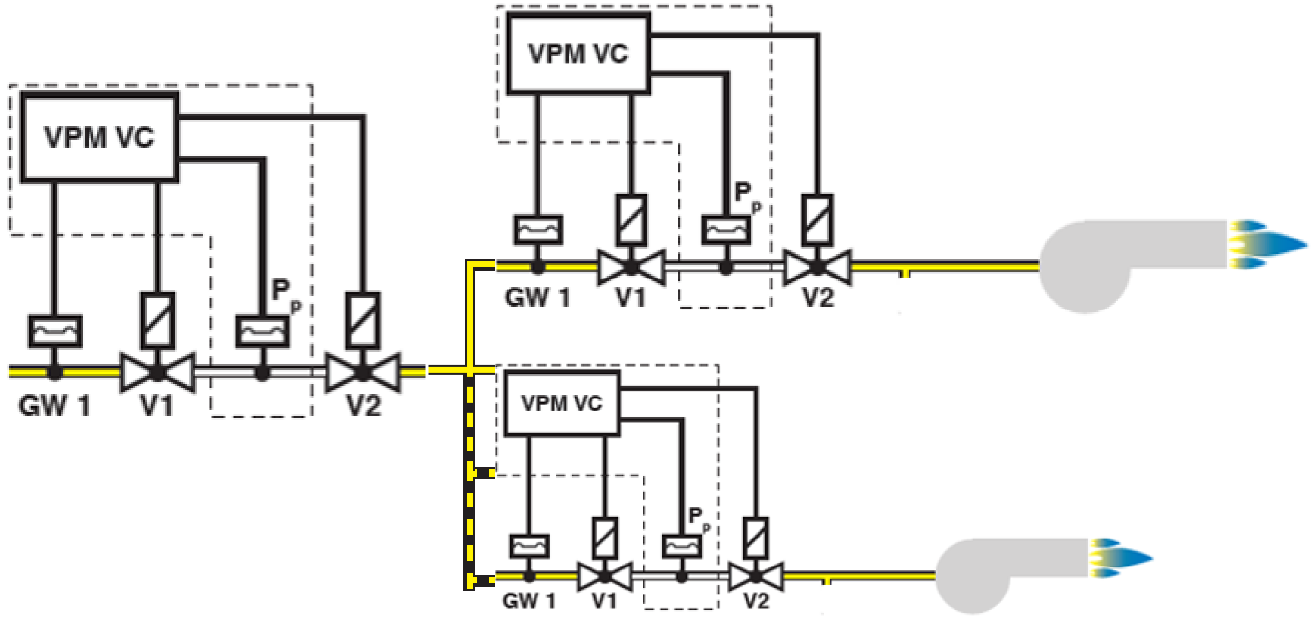
Valve Proving Systems

VPS at each burner on multiple burner.



Valve Proving Systems

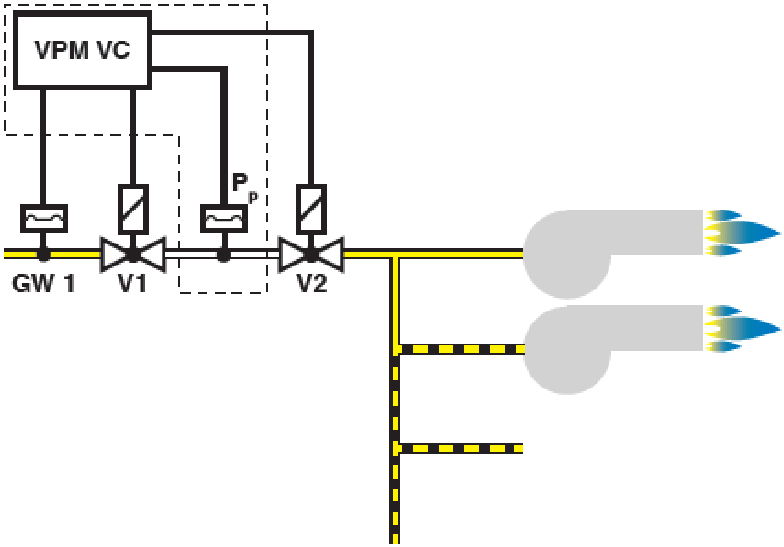
VPS on header and at each burner on multiple burner.



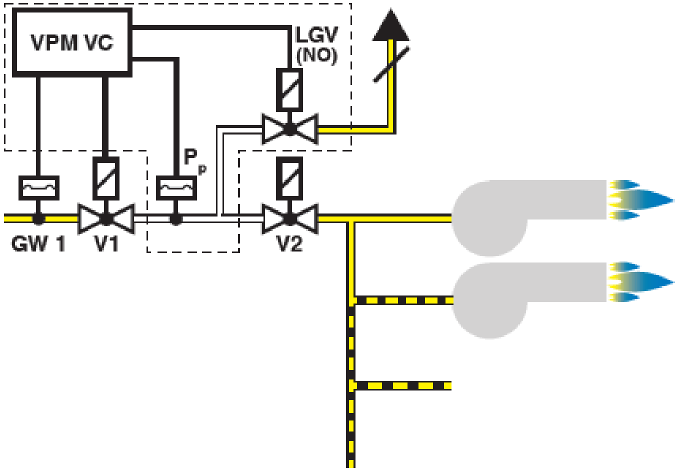
Valve Proving Systems

VPS: Multiple burner with common burner management

Vented into burners via main safety valve



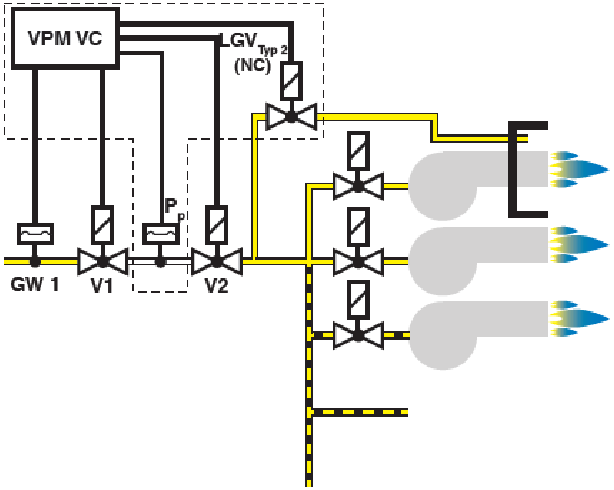
Vented outside via vent valve



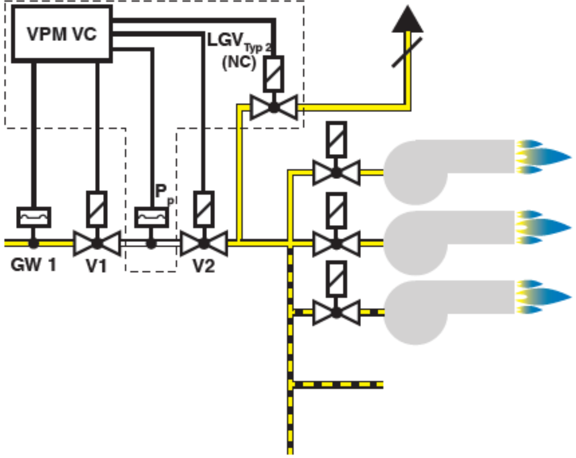
Valve Proving Systems

VPS at header on a multiple burner system with independent burner management at each burner.

Vented into a burner via auxiliary safety valve.



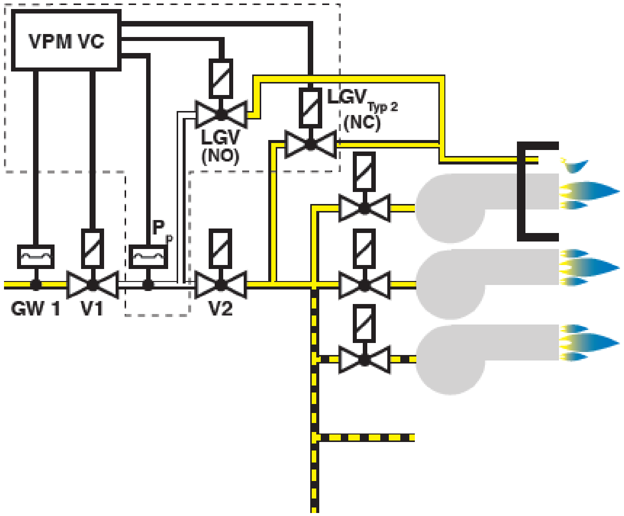
Vented outdoors via auxiliary safety valve.



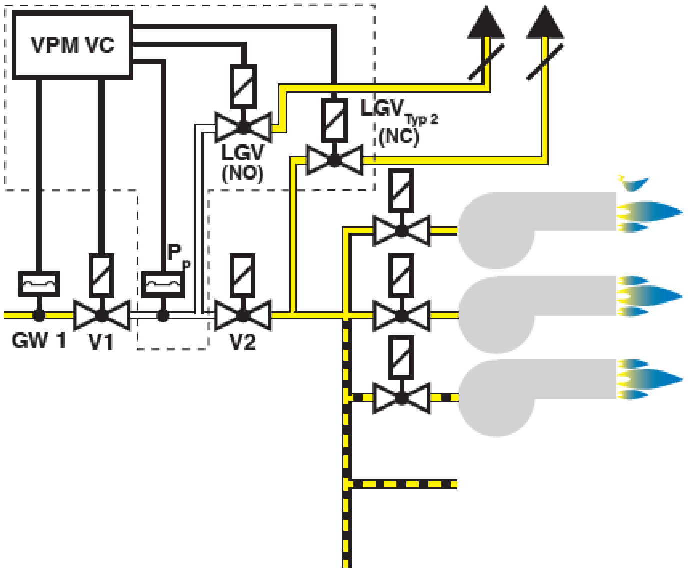
Valve Proving Systems

VPS - Multiple burner with independent burner management at each burner.

VPS vented into combustion chamber via vent valve and safety valve.



VPS vented outside into via vent valve



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VPS vs. Vent Valve for leakage to the burner

WORST CASE Failures: Maximim allowable burner leakage							
#	V1 leakage (CFH)	V2 leakage (CFH)	Vent Valve allowable leakage to burner	VPS allowable leakage to burner	Better Safety Practice on lightoff	Better Safety Practice on shutdown	Comment (venting of gas not considered a risk)
1	0	0	0	0	equivalent	equivalent	
2	0	<1.7	0	0	equivalent	equivalent	
3	0	>1.7	0	0	VPS	equivalent	VPS detects failure of V2. VV/POC does not.
4	0	fails to Close	0	0	equivalent	equivalent	
5	<1.7	0	0	0	equivalent	equivalent	
6	<1.7	<1.7	0	<1.7	Vent Valve	Vent Valve	VV prevents less leakage to burner
7	<1.7	>1.7	<1.7	<1.7	VPS	Vent Valve	VPS detects failure of V1, and V1 is replaced. Vent valve will allow less leakage to the burner until next startup.
8	<1.7	fails to Close	<1.7	<1.7	equivalent	equivalent	
9	>1.7	0	0	0	VPS	equivalent	VPS detects failure of V1.
10	>1.7	<1.7	<1.7	<1.7	VPS	Vent Valve	VPS detects failure of V1. Vent valve will allow less leakage to the burner.
11	>1.7	>1.7	>1.7	NA	VPS	VPS	Consided a double failure: VPS detects failure of V1 before leakage on V2 exceeds 1.7.
12	>1.7	fails to Close	>1.7	0	VPS	VPS	VPS : Double failure that would not occur. Failure of V1 would have been detected before this double fault occurred.
13	Fails to Close	0	0	0	equivalent	equivalent	
14	Fails to Close	<1.7	<1.7	<1.7	Vent Valve	Vent Valve	VV prevents less leakage to burner
15	Fails to Close	>1.7	>1.7	NA	VPS	VPS	VPS : Double failure that would not occur. Failure of V1 would have been detected before this double fault occurred.
16	Fails to Close	Fails to Close	NA	NA	equivalent	equivalent	Double failure that would not occur. Both systems would have detected failure of one before other.
				score	7 to 2	3 to 4	

Valve Proving Systems

Thanks for your attention!

Attachment B - Committee Roster

03/05/2021
Heath Dehn
BCS-MBB

Multiple Burner Boilers

Boiler Combustion System Hazards

Daniel R. May **SE** 10/27/2009
Chair **BCS-MBB**
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David E. Dexter **U** 10/29/2012
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Multiple Burner Boilers

BCS-MBB

Boiler Combustion System Hazards

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Donald Zissa SE 08/17/2015
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03/05/2021
Heath Dehn
BCS-MBB

Multiple Burner Boilers

Boiler Combustion System Hazards

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Principal: David E. Dexter

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Principal: James P. Walawender

Tanesua Williams **U** 12/07/2018
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Principal: Frank J. Bennett

Address List No Phone

03/05/2021
Heath Dehn
BCS-MBB

Multiple Burner Boilers

Boiler Combustion System Hazards

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Hartford, CT 06103
Principal: James E. Franks

Heath Dehn 7/20/2018
Staff Liaison **BCS-MBB**
National Fire Protection Association
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NFPA 85:

Technical Committee on Multiple Burner Boilers

Public Inputs

PI-22	PI-78	PI-100
PI-25	PI-82	PI-101
PI-40	PI-96	PI-103
PI-52	PI-98	PI-104
PI-53	PI-99	

Public Input No. 22-NFPA 85-2019 [Section No. 6.7.5.2.1.3(B)]

(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, and the following shall be performed:

(3) An FD fan then shall be started.

(4) Additional ID fans or FD fans shall be started in accordance with 6.5.3 , as necessary, to achieve purge flow rate.

(5) Dampers and burner registers shall be opened to the purge position in accordance with the open register purge method objectives outlined in 6.7.5.1.5.7.

(6) The airflow shall be adjusted to purge airflow rate, and the following shall be performed:

(7) A unit purge

(8) Special provisions as necessary to prevent the hazardous accumulation of volatile vapors that are heavier than air or to detect and purge accumulations in the furnace ash pit

(9) It shall be determined that the oil temperature or viscosity is within predetermined limits to ensure that atomization will occur. The circulating valve and throttle recirculating valve, if necessary, shall be closed to allow establishment of burner header pressure within manufacturer's limits as specified in 6.7.5.2.1.3(B)(7).

(10) The main fuel control valve shall be closed and the main safety shutoff valve(s) shall be open, but only after the requirements of 6.7.5.1.3 for leak test requirements (if applicable) and 6.4.1.2.4 for purge interlocks have been satisfied.

(11) It shall be determined that the main fuel control valve is closed, and the following procedures shall be performed:

(12) The main fuel bypass control valve, if provided, then shall be set to maintain the necessary burner header pressure for light-off.

(13) The main fuel control valve shall be opened when necessary.

(14) For fuel gas– or fuel oil–fired igniters, the igniter safety shutoff valve(s) shall be opened, and the following shall be performed:

(15) 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.

(16) Fuel gas 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.

(17) For gas igniters, the time needed to vent for control of header pressure after header charging shall be evaluated and minimized.

(18) 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 6.7.5.1.5.7(C) through 6.7.5.1.5.7(F).

(19) 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:

(20) The individual igniter safety shutoff valve(s) shall be

~~opened~~

(a) commanded to open , and all igniter system atmospheric vent valves (fuel gas igniters only) shall be

~~closed~~

(a) commanded to close .

(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.

(21) Where Class 3 special electric igniters are used, the procedures described in 6.7.5.2.1.3(B)(1) through 6.7.5.2.1.3(B)(7), 6.7.5.2.1.3(B)(9), and 6.7.5.2.1.3(B)(12) through 6.7.5.2.1.3(B)(14) shall be used, consistent with the requirements for individual main burner flame supervision.

(22) 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:

(23) The individual burner safety shutoff valve(s) shall be

~~opened~~

(a) commanded to open .

(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 and established operating procedures for light-off shall exist before the burner(s) is restarted.

(24) 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.

(25) 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:

(26) That the stable flame continues on the main burners after the igniters are shut off

(27) That 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

(28) The sequence shall continue as follows:

(29) The procedures of 6.7.5.2.1.3(B)(9) through 6.7.5.2.1.3(B)(14) shall be followed for placing additional burners with open registers in service, as necessary, to raise steam pressure or to carry additional load.

(30) 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 6.7.5.2.1.3(B)(18) .

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

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

(33) 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.

(34) 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.

(35) 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.

(36) After a predetermined number of burners that allow control of header fuel flow and temperature have been placed in service, the recirculating valve shall be closed unless the system is designed for continuous recirculation.

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

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

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

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

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

(42) Stable flame and specified furnace conditions have been established.

(43) 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.

(44) It shall be permitted to place a multiple number of burners served by their corresponding multiple igniters from a single burner safety shutoff valve in service simultaneously, 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.

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

(46) On units with an overfire air system, the boiler shall be operating in a stable manner before the overfire air is introduced.

(47) 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.

(48) A reburn system shall be placed in service only after the following have occurred:

(49) The boiler shall be operating at a load that ensures the introduction of the reburn fuel will not adversely affect continued boiler operation.

(50) The temperature in the reburn zone shall be maintained in accordance with 6.7.3.5.2 .

(51) 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

A customer had requested an increase of the igniter trial for ignition from the programmed 10 seconds. They were informed this is not permissible. However, while reviewing the code, the wording appeared to be ambiguous in that it was not clear if 6.7.5.2.1.3(10)(a) was describing to wait until feedback of the vent valves closed and feedback of the safety shutoff valves open were required to move to the next step (b), or if the intent was to move to step (b) upon commanding the vent valve closed and safety shutoff valves open.

Starting the 10 second igniter trial for ignition upon the sending the valve commands appears to be more stringent and safer on the surface. However, another two to three seconds to wait until feedback of the valves are open/closed could mean the difference (depending on routing issues) of the igniter lighting off or not. What was the original intent of when to start the trial for ignition? If it is on the command to open from the control system, the suggested changes will help with interpretation issues. Section 6.3.3.6 requires limit switches for the closed position feedback for the igniters. However, if it is deemed that the sequence should wait for the open feedback, then open position limit switches would also need to be required feedback, and a failed to open after a few seconds would be a way to trip the igniters so the igniter is not stuck in the sequence.

The same changes would also need done to 6.6.5.2.1.3(B) and 6.8.5.2.1.3(B).

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Public Input No. 25-NFPA 85-2020 [Section No. A.6.6.5.1.5.4]

A.6.6.5.1.5.4

Sequences of operation are based on the typical fuel supply system shown in Figure A.6.6.5.1.5.4(a) and Figure A.6.6.5.1.5.4(b). As permitted in 6.6.3.1, variations in these piping arrangements are allowed, provided all the functional requirements of this code are met by the arrangement.

Figure A.6.6.5.1.5.4(a) Typical Gas Igniter System.

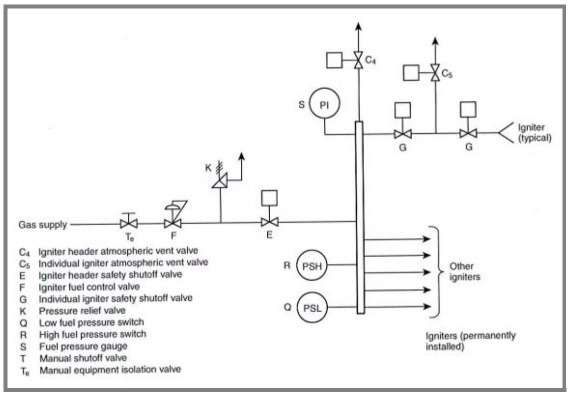
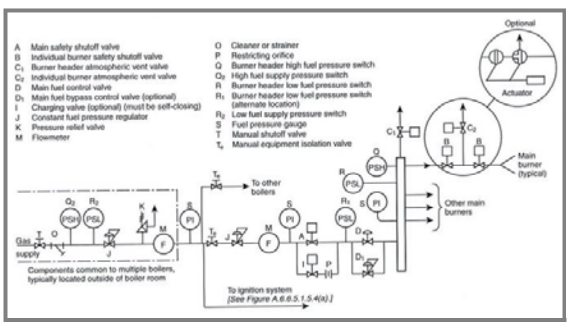


Figure A.6.6.5.1.5.4(b) Typical Main Burner Fuel Supply System for Fuel Gas-Fired Multiple Burner Boiler.



Additional Proposed Changes

File Name	Description	Approved
NFPA_85-2019_-_Proposed_Modification.pdf		

Statement of Problem and Substantiation for Public Input

The current Figure A.6.6.5.1.5.4(b) shows two constant fuel pressure regulators (TAG J). One common for all the boilers (if the plant is equipped with more than one boiler) and one dedicated for each boiler. By applying this arrangement, suppliers are often requested to provide two different pressure regulators. However, if the pressure downstream the first pressure regulator (pressure reducing station) is already suitable for boiler operation (without a further reduction), the second pressure regulator could be omitted since it would be not necessary.

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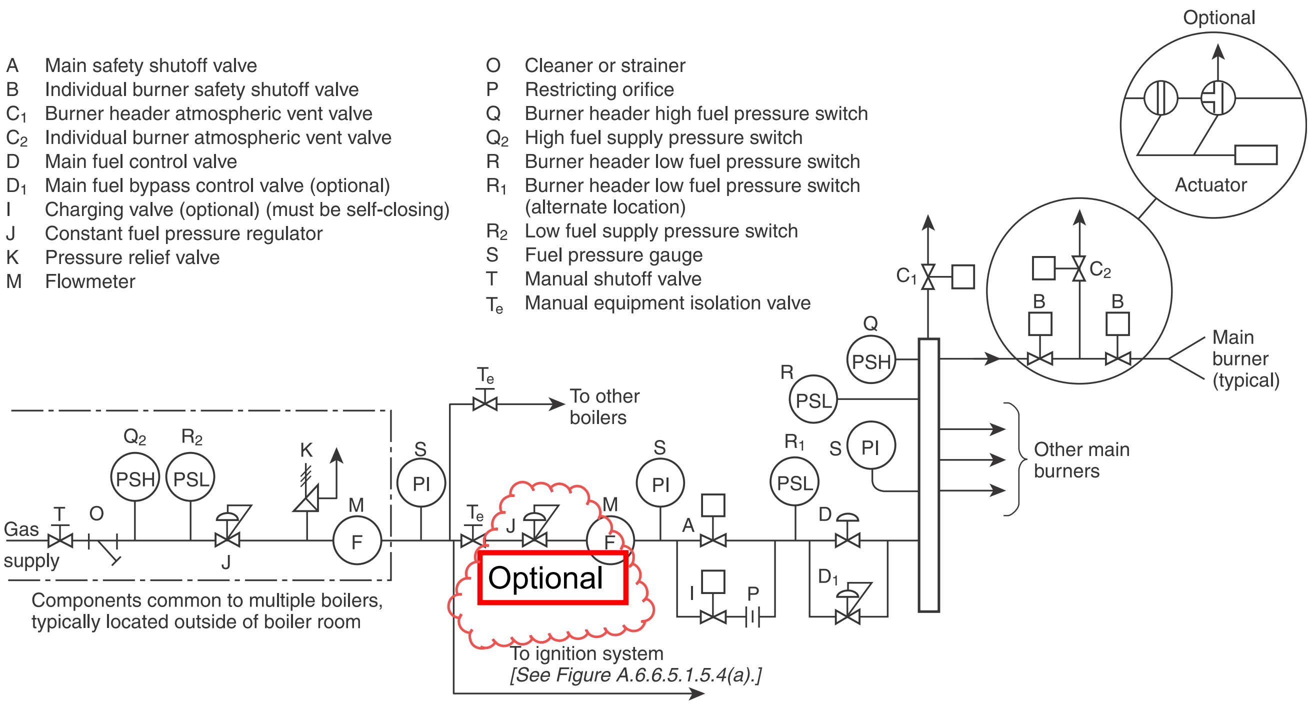

FIGURE A.6.6.5.1.5.4(b) Typical Main Burner Fuel Supply System for Fuel Gas-Fired Multiple Burner Boiler.

A.6.6.5.1.5.7 Although NO_x and other emissions during start-up and extremely low load operation are low, they might not comply with increasingly stringent emission limits. Deviation from the open-register light-off procedure, continuous purge, and minimum airflow requirements defined in this code to meet those limits is not recommended. There are insufficient data and operating experience to justify changes to this code.

A.6.6.5.2.1.1(2) Such an inspection is particularly important for a cold start where the fuel burned prior to shutdown contained volatile vapors heavier than air.

A.6.6.5.2.1.1(15) The frequency of testing depends on the design and operating history of each individual boiler and ignition system. As a minimum, the test should be made at each start-up following an igniter overhaul or other significant maintenance that could have affected the igniter.

A.6.6.5.2.1.1(17) The importance of reliable igniters and ignition systems cannot be overstressed.

A.6.6.5.2.1.3(B)(15) Automatic control of burner fuel and burner airflow during the lighting and start-up sequence is recommended.

A.6.6.5.2.2.1 For burners having a high airside pressure drop [generally greater than 102 mm (4 in.) water column at full boiler load], one way to indicate proper air-fuel ratio is to compare burner airflow with burner fuel flow as determined by windbox-to-furnace differential and burner header pressure. The ratio thus determined plus the open register procedure provide a guide for proper operation of burners under start-up conditions where flows might be out of the range of other meters. Windbox-to-furnace differential taps, where provided, should be located at the burner level.

A.6.6.5.2.3.10 Maintaining airflow through the unit to prevent accumulation of combustible gases is a prudent procedural step due to the potential of fuel leak-by.

A.6.6.5.2.8.2 This signal should be based on steam flow, main fuel flow, turbine load, burners in service, any combination thereof, or other means to ensure that temperatures in the reburn zone are greater than the autoignition temperature of the reburn fuel.

A.6.6.5.3.2 A trip of the fuel during a fuel-rich condition while flame is being maintained results in a sudden increase in the air-fuel ratio, which can create a greater hazard.

•

A.6.6.7.1.1 These boilers are subject to hazardous air-fuel ratio upsets at either burner during light-off and fuel transfer and when one of the two burners automatically trips during operation.

A.6.6.7.2.1.1(2) The result of this operation is that the remaining operating burner maintains its air-fuel ratio within the manufacturer's suggested limits after the fuel is shut off to the failed burner.

A.6.7.2(8) NFPA 77 and API RP 2003, *Recommended Practice for Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents*, provide design parameters.

A.6.7.2(10) Initial firing of fuel oil in a cold boiler can create a special hazard by causing fires in air heaters.

A.6.7.3.1.1.3 Free fall can generate static electricity and increase vaporization of fuel.

A.6.7.3.1.2.1 This is especially important for crude oil.

Public Input No. 40-NFPA 85-2020 [Section No. 6.6.3.1.9]

6.6.3.1.9

~~A~~ _ double block and vent valve arrangement shall be provided in the fuel line to each burner and each igniter. A valve proving system may be used an alternative to a vent valve if the valve proving system has a leak detection limit of 1.0 cubic feet per hour and the valve proving system is proving only two valves is series per burner.

Additional Proposed Changes

File Name	Description	Approved
PC_No._12.pdf	NFPA 85 Public Comment No. 12	

Statement of Problem and Substantiation for Public Input

NOTE: This Public Input appeared as "Reject but Hold" in the Public Comment No.12 of the F2018 Second Draft Report for NFPA 85 and per Regs. at 4.4.8.3.1.

The committee's justification for rejecting PI 141 was "MBB's have significantly higher risks and are more complex than SBB, and valve proving systems should not be accepted in place of double block can vent systems. In addition, the valving is larger and more complex".

Comments:
1)By adding a detection limit 1.0 CFH, a VPS reduces the amount of leakage to the furnace more than the vent valve. So, within this case, a VPS should be permitted at an alternative.
2) If each burner has two valves in series, then installing a VPS is no less complex on a MBB than on a SBB, and this should not preclude the use of a VPS. In fact, installing a VPS in such a system would be less complex than installing a vent valve and running vent lines from each double block per burner.
3) A VPS can be used with large valves, and since a leakage rate has now been added to the paragraph, the use of large valves should not preclude the use of a VPS as an alternative.

Submitter Information Verification

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Submittal Date: Tue Dec 01 13:48:19 EST 2020
Committee: BCS-AAC

Public Comment No. 12-NFPA 85-2017 [Section No. 6.6.3.1.10]

6.6.3.1.10

~~A~~ A double block and vent valve arrangement shall be provided in the fuel line to each burner and each igniter. A valve proving system may be used an an alternative to a vent valve if the valve proving system has a leak detection limit of 1.0 cubic feet per hour and the valve proving system is proving only two valves in series per burner.

Statement of Problem and Substantiation for Public Comment

The committee's justification for rejecting PI 141 was "MBB's have significantly higher risks and are more complex than SBB, and valve proving systems should not be accepted in place of double block can vent systems. In addition, the valving is larger and more complex".

Comments:
1) By adding a detection limit 1.0 CFH, a VPS reduces the amount of leakage to the furnace more than the vent valve. So, within this case, a VPS should be permitted at an alternative.
2) If each burner has two valves in series, then installing a VPS is no less complex on a MBB than on a SBB, and this should not preclude the use of a VPS. In fact, installing a VPS in such a system would be less complex than installing a vent valve and running vent lines from each double block per burner.
3) A VPS can be used with large valves, and since a leakage rate has now been added to the paragraph, the use of large valves should not preclude the use of a VPS as an alternative.

Related Item

- PI 141

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Committee Statement

Committee Action: Rejected but held

Resolution: The Technical Committee does not have adequate information at this time regarding the impact on safety of multiple burner boilers, a safe setpoint, and feasibility of verifying the leakage rate.

Public Input No. 52-NFPA 85-2020 [Section No. 6.4.1.1.3]

6.4.1.1.3*

~~Testing and maintenance shall be performed to keep the interlocks functioning as designed.~~

A functional test of all required interlocks as defined in 6.4.1.2 shall be performed at least annually. For continuously fired units exceeding 12 months since last functional test, a functional test shall be conducted at the next shutdown of the boiler.

6.4.1.1.3.1 Functional testing shall confirm field devices activate interlocks at the design set point.

6.4.1.1.3.2 All functional tests shall be documented and the records compared to previous functional test.

6.4.1.1.3.3 Deficiencies found during the functional test shall be addressed by repair, replacement or additional trouble shooting to correct the deficiencies.

6.4.1.1.3.4 All repairs made to correct deficiencies shall be re-tested for verification.

Statement of Problem and Substantiation for Public Input

The revisions to 6.1.1.3 are the work of the Functional Test Task Group formed by MBB. The purpose was to clarify the Testing and Maintenance requirements for interlocks.

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Public Input No. 53-NFPA 85-2020 [Section No. A.6.4.1.1.3]

A.6.4.1.1.3

~~A functional test of all required interlocks as defined in 6.4.1.2 should be performed at least annually or, for continuously fired units, at the first opportunity that the unit is down since the last functional test was performed, which could be longer than a year.~~

Functional testing should verify that the safety systems field devices, wiring, hardware and logic are in sound conditions (i.e. no jumpers, bridges or forces in place, no plugged sensing lines, no broken actuators, stuck valves or dampers, no damaged instruments, no burnt or corroded wiring, no inadvertent undocumented and/or improper logic changes, etc.).

Functional tests should incorporate a signal test from the sensing line (or initiating device for manual trips) through all associated circuitry and logic, and includes actuation of the final elements (valves, pumps, dampers, etc.) being interlocked. It should create or simulate, as safely as possible, the actual conditions being monitored at the sensing lines. Where process conditions cannot be met, the field device signal can be simulated for a single device at a time. Any logic forces shall be immediately removed at the time of the test.

After initial functional tests have been verified back through the master fuel trip relay, remaining functional tests can be verified back to the master fuel trip relay rather than tripping the master fuel relay during each functional test

Statement of Problem and Substantiation for Public Input

The revisions to A.6.1.1.3 are the work of the Functional Test Task Group formed by MBB. The purpose was to clarify the Testing and Maintenance requirements for interlocks.

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Committee: BCS-AAC

Public Input No. 78-NFPA 85-2021 [Section No. 6.6.3.1.9]

6.6.3.1.9

A double block and vent valve arrangement or a double block with a valve proving system shall be provided in the fuel line to each burner and each igniter.

Statement of Problem and Substantiation for Public Input

The double block and valve proving system, which has been in the market and has already been in the fundamentals section since the late 1990's, is an equivalent and alternate method to minimize leakage to the burner on multiple burner systems.

Should this be adopted, then the following sections also will need some revising.
6.4.1.2.1 (a) (2)
6.6.3.1.10.1
6.6.3.5.1.1
6.6.3.1.10.1
6.6.3.6.1
6.6.5.2.1.3(9)
6.6.5.2.3.5
6.6.5.2.3.7
6.6.5.2.5.3
6.6.5.2.5.4 (A)
6.6.5.2.6.2 (3)
6.6.5.2.7.1
6.6.5.2.7.4
6.6.5.2.9.2 (4), and
6.7.5.2.1.3 (10)

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Submittal Date: Tue Jan 05 12:39:21 EST 2021
Committee: BCS-AAC

Public Input No. 82-NFPA 85-2021 [Section No. 6.4.1.2.1]

6.4.1.2.1*

Figure 6.4.1.2.1 and Table 6.4.1.2.1(a) through Table 6.4.1.2.1(c) show the minimum required interlocks that shall be provided for basic furnace protection for a multiple burner boiler operated in accordance with this code.

Figure 6.4.1.2.1 Interlocks for a Multiple Burner Boiler.

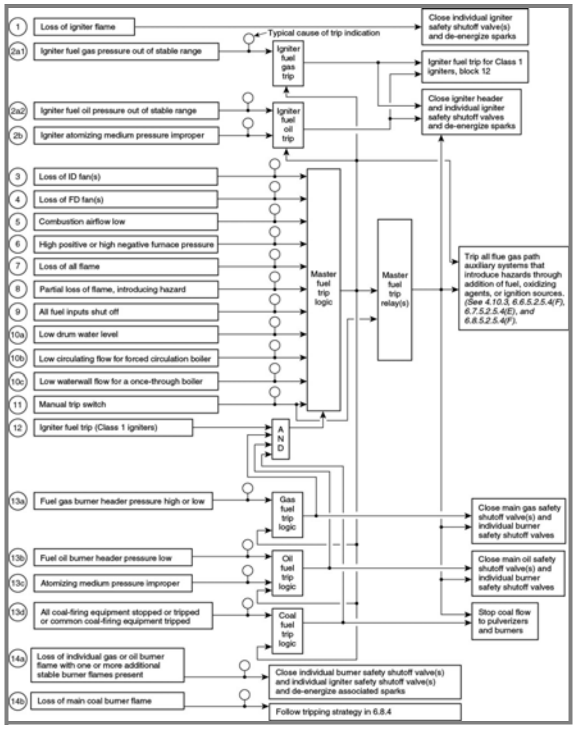

Table 6.4.1.2.1(a) Interlocks for a Multiple Burner Boiler

Block Number	**Action**	
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 header and individual igniter safety shutoff valves and de-energize sparks.	

<u>**Block Number**</u>	<u>**Action**</u>	
	-	Where direct electric igniters are used, blocks 1 and 2 shall not apply. However, the master fuel trip 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 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 contacts shall also trip all ~~fuel~~ <u>flue</u> 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 *(See A.6.4.1.2.1~~.~~)*	High positive furnace pressure shall activate the master fuel trip relay. High negative furnace pressure shall activate the master fuel trip relay.	

Block Number	Action
Block 7	Loss of all flame in the furnace shall activate the master fuel trip relay.
Block 8 *(See A.6.4.1.2.1.)*	A partial loss of flame that results in a hazardous condition shall activate the master fuel trip relay.
Block 9 *(See A.6.4.1.2.1.)*	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 6.4.1.2.1(b) or Table 6.4.1.2.1(c).
Block 10a *(See A.6.4.1.2.1.)*	For drum-type boilers, a low drum water level shall activate the master fuel trip relay.
Block 10b *(See A.6.4.1.2.1)*	For forced circulation boilers, circulating flow below the minimum specified by the manufacturer or related waterwall protection signals shall activate the master fuel trip relay.
Block 10c *(See A.6.4.1.2.1)*	For once-through boilers, waterwall flow below the minimum specified by the manufacturer or related waterwall protection signals 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 6.4.1.2.1(b) or Table 6.4.1.2.1(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 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 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

Block Number	Action
	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 6.4.1.2.1(b) Fuel Inputs Shutoff When Class 1 Igniters Are Used

Condition	Action Required
(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).]*	(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.
(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 start-up 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 6.4.1.2.1(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 tripped.	(3a.3) Master fuel trip shall be actuated.

Condition	Action Required	
(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 tripped.	(3b.3) Master fuel trip shall be actuated.	
(4) Any Class 2 igniter(s) proven on, any pulverizer start-up 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

Fuel should be changed to Flue since this section is referencing Flue Gas Path Auxiliary Systems (section 4.10.3)
The periods at the end of the Annex references in Blocks 6,8,9, and 10a should be removed to be consistent. The periods are not in the referenced Annex sections nor in Blocks 10b or 10c

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Public Input No. 96-NFPA 85-2021 [Section No. 6.8.5.2.1.3(B)]

(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 Section 6.5, as necessary, to achieve purge flow rate.

(3) Dampers and burner registers shall be opened to purge position in accordance with the open-register purge method objectives outlined in 6.8.5.1.5.7.

(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 ash pit.

(5) For fuel gas– or fuel oil–fired igniters, the igniter safety shutoff valve(s) shall be opened, and it shall be confirmed that the igniter fuel control valve is holding the manufacturer's recommended fuel pressure necessary to allow the igniter to operate at design capacity. Fuel gas 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 can function to regulate and maintain the pressure within design limits specified by the manufacturer for lighting the igniters.

(6) The air register or damper on the burners selected for light-off shall be adjusted to the position recommended by the manufacturer or the established operating procedure, in accordance with 6.8.5.1.5.7(C) through 6.8.5.1.5.7(F).

(7) The spark or other source of ignition for the igniter(s) on the burner(s) to be lit shall be initiated, and the following procedures shall be performed:

  (8) <u>The individual igniter safety shutoff valve(s) shall be opened.</u>

  (9) <u>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.</u>

  (10) <u>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.</u>

  (11) <u>Repeated retrials of igniters without investigating and correcting the cause of the malfunction shall be prohibited.</u>

(12) With the coal feeder off, all gates between the coal bunker and the pulverizer feeder shall be opened, and it shall be confirmed that coal is available to the feeder.

(13) The igniters shall be checked to ensure they are established and are providing the required level of ignition energy for the main burners. The pulverizing equipment shall be started in accordance with the equipment manufacturer's instruction.

(14) The furnace airflow shall be readjusted after conditions stabilize, as necessary. Airflow shall not be reduced below the purge rate.

(15) The feeder shall be started at a predetermined setting with the feeder delivering coal to the pulverizer, and the following shall be performed:

  (16) <u>Pulverized coal shall be delivered to the burners after the specific time delay necessary to build up storage in the pulverizer and transport the fuel to the burner.</u>

  (17) <u>This time delay, which shall be determined by test, shall be permitted to be as short as a few seconds with some types of equipment or as long as several minutes with others.</u>

(18) Ignition of the main burner fuel admitted to the furnace shall be confirmed, and the following requirements shall be met:

(19) Required ignition shall be obtained within 10 seconds following the specific time delay described in 6.8.5.2.1.3(B)(11) .

(20) The coal fuel trip shall be initiated on failure to ignite or loss of ignition on burners served by the first pulverizer placed in operation.

(21) Except where associated Class 1 igniters are in service, a master fuel trip shall be initiated on failure to ignite or on loss of ignition on placing the first pulverizer into service.

(22) Where the cause of failure to ignite or loss of ignition is known to be due to loss of coal in the pulverizer subsystem, initiation of the master fuel trip shall not be required, but all required conditions for light-off shall exist before coal feed is restored.

(23) For the following pulverizer and all subsequent pulverizers placed in operation, failure to ignite or loss of ignition for any reason on any burner shall cause the fuel flow to that burner to stop in accordance with the manufacturer's recommendations. All conditions required by established operating procedures for light-off shall exist before the burner is restarted.

(24) 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.

(25) The load for the operating pulverizer shall be at a level that prevents its load from being reduced below operating limits when an additional pulverizer is placed in operation.

(26) If a pulverizer has been operating but does not have all its burners in service, the idle burners shall be permitted to be restarted if the pulverizer-burner subsystem and its controls are designed specifically for such operations, and precautions are incorporated to prevent all the following conditions:

(27) Accumulation of coal in idle burner lines

(28) Hot burner nozzles and diffusers that have the potential to cause coking and fires when coal is introduced

(29) Excessive disturbance of the air-fuel ratio of the operating burners

(30) If the precautions have not been taken, the idle burner(s) shall not be restarted. Instead, another pulverizer with all burners in service shall be started, and the pulverizer with idle burners shall be shut down and emptied.

(31*) The procedures of 6.8.5.2.1.3(B)(6) through 6.8.5.2.1.3(B)(16) shall be followed for placing an additional pulverizer into service. When fuel is being admitted to the furnace, igniters shall not be placed into service for any burner without proof that there is a stable fire in the furnace.

(32*) Igniters shall be permitted to be shut off after exceeding a predetermined minimum main fuel input that has been determined in accordance with 6.8.3.2.2. Verification shall be made that the stable flame continues on the main burners after the igniters are removed from service.

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

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

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

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

(37) Stable flame and specified furnace conditions have been established.

(38) Additional pulverizers shall be placed into service as needed by the boiler load in accordance with the procedures of 6.8.5.2.1.3(B)(6) through 6.8.5.2.1.3(B)(16) .

(39) 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.

(40) 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.

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

(42) A reburn system shall be placed in service only after the boiler is operating at such a load as to ensure that the introduction of the reburn fuel will not adversely affect continued boiler operation. The required reburn zone temperatures shall be maintained in accordance with 6.8.3.5.2. 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

This section is redundant with 6.8.5.2.1.3(B)(18) and adds no further information to the end user.

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Public Input No. 98-NFPA 85-2021 [Section No. 6.4.1.2.4.5]

6.4.1.2.4.5* 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_t (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_t (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 and , if so equipped, overfire air dampers are in purge position.

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

(8) At least one OFA fan , if so equipped, is in service.

(9) Flue gas recirculation fans shall be operated as recommended by the boiler manufacturer.

(10) Total boiler airflow is at purge rate airflow.

Statement of Problem and Substantiation for Public Input

Purging of the overfire air system has been a requirement since at least the 2001 Edition. (See 6.6.5.1.5.7(B)(2) &(3), 6.7.5.1.5.7(B)(2) &(3), and 6.8.5.1.5.7(B)(2) &(3) of the 2019 Edition). These changes would define an Overfire Air (OFA) Fan, include the OFA Fan being in service(if supplied) and the OFA dampers being in purge position as Boiler Enclosure Purge Permissives and reword the Starting Sequence to clarify that the OFA system is in service before the boiler is operating(lit off).

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Public Input No. 99-NFPA 85-2021 [Section No. 6.6.5.2.1.3(B)]

(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 positioned at light-off firing rate (or closed if a bypass regulator is being provided) and the main safety shutoff valve(s) shall be opened, but only after the requirements of 6.6.5.1.3 for leak test requirements (if applicable) and 6.4.1.2.4 for purge interlocks have been satisfied.

(6) It shall be determined that the main fuel control valve is closed, and the following procedures shall be performed:

  (7) <u>The main fuel bypass control valve, if provided, shall be set to maintain the necessary burner header fuel pressure for light-off.</u>

  (8) <u>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.</u>

  (9) <u>The main fuel control valve shall be opened when necessary.</u>

  (10) <u>The time needed to vent for control of header pressure after header charging shall be evaluated and minimized.</u>

(11) The igniter safety shutoff valve shall be opened, and the following shall be performed:

  (12) <u>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.</u>

  (13) <u>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.</u>

  (14) <u>The time needed to vent for control of header pressure after header charging shall be evaluated and minimized.</u>

(15) 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).

(16) 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:

  (17) <u>The individual igniter safety shutoff valve(s) shall be opened, and all igniter system atmospheric vent valves shall be closed.</u>

  (18) <u>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.</u>

  (19) <u>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.</u>

  (20) <u>Repeated retrials of igniters without investigating and correcting the cause of the</u>

malfunction shall be prohibited.

(21) 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 requirements for individual main burner flame supervision.

(22) 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:

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

(24) 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.

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

(26) 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.

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

(28) 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.

(29) 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:

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

(31) 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.

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

(33*) The sequence shall continue as follows:

(34 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.

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

(36 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.

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

(38 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.

(39 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.

(40)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.

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

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

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

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

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

(46) Stable flame and specified furnace conditions have been established.

(47) 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.

(48) 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.

(49) 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.

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

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

(52) A reburn system shall be placed in service only after the following have occurred:

(53) The boiler shall be operating at a load that ensures the introduction of the reburn fuel will not adversely affect continued boiler operation.

(54) The temperature in the reburn zone shall be maintained in accordance with 6.6.3.5.2 .

(55) The boiler shall be operating in a stable manner before the reburn startup sequence is initiated.

Statement of Problem and Substantiation for Public Input

Purging of the overfire air system has been a requirement since at least the 2001 Edition. (See 6.6.5.1.5.7(B)(2) &(3), 6.7.5.1.5.7(B)(2) &(3), and 6.8.5.1.5.7(B)(2) &(3) of the 2019 Edition). These changes would define an Overfire Air (OFA) Fan, include the OFA Fan being in service(if supplied) and the OFA dampers being in purge position as Boiler Enclosure Purge Permissives and reword the Starting Sequence to clarify that the OFA system is in service before the boiler is operating(lit off).

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Public Input No. 100-NFPA 85-2021 [Section No. 6.7.5.2.1.3(B)]

(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, and the following shall be performed:

  (3) An FD fan then shall be started.

  (4) Additional ID fans or FD fans shall be started in accordance with 6.5.3 , as necessary, to achieve purge flow rate.

(5) Dampers and burner registers shall be opened to the purge position in accordance with the open register purge method objectives outlined in 6.7.5.1.5.7.

(6) The airflow shall be adjusted to purge airflow rate, and the following shall be performed:

  (7) A unit purge

  (8) Special provisions as necessary to prevent the hazardous accumulation of volatile vapors that are heavier than air or to detect and purge accumulations in the furnace ash pit

(9) It shall be determined that the oil temperature or viscosity is within predetermined limits to ensure that atomization will occur. The circulating valve and throttle recirculating valve, if necessary, shall be closed to allow establishment of burner header pressure within manufacturer's limits as specified in 6.7.5.2.1.3(B)(7).

(10) The main fuel control valve shall be closed and the main safety shutoff valve(s) shall be open, but only after the requirements of 6.7.5.1.3 for leak test requirements (if applicable) and 6.4.1.2.4 for purge interlocks have been satisfied.

(11) It shall be determined that the main fuel control valve is closed, and the following procedures shall be performed:

  (12) The main fuel bypass control valve, if provided, then shall be set to maintain the necessary burner header pressure for light-off.

  (13) The main fuel control valve shall be opened when necessary.

(14) For fuel gas– or fuel oil–fired igniters, the igniter safety shutoff valve(s) shall be opened, and the following shall be performed:

  (15) 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.

  (16) Fuel gas 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.

  (17) For gas igniters, the time needed to vent for control of header pressure after header charging shall be evaluated and minimized.

(18) 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 6.7.5.1.5.7(C) through 6.7.5.1.5.7(F).

(19) 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:

  (20) The individual igniter safety shutoff valve(s) shall be opened, and all igniter system atmospheric vent valves (fuel gas igniters only) shall be closed.

  (21) 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.

(22) 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.

(23) Repeated retrials of igniters without investigating and correcting the cause of the malfunction shall be prohibited.

(24) Where Class 3 special electric igniters are used, the procedures described in 6.7.5.2.1.3(B)(1) through 6.7.5.2.1.3(B)(7), 6.7.5.2.1.3(B)(9), and 6.7.5.2.1.3(B)(12) through 6.7.5.2.1.3(B)(14) shall be used, consistent with the requirements for individual main burner flame supervision.

(25) 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:

(26) The individual burner safety shutoff valve(s) shall be opened.

(27) 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.

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

(29) 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.

(30) All conditions required by the manufacturer and established operating procedures for light-off shall exist before the burner(s) is restarted.

(31) 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.

(32) 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:

(33) That the stable flame continues on the main burners after the igniters are shut off

(34) That 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

(35) The sequence shall continue as follows:

(36) The procedures of 6.7.5.2.1.3(B)(9) through 6.7.5.2.1.3(B)(14) shall be followed for placing additional burners with open registers in service, as necessary, to raise steam pressure or to carry additional load.

(37) 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 6.7.5.2.1.3(B)(18) .

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

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

(40) 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.

(41) 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.

(42) 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.

(43) After a predetermined number of burners that allow control of header fuel flow and temperature have been placed in service, the recirculating valve shall be closed unless the system is designed for continuous recirculation.

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

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

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

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

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

(49) Stable flame and specified furnace conditions have been established.

(50) 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.

(51) It shall be permitted to place a multiple number of burners served by their corresponding multiple igniters from a single burner safety shutoff valve in service simultaneously, 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.

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

(53)

(54) On units with an overfire air system, the boiler shall be operating in a stable manner before the overfire air is

~~introduced.~~

(55) ~~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~~ released to control. The releasing to control of the overfire air shall not adversely affect boiler operation.

(56) A reburn system shall be placed in service only after the following have occurred:

(57) The boiler shall be operating at a load that ensures the introduction of the reburn fuel will not adversely affect continued boiler operation.

(58) The temperature in the reburn zone shall be maintained in accordance with 6.7.3.5.2 .

(59) 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

Purging of the overfire air system has been a requirement since at least the 2001 Edition. (See 6.6.5.1.5.7(B)(2) &(3), 6.7.5.1.5.7(B)(2) &(3), and 6.8.5.1.5.7(B)(2) &(3) of the 2019 Edition). These changes would define an Overfire Air (OFA) Fan, include the OFA Fan being in service(if supplied) and the OFA dampers being in purge position as Boiler Enclosure Purge Permissives and reword the Starting Sequence to clarify that the OFA system is in service before the boiler is operating(lit off).

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Public Input No. 101-NFPA 85-2021 [Section No. 6.8.5.2.1.3(B)]

(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 Section 6.5, as necessary, to achieve purge flow rate.

(3) Dampers and burner registers shall be opened to purge position in accordance with the open-register purge method objectives outlined in 6.8.5.1.5.7.

(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 ash pit.

(5) For fuel gas– or fuel oil–fired igniters, the igniter safety shutoff valve(s) shall be opened, and it shall be confirmed that the igniter fuel control valve is holding the manufacturer's recommended fuel pressure necessary to allow the igniter to operate at design capacity. Fuel gas 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 can function to regulate and maintain the pressure within design limits specified by the manufacturer for lighting the igniters.

(6) The air register or damper on the burners selected for light-off shall be adjusted to the position recommended by the manufacturer or the established operating procedure, in accordance with 6.8.5.1.5.7(C) through 6.8.5.1.5.7(F).

(7) The spark or other source of ignition for the igniter(s) on the burner(s) to be lit shall be initiated, and the following procedures shall be performed:

    (8) The individual igniter safety shutoff valve(s) shall be opened.

    (9) 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.

    (10) 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.

    (11) Repeated retrials of igniters without investigating and correcting the cause of the malfunction shall be prohibited.

(12) With the coal feeder off, all gates between the coal bunker and the pulverizer feeder shall be opened, and it shall be confirmed that coal is available to the feeder.

(13) The igniters shall be checked to ensure they are established and are providing the required level of ignition energy for the main burners. The pulverizing equipment shall be started in accordance with the equipment manufacturer's instruction.

(14) The furnace airflow shall be readjusted after conditions stabilize, as necessary. Airflow shall not be reduced below the purge rate.

(15) The feeder shall be started at a predetermined setting with the feeder delivering coal to the pulverizer, and the following shall be performed:

    (16) Pulverized coal shall be delivered to the burners after the specific time delay necessary to build up storage in the pulverizer and transport the fuel to the burner.

    (17) This time delay, which shall be determined by test, shall be permitted to be as short as a few seconds with some types of equipment or as long as several minutes with others.

(18) Ignition of the main burner fuel admitted to the furnace shall be confirmed, and the following requirements shall be met:

(19) Required ignition shall be obtained within 10 seconds following the specific time delay described in 6.8.5.2.1.3(B)(11) .

(20) The coal fuel trip shall be initiated on failure to ignite or loss of ignition on burners served by the first pulverizer placed in operation.

(21) Except where associated Class 1 igniters are in service, a master fuel trip shall be initiated on failure to ignite or on loss of ignition on placing the first pulverizer into service.

(22) Where the cause of failure to ignite or loss of ignition is known to be due to loss of coal in the pulverizer subsystem, initiation of the master fuel trip shall not be required, but all required conditions for light-off shall exist before coal feed is restored.

(23) For the following pulverizer and all subsequent pulverizers placed in operation, failure to ignite or loss of ignition for any reason on any burner shall cause the fuel flow to that burner to stop in accordance with the manufacturer's recommendations. All conditions required by established operating procedures for light-off shall exist before the burner is restarted.

(24) 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.

(25) The load for the operating pulverizer shall be at a level that prevents its load from being reduced below operating limits when an additional pulverizer is placed in operation.

(26) If a pulverizer has been operating but does not have all its burners in service, the idle burners shall be permitted to be restarted if the pulverizer-burner subsystem and its controls are designed specifically for such operations, and precautions are incorporated to prevent all the following conditions:

(27) Accumulation of coal in idle burner lines

(28) Hot burner nozzles and diffusers that have the potential to cause coking and fires when coal is introduced

(29) Excessive disturbance of the air-fuel ratio of the operating burners

(30) If the precautions have not been taken, the idle burner(s) shall not be restarted. Instead, another pulverizer with all burners in service shall be started, and the pulverizer with idle burners shall be shut down and emptied.

(31*) The procedures of 6.8.5.2.1.3(B)(6) through 6.8.5.2.1.3(B)(16) shall be followed for placing an additional pulverizer into service. When fuel is being admitted to the furnace, igniters shall not be placed into service for any burner without proof that there is a stable fire in the furnace.

(32*) Igniters shall be permitted to be shut off after exceeding a predetermined minimum main fuel input that has been determined in accordance with 6.8.3.2.2. Verification shall be made that the stable flame continues on the main burners after the igniters are removed from service.

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

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

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

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

(37) Stable flame and specified furnace conditions have been established.

(38) Additional pulverizers shall be placed into service as needed by the boiler load in accordance with the procedures of 6.8.5.2.1.3(B)(6) through 6.8.5.2.1.3(B)(16).

(39) 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.

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

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

(42) A reburn system shall be placed in service only after the boiler is operating at such a load as to ensure that the introduction of the reburn fuel will not adversely affect continued boiler operation. The required reburn zone temperatures shall be maintained in accordance with 6.8.3.5.2. 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

Purging of the overfire air system has been a requirement since at least the 2001 Edition. (See 6.6.5.1.5.7(B)(2) &(3), 6.7.5.1.5.7(B)(2) &(3), and 6.8.5.1.5.7(B)(2) &(3) of the 2019 Edition). These changes would define an Overfire Air (OFA) Fan, include the OFA Fan being in service(if supplied) and the OFA dampers being in purge position as Boiler Enclosure Purge Permissives and reword the Starting Sequence to clarify that the OFA system is in service before the boiler is operating(lit off).

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Public Input No. 103-NFPA 85-2021 [Section No. A.6.6.5.1.5.4]

A.6.6.5.1.5.4

Sequences of operation are based on the typical fuel supply system shown in Figure A.6.6.5.1.5.4(a) and Figure A.6.6.5.1.5.4(b). As permitted in 6.6.3.1, variations in these piping arrangements are allowed, provided all the functional requirements of this code are met by the arrangement.

Figure A.6.6.5.1.5.4(a) Typical Gas Igniter System.

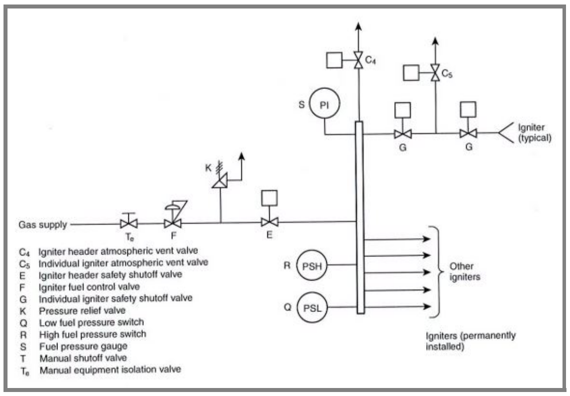
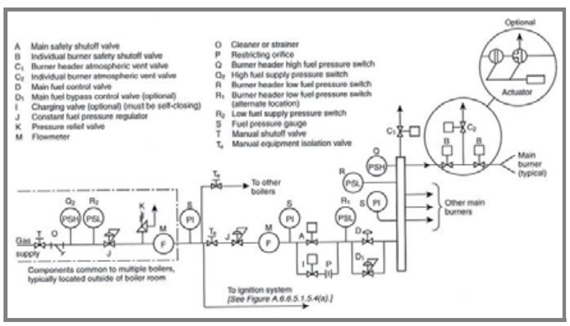


Figure A.6.6.5.1.5.4(b) Typical Main Burner Fuel Supply System for Fuel Gas-Fired Multiple Burner Boiler.



Additional Proposed Changes

File Name	Description	Approved
Fig_A.6.6.5.1.5.4_a_.pdf	Proposed change to Fig A.6.6.5.1.5.4(a)	

Statement of Problem and Substantiation for Public Input

Item T Manual Shutoff Valve is not show on the Figure. Label for item T should be removed for clarity.

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A.6.6.3.2.1 Variations in the burning characteristics of the fuel and in the normal variations in fuel-handling equipment and fuel-burning equipment introduce unreliability to the lower operating limits of the main fuel subsystem in any given furnace design.

Boilers with a small number of burners can be subject to hazardous air-fuel ratios, particularly where a burner is being placed into service or being taken out of service and one burner is tripped.

The smaller the number of burners (e.g., only two burners), the greater the potential hazard.

Specific recommendations for the design and operation of two-burner boilers are provided in 6.6.7 and 6.7.7. These same principles can be applied to boilers with more than two burners but generally fewer than six burners that are subject to this hazard.

A.6.6.3.2.2 Such transients are generated by means such as burner shutoff valves and dampers that operate at speeds faster than the speed of response of other components in the system.

A.6.6.3.5.3 Various types of fuel reburn systems are being applied across many types of multiple burner boilers for control of NO_x. A limited accumulation of operating history with reburn systems prompted the Technical Committee on Multiple Burner Boilers to provide redundant safety requirements. These redundant requirements utilize either reburn flame sensors or boiler furnace gas temperature monitoring. Reburn flame sensing or furnace gas temperature monitoring provides direct supervision of variables critical to the operating safety of reburn systems. These measured variables augment the other requirements of 6.4.1.2.10.

A.6.6.4.3 Loss of multiple burners for any reason within a short time frame can indicate or create hazardous conditions within the furnace. A master fuel trip should be considered if it is determined that the loss of a predetermined number of burners within a predetermined time frame indicates such a hazardous condition. Hazards include furnace pressure excursions, fuel pressure excursions, improper fuel and air distribution, excessive combustibles, and so forth.

A.6.6.5.1.3 The objective of the leak test is to ensure that the individual burner safety shutoff valves are not leaking gas into the furnace. The test can be performed by proving the individual burner safety shutoff valves are closed, then closing the main fuel header vent valve, opening the main safety shutoff valve, thus pressurizing the header, then closing the main safety shutoff valve. If a charging valve is used, the test is performed by proving the main safety shutoff valve is closed and proving the individual burner safety shutoff valves are closed, then closing the main fuel header vent valve, then opening the charging valve to pressurize the header, then closing the charging valve. That pressure must be held within predetermined limits for a predetermined amount of time for the test to be successful.

A.6.6.5.1.3.2 See Figure A.6.6.5.1.5.4(b), which shows a typical main burner fuel supply system that includes the piping that should be checked.

A.6.6.5.1.5.4 Sequences of operation are based on the typical fuel supply system shown in Figure A.6.6.5.1.5.4(a) and Figure A.6.6.5.1.5.4(b). As permitted in 6.6.3.1, variations in these piping arrangements are allowed, provided all the functional requirements of this code are met by the arrangement.

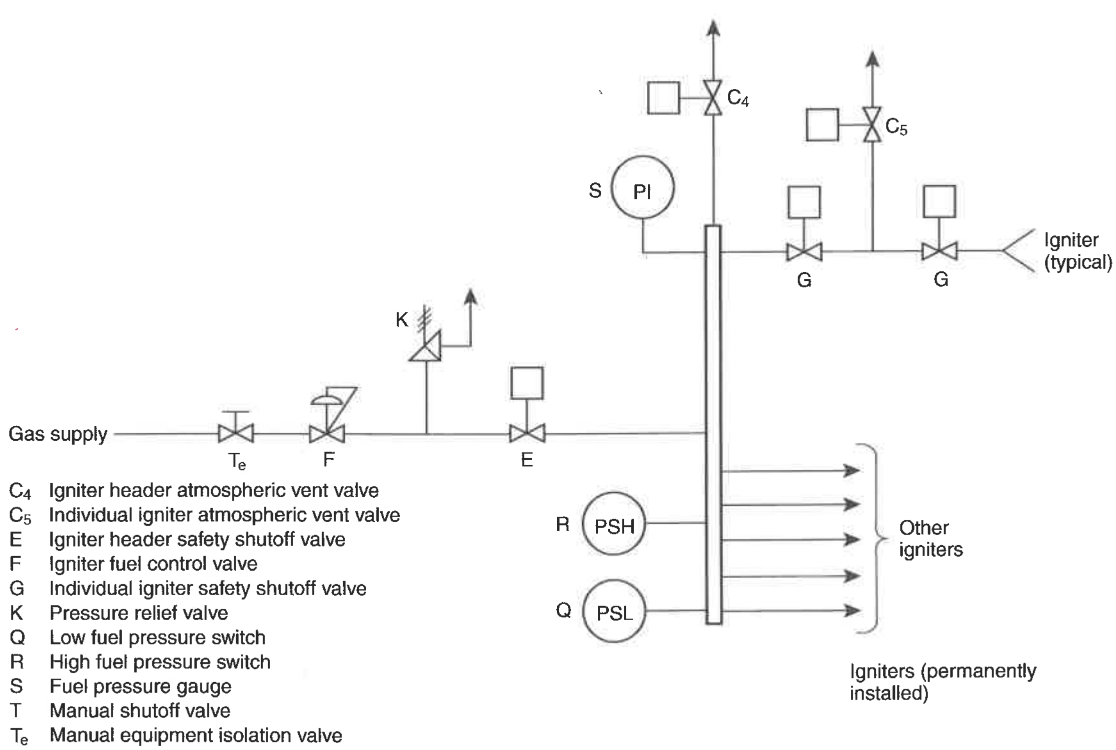


FIGURE A.6.6.5.1.5.4(a) Typical Gas Igniter System.

Public Input No. 104-NFPA 85-2021 [Section No. A.6.7.5.1.5.4]

A.6.7.5.1.5.4

Sequences of operation are based on the typical fuel supply system shown in Figure A.6.7.5.1.5.4(a) through Figure A.6.7.5.1.5.4(d) As permitted in 6.7.3.1, variations in these piping arrangements are allowed, provided all the functional requirements of this code are met by the arrangement. Figure A.6.7.5.1.5.4(a) through Figure A.6.7.5.1.5.4(d) show the typical piping arrangements on which the text in 6.7.5 is based.

Figure A.6.7.5.1.5.4(a) Typical Mechanical Atomizing Light Oil Igniter System.

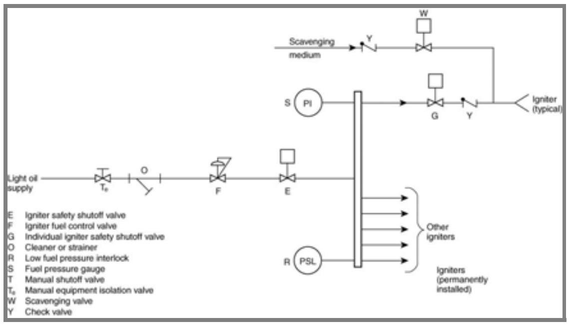


Figure A.6.7.5.1.5.4(b) Typical Steam or Air Atomizing Light Oil Igniter System.

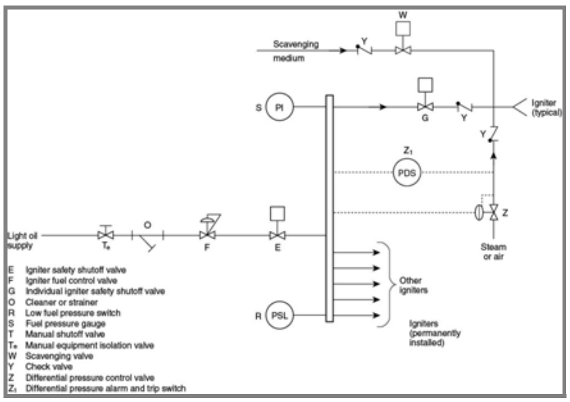


Figure A.6.7.5.1.5.4(c) Typical Mechanical Atomizing Main Oil Burner System.

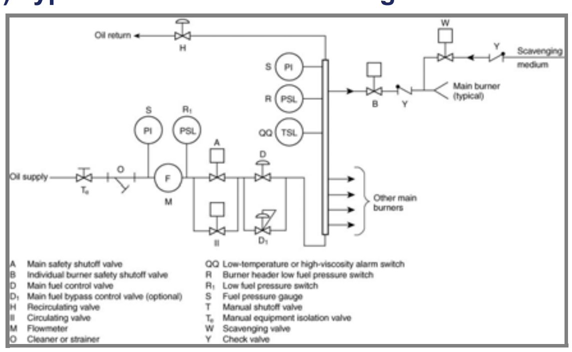
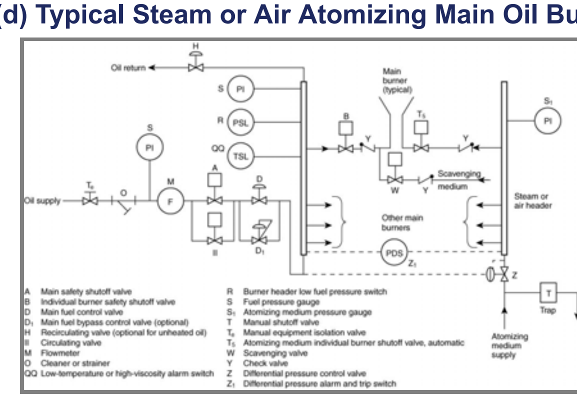


Figure A.6.7.5.1.5.4(d) Typical Steam or Air Atomizing Main Oil Burner System.



Additional Proposed Changes

File Name	Description	Approved
A.6.7.5.1.5.4.pdf	Proposed changes to A.6.7.5.1.5.4(a),(b),(c), &(d)	

Statement of Problem and Substantiation for Public Input

Item T Manual Shutoff Valve is not show on the Figures. Label for item T should be removed for clarity.

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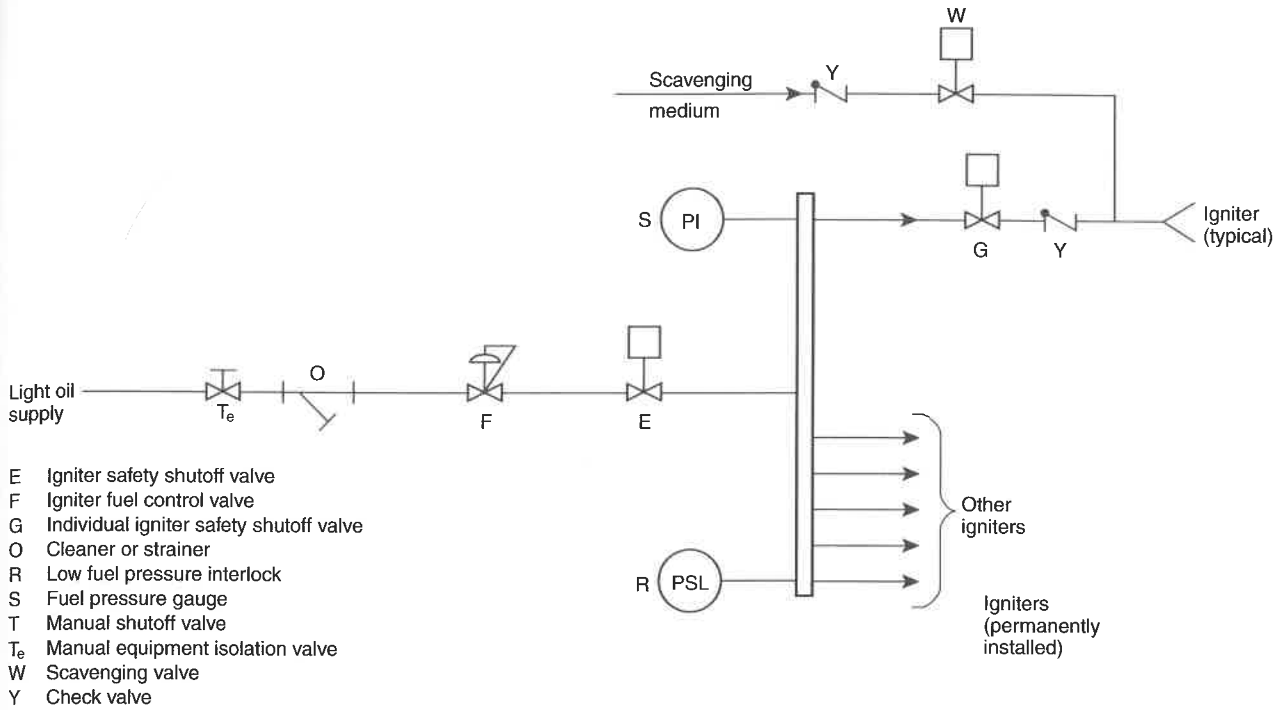


Δ FIGURE A.6.7.5.1.5.4(a) Typical Mechanical Atomizing Light Oil Igniter System.

A.6.8.2.1(1) Coal undergoes considerable processing in several independent subsystems that need to operate together. Failure to process the fuel properly in each subsystem increases the potential explosion hazard.

A.6.8.2.1(2) Methane gas released from freshly crushed or pulverized coal can accumulate in enclosed spaces.

A.6.8.2.1(3) Pulverized coal is conveyed through pipes from the pulverizer to the burner by transport air. Improper operation can introduce multiple hazards. For example, improper removal of a burner from service can introduce the following:

(1) The settling out of pulverized coal in the burner pipes to inoperative burners, which, on restarting of the burner, can cause a furnace puff
(2) Leakage of pulverized coal from the operating pulverizer through the burner valve into the idle burner pipe
(3) Leakage of gas or air through a burner valve, thereby causing a fire in an idle pulverizer

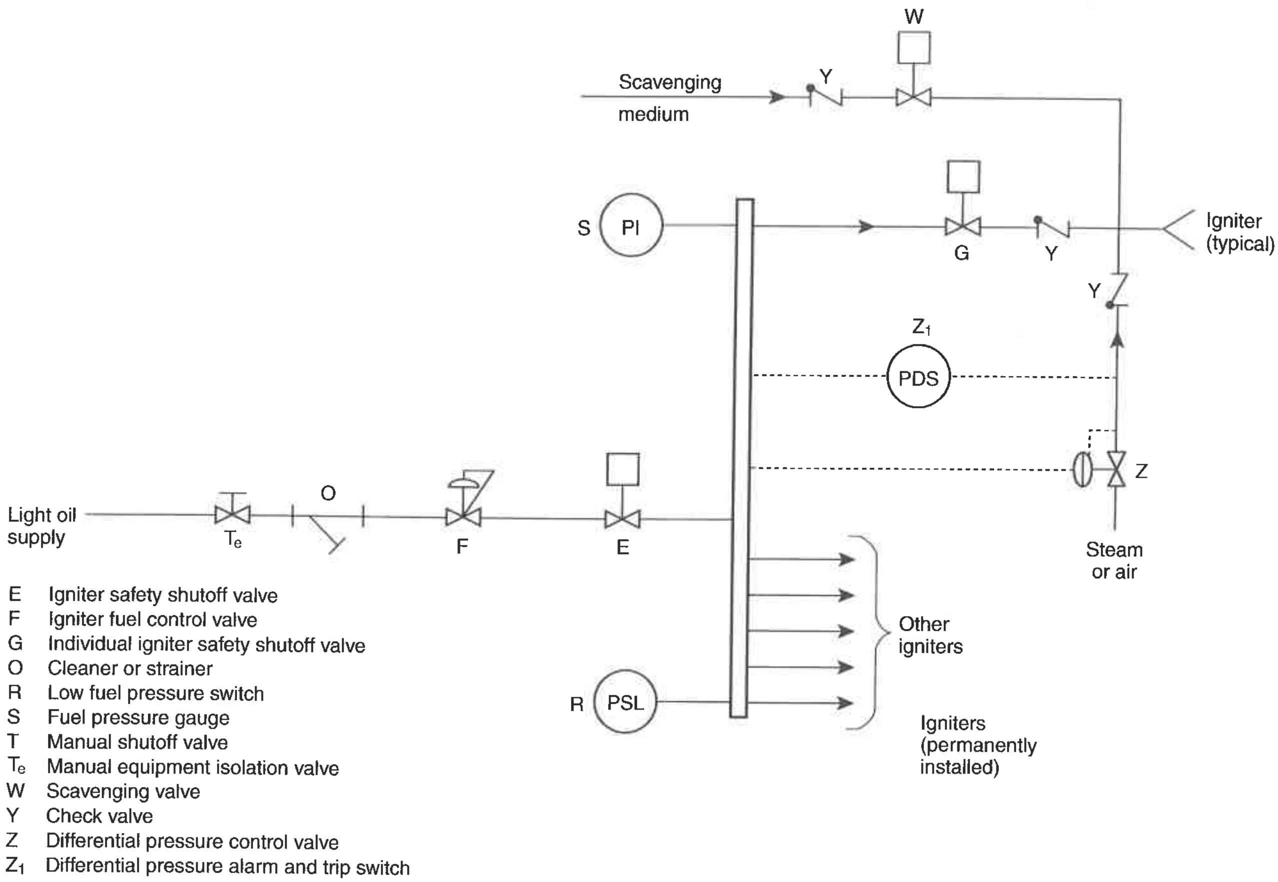
See 6.8.5 for precautions to minimize such hazards.

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.

A.6.8.2.1(5) The burning of pulverized coal requires close integration of the pulverizer system. Normally, the pulverizer system and the burner system function as a unit so that start-up of the pulverizer is integrated with the light-off of all its associated burners. Ignition of pulverized coal in the burner pipe could occur if the velocity of the transport air falls below a minimum value. In addition, operating and purging the pipes with this minimum airflow during the shutdown procedure prevent the settling of the fuel in the burner pipes. The danger associated with this settling is that the accumulated coal could cause an explosion as the flow in the pipe is increased.

A.6.8.2.1(6) It is necessary to dry coal for proper pulverizer operation and combustion. This drying usually is accomplished by supplying hot air to the pulverizer. Temperature control normally is maintained by mixing tempering air with hot air from the air heater. An outlet temperature that is too low impedes pulverization. An outlet temperature that is too high causes coking or overheating of burner parts and increases the possibility of pulverizer fires. Maintaining a controlled outlet temperature also aids in controlling the relationship between the fuel and the primary air.

A.6.8.2.2.2 Coal is subject to wide variations in analysis and characteristics. The change in the percentage of volatile constituents affects the ignition characteristics of the coal and can affect the permitted turndown ratio of a particular burner design. Coals having high volatile content (above 28 percent, as fired) are easier to ignite than coals having low volatile content (below 20 percent, as fired). As the volatile content decreases, the minimum permitted firing rate can increase significantly. The fineness of pulverized coal also can affect the permitted turndown ratio. Therefore, it is necessary to establish minimum firing rates for the range of volatility and fineness expected. A firing rate that is too low could result in a gradual buildup of coke or slag on the burner tip or on the furnace floor and must be avoided.



Δ FIGURE A.6.7.5.1.5.4(b) Typical Steam or Air Atomizing Light Oil Igniter System.

A.6.8.2.3.1 The restrictions described in 6.8.2.2 might limit the turndown ratio significantly. This might make it necessary to light off the burner at higher loads than is necessary for either oil or gas. As a result, the procedures of the open register-purge rate light-off system advocated in this code are somewhat different from those for oil or gas.

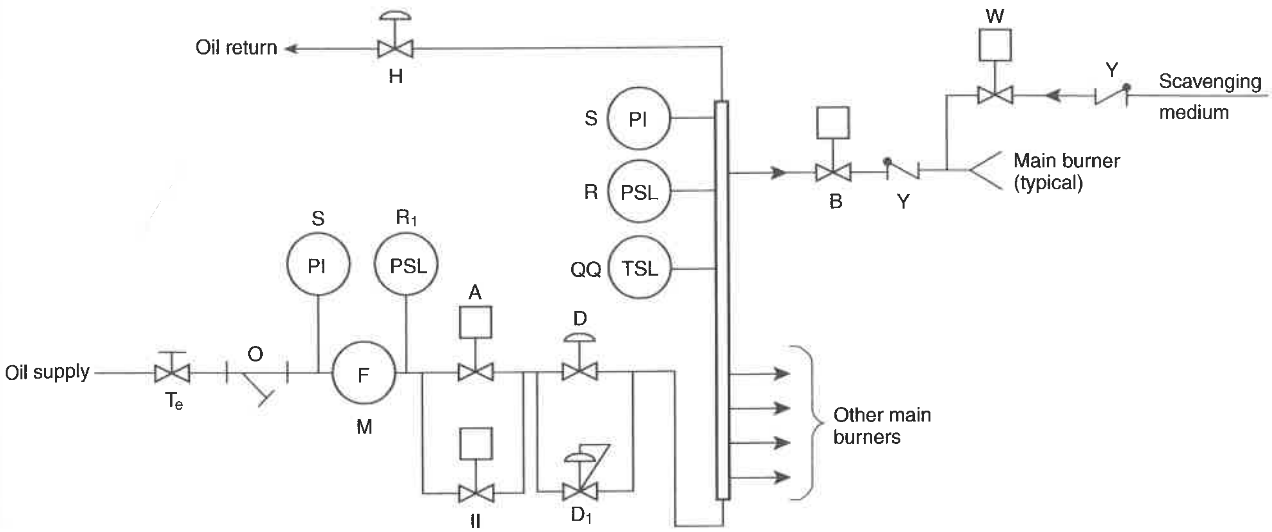
A.6.8.2.3.2 Wide variations in coal quality and spare pulverizer capability lead to large burner throats; therefore, the turbulence necessary for good mixing of coal and air is significantly restricted as the load is reduced. These factors can restrict the turndown ratio when all pulverizers are in service.

A.6.8.2.3.3 With gas and fuel oil, it usually is possible to purge and light off with the idle registers in the normal firing position by momentarily closing the registers on burners to be lit in order to establish initial ignition. Although, in the case of some coal-fired boilers, this identical procedure is possible, there are other installations where the windbox-to-furnace differential necessary to obtain the desired turbulence for purge and light-off is best obtained with all registers open to an intermediate (light-off) position; the registers then are opened progressively to the normal firing position immediately after each group of burners has been lit.

A.6.8.3.2.1 Variations in the burning characteristics of the fuel and normal variations in fuel-handling equipment and fuel-burning equipment introduce unreliability to the lower operating limits of the main fuel subsystem in any given furnace design.

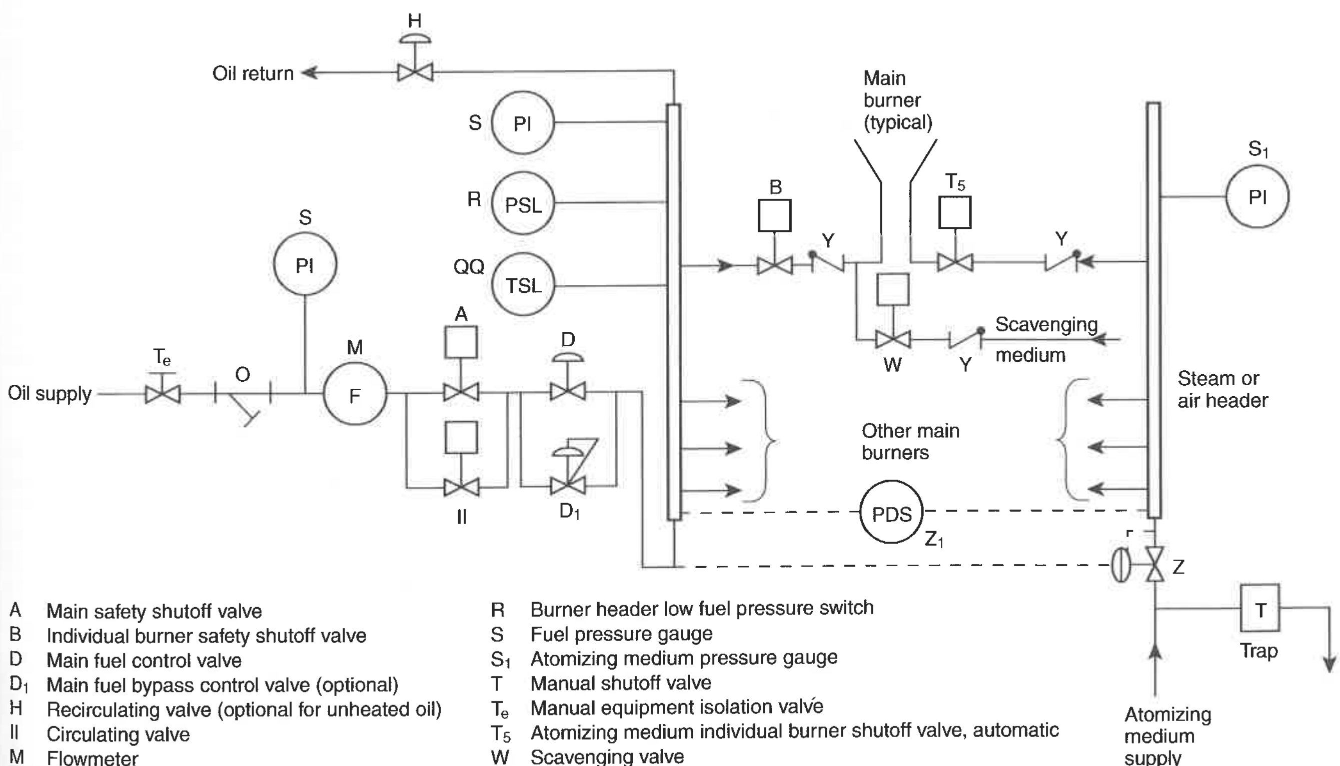
A.6.8.3.2.2.1 Such transients are generated by means such as burner shutoff valves and dampers that operate at speeds faster than the speed of response of other components in the system.

A.6.8.3.5.3 There are various types of reburn systems being applied across many types of multiple burner boilers for control of NO_x. A limited accumulation of operating history with reburn systems prompted the Technical Committee on Multiple Burner Boilers to provide redundant safety requirements. These redundant requirements utilize either reburn flame sensors or boiler furnace gas temperature monitoring. Reburn flame sensing or furnace gas temperature monitoring provides direct supervision of variables critical to the operating safety of reburn systems. These measured variables augment the requirements of 6.4.1.2.10.



A Main safety shutoff valve
B Individual burner safety shutoff valve
D Main fuel control valve
D_1 Main fuel bypass control valve (optional)
H Recirculating valve
II Circulating valve
M Flowmeter
O Cleaner or strainer
QQ Low-temperature or high-viscosity alarm switch
R Burner header low fuel pressure switch
R_1 Low fuel pressure switch
S Fuel pressure gauge
T Manual shutoff valve
T_e Manual equipment isolation valve
W Scavenging valve
Y Check valve

Δ FIGURE A.6.7.5.1.5.4(c) Typical Mechanical Atomizing Main Oil Burner System.



A Main safety shutoff valve
B Individual burner safety shutoff valve
D Main fuel control valve
D_1 Main fuel bypass control valve (optional)
H Recirculating valve (optional for unheated oil)
II Circulating valve
M Flowmeter
O Cleaner or strainer
QQ Low-temperature or high-viscosity alarm switch
R Burner header low fuel pressure switch
S Fuel pressure gauge
S_1 Atomizing medium pressure gauge
T Manual shutoff valve
T_e Manual equipment isolation valve
T_5 Atomizing medium individual burner shutoff valve, automatic
W Scavenging valve
Y Check valve
Z Differential pressure control valve
Z_1 Differential pressure alarm and trip switch

Δ FIGURE A.6.7.5.1.5.4(d) Typical Steam or Air Atomizing Main Oil Burner System.