First Revision No. 703-NFPA 85-2017 [Detail]

7.5.4 ~~Interlock System~~ Interlocks .

7.5.4.1 Functional Requirements.

The functional requirements for ~~interlock systems~~ interlocks specified in Section 7.9 shall be followed.

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Committee Statement

Committee Statement: This revision has been made to align with the new and revised definitions for interlock, permissive, and trip.
Response Message:

First Revision No. 712-NFPA 85-2017 [Detail]

7.9 ~~Interlock System~~ Interlocks .

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First Revision No. 701-NFPA 85-2017 [Section No. 7.4.3.1.10 [Excluding any Sub-Sections]]

~~For each igniter~~ Where gas igniters are provided , the minimum requirement shall be two safety shutoff valves with an intermediate vent valve or equivalent valve arrangement.

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Committee Statement

Committee Statement: The revised language limits the requirement to gas igniters and mirrors the language in 7.4.3.2.11.4.
Response Message:

Public Input No. 198-NFPA 85-2017 [Section No. 7.4.3.1.10 [Excluding any Sub-Sections]]

First Revision No. 702-NFPA 85-2017 [Section No. 7.4.4.2]

7.4.4.2 Combustion Monitoring and Tripping Systems — Functional Requirements.

The basic requirements of the combustion monitoring and tripping system shall be as follows:

(1) Combustion instability situations shall be brought to the attention of the operator for remedial action.

(2) ~~An emergency shutdown~~ A trip of the involved equipment shall be automatically initiated on detection of serious combustion problems that would lead to the accumulation of unburned fuel or to other hazardous situations.

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Response Message:

First Revision No. 723-NFPA 85-2017 [Section No. 7.5.4.2.2.2(E)]

(E)

The value of the negative pressure at which the ID fan trip is activated shall ~~be greater~~ more negative than that specified in 7.5.4.2.2.2(A).

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Committee Statement

Committee Statement: This revision is made for consistency with the language in Chapter 6.
Response Message:

Public Input No. 199-NFPA 85-2017 [Section No. 7.5.4.2.2.2(E)]

First Revision No. 704-NFPA 85-2017 [Section No. 7.5.4.2.2.3]

7.5.4.2.2.3 Loss of FD Fans.

(A)

An interlock to prove that each FD fan is running and capable of providing the required flow shall be provided.

(B)

Loss of such proofs shall initiate “loss of FD fan(s)” interlocks in accordance with the manufacturer's requirements and the requirements of this code.

(C)

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

(D)

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

(E)

If they are the last fans in service, the FD fan dampers shall remain open, and the ID fan shall remain in controlled operation.

(F)

A master fuel trip shall be initiated on loss of all FD fans.

(G)

All FD fan dampers shall be opened after a time delay to prevent high duct pressure during fan coastdown.

(H)

Dampers shall remain open.

(I)

Gas recirculation fan system dampers shall be closed.

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First Revision No. 705-NFPA 85-2017 [Section No. 7.5.4.2.2.4]

7.5.4.2.2.4 Loss of ID Fans.

(A)

An interlock to prove that each ID fan is running and capable of providing the required flow shall be provided.

(B)

Loss of such proofs shall initiate “loss of ID fan(s)” interlocks in accordance with the manufacturer's requirements and the requirements of this code.

(C)

Damper(s) shall be closed on loss of an individual ID fan, provided it is not the last ID fan in service.

(D)

Where ~~an interlock system is~~ interlocks are provided to start, stop, and trip ID fans and FD fans in pairs, the associated FD fan shall be tripped on loss of an individual ID fan.

(E)

The dampers associated with both fans shall be closed, provided they are not the last fans in service.

(F)

A master fuel trip shall be initiated on loss of all ID fans.

(G)

All FD fans shall be tripped.

(H)

All ID fan dampers shall be opened after a time delay to prevent high draft during fan coastdown.

(I)

Dampers shall remain open, and fans shall be started in accordance with 7.5.3.1.2 through 7.5.3.1.4.

(J)

Gas recirculation fan system dampers shall be closed.

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First Revision No. 706-NFPA 85-2017 [Section No. 7.6.1.2 [Excluding any Sub-Sections]]

The sequence of operations for boiler tripping shall be based on the ~~safety interlock system~~ interlocks shown in Figure 7.9.3.1.1(b).

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Response Message:

First Revision No. 707-NFPA 85-2017 [Section No. 7.6.2.5]

7.6.2.5 ~~Emergency Shutdown —~~ Master Fuel Trip.

7.6.2.5.1

With the initiation of a master fuel trip due to any of the emergency conditions listed in 7.6.2.5.2 and 7.6.2.5.3, all fuel shall be stopped from entering the boiler.

7.6.2.5.2 Conditions Resulting in Mandatory Automatic Master Fuel Trips.

A master fuel trip shall result from any of the following conditions *(see Section 7.9)*:

(1) Loss of any ID or FD fan required to sustain combustion *(See Section 7.5.)*

(2) Furnace pressure in excess of the design operating pressure by a value recommended by the manufacturer *(See Section 7.5.)*

(3) Insufficient drum level (a short time delay as established by the manufacturer is permitted)

(4) Loss of boiler circulation pumps or flow, if applicable

(5) Total airflow decrease below the purge rate by 5 percent of the full load airflow

(6) Bed temperature falling below the value specified in 7.6.2.2.5 when the main fuel is being admitted to bed and no warm-up burner is established

(7) All fuel inputs zero and bed temperature not adequate once any fuel has been admitted to the unit

7.6.2.5.3 Conditions Resulting in Mandatory Master Fuel Trips with Alarms — Not Necessarily Automatically Initiated.

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

(1) Loss of energy supply for boiler control system , burner management system , or ~~interlock systems~~ interlocks

(2) Cooling water flow for fluidized bed system components less than minimum

(3) Plant air or instrument air pressure low (process requirement only)

(4) Bed temperature high — trip to prevent unit damage resulting from excessive temperature

(5) Furnace pressure falling below the design operating pressure by a value recommended by the manufacturer

7.6.2.5.4 Actions upon Initiating a Master Fuel Trip.

Upon the occurrence of a master fuel trip as a result of any of the emergency conditions in 7.6.2.5.2 and 7.6.2.5.3, all fuel shall be stopped from entering the boiler.

7.6.2.5.4.1

Oil and gas safety shutoff valves shall be tripped and igniter sparks de-energized.

7.6.2.5.4.2

The fuel, sorbent, and bed feed system shall be tripped.

7.6.2.5.4.3

Electrostatic precipitators, fired reheaters, or other ignition sources shall be tripped.

7.6.2.5.4.4

Master fuel trips shall operate in a manner to stop all fuel flow into the furnace within a period that does not allow a dangerous accumulation of fuel in the furnace.

7.6.2.5.4.5

The owner shall have the option of allowing a master fuel trip to initiate a time delay FD fan and ID fan trip. *(See 7.6.2.3.2.2.)*

7.6.2.5.4.6

Where the design allows, char recirculation shall be stopped.

7.6.2.5.5 Actions Following a Master Fuel Trip.

7.6.2.5.5.1

The sorbent, bed material feed, and bed material drain system shall be permitted to be restarted as necessary.

7.6.2.5.5.2

The owner shall have the option under conditions where there is low-low drum water level and furnace outlet temperature is above 482°C (900°F) to stop the flow of fluidizing air immediately.

(A)

An FD fan shall be permitted to be tripped to stop the flow of fluidizing air.

(B)

The ID fan shall not be tripped.

7.6.2.5.5.3

If the option for tripping fans on a master fuel trip is not exercised, the fans that are operating after the master fuel trip shall be continued in service, and the airflow shall not be increased immediately by deliberate manual or automatic control action.

7.6.2.5.5.4

Except as permitted in 7.6.2.5.5.1, equipment that is tripped at the time of or following a master fuel trip shall not be restarted until conditions have stabilized and it is determined that the equipment can be safely restarted.

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Response Message:

First Revision No. 708-NFPA 85-2017 [Section No. 7.6.2.6]

7.6.2.6 ~~Emergency Shutdown —~~ Main Fuel Trip.

7.6.2.6.1

With the initiation of a main fuel trip due to any of the emergency conditions listed in 7.6.2.6.2 or 7.6.2.6.3, all main fuel shall be stopped from entering the boiler.

7.6.2.6.2 Conditions That Result in Mandatory Automatic Main Fuel Trips.

A main fuel trip shall result from any of the following conditions *(see Section 7.9)*:

(1) Master fuel trip

(2) Inadequate bed temperature as defined by the boiler designer with warm-up burners in service *(See 7.6.1.5.1.6.)*

(3) Inadequate bed temperature as defined by the boiler designer without warm-up burners in service *(See 7.6.2.2.5.)*

(4) Inadequate airflow to fluidize the bed as defined by the boiler designer

7.6.2.6.3 Mandatory Main Fuel Trips — Not Necessarily Automatically Initiated.

A main fuel trip shall result from inadequate solids inventory.

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First Revision No. 709-NFPA 85-2017 [Section No. 7.6.2.9]

7.6.2.9 After ~~Emergency Shutdown~~ Master Fuel Trip .

The following actions shall be taken after ~~an emergency shutdown~~ a master fuel trip :

(1) The unit shall be shut down in accordance with 7.6.2.3.

(2) If conditions for a hot restart in accordance with 7.6.2.4.1 exist following ~~an emergency shutdown~~ a master fuel trip , a hot restart shall be permitted.

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Response Message:

First Revision No. 710-NFPA 85-2017 [Section No. 7.7.5.2.1.1]

7.7.5.2.1.1

Preparation for starting shall include a thorough inspection and shall verify the following:

(1) All safety shutoff valves are closed, and all sparks are de-energized.

(2) Oil ignition systems meet the requirements of Section 7.8.

(3) Fuel system vents are open and venting to atmosphere outside the boiler room; lines are drained and cleared of condensate and other foreign material.

(4) The correct drum water level is established in drum-type boilers, circulating flow is established in forced circulation boilers, or minimum water flow is established in once-through boilers as established by the boiler manufacturer.

(5) Burner elements and igniters are positioned in accordance with the manufacturer's specification.

(6) Energy is supplied to the control systems and ~~interlock systems~~ to the interlocks and associated devices .

(7) Meters or gauges are indicating fuel header pressure to the unit.

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Response Message:

First Revision No. 711-NFPA 85-2017 [Section No. 7.8.5.2.1.1]

7.8.5.2.1.1

Preparation for start-up shall include a thorough inspection and shall verify the following:

(1) Energy is supplied to the control ~~system~~ systems and to the ~~interlock systems~~ interlocks and associated devices .

(2) All safety shutoff valves are closed; all sparks are de-energized.

(3) Gas ignition systems meet the requirements of Section 7.7.

(4) Circulating valves are open to provide and maintain hot oil in the burner headers.

(5) The proper drum water level is established in drum-type boilers, circulating flow is established in forced circulation boilers, or minimum water flow is established in once-through boilers.

(6) Burner guns have been checked to ensure that the correct burner tips and sprayer plates and gaskets are in place to ensure a safe operating condition.

(7) Burner elements and igniters are positioned in accordance with the manufacturer's specifications.

(8) Meters or gauges indicate fuel header pressure to the unit.

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Committee Statement

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Response Message:

First Revision No. 713-NFPA 85-2017 [Sections 7.9.1.1, 7.9.1.2]

7.9.1.1*

The basic requirements of ~~an interlock system~~ interlocks for a unit shall be to protect personnel from injury ~~and also~~ , to protect the equipment from damage, and to allow proper and stable operation of the unit .

7.9.1.2

The ~~interlock system~~ interlocks shall function to protect against improper unit operation by limiting actions to a prescribed operating sequence or by initiating trip devices when approaching an undesirable or unstable operating condition.

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First Revision No. 714-NFPA 85-2017 [Sections 7.9.2.2, 7.9.2.3, 7.9.2.4]

7.9.2.2

~~An interlock system~~ All interlocks and associated devices shall be installed, adjusted, and tested to confirm design, function, and required timing.

7.9.2.3

Periodic testing and maintenance shall be performed to keep the ~~interlock system~~ interlocks functioning in accordance with the manufacturer's specifications.

7.9.2.4

The design of ~~an interlock system~~ interlocks shall be predicated on the fundamentals in 7.9.2.4.1 through 7.9.2.4.10.

7.9.2.4.1

The starting procedure and operation shall be supervised to ensure proper operating practices and sequences.

7.9.2.4.2

The minimum amount of equipment shall be tripped in the required sequence where the safety of personnel or equipment is jeopardized.

7.9.2.4.3

The cause of the trip shall be indicated and shall prevent restarting of any portion of the affected equipment until nonhazardous conditions are established.

7.9.2.4.4

The required fuel safety subsystems related to duct burner, lance, warm-up burner, solid fuel and master fuel trip, and their related trip devices shall be functionally coordinated into an overall unit interlock ~~system~~ scheme .

7.9.2.4.5

Where automatic equipment is not available to accomplish the intended function, instrumentation shall be provided to enable the operator to complete the required operating sequence.

7.9.2.4.6

The design shall provide as much flexibility with respect to ~~alternate~~ alternative modes of operation as is consistent with good operating practice.

7.9.2.4.7

Preventive maintenance shall be provided in accordance with the manufacturer's recommendations.

7.9.2.4.8

The design shall not require any deliberate defeating of an interlock to start or operate equipment. Whenever ~~a safety~~ an interlock or associated device is removed temporarily from service, it shall be noted in the log and annunciated if practicable, and a manual or other means shall be substituted to supervise this interlock ~~function~~ .

7.9.2.4.9*

Except as permitted in 7.9.2.4.9.1 and 7.9.2.4.9.2, the mandatory automatic master fuel trip and mandatory automatic main fuel trip systems, including sensing elements and circuits, shall be functionally independent from all other control system functions. The warm-up burner fuel trip system, sensing elements, and circuits shall be functionally independent from all other control system functions.

7.9.2.4.9.1

Individual burner flame failure devices shall be permitted to be used for initiating master fuel trip systems.

7.9.2.4.9.2

Airflow measurement, drum level measurement, and auctioneered furnace draft signals from the boiler control system shall be permitted to be used for a master fuel trip, provided all the following conditions are met:

(1) These interlocks are hardwired into the burner management system.

(2) Tripping set points are protected from unauthorized changes.

(3) Any single component failure of these sensing elements and circuits does not prevent a mandatory master fuel trip.

7.9.2.4.10

The misoperation of ~~the~~ an interlock ~~system~~ or related equipment due to interruption and restoration of the interlock power supply shall be prevented.

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First Revision No. 715-NFPA 85-2017 [Section No. 7.9.3.1.1]

DELETED

7.9.3.1.1

Interlocks shall be required as shown in Figure 7.9.3.1.1(a) through Figure 7.9.3.1.1(f) to provide the basic furnace protection for fluidized bed boilers.

Figure 7.9.3.1.1(a) Interlock ~~System~~ Overview.

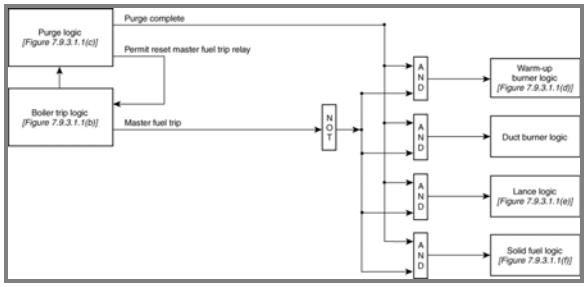


Figure 7.9.3.1.1(b) Boiler Trip Logic.

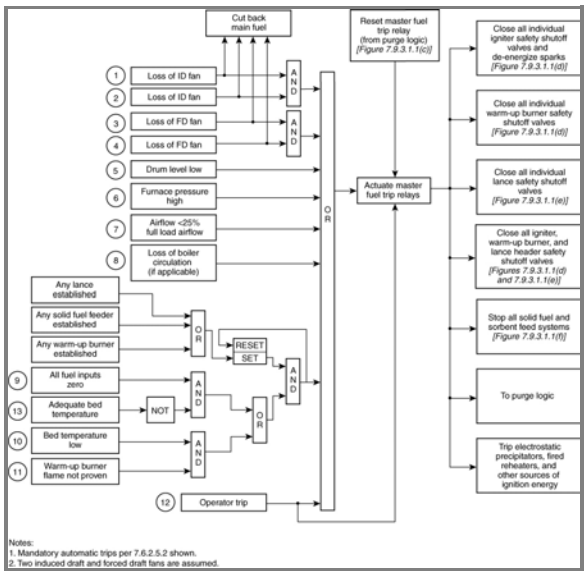


Figure 7.9.3.1.1(c) Purge Logic.

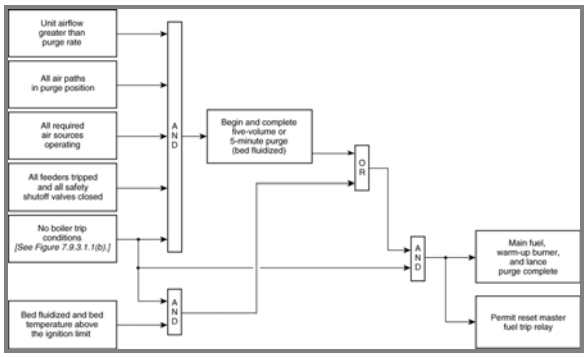


Figure 7.9.3.1.1(d) Warm-up Burner Safety Subsystem.

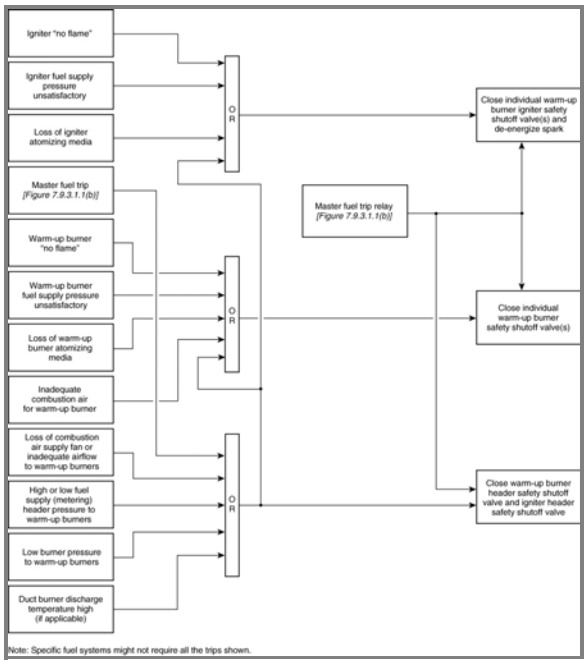


Figure 7.9.3.1.1(e) Lance Safety Subsystem.

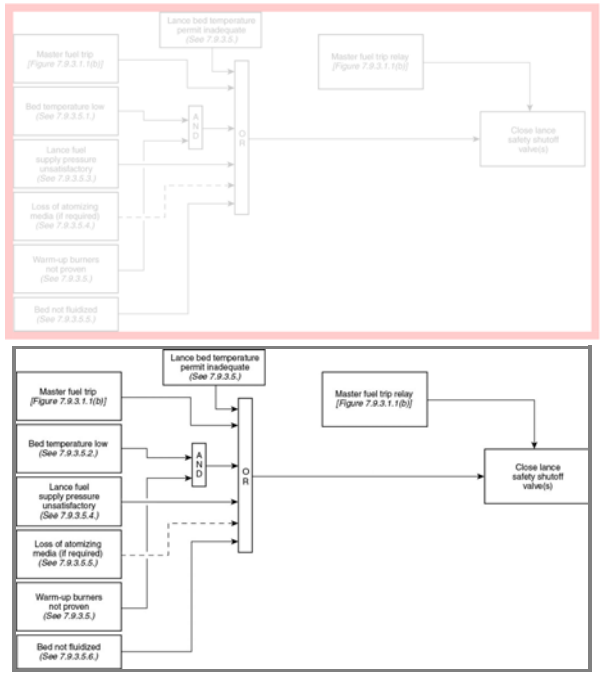
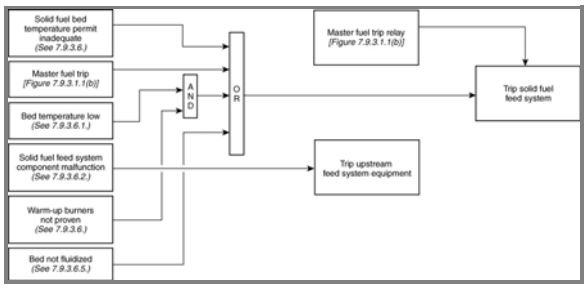


Figure 7.9.3.1.1(f) Solid Fuel Safety Subsystem.



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Response Message:

First Revision No. 716-NFPA 85-2017 [Section No. 7.9.3.2]

7.9.3.2 Master Fuel Trip Logic.

The master fuel trip logic that initiates the tripping of all fuel supplies through a master fuel trip ~~device~~ relay(s) and associated devices shall be as shown in Figure 7.9.3.1.1(b) and shall be in accordance with Section 7.6.

7.9.3.2.1

The master fuel trip ~~device~~ relay(s) and associated devices shall remain tripped until reset by either the successful completion of the purge cycle or the main fuel temperature permissive from the fuel release logic, as shown in Figure 7.9.3.1.1(c).

7.9.3.2.2

Each source of operation of the master fuel trip ~~devices~~ relay(s) shall actuate a “cause of trip” indication that informs the operator of the initiating cause of trip impulse.

7.9.3.2.2.1

The loss of all ID fans or all FD fans shall operate the master fuel trip ~~device~~ relay(s) and associated devices , as shown in blocks 1 through 4 of Figure 7.9.3.1.1(b).

7.9.3.2.2.2

The loss of an individual ID fan or FD fan shall cause an immediate runback in unit fuel input in order to maintain the air-fuel ratio within the required limits. This shall be permitted to be interlocked or made a part of the combustion control system.

7.9.3.2.2.3

The signal indicating furnace pressure high [block 6 in Figure 7.9.3.1.1(b)] shall be interlocked with the master fuel trip ~~device~~ relay(s) and associated devices to protect against abnormal furnace conditions, such as those resulting from a tube rupture or damper failure.

7.9.3.2.2.4

A manual trip switch [block 12 in Figure 7.9.3.1.1(b)] shall be provided for operator use in an emergency and shall actuate the master fuel trip relay directly.

7.9.3.2.2.5*

The signal indicating low bed temperature [block 10 in Figure 7.9.3.1.1(b)], as defined in 7.6.1.5.1.6, and the signal indicating that the warm-up burner flame is not proven (block 11) shall be interlocked with the master fuel trip ~~device~~ relay(s) and associated devices to prevent the further admission of fuel into the furnace under “no-flame” conditions.

7.9.3.2.2.6 All Fuel Inputs Zero [block 9 in Figure 7.9.3.1.1(b)].

(A)

A mandatory master fuel trip shall occur once any fuel has been admitted to the unit, all fuel sources are subsequently isolated, and bed temperature is less than the main fuel operating permissive (block 13) as defined in 7.6.2.2.5.

(B)

This trip shall be permitted to be reset and bypassed once the bed temperature exceeds the temperature permissive level for admitting fuel.

7.9.3.2.2.7

Other trips as required by 7.6.2.5.2 and additional automatic master fuel trips required for a particular boiler design shall actuate the master fuel trip relay.

7.9.3.2.2.8

In all cases following a master fuel trip, operator initiation of fuel input to the unit shall be required.

7.9.3.2.2.9 Type.

(A)

The master fuel trip ~~device~~ relay(s) and associated devices shall be of the type that remains tripped until the boiler purge system permits it to reset.

(B)

When actuated, the master fuel trip ~~device~~ relay(s) and associated devices shall trip all sources of solid fuel input directly, close all safety shutoff valves, de-energize all igniter sparks, and de-energize all other ignition sources within the unit and the flue gas path.

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Response Message:

First Revision No. 717-NFPA 85-2017 [Section No. 7.9.3.3.3.4]

7.9.3.3.3.4

On successful completion of the purge or following completion of the purge bypass and reset, the master fuel trip ~~device~~ relay(s) and associated devices shall be reset.

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Committee Statement: This revision has been made to align with the new and revised definitions for interlock, permissive, and trip. The changes from “master fuel trip device” to “master fuel trip relay and associated devices” were made because “master fuel trip relay” is the defined term in Chapter 3.

Response Message:

First Revision No. 718-NFPA 85-2017 [Section No. 7.10.2.1.5]

7.10.2.1.5 Loss of Interlock Power.

This condition shall be sensed and alarmed and shall include all sources of power necessary to ~~complete interlock functions~~ activate the interlock(s) . If multiple sources of power, including compressed air, are required for ~~an~~ the interlock(s) ~~system~~ , then loss of each power source shall be annunciated separately.

Submitter Information Verification

Submitter Full Name: BCS-FBB
Organization: National Fire Protection Assoc
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Committee Statement

Committee Statement: This revision has been made to align with the new and revised definitions for interlock, permissive, and trip.
Response Message:

First Revision No. 724-NFPA 85-2017 [Section No. A.7.6.2.1.1(10)]

A.7.6.2.1.1(10)

Analyzers could contain heated elements that exceed the autoignition temperature of some fuels. Zirconium oxide analyzers, commonly used for oxygen analysis, contain an element heated to 704°C (1300°F). This high temperature element presents a potential ignition source to unburned fuel that could be present at start up. Some analyzers are designed to protect the sampled space from the ignition source by providing flashback protection (such as flame arresters in the sample gas path).

It should be noted, however, that flame ~~arrestors~~ arresters might only work below a certain temperature ~~which~~ that is usually not quantified, might not quench a flame as well once ~~it becomes~~ they become corroded, and might induce a speed of response delay that could be detrimental to the control or protection strategy. Consideration should be given to powering down analyzers during boiler or fuel trip situations if they can exceed the autoignition temperature of the fuel being fired. Alternatively, consideration could be given to using analyzer technologies that operate below autoignition temperatures or to using installation techniques that mount the analyzer external to the process where the flue gas sampling can be shut off during a boiler or fuel trip situation.

Submitter Information Verification

Submitter Full Name: BCS-FBB
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City:
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Submittal Date: Thu Feb 16 16:50:54 EST 2017

Committee Statement

Committee Statement: None of the insurers contacted had any specific loss history that they could identify on oxygen analyzer initiated fires so it is difficult to determine how much of a hazard this situation actually provides. There is not, therefore, justification to state a mandatory requirement beyond the present requirements found in 5.4.4.6.3, 6.4.1.2.4.6(2) and 7.6.2.1.1(10) in NFPA 85-2015. Additional Annex material, however, would be helpful so that was developed based on information provided by a number of analyzer manufacturers.

Response Message:

Public Input No. 117-NFPA 85-2016 [Section No. A.7.6.2.1.1(10)]

First Revision No. 719-NFPA 85-2017 [Section No. A.7.9.2.4.9]

A.7.9.2.4.9

The mandatory master fuel trip system and circuits should be functionally independent and physically separated from all other control system operations. The intent of this separation should be to ensure that any credible failure in the control system cannot prevent or prohibit any necessary mandatory automatic trip. The intent is that the master fuel trip system function should not be intermixed with other control system functions, although they can be permitted to use the same type of hardware and software. Components such as operator interfaces or annunciation can be shared where it is desirable to do so. Information on input status should be dedicated to the mandatory master fuel trip and ~~interlock system~~ interlocks to the greatest extent possible. Where signals are shared between the mandatory master fuel trip and ~~interlock systems~~ interlocks and other control systems, the signal should be input to the master fuel trip system and retransmitted to any other control system(s).

Submitter Information Verification

Submitter Full Name: BCS-FBB
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Committee Statement

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Response Message:

First Revision No. 720-NFPA 85-2017 [Section No. A.7.9.3.3.3.3]

A.7.9.3.3.3.3

It is recommended that manual initiation be required before the purge reset of the master fuel trip ~~device~~ relay(s) and associated devices is completed.

Submitter Information Verification

Submitter Full Name: BCS-FBB
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Response Message:

First Revision No. 721-NFPA 85-2017 [Section No. A.7.10.2.2]

A.7.10.2.2

In addition to the recommended alarms for fuel gas burners, the following alarms are recommended to indicate abnormal conditions and, where applicable, to alarm in advance of ~~an emergency shutdown~~ a trip . It is recommended that provision be made in the design for possible future conversion to automatic trips ~~in the interlock system~~ .

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

(2) *Change in heating value of the fuel gas.* In the event that the gas supply is subject to heating value fluctuations in excess of 1863 kJ/m^3 (50 Btu/ft^3), a meter in the gas supply or an oxygen meter on the flue gas should be provided.

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

(4) *Flame detector trouble.* This alarm warns the operator of a flame detector malfunction.

(5) *Ignition fuel supply pressure (low).* This alarm monitors the ignition fuel supply pressure at a point as far upstream of the control and safety shutoff valves as practicable.

(6) *Any vent valve failed to close.* An alarm warns the operator of vent valve failure to close.

Submitter Information Verification

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Committee Statement

Committee Statement: This revision has been made to align with the new and revised definitions for interlock, permissive, and trip.
Response Message:

First Revision No. 722-NFPA 85-2017 [Section No. A.7.10.2.3]

A.7.10.2.3

In addition to the required alarms for fuel oil, the following alarms are recommended to indicate abnormal conditions and, where applicable, to alarm in advance of a ~~safety shutdown~~ trip . It is recommended that provisions be made in the design for possible future conversion to automatic trips ~~in the interlock system~~ .

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

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

(3) *Ignition fuel supply pressure (low).* This alarm monitors the ignition fuel supply pressure at a point as far upstream of the control and safety shutoff valves as practicable.

(4) *Flame detector trouble.* This alarm warns the operator of a flame detector malfunction.

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

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

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

Submitter Information Verification

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Committee Statement

Committee Statement: This revision has been made to align with the new and revised definitions for interlock, permissive, and trip.
Response Message: