6.4.3.2.21 Loss of Control Power. This condition shall be sensed and alarmed to include any sources of power for the control systems.

6.4.3.2.22 Loss of Flame. A partial or total loss of flame envelope still receiving fuel shall be monitored and alarmed.

6.4.3.2.23 Burner Valves Not Closed. The closed position of individual burner safety shutoff valves shall be monitored, and failure of any valve to close following a trip shall be alarmed.

6.4.3.2.24 Drum Water Level (Low). The average water level in the boiler drum shall be monitored and shall alarm when the level in the drum drops to the lowest operating point, as recommended by the manufacturer.

6.4.3.2.25 Initiation of Directional Blocking or Override Action. Initiation of directional blocking or override action within the furnace pressure control system shall be monitored and alarmed.

6.4.3.2.26 Redundant Transmitter Malfunctions. Redundant transmitter malfunctions within the furnace pressure control system shall be monitored and alarmed.

6.4.3.2.27 Axial Flow Fan Nearing Stall Line.

6.4.3.2.28 Reburn Fuel Gas Pressure (High and Low).

6.4.3.2.28.1 This alarm shall apply to units with a reburn system.

6.4.3.2.28.2 The reburn fuel header pressure shall be monitored as close to the burners and injectors as practicable in order to warn the operator of abnormal fuel pressures in advance of trip conditions.

6.4.3.2.29 Failure of Reburn Safety Shutoff Valve to Close.

6.4.3.2.29.1 This alarm shall apply to units with a reburn system.

6.4.3.2.29.2 The closed position of reburn safety shutoff valves shall be monitored, and failure of any valve to close following a trip shall be alarmed.

6.4.3.2.30 Reburn Fuel Oil Supply Pressure Low.

6.4.3.2.31 Reburn Fuel Oil Temperature Low. A low fuel oil temperature alarm shall be provided if the reburn fuel needs to be heated to maintain viscosity for correct atomization.

6.4.3.2.32 Reburn Atomizing Steam or Air Pressure Low. A low differential pressure alarm between the fuel oil and the atomizing medium or a low atomizing pressure alarm shall be provided, depending on the requirements.

6.4.3.2.33 Reburn Fuel (Coal) Transport Flow (Low). This alarm shall apply to units with a reburn system.

6.4.3.2.34 Reburn Fuel (Coal) Transport Temperature (High). This alarm shall apply to units with a reburn system.

6.4.3.2.35 Reburn Fuel (Coal) Preparation System Fault.

6.4.3.2.35.1 This alarm shall apply to units with a reburn system.

6.4.3.2.35.2 Any failure of the fuel preparation equipment that results in reburn fuel preparation outside design specifications shall be alarmed.

6.4.3.2.36 Flue Gas Combustibles (High).

6.4.3.2.36.1 This alarm shall apply to units with a reburn system.

6.4.3.2.36.2 This alarm shall occur when combustible mixtures measured by the analyzer exceed 1 percent by volume of the flue gas.

6.4.3.2.37 Furnace Temperature (Low). This alarm shall apply to units with a reburn system and shall be set as defined in 6.6.3.5.2, 6.7.3.5.2, and 6.8.3.5.2.

6.4.3.2.38 Duct Burner Fuel Header Pressure (High and Low). The duct burner header pressure shall be monitored as close to the duct burners as practicable.

6.4.3.2.39 Failure of Duct Burner Safety Shutoff Valve to Close. The closed position of all duct burner safety shutoff valves shall be monitored, and failure of any valve to close shall be alarmed.

6.4.3.2.40 Duct Burner Igniter Fuel Header Pressure (High and Low). The duct burner igniter header pressure shall be monitored as close to the duct burners as practicable.

6.4.3.2.41 Duct Burner Discharge Temperature (High). This alarm shall indicate when the duct burner outlet temperature exceeds design operating limits.

6.5 Furnace Implosion Protection.

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

6.5.1.1 Transient Design Pressure.

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

6.5.1.1.2 This transient design pressure need not be considered as acting simultaneously with other transient loads such as wind load or seismic load.

6.5.1.2 Pressure Fired Units. Implosion protection requirements shall not apply to units without a fan located in the flue gas path downstream of the boiler enclosure.

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

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

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

6.5.1.3.2.1* Positive Transient Design Pressure.

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

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

6.5.1.3.2.2* Negative Transient Design Pressure.

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

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

6.5.2 Furnace Pressure Control Systems (Implosion Protection).

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

6.5.2.2 System Requirements.

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

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

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

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

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

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

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

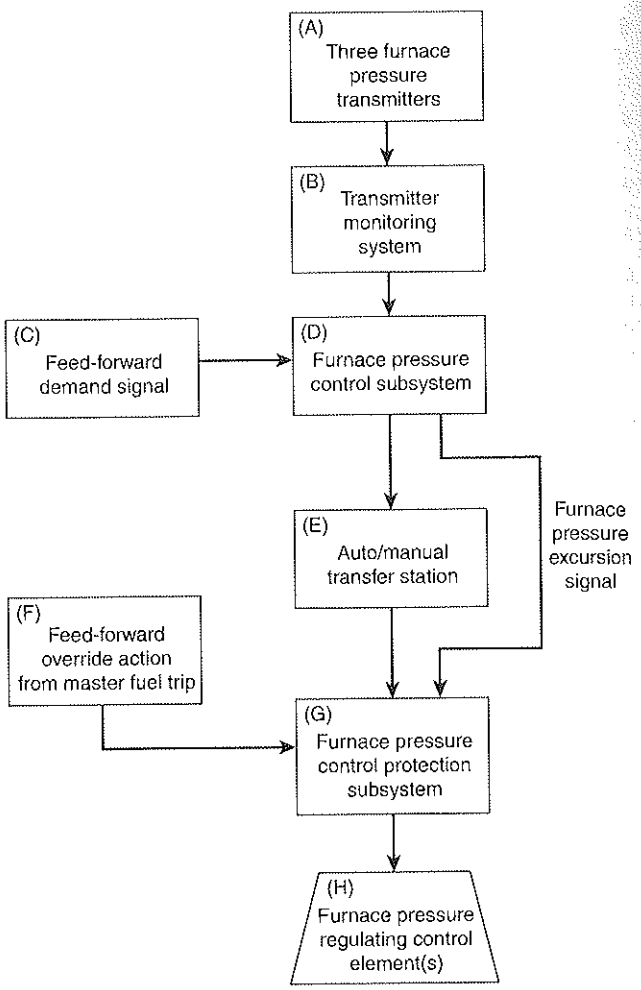

FIGURE 6.5.2.2.1 Furnace Pressure Control Systems Requirements.

6.5.3.2* Open-Flow Air Path.

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

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

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

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