

AIR SUPPLY TO FUEL-BURNING EQUIPMENT

All rooms or spaces containing boilers, furnaces, water heaters, or any other fuel-burning equipment must be provided with a constant supply of combustion air at adequate static pressure to insure proper combustion in the fuel burners. Additional air is required to replace air entering chimneys through draft hoods and barometric draft dampers, and also to provide ventilation in closely confined boiler and furnace rooms.

Experience has shown that the ventilating air openings required in heater rooms depend not only on the size of the heating plant but also on the type of fuel being burned, the relative size of the equipment room, the tightness of building construction, and the operation of exhaust fans or other devices which affect the static pressure in a building.

Because of the number of variables involved in establishing air requirements, and the variations in building construction and arrangement, there is no universally accepted rule for providing ventilating openings. However, the importance of providing proper ventilation should not be underestimated, and a failure to do so may result in erratic or even dangerous operating conditions for equipment.

Rules for providing air supply openings are found in technical standards^{1,2} in state and municipal building codes and in service and installation bulletins published by various manufacturers of fuel-burning appliances. Table 11 is a compilation of reasonably consistent data taken from a number of these sources, and should be used only as an aid to independent judgment for any particular installation.

Ventilating air requirements are particularly critical for residential type appliances in closely confined rooms. Fig. 6 illustrates minimum requirements for this type of installation.

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AUTOMATIC FUEL-BURNING EQUIPMENT

Classification of Stokers, Combustion Process and Adjustments, Furnace Design, Rating; Classification of Oil Burners, Combustion Process, Combustion Chamber Design, Commercial and Industrial Oil Burners, Types of Burners; Storing and Handling Heavy Fuel Oil; Oil Storage Tanks and Piping; Classification of Gas-Fired Heating Equipment, Combustion Process, Ratings; Sizing of Gas Piping, Commercial and Industrial Gas Equipment; Fuel-Burning Rates; Controls for Automatic Equipment

AUTOMATIC mechanical equipment for the combustion of solid, liquid, and gaseous fuels is considered in this chapter. The type of fuel to be burned affects the design of the heat exchanger (furnace, boiler, etc.); therefore, one should refer to Chapter 35, Heating Boilers, Furnaces, Space Heaters when considering fuels and fuel-burning equipment. Some heat exchangers are designed specifically for one type of fuel. As a result, maximum efficiency and best performance require the simultaneous consideration of fuel and fuel-burning equipment during the initial stages of equipment selection.

MECHANICAL STOKERS

A mechanical stoker is a device that feeds a solid fuel into a combustion chamber, provides a supply of air for burning the fuel under automatic control and, in some cases, incorporates a means of removing the ash and refuse of combustion automatically. Coal can be burned more efficiently by a mechanical stoker than by hand firing because the stoker provides a uniform rate of fuel feed, better distribution in the fuel bed, and positive control of the air supplied for combustion.

In many cities, measures for control of excess smoke require installation of stokers even in residences, unless fuel used contains less volatile matter than bituminous coal.

Classification of Stokers According to Capacity

Stokers may be classified roughly according to their coal burning capacities, as follows:

- Class 1 10 to 100 lb per hr
- Class 2 100 to 300 lb per hr
- Class 3 300 to 1200 lb per hr
- Class 4 over 1200 lb per hr

Class 1 Stokers

These stokers are used primarily for home heating and are designed for quiet, automatic operation. Simple, trouble-free construction and attractive appearance are desirable characteristics of these small units.

A common stoker in this class (Fig. 1) consists essentially of a coal hopper, a screw for conveying the coal from the hopper to the retort, a fan that supplies the air for combustion, a transmission for driving the coal feed worm, and an electric motor for supplying power for coal feed and air supply.

Air for combustion is admitted to the fuel through tuyeres at the top of the retort which may be either round or rectangular. Stokers in this class are made for burning anthracite, bituminous, semi-bituminous, and lignite coals, and

coke. The U. S. Department of Commerce has issued commercial standards for household anthracite stokers.¹

Units are available in either the hopper type, as shown in Fig. 1, or in the bin-feed type as shown in Fig. 2. Some stokers, particularly those designed for use with anthracite, automatically remove ash from the ashpit and deposit it in an ash receptacle. Most of the bituminous models, however, require hand removal of the ash from the fuel bed after it is fused into a clinker.

Stokers in this class feed coal to the furnace intermittently in accordance with temperature or pressure demands. A special control is used to insure sufficient stoker operation to maintain a fire during periods when no heat is required.

Class 2 Stokers

Stokers of this class are usually of the underfeed motor-driven screw type, Fig. 3, and are used extensively for heating apartments, schools, hotels, and industrial plants. They are also built in plunger-feed type, Fig. 4, with electric motor or steam or hydraulic cylinder coal feed drive. The tuyeres and retort design vary according to the fuel and load conditions. They are available for burning all types of anthracite, bituminous and lignite coals.

Stationary type grates or dead plates surround the retort of bituminous models to collect the ash and clinkers which are removed periodically by hand. Anthracite stokers in this class may be equipped with moving grates that discharge the ash into a pit, below the grates, having capacity for several weeks of ash accumulation.

Class 3 and 4 Stokers

These stokers are: underfeed side cleaning, underfeed rear cleaning, overfeed flat grate, or overfeed inclined grate type.

Underfeed side cleaning stokers are made in sizes up to about 500 boiler horsepower (or approximately 17 million Btuh). They are not so varied in design as those in the smaller classes, although the principle of operation is similar. A stoker of this type is illustrated in Fig. 4.

The rear cleaning underfeed stoker is usually of the mul-

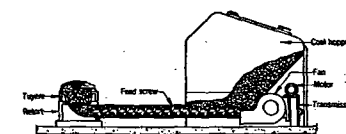


Fig. 1.... Underfeed Stoker, Hopper Type, Class 1