

Class 3 Stokers, General Commercial, Small High Pressure Plants

The general commercial heating and high pressure plant with boilers burning from 500 lb of coal per hour to 1200 lb of coal per hour, is a field distinct from the large commercial and industrial field. The prevalent type of stoker employed is the single retort underfeed side-cleaning type. In this field is found the greatest financial return on stoker investments due to the fact that 90 per cent of the fuel is purchased in the retail market where prices are on the average 40 per cent higher for the same fuel than if the coal were purchased in carload quantities. This is, therefore, an extremely important class of stokers. Savings of 40 per cent to 50 per cent are not at all unusual, and many plants show as much as a 50 per cent return on the investment.

Automatic Stoker Controls

The industry developed by stokers in Classes 1, 2 and 3 has been due as much to the application of proper controls as to the stoker itself, as the types of stokers used in these classes are not basically new, while the industry is distinctly new, originating in 1923. The usual controls applied are as follows:

- Thermostats (plain and clock).
- Limit Controls (steam, vapor, hot water, etc.).
- Stack Temperature or Time Controls (for actuating fires periodically).
- Relay (for low voltage controls).
- Safety or Overload Cutout (for protection against overload).

Class 4 Stokers, Large Commercial, High Pressure Steam Plants

This class includes stokers with grate areas above 36 sq ft and with hourly burning rates of over 1200 lb of coal per hour. The prevalent stokers in this field are:

- Overfeed flat grate stokers.
- Overfeed inclined grate stokers.
- Underfeed side cleaning stokers.
- Underfeed rear cleaning stokers.

Overfeed inclined grate stokers are seldom built in sizes of over 500 hp and are not as extensively used as other types of stokers.

Underfeed side-cleaning stokers are made in sizes up to approximately 500 hp and in this field are extensively used. These stokers are not so varied in design as those in the smaller classes although the principle is much the same. Practically all of them are of the front coal feed type, either power driven or steam driven. Dump plates at the side are manually operated. These stokers are heavily built and designed to operate continuously at high boiler ratings with a minimum amount of attention. Because of the fact that all volatile gas must pass through the fire before reaching the combustion chamber, these stokers will operate smokelessly under ordinary conditions. Also because of the fact that these stokers are always provided with forced draft, they are the most desirable type for fluctuating loads or high boiler ratings.

In the design of the grates for supporting the fuel between the retort and the ash plates, the stokers differ in providing for movement of the

fuel during combustion. Some stokers are designed with fixed grates of sufficient angle to provide for this movement as the bed is agitated by the incoming fuel, while others have alternate moving and stationary bars in this area and provide for this movement mechanically. In either type, with proper operation, all refuse will be deposited at the dump plate. Recent developments in this type of stoker provide for sliding distributor blocks along the bottom of the retorts which give flexibility in providing proper distribution of fuel over the grate area and assist in preventing coke masses when strong coking coals are used. Another difference in these stokers is that some use a single air chamber under the whole grate area thus having the same air pressure under the ignition area as under the rest of the grate, while others have a divided air chamber using the full air pressure under the ignition area and a reduced air pressure under the remainder of the grate. These stokers vary in size from approximately 5 sq ft to a maximum of 8½ sq ft.

The most prevalent type of rear-cleaning underfeed stoker is the multiple retort design. Occasionally double or triple retort side-cleaning underfeeds are made. The multiple retort underfeed stoker is made for the largest sizes of boilers for large industrial plants and central stations. This stoker has reached a very fine stage of development mechanically and in the matter of air supply and control. In some instances zoned air-control has been applied both longitudinally and transversely to the grate surface. Ash dumps on smaller sizes are sometimes manually operated,

TABLE 1. RECOMMENDED SETTING HEIGHTS FOR HEATING BOILERS EQUIPPED WITH MECHANICAL STOKERS^a

FIREBOX BOILERS									
Actual Load	2500	5000	7500	10000	12500	15000	20000	25000	30000
A	18"	18"	20"	20"	22"	22"	24"	24"	24"
B	42"	48"	54"	60"	66"	72"	78"	84"	84"

A = Distance from bottom of Water Leg to floor.

B = Distance from Crown Sheet to bottom of Water Leg.

COMPACT WELDED BOILERS									
Actual Load	2500	5000	7500	10000	12500	15000	20000	25000	30000
A	18"	18"	20"	20"	22"	22"	24"	24"	24"
B	30"	33"	36"	42"	45"	48"	54"	60"	60"

A = Distance from bottom of Water Leg to floor.

B = Distance from Crown Sheet to bottom of Water Leg.

H. R. T. BOILERS											
Rp	50	75	100	125	150	175	200	225	250	275	300
A	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	7'-0"	7'-6"	8'-0"	8'-6"	9'-0"	9'-0"

A = Distance from bottom of shell to floor.

Hp = Installed horsepower.

In the case of the Firebox or Compact Welded type boilers the desired setting height can be obtained by combining A and B dimensions. The load ratings shown for this class of boilers are actual developed loads in square feet of equivalent cast iron steam radiation and are not manufacturers' ratings.

The setting heights given for H. R. T. boilers may be used for developed loads up to 50 per cent above normal rating.

^aFrom Data Prepared by the Midwest Stoker Association.