

fuel beds on the grate increase the effective combustion space in the furnace, supply more air for combustion, and are sometimes effective in reducing the smoke emitted, but care should be taken that holes are not formed in the fire. A *lower volatile coal* or a higher A.P.I. gravity oil always produces less smoke than a high volatile coal or low A.P.I. gravity oil used in the same furnace and fired in the same manner.

The installation of more modern or better designed fuel burning equipment, or a change in the construction of the furnace, will often reduce smoke. The installation of a Dutch oven which will increase the furnace volume and raise the furnace temperature often produces satisfactory results.

In the case of new installations, the problem of smoke abatement can be solved by the selection of the proper fuel-burning equipment and furnace design for the particular fuel to be burned and by the proper operation of that equipment. Constant vigilance is necessary to make certain that the equipment is properly operated. In old installations the solution of the problem presents many difficulties, and a considerable investment in special apparatus is often necessary.

Lower rates of combustion per square foot of grate area will reduce the quantity of solid matter discharged from the chimney with the gases of combustion. The burning of coke, coking coal, and sized coal from which the extremely fine coal has been removed will not as a general rule produce as much dust and cinders as will result from the burning of non-coking coals and slack coals when they are burned on a grate.

Modern boiler installations are usually designed for high capacity per square foot of ground area because such designs give the lowest cost of construction per unit of capacity. Designs of this type discharge a large quantity of dust and cinders with the gases of combustion, and if pollution of the atmosphere is to be prevented, some type of catcher must be installed.

FIRING METHODS FOR SEMI-BITUMINOUS COAL

The *Pocahontas Operators' Association* recommends the central cone method of firing, in which the coal is heaped on to the center of the bed forming a cone, the top of which should be level with the middle of the firing door. This allows the larger lumps to fall to the sides, and the fines to remain in the center and be coked. The poking should be limited to breaking down the coke without stirring, and to gently rocking the grates. It is recommended that the slides in the firing door be kept closed, as the thinner fuel bed around the sides allows enough air to get through.

FIRING METHODS FOR COKE

Coke ignites less readily than bituminous coal and more readily than anthracite and burns rapidly with little draft. In order to control the air admitted to the fuel it is very important that all openings or leaks into the ashpit be closed tightly. A coke fire responds rapidly to the opening of the dampers. This is an advantage in warming up the system, but it also makes it necessary to watch the dampers more closely in order to prevent the fire from burning too rapidly. In order to obtain the same interval of attention as with other fuels a deep fuel bed always should be maintained when burning coke. The grates should be shaken only slightly in mild weather and should be shaken only until the first red particles drop from the grates in cold weather. The best size of coke for

TABLE 7. DETAILED REQUIREMENTS FOR FUEL OILS*

GRADE*	FLASH POINT F Deg		POUR POINT F Deg	WATER SEDIMENT PER CENT	CARBON RESIDUE PER CENT	ASH PER CENT	DISTILLATION TEMPERATURES F Deg			VISCOSITY SECONDS	
	Min.	Max.					10 Per Cent Point	90 Per Cent Point	End Point	Saybolt Universal at 100 F	Saybolt Fuel at 122 F
							Max.	Min.	Max.	Max.	Min.
No. 1 Fuel oil—a distillate oil for use in burners requiring a volatile fuel.	100 or Legal	165	0°	Trace	0.05 on 10% Residue ²		410		560*		
No. 2 Fuel oil—a distillate oil for use in burners requiring a moderately volatile fuel.	110 or Legal	190	10°	0.05	0.25 on 10% Residue ²		440	600			
No. 3 Fuel oil—a distillate oil for use in burners requiring a low viscosity fuel.	110 or Legal	230	20°	0.10	0.15 Straight			675	600*	45	
No. 5 Fuel oil—an oil for use in burners requiring a medium viscosity fuel.	130 or Legal			1.00		0.10				50	40
No. 6 Fuel oil—an oil for use in burners equipped with preheaters permitting a high viscosity fuel.	150			2.00*							300 45

*Recognizing the necessity for low sulphur fuel oils used in connection with heat-treatment, non-ferrous metal, glass and ceramic furnaces and other special uses, a sulphur requirement may be specified in accordance with the following table:

GRADE OF FUEL OIL	SULPHUR, MAX. PER CENT
No. 1	0.6
No. 2	0.6
No. 3	0.6
No. 5	0.6
No. 6	No Limit

Other sulphur limits may be specified only by mutual agreement between the buyer and seller.

*It is the intent of these classifications that failure to meet any requirement of a given grade does not automatically place an oil in the next lower grade unless in fact it meets all requirements of the lower grade.

*Lower or higher pour points may be specified whenever required by conditions of storage or use. However, these specifications shall not require a pour point lower than 0° F. for any grade. For use in other than blue flame burners, blue flame burners carbon residue on 10 per cent residue may be increased to a maximum of 0.12 per cent. This limit may be specified by mutual agreement between the buyer and seller.

*The maximum end point may be increased to 590 F when used in burners other than sleeve type blue flame burners.

*To meet certain burner requirements the carbon residue limit may be reduced to 0.15 per cent on distillate residue.

*Water by distillation, plus sediment by extraction. Sum, maximum 2.0 per cent.

*The maximum sediment by extraction shall not exceed 0.50 per cent. A deduction in quantity shall be made for all water and sediment in excess of 1.0 per cent.