No stoker will handle every class of fuel satisfactorily so that in selecting a stoker the engineer should take into consideration the type best suited for the fuel and operating conditions. Relative to efficiency of combustion, other conditions being similar, there will be no appreciable difference with the different types of stokers provided that the proper type is used for the fuel to be burned and the operating conditions are fulfilled.

The duct for forced draft work should be as short and straight as possible and designed so that the maximum velocity pressure under load conditions should not exceed 10 per cent of the static pressure. The air velocity should generally not exceed 2500 cu. ft. per min. Air ducts are made of heavy steel but concrete ducts are commonly used. Duct sizes are determined in accordance with the general laws of frictional resistance.

RECOMMENDATIONS FOR THE INSTALLATION OF STOKER FANS

By the

STOKER AND FAN MANUFACTURERS' ASSOCIATIONS

as reported by the Joint Committee, April, 1923

DUCTS

Velocities and Duct Proportions

The area of the main air ducts shall be determined by using a velocity in the ducts based on a velocity pressure of from 5 per cent to a maximum of 10 per cent of the static pressure. The area of the branch air ducts leading to boilers should be such that the velocity will not be more than two-thirds of that in the main ducts.

The following table shows the relation between velocities and static pressures on the above basis:

STATIC PRESSURES	VELOCITY IN MAIN AIR DUCT 5 PER CENT S. P.	VELOCITY IN MAIN AIR DUCT 10 PER CENT S. P.
2	1300	1800
2½	1400	2000
3	1550	2200
3½	1700	2400
4	1800	2550
4½	1900	2700
5	2000	2850
5½	2100	3000
6	2200	3100
6½	2300	3250
7	2400	3350

The above table is based on a weight of air of .075 lb. per cu. ft. which corresponds to a temperature of 68 deg. fahr., a barometric pressure 29.92 in. (sea level) and 50 per cent relative humidity. (For higher elevations or temperatures, the above velocities may be increased 1 per cent for each 500 ft. increase in elevation, and 1 per cent for each 10 deg. fahr. increase in temperature.)

Any change in the direction of the air flow should be accomplished by means of bends having a radius of throat not less than one-half the diameter of a round duct or one-half the width of a rectangular duct.

With rectangular ducts, the ratio of one side to the other should preferably be not greater than two to one.

For rectangular ducts having a ratio of one side to the other greater than 2/1 lower velocities are recommended, the reduction being 5 per cent for a ratio of sides of 3/1; 10 per cent for ratio of sides of 4/1; 15 per cent for ratio of sides 5/1; etc.

Dampers in air ducts should be located at points where the air velocity does not exceed the velocities specified above.

Construction

Air ducts shall be constructed so as to be smooth and air tight.

Where concrete or masonry ducts are used, the interior surface shall be coated with cements, paints, or other materials that will prevent air leakage. If the ducts are of metal construction, particular attention shall be given to making the joints air tight.

Where ducts are located under ground, sewer drainage shall be provided at the lowest point and manholes or doors provided for access to the ducts.

Design of Fan Discharge Connections and Main Ducts

If the fan outlet velocity exceeds the velocity in the main air duct, the connection between the fan discharge and the main air duct shall be straight and of such length that the slope of any side relative to the axis of the duct will not exceed 1 to 8.

If the discharge connection expands on one side only the slope relative to the axis of the duct may be 1 to 5.

Changes in section of the main air duct shall be made to conform with the above recommendations.

If the fan outlet velocity is not greater than the velocity in the main duct, the fan may discharge directly into the duct, unless the proportions of the fan outlet and duct are sufficiently different as to require a transformation piece, in which case the above recommendations shall apply.

Branch Air Ducts

Branch ducts shall not be taken from the connection between the fan discharge and the main duct.

Where the direction of air flow in the main duct is constant, branch ducts shall be taken off the main duct at an angle of 45 deg.

Where the air flow in the main duct may be in two directions, the branch ducts shall be taken off at right angles to the main duct with a radius of throat not less than one-half the diameter of a round branch duct or one-half the width of a rectangular branch duct.

Parallel Operation of Fans

Only fans with rising pressure characteristics shall be used for parallel operation. A fan is of rising pressure characteristic type when the pressure curve rises continuously from free delivery to no delivery condition.

If two or more fans discharge into the same duct, the connections from the fan discharges to the duct shall be designed so that the frictional loss in each case between the fan discharge and the duct will be equal.

If two or more fans discharge into the same duct with the same and constant direction of air flow, the connections from the fan discharges to the duct shall be designed so that the air streams at the point where they merge will be flowing in a parallel direction.

DATA

Fan performance is a statement of the capacities, pressures, speeds and horsepower inputs of a fan.

Performance Tables

Fan performance tables shall be based upon uniform increments of outlet velocities and give volume, speed, static pressure and horsepower.

Performance tables shall be based upon the use of inlet screens, guards, or other devices serving a similar purpose. Factors shall be given for the proper correction of performance for fans equipped with outlet dampers.