

in balancing the air distribution of the system, a damper should be placed in each leader pipe except one, this latter leader preferably being connected to a room heated at all times, such as a living room.

In a gravity circulating system, the ratio of stack to leader area is quite

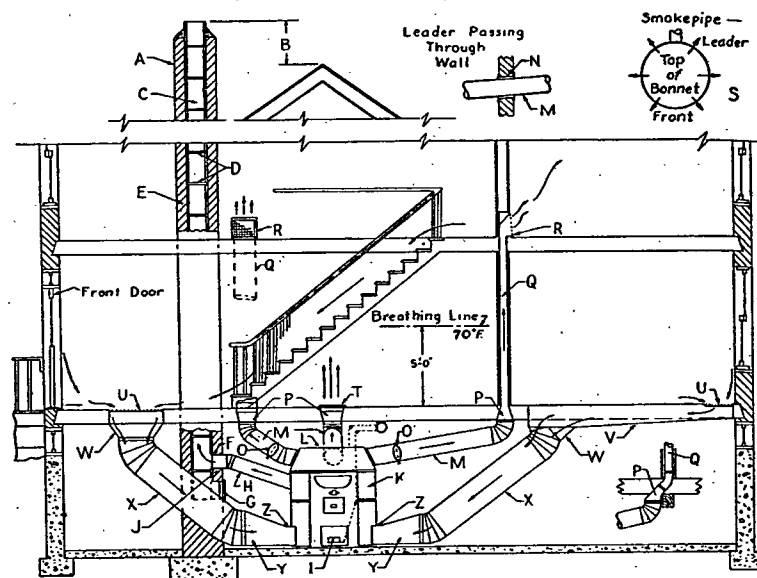


FIG. 1. A SECTIONAL VIEW OF A TYPICAL PLANT SHOWING GOOD INSTALLATION PRACTICES*

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| A. House chimney, no bends nor offsets. | N. Sleeve with air space around leader where passing through wall. |
| B. Top of chimney at least 2 ft above ridge of roof. | O. Dampers in all leaders, except one. |
| C. Flue lining, fireclay. | P. Transition fittings. |
| D. All joints air tight. | Q. Rectangular wall stack. |
| E. At least 8 in. brick. | R. Baseboard register. |
| F. No other connection beside that to furnace. | S. Distribute pipes equally around bonnet. |
| G. Cleanout frame and door, airtight. | T. Floor register. |
| H. Smoke pipe, end flush with inner surface of flue. | U. Return air face. |
| I. Draft door. | V. Raining under joist. |
| J. Use flue thimble. | W. Transition collar. |
| K. Casing body. | X. Round return pipe. |
| L. Casing hood or bonnet, top of all leader collars on same level. | Y. Transition shoe. |
| M. Round leader, pitch 1 in. per foot. | Z. Top of shoe at casing not above grate level. |

* From N.W.A.H. & A.C.A. Manual 5: Gravity Code and Manual, Third Edition, 1947.

important, although little is gained by providing wall stacks with areas in excess of 75 percent of their connected leader pipe area. In most cases a $3\frac{1}{2}$ in. $\times$ 12 in. stack is the largest which can be installed in normal wall construction. Hence, any room having a heat loss much in excess of 9000 Btu per hr, will require two or more stacks, or one oversized stack built into a 6 in. studding space, providing the design register temperature is to be retained at the average value of 175 F, which has been recommended.

Registers used for discharging warm air into rooms should have a net area not less than the area of the leader pipe to which the register is attached. First story registers should be connected through boot and register box extensions having areas at least equal to leader areas. Upper story registers should be of the same width as the wall stack, and should be placed either in the baseboard or sidewall, preferably without offsets. First story registers may be of the baseboard or floor type, with the former location preferred. Floor registers are easy to install, but they may interfere with placement of carpets and may be dirt catchers.

RETURN AIR GRILLES, DUCTS, AND CONNECTIONS

The placement and number of return grilles will depend upon the size, details, and exposure of the house. Small compactly built houses may be adequately served by a single return grille effectively placed in the central hall. It is usually desirable to have two or more returns, provided that in two-story residences one return is placed to effectively receive the return air at the foot of the stairs. A return air connection must be carried to any room whose floor level is below that of adjacent rooms.

The return air grilles should have free areas at least equal to the ducts to which they connect, and should be installed in the floor, or in the baseboard with the top edge of the grille not more than about 14 in. above the floor line. Frictional resistance in the return air system is as detrimental as is resistance in the warm-air system, so that care should be exercised in locating return air grilles which require long return ducts.

Where a divided system of two or more returns is used, the grilles must be placed to serve the maximum area of cold wall or windows. Thus, in rooms having only small windows the grilles can be brought as close to the furnace as possible, but if the room has large window exposure the grille should be located near the exposure.

The frictional resistance of the long ducts used in parallel with short return ducts must be reduced to compensate for the length. This is accomplished by using design data given in the following section Outline of Design Procedure.

Return ducts from upstairs rooms may be necessary in spaces which are closed off from the rest of the house, or which have much outdoor exposure. Return grilles on different floor levels should not be connected to the same vertical return duct.

The ducts through which air is returned to the furnace should be designed to minimize resistance to air flow. They should be of ample area, with sizes selected according to capacity and construction, as specified in section Outline of Design Procedure, and should be streamlined. Horizontal ducts should pitch at least $\frac{1}{4}$ in. per foot downward toward the furnace, avoiding fittings which would require lifting of the return air after the duct has passed under some obstacle.

Ducts returning air to the furnace should avoid heat sources which tend to reheat the return air. If the duct must be run over the top of the furnace, or above the vent pipe from the furnace, insulation should be interposed between the heat source and the duct.

The top of the return shoe should enter the casing below the level of the grate in the case of a coal furnace, and not more than 14 in. above the floor in the case of oil or gas furnaces. It may be wide to retain proper area.