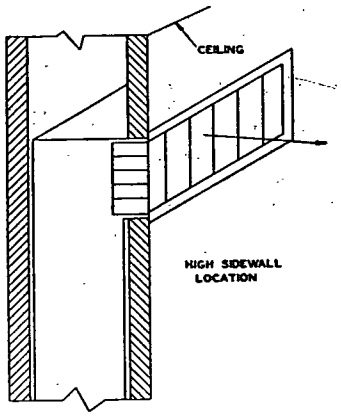

FIG. 2. RECOMMENDED TYPE OF HIGH SIDEWALL INSTALLATION ON WARM WALL[a]

[a] Horizontal vanes, in back or front, to give downward deflections not to exceed from 15 to 22 deg.

used where a branch is taken off a main trunk. *Squeeze dampers* are used for adjusting the volume of air flow and resistance through a given duct. A damper with positive locking device should be provided for each main or duct branch. Labels placed on ducts should indicate the room being served. Damper positions should be marked to indicate proper summer and winter settings, and to reveal tampering.

Ducts

The ducts may be either round or rectangular in cross section. The centerline radii of elbows should preferably be not less than one and one-

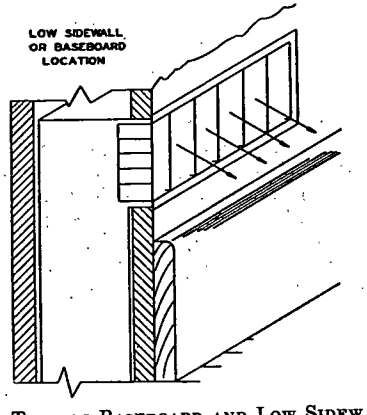

FIG. 3. RECOMMENDED TYPE OF BASEBOARD AND LOW SIDEWALL INSTALLATION ON WARM WALL[a]

[a] Vertical bars with adjustable deflection, or fixed vertical bars with deflections to right and left not exceeding about 22 deg. For low sidewall location, the deflection for horizontal, multiple vane registers should not exceed 22 deg. For baseboard locations, the deflection for horizontal, multiple vane registers should not exceed about 10 deg.

half times the pipe diameter for round pipes. The throat radius of a turn in a rectangular duct should be at least one-half the duct dimension in the plane of the turn. Warm air ducts passing through cold spaces or located in exposed walls, should have 1 to 2 in. of insulation.

Special attention should be given to the problem of noise elimination. The metal duct connection to and from the furnace casing and fan housing should be broken by strips of fire resistant fabric. Motors and mountings must be carefully selected for quiet operation. Electrical conduit and water piping must not be fastened to, nor make contact with the fan housing. Installation of a fan directly under a return air grille is usually avoided.

SIMPLIFIED METHODS OF DESIGN

Simplified methods of design have been developed for several types of forced warm air heating systems. In general, the specific procedure chosen depends upon the type of system and the type of structure in which it is

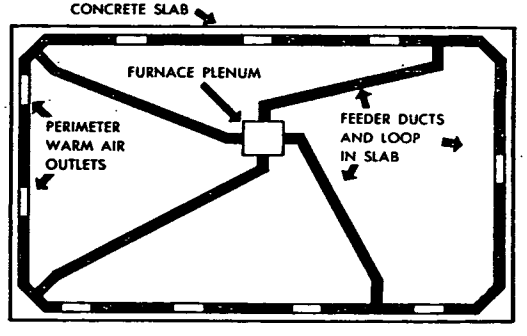

FIG. 4. PERIMETER LOOP SYSTEM WITH FEEDER AND LOOP DUCTS IN CONCRETE SLAB

to be used. In most cases, more than one type of system may be used in a specific structure. It is therefore necessary to first choose the system desired and then determine the applicable design procedure.

Perimeter-Loop Systems in Concrete Slab Construction

The perimeter-loop system,[5] shown in Fig. 4, conveys the warm air through embedded ducts to perimeter diffusers. The air is delivered from the furnace to *feeder ducts* which extend radially to the *loop duct*. The air flows through the loop duct to the diffusers. The ducts serve the dual purpose of conveying the warm air and of warming the floor. Although the design of the concrete slab is not specifically the concern of the mechanical engineer, it is absolutely necessary that he understand the considerations involved lest improper construction be used with consequent adverse effect on the performance of the heating system. For information on slab construction, as well as duct placement, duct insulation, etc., see Manual 4 of the *National Warm Air Heating and Air Conditioning Association*. A section of typically installed loop duct is shown in Fig. 5.

Simplified design procedures[5] are contained in Manual 4. One of these, subject to the following limitations: total heat loss 100,000 Btuh, maxi-