AUTOMATIC CONTROLS

Air stratification, high bonnet temperatures, excessive flue gas temperatures, and heat overrun or lag in a properly designed system, can be largely eliminated through proper care in the planning and installation of the control system;[6] desirable controls usually employed are:

1. A *thermostat* located in occupied space where maximum fluctuation in temperature can be expected in order to secure frequent operation of fans, drafts, and burners. The thermostat location should not be on an outside wall, in a bedroom, bathroom, or sun room, or in a location where it will be affected by direct radiant heat from the sun or from a fireplace, or by direct heat from any warm air duct, register or chimney.

2. A fan switch control to start blower operations at air temperatures between 110 and 130 F, and stop the blower at about 15 deg below the cut-in point. The lower settings are used for high sidewall register installations, and the higher settings for baseboard register installations. For most satisfactory results these settings should be as low as is feasible.

3. A protective *high limit* control to stop the flow of fuel to the burner independently of the thermostat if the air temperature exceeds 175 F.

4. On oil and gas burner installations, a protective control should be included to cut off the fuel supply if the fire is extinguished, or if there is a failure of the ignition system.

5. On automatic stoker installations, a control is usually included to operate the stoker regardless of thermostat settings whenever the bonnet temperature indicates that the fire is dying, or a time interval contactor is used to cause the stoker to run a few minutes out of each hour.

6. A *humidistat* to regulate the moisture supplied to the rooms, located either in one of the rooms or in the main return duct near the furnace.

ADJUSTMENT OF SYSTEM FOR CONTINUOUS AIR CIRCULATION

This procedure applies to the adjustment of an automatically-fired forced warm air heating system to provide continuous air circulation, when the control arrangement is of the type where the room thermostat controls the fire, and the blower control (fan switch) controls the blower operation. This procedure as outlined in detail in Manual 6 of the *National Warm Air Heating and Air Conditioning Association*, is as follows:[7]

1. Adjust the fuel input in proper relation to the heat loss of the structure.

2. Determine the temperature rise through the furnace.

3. Adjust the air volume to produce a temperature rise through the furnace of about 100 deg.

4. If adjustable, set the fan switch differential to a minimum of about 15 deg.

5. Adjust the fan switch cut-out point as low as practicable.

6. Balance the system by adjusting dampers to produce even temperature distribution between rooms.

7. Set the room thermostat at the desired room temperature.

8. The operation of the system is more satisfactory if the thermostat is of the type which is capable of close temperature control.

WARM AIR CEILING PANEL SYSTEMS

Warm air ceiling panel heating systems utilize a false ceiling suspended 3¼ in. from the ceiling joists which have previously been covered on the bottom with sheets of plasterboard. Special hangers are used to suspend the false ceiling or heating panel from the joists. Steel supporting rods are installed through these hangers and metal lath is attached to the rods.

The lath is then plastered to a thickness of ¾ in., making a completely sealed air space above the ceiling. Warm air is delivered to this sealed space through a standard warm air duct, installed in the usual manner. The air is then circulated over the entire ceiling being guided by sheet-metal baffles. After the air has passed over the ceiling, it is returned to the furnace through a return air duct for reheating. The system is closed, and no air is introduced into the heated space from the panel. (See also Chapter 24, Panel Heating.)

Because a warm air ceiling panel system involves a different type of ceiling construction, its installation is practically limited to new construction. Only automatically-fired and thermostatically-controlled furnace-blower units may be used with this system. The standard automatic heating controls consisting of a room thermostat, temperature limit control, blower control (fan switch), and primary control are all that are required. While warm air ceiling panel heating has particular advantages in one-story utility room houses, it can be just as effectively installed in one- and two-story houses with basements.

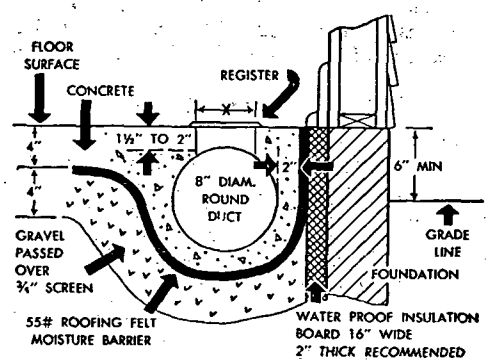

FIG. 5. CROSS-SECTION OF SLAB CONSTRUCTION CONTAINING PERIMETER DUCT[9]

Complete design and installation procedure is given[8] in Manual 7-A of the *National Warm Air Heating and Air Conditioning Association.*

WARM AIR PERIMETER SYSTEMS

Perimeter heating is a method of heating residential and commercial buildings, with or without basements, in which warm air is (a) conveyed under the floor to warm the floor surface and (b) introduced into the rooms, preferably under the windows, at or near the floor, and delivered upward in diffused pattern blanketing the outside walls. The return air is collected through one or more grilles located high on the interior sidewalls or in the ceiling. Suggested procedures[10] for the design and installation of warm air perimeter heating systems are given in Manuals 4 and 10 and in the accompanying work sheets[11] of the *National Warm Air Heating and Air Conditioning Association.*

The furnace may be either the down-flow or the conventional up-flow type. For basementless houses the down-flow type is preferred since it requires a minimum amount of floor area and ductwork, and eliminates