ADVANTAGES OF STEAM AS A HEATING MEDIUM

Probably the greatest single advantage offered by steam as a heating medium is the superior ability to carry heat. But steam has many other virtues. It offers freedom from freeze-up and assures absence of damage from water leakage. Steam requires low power to circulate through the system. Especially, steam offers the advantage of rapid response.

Rapid response, or the ability of the heating system to heat-up or cool-down radiation units quickly, is not only convenient but contributes directly to economical operation characteristic of steam. With steam, the heating system of a school or other building may be shut down and left unattended over a night or weekend without danger of freezing or damage from water leakage. Rapid response assures fast warm-up when heat is again required.

Steam, when used for space heating, does away with secondary steam boilers and related equipment required for utility water heating, ventilating fan coils, and kitchen equipment.

STEAM HEAT MAY BE PERFECTLY CONTROLLED

The Nash Synchronized Heating Control is a new primary control which, for the first time, successfully regulates steam to the heating system in proportion to the heat loss of the building. It operates on a unique principle by which the steam supply pressure or vacuum is controlled by and synchronized to conditions in the return side of the heating system.

In the return side of the heating system, conditions are controlled directly by outside temperature and, in turn, the steam supply is varied from approximately 2 lbs. pressure and corresponding temperature of 218°F., or higher in the coldest weather, to 20″ Hg. vacuum and corresponding temperature of 161°F. in mild weather.

The control provides a wide differential in cold weather and a decreasing differential as weather moderates, assuring complete distribution and system balancing at all times.

Individual room temperature controls can provide closely regulated heat output without "hunting" and without overruns when Nash Synchronized Heating Control is employed. This is particularly important in the moderate weather which constitutes the major part of the heating season. During this season the control supplies low temperature expanded steam. This permits individual valves to accurately supply steam to heating elements, requiring only minor adjustments by individual room control.

In comparison with low vacuum steam heating systems, fuel savings of greater than 20 percent are obtained. These savings can be confirmed to the satisfaction of any consulting engineer or building owner by examination of a Nash Control in operation.

When the Nash Control is employed, specification is flexible and convenient because any type or make of radiation, valve, or trap, suitable for high vacuum operation, can be used.

Operation of a heating system with Nash Control is quiet with a complete absence of orifice hiss and water hammer.

In moderate weather, the Nash Control eliminates drafts and variations in room temperature due to its ability to supply expanded low temperature steam and evenly distribute it throughout the heating surfaces, thus eliminating overheating of a portion of the radiation. This is especially important with fin-tube radiation.

When unit ventilators are employed, troublesome and fuel consuming overruns and underruns are eliminated. Because the Nash Control expands the steam and delivers it to the unit ventilators at lower temperature, the unit ventilator is not overheated and, therefore, is not caused to introduce outside cooling air in excess of that required for ventilation.

HOW THE NASH SYNCHRONIZED HEATING CONTROL OPERATES

This advanced Nash Heating Control automatically and accurately regulates the vacuum in the return side of the heating system as shown on Chart 1. In the coldest weather only a low vacuum is maintained and as the weather moderates the vacuum is increased until it reaches 20″ Hg. vacuum or greater. Simultaneously, admission of steam to the supply side of the system is closely regulated so as to maintain a correct differential at all times between the supply and return side. Chart 1 shows typical operation of the control and indicates how the supply side steam conditions vary with return side vacuum. The control produces a wide differential in cold weather and a decreasing differential as the weather moderates. To match the requirements of any installation, the Nash Control is readily adjusted when the system is put into initial operation. This is accomplished by changing, if necessary, the slope of the average steam main pressure curve or changing the differential between this curve and the average vacuum in the return main.

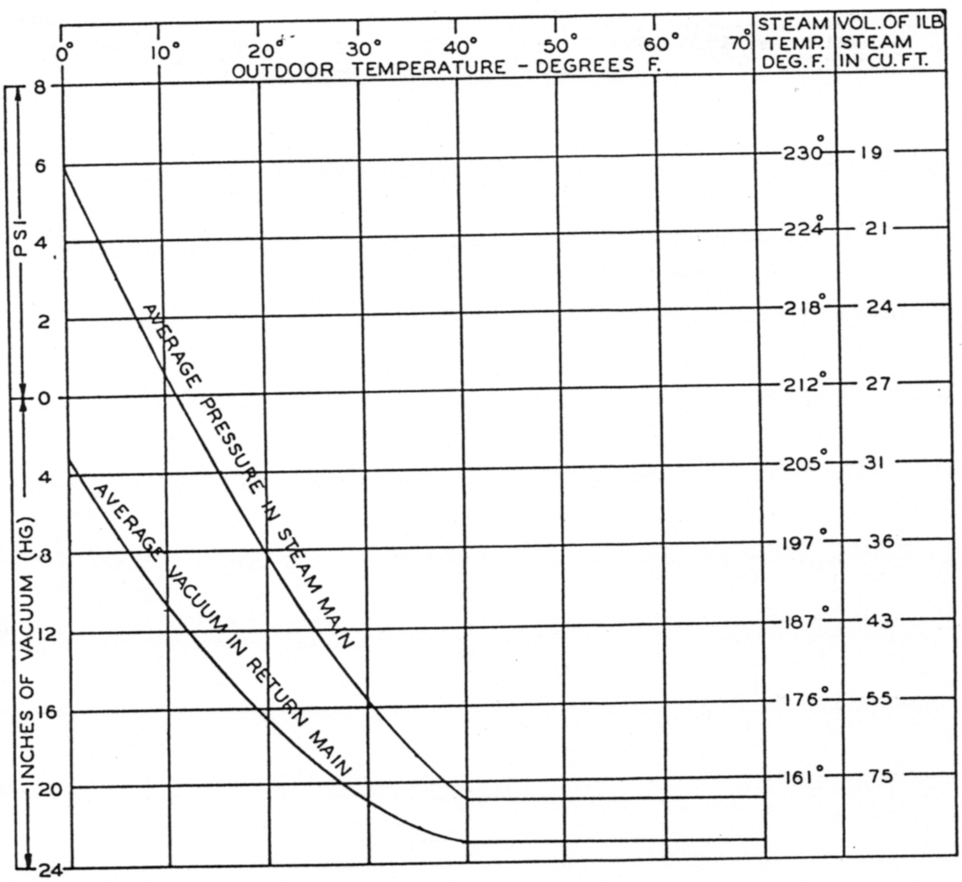


CHART NO. 1

TYPICAL PERFORMANCE WITH 6 LBS. MAXIMUM SUPPLY PRESSURE AT 0° F. DESIGN TEMPERATURE

The Nash Synchronized Heating Control assures balanced distribution of steam to all parts of the heating system over the entire outside temperature range by a new process of regulated expansion. This is accomplished by automatically reducing the flow of steam to the supply side, at proper intervals.

APPLICATION OF NASH SYNCHRONIZED HEATING CONTROL

Figure 1 shows the general arrangement of a system employing a Nash Synchronized Heating Control. This may be varied to meet individual conditions, but in no case is it necessary to depart from established practice with any low vacuum return system.

In Figure 1 is shown a variety of radiation units such as are frequently present on a single installation. The Nash Synchronized Heating Control functions equally well with any type of direct heating unit.

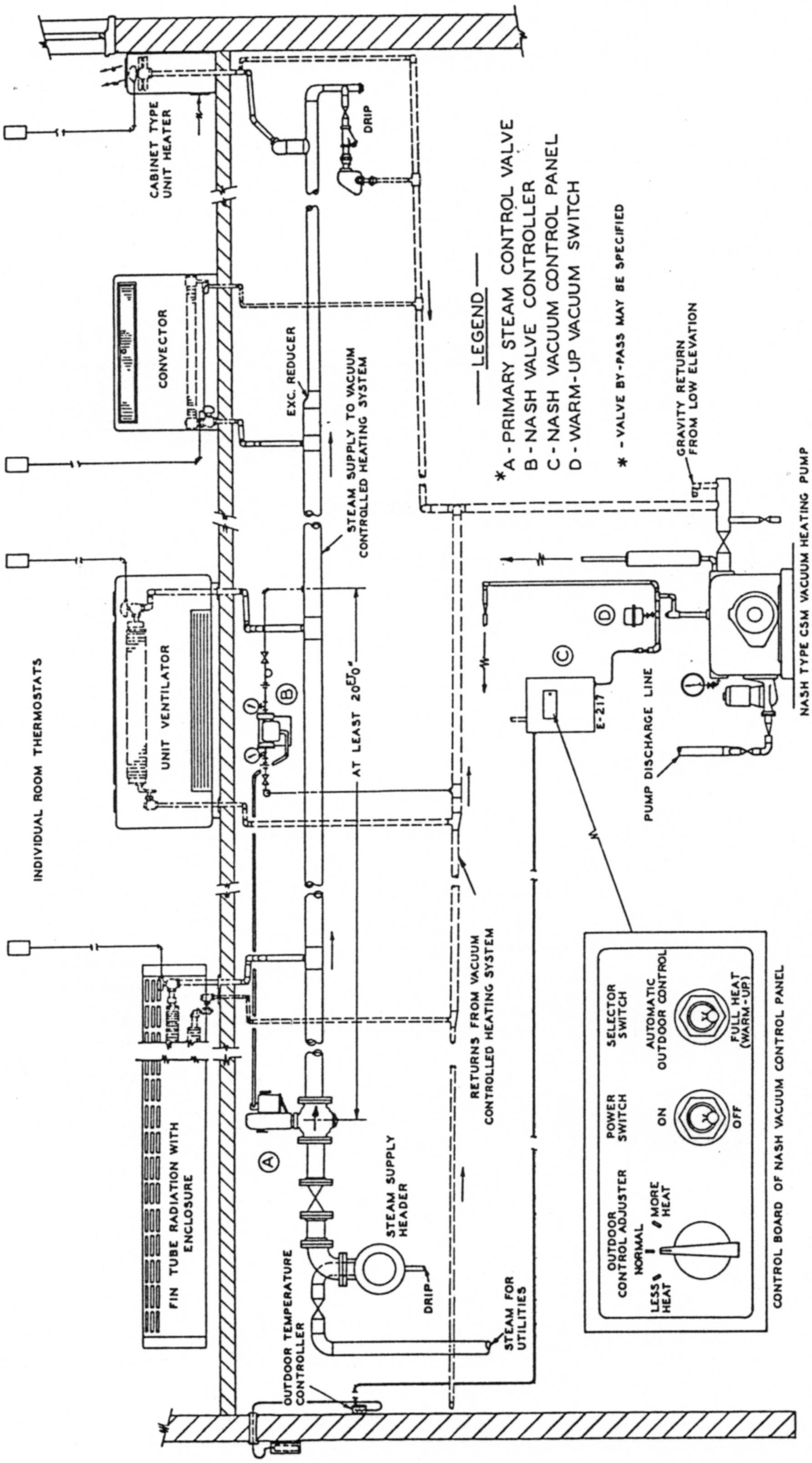
SPECIFICATION OF A NASH SYNCHRONIZED HEATING CONTROL

Furnish and install, as shown on plans and in accordance with manufacturer's instructions, a Nash Synchronized Heating Control which shall include the following components:

One (1) size______ Nash Primary Control Valve of the modulating motor-operated type, capable of passing_____lbs. of steam per hour from an average supply pressure of_____lbs. to_____lbs. average pressure in the heating main. (NOTE: Pneumatic Type Primary Control Valve may be specified if desired when a source of 15 lb. control air is available.)

One (1) variable differential type Nash Valve Controller for primary valve. This controller shall cause the valve to operate so as to maintain a pressure differential between the supply side and return side of the heating system sufficient for complete circulation at all times. The differential shall be variable, such that the greatest differential is provided at outside design temperature with this differential reduced as outdoor temperature moderates. The maximum differential shall be approximately______and reduced to approximately______ in moderate weather.

One (1) Nash Vacuum Pump Controller with outdoor sensing element and temperature switch for controlling operation of the vacuum heating pump directly from outside temperature. This controller shall cause pump operation to maintain an average vacuum in the return side of the heating system from 5½" Hg. vacuum at design temperature to approximately 20" Hg. vacuum or greater as outside temperature moderates. At design temperature, the pump operating range shall be varied from approximately 5" Hg. between start and stop to approximately 2" Hg. between start and stop in mild weather.



SCHEMATIC DRAWING SHOWING BASIC LAYOUT

FIGURE 1

The Nash Vacuum Pump Controller shall be installed in the pump room, and the temperature switch shall be mounted on an outside wall of the building, with its outdoor sensing element located out of the sun and out of the path of air discharged from the building. The temperature switch shall be furnished with 5 feet of capillary tubing and a shield for the outdoor sensing element.

One (1) Nash Type CSM, Series____ (Modified Duplex) Duplex Vacuum Heating Pump complete with all standard accessories. (Modified duplex unit shall be three motor construction with two bronze fitted centrifugal pumps and one bronze fitted rotary water sealed positive displacement type vacuum pump.) Duplex unit shall be four motor construction with two bronze fitted centrifugal pumps and two bronze fitted rotary water sealed positive displacement type vacuum pumps.

(Each) centrifugal pump shall be direct connected to a____hp motor, and (each) shall have a capacity of_____ gpm from 20″ Hg. vacuum to ____lbs. discharge pressure at the pump. (Each) vacuum pump shall be direct connected to a____hp motor, and (each) shall have a capacity of ____cfm dry air at 20″ Hg. vacuum and 70°F. and shall be capable of maintaining this vacuum through a____ diameter sharp edged orifice plate ⅛″ thick when taking air from atmosphere. Condensate and air shall be separated under vacuum, with all pumping units capable of delivering their rated capacity separately or simultaneously.

All pumping units shall be mounted on one cast iron receiver with inlet strainer, gauge glass, and built-in air discharge separator(s). Standard accessories shall include condensate discharge check valves, air inlet check valve(s), vacuum gauge, and thermometer. The receiver shall be equipped with two float switches to provide sequence water pump control. The vacuum pump(s) shall be controlled by the Nash Vacuum Pump Controller.

Motors shall be drip-proof, suitable for operation on____ phase,____ cycle, ____volts, and each shall be furnished with across-the-line type magnetic starter for wall mounting. Nash Primary Valve Motors and Nash Vacuum Pump Controller shall operate at 24 volts with primary supply at 120 volts, single phase.

The electric wiring for the motors, starters, and control equipment is included in the electrical specification and will not be a part of this contract.

HEATING SYSTEM REQUIREMENTS

Return piping shall be pitched, without pockets or seals, so that all condensate will flow by gravity into the receiver of the vacuum heating pump.

Accumulator tanks shall not be used nor shall lift fittings be used in any part of the return side of the heating system.

Only condensate from steam that has passed through the Nash Primary Steam Control Valve, or which has been properly flashed, shall be drained to the return side of the heating system.

All return piping shall be left uncovered wherever practicable.

All steam mains and branches shall be properly dripped at least once in every 200 feet of run.

All steam specialties shall be suitable for high vacuum operation.

After completion, the system shall be tested for tightness when cold. To do this, close the valve in the steam main at the boiler. Using the air pump, a vacuum of 20″ Hg. shall then be established in the entire system. The pump shall then be stopped, whereupon the vacuum shall not drop more than 2″ Hg. in twenty minutes.

The CSM vacuum heating pump should be selected from the tables appearing on Page 12 based on the following:

(a) For heating units equipped with fin-tube heating elements, the water capacity of each centrifugal pump should not be less than 1 gpm per 1000 square feet EDR, and the air capacity of (each) vacuum pump not less than 1 cfm per 1000 square feet EDR.

(b) For cast iron radiators, the water capacity remains the same, but the air capacity should be 2 cfm per 1000 square feet EDR.

When necessary, the specifications may be modified to provide the following:

(a) More than one Nash Primary Control Valve.

(b) Water capacity of 1½ gpm per 1000 square feet EDR for a single CSM unit with one centrifugal pump only.