SelecTemp®

MODULATING ZONE HEATING

TURBONICS INC.

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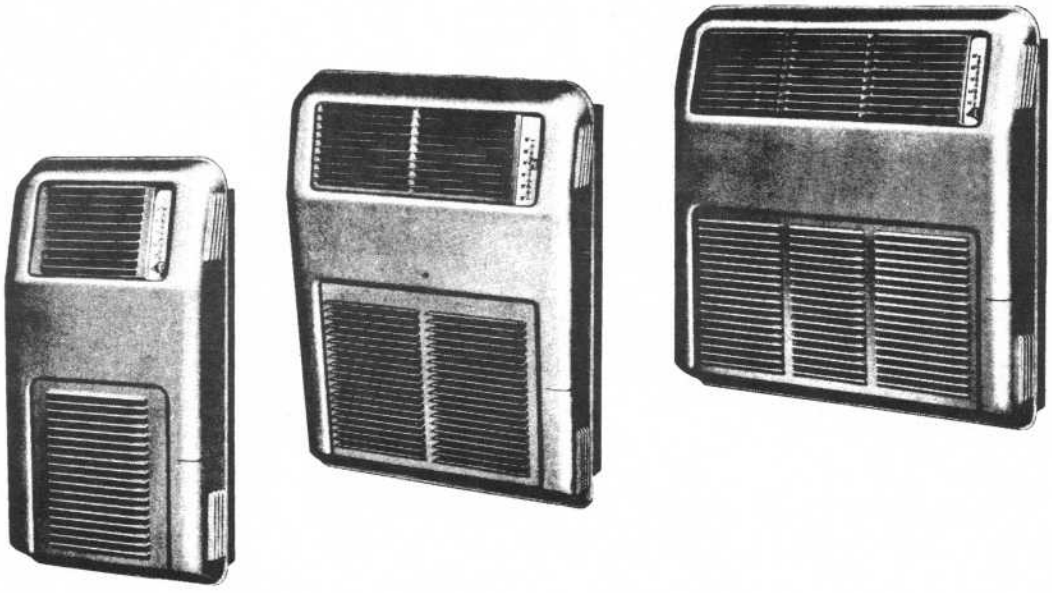
APPLICATION,
INSTALLATION AND SERVICE MANUAL

for the

SelecTemp®

MODULATING ZONE HEATING SYSTEM



This manual has been compiled for the purpose of supplying the necessary information for the application, installation and service of the Selec-Temp heating system under normal conditions. Inquiries for additional information on unusual applications or special conditions should be directed to:

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SECTION I

APPLICATION

1. DETERMINE HEAT LOSS

The heat loss for each room or individual area to be heated should be accurately determined using the methods shown in the American Society of Heating and Refrigerating and Air-Conditioning Engineers Guide or manuals of The Institute of Boiler and Radiator Manufacturers or National Warm Air Heating and Air Conditioning Association.

2. SELECT UNIT SIZE

The sizing of the units for each room is based on the room heat loss and steam pressure available at the unit. Table I gives the capacity of the three sizes of units at different pressures. On most systems a design pressure of 6 to 7 psi at the unit should be used, although pressures up to 10 psi may be used on applications where higher discharge air velocities are not objectionable.

Where the heat loss of the room exceeds the capacity of the H-18 unit, two or more units may be used. Extremely long and narrow or other odd-shaped rooms may require more than one unit for the best heat distribution. Unit capacity in excess of the heat loss is not objectionable because the unit automatically modulates to maintain the temperature selected.

On residential or other applications where constant temperatures are maintained throughout the heating season, no pickup factor need be added. On installations where lower temperatures may be carried when the rooms or building are not in use, a pickup allowance of about 25% should be added to the heat loss and the units sized accordingly.

3. SELECT UNIT LOCATION

The unit should be located on an outside wall or close to an outside wall and as near to the floor as practical. It should not, however, be located so close to the floor that carpeting will interfere with the removal of the grille. When located in a corner, the unit should be mounted so the thermostat side is at least four inches from the adjacent wall.

4. DETERMINE BOILER SIZE

The required output of the boiler is based on the total heat loss from the building and not on the total capacity of the individual units. An allowance for heat loss from piping is not necessary on the average domestic installation, but on commercial and industrial applications a piping allowance of about 5% should be added.

On installations where temperatures are maintained continuously, a pickup allowance need not be added to the load. On applications such as churches or public buildings, where low temperatures are carried when the building is not in use but where quick pickup is desired, a combined piping and pick-up allowance of 30% should be added to the design heat loss in sizing the boiler.

In small dwellings with one bath using an instantaneous hot water coil, the hot water load is not added to the heating load in sizing the boiler. In larger buildings, however, the load from either storage type or tankless water heaters should be considered in sizing the boiler. Methods for sizing such hot water loads are found in the A. S. H. R. A. E. Guide.

TABLE I

UNIT BTUH OUTPUT (@ 65° INLET AIR)

MODEL	STEAM PRESSURE AT UNIT - LBS. PER SQ. IN.								
	2	3	4	5	6	7	8	9	10
H-6	2,100	2,900	3,700	4,200	4,900	5,300	5,600	5,900	6,150
H-12	4,000	5,850	7,500	8,750	9,700	10,550	11,300	11,850	12,300
H-18	6,600	9,100	11,200	13,050	14,600	15,850	17,000	17,850	18,600

5. LOCATE AND SELECT BOILER

The boiler may be located as desired, since properly sized mains will carry the steam long distances and still assure positive heat distribution. The smoke pipe from the boiler to the chimney should be kept as short as possible. Sufficient space should also be allowed around the boiler for access and service.

It is imperative that the boiler selected is of a design that reliably delivers *dry* steam under adverse operating conditions. Contact the factory for boiler recommendations.

6. SELECT TYPE OF PIPING SYSTEM

The following types of piping systems should be carefully studied to determine which is best suited for the building in which the equipment will be installed. The considerations in regard to supply lines are:

The pressure drop in the supply mains and tubing must be low enough to give the desired pressure at the unit.

The piping must be sized and pitched to permit the flow of condensate in the supply lines without objectionable noise.

The maximum vertical height of tubing takeoffs must be limited to that where the steam pressure in the main will lift the condensate through the tubing, (about 2 feet per psi in the main).

Where steam and condensate are flowing in the same direction, in pipes either vertical or on a downward horizontal pitch, the pressure drop is the controlling factor. Where steam and condensate are flowing in the opposite direction, either in a vertical riser or in a horizontal line with an upward pitch, selecting pipe large enough to obtain quiet operation is necessary. In tubing supply take-offs both the pressure drop and the maximum vertical lift must be considered, but the pitch is not a factor.

Locating supply piping underneath concrete slabs is not recommended. The difficulties in providing a proper pitch, suitable expansion joints and anchors, waterproof insulation, and connections that are both tight initially and undamaged during construction all make this type of piping impractical for most installations. When the steam supply must be located below concrete floors, a suitable access trench with removable cover should be used.

Return piping under slabs is also subject to many of the same limitations. Insulation is seldom required and the lines are not under pressure; so serious leaks are less likely. Maintaining proper pitch in the piping while the floor is being poured, on the other hand, is even more critical than for the steam supply lines. For these reasons, return piping under slabs without provisions for access should be avoided if possible.

Steam supply piping in longer lengths is usually pitched downward in the direction of steam flow (not less than one inch in 40 feet) with a float trap at any low point to drain the condensate. Supply piping may also be pitched upward in the direction of steam flow but larger pipe sizes are then required to permit the condensate to drain back against the flow of steam, as explained in Article 7.

Steam supply mains may be run with either iron or type L copper pipe. The copper pipe with

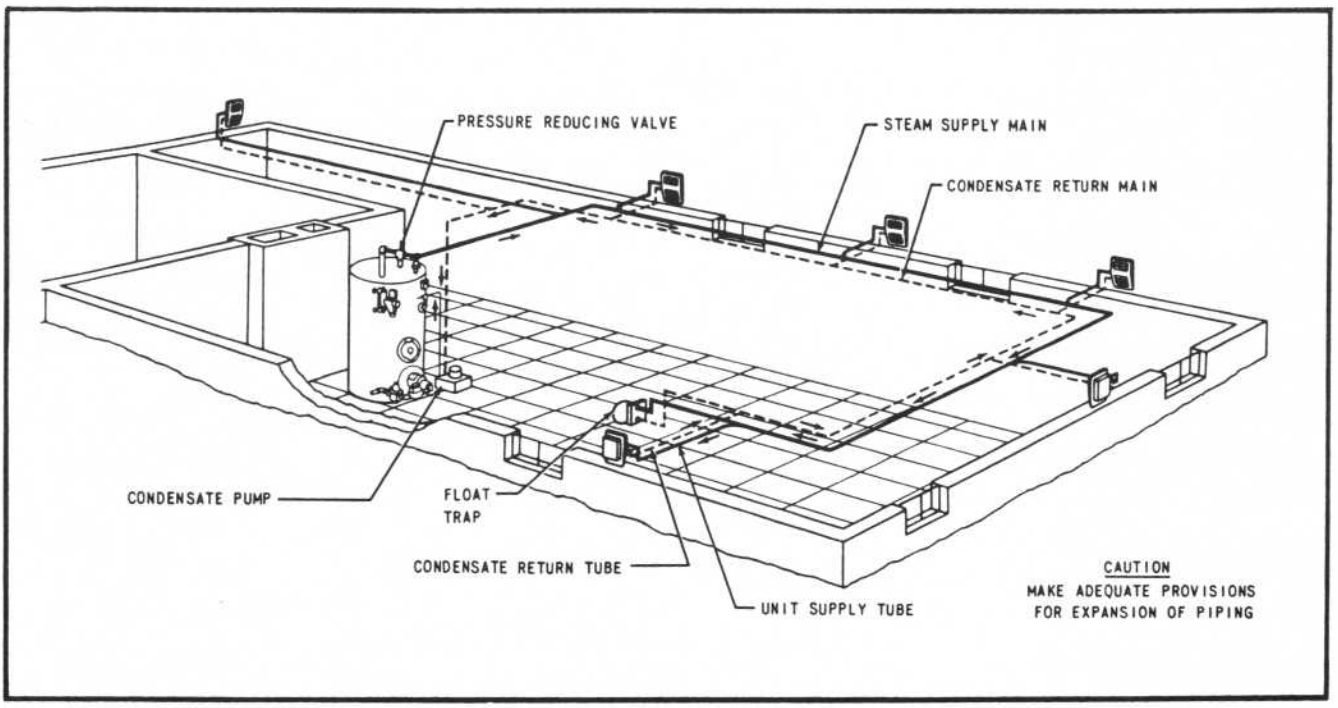

Figure 1 - Perimeter Main System - Up-Feed to Units With Tubing Take-Offs

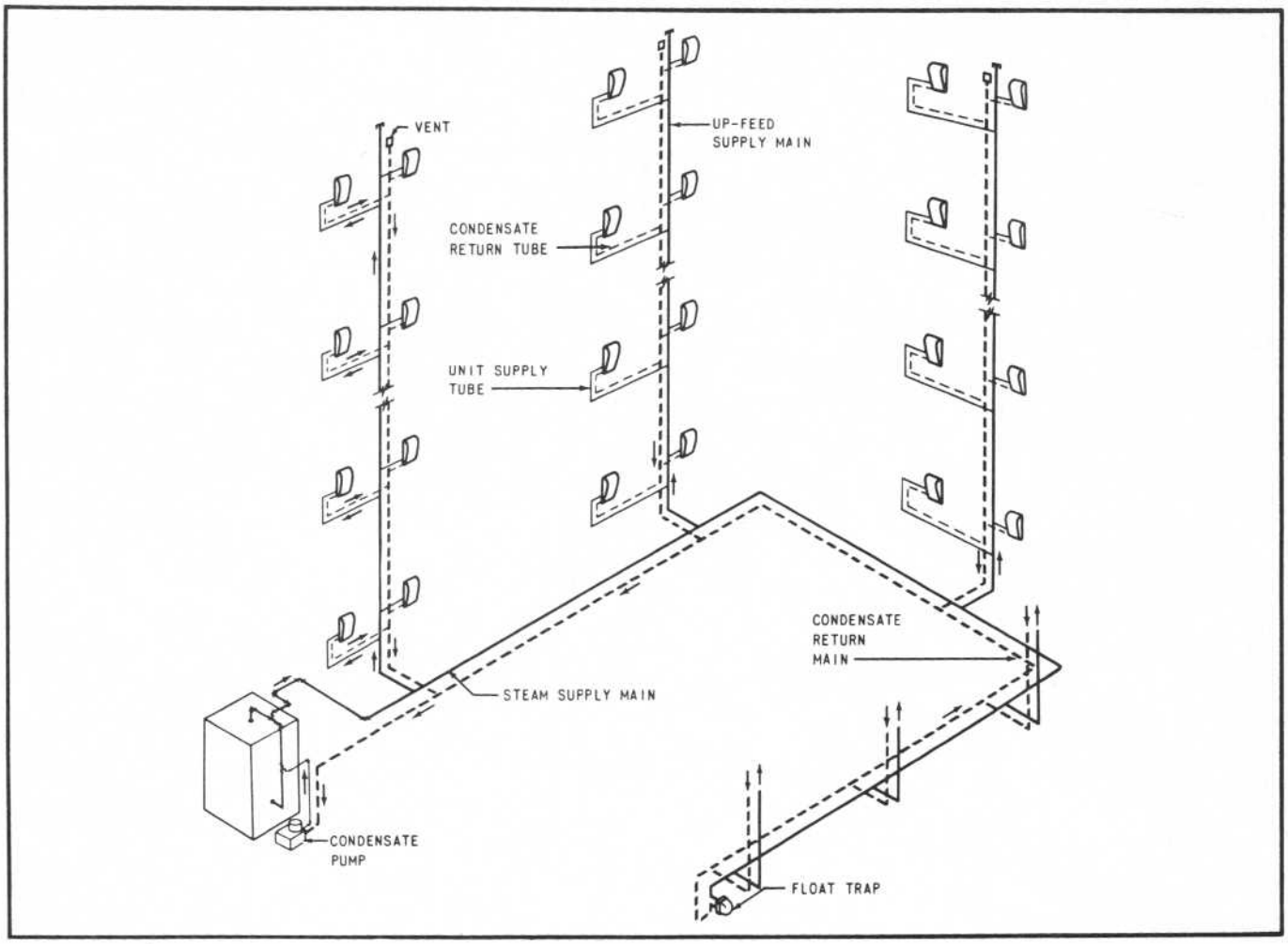

Figure 2 - Perimeter Main System - Up-Feed to Units With Pipe

soldered joints will be found more economical in sizes up to two inches. Iron pipe will generally be lower in cost on mains larger than two inches or those in which few or no tubing take-offs are made. Care must be taken when using iron pipe to keep the system free from cutting oil, pipe dope or metal chips. Flushing iron pipe mains with a hot caustic solution before the units and traps are connected is desirable.

The return mains in all systems should provide a downward pitch towards the condensate pump of not less than one inch in twenty feet. Return mains may be run with either type L copper or steel pipe, but where a number of tubing connections are made, soldered joints and copper pipe are recommended.

The general piping arrangements commonly used are described below. Combinations of the different methods of piping may, of course, also be employed on any installation to best fit the particular building layout and available space.

a. PERIMETER MAIN, UP-FEED TO UNITS (Figure 1 and 2.) This system employs a return main generally parallel to the supply. In a single or two-story building this permits short supply and return tubing connections between the mains and the units. In multi-story buildings the same system may be used with vertical pipe risers. The main may also be run in two directions from the boiler with separate traps on the end of each branch.

b. CENTRAL MAIN, UP-FEED TO UNITS (Figure 3.) This system may be used where units are located on the floor above the main with tubing runs not over 10 to 15 feet in length; or in multi-story buildings with pipe run-outs from the main to vertical supply risers.

c. PERIMETER MAIN, DOWN-FEED TO UNITS (Figure 5 and 6.) This system may be used in single story construction where a main under the first floor is not practical or in multi-story construction where the use of a number of large vertical risers would result in high material cost. With this system one large riser would be piped from the boiler to the level of the horizontal main with smaller down-feed supply lines, either pipe or tubing, from the main to the units.

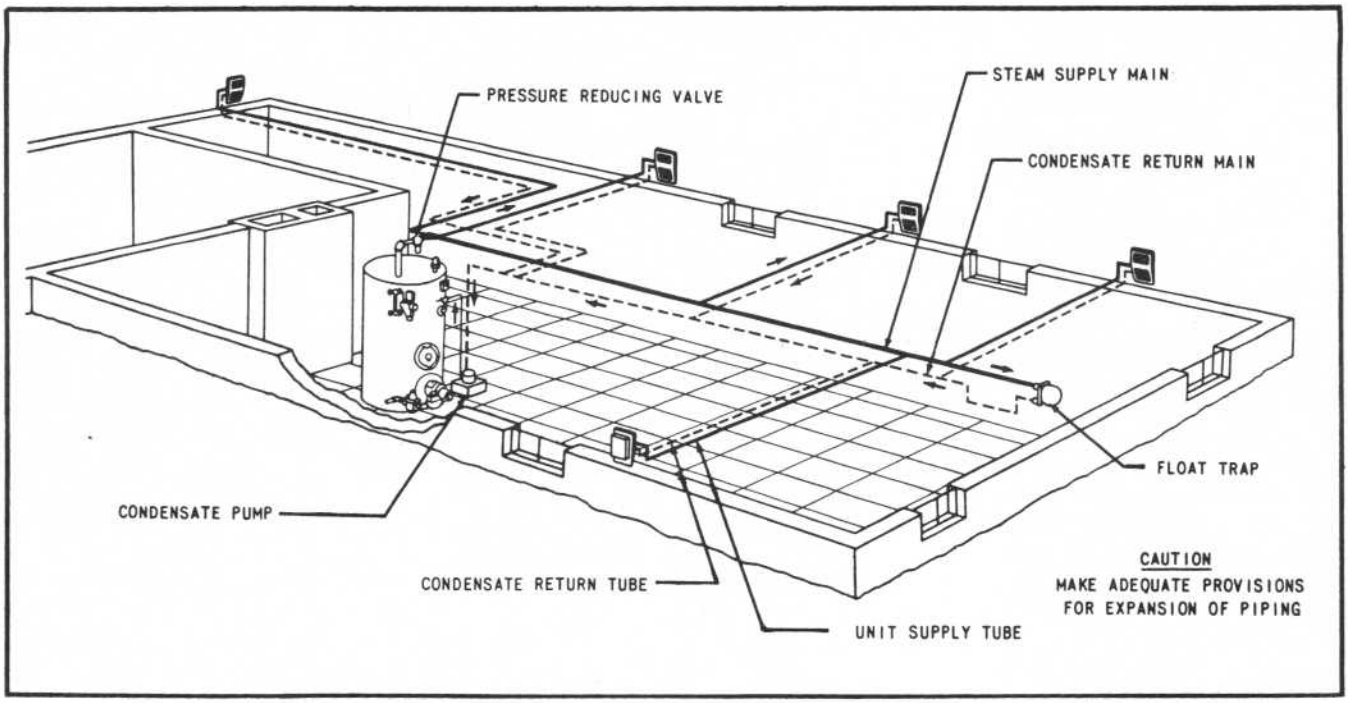

Figure 3 - Central Main System - Up-Feed to Units With Tubing Take-Offs

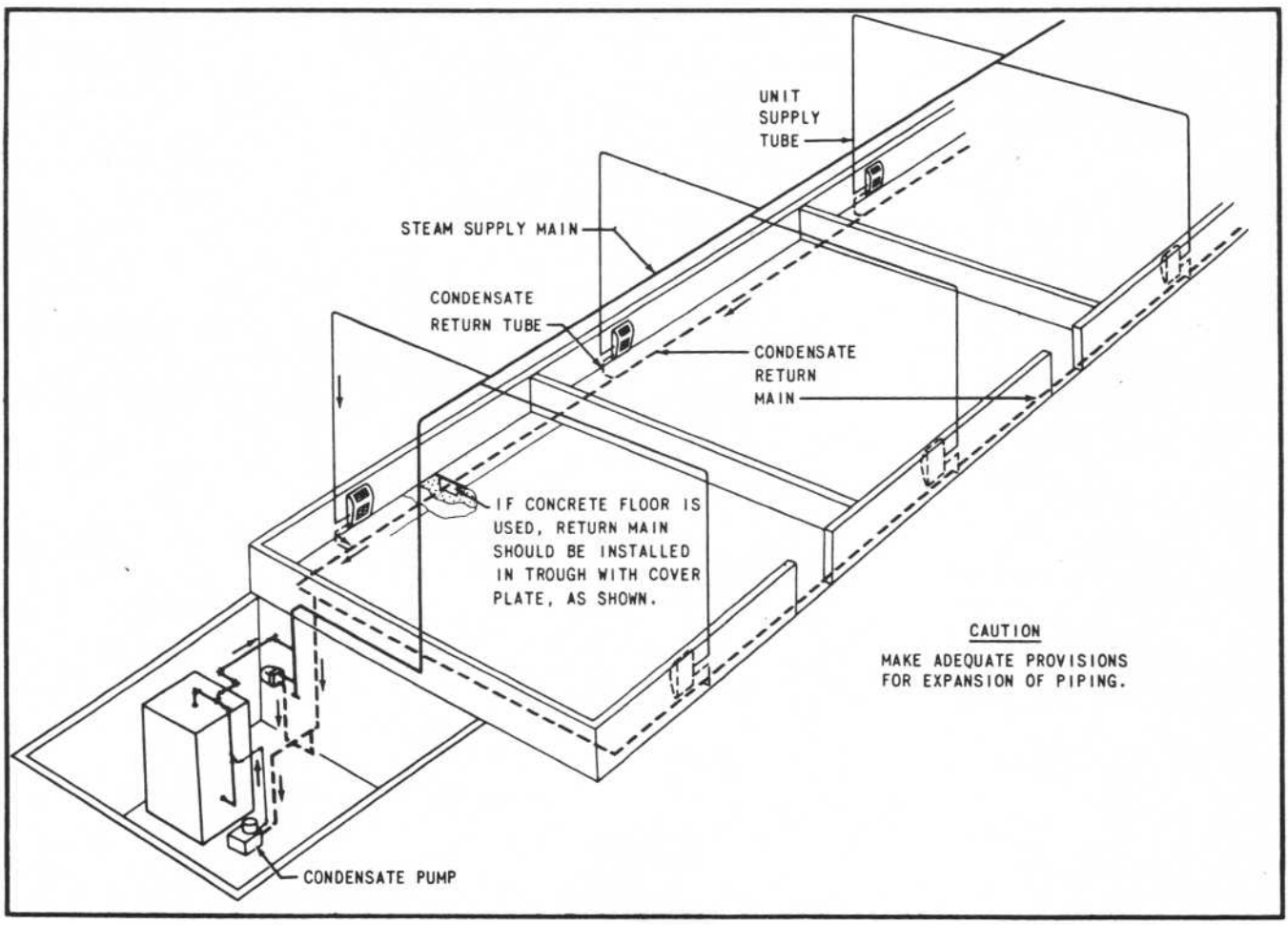

Figure 4 - Central Main System - Down-Feed to Units With Tubing Take-Offs

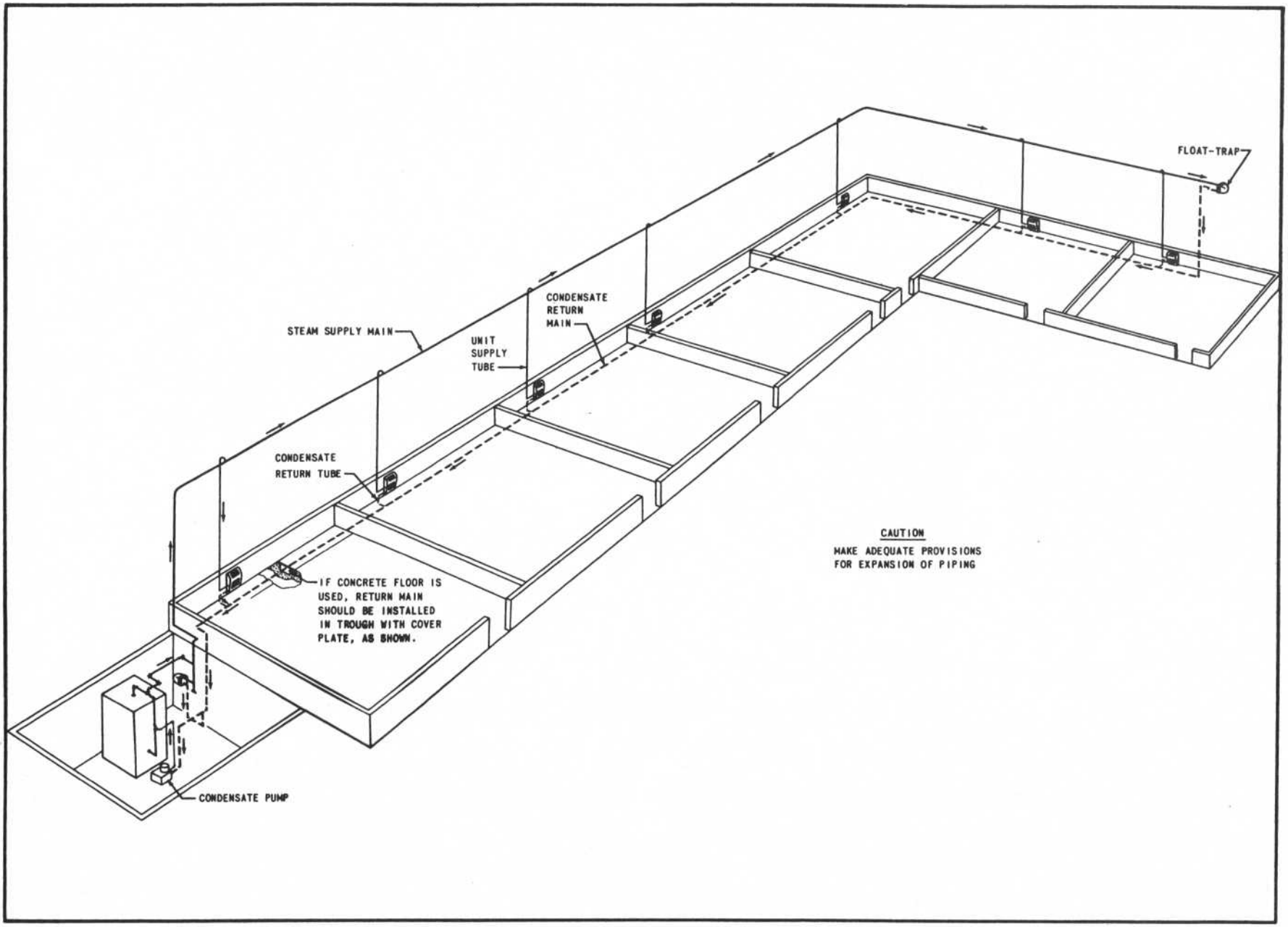

Figure 5 - Perimeter Main System - Down-Feed to Units With Tubing Take-Offs

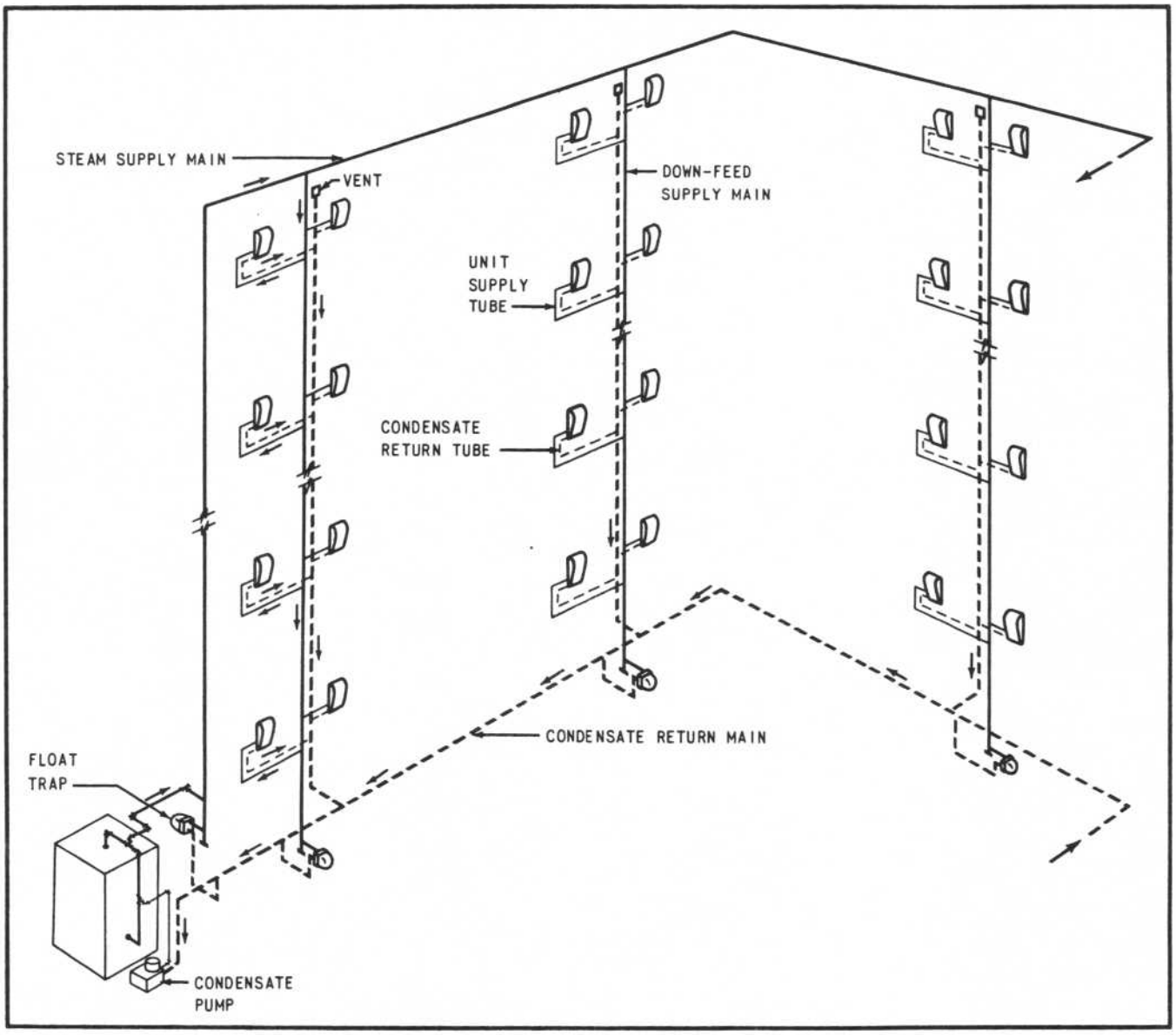

Figure 6 - Perimeter Main System - Down-Feed to Units With Pipe

d. CENTRAL MAIN, DOWN-FEED TO UNITS (Figure 4.) This system can be used with tubing supply lines to outside walls only when the building is very narrow, since otherwise the tubing lengths will be excessive. Pipe runouts from the main and vertical down-feed supply pipes may be used on larger buildings.

e. PERIMETER MAIN, COMBINATION UP-FEED AND DOWN-FEED TO UNITS (Figure 7.) This system can be used advantageously in larger buildings where horizontal mains can be installed on intermediate floors.

When adapting SelecTemp to an existing steam system in smaller buildings a complete new piping installation is usually desirable, but in larger buildings some or all of the present piping may be utilized. On two-pipe systems the existing piping will frequently be satisfactory providing the supply pipes are properly insulated and both supply and return piping is correctly pitched. If the existing piping on a one-pipe system is used as a supply, the large pipes may be expensive to insulate or result in high stand-by losses. This piping, however, can be readily adapted for return lines if new supply piping is added. Y-type strainers should be used in any supply main between steel pipe and copper pipe or tubing. Return lines from SelecTemp units cannot be connected directly into a vacuum return, but the condensate from one or more units may be piped as shown in Figure 8. A separate return system from the SelecTemp units may also be drained to a condensate pump discharging into the vacuum return or into the boiler.

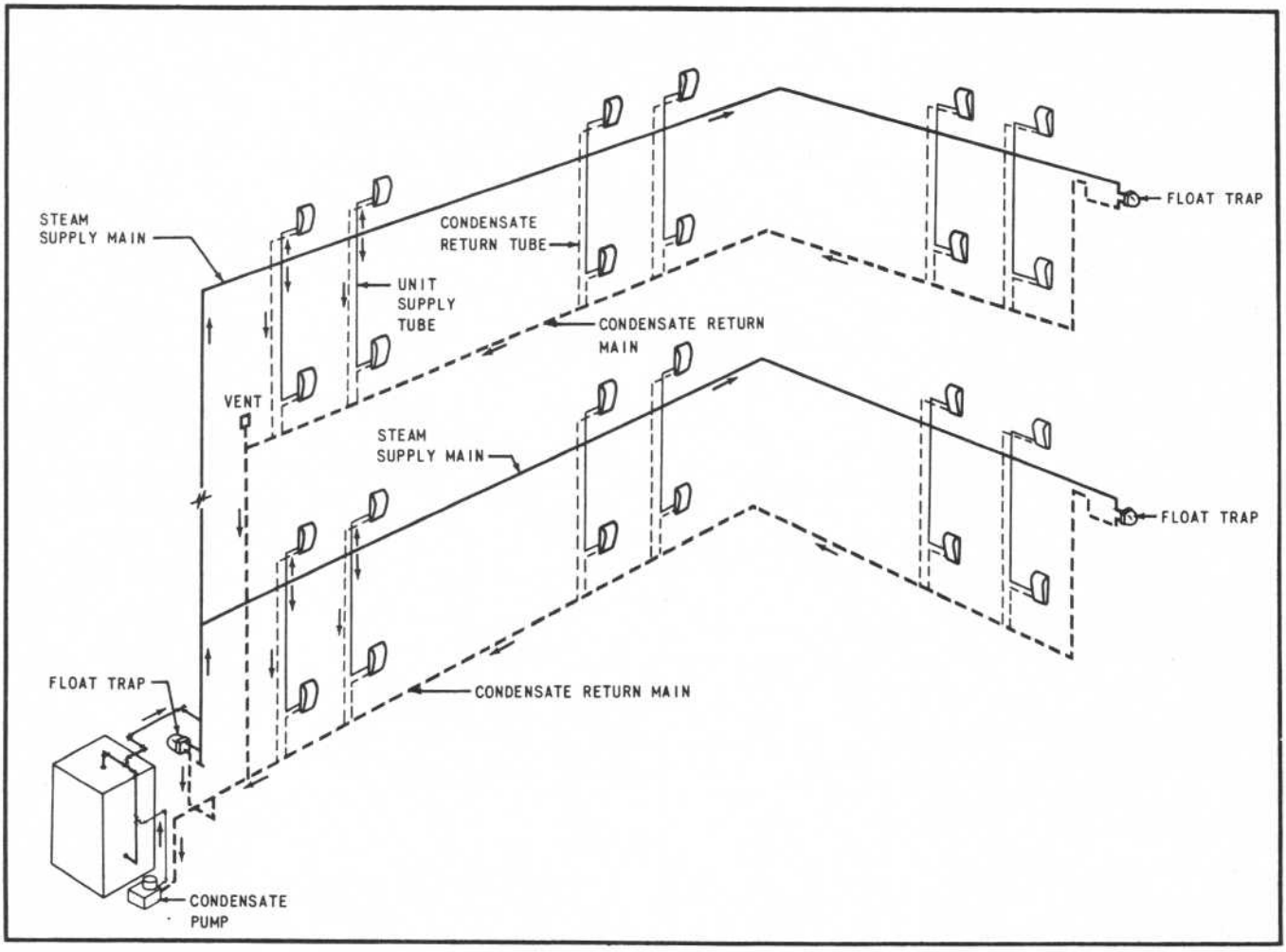

Figure 7 - Perimeter Main System - Up-Feed and Down-Feed to Units

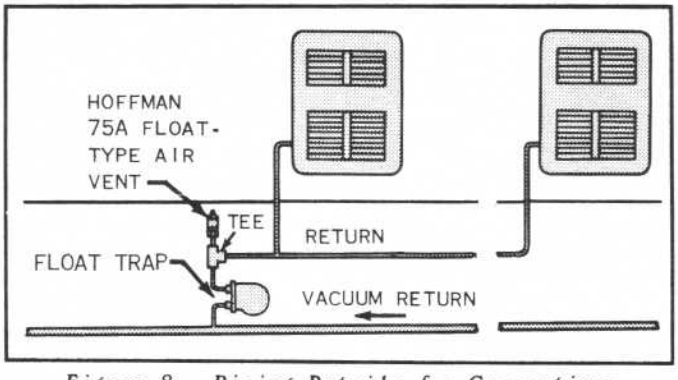

Figure 8 - Piping Details for Connections to Existing Vacuum Return System

7. SIZE SUPPLY PIPE AND TUBING

The total allowable pressure drop in the system is determined by the difference between the pressure available at the boiler and that required at the units. The pressure available at the boiler varies between the cut-in and cut-out settings of the burner pressure regulator. These settings may differ somewhat with the size and type of burner, but a cut-in pressure not over 9 psi should be used as a normal design basis. The pressure required at the units, as discussed in Article 2, will generally be 6 to 7 psi. Therefore, the difference available for pressure drop in the piping system will be about 2 psi, which is divided between the steam supply main and tubing.

Table II shows the pressure drop through 3/8" and 1/2" O.D. copper tubing for various lengths and steam flow rates. The tubing size selected should generally give a pressure drop of not over one psi at the steam flow required for the desired unit output (not at the nominal capacity of the unit, if greater than required for the load).

The allowable pressure drop in the supply main is the remainder obtained by subtracting the tubing drop from the total allowed for the system. If a section of main is to be designed for a one psi pressure drop and is the same diameter through its entire length, Table III can be used to find the capacity of various pipe sizes and lengths. The capacities shown are for the same flow through the complete length of the pipe. Where the unit sup-

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TABLE II
CAPACITY OF COPPER SUPPLY TUBING, MBTUH
7 PSI AVERAGE STEAM PRESSURE

PRESSURE DROP, PSI	3/8 IN. O.D. TUBING LENGTH, FEET				1/2 IN. O.D. TUBING LENGTH, FEET		
	5	10	15	20	10	15	20
0.50	8.7	5.9	4.7	4.0	17.0	14.5	12.8
0.75	13.1	8.7	6.8	5.8	22.0	18.2	16.2
1.00	16.8	11.1	8.7	7.3	26.0	22.0	19.0
1.25	20.0	13.0	10.5	8.8	27.5	24.5	21.5
1.50	23.0	17.7	15.0	10.0	32.0	27.5	24.0

TABLE III
CAPACITY OF HORIZONTAL OR DOWN FLOW STEAM SUPPLY MAINS
MBTUH for 1 PSI Pressure Drop
(Based on 7 PSI Average Steam Pressure)

PIPE SIZE	LENGTH OF PIPE (FEET)									
	20	30	40	50	60	70	80	90	100	120
3/4"	81	69	57	52	46	43	40	38	36	- - - -
1"	141	120	100	91	81	76	71	67	63	58
1-1/4"	322	276	228	208	186	173	161	153	144	131
1-1/2"	501	428	354	323	289	269	251	238	224	204
2"	1040	869	719	655	587	545	510	481	454	415

ply tubes are taken off along the main, however, the amount of steam flowing in the pipe is reduced in the portions farther from the boiler, and the pressure drop is less than that with the full quantity of steam flowing through the entire length. Under these circumstances, the pressure drop can be approximated by using an arbitrary effective length instead of the actual length. Where the supply tubes are taken off at fairly regular intervals and all of the steam is used in the length of piping to be sized, the effective length is half the actual length. For example, with a load of 80 M Btuh, a main length of 100 feet, and supply tubes taken off regularly from a perimeter main, the effective length would be 100/2 or 50 feet. Referring to Table III, for a 50 foot length, 91 thousand Btuh is the capacity of a 1" pipe, so this size would be selected and the pressure drop would be somewhat less than one psi.

Mains of more than one pipe size may be designed for larger systems by dividing the main into two or more sections and sizing each section separately. Table IV can be used for finding the pressure drop in these cases. This table is based on 100 feet of pipe, and for other lengths the pressure drop will be increased or decreased in direct proportion to the length. For example, if the section were 75 feet long the pressure would be 75/100 or 3/4 of that shown for 100 feet, or if the section were 150 feet long the pressure would be 150/100 or 1-1/2 times that shown in Table IV.

Estimating the effective length for mains where all of the steam is used in the section being sized is explained above. In sections of main where only a portion of the steam is used, the effective length is estimated in a different manner. The effective length in any section of main where the steam is used from take-off's spaced more or less regularly can be calculated from the relation: EFFECTIVE LENGTH = ACTUAL LENGTH x AVERAGE FLOW/ MAXIMUM FLOW. For example, in a section 80 feet in length with a flow of 250 M Btuh entering and 150 M Btuh leaving, the average flow is $\frac{250 + 150}{2}$ = 200 M Btuh and the effective length would be 80 (actual length) x $\frac{200}{250}$ (avg. flow) (max. flow) = 64 feet. This value of length would then be used to determine the pressure drop from Table IV. Using the above example with an effective length of 64 feet and a maximum flow of 250 M BTUH, from Table IV, 1-1/2" pipe will have 1.2 psi pressure drop per 100 feet and 1.2 x 64/100 or 0.768 psi for conditions given.

The above methods are used for either vertical or horizontal supply piping where the flow of both steam and condensate forming in the main are in the same direction. Where steam and condensate flow in opposite directions, as in a vertical pipe supply riser, or a runout pitched up in the direction of steam flow, Table V is used to obtain the pipe sizes. The pressure drop with the flow rates shown

in this Table will be about one ounce per square inch for each 100 feet of pipe length and can be disregarded in most instances.

Pressure drop calculations for supply mains pitched down in the direction of steam flow should be based on the steam flow required for the calculated heat loss (plus pick-up, if applicable) rather than the total maximum capacity of connected units. Selection of pipe sizes from Table V, vertical risers or horizontal runouts, on the other hand, should be based on the maximum unit capacity at the operating pressure.

TABLE IV

STEAM PRESSURE DROP

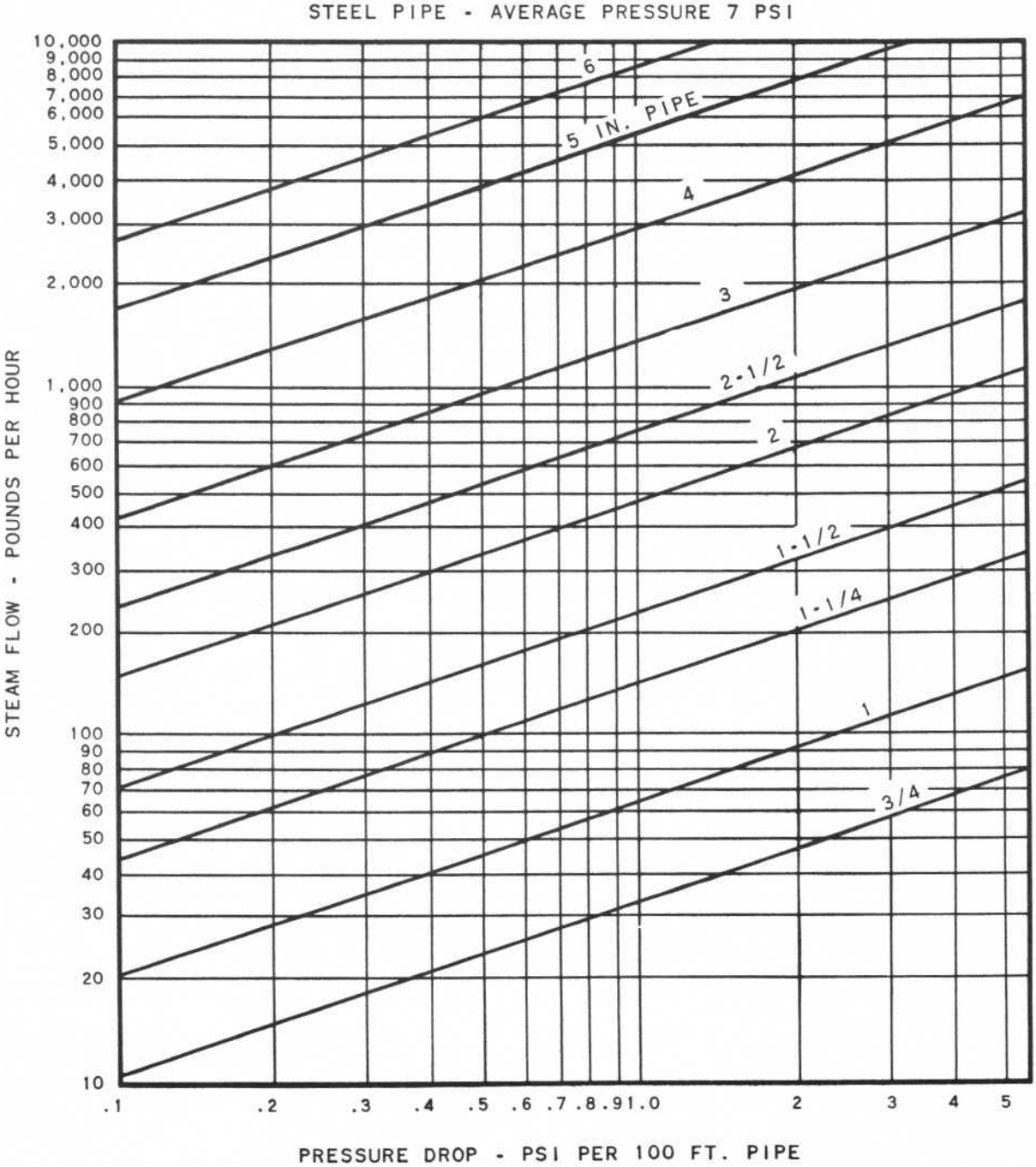


TABLE V

CAPACITY OF VERTICAL SUPPLY RISERS AND HORIZONTAL RUNOUTS PITCHED UP IN THE DIRECTION OF STEAM FLOW *

PIPE SIZE INCHES	CAPACITY, MBTUH		
	VERTICAL RISER	HORIZONTAL RUNOUTS	
		1"/10' PITCH	4"/10' PITCH
3/4	8	9.3	11.9
1	14	15.8	22.0
1-1/4	31	33.3	43.2
1-1/2	48	45.3	56.0
2	97	74.9	92.4
2-1/2	159	—	—
3	282	—	—
3-1/2	387	—	—
4	511	—	—
5	1050	—	—
6	1800	—	—
8	3750	—	—
10	7000	—	—

** Data from: ASHRAE Guide.*

8. SIZE RETURN PIPE AND TUBING

Sizes for return mains are shown in Table VI. The capacity in pounds of condensate per hour should include not only the condensate from the units but also the condensate occurring in the supply main during the initial startup of a cold system. All of the latter will be discharged into the return main through a trap or traps. Therefore the return main at the point where the trap is connected must be sized for that proportion of the total boiler capacity which will be handled by the trap plus any accumulated flow from the upstream side of this connection. The return main at the point where a single trap drains a supply main should be sized for a condensate flow of about 3/4 of the boiler capacity.

TABLE VI

CAPACITY OF HORIZONTAL OR VERTICAL RETURN MAINS

(Horizontal Mains Pitched Not Less Than 1 In. per 20 Ft.)

PIPE SIZE (NOM. I.D.)	1/2	3/4	1	1-1/4	1-1/2
CAPACITY LBS. PER HR.	100	250	500	1000	1500

1/4" O.D. tubing may be used for single unit short condensate return tubes, while 3/8" O.D. tubing is mandatory for runs longer than 5 feet. Larger tubing may also be required where special piping provisions must be made, as explained in the installation section. Vertical pipe returns should be vented at the highest point with a float type air vent of sufficient capacity. (Hoffman 75A or equivalent) Horizontal return mains longer than 100 feet may also be vented at the point farthest from the condensate return pump. Maintaining the minimum pitch of not less than one inch in 20 feet is extremely important in both return mains and tubing. Although it is possible to use 1/2" condensate return mains for low flows, it is preferable to use 3/4" condensate returns for 3 units or more.

9. SELECT AUXILIARY EQUIPMENT

The final step in the application of a SelecTemp system is to select the auxiliary equipment. The common items used, some required and some optional, are discussed below.

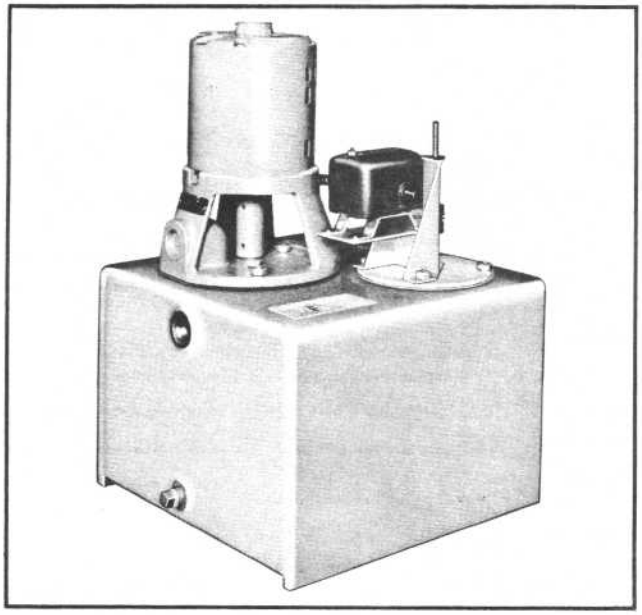


Figure 9 - Condensate Return Pump

a. CONDENSATE PUMP - A condensate return pump having a capacity about double the average peak hourly condensate flow rate should be selected. The pump must be located at a level below the lowest point in the return system. The pump receiver must be vented to the atmosphere and an overflow to a drain should be provided. The pump overflow opening should preferably be at a level below the lowest unit in the system, otherwise water may be forced out of the unit bearings in case of pump failure.

Condensate return pump capacities are given at a specified discharge pressure; which in operation will be the sum of the boiler operating pressure, the pressure required to lift the water from the pump level to the water line, the friction loss in the piping from pump to boiler, and the pressure required to open the check valve. The lift pressure is 1 psi for each 28" of lift. The friction loss in the piping per hundred feet at a 3 GPM rate can be estimated at 0.5 psi for 1" pipe and 2 psi for 3/4" pipe. The pressure required to lift the check valve will vary with the valve design, but will generally be less than 1 psi. Condensate pumps should not be used with discharge pressures exceeding that for which they are nominally rated.

Condensate Return Pumps with float switches are available. The No. 203275 Pump has a capacity of 3 GPM against a head of 40 psi and is suitable for use on loads up to 750,000 Btuh. The No. 203295 Pump has a capacity of 5 GPM

against a head of 40 psi and may be used on loads up to 1,500,000 Btuh.

The condensate pump motor on these models starts and stops from a float switch which is operated from the water level in the receiver.

Where automatic water feed is required, a feed water tank group, Figure 10, is available. These parts provide an open tank of about 12 gallons capacity, a solenoid valve between the tank and pump receiver, and the necessary tank supports for mounting. A combination low water cut-off and pump control, a McDonnell-Miller No. 42, is used to operate the solenoid valve. This arrangement permits the treatment of the make-up water and allows the operator to observe the amount of water used by the system.

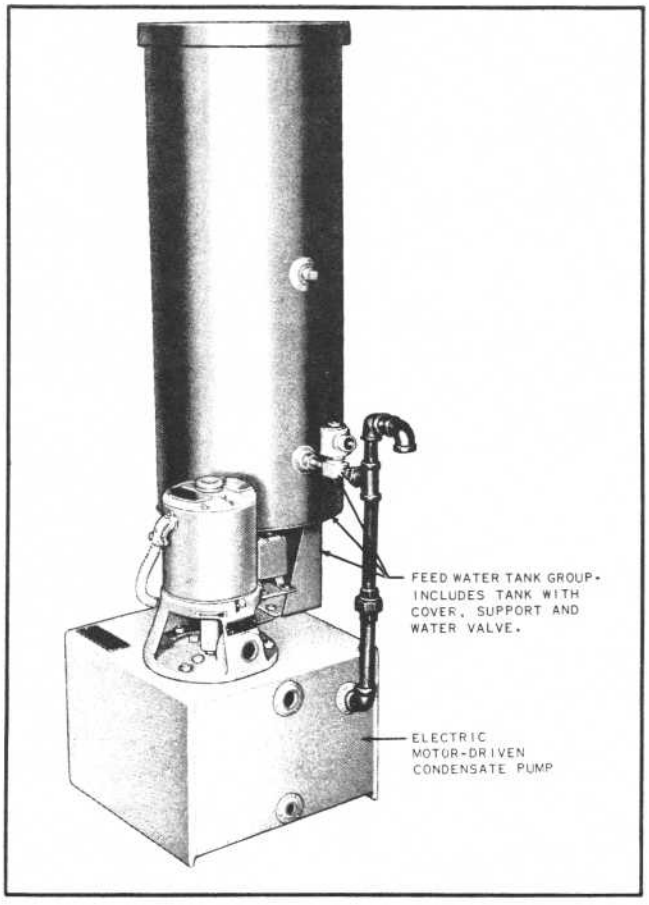


Figure 10 - Feed Water Tank

The addition to the boiler of undetermined amounts of untreated water may result in boiler corrosion with resulting short life for the equipment. **For this reason, an automatic feed to the pump receiver without the tank is not recommended.**

Automatic water feeders connected directly to the boiler should never be used on SelecTemp systems.

b. **PRESSURE REDUCING VALVE** - Rapid variations of pressure at the Selectemp units is undesirable. Therefore, on smaller boilers particularly, where the burner cycles frequently, a pressure reducing valve in the supply main should be used. For mains up to 200,000 Btuh capacity and not over 15 psi inlet pressure, a 1-1/4" regulator valve, Part Number 203160, is available.
For larger mains or higher pressures, any of the standard commercially available steam reducing valves may be used.

c. STEAM TRAPS - Condensate forming in the steam supply mains must be removed by a steam trap and not allowed to drain through the units. A float type, non-thermostatic trap is recommended for this purpose, such as the Part No. 203300. This 3/4" trap has a discharge capacity of about 200 pounds of water per hour under SelecTemp system operating conditions. During running periods, the trap handles only the small amount of condensate formed to offset the heat lost from the pipe main. During start-up periods, however, the trap handles the condensate required to heat the main initially, with flow through the trap at a much higher rate. The main trap should, therefore, be selected to handle not less than 75% of the full capacity of the boiler on a single main, or the proportional part of the boiler capacity on branch mains. Using the 3/4" trap, at least one trap for each 250,000 Btuh of boiler capacity would thus be required. Traps of larger diameter and capacity are available, but most SelecTemp piping systems should not be designed to collect supply main condensation at any one point at a rate in excess of the capacity of the 3/4" trap.

d. EXPANSION JOINTS - Supply and return mains of copper or steel will expand and contract approximately 1/4" and 1/6" respectively for each ten feet of length. On mains where tubing take-offs are made, this expansion or contraction should be limited to no more than 1" of movement at any one point to prevent excessive stress on the supply and return tubes. Therefore, on such straight mains over 40 feet in length, provisions must be made to control the expansion. Table VII shows a common type of expansion joint and the necessary design data for copper pipe. The same dimensions can also be used for steel pipe.

Where this type of expansion joint is used, the added length for pipe and fittings should be included in the equivalent length when calculating pressure drop.

Commercially available expansion joints, such as those manufactured by the Flexonics Corp., Maywood, Illinois, may be necessary on some installations where space limitations prevent the use of the U-type joint. When any expansion joint is used, the main must be firmly anchored so that maximum movement will occur at the joint.

SelecTemp

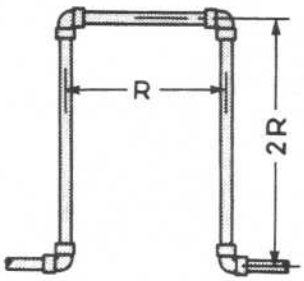


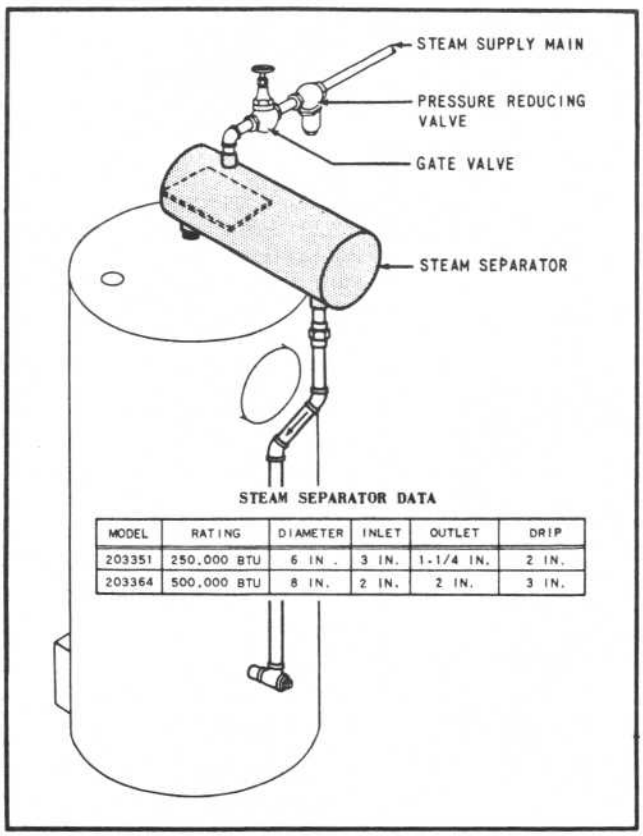
TABLE VII

EXPANSION LOOP FOR COPPER PIPE*
DIMENSION "R" - INCHES

INCHES OF EXPANSION	NOMINAL PIPE SIZE						
	3/4	1	1-1/4	1-1/2	2	2-1/2	3
1	15	17	19	20	23	26	28
2	21	24	26	28	32	36	39
3	26	29	32	35	40	44	48

**Data from American Brass Co. Bulletin A1A File No. 29-B-41*

e. STEAM SEPARATORS - A minimum amount of water flowing through the SelecTemp units and piping is desirable for best operation of the system. Water carry-over from the boiler into the steam main is particularly detrimental to the proper functioning of units, traps, and condensate pump. Most small boilers, below 30 BHP, will tend to carry over considerable water; so that some means of draining off this water before it goes out through the main is necessary. This may be accomplished by providing a steam separator at the boiler. Figure 11 shows typical piping connections and the capacities and dimensions of separators available from the factory. Where the load exceeds the capacity of one separator or where dual outlets are used from the boiler, two separators may be used. In some installations, to obtain other sizes or numbers of outlet and inlet tappings, a similar separator can best be fabricated on the job.



STEAM SEPARATOR DATA

MODEL	RATING	DIAMETER	INLET	OUTLET	DRIP
203351	250,000 BTU	6 IN.	3 IN.	1-1/4 IN.	2 IN.
203364	500,000 BTU	8 IN.	2 IN.	2 IN.	3 IN.

Figure 11 - Steam Separator

f. SUPPLY PIPE AND TUBING INSULATION - All supply mains and vertical pipe supply risers must be insulated. Where steam pressure is maintained most of the time on the SelecTemp system, the heat loss from uninsulated supply piping is greater than in "on-off" types of heating. Uninsulated mains in basements or other space should not be expected to heat these areas, since no control of the heat is available and during mild weather the wasted heat will appreciably increase fuel consumption. Supply tubing should be insulated in runs through unheated spaces, in walls, or in any cases where the run is longer than 6 feet.

Return mains and tubing do not require insulation unless exposed to freezing temperatures.

For steel or copper pipe, preformed glass fibre insulation of 1" thickness should be used because of the superior insulating properties as compared with 4 ply air cell, 1" thick 85% magnesia, or 1/2" thick glass fiber. The material is distributed and stocked nationally under several trade names, a few of which are listed below:

Owens-Corning "Fibreglas" Corp.
Nicholas Building
Toledo, Ohio
Trade Name - "Fibreglas"

Gustin-Bacon Mfg. Co.
210 W. 10th Street
Kansas City, Missouri
Trade Name - "Snap on Pipe Insulation"

Baldwin-Hill Company
1705 Breunig Avenue
Trenton 2, New Jersey
Trade Name - "Mono-Kover"

Procedures for installing insulation are given in section II, Page 25.

g. DUAL WALL ADAPTER GROUP - Parts groups are available to permit supplying heat through a common wall to two adjacent rooms with a single H-12 or H-18 SelecTemp unit. A manual damper arrangement permits adjustment to supply to the second room up to 50% of the heat output through a short duct and a grill. This application provides thermostatic control, of course, in only the room where the unit is mounted, but where this factor or the open duct connection between two rooms is not objectionable the cost of the installation is reduced.

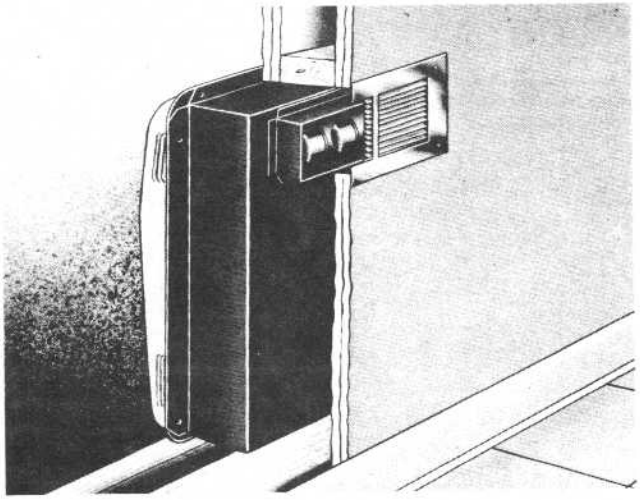


Figure 12 - Dual Wall Adapter Parts

The dual wall adapter parts are illustrated in Figure 12. The H-12 dual wall group may be used also with the H-18 unit if not more than 6,000 Btuh is required from the back side of the unit.

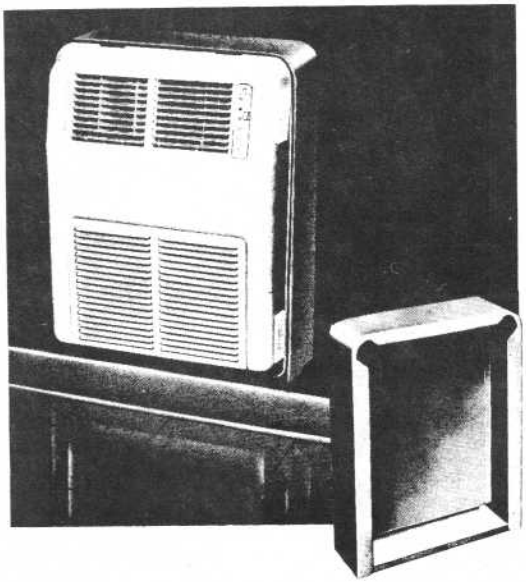


Figure 13 - SelecTemp Unit Installed in Free-Standing Frame

h. FREE STANDING FRAMES - These adapters provide a metal frame, 5" in depth and about 1/2" larger than the unit in length and width. The bottom of the frame is open as shown in Figure 13.

The frame can be used to mount a unit on a masonry or other wall where the recessed unit mounting is not feasible. The frame can also be used on installations where the wall studs are less than 3-5/8" and the unit can be only partially recessed into the wall.

The 5" depth on the frame is sufficient to permit running supply and return tubing inside the frame and across the back of the unit. Holes are provided in the left side of the frame for the usual passage of the supply and return tubing. The tubing can also be run up inside the frame from the bottom.

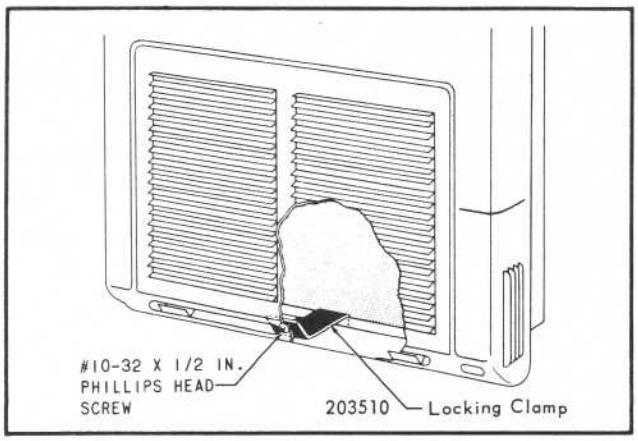


Figure 14 - Grille Locking Clamp

i. GRILLE LOCKING CLAMP - To prevent tampering with or damage to units installed in dormitories, hotels, or other public buildings, a grille locking clamp is available. This clamp illustrated in Figure 14, can be used with any standard SelecTemp unit. A Phillips head screw driver is required for removal of the grille equipped with the clamp.

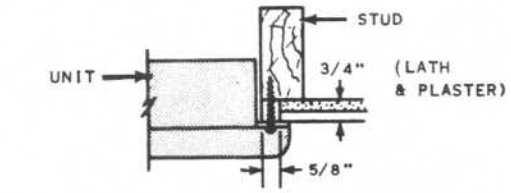
SelecTemp

SECTION II
INSTALLATION

10. UNIT WALL OPENINGS

a. NEW CONSTRUCTION - For framed walls, a header and vertical side support member should be provided as shown in Figure 17. The dimensions shown are slightly greater than the actual outside measurements of the unit cabinet to allow clearance for mounting.

If units are to be recessed in solid masonry walls, wooden frames with dimensions as shown in Figure 17 may be pre-fabricated and set into the wall, or the free standing metal frame Figure 13 may be used in the same manner. Where units are not recessed, the free standing frame may be fastened directly to the wall surface.



ALTERNATE METHOD OF USING 5/8" X 3/4" WOOD STRIPS AROUND FRAME

MODEL	H-6	H-12	H-18
DIM. C	6-3/4"	11"	15-1/2"

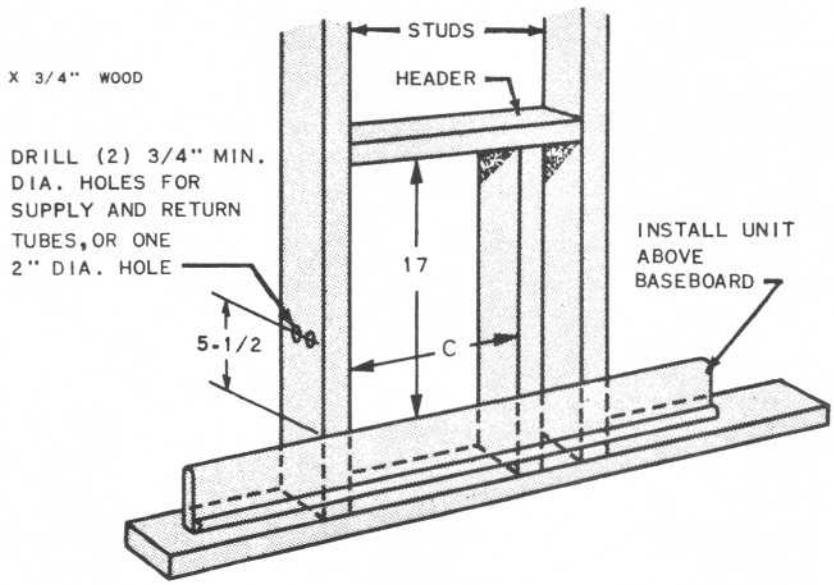


Figure 17 - Details for Mounting Unit in Wall on New Construction

DIM.	H-6	H-12	H-18
A	9 5/16	13 5/8	17 15/16
B	6 7/32	10 13/32	14 23/32

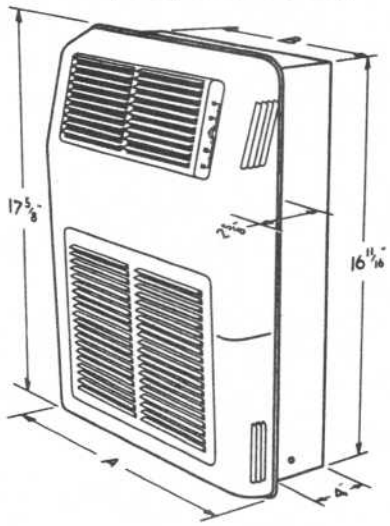


Figure 18 - Unit Dimensional Drawing

Metal plaster stop frames for lath and plaster walls are available with dimensions as shown in Figure 16. These frames insure a substantial finished edge to the wall opening. After the plastering has been completed, the unit is mounted in the framed opening using the wood screws which are provided with the unit.

b. OLD CONSTRUCTION - Framed walls with lath and plaster or dry wall should be sounded in order to locate the stud nearest the desired unit location. An opening should then be made in the wall on the left hand side of the stud in order to determine its exact location. The unit opening should then be marked on the wall, using the left side of the stud for the right hand side of the unit opening. The dimensions for these openings are shown in Figure 19. Since the cabinet of an H-18 unit is slightly wider than the distance between studs located on 16" centers, the left hand stud will have to be notched about 1/2" when making an opening for an H-18 unit.

Openings are marked and cut in older framed walls finished with wood lath and plaster in the same manner as described above. However, the wall on the left side of the opening for the H-6 and H-12 units must be reinforced by using flat-head wood screws to fasten a 1" x 2" x 20" wood strip along the inside edge of the opening as shown in Figure 20.

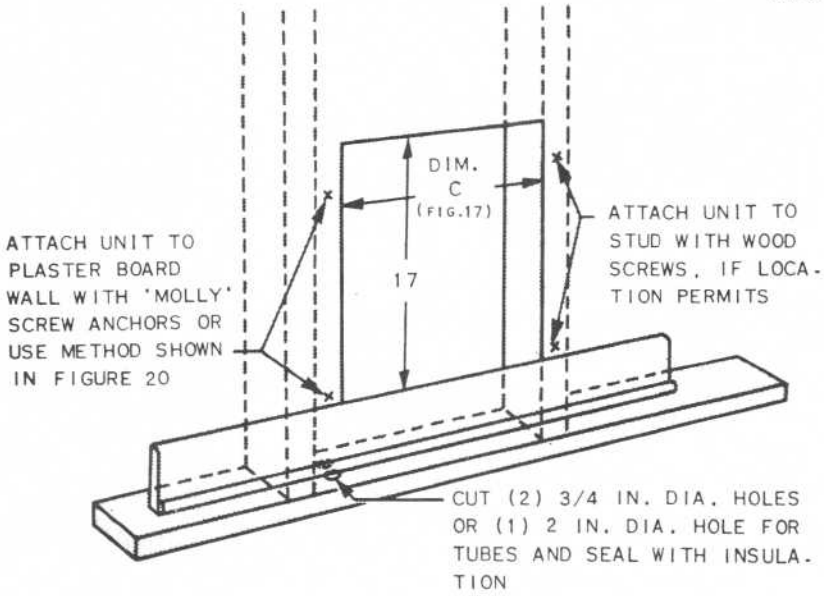


Figure 19 - Details for Mounting Unit in Wall on Old Construction

If units are to be recessed in masonry walls, the proper size opening should be marked and then cut with either a hammer and chisel or skill saw equipped with a carborundum blade. Normally it is much cheaper and simpler to mount the units in metal free standing frames as described in Article 22 unless the inside wall is finished with furring strips and lath or plaster or some other type of wall board. If this is the case, the proper size opening should be made and the unit fastened to plaster or wall board with molly screws or their equivalent.

c. TUBE OPENINGS - For new, framed construction two 3/4" diam. holes or one 2" diam. hole should be drilled in the left hand stud as shown in Figure 17. If the tubes approach from underneath, similar holes would have to be drilled in the floor plate but as far to the left as possible in the adjoining stud space so a sharp bend would not be made in the tubes. If the supply tube approaches from overhead or other stud spaces, one 3/4" diam. hole is required in each stud, header, or plates through which the tube must pass. A second 3/4" diam. hole is needed in the floor plate for the return tube which must pitch downward.

On new installations using masonry walls the tubes can be run in furred spaces if available. If the units are to be mounted in or on the walls and the tubes cannot be exposed, metal pipes or waterproof cardboard tubes can be located in the openings in the block to provide channels for the tubes. If this method is followed, the space around the supply tube must be large enough to provide room for insulation. Pipe sleeves must also be provided at any point where the tubes pass through slab floors or other masonry partitions.

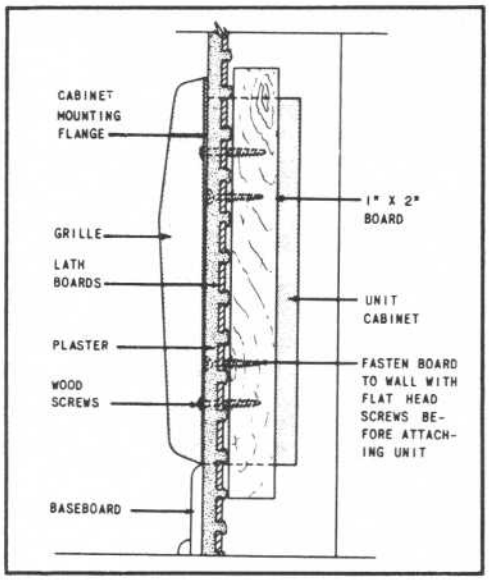


Figure 20 - Method of Attaching Unit to Wood Lath and Plaster-Type Walls

On framed walls in existing buildings the supply tube can be dropped down through the stud space if it approaches from overhead. However, the return tube will always approach from below and in many cases the supply tube will too. This means the floor plate must be drilled near the left hand stud member and the tubes pushed through. Sufficient space is provided between the cabinet and the left hand stud on the H-6 and H-12 units although the use of a tube bender to make a 90° bend at the point where the tubes enter the unit is desirable. A proper bend is mandatory on the H-18 unit where the stud has to be notched an additional 1/2" over that required for the unit in order to provide clearance for the tubes.

If free standing frames are fastened directly to the wall and the tubes approach from the bottom, they should run up inside the frame in the space between it and the unit. Clearance is also provided between the back of the unit and back of the frame if the tubes approach from the right.

If the units are recessed in solid masonry walls or masonry walls which are furred out, a pipe chase will have to be provided between the face of the wall and the tube opening in the unit cabinet unless the tubes have been previously located inside the wall.

11. UNIT MOUNTING

On either new construction or remodeling, the units should not be installed until all other work has been completed. Otherwise they are subjected to all types of dirt and unnecessary abuse. If temporary heat is required, and other methods are not available or approved, a small number of SelecTemp units should be rotated from room to room as needed. When the work is completed these units should then be carefully cleaned and checked before permanent installation is made.

The left hand, right hand and top flange of any SelecTemp unit each contains two holes through which wood screws or other type fasteners may be inserted when fastening the unit to the wall or frame. Thus a total of six possible fastening locations are provided, although to securely mount a unit only four of the openings need to be used.

For wood-framed openings on new construction the right hand, left hand and top flange of all units may be fastened directly to the frame with wood screws which are provided.

The right hand flange of all units may also be fastened in the same manner when installed in framed walls on existing buildings. In cases where one or more of the three flanges must be fastened to lath and plaster, dry wall or other panels which are not backed up by wood framing, molly screw anchors or equivalent fasteners should be used.

After the mounting holes have been located, which is easily done by sliding the unit into the prepared opening and using a pencil to mark the wall through the opening in the flanges, a pilot opening for wood screws should be drilled through the plaster or wall board into the wood frame. If molly anchors are used, the same procedure is followed except that a proper size opening for the expansion screw must be drilled through the wall.

Sheet metal screws may be used to fasten the units to the free standing metal frames.

12. BOILER PIPING

Iron Fireman steel boilers in the smaller sizes will produce a satisfactory quality of dry steam under most operating conditions. This permits simple piping connections at the boiler as shown in Figure 21. A riser of the same size as the boiler outlet tapping should be run to the desired height of the supply main. A reducing elbow should be used at the top of this riser, with the inlet the same size as the riser and the outlet the same size as the main or the reducing valve, if used. A gate valve should be connected ahead of the reducing valve. Gate valves may also be used at the boiler on branch mains.

The piping at the boiler must permit the water condensing in the main to drain either back into the boiler or out through the supply main. Condensate will not drain back through a reducing valve; so reducing fittings used on horizontal runs on the outlet side of the valve must be of the eccentric type to permit condensate flow in the same direction as the steam flow. The boiler piping also should not be designed to drain condensate back into the boiler through the steam outlet if the outlet is smaller than the sizes shown for vertical risers in Table V, page 10.

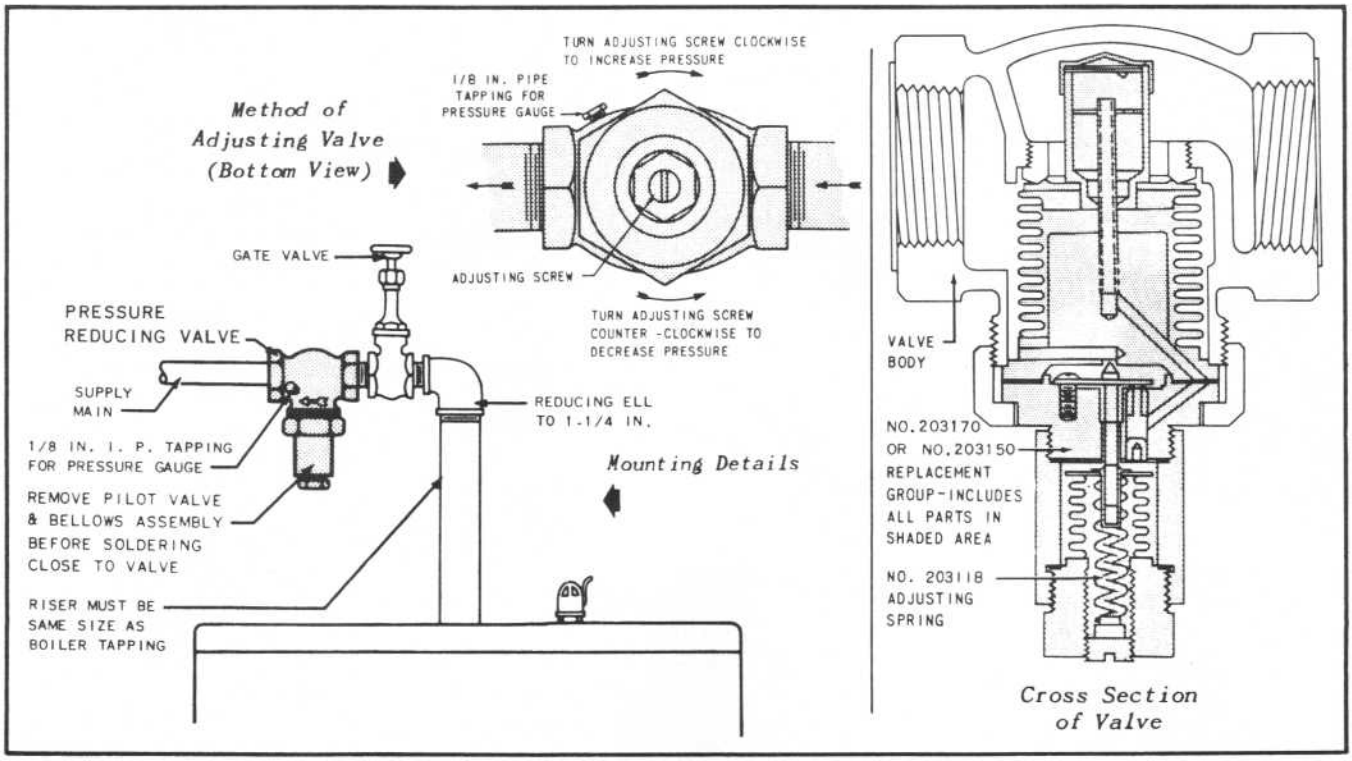


Figure 21 - Boiler Steam Piping With Reducing Valve

The return line from the condensate pump should be connected to a boiler tapping at least 2" below the minimum water line on Iron Fireman boilers. On boilers equipped with steam separators the same connection can be made if such a tapping is provided on the boiler. If not, it should be connected into a T which is located in the drip line from the separator at least 2" below the minimum water level. The boiler water feed lines are also connected at the same points.

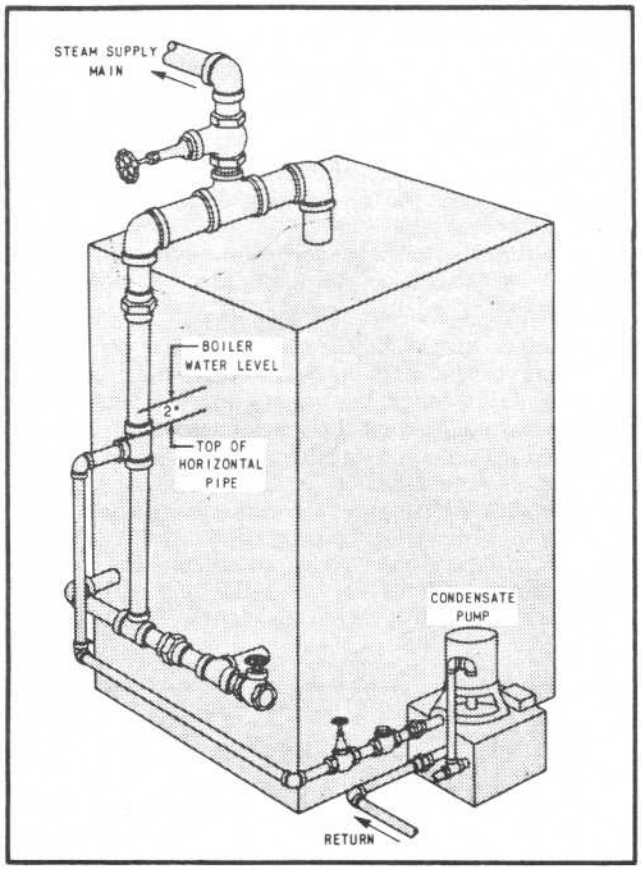


Figure 22 - Piping Arrangement on Larger Boilers

On larger boilers or those not equipped with steam separators, the piping at the boiler should be installed as shown in Figure 22. The riser from the boiler should be as large as the boiler tapping, and the horizontal section of the equalizer pipe should be not smaller than:

1-1/2"	up to	80,000	BTUH Output
2"	up to	150,000	BTUH Output
2-1/2"	up to	200,000	BTUH Output
3"	up to	400,000	BTUH Output
4"	up to	800,000	BTUH Output
6"	up to	2,000,000	BTUH Output

The T for connection to the main should be taken off vertically as shown and at a point several inches from either the riser from the boiler or the equalizer line to the return. The vertical return section of the equalizer line should be not smaller than:

1-1/4"	up to	200,000	BTUH Output
1-1/2"	up to	300,000	BTUH Output
2"	up to	800,000	BTUH Output
2-1/2"	up to	1,200,000	BTUH Output
3"	up to	2,000,000	BTUH Output

The piping below the T in the vertical equalizer line would be sized to fit the boiler return tapping.

13. PRESSURE REDUCING VALVE NO. 203160

The valve should be installed in a horizontal position as shown in Figure 21. Care must be taken to use pipe joint compound sparingly only on male threads. A 1-1/4" gate valve should be installed ahead of the valve. If the main is larger or smaller than 1-1/4", a reducing coupling from 1-1/4" to the desired main size should be used. A pipe union should be provided near the valve.

The valves are tested and set at the factory for a discharge pressure of approximately 5 lbs., but this setting can be increased to a maximum of 10 lbs. To increase the pressure one pound, turn the adjusting screw 1-1/2 turns clockwise. Ten pounds pressure would be reached by turning the adjusting screw clockwise approximately 7-1/2 turns. A 1/4 inch tapping is provided on the outlet side of the valve for installing a pressure gage to check the discharge pressure.

This is a pilot type valve with a water-cushioned opening of the main bellows. Therefore, when the valve is first put into operation an irregular regulating characteristic can be expected for about 30 minutes while the water chamber is filling with condensate.

The same general piping procedure should be followed where other types of pressure reducing valves are used.

14. CONDENSATE RETURN PUMP

a. RETURN PIPING - The condensate return main is connected into the opening provided on the side of the condensate pump receiver. The line should be pitched toward the pump with a union provided close to the receiver.

b. VENT LINE AND OVERFLOW - A full size pipe nipple and tee should be connected into the vent connection on the side of the receiver which is slightly lower than the condensate inlet. The side of the tee should point up with a short length of pipe threaded into it and a "U" type fitting threaded on to the top of this pipe. An overflow pipe, which can be reduced to 3/8" or 1/2" O.D. tubing, should be run from the end of the tee to a drain below the level of the opening in the side of the receiver. (See Figures 23A and 23B)

c. DISCHARGE PIPING - The pipe and fittings between the pump and the boiler should be the same pipe size as the pump discharge opening. A good grade of horizontal swing check valve should be in the discharge line

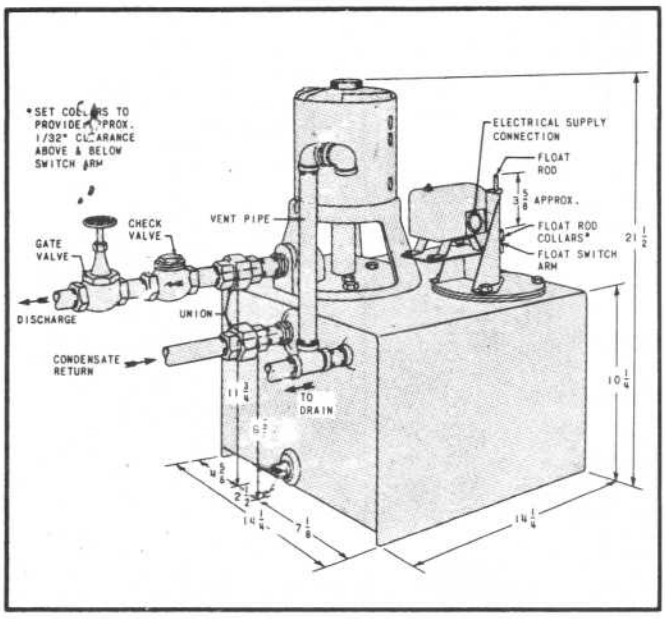


Figure 23A - Details of Condensate Pump, No. 203275

close to the pump, along with a union between it and the pump. A gate valve should be installed between the check valve and the boiler. The connection at the boiler should be made at the locations as described in Article 12.

d. WIRING - All wiring should be installed in accordance with the National Electrical Code or any local, municipal, or state regulations which may apply. Check motor nameplate to be sure voltage and cycle correspond to electric current to be used.

The hot line goes from the disconnect switch through terminals 1 and 2 on the No. 42 low water cut-off and pump control before being connected to the valve.

e. ADJUSTMENT OF FLOAT SWITCH - The two collars on the float rod should be reset from the shipping position. The upper collar should be located 3-5/8" from the top of the rod and the lower collar set to allow approximately 1/32" clearance between each collar and the float switch arm.

f. INSTALLATION OF FEED WATER TANK GROUP - The tank may be mounted directly to the pump receiver using the bracket provided or it could be mounted on the wall or other close-by support if desired. The bottom of the tank should be higher than the top of the pump opening in order to utilize the full tank capacity. The connection between the tank and the make-up valve in the pump can be made with 3/8" O.D. tubing. The make-up water line can be connected into the

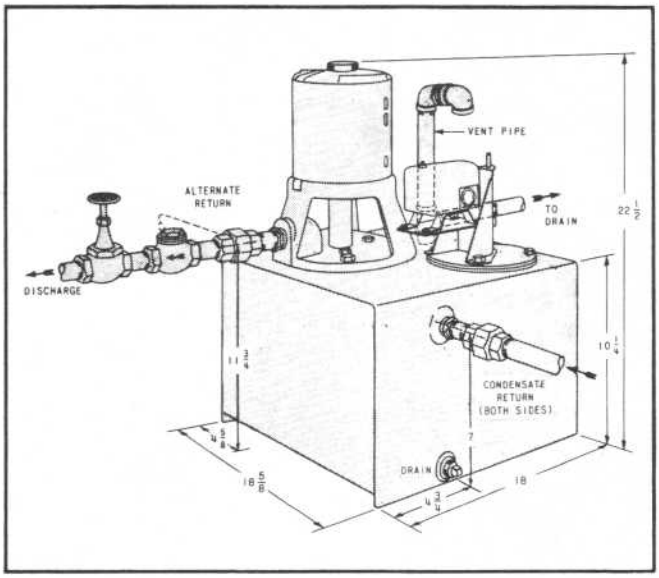


Figure 23B - Details of Condensate Pump, No. 203295

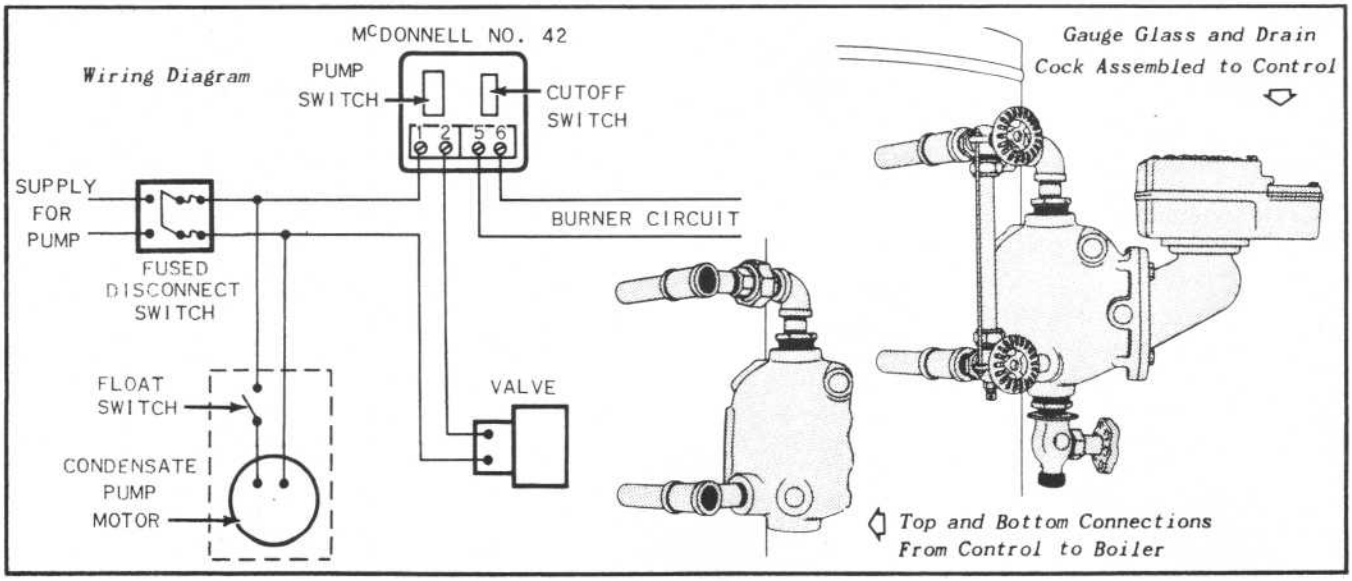


Figure 24 - Piping and Wiring For McDonnell-Miller No. 42 Low Water Cutoff

tapping provided on the side of the tank or an open end of a water line can be left over the top of the tank. In either case a stop and waste valve should be installed in this line.

g. PIPING FOR McDONNELL-MILLER NO. 42 LOW WATER CUTOFF & PUMP CONTROL

1. Thread 1/2" short nipple into side tapping near bottom of the float chamber. Screw the side outlet of 1/2" x 1/2" x 1/2" tee on the nipple and tighten. A 1/2" nipple approximately 11" long is then threaded into the tee, and the other end into the bottom 1/2" tapping on the side of boiler. The control should then be rotated until these fittings are tight. The length of the nipple between the tee and the boiler tapping may be varied in order to allow the controls to clear the boiler casing. (See Figure 24)

2. A second 1/2" nipple the same length as the bottom nipple, and a second 1/2" x 1/2" x 1/2" tee attached, are then threaded into the top 1/2" tapping on the side of the boiler. The following fittings should then be connected between the side outlet of the tee and the top opening of the control; 1/2" close nipple, 1/2" union, 1/2" close nipple, 1/2" ell, 1/2" short nipple, 1" x 1/2" reducing bushing.

3. Install reducing bushing and drain cock into opening in bottom of float chamber. (See Figure 24)

4. Install gauge glass fittings into ends of tees and mount glass and guard rods. (See Figure 25 for method of assembling gauge glass).

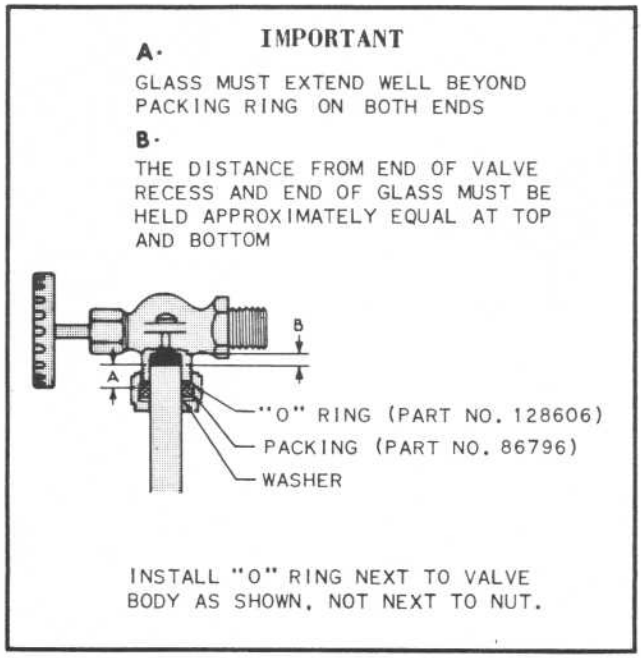


Figure 25 - Assembly of Steam Gauge Glass

15. SUPPLY AND RETURN MAINS

a. LOCATION AND SIZING - The proper main sizes must first be obtained by using the methods and procedures described in Section I. In doing so the locations had to be determined and they should be followed as closely as possible on the actual job site. If it is necessary to make major variations in the main locations, the main may have to be resized for the new conditions.

b. PITCH - Unless otherwise specified the steam mains should be pitched downward a minimum of 1" in 40' in the direction of flow and the condensate return mains a minimum of 1" in 20' in direction of flow. Additional pitch is most desirable and if conditions permit obtaining a pitch greater than the above minimums it would be well to do so.

c. SUPPORTS - The mains must be supported at close enough intervals to prevent any sags, bends or any other deviations from the required pitch. Minimum requirements call for support every 6'-8' for lines up to 1" nominal copper and 12'-15' for lines between 1" and 2" nominal copper. If the mains are buried underground, suitable supports of masonry or other permanent materials should be provided. In some instances pipe supports may be fastened to the building footings. In any case the pitch should be checked with the aid of a transit before the pipes are covered.

d. EXPANSION JOINTS - The proper size or type of expansion joint must be determined by use of the data described in Art. 9d. Proper anchoring of the mains at the recommended locations is most important. Special pipe hangers are available for this purpose if the mains are hung. If they are buried, they must be securely clamped with "U" bolts or similar devices to the concrete piers or other types of permanent supports.

If "U" type expansion joints are used, it is most important that the proper pitch be maintained and the loop of the "U" supported, or anchored as called for in the design, to prevent whipping. Also, if they are located underground, provisions should be made for preventing backfill from packing around the joint and restricting movement.

If the bellows or sliding type ready made joints are used, the mains on each side of such joints must be carefully guided so all movement is in the same plane and parallel with the main.

e. REDUCING COUPLINGS - Standard reducing type couplings are used when the size of the condensate return main is increased.

Any reductions in the size of the steam main call for eccentric type reducing couplings as

shown in Figure 26. If these are not used, the condensate formed in the bottom of the steam main will not flow evenly causing objectionable noise and possible rupture of the main.

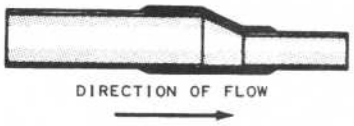


Figure 26

Cross Section of Eccentric Coupling

f. SPECIAL ARRANGEMENTS FOR RETURN MAINS - If the condensate return main is trapped when passing underneath a door, beam or other obstacle, it may be piped as shown in Figure 27 below. It is most important that the air in the main on the upstream side of the trapped line be allowed to escape without creating any appreciable back pressure. Large float type air vents such as the Hoffman #75A are most satisfactory for this purpose. On longer return mains these vents should also be used at intervals of about 100 feet.

The substitution of tubing for an air vent as shown in Figure 27 is satisfactory for small return mains (3/4" or 1/2"). If this method is used on larger return mains, the loop should be at least 1/2 the size of the horizontal main.

16. TRAP AND DRIP MAIN CONNECTIONS

a. TYPE - Float type non-thermostatic steam traps are used to drain the condensate from any low points and the end of the steam mains. Unions should be provided at both the steam and condensate sections and on steel mains a properly sized Y-type steam strainer should be installed on the inlet side of the trap.

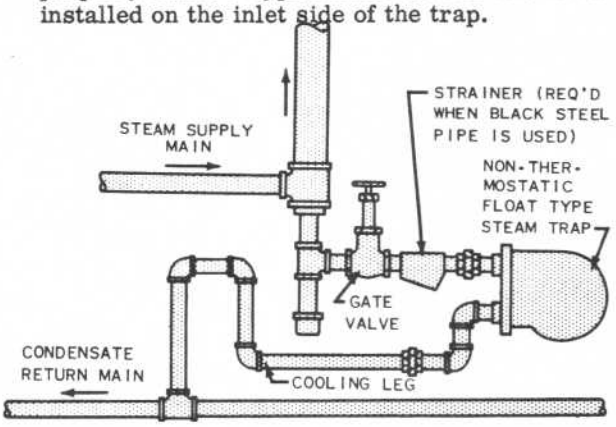


Figure 28 - Steam Trap Connections

b. COOLING LEG - In order to reduce the temperature of the condensate being discharged from a trap and also to prevent any flash steam (the condensate passing through a trap is at steam temperature and pressure when it passes into the return main which is under no pressure, a portion will boil and make steam) from escaping into the return line a cooling leg should be used. (See Figure 29)

This cooling leg may be vertical, horizontal or inclined - the important consideration being the length of pipe in which the water discharging from the trap is held before it spills over into the return main at the high point.

For the average application, a cooling leg of 3 feet of 3/4 in. pipe is adequate to reduce the

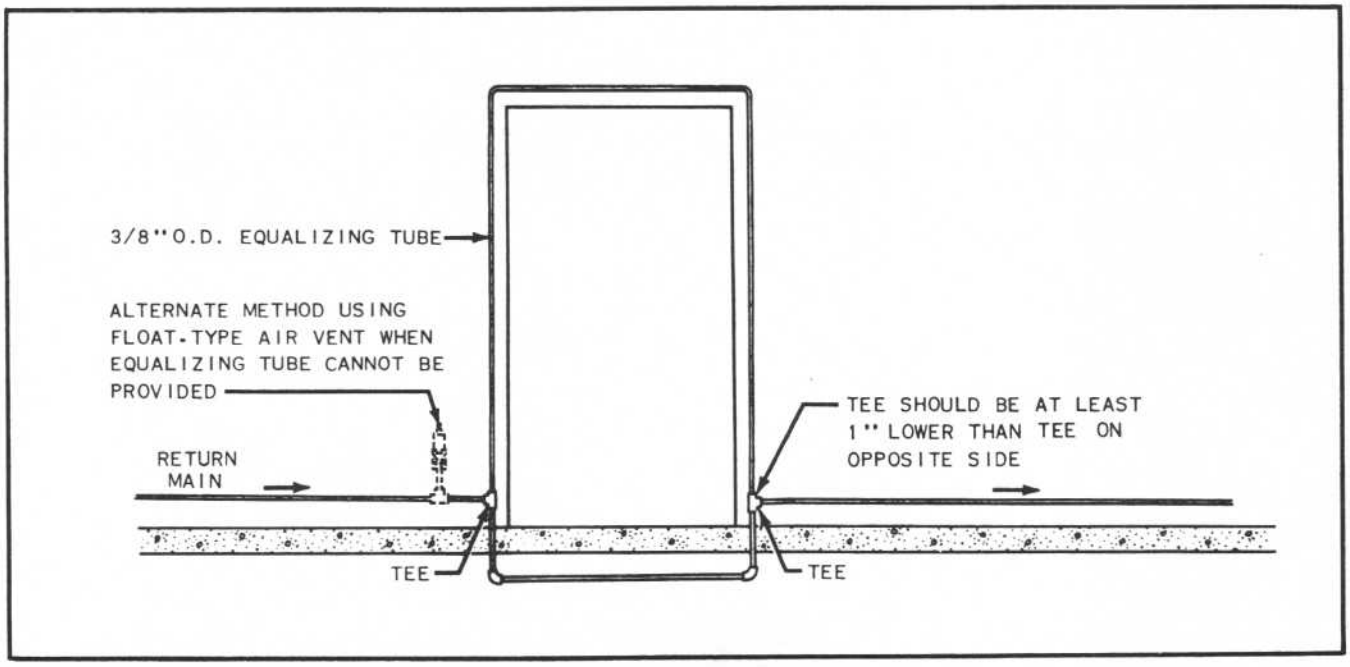


Figure 27 - Return Main Piping Under Doorway or Beam

condensate temperature below 212°F, thus preventing any of the condensate from flashing into steam as it empties into the return main.

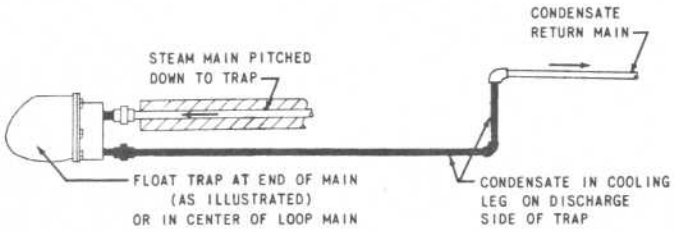


Figure 29 - Cooling Leg at Steam Trap

c. DRIP MAINS - In some instances the steam main may end at a point where the trap would be difficult to service under these circumstances, a drip line sized as for a return main (Article 8, Page 10) may be run from the end of the steam main back to the trap. This "drip" line must be pitched downward in the direction of flow and thoroughly insulated. (See Fig. 30)

17. SUPPLY AND RETURN TUBES

a. TYPE AND SIZES – Soft copper refrigeration tubing is used for the supply and return tube connections between the mains and the units. Normally 3/8" O.D. used for the supply and return tubes respectively, although 1/2" supply tubes are recommended for single units with runs longer than 10'. If these larger sizes are used they can be reduced before entering the unit with sweat-type reducing couplings.

b. LENGTH - The length of supply tubes is limited by the factors described in Article 7, Page 7. The 3/8 in. O.D. tubing for the pressure drop recommended is thus limited to about 10 feet on H-12 Units and 6 feet on H-18 Units.

The length of return tubes is not nearly as important although if the runs exceed a length of 5' the size of the entire tube should be increased to 3/8" O.D. tubing.

c. PITCH - The pitch of supply tubes is not too important and if the occasion demands, they may be trapped. However, for quiet operation a slight downward pitch in direction of flow is desirable.

The condensate return tubes must have a continuous minimum downward pitch of 1" in 20' in direction of flow. As with return mains, additional pitch is desirable and should be taken if conditions permit.

If a continuous pitch is not possible, the return tube should be piped as shown in Figure 31. Note that 3/8" O.D. tube is used.

d. SUPPORTS - At least 3' of free tubing should be allowed between the mains and the point where lateral movement of the tubes is restricted such as the opening in a floor plate or slab. If these or slightly longer lengths are maintained, no supports are required. However, if the length exceeds five feet or the pitch of the return tube is questionable, the tubes can be lightly stapled to the floor joists keeping in mind that there must be 3' of free tube between the main and the first fastener. Also if the supply tube is fastened, it must first be insulated as described in Article 19.

Vertical supply and return tubes should be allowed to stand free and in fact care should be taken to prevent them from contacting studs or inside walls in order to prevent the transmission of sound. If it is necessary to run sup-

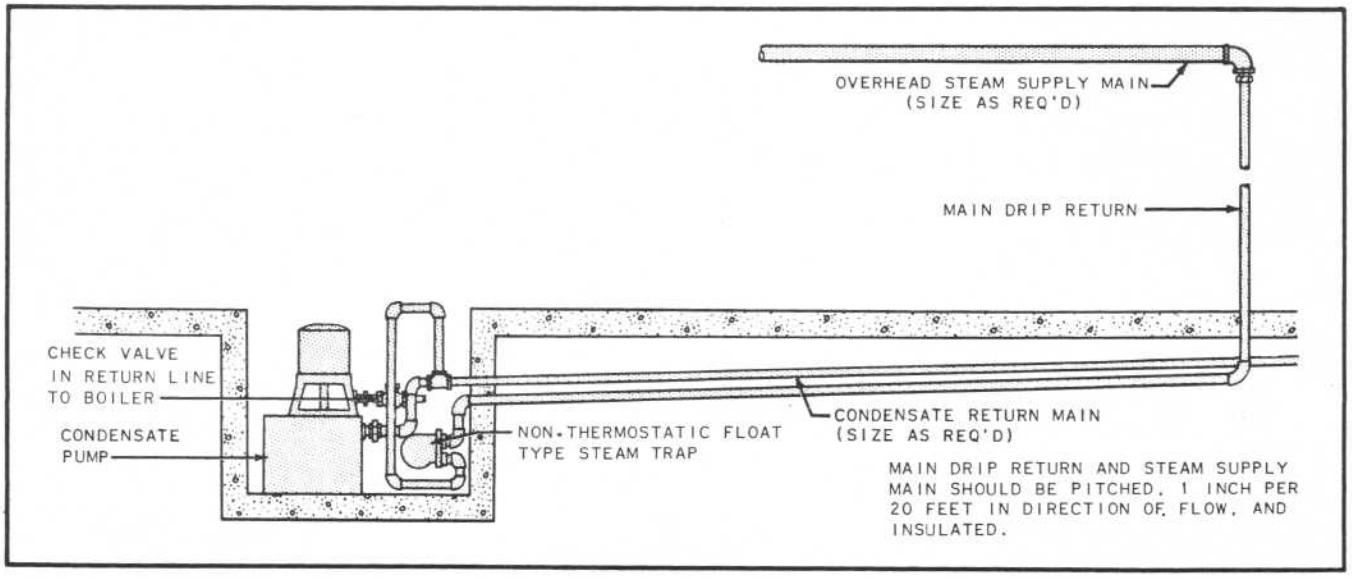


Figure 30 - Drip Main Connection

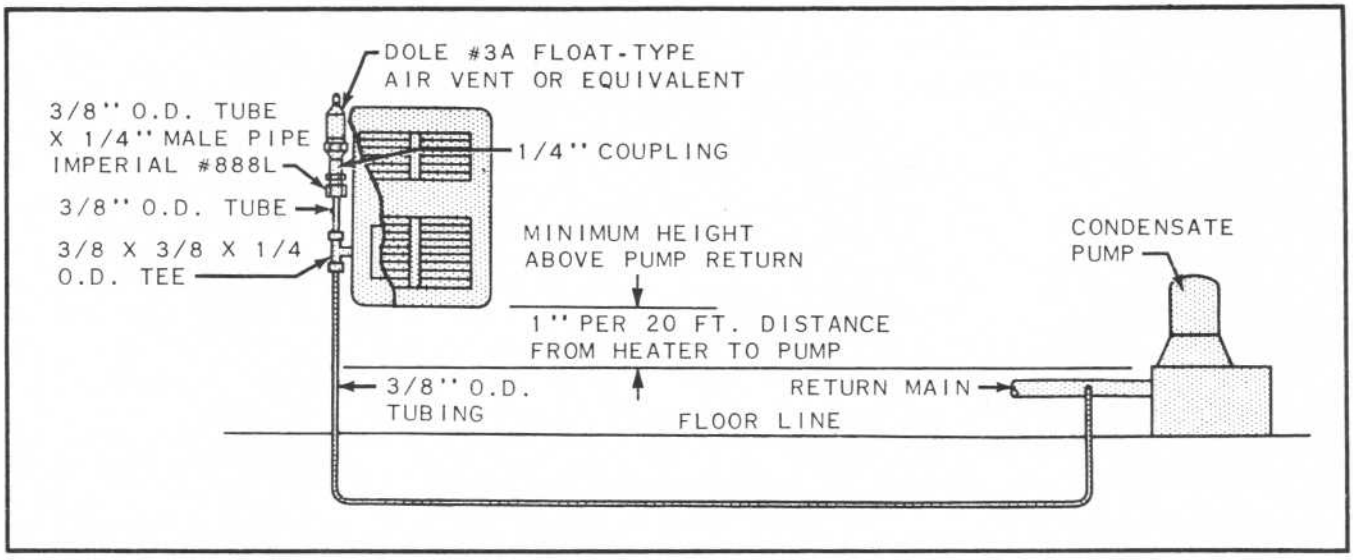


Figure 31 - Condensate Return Tube Installation When Continuous Pitch Is Not Possible

ply tubes along the face of a wall, they should be well insulated as prescribed in Article 19 and covered with metal or wooden molding, particularly if appearance is a factor. Return tubes should also be protected by molding if the situation demands.

If the tubes are to be located underground, supports are not generally used but it is necessary to keep both the supply and return tubes as short as possible and the return main well below the units in order to assure adequate pitch.

e. OTHER PRECAUTIONS - Supply and return tubes should never be in direct contact with each other since the condensate return line could become overheated and cause erratic operation of the unit.

Close the ends of the tubes with pliers before running the tubes from the mains into the unit openings and leave them sealed to avoid contamination until unit is actually connected.

Always use tube benders for bending tubing since they insure a neater installation and also avoid the danger of kinking the tubing. It is extremely important that proper bends be made in the tubing as shown in Figure 32 when connecting the H-6 unit.

On slab installations, be certain supply tube does not cross in front of heater, as heated slab may also cause erratic operation.

In order to prevent air leakage, seal with glass wool all openings where tubing passes through floors, studs, or into unit.

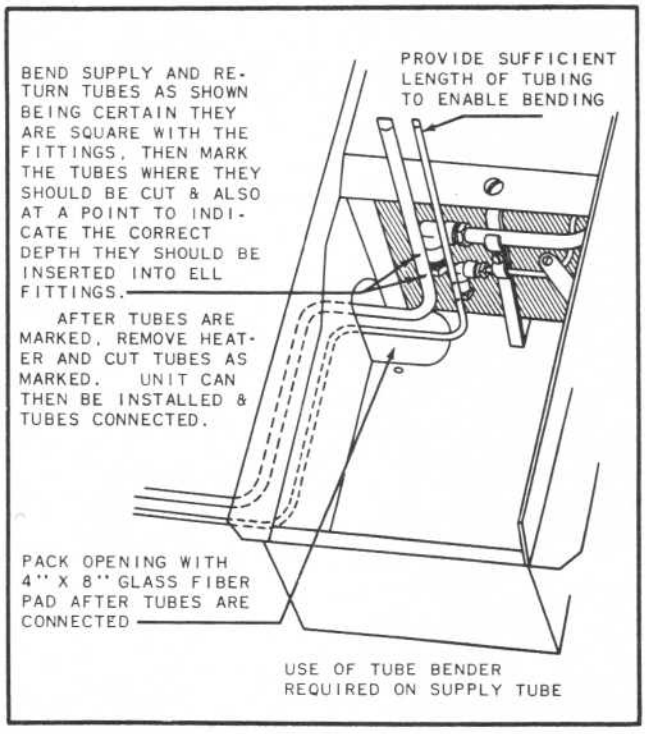


Figure 32 - Supply and Return Tube Bends on Model H-6

All joints that are to be concealed or not easily accessible should be silver soldered.

18. SOLDERED CONNECTIONS

Soft soldering is satisfactory for joints if they are to remain exposed. For this purpose, 95-5 solder is recommended.

19. INSULATION

All supply mains and vertical risers must be insulated. Do not attempt to heat any portion of the building with the heat radiated from an uninsulated steam main. The boiler riser, pressure valve and drip returns (if used) should also be insulated.

a. STEAM MAINS - Preformed glass fiber insulation of 1" thickness is recommended because of its superior insulating properties as compared to 1" thick 4 ply air cell, 1" thick 85% magnesia or 1/2" glass fiber. It is nationally distributed by several manufacturers listed in Article 9f, page 12.

For applications where the steam mains are to be buried in the ground or exposed to excessive moisture conditions the insulation must also be waterproofed. Glass fiber pipe insulation is available with a waterproof covering, but when applied the longitudinal or lap joints and the joints between each section must be sealed with a waterproof coating such as liquid asphalt. If mains insulated with glass fiber are to be buried under concrete slabs, clean sand or gravel fill should be placed over and around the pipe before pouring the concrete and care should be taken to prevent puncturing the waterproof jacket. Special bitumastic preparations such as "Gilsulate" as manufactured by the American Gilsonite Company may be used instead of waterproof glass fiber, especially on the larger applications.

b. STEAM SUPPLY TUBES - All supply tubing longer than six feet or any tubes passing through unheated areas or up outside walls should be insulated. This can be easily and cheaply accomplished by using 1" thick glass fiber blanket type insulation which is available plain or with aluminum foil or vinyl facing from the same manufacturers as listed for preformed glass fiber pipe insulation. The blanket insulation can be cut into strips of the desired width (4" - 5") and taped, tied, or stapled to the tubing.

On slab applications the supply tubes should be insulated with waterproof covered preformed glass fiber pipe insulation. Since it is not made for 3/8" or 1/2" O.D. tubing, use of the same size insulation as needed for the steam main is recommended. Particular care must be paid to obtaining a waterproof joint at the point where the insulation covering the supply tube is butted against the steam main insulation. By using the same size insulation on the tubing take-off an expansion pocket is provided for the supply tube at the point it is joined into the main. When pouring the slab, pipe sleeves should be used at the point where the supply and return tubes are brought up through it in order to also provide room for movement at this point.

c. RETURN MAINS AND TUBES - The condensate return mains and tubes do not have to be insulated unless they will be subjected to freezing conditions. If the mains must be insulated, the same recommendations as made for steam mains on comparable applications should be followed.

To prevent return tubes from freezing slip electrical loom over the steam supply tubes, and then tape the returns to it. The loom is used so the supply and return tubes do not come in direct contact with each other - otherwise the condensate may become overheated causing erratic unit operation. For crawl space or applications where the lines are not buried, both lines should then be insulated by wrapping them with strips of 1" thick fiber blanket insulation. On underground applications the two tubes should be run inside the standard pipe insulation.

20. UNIT CONNECTION

Insert the unit into the wall opening and mark both the supply and return tubes so they may be cut to the proper length. Remove unit, cut tubes, ream the ends and then blow through them to make certain they are not blocked with dirt and solder. Again reinsert the unit into the wall opening and check to make certain the tubes were cut to the proper length. If so, fasten the unit to the wall or frame through at least three of the six openings provided in the flanges. Be certain that the steam line filter is installed as shown in Figure 33 and then connect the supply and return tubes so the unit using the compression fittings provided. A pair of 1/2" and 5/8" open end wrenches and 7/16" and 9/16" open end wrenches are recommended for properly tightening the fittings.

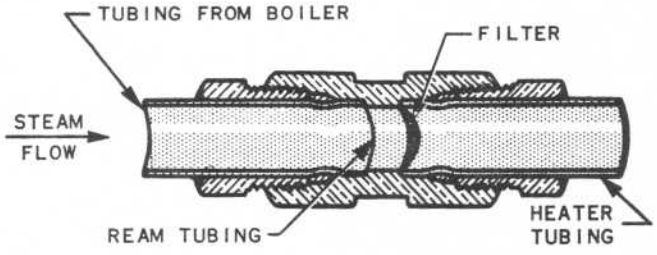


Figure 33 - Steam Line Filter at Unit

Pack the 4" x 8" glass fiber pad which is furnished with the unit around the tubes where they pass through the opening in the left rear corner of the cabinet. Then install the air filter and grill.

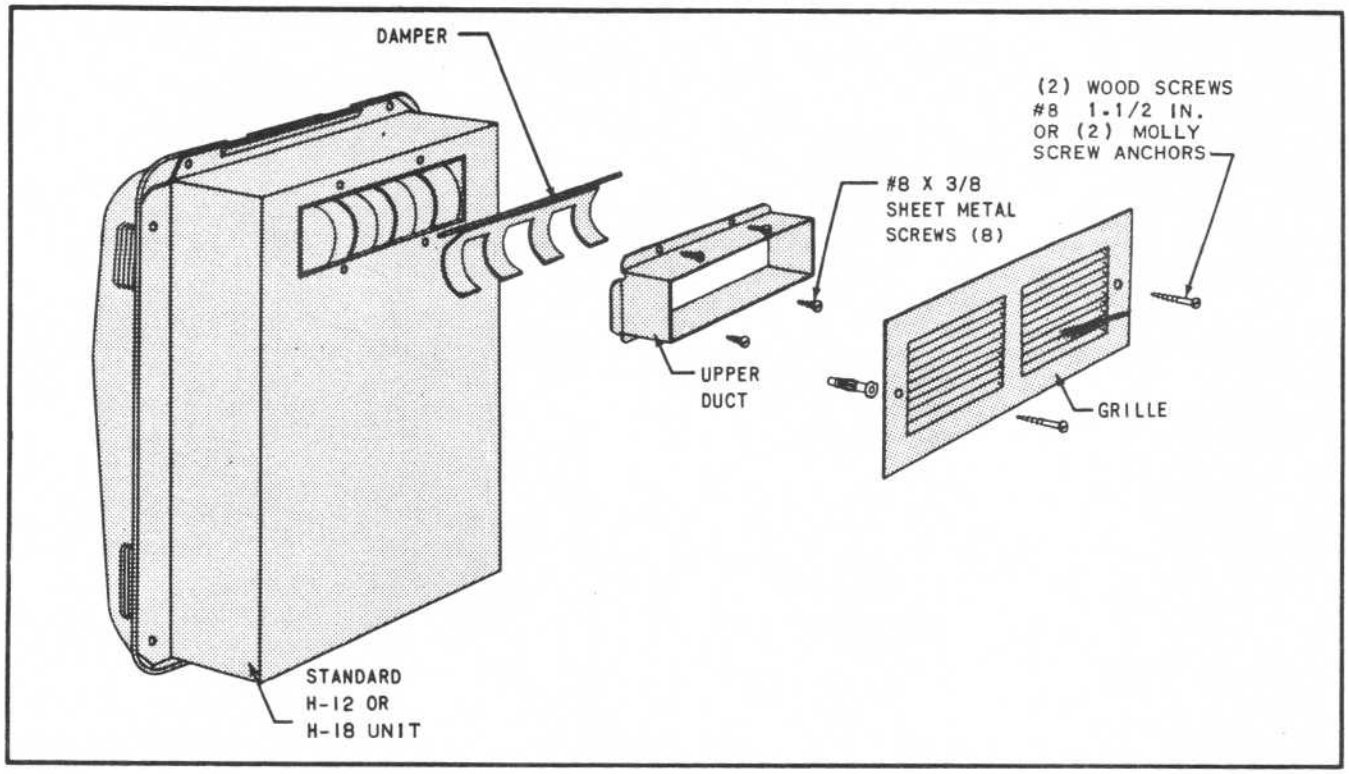


Figure 34 – Exploded View of Dual Wall Adapter

21. DUAL WALL GROUP

a. WALL OPENING FOR DUAL WALL ADAPTER
The wall openings for the standard unit are the same as shown in Figure 17. The opening for the discharge adapter duct should be cut into the adjoining wall according to the dimensions shown in Figure 35. The left edge of the opening is located by measuring from the stud at the left of unit (facing adapter side of wall).

b. ASSEMBLY OF DUAL WALL ADAPTER
After openings have been cut, assembly Dual Wall Adapter parts as follows: (Refer to the Exploded View, Figure 34).

1. Remove top knockouts from back of unit. Then, using a sharp knife, cut away insulation around the opening exposing the blower housing.

2. Place damper into the upper cabinet knockout, inserting the curved blades into the unit blower opening. Then fasten the upper air duct to the cabinet with the sheet metal screws provided. The damper rod must be located in the air duct notches before screws are tightened. Then install unit into framed opening.

3. Next, place the grille over the wall opening and mount with the aid of either the wood screws or Molly Screw Anchors. The latter are used in case the opening for the small discharge grille is cut through lath and plaster and not backed by wood framing.

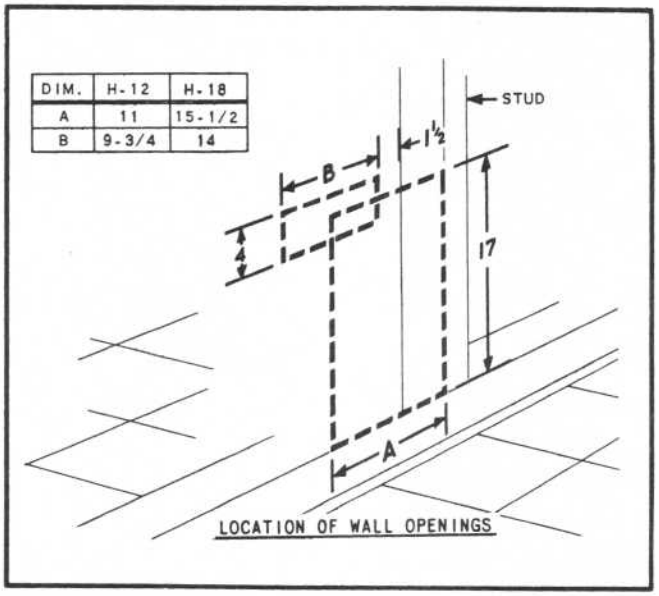


Figure 35 – Installation Dimensions for Dual Wall Adapter

22. FREE STANDING FRAMES

The frames may be mounted on masonry walls with the use of at least three standard lag screws. The unit can then be fastened to the frame with sheet metal screws.

Two holes are provided in the left side of the frame for passage of the supply and return tubing. If tubes approach from the right, they can be run between the back of the unit and the inside of the

frame. Clearance is also provided between the left hand side of the unit and the inside of the frame, so the supply and return tubes can be run up from the under side. This makes a neater application, providing that either the supply and return mains, or both, are located underneath the units. If this method is used, it will be necessary to use a tube bender in order to make a right angle bend at the point where the supply and return tubes pass into the unit.

23. SUMMARY OF INSTALLATION PROCEDURE

a. SUPPLY MAINS

1. Perimeter-type preferred - (short tube runs - neater)
2. Use Type L Hard Drawn copper pipe. Type K may be required when installed underground.
3. Pitch down (continuous 1"/40' minimum) away from boiler to trap at end.
4. All supply mains and risers must be insulated at time of original installation even though purchaser may insist it is not necessary.
5. Preformed 'Glass Fiber' insulation - 1 inch thick greatly preferred - cuts heat loss to almost one-half that obtained using 'Air-Cell' - permanent and neater in appearance.
6. Insulate underground piping with waterproof glass fiber insulation or other suitable materials.
7. Float trap always used at end of main and at any point of rise from the uniform downward pitch away from boiler.
8. Condensate from trap can be forced up short distance to start return main at higher elevation than supply main.
9. Drip line from float trap should provide a submerged water cooling leg of at least 3 feet of 3/4 inch pipe before entering return main.
10. Size of supply mains usually based on 1 lb. pressure drop.
11. Capacity of vertical risers (larger than 1/2 inch) is much less than horizontal mains (See Table V on Page 10).
12. Keep inside of mains clean during installation - blow out and seal ends.
13. Piping must be installed so that expansion can take place without putting excess strain on any portion - otherwise stresses may develop leaks at joints or actually break sections of pipe.
14. Use eccentric reducing couplings to provide free drainage of condensate when horizontal steam main sizes are reduced.

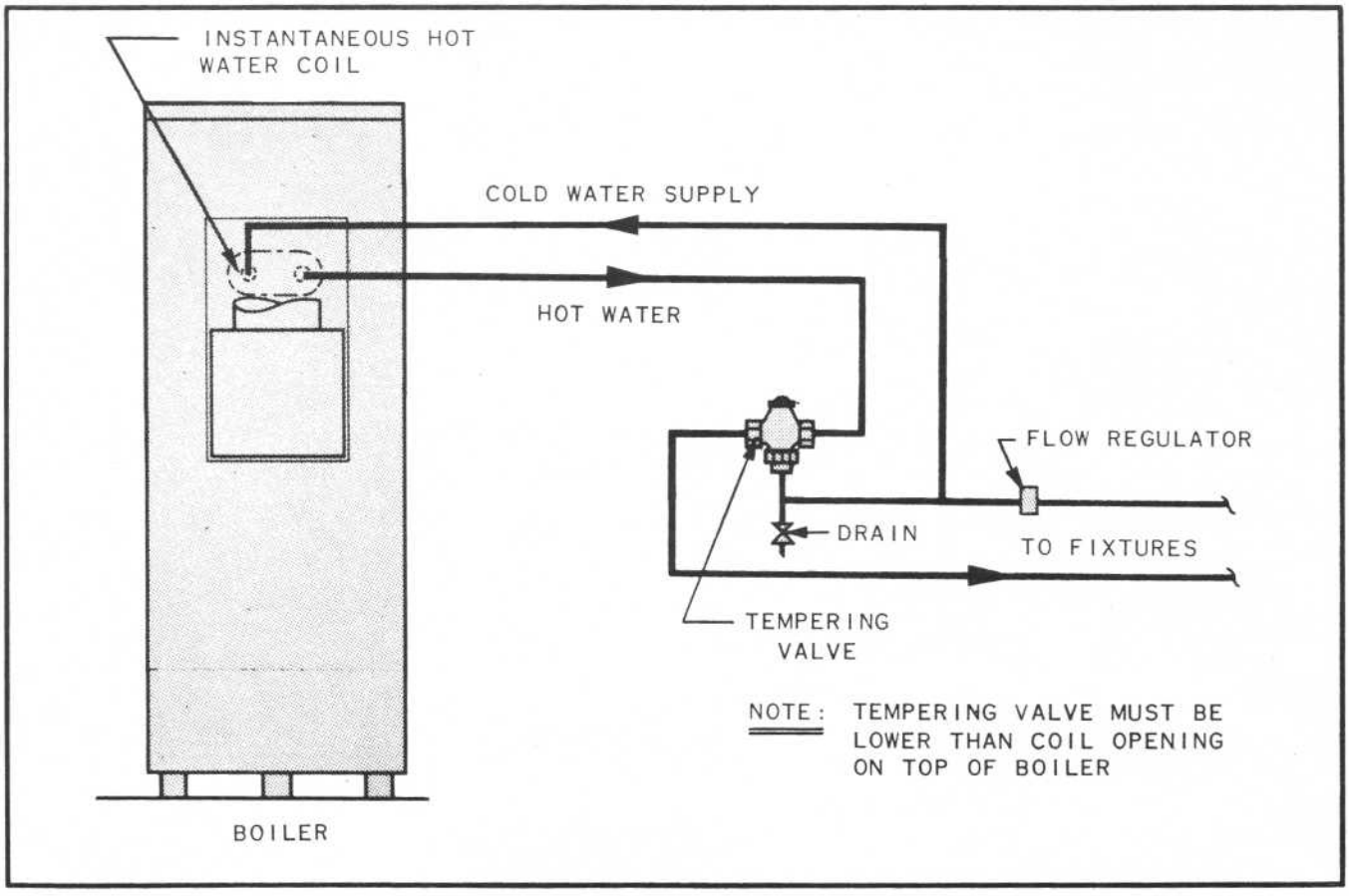


Figure 36 – Piping for Instantaneous Hot Water Coil

15. Do not run supply main under thermostat of unit or sufficiently near to artificially heat thermostat.
16. Provide unions at steam traps and valves.
17. Install a gate valve for each steam main.

b. RETURN MAINS

1. Use Type 'L' Hard Drawn copper pipe (Type 'K' may be required when installed underground.)
2. Do not use pipe smaller than 3/4 inch for connecting return tubes from 2 or more units.
3. Provide continuous downward pitch of at least 1 inch in 20 feet to return pump.
4. If exposed where freezing may occur, tape 3/8 inch O.D. steam tracer tube to return main and insulate both main and tube together. Tracer tube should be valved for manual operation and trapped with float trap at opposite end.
5. Size return mains to handle condensate from steam traps on start-up as well as from units (Article 8).
6. Provide minimum spacing of 5 feet on hangers for 1/2 inch pipe to avoid sags.
7. Do not insulate return mains or tubes, except as needed to avoid freezing.

c. SUPPLY TUBES TO UNITS

1. Keep supply tubes as short as practical to reduce radiation loss, condensation and pressure drop.
2. Insulate supply tubes if over 6 ft. long, or if they pass through cold areas. Also if passing through uninsulated outside walls.
3. Do not fasten tubing to studs when passing up through walls. Space from studs and wall with small pieces of insulation to avoid transmission of sound and heat.
4. Seal all openings around tubing where it passes through floors or studding.
5. Be sure to install insulation around tubes in cabinet opening.
6. Clean end of tube and mark for correct depth of insertion before soldering.
7. Soft solder is suitable for exposed joints.
8. Use silver brazing for all concealed joints of supply and return tubes and mains.
9. Close ends of tubing with pliers while installing and leave sealed to avoid contamination until unit is actually connected. Leave about 6 inches excess on both supply and return tubing before cutting to final length at unit.
10. Ream ends of 3/8 inch O.D. tubing before connecting to unit.
11. Always use tube benders for bending tubing.
12. Make certain strainer is installed in supply tube at coupling on unit.
13. Do not loosen at any time the clamp holding supply and return tubes in place.
14. Do not run supply tube under thermostat of unit or sufficiently near to artificially heat thermostat.

d. RETURN TUBES TO UNITS

1. Provide continuous pitch downward (without sags or dips) away from unit of at least 1 inch in 20 feet.
2. If exposed where freezing may occur, space at least 1/4 inch from supply tube and insulate both tubes together. (Heat from supply tube will keep return from freezing.)
3. Keep clean during installation - blow out and close ends with pliers. Ream ends of all 1/4 inch O.D. tubing before connecting to unit.
4. Use minimum amount of solder in making joints to reduce possibility of plugging. (Blow through joint after soldering to check against plugging.)
5. Do not fasten return tubes in direct contact with supply tubes.
6. Never connect more than one unit to a 3/8 inch O.D. return tube.
7. Use 3/8 inch O.D. for runs over 5 Ft., or any run where adequate pitch cannot be maintained or return is trapped and vented on unit side of trap.

e. BOILER-BURNER UNIT AND RETURN PUMP

1. Do not use softened water as boiler feed water supply. Connect ahead of water softener if there is one on the job.
2. Provide gate valve between boiler and steam main or mains. If pressure reducing valve is used, the gate valve should be between it and boiler.
3. If Iron Fireman boilers are not used make certain that proper header piping is provided in order to prevent water carryover.
4. Connect discharge from condensate return pump into boiler at least 2 inches below minimum water level.

SelecTemp®

SECTION III
MAINTENANCE AND SERVICE

24. GENERAL

This section covers the maintenance and service of the units and auxiliary equipment. The units, pressure reducing valves, and condensate pumps are thoroughly tested at the factory before shipment. All of these items are warranted for a period of one year, and if found defective within this period will be replaced F. O. B. the factory. Improper operation, however, may result from deficiencies in application, maintenance or installation procedures, most of which are enumerated in the following paragraphs.
difficulties with certain unit components can be readily corrected in the field by parts replacement described in this section.

25. DESIGN AND OPERATION (See Figure 37)

Low pressure steam enters the unit through a 3/8 inch nominal O.D. copper tube supply line (A). After passing through the small turbine (B) which drives the air circulating fan (C), the steam enters the heat transfer core (D) where it is condensed. The condensate then leaves the unit through a 3/8 inch nominal O.D. copper tube return line (E).

Room air enters the unit through the lower grille opening (F), passes through an air filter (G), the heat transfer core and the circulating fan. The warm air is then discharged into the room through adjustable, vaned-openings (H) and (I) which control the vertical and horizontal distribution of the heated air.

A highly sensitive but rugged thermostat controls both the heat output and the speed of the circulating air fan by regulating the supply of steam to the turbine. No electrical connections are needed as the power required for operating the fan and controls is supplied by the steam that is used for heating.

Extremely accurate temperature regulation is assured by the continuous circulation of room air over the bi-metal helix (J) which is connected to the free-floating damper (K). This continuous positive sampling of room air by the thermostat is accomplished by the draft created in the small heat actuated chimney (L).

As the temperature of the air passing over the thermostat decreases, the damper (K) moves slightly farther away from its seat, thus permitting more air to pass through the chimney. The cooling effect of this greater air movement through the chimney modifies the heat balance in the control bulb and bellows assembly, causing the throttle valve to the turbine to open wider, thus increasing the speed of the fan and the rate of heat delivery to the room. A slight increase in room temperature reverses this process.

The change in position of the throttle valve takes place very gradually and, since the control elements are fully compensated, a stable condition of equi-

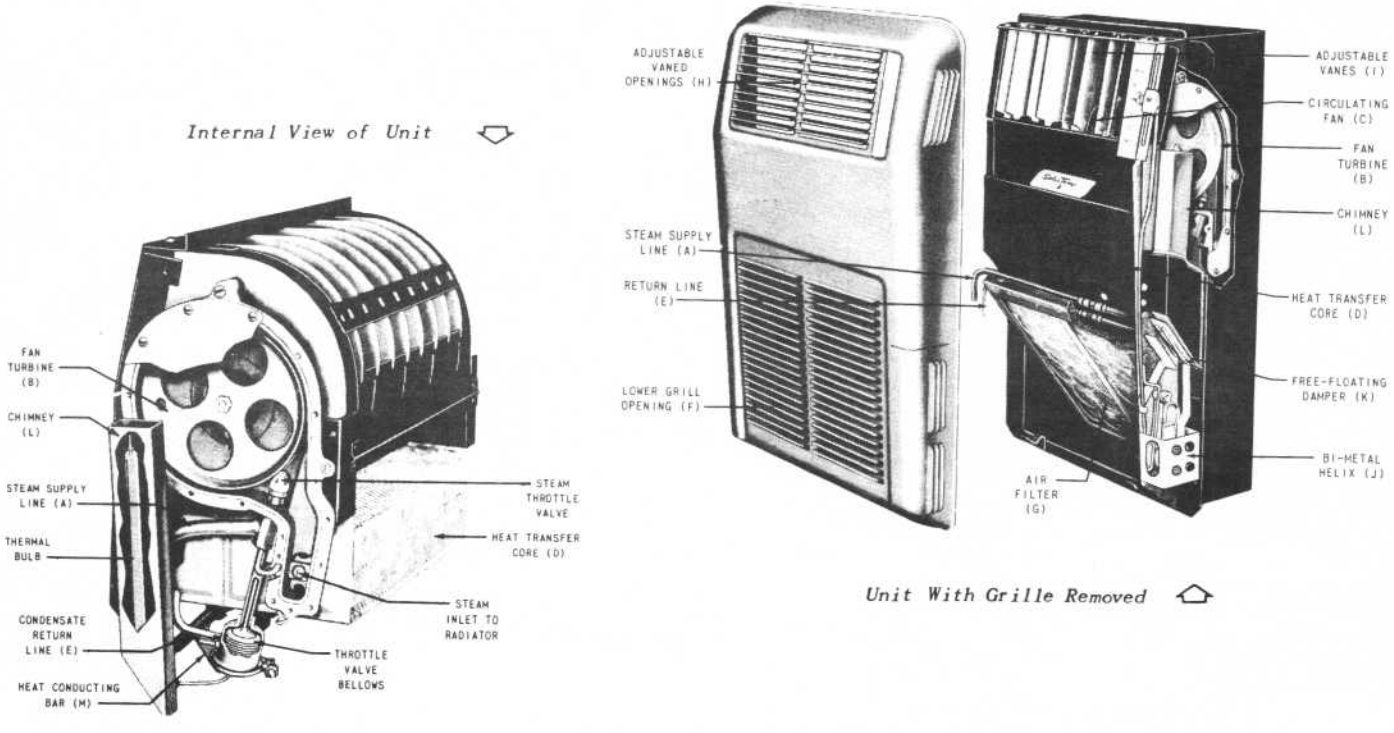


Figure 37 – Details of Unit Construction

librium is maintained, and the heat output is accurately modulated to offset the heat loss from the area being heated. When heating requirements are less than the minimum of unit capacity, the heater will cycle on and off to supply only the amount of heat needed.

During stand-by periods when no heat is required, the unit automatically purges itself of condensate, maintaining the unit ready for immediate operation at all times.

Refer to Section I and paragraphs on application and installation for further information on operation of units and accessories.

26. PUTTING SYSTEM IN SERVICE

a. Fill boiler with water to the normal level, (gage glass approximately 2/3 filled).

b. Start the burner following instructions furnished for the particular firing unit.

1. Assemble and check burner on gas or oil fired units as specified in installation data sheet packed with burner.

2. Assemble and check gas burners as specified in Installation Instructions.

3. Adjust burners for efficient operation using flue gas analyzer and draft gauge.

c. When starting new installation, drain initial condensate to sewer for 2 or 3 hours before connecting the return main to pump. Blowing out all lines with steam at maximum pressure before connecting units and pump is a good precaution.

d. When starting up a SelecTemp heating system during mild weather to check its performance, several conditions occur which are not experienced during the normal heating season.

In many instances, the temperature of the air entering the unit is considerably higher than 70 degrees -- therefore, the heat transfer core will not, on the initial startup, condense all of the steam as rapidly as it is being delivered through the turbine nozzle. This will cause live steam to pass on through the units into the return line for a few minutes until the return line temperature control heats up sufficiently to throttle back the steam supply.

When first starting up a system the units will operate for several minutes regardless of thermostat setting or room air temperature until the control mechanism has heated up to its regulating temperature.

e. Be certain that the air filters in the units are clean. It is advisable when installing units on new construction work to have a quantity of old filters available, to be used temporarily during the construction period so the new filters will not be blocked with plaster dust, saw dust, etc. UNDER NO CIRCUMSTANCES SHOULD THE UNIT BE OPERATED WITHOUT THE FILTER IN PLACE.

f. Check all piping connections for steam or water leaks.

g. Check operation of Steam Limit Control, Low Water Cutoff, Safety Pilot on Gas Burner, and Primary Safety Control on Oil Burner.

h. Refer to Article 31, Page 32. Check List for further information concerning details in checking operation of units, pressure valve and condensate pump.

27. CALIBRATION OF THERMOSTAT

The thermostat is calibrated at the factory before shipment and normally should require no further adjustment. However, if calibration is necessary it can be done very simply, as follows:

After operating the units a sufficient length of time for the temperature in the room to reach equilibrium, observe the reading on a good mercury thermometer which has been centrally located in the most generally used portion of the room. The thermostat pointer on the unit should then be set so as to correspond to the thermometer reading and the damper on the unit adjusted by turning the small nylon adjusting cam with a screw driver until the space between the bottom

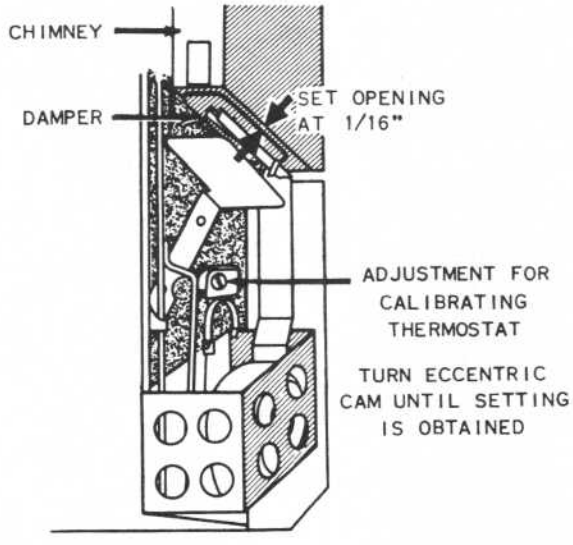


Figure 38 – Thermostat Calibration

of the chimney and the face of the damper is approximately 1/16 of an inch. *(See Figure 38)*

NOTE

Damper face must be in a plane parallel to seat as it approaches closed position.

28. STEAM BOILER CLEANING PROCEDURE

Reasonable care should be taken when installing the boiler and connecting piping to prevent excesses of pipe dope, oil, etc., from contaminating the system. Pipe dope, oil, soldering flux, etc., in the boiler may materially effect the quality of the steam.

Before boiler is placed in service, the following steps should be taken:

a. Fire up boiler to operating pressure allowing steam and condensate to flow through entire system for approximately 2 hours with condensate return line disconnected and condensate discharged to drain.

b. Cool boiler sufficiently to add required amount of boiler cleaning compound. - 1 lb. Tri-Sodium - Phosphate - per 100,000 Btu Output. is a "rule of thumb."

c. Close steam lines to system and condensate pump and bring boiler to operating pressure for one hour or recommended period for particular cleaning compound used.

d. Allow boiler to cool sufficiently to remove pressure relief valve or most convenient top boiler connection and attach pipe or hose.

e. Fire up boiler and open feedwater valve slowly, flushing from bottom to top where water is allowed to flow out of the boiler through pipe or hose. Fire should remain in boiler during this procedure. This procedure is called "skimming".

f. Allow boiler to cool approximately 1/2 hour to allow suspended solids in the water to settle, drain completely and flush.

g. Add recommended water treatment compound, fill boiler to operating level and place in service.

The skimming procedure ("e." above) is important. If a boiler is allowed to bottom drain, the oil and grease collected on the surface in the boiling out process will be spread over the boiler surfaces as the water lowers. The skimming process allows the floating matter to pass through the top opening and out of the system.

29. WATER TREATMENT FOR STEAM BOILERS

The correct amount of SBI compound should be dissolved in one or two gallons of warm water and added to the boiler water through the pop safety valve opening or through the vent opening of the return pump. For new installations, the treatment should be added when the boiler is first filled. For summer servicing existing boilers, they should be drained until the water runs clean and then refilled with fresh water, along with sufficient compound to impart a yellow color in the water.

In either case, the boiler water should be brought to a boil soon after filling so that all the compound used for treatment will be thoroughly mixed in the boiler water and the oxygen and the other gases dissolved in the water will be driven off. While the water is being heated, the main steam valve should be left open so that the gases can escape through the system and out the vent opening on the condensate return.

If, for any reason, excessive amounts of make-up water are used during the heating season, additional water treatment should be added. For larger commercial installations, as with other steam systems, it is recommended that an inexpensive water analysis kit be purchased and used to periodically check the boiler water.

Refer to Paragraph 37 for additional water treatment data.

30. ADDITION OF MAKE-UP WATER TO RESIDENTIAL BOILERS

In any steam system there is a small loss of water; and eventually the water level in the boiler will drop until it reaches a point about 1" from the bottom of the gage glass, at which time make-up water must be added. If care is taken to see that all connections are tight so that water loss is kept to a minimum, the average SelecTemp boiler should operate several weeks without requiring make-up water. When filling the boiler, water should be added until the water level is approximately 1" from the top of the gage glass.

Automatic water feeders are not recommended for use on SelecTemp boilers as a method of maintaining boiler water level, because they may stick in the open position and flood the system. On most domestic installations, a means of automatically feeding make-up water will not be required. On larger installations, or those where automatic water feed is required, a condensate pump equipped with a float valve (See Article 9 a) in conjunction with a water level control and make-up water tank should be used. The amount of water added to the make-up tank indicates the loss of water from the system.

Introducing make-up water into the boiler not only increases the dissolved solids content of the water, which may eventually lead to foaming and resulting water carryover into the system, but also introduces additional oxygen and CO_2 which is dissolved in the make-up water. Dissolved oxygen in boiler water will cause pitting and the dissolved CO_2, along with that which is formed by reaction of other components in the feed water, will lead to an acid condition which is highly corrosive.

The addition of make-up water must, therefore, be reduced to a minimum by making certain that the system is tight. Common points of leakage are packing rings around the gage glass, improperly seated pop safety valve, lack of adequate cooling leg on steam traps, defective traps, and leaky pipe connections.

31. CHECK LIST FOR UNIT PERFORMANCE

a. UNITS WON'T HEAT PROPERLY

Possible Causes:

1. Return line flow restricted or back pressure in line.
   - Return line not properly pitched.
   - Blocked with solder.
   - Tube flattened.
   - Steam backing into line from trap or other units.

   To Check: Disconnect return line at unit and collect condensate temporarily in small pan or cup. (Blow through return line.)

2. Excess water in steam supply to unit.
   - Boiler priming.
   - Defective float trap.
   - Main not pitched properly.
   - Long, cold, uninsulated supply tube.

   To Check: Note temperature of return line of unit. Line will be very hot but turbine not up to speed. Can usually hear water going through the turbine. Can also check by extending short length of tubing from steam connection at unit and discharging steam into a pail to note if it contains a high percentage of water.

3. Low steam pressure at unit.

   To Check: Measure pressure at unit (with unit in operation) and/or check pressure drop in piping. (See pressure drop tables.)

4. Control bulb touching side of chimney.

   To Correct: Bend capillary tube with pliers to center bulb and carefully repack insulation seal around tube entrance into chimney. Also center top of bulb in wire clip.

5. Dirty Steam Line Filter.

   To Correct: Clean or replace filter which is installed in the inlet tubing fitting.

6. Chimney damper not opening.
   Check calibration of thermostat.

7. Outer grill not closing tightly against vertical separator, isolating thermostat compartment. (May be due to excess plaster around unit frame or frame being bent or warped out of line during installation)

8. Dirty air filter or heat transfer core (filters must be in place at all times). If core is dirty, clean with vacuum cleaner attachment. Clean or replace air filter.

9. Heat deflecting off walls or furniture overheating thermostat.

10. Excess air circulating around back of unit. (Seal all openings around piping where it passes through walls or studding.)

11. Dirty outboard bearing assembly causing blower assembly to operate at reduced speed or not at all.

    To Check: Spin blower by hand to see if it turns freely. Also check temperature at return line clamp which should be very hot.

    To Correct: Replace outboard bearing assembly in accordance with Article 35 this section.

12. High return air temperature. This could be due to high ambient temperature conditions or for reason given in paragraph 9.

    To Check: Observe inlet air temperature and also temperature of return line clamp.

NOTE

On H12 and H18 units paragraphs 1, 2, 8, 9, 11 and 12 will be indicated by a very hot return line clamp or heat conductor bar. (Article 25 of this section.)

b. UNITS WON'T SHUT OFF

Possible Causes:

1. Thermostat damper not closing properly.

   To Correct: Align damper blade to seal properly (around entire circumference) against bottom of chimney.

2. Leakage in insulation sealing entrance of capillary tubing into chimney.

   To Correct: Repack insulation at this point.

3. Cold draft blowing on thermostat.

   To Correct: Seal area against excess air infiltration.

4. Defective bellows in needle, bulb and bellows assembly.

   To Check: Close chimney damper and completely block top of chimney. Unit will not shut off but continue to operate at a very low speed. (Cont'd)

To Correct: Replace needle, bulb and bellows assembly in accordance with Article 34, this section.

5. Defective bulb in needle, bulb and bellows assembly.

To Check: Close chimney damper and completely block top of chimney. Unit will continue to operate at top output.

To Correct: Replace needle, bulb and bellows assembly in accordance with Article 34, this section.

6. Insufficient insulation around chimney.

To Check: Follow same procedure as in above two paragraphs. Also visually observe amount of insulation. If unit slows down or stops additional insulation is required around chimney or at point where the capillary tube, between the bulb and bellows, enters the chimney (see paragraph b (2). If unit continues to run refer to paragraph b (4) and b (5).

c. EXCESS PURGING DURING OFF PERIOD

Cause:

1. Excess water in steam supplied to unit.
   - Boiler priming.
   - Defective float trap.
   - Main not pitched properly.
   - Long, cold, uninsulated supply tube.
2. Excess air circulating around back of unit. (Seal all openings around piping where it passes through walls or studding.)

32. CHECK LIST FOR PRESSURE VALVE PERFORMANCE

a. DOES NOT MAINTAIN REGULATED PRESSURE

To Check: Install pressure gauge in tapping on discharge side and note pressure on line as boiler pressure changes. The discharge pressure should remain steady providing the boiler pressure is at least one to two pounds above the valve setting. Excessive chattering of the valve could indicate wet steam. Any steam or water leakage around the large hex nut indicates the need for a new valve gasket No. 203120.

The No. 203100 valve should not admit any volume of steam into the piping system until the boiler pressure equals or slightly exceeds the valve setting. At this point the valve will open rapidly. Should the boiler pressure drop below the valve setting it will close, although a small amount of steam can leak by since the valve does not provide a 100% shut off.

The No. 203160 valve will admit steam to the distribution system at all times, although it will not regulate until the boiler pressure exceeds the valve setting.

The valve bodies on No. 203100 and No. 203160 are identical, and the pressure adjustment is made similarly on both. The operating parts on the two valves are interchangeable, with the part numbers as listed below:

Valve No. 203100 (Pressure Regulating & Low Pressure Cutoff) - Replacement Group No. 203150
Valve No. 203160 (Pressure Regulating Only) - Replacement Group No. 203170

To replace the internal parts make certain that valve is not under pressure. Then unscrew the large hex nut from the valve body and remove the working parts. Please replace parts with the correct replacement group assembly and retighten hex nut.

33. CHECK LIST FOR CONDENSATE PUMP PERFORMANCE

a. MOTOR WILL NOT RUN

1. check to see that power is on and fuses are okay
2. press overload button on side of motor
3. for 203275 pump make certain that float switch contacts are made and that float is not water logged or float rod bound
4. for 203285 pump make certain contacts on low water cutoff are properly made.

b. MOTOR RUNS CONTINUOUSLY

1. check valve not opening or some other obstruction in line between pump discharge and boiler
2. float switch contacts on No. 203275 pump sticking or float rod binding
3. water level controller contacts on low water cutoff stuck in closed position
4. dirty impeller screen.

c. RAPID CYCLING

1. check valve sticking open allowing boiler water to flow back into pump
2. surging or priming boiler causing uneven water line.

d. OVERFLOW OF WATER THROUGH VENT

1. float valve on No. 203285 leaking due to excessive water pressure, dirt in valve or defective valve asm.
2. boiler foaming or priming - large quantities of water would be carried into the piping system - water level control would operate pump motor and because of insufficient water in the receiver the float valve would open. Eventually the water in the lines would flow back to the pump, flooding same.

34. REPLACEMENT OF NEEDLE, BULB AND BELLOWS IN SELECTEMP UNITS

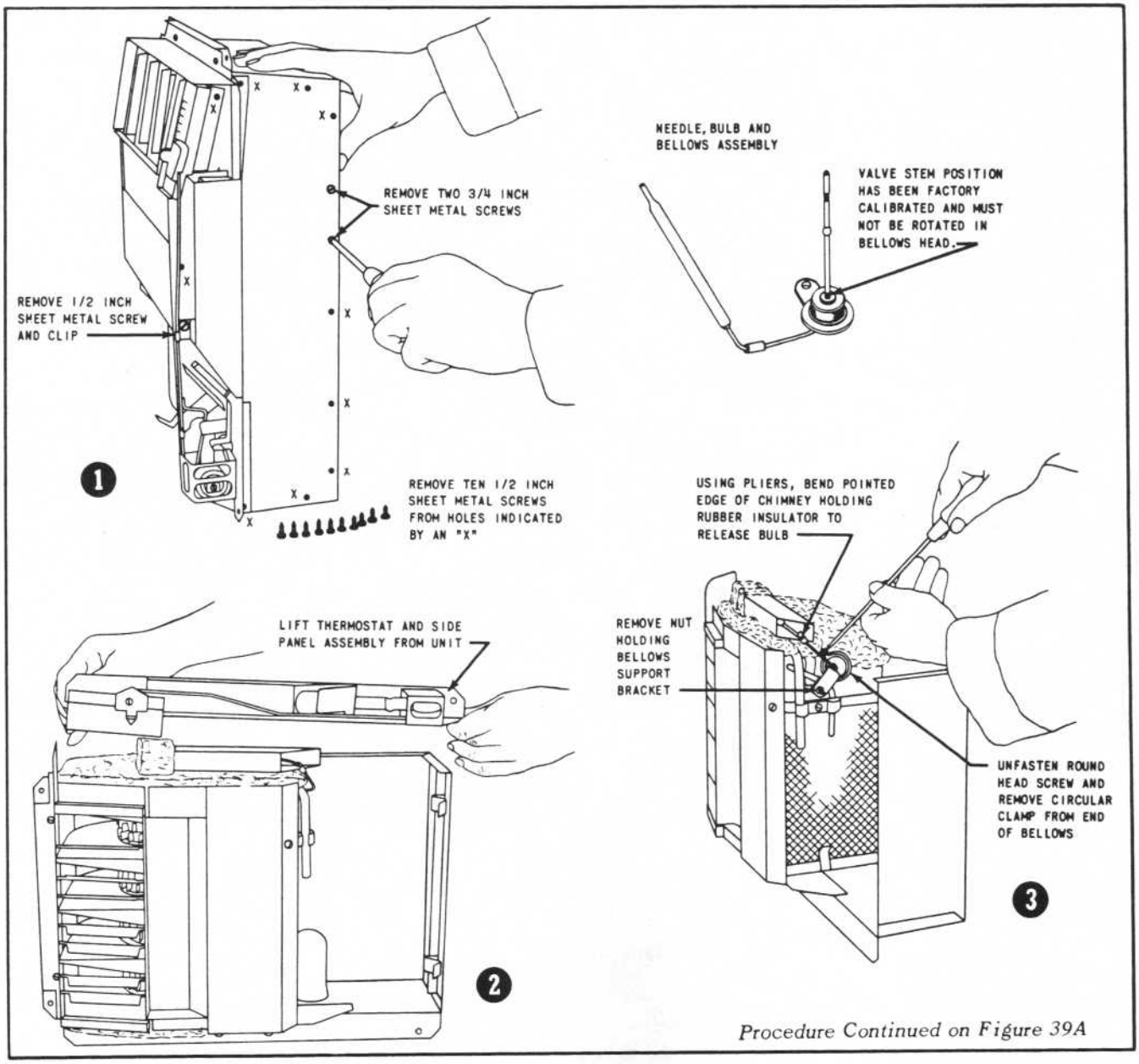
PARTS KIT NO. 200711 – INCLUDES NO. 200444 NEEDLE, BULB AND BELLOWS ASM. AND NO. 201273 INSULATION STRIP.

A defective needle, bellows and bulb assembly in a SelecTemp unit may be indicated when unit runs at full speed and will not modulate or shut off, or by one that will modulate down to a low speed, but will not come to a complete stop.

Before concluding that the control assembly is faulty, the following items should be checked:

1. Check to see if bulb is in support clip and centered in chimney.
2. Make certain that damper is not caught on bottom of chimney cover.
3. Make certain that there is sufficient fiberglas insulation around the top of chimney and around the steam and capillary tubes at the opening in the side panel. These areas must be well packed to prevent air being drawn down the chimney and through the side panel into the core area.

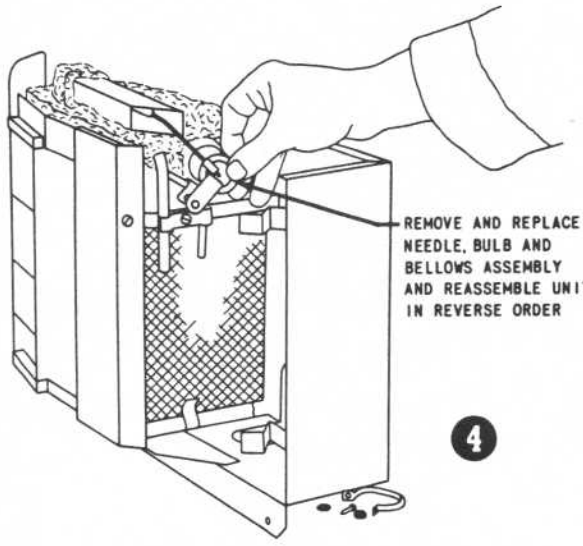
If after checking the above items, the unit still fails to function properly and symptoms indicated are present, remove and replace the needle, bellows and bulb assembly.



Procedure Continued on Figure 39A

Figure 39 – Procedure for Replacement of Needle, Bulb and Bellows in SelecTemp Units

SelecTemp®

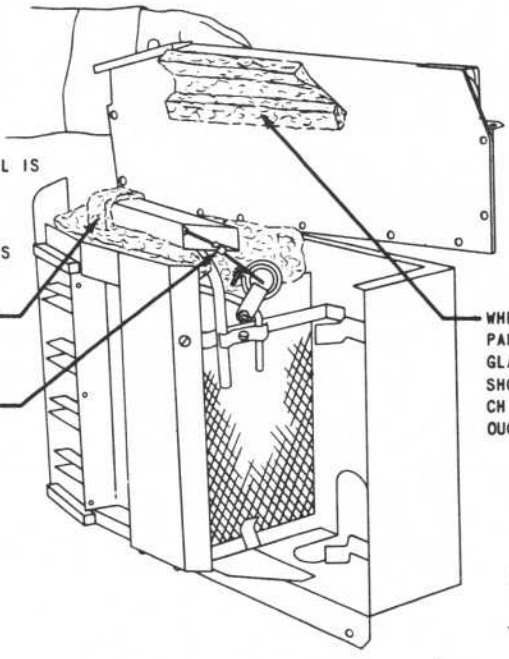


REMOVE AND REPLACE NEEDLE, BULB AND BELLOWS ASSEMBLY AND REASSEMBLE UNIT IN REVERSE ORDER

4

BE CERTAIN WIRE CLIP IS ENGAGED ON END OF BULB TO SUPPORT AND CENTER BULB IN CHIMNEY.

5



AFTER SIDE PANEL IS REASSEMBLED BE CERTAIN THAT INSULATION COMPLETELY FILLS SPACE BETWEEN CHIMNEY AND CHIMNEY COVER

RE-BEND TO HOLD INSULATOR

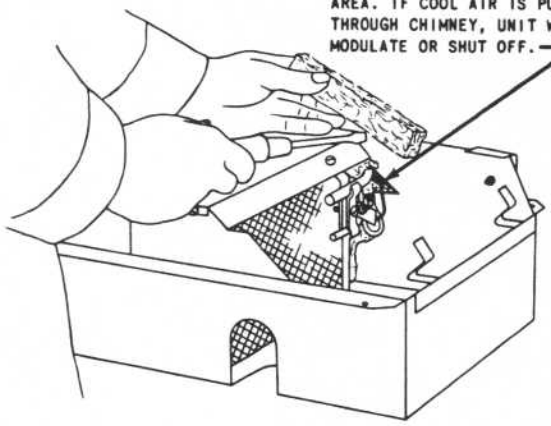
IMPORTANT

WHEN REPLACING SIDE PANEL, SPREAD FIBRE-GLAS INSULATION AS SHOWN SO ALL SIDE OF CHIMNEY WILL BE THOR-OUGHLY COVERED.

IMPORTANT

FINALLY, PACK PIECE OF FIBREGLAS, FURNISHED WITH KIT, AROUND THERMAL TUBE AND SIDE PANEL OPENING TO PREVENT COOL AIR FROM BEING PULLED DOWN THROUGH CHIMNEY AND INTO CORE AREA. IF COOL AIR IS PULLED DOWN THROUGH CHIMNEY, UNIT WILL NOT MODULATE OR SHUT OFF.

6



7

NOTE

IF THE BULB AND BELLOWS IS REPLACED, IT IS MOST IM-PORTANT THAT THE COPPER CHIMNEY ASSEMBLY BE THOR-OUGHLY WRAPPED WITH GLASS FIBER INSULATION BEFORE THE CONTROL BOARD (STEP NO. 6) IS RE-INSTALLED. IF THE CHIMNEY IS NOT THOROUGHLY INSULATED, THE HEAT LOSS MAY BE EXCESSIVE. THUS, WHEN THE DAMPER CLOSES, THE TEMPERATURE INSIDE THE CHIMNEY MAY NOT BE HIGH ENOUGH FOR THE ALCOHOL TO BUILD UP SUFFICIENT PRES-SURE TO EXPAND THE BELLOWS AND SEAT THE NEEDLE VALVE AGAINST THE NOZZLE. IF THIS OCCURS, THE UNIT WILL NOT SHUT OFF.

IMPROPER PACKING AT THE POINT WHERE THE TUBE CON-NECTING THE BULB AND BELLOWS PASSES THROUGH THE MA-SONITE CONTROL BOARD WILL ALSO ALLOW THE UNIT TO KEEP OPERATING BECAUSE AIR IS BYPASSING THE CLOSED DAMPER.

Figure 39A – Procedure for Replacement of Needle, Bulb and Bellows in SelecTemp Units

35. INSTRUCTIONS FOR REPLACING OUTBOARD BEARING ASSEMBLY NO. 200811 ON FAN WHEEL SHAFT OF SELECTEMP UNITS

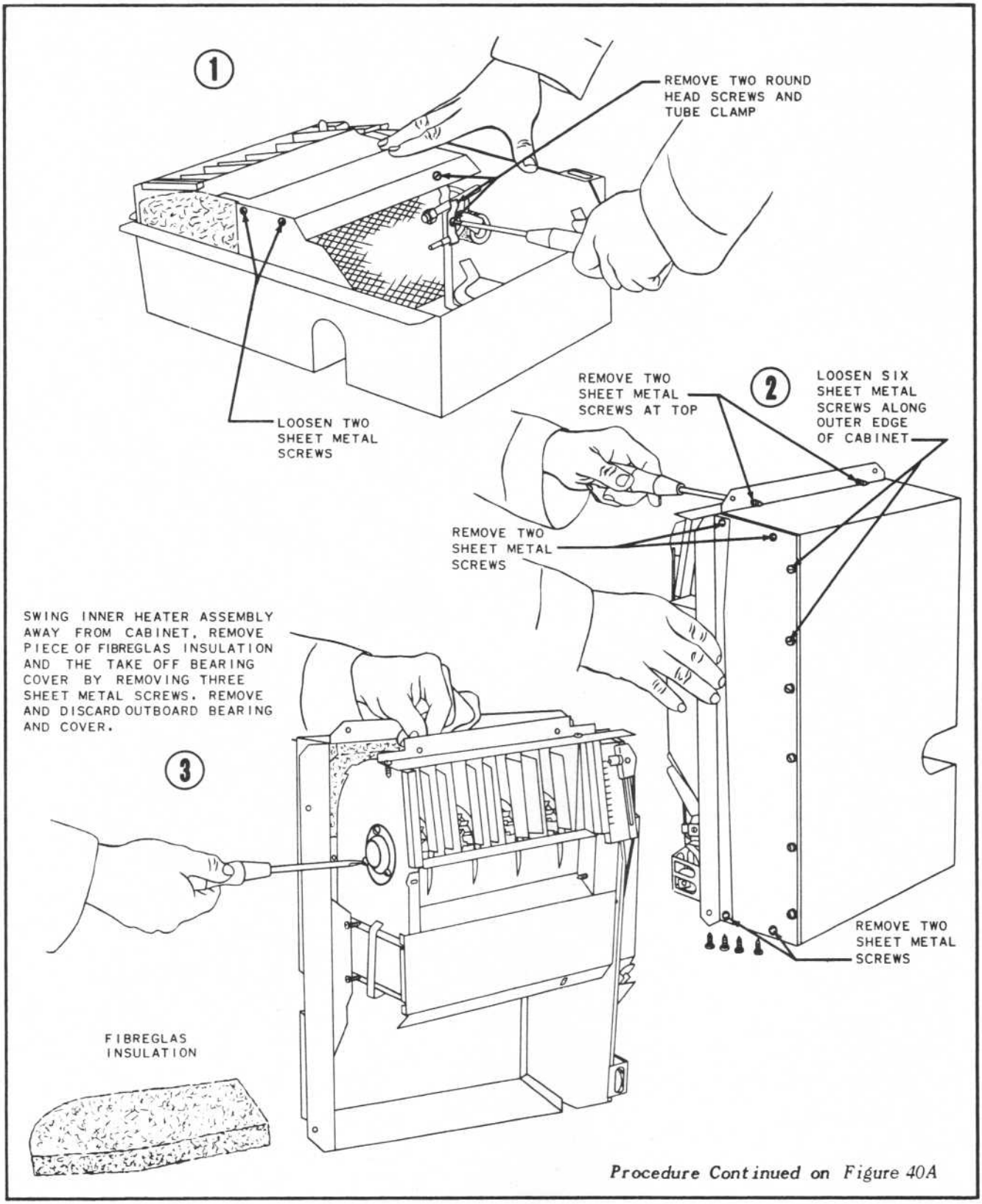


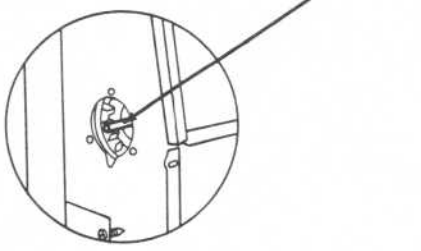
Figure 40 — Procedure for Replacement of Outboard Bearing on SelecTemp Units

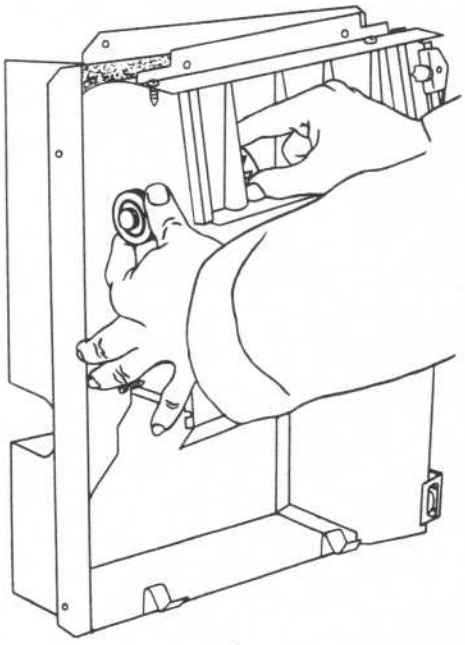
SelecTemp

IMPORTANT

CLEAN FAN WHEEL SHAFT USING CARBON-TETRACHLORIDE OR ACETONE ONLY. USE A CLEAN CLOTH AND BE VERY CAREFUL NOT TO MAR THE SURFACE OF SHAFT.

4



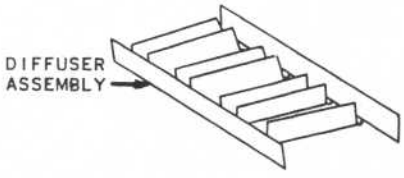


5

REMOVE DIFFUSER ASM. FROM FAN OUTLET AND HOLD FAN WHEEL WITH ONE HAND TO HELP GUIDE THE BEARING ONTO SHAFT.

IMPORTANT

INSERT BEARING ASSEMBLY ON SHAFT TAKING CARE TO NOT PUSH THE OIL DUST BARRIER INTO BEARING BORE.



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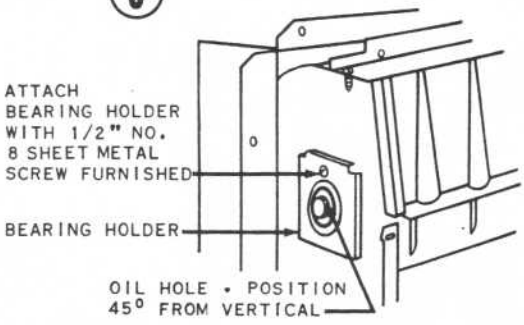

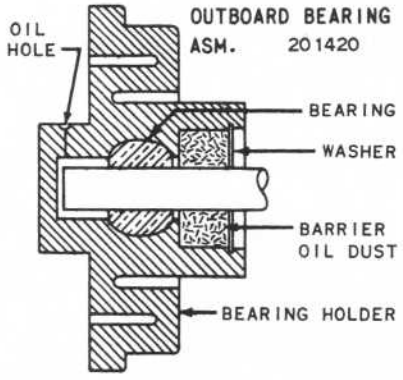

IMPORTANT - BEARING LUBRICATION

THE OUTBOARD BEARING IS FACTORY LUBRICATED BUT SHOULD BE LUBRICATED AT TIME OF INSTALLATION. BEARING SHOULD BE LUBRICATED TWICE EACH YEAR BY INSERTING OIL CAN SPOUT IN OIL HOLE IN END OF BEARING HOLDER AND FILLING RESERVOIR AROUND SHAFT. A SPECIAL LUBRICANT MUST BE USED. THIS IS AVAILABLE IN HALF PINT CANS FROM THE FACTORY, SPECIFY PART NO. 200923.

7

AFTER BEARING HAS BEEN REPLACED RE-ASSEMBLE UNIT IN REVERSE ORDER AS SHOWN IN STEPS 3, 2 AND 1.

Figure 40A – Procedure for Replacement of Outboard Bearing on SelecTemp Units

36. SELECTEMP BEARING CLEANING AND LUBRICATION

The following describes maintenance procedures for SelecTemp bearings. Until early 1961 a graphitar bearing was used for outboard and inboard assemblies. Since that time a rubber mounted sintered bronze outboard bearing has been used for production units as well as factory replacement assemblies for the graphitar type.

Figure 41

No. 200924 Plastic Applicator Tube and No. 204745 Pressure Type Lubricator with 90° Tip.
**90° Tip no longer available with plastic applicator tube.*

Twice yearly lubrication of the graphitar outboard bearing assemblies is recommended. Two types of applicators are available for this purpose (Figure 41). For smaller installations, a No. 200924 plastic applicator tube filled with bearing lubricant is available. For larger installations, a No. 204745 pressure-type applicator along with 1/2 pint cans of the special No. 200923 outboard bearing lubricant will prove more useful.

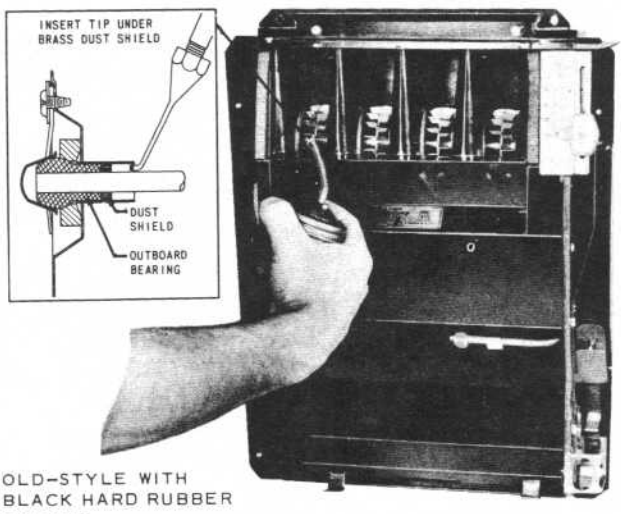

Figure 42

Lubricating Graphitar Outboard Bearing Using No. 200923 Lubricant in Pressure Type Applicator

The tip of the applicator (Figure 42) must be inserted under the brass dust shield of the outboard bearing and a liberal quantity of lubricant applied. The blower shaft should then be rotated and also worked back and forth horizontally until the blower assembly spins freely. In some instances a second application of fluid to the outboard bearing (or cleaning of the inboard bearing assembly as recommended in the last paragraph) may be required. On older units, replace the entire outboard bearing assembly with the new style No. 201420 outboard bearing assembly is sometimes warranted.

Lubrication of the resilient type No. 201420 outboard bearing assembly is normally required twice every year (Figure 43). The port seal must be punctured the first time the bearing is lubricated. Thereafter, the tip is inserted into the opening and lubricant pumped in under pressure until it runs out the blower shaft opening. The same procedures outlined above for obtaining free blower rotation should then be followed.

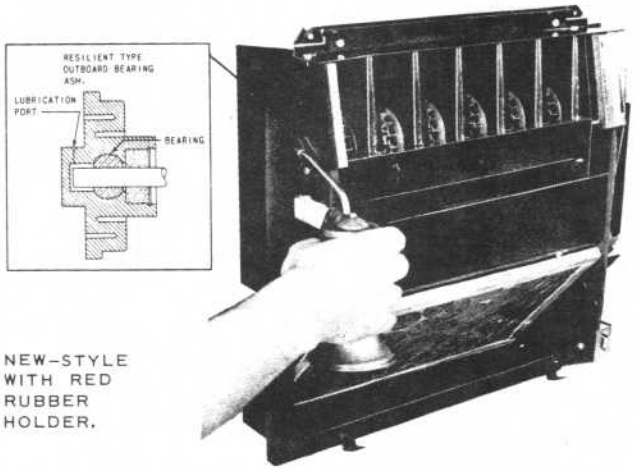

Figure 43 – Lubricating Resilient Type Outboard Bearing Using Pressure Type Applicator

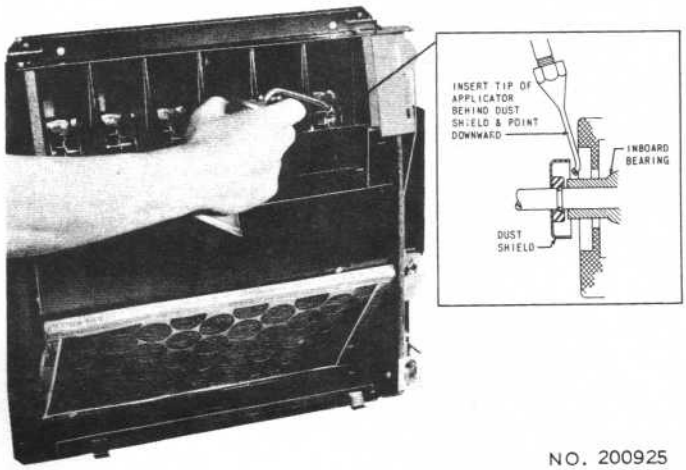

Figure 44 – Cleaning Inboard Bearing with Solvent

Inboard bearings do not require lubrication, but may be flushed or cleaned with a No. 204745 pressure-type applicator containing tri-chlor-ethylene type solvent. Insert the applicator tip behind the aluminum dust shield and apply at least two shots of solvent (Figure 44). Then rotate blower shaft until it spins freely. In some instances a second application of solvent will be required. Avoid toxic solvents containing carbon tetrachloride, or flammable cleaners.

37. GENERAL WATER TREATMENT PROCEDURES FOR STEAM BOILERS

As part of your summer service, or annual maintenance program, it is important that the boiler water be properly treated in order to protect and prolong the life of the boiler. If makeup water has been added from time to time, the boiler should be drained in order to remove the excess dissolved solids remaining in the boiler water. The boiler should always be fired to full operating pressure just previous to draining to loosen dirt and scale which may have deposited in the mud ring, Allow to cool approximately thirty minutes before dumping to allow fine suspended matter to settle rather than cling to the sides of the heating surfaces. Refill the boiler, treat the water, and bring to a boil.

Two water treatment compounds are available: one to improve the quality of steam, and the other to protect the boiler. A third compound is available to inhibit condensate corrosion.

a. T-353 Condensate Corrosion Inhibitor (Part No. 205332)

   In steam heating systems where either the amount of makeup water or the carbon dioxide and oxygen in the steam supply is high, corrosion can damage heat exchanger cores and piping. These parts can be protected by a film-forming liquid that is mixed with a small amount of water and introduced into the condensate receiver. The inhibitor vapor flows with the steam and forms a protective wax-like coating on steam condensing and return pipe surfaces.

   Where used in SelecTemp systems, this inhibitor has not damaged aluminum alloy parts or affected unit capacity.

   The material is not available from commercial sources in small quantities, so we are supplying it from the factory in one pint bottles or cartons of twelve bottles. It will be known as "T-353 Condensate Corrosion Inhibitor," Part Number 205332 for the single bottles, Part No. 205333 for the carton of 12 bottles.
   In a closed system, the amount of corrosion inhibitor for each 100 gallons of boiler water is: Initial charge – 1 ounce; Monthly feed – 1/2 ounce.

   Add the amount of corrosion inhibitor to be used to double or more the amount of water, mix well, and pour directly into the condensate receiver.

   The amount of inhibitor in small systems need not be maintained in an exact ratio. However, excessive quantities will not give greater protection and are not recommended because the boiler will tend to "prime" and "foam" if the concentrate is too high.

   For a system operating on district steam, an automatic mechanical feeder will be required.

b. BA-55 Steam Boiler Anti-Foaming Treatment (Part No. S-1121)

   BA-55 is an anti-foaming compound which reduces carry-over of water into the piping system, caused by a high dissolved solids content in the boiler water. These solids are principally magnesium, sodium and calcium salts which remain in solution increasing the surface tension of the water. As a result, steam bubbles do not disengage freely and water is carried along with the steam.

   There are several materials commercially available for this purpose but most have their limitations. The principal shortcoming of most anti-foaming agents is short life, making it necessary to treat the boiler at frequent intervals. Some treatments are more effective in certain types of water than others.

   The BA-55 compound has proved to be effective against a wide range of different types of contaminants in water and unless the water is lost from the boiler by leakage, one treatment should be effective for a full heating season.

   BA-55 treatment is not a cleaning agent. The boiler should be properly cleaned and flushed before the treatment is introduced. It does tend to keep dirt in suspension and therefore, helps to keep the gauge glass clean.

   One quart of BA-55 will effectively condition approximately 30 gallons of boiler water. Less than the normal treatment is effective in proportion to the amount used. No benefit will result from using more than specified, but no harm will result.

   BA-55 is in liquid form and can easily be added either through the pop safety valve opening or the vent opening of the condensate return pump.

c. SBI Water Treatment (10 oz. can Part No. 87646, 50 oz. can Part No. 87647).

   The SBI Water Treatment is principally a corrosion inhibitor. This is a class of chemicals which deposits a protective coating on the water surfaces of the boiler, or reacts with it to protect it against corrosion and pitting. It imparts a distinctive yellow color to the boiler water which can easily be seen in the gauge glass.

   SBI Compound comes in powder form and is more easily installed if it is dissolved in water prior to adding it to the boiler. SBI Compound can be installed either through the pop safety valve opening on the boiler or the vent opening of the condensate return pump.

d. General precautions when adding any treatment to the system:

   1. Install the proper quantity. Refer to the following application chart.

2. DO NOT ATTEMPT TO ADD TREATMENT TO THE BOILER THROUGH THE SAFETY VALVE OPENING WHEN BOILER IS UNDER PRESSURE.

3. Use extreme care not to distort the safety valve body when removing it from the boiler.

4. Bring the boiler to a boil after adding the solution to insure that the treatment will be thoroughly mixed and the excess oxygen and other dissolved gases in the water are driven off. The main steam valve should be left open so that the gases can escape through the system and out the vent opening on the condensate return pump.

WATER TREATMENT FOR IRON FIREMAN STEAM BOILERS USED WITH SELECTEMP SYSTEMS

MODELS		WATER CAPACITY IN GALS. AT NORMAL WATER LEVEL	BA–55 REQUIRED (QUARTS)	SBI COMPOUND REQUIRED (10 OZ. CANS)
OIL–FIRED	GAS–FIRED			
BTO-112	BTG-142	23	1	1
MSO-114	MSG-142	26-1/2	1	1
SOV-114	SGB-145	27	1	1
SOV-115	SGB-144	18	1	1
MSO-140	MSG-175	31	1	1
SOV-143	SGB-175	34	1	1
SOV-144	SGB-180	26	1	1
BTO-160	BTG-200	33	1	1
MSO-180	MSG-225	42-1/4	2	2
SOV-198	SGB-230	40	2	2
SOV-200	SGB-250	32	1	1
BTO-230	BTG-280	41	2	2
MSO-240	MSG-300	52	2	2
SOV-252	SGB-288	47	2	2
SOV-255	- - -	38	2	2
MSO-320	MSG-400	65	3	3
MSO-400	MSG-500	79	3	3
MSO-500	MSG-625	110	4	4
MSO-750	MSG-937	155	5	1-50 OZ. CAN
MSO-1000	MSG-1250	235	8	1-50 OZ. CAN

T-353 – Initial charge – 1 oz. for each 100 gallons of boiler water
Monthly feed – 1/2 oz.
DO NOT EXCEED THIS DOSAGE

Printed in U.S.A.

SelecTemp®

MODULATING ZONE HEATING

TURBONICS INC.

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(216) 741-8300 FAX: (216) 741-7768