



Slant/Fin® INTREPID

OIL-FIRED WATER AND STEAM BOILERS/NO. 2 OIL

SERVICE COMPANY

Name _____

Address _____

Telephone _____

Model # _____

Serial # _____

INSTALLATION AND OPERATING INSTRUCTIONS

READ AND SAVE THESE INSTRUCTIONS FOR REFERENCE.

SAFETY WARNING:

KEEP BOILER AREA CLEAR AND FREE FROM COMBUSTIBLE MATERIALS, GASOLINE AND OTHER FLAMMABLE VAPORS AND LIQUIDS. FAILURE TO ADHERE TO ABOVE SAFETY WARNING, MAY RESULT IN PERSONAL INJURY OR DEATH AND PROPERTY DAMAGE.



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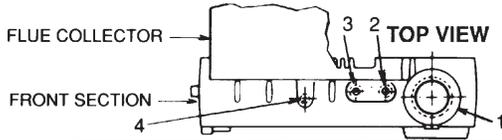
IMPORTANT: The installation of this equipment must conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, to the Installation of Oil Burning Equipment, ANSI/NFPA 31, latest edition, and to the National Electrical Code ANSI/NFPA 70, latest edition. The installation must also conform to the additional requirements in this Slant/Fin Instruction Manual. Where there is any difference, the more stringent requirement shall govern.

In addition, where required by the authority having jurisdiction, the installation must conform to American Society of Mechanical Engineers Safety Code for Controls and Safety Devices for Automatically Fired Boilers, No. CSD-1, latest edition.

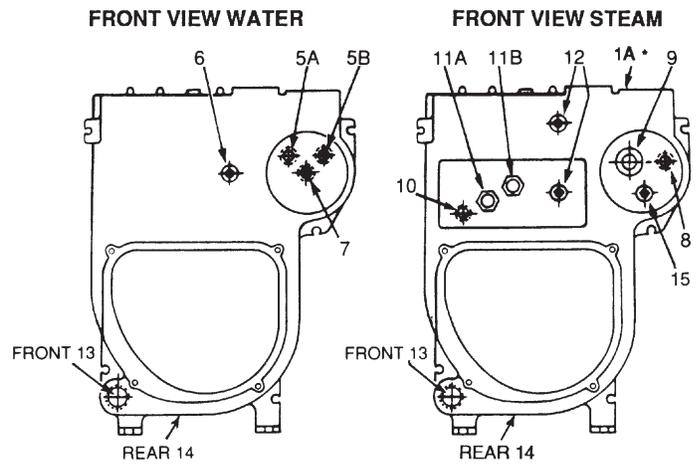
THIS MANUAL MUST BE LEFT WITH OWNER AND SHOULD BE HUNG ON OR ADJACENT TO THE BOILER FOR REFERENCE.

IMPORTANT: This boiler must be installed by a trained, experienced, service technician, licensed for the installation and servicing of oil burning equipment or otherwise qualified by the authorities having jurisdiction over the installation.

TAPPINGS AND OPENINGS



Tapping Location	Steam Boiler	Water Boiler
1	3" supply	1 1/2" supply
1A	2" supply on rear section *	—
2	second 1/4" siphon & pressure cutout if required	3/4" air vent or expansion tank
3	3/4" steam safety valve	3/4" water relief valve
4	1/4" siphon, pressure gauge & pressure cut-out	—
5A	—	1/2" tankless inlet
5B	—	1/2" tankless outlet
6	—	1/4" pressure temp. gauge
7	—	1/2" high limit, hi/lo or combination control
8	3/4" alternate electronic low water cut-off	—
9	1 1/2" skimmer tapping	—
10	1/2" low limit for tankless	—
11A	1/2" tankless inlet	—
11B	1/2" tankless outlet	—
12	1/2" steam gauge glass & 67 LWCO	—
13	1 1/2" bushed to 3/4" for drain cock	1 1/2" return & 3/4" drain cock
14	1 1/2" condensate return	1 1/2" alternate return
15	3/4" NPT zone tapping	—



* Rear section TR-50, TR-60, TR-70 steam boilers only.

Figure 1

DIMENSIONS

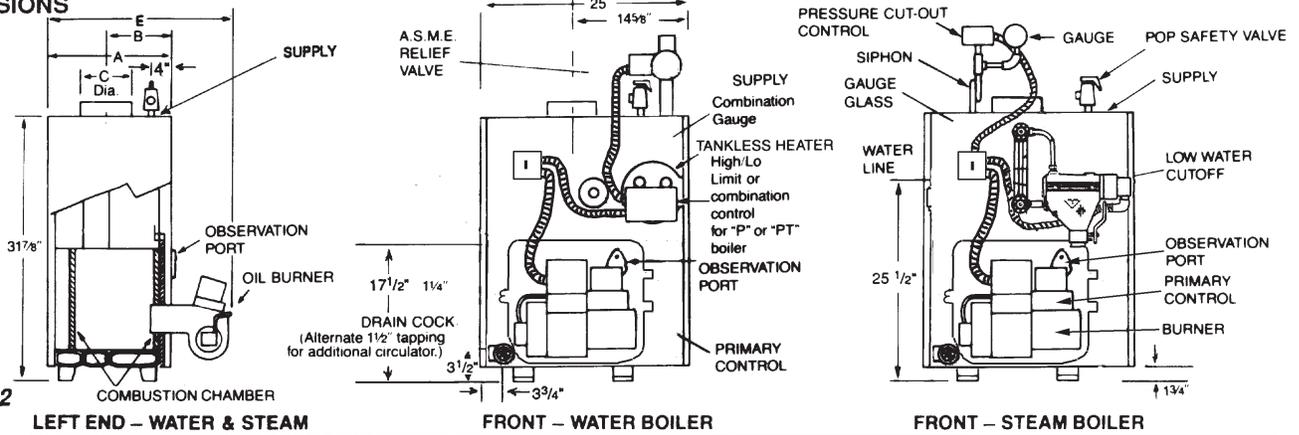


Figure 2

RATINGS

Boiler Model No. *	AHRI Burner Capacity Oil Input		D.O.E. Heating Capacity MBH		AHRI Net Ratings			AHRI Chimney Size		A.F.U.E. %		Dimensions (inches)				Boiler Sect.	Tankless Heater GPM **		
	GPH †	BTUH	Water	Steam	Water MBH *	Steam MBH *	Steam Sq. Ft.	Nom. Rect. x Height § (in x in x ft)	I.D. Round x Height (in x ft)	Water	Steam	Boiler Length "A"	Front to Flue ^c "B"	Flue Dia. "C"	Return Circulator Flange "D"		Overall Length "E"	Water	Steam
TR-20	0.75	105,000	89	—	77	—	—	8 x 8 x 15	5 x 15	85.1	—	11 1/2	8 5/8	6 [□]	1 1/4	24 1/4	2	2.20	—
TR-30H	1.00	140,000	120	—	104	—	—	8 x 8 x 15	6 x 15	86.0	—	14 1/2	10 1/2	6	1 1/4	27 1/4	3	3.10	—
TR-30-1.10 ¶	1.10	154,000	131	130	114	98	408	8 x 8 x 15	6 x 15	84.8	84.1	14 1/2	10 1/2	6	1 1/4	27 1/4	3	3.20	3.00
TR-30-1.25 ¶	1.25	175,000	149	—	129	—	—	8 x 8 x 15	6 x 15	85.0	—	14 1/2	10 1/2	6	1 1/4	27 1/4	3	3.40	—
TR-40H	1.50	210,000	181	176	157	132	550	8 x 8 x 15	7 x 15	86.0	84.0	18 1/4	11 3/8	7	1 1/4	31	4	3.80	3.40
TR-40-1.60 ¶	1.60	224,000	189	188	164	146	588	8 x 8 x 15	7 x 15	84.4	83.8	18 1/4	11 3/8	7	1 1/4	31	4	3.90	3.50
TR-40-1.80 ¶	1.80	252,000	212	—	184	—	—	8 x 8 x 15	7 x 15	84.2	—	18 1/4	11 3/8	7	1 1/4	31	4	4.15	—
TR-50H	2.00	280,000	241	235	210	177	736	8 x 8 x 15	8 x 15	86.0	84.0	21 1/2	13 3/8	8	1 1/2	34 1/4	5	4.30	3.90
TR-50-2.10 ¶	2.10	294,000	247	245	215	184	767	8 x 8 x 15	8 x 15	84.0	83.4	21 1/2	13 3/8	8	1 1/2	34 1/4	5	4.40	4.00
TR-50-2.35 ¶	2.35	329,000	272 [‡]	—	237	—	—	8 x 12 x 15	8 x 15	82.7 [‡]	—	21 1/2	13 3/8	8	1 1/2	34 1/4	5	4.70	—
TR-60	2.60	364,000	301 [‡]	311 [‡]	262	233	971	8 x 12 x 15	10 x 15	82.7 [‡]	85.5 [‡]	25	15 1/2	8	1 1/2	37 1/4	6	4.90	4.50
TR-70-3.00 ¶	3.00	420,000	355 [‡]	349 [‡]	309	262	1092	8 x 12 x 15	10 x 15	84.6 [‡]	83.2 [‡]	28 1/2	16 3/8	9	—	41 1/2	7	5.40	5.00
TR-70-3.10 ¶	3.10	434,000	358 [‡]	362 [‡]	311	272	1129	8 x 12 x 15	10 x 15	82.4 [‡]	83.3 [‡]	28 1/2	16 3/8	9	—	41 1/2	7	5.45	5.00

Standard working pressure 30 psi water, 15 psi steam. All boilers hydrostatically tested — A.S.M.E.

* For forced hot water heating systems where the boiler and all piping are located within the area to be heated, the boiler may be selected on the basis of gross D.O.E. capacity output. The net AHRI output ratings shown are based on an allowance for piping and pickup of 1.15 (water) or 1.33 (steam). D.O.E. capacity gross output is divided by the allowance to obtain net rating. The manufacturer should be consulted before selecting a boiler for unusual piping and pickup requirements such as intermittent system operation, extensive piping, etc.

† Ratings apply to the use of light oil at 140,000 Btu per gallon, and apply only when burner models listed on pages 17-19 of this manual are used, and are properly adjusted to produce 13% CO₂.

§ Nominal clay tile liner dimensions.

** Tankless heater rating based on intermittent draw.

¶ Water boiler models TR-30 and larger may have two firing rates. The boiler is factory shipped at the lower firing rate. To obtain the higher firing rate, refer to the INTREPID boiler installation instructions for the appropriate field adjustments.

‡ AHRI gross output (Btu/h) and thermal efficiency.

□ Collar is oblong, will fit 6" diameter nominal connector.

c This dimension is from the boiler jacket to the center of the flue outlet.

NOTE: All boilers under 300,000 Btu/h input are tested and rated for capacity under the U.S. Department of Energy (D.O.E.) test procedures for boilers.

INSTALLATION REQUIREMENTS

BOILER LOCATION

Provide a level, solid foundation for the boiler. Location should be near the chimney so that the Flue Pipe Connector or Breeching to the chimney is short and direct.

- A. The foundation must be capable of supporting the weight of the boiler when filled with water:

Boiler Size	Approximate Total Weight of Boiler Assembly, filled with water
TR-20	440
TR-30	550
TR-40	660
TR-50	785
TR-60	895
TR-70	1000

- B. The boiler can be installed on both combustible and non-combustible floors, but must NOT be installed on or above carpeting.
- C. The Intrepid Boiler has full wet base sections which surround fire-box for maximum heat absorption of burning fuel, and low floor temperature.
- D. If boiler is to be located over buried conduit containing electric wires or telephone cables, consult local codes or the National Board of Fire Underwriters for specific requirements.

CAUTION: NEVER BURN GARBAGE OR PAPER IN THE UNIT AND NEVER LEAVE COMBUSTIBLE MATERIAL AROUND IT.

MINIMUM CLEARANCE

Provide accessibility clearance of 24" from surfaces requiring servicing (top and front) and 18" on any side requiring passage. The boiler shall be installed with the following MINIMUM clearances from combustible materials:

- A. CHIMNEY CONNECTOR-18"
- B. BACK AND SIDES- 6" EXCEPT as limited by 18" clearance from chimney connector

NOTE: Except in closets and alcoves, clearances above in (A) and (B) may be reduced by providing forms of protection as specified in NFPA 31, latest edition.

CHIMNEY REQUIREMENTS

- A. The chimney must be constructed in accordance with all local applicable codes and the National Board of Fire Underwriters. See boiler models and rating table shown on page 2 for chimney sizes.
- B. Check chimney condition. Existing chimneys and stacks may have deteriorated; without repairs their use would be hazardous. Before connecting to an old chimney or stack:
 1. Clean it.
 2. Inspect it thoroughly.
 3. Remove obstructions.
 4. Replace worn sections of metal stacks.
 5. Seal bad masonry joints.
 6. Repair damaged linings.
- C. Where more than one appliance vents into a common chimney, the area of the common breeching should at least equal the area of the largest appliance flue plus 50% of the additional flue areas.
- D. Breeching area must not be reduced at connection into chimney. Breeching must be inserted into, but not beyond, inside of chimney liner.
- E. Chimney height shall extend at least 3 feet above where it passes through the roof of the building, and at least 2 feet above any ridge within 10 feet of the chimney.
- F. The use of a vent cap, where permitted by code, gives additional protection against adverse wind conditions and precipitation.
- G. Flue Connection: Connect flue pipe between top of boiler and chimney. Horizontal sections of flue pipe must be pitched upward to the chimney at least 1/4" per foot. Flue must be inserted into, but not extend beyond, the inside wall of the chimney flue. Install draft regulator in flue pipe, as shown in figure 3.

AIR SUPPLY AND VENTILATION (see NFPA 31, latest edition)

Sufficient air for combustion and ventilation in the boiler room must be provided. Failure to do this will result in poor combustion, heavy sooting and health hazards.

CAUTION: AN OIL-FIRED UNIT SHALL BE CONNECTED TO A VENT HAVING A SUFFICIENT DRAFT AT ALL TIMES TO ENSURE SAFE AND PROPER OPERATION OF THE UNIT.

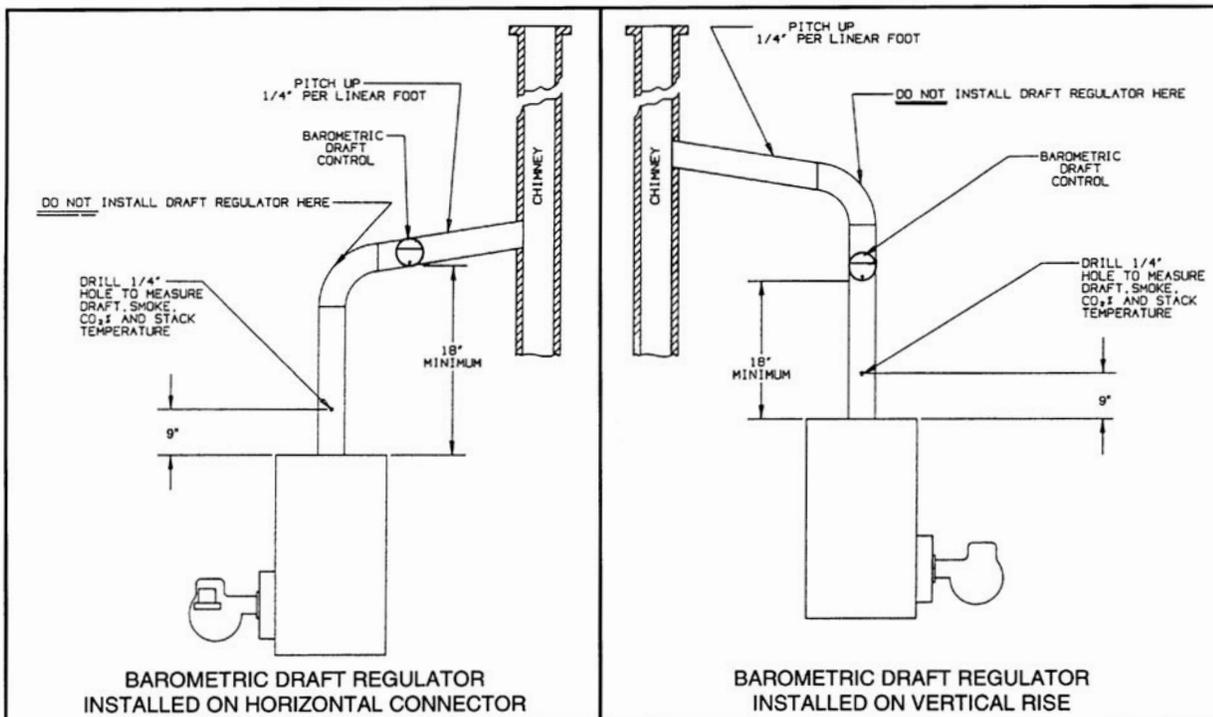
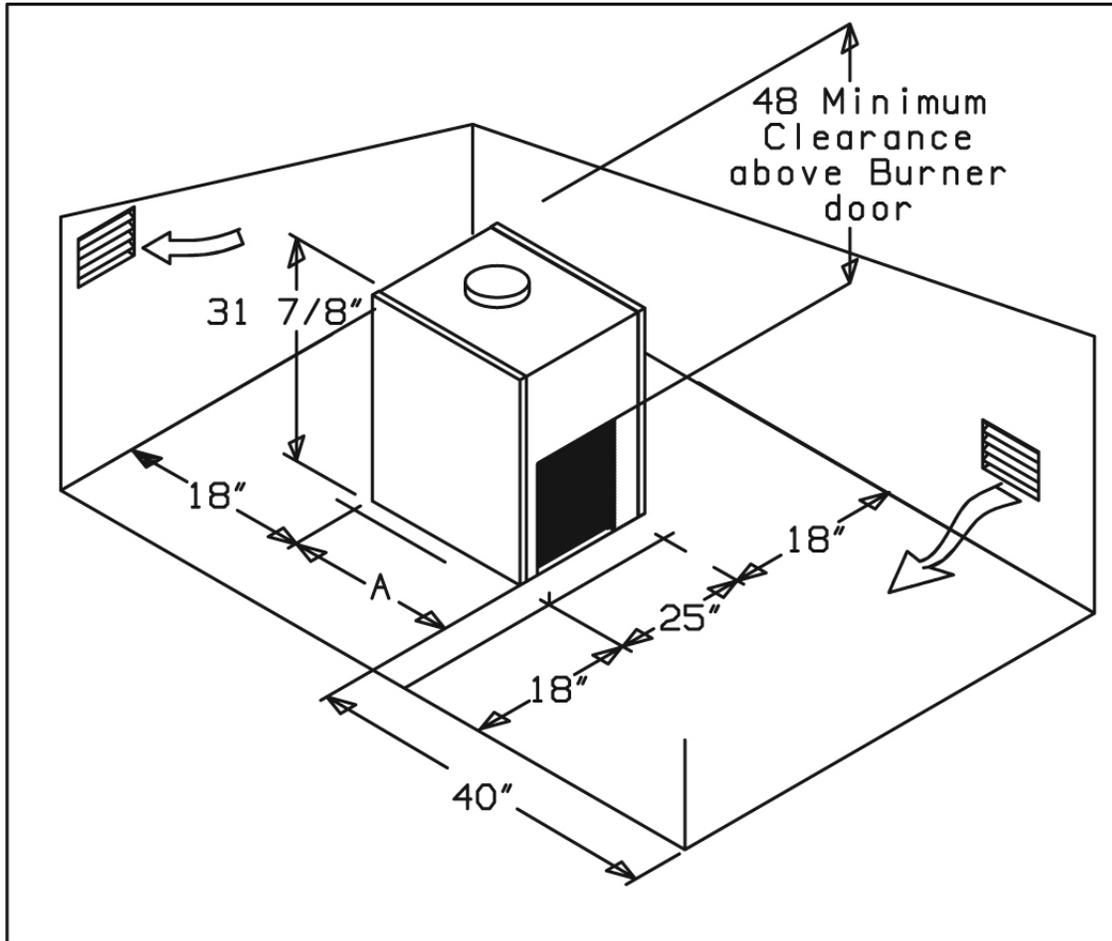


Figure 3. Barometric Draft Regulator

Sufficient space shall be left clear around the boiler.

Do not stack items on or box in the appliance within the required clearances to combustibles.



BOILER MODELS	A (in)
TR-20 / LD-20	11 1/2"
TR-30H / TR(DV)-30 / LD-30	14 7/8"
TR-40H / TR-40 / LD-40	18 1/4"
TR-50H / TR-50 / LD-50	21 5/8"
TR-60 / LD-60	25"
TR-70 / LD-70	28 3/8"

Any oil-fired boiler must have a steady draft* and an ample supply of combustion air at all times during firing. If air supply or chimney draft* is unreliable, CO₂ and overfire draft* will change unpredictably.

DO NOT vent this boiler to the same chimney flue used by a fireplace or coal or wood burning furnace or boiler. The draft* produced by solid fueled devices varies tremendously between high fire and low fire:

In modern, weather stripped, energy-saving buildings or older buildings which have been modified similarly, natural infiltration may not supply enough air for combustion, particularly if other fuel burning appliances, exhaust fans or draft inducers are competing for the same air supply. Fireplaces, other solid fuel burning appliances and exhaust fans consume great quantities of air; if air supply is not ample, such an appliance will create a downdraft in the oil-fired boiler flue. This can create a hazardous condition. Flue gases can be sucked out of the chimney through

the vent regulator into the living space. DO NOT operate this boiler and a solid fuel burning appliance at the same time, unless the solid fuel burner is provided with its own outside air supply.

See Table 2, "Provisions for Combustion and Ventilation Air Supply" for determining need and method of providing air for combustion and ventilation.

If fly screen must be used over air supply openings, areas calculated should be doubled; the screen should be inspected and cleaned frequently to maintain free air flow.

Protect air openings against closure by snow, debris, etc. Openings such as doors or windows, if used, must be locked open.

* Draft is negative or suction pressure

TABLE 2: Provisions for Combustion and Ventilation Air Supply. See NFPA 31, latest edition for more detailed information.

	Boiler Location	Air Supply	Action Required
2.1	Unconfined space	Is there sufficient air for combustion by natural infiltration (see NOTE (1), "Test..." below)?	NONE
2.2	Unconfined space	If there is NOT sufficient air for combustion by natural infiltration due to tight construction or other conditions, then it REQUIRES AIR FROM OUTDOORS. SEE "ACTION REQUIRED" column at right. See Notes (1) and (2) below.	Provide air from outdoors directly through a permanent outside wall opening or openings with a free open area of not less than 1 sq. in. per 4000 Btu/hr of TOTAL input of ALL fuel burning appliances in the building. See Note (1) and (3).
2.3	Confined space	If there is sufficient air for combustion from within building but it comes from outside of the confined space. SEE "ACTION REQUIRED" column at right. See Note (1) below.	The confined space shall be provided with two permanent air openings, one near the top of the enclosure and one near the bottom. EACH opening shall have a free air opening of not less than 1 sq. in. per 1000 Btu/hr. of TOTAL input of ALL fuel burning appliances within the enclosure. The two openings shall freely communicate with the interior areas of the building which in turn would have to have adequate infiltration of air from outdoors. See Notes (1, 3) and Figure 3a.
2.4	Confined space	If there is NOT sufficient air for combustion due to tight construction or other conditions it REQUIRES AIR FROM OUTDOORS. SEE "ACTION REQUIRED" column at right. See NOTE (2) below.	(a) Air from the outdoors shall be provided to the confined space by two permanent openings, one in or near the top of the enclosure space and one in or near the bottom. The openings shall communicate directly, or by means of ducts, with outdoors or to such spaces (crawl or attic) that freely communicate with outdoors (See figures 3b, 3c and 3d). (b) Where directly communicating with outdoors or by means of vertical ducts, each opening shall have a free area of not less than 1 sq. in. per 4,000 Btu/hr. (35 sq. in. per gal. per hr.) of TOTAL input rating of ALL appliances in the enclosure. If horizontal ducts are used, each opening shall have a free area of not less than 1 sq. in. per 2,000 Btu/hr. (70 sq. in. per gal. per hr.) of TOTAL input of ALL appliances in the confined space. See Figures 3b, 3c and 3d.

- (1) Test for sufficient air for combustion by infiltration by running this boiler for 30 minutes under all of the following conditions and at the same time: a) all doors, windows and other like openings must be closed, b) all fuel burning appliances should be FIRING, c) all exhaust fans and clothes dryers turned ON. At the above conditions the CO₂, smoke and draft readings must be normal. (CO₂ between 11% and 13%, smoke between ZERO and a TRACE, draft between .02" W.C. and .04" W.C. negative pressure.)
- (2) Aside from tight construction, some of the conditions that steal air for combustion from a boiler are other fuel burning appliances, exhaust fans and clothes dryers.
- (3) Generally, louvers made of wood have a free open area of 20% and those made of metal have a 60% to 70% free open area. Screens also reduce the open area of the louvers.

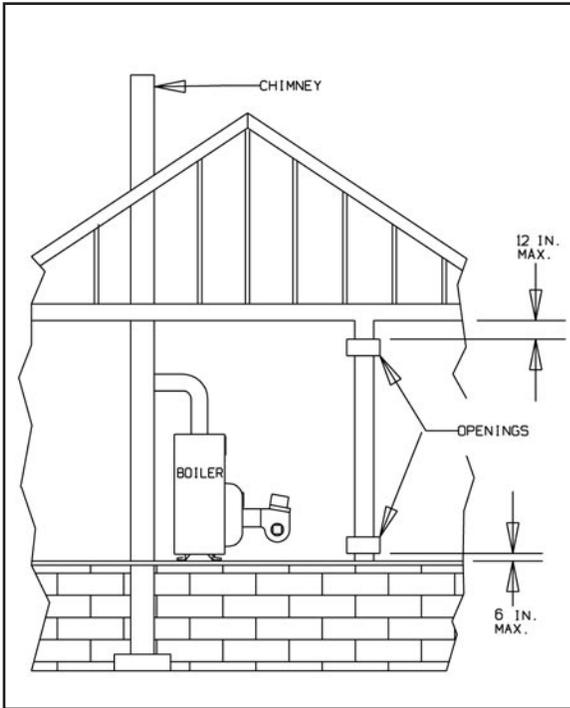


Figure 3a.
Appliances located in confined spaces. Air from inside the building. See Table 2 (2.3).

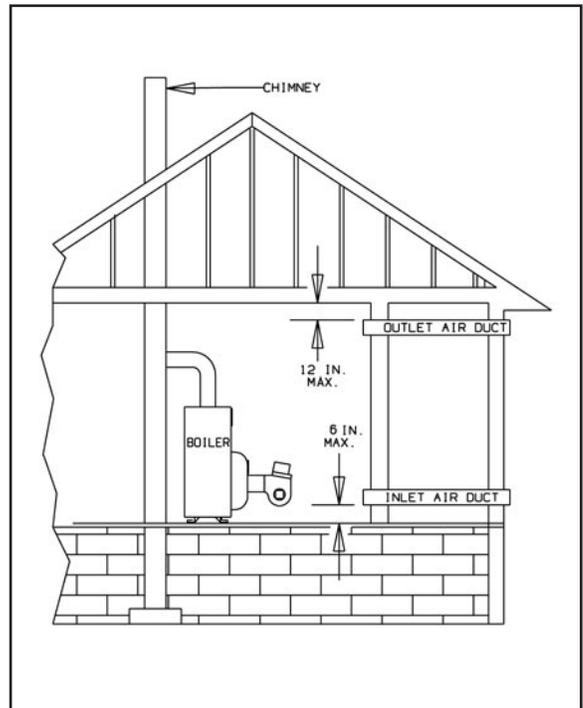


Figure 3b.
Appliances located in confined spaces. Air from outdoors. See Table 2 (2.4).

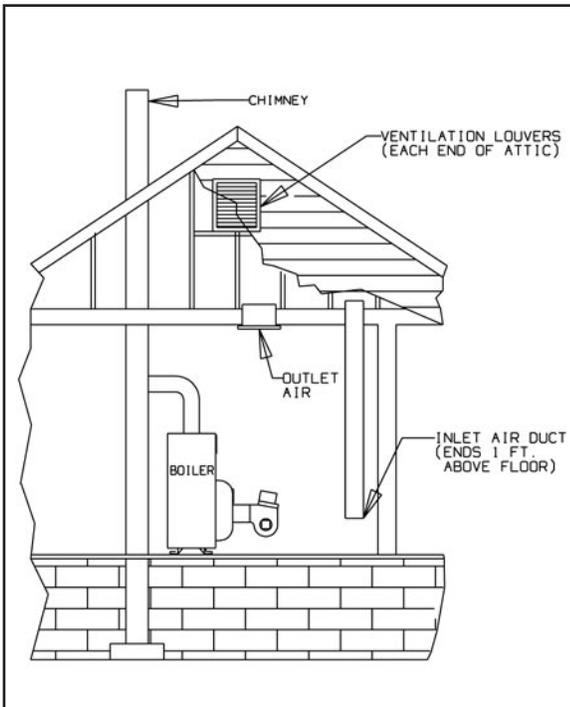


Figure 3c.
Appliances located in confined spaces. Air from outdoors through ventilated attic. See Table 2 (2.4).

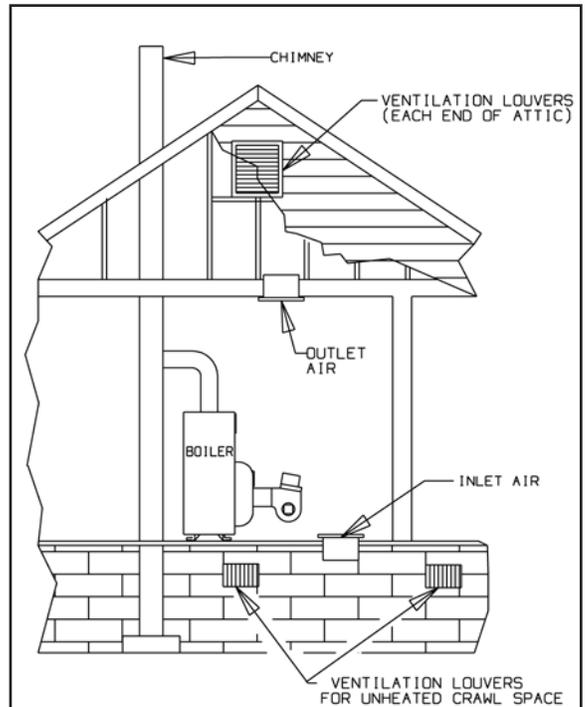


Figure 3d.
Appliances located in confined spaces. All air from outdoors through ventilated crawl space and outlet air to ventilated attic. See Table 2 (2.4).

INSTALLING CONTROLS AND ACCESSORIES ON BOILER UNITS

Note: Jacket must be installed on boiler units prior to installation of trim.

- I. STEAM BOILER TRIM, see page 2 for tapping locations, and figure 4 for illustration of steam boiler.
 - A. Steam pressure gauge and pressure cut-out, install in tapping no. 4, figure 4.
 - B. Gauge glass set — use tapping no. 12.
 - C. Pop safety valve — use tapping no. 3, piped full size to boiler; or pipe full size into a valveless steam header.
 - D. Combustion safety control — mounted on burner.
- II. WATER BOILER TRIM, see page 2 for tapping locations, and figures 1 and 2 for illustration of water boiler.
 - A. Pressure- temperature - altitude gauge — use tapping no. 6.
 - B. High temperature limit — use tapping no. 7.
 - C. Operating control (if used) — use tapping no. 7.
 - D. Water relief valve — use tapping no. 3, piped full size to boiler.
 - E. Automatic air vent or compression tank tapings — if used, install in tapping no. 2.
 - F. Combustion safety control — mounted on burner.

PIPING

IMPORTANT: Boilers are to be used with closed system. Any application that uses steam or water from system, causes the introduction of a frequent supply of fresh water into the boiler. This will cause damage to the boiler. Use of heat exchangers will prevent this damage.

PIPING FOR STEAM BOILERS

Provide Header and Hartford Loop as suggested. See figures 4 and 5. Local codes apply.

CLEANING PIPING SYSTEM

- A. To clean piping system, open all valves at the heating elements. After getting up a good head of steam, shut the boiler down and allow the condensate to return to the boiler. The condensate will carry the oil film with it. Again blow-off the boiler. On extremely fouled systems, it may require several visits over a few days to clean the system.
- B. When steam only (no water) is released through the hand valve, the boiler will not surge or flood.

PIPING FOR WATER UNITS

NOTE: On knocked-down boiler only, jacket may be installed after supply and return piping connection, but must be installed prior to adding trim.

I. CIRCULATING SYSTEM

- A. **FORCED CIRCULATION** hot water heating system: Use the top tapping as supply tapping, and use the front or rear bottom tapings for the return.
- B. A **FLOW CONTROL VALVE** (See figure 6) will prevent gravity circulation and usually is required when tankless heater is installed.

II. AIR CONTROL SYSTEMS

- A. **DIAPHRAGM-TYPE COMPRESSION TANKS** are used to control system pressure in an **AIR ELIMINATING SYSTEM**: an automatic air vent is used to REMOVE air from the system water. See figure 6. If system pressure needs further control, add an additional tank or install a larger capacity tank. The automatic air vent should be installed in the top of the boiler, as in figure 6.
- B. **CONVENTIONAL COMPRESSION TANKS** (non-diaphragm type) are used to control system pressure in an **AIR COLLECTING SYSTEM**. Within the system, after initial start-up and venting, air is collected in the tank and acts in contact with the water to control pressure. Air is not vented from this system. If system pressure needs further control, add another tank in parallel with the original tank or install a large capacity tank. Locate the tank at the inlet end of the pump near the boiler. (See figure 7)

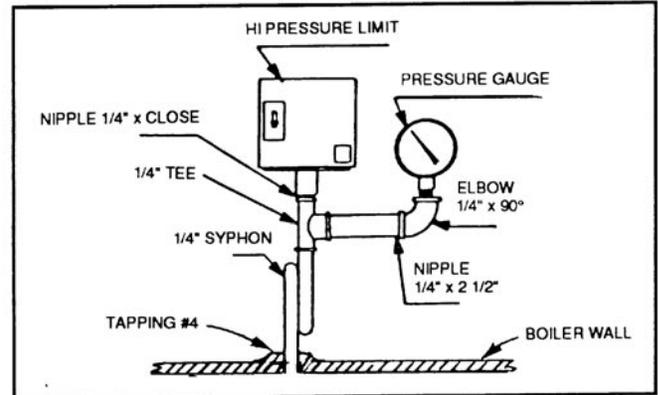


Figure 4.

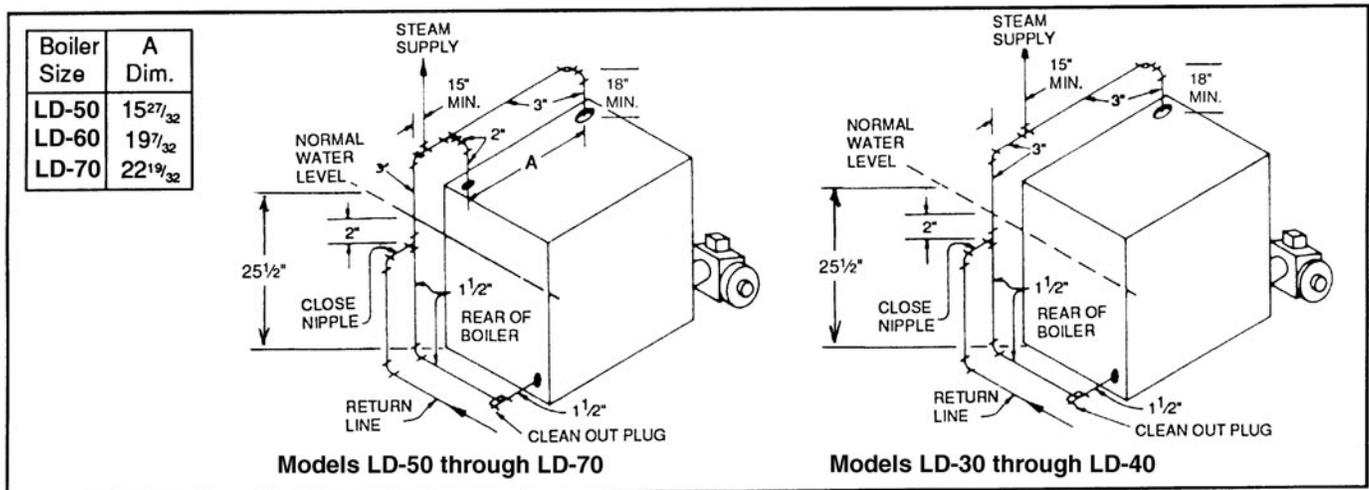


Figure 5. Recommended Steam Piping at Boiler

C. **HOT WATER RADIATION VENTING** - Manual air vents should be installed at the top of all "drops"(where piping goes downward).

Air must be vented or purged from all zone lines to permit proper system heating.

D. **PUMP LOCATION**-Locating low-head pump(s) on return to boiler is only acceptable in residences of one or two stories. (See figure 6) The pump location shown in figure 7 is required in large, multi-story building installations, especially when high-head pumps are used and is also recommended for all applications.

E. A conventional compression tank may be connected to the 3/4" tapping as shown in figure 7.

IMPORTANT: Hot water heating systems containing high water volume, such as would occur with cast-iron radiation, require special care with air elimination. The circulator pump should be located on the boiler supply pipe and the expansion tank and air scoop should be located near the pump suction. (See Figure 6, Alternate Pump Location.)

PIPING TANKLESS HEATER (if used)

I. Heater capacities are listed on Page 2.

II. Pipe the built-in tankless heater using the inlet and outlet tappings indicated on the heater (figure 8).

- Tempering valve (illustrated, but not furnished) is suggested to provide more volume of temperate water to kitchen and bath.
- High temperature water, for dishwasher and laundry, may be piped direct.
- A flow control valve should be used to control the rate of flow of water through the coil, otherwise the heating capacity of the coil will be exceeded. To insure sufficient hot water, the flow rate through the coil should be limited to a maximum shown for intermittent draw in the ratings table on page 2.

IMPORTANT: Escape pipes or drain pipes from relief valves, safety valves, blow-down valves, and low-water cut-off must be piped off to a safe place.

INSTALLING THE BURNER

See Burner Data, pages 14-18, and Burner Manual supplied with burner. If burner is not mounted as received, mount to boiler, placing flange over mounting studs. Use gasket between flange and boiler. Distance between flange and nose of burner must be as shown on pages 14-18. Check to see that nozzle and settings are as given in burner data tables, pages 14-18.

CAUTION: DO NOT USE GASOLINE, CRANKCASE DRAININGS, OR ANY OIL CONTAINING GASOLINE.

OIL SUPPLY PIPING

Install the oil tank or tanks and piping from tank to burner. Follow local codes and practices, NFPA No. 31, **INSTALLATION OF OIL BURNING EQUIPMENT** and the instruction sheet attached to the oil burner pump. A one-pipe system should be used for gravity-fed fuel systems and for lift systems, where the total lift is less than 8 feet. Where the total lift is greater than 8 feet, a two-pipe system must be used. In some instances, local codes may require a two-pipe system for below grade fuel oil tanks. Be sure to set-up the fuel oil pump for the piping system used; follow the instructions attached to the pump. Be sure to include a good quality, low pressure drop fuel oil filter in the supply line from the tank. This is necessary, especially at low fuel oil flow rates (small nozzle sizes), to prevent nozzle plugging. See Slant/Fin publication on one-pipe and two-pipe fuel oil systems.

WIRING THE BOILER

- The wiring diagrams for the burner and boiler may be found on pages 11-13.
- 24 volt control wiring should be approved Safety Circuit wire, protected as needed.
- Power supply wiring to the burner must be 14 gauge or heavier, as required, and should have a properly fused disconnect switch. 120 volt wiring to pumps and safety controls must also be 14 gauge or heavier. Wire must be enclosed in approved conduit.
- All wiring must be installed in compliance with the National Electric Code, or any local or insurance codes having jurisdiction.

Wiring to the boiler must come through an emergency power isolation switch with a clearly marked red switch plate. This switch should be located so that it is apparent to the homeowner when entering the basement or other boiler area. The homeowner should be made familiar with operating the toggle to provide or stop the power to the boiler.

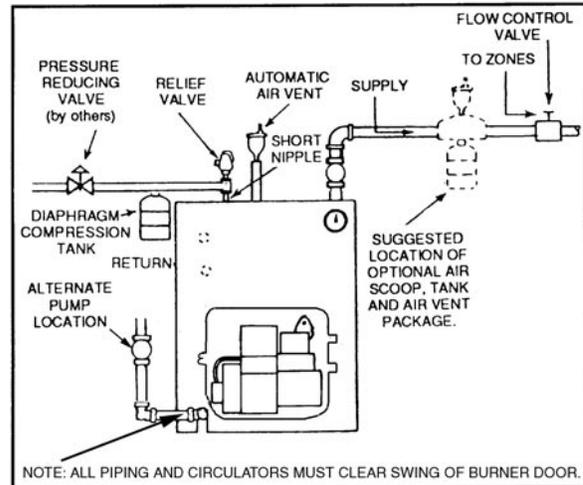


Figure 6. Air Eliminating System

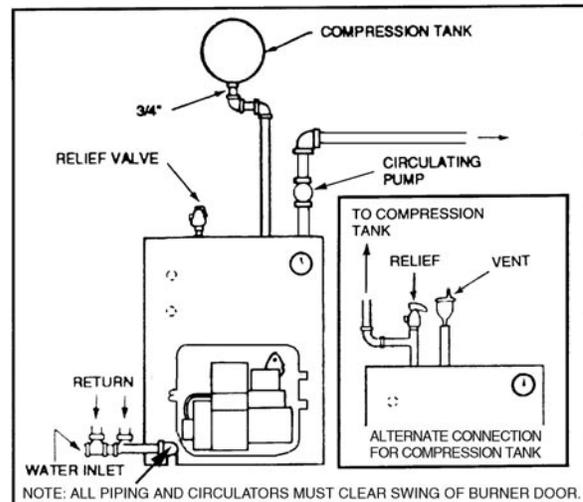


Figure 7. Air Collecting System

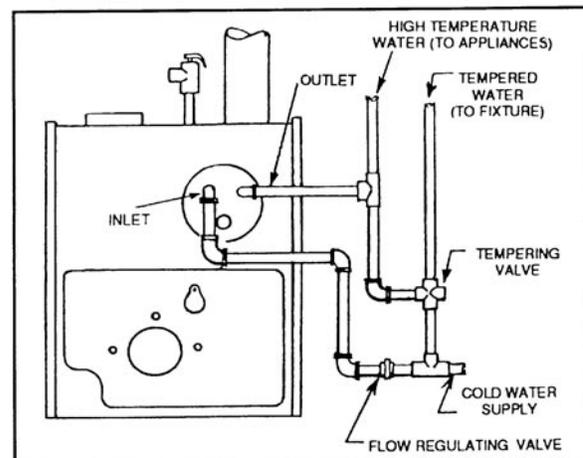


Figure 8. Recommended Piping to Tankless Heater