



ALTERNATE HEATING SYSTEMS USED-OIL FIRED FURNACE

Owner's and Operator's Manual

Models AHS250, AHS500



All Installations Must Be In Accordance With
State and Local Codes

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INTRODUCTION

The Alternate Heating Systems used oil-fired furnaces have been specifically designed for burning No. 2 fuel oil, used motor oil, transmission oil, and mixtures not exceeding 50 SAE. These furnaces have unique features not found in conventional furnace designs.

Alternate Heating Systems manufactures the furnace vessel to ASME standards. Used oil combustion technology differs significantly from burners designed for No. 2 fuel oil only. Additionally, used oil combustion in the furnace can produce adverse results not encountered in warm air heat exchangers.

Fast access to the fire tubes is provided by the large doors on the rear and front of the furnace. **CAUTION: Do not open the access door unless the power has been turned off.**

This furnace must be installed by a qualified technician, knowledgeable in hot water heating system design requirements.

These furnaces may have one or more hot water heating coils to produce domestic hot water for car washes, shower, etc. Consult the enclosed diagram for an appropriate method for piping the domestic coils. If the furnace coil serves hand taps it must have a tempering valve to ensure that excessively hot water does not contact humans.

IMPORTANT: Furnace temperature must be around 180^o.

If anything in this manual is unclear or technical assistance is required, contact your authorized representative or call Alternate Heating Systems at 717-987-0099.

GENERAL OPERATION AND INSTRUCTION

WATER PRESSURE

It is of utmost importance to maintain the water pressure. An automatic fill device is recommended.

WARNING: Never add water to a hot unit if the water level has fallen below the metal dome. Failure to allow the dome to cool could result in severe injury or death and damage to property.

OVERFLOW PIPE

Plumbing from the overflow pipe should direct the flow toward the floor, preferably near a floor drain.

BURNER DOOR

A lock nut and hair pin should always be used on the burner door to ensure that it does not open during operation.

STOP: BEFORE FIRING THE BURNER, THE FURNACE & HEATING SYSTEM MUST TO BE FULL OF WATER. Firing without the furnace being completely full **VOIDS** all warranty.

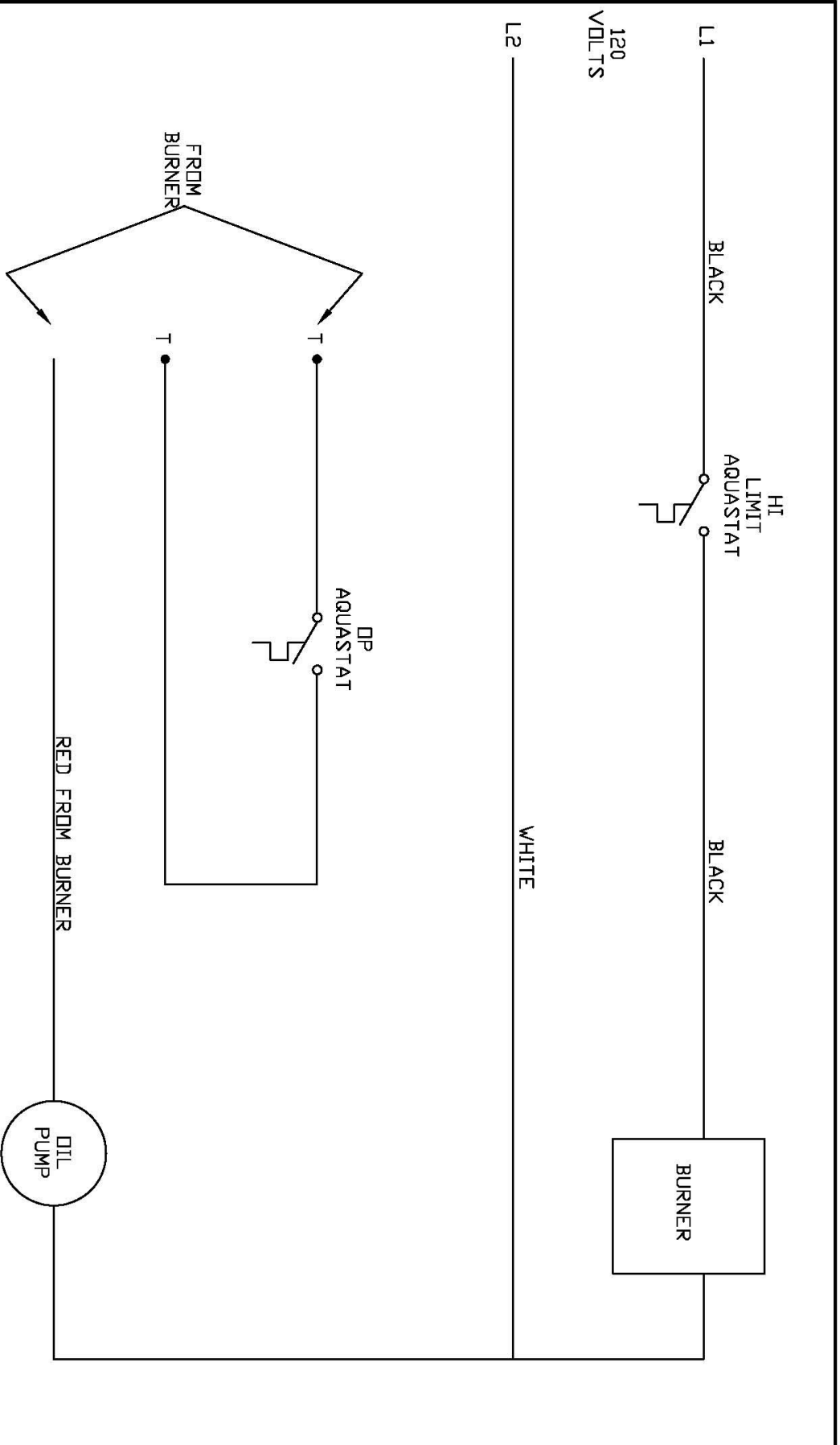
ELECTRICAL CONTROLS:

The AHS Furnace is designed to maintain a constant Furnace Temperature (Higher than 180⁰) controlled by the Operational Temperature Aquastat (OP) and the High Limit Aquastat (Hi) located at the top of each furnace. The OP Aquastat is in series with the Hi Limit Aquastat. The Hi Limit Aquastat is used only for safety. If by some means the operational aquastat allows the burner to operate over it's set point, the Hi limit Aquastat will shut the burner down some (most Hi Limits have a manual reset).

ELECTRICAL CONNECTIONS:

Heat is provided by the primary control on the burner. We have a very simple electrical hook up. When installing your burner to the AHS Waste Oil Furnace, just locate the cable with 2-conductor thermostat wire (red, white, black) coming from the junction box on the side of the furnace to your burner. Then find the thermostat "T" terminal screws on the primary control and attach 1 wire to 1 "T" screw and the other wire to the other "T" screw. See Illustration on the next page. The **red** wire is for oil pump power, the **white** wire is neutral and the **black** wire is power.

AHS250 & AHS500 WASTE OIL FURNACES ELECTRICAL SCHEMATIC



GENERAL INFORMATION			
PROJECT NO.	DRAWING NO.	DATE	REV.
1000	AHS FURNACES	08-08-08	0
ALTERNATE HEATING SYSTEMS			
AHS FURNACES			
AHS250 - AHS500			
DRAWN BY: B-H			
CHECKED BY: JLT			
SCALE: DRAWING NOT TO SCALE			
A ELEC. SCHEM.			

CODE INFORMATION

Purchase of an Alternate Heating Systems, LLC multi-oil furnace is a wise investment. To maximize the return of this investment you must read the manual.

You can expect years of reliable performance with a properly installed and maintained system.

NOTE: THIS FURNACE CANNOT BE INSTALLED IN A RESEIDNTIAL HOME.

The installation of the equipment shall be in accordance with the codes and regulations of authorities (state or local) having jurisdiction over environmental control, fuel, fire and electrical safety. The installation of equipment in the United states must consider the requirements of the following publications of the National Fire Protection Association, Battery March Park, Quincy, Massachusetts 02269.

N.F.P.A. No 30	Flammable and Combustible Liquids Code
N.F.P.A. No. 31	Standard for Installation of Oil Burning Equipment
N.F.P.A. No. 88A	Standard for Parking Structures.
N.F.P.A. No. 88B	Standard for repair Garages.
N.F.P.A. No 211	Standard for Chimney, Fireplaces, Vents and Solid Fuel Burning Appliances.

The installation of equipment in Canada must consider the requirements of C.S.A., Standard B 139, Installation Code for Oil Burning Equipment.

NOTE: Installation, operating and maintenance permits from each of the above authorities may be required, as well as municipal permits.

Please read and save your manual for future reference. Read your installation manual thoroughly first in order to insure that you're new heating system operates properly.

Minimum Clearances Between Furnace and Combustibles:

Above 12"	Chimney Connector 18"
Sides 24"	

Rear 36”
Front 36”

This furnace is listed for burning #2 fuel oil, used motor oil, and transmission oils with mixtures not exceeding 50 S.A.E.

DO NOT BURN unknown garbage oils, gasoline, and naphtha or chlorinated cleaning solvents in this furnace.

WASTE OIL FURNACE INSTALLATION

Sizing Furnace Correctly

In order to make a prudent choice when determining the size of a waste oil furnace required for an installation, it is necessary to do a heat loss survey of the building.

If the unit is equipped with a domestic hot water coil, this fact will need to be considered when sizing. Drawing hot water at a rate of 3 gallons per minute requires approximately 150,000 BTUH, assuming a temperature rise of 100 degrees F. (55 Degrees C.). Other unusual factors such as supplying heat for a pool or hot tub should be considered.

Rigging and Positioning of Furnace

Do not attempt to move or off-load the furnace without the aide of a crane or dolly. Most waste oil models have a lifting lug in the center of the top while on some units two lifting lugs in the front and rear are provided.

Once on the floor level where it will be installed, the unit may be rolled on pipe or by means of a pallet jack. The waste oil furnace must be placed on a concrete slab, or other rigid pad of non-combustible material, with sufficient strength to adequately support the furnace, including its contents of water.

AHS WASTE OIL FURNACE SPECS		
	Model 250	Model 500
Waste Oil GPH approx.	1.75	4.0
Gross BTUH approx.	240,000	500,000
Heating surface fireside (sp. Ft.)	36 Sq. Ft.	73 Sq. Ft.
Water volume (gals) approx.	110 Gal	225 Gal
Boiler length	37”	67”
Boiler width	41 ½”	38”
Boiler Height	47”	43”
Flue Diameter	8”	8”
Shipping weight approx.	1,260 lbs	1,640 lbs

*Specification and design subject to change without notice.

FURNACE ROOM REQUIREMENTS

- a. Room should be well lighted and should have a source of emergency light.
- b. Convenient water supply available for furnace flushing and to clean the furnace room floor.
- c. Unobstructed floor drains.
- d. Must have adequate air supply, which must be kept clear at all times.

Since the combustion process requires a supply of air at all times, it is essential that provisions are made to supply adequate air to the furnace room. This air supply is necessary to insure complete combustion, a clean fire and to prevent nuisance shut downs due to excessively dirty burner parts. Air from the outside may be provided through ducts, fixed louvers or motorized louvers.

BOILER CONDITIONER/SEALANT

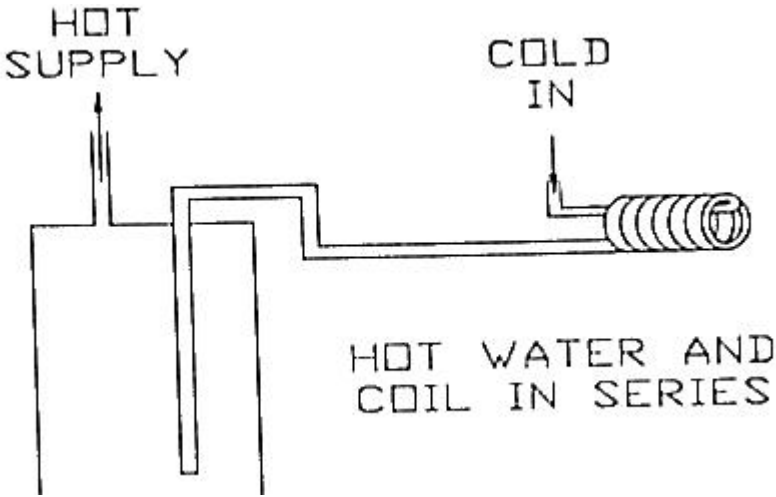
AHS provides two bottles of Boiler Conditioner/Sealant with the purchase of your boiler. When filling your boiler with water for the **first** time, mix content of each bottle with 2 gallons of warm water. Pour into boiler opening. Replace plug. An MSDS is available upon request.

INSTALLATION OPTIONS

Domestic Hot Water Coil

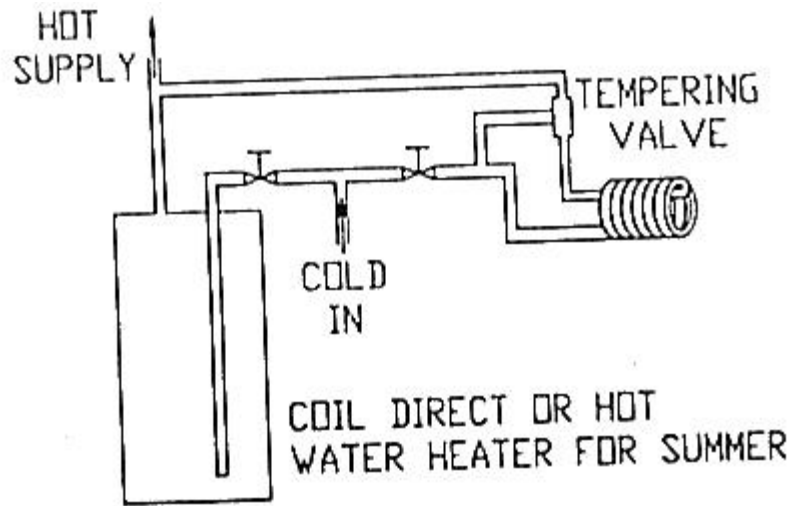
These coils can be factory or field installed. Coils are rated at 5 GPM. The coils can be used for domestic hot water and wash bays. You can also use these coils to pre-heat water in hot water heaters.

There are three methods for plumbing the domestic coil. One way is to connect the coil in series with an existing hot water heater.



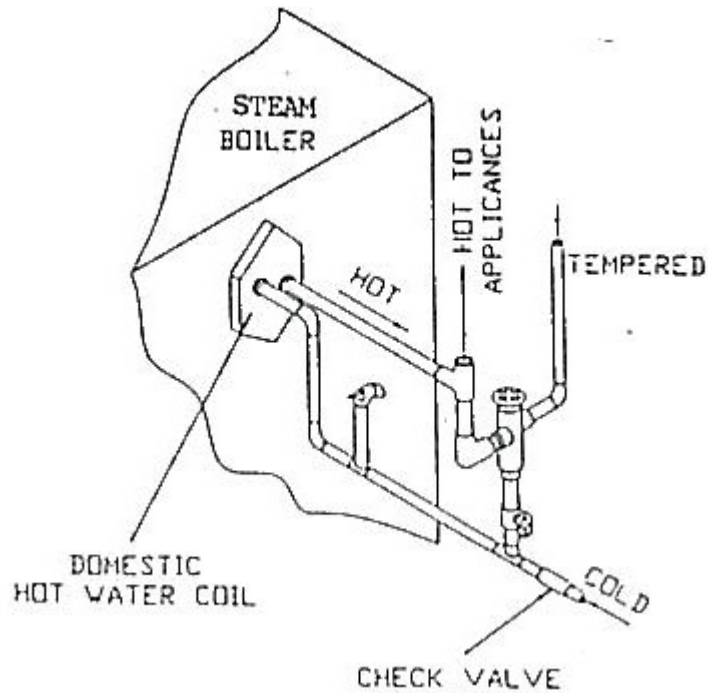
PLUMBING – COIL IN SERIES

A second method is to connect the coil in parallel with an existing water heater so that the conventional water heater may be used when the waste oil boiler is not being fired, in the summer, for example. The diagram below indicates how this can be done.

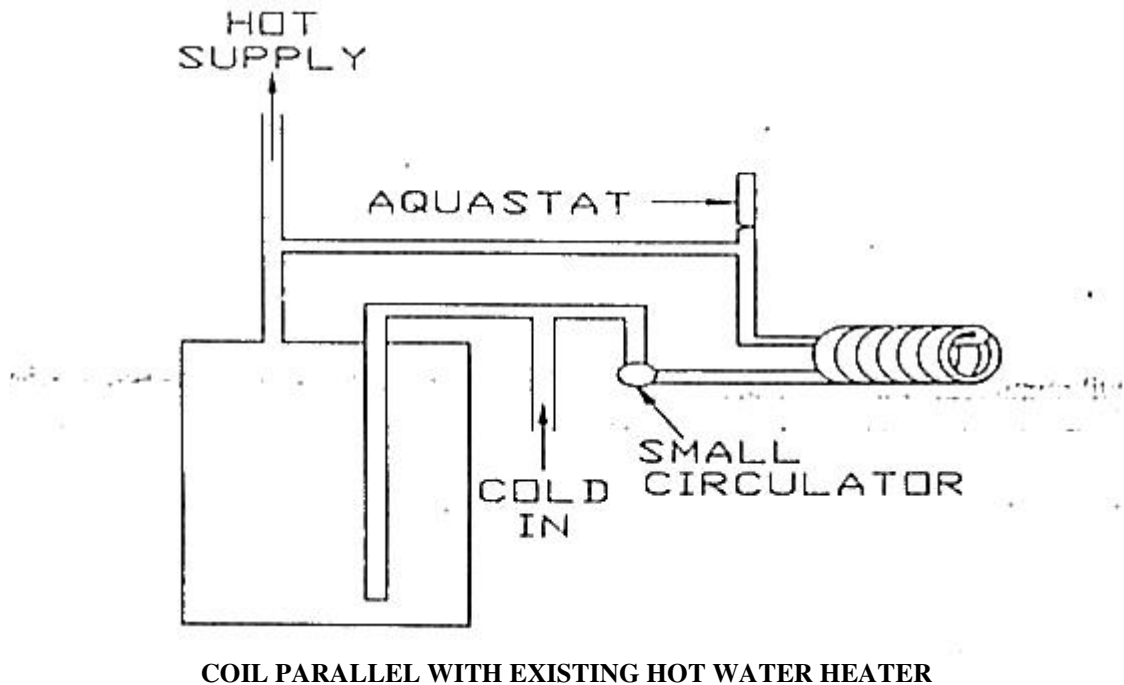


PLUMBING – COIL IN PARALLEL

NOTE: Installation where the coil discharges directly into the hot water distribution system, a tempering valve must be included to limit the temperature of the water at the faucet to a safe level.



The third method uses a small pump to circulate water continuously between the coil and existing hot water heater. It is also necessary to include a tempering valve on the supply side of the storage tank/water heater.



ADDITIONAL INFORMATION:

- Each gallon of water circulated through the system delivers a definite quantity of heat which is dependent on the water temperature drop for which the system is designed. Water temperature drop is the difference between the temperatures of the water leaving the furnace and the water returning to the furnace.
- It will be noted that the smaller water temperature drops result in less BTU/H capacity per GPM. This means an increase in the GPM requirements of the pump. It has been found that a 20-degree water temperature drop usually provides the most economical selection of pump and pipe sizes.
- It should be noted that under actual operating conditions the temperature drop usually is considerably less than that for which the system is designed and will not appreciably affect the outputs of the heat distributing units. The temperature drop provides a starting point for determining the number of BTU/H which will be delivered to the heat distributing units by the circulation of each gallon of water per minute.
- In accordance with the definition of a BTU, if one pound of water drops one degree Fahrenheit as it circulates through the forced hot water heating system, then one BTU is given off. A gallon of water, weighing approximately 8.3 lbs. At the temperatures used in a system, will give off 8.3 BTU if it drops one degree as it is circulated through the system. One gallon per minute for 60 minutes, or one hour, will, if it drops one degree, give off $8.3 \times 60 = 498$ BTU/H.

- Using 500 rather than 498 for easier figuring, the design water temperature drop multiplied by 500 is the BTU/H (BTU per hour) delivered by the system when one GPM is circulated through the system.

- The proper pump capacity is determined by dividing the calculated BTU/H heat loss of the structure by the BTU/H carrying capacity of each gallon per minute calculated. In a system designed for a 20 degree water temperature drop, one GPM equals 10,000 BTU/H.

FURNACE MAINTENANCE

- Disconnect all incoming electrical power prior to servicing this furnace.
- Use extreme caution around furnace piping and the McDonnell & Miller low water cut off since they may be hot (if provided).
- Accumulation of ash produces numerous adverse effects. Reduced heat transfer (U.S. Bureau of Mines) Research by the U.S. Bureau of Mines has determined that 1/32-inch of soot coating causes 9.5% loss of furnace efficiency. The following table shows how soot thickness effects efficiency

1/32 – inch of soot	9.5% loss of efficiency
1/16 – inch of soot	26% loss of efficiency
1/8- inch of soot	45% loss of efficiency
3/16 – inch of soot	69% loss of efficiency

- The life of your furnace can only be measured by the care given to it by those who are charged with the responsibility of furnace maintenance. A log of the following items should be maintained in the furnace room at all times. A sample recording sheet is the rear of the section.

Daily furnace check/maintenance list

1. Observe operating levels are normal.
2. Observe operating temperatures are normal
3. Listen for any unusual noises and correct as necessary.

Weekly furnace check/maintenance list

1. Observe condition of flame.
2. Check fuel valves-open limit switch and make aural and visual check.
3. Check fuel supply.
4. Observe operation of circulating pump(s).

Monthly furnace check/maintenance list

1. Test flame detection devices.
2. Test limit controls
3. Test operating controls
4. Check furnace room floor drains for proper operation
5. Inspect fuel systems in furnace room.
6. Check condition of heating surfaces.
7. Perform draft and combustion test.
8. Test low water cut-off.
9. Check coil plate and spud gaskets.

Annual furnace check/maintenance list

1. Routine burner maintenance.
2. Routine maintenance of circulating pump(s).
3. Combustion and draft tests.
4. Inspect furnace room louvers or fresh air intake.

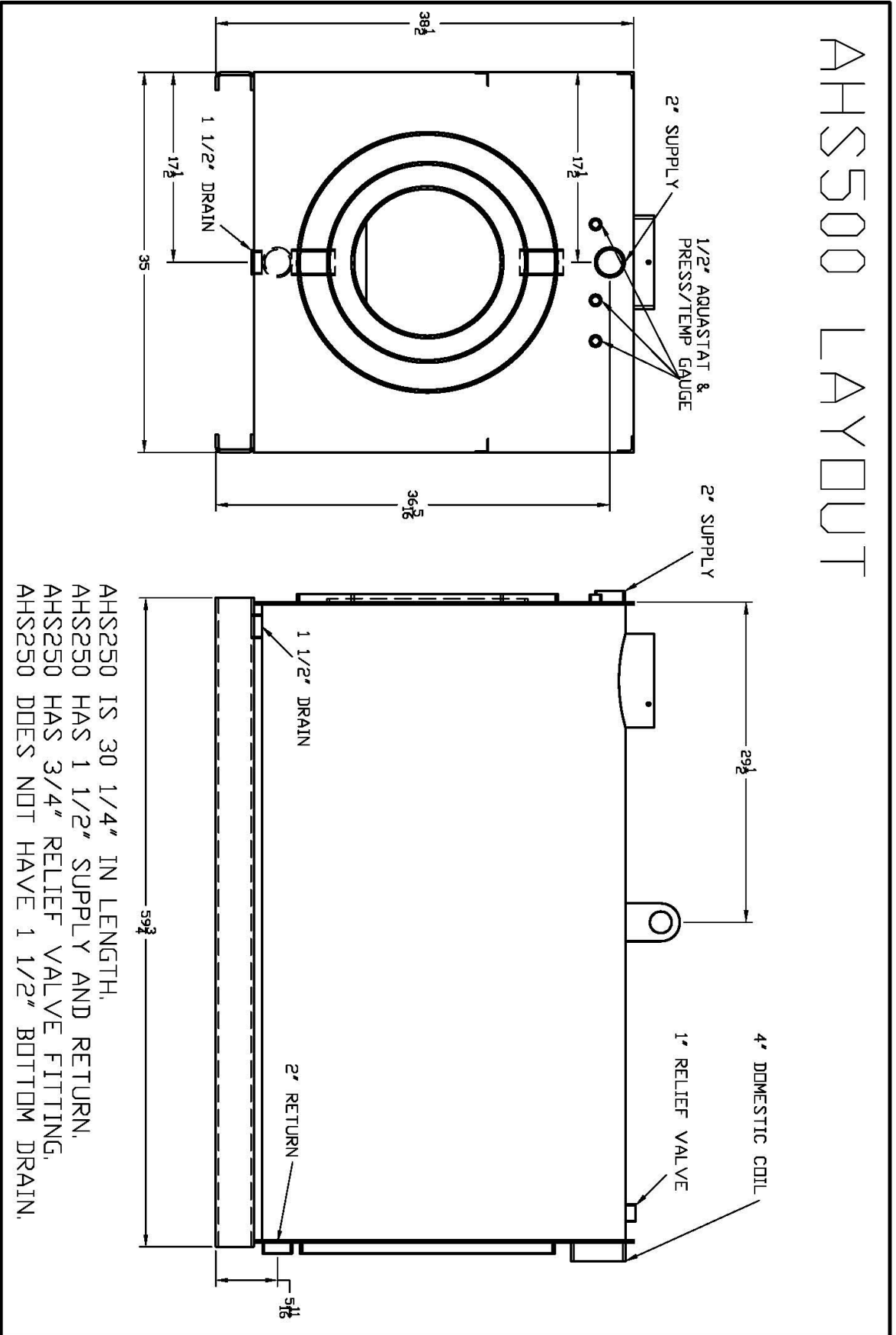
Cleaning the Flue Passages

NOTE: When cleaning waste oil appliance, use appropriate respirator and apparel. Be sure electric power is OFF before opening access doors.

Under normal operating conditions the flue passages will need to be cleaned. If excessive soot has built up on the flue passages they can be cleaned following this procedure.

1. Open the front cleanout doors. Care must be taken when removing these doors not to damage the insulating ceramic board. Be sure electric power is off to prevent accidental burner firing.
2. Remove the smoke hood access panel and gasket on rear of furnace.
3. Using a flue brush, brush the accumulated soot and scale starting in the rear of the furnace brushing the top, proceed to brush down the heat exchanger.
4. Brush the side wall of the firebox through the burner opening.
5. Carefully vacuum the soot and scale which is now laying in the chamber of the furnace.

AHS WASTE OIL FURNACE DIAGRAM:



Maintenance, Testing and Inspection Log

Hot Water Heating Boilers

Building: _____

Address _____

Month: _____

Year: _____

Fuel Type: _____

Boiler No: _____

Person(s) to be notified in Emergency (Name & Telephone No.) _____

DAILY CHECKS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
(1) Record Pressure																															
(2) Record Boiler Water Temperature																															
(3) Record Flue Gas Temperature																															

WEEKLY CHECKS (Enter Date)

	WEEK 1	WEEK 2	WEEK 3	WEEK 4
(1) Observe Flame Condition				
(2) Observe Circulating Pumps				

MONTHLY CHECKS (Enter Date)

	(A) Flame Detection Devices	(F) Refractory
(2) Review Condition of or Test each item	(B) Limit Controls	(G) Stop Valves
	(C) Operating Controls	(H) Check Valves
	(D) Floor Drains	(I) Drain Valves
	(E) Fuel Piping	(J) Linkages

(3) Observe Gauge Glass on Expansion Tank

(4) Combustion Air Adequate / Unobstructed

General Comments: