PLAINTIFF'S EXHIBIT

ASI-797

AMERICAN STANDARD

OIL BURNER INSTALLATION INSTRUCTIONS AND BURNER SPECIFICATIONS FOR PBA-3 BOILERS

AMERICAN STANDARD

PLUMBING & HEATING
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GENERAL INFORMATION

This manual is to be used in conjunction with the appropriate PFA-3 boiler manual. The boiler should be assembled, tested, and the boiler controls installed before the burner is unpacked and serviced for installation. All electrical and oil lines should be run adjacent to the boiler-burner installation. It is important that the serviceman and installer have the following instruments available for proper testing, adjustments, and servicing the burner:

CO_2 Test Instrument
Smoke Tester
Draft Gauge (Inclined tube .0 to 1.0 inch)
Oil Pressure Gauge
Oil Vacuum Gauge
Multi-Meter
Flame Mirror

The burners covered by this book have been specifically designed and tested for the boiler-burner units involved. At the rear of this manual are specific charts showing "Air Handling Data", "Burner Data", and various parts data. For proper burner operation the dimensions shown should be strictly adhered to.

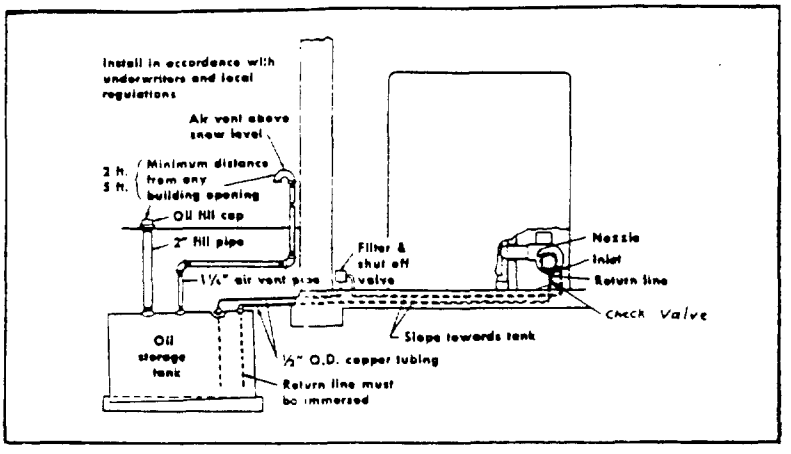
AIR FOR COMBUSTION

It is necessary to have sufficient outside air for combustion to be supplied at all times to the Boiler Room. A permanent opening or duct should be provided such that the boiler input will not exceed 5000 Btuh/square inch of free area. The air inlet opening should be located at a point where it cannot be covered with snow or where it cannot be obstructed by any other means. Movable louvers should not be used. Never depend on an open door that can be closed for the air inlet or rely on cracks under doors or around loose windows.

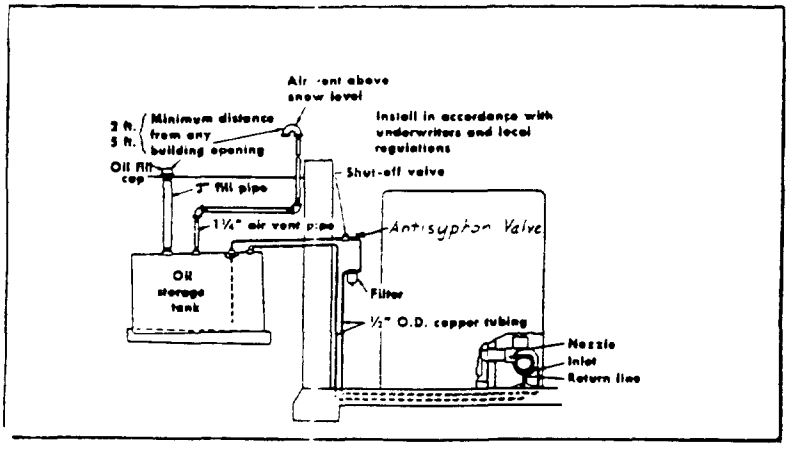
FUEL SYSTEM

All Burners are furnished with two-stage fuel units. Two-pipe systems are recommended. Refer to Fuel Unit Literature for proper vacuum, pipe sizes, etc. Suggested piping is illustrated below.

FUEL-UNIT ABOVE TANK, TWO-PIPE SYSTEM



FUEL-UNIT BELOW TANK, TWO-PIPE SYSTEM



PREPARATION OF BURNER FOR INSTALLATION ON BOILER

1. Insert proper nozzle. (See "Nozzle Data" in charts of this manual.)
2. Check nozzle settings as shown in this manual.
3. Check electrode settings as shown in this manual.
4. Be sure all parts and settings agree with those shown in this manual.
5. Set drawer assembly to middle position on side of housing. .
6. Burner is now ready for installation on boiler mounting plate.

ELECTRICAL POWER CONNECTION

Check burner, this manual, and wiring diagrams for the proper power supply to be connected to burner and controls. Note that all burners are factory wired, eliminating field wiring as much as possible.

START -UP AND FINAL ADJUSTMENTS

1. Make sure that flue damper in PFA-3 boiler is in full open position. (To be adjusted later if required.)
2. CAUTION Make sure there is water in the boiler and that there is oil in the oil line to prevent burn-out of Fuel Unit.
3. Connect oil lines to burner.
4. Connect electrical power wiring to burner and boiler controls.
5. Set air adjustments on burner to half open position. (These adjustments are temporary and will probably have to be changed to achieve proper smoke and CO_2 readings.
6. Turn on power to burner.
7. Set limit and operating controls to desired settings. Burner should start.
8. Check smoke characteristics immediately. Adjust air to get No. 2 smoke or less.
9. Check oil pressure. Should be 100 P.S.I.

10. Check CO_2 reading (should be 12% ± 1%)

11. Check Out Operation of:

Limit Control	Ignition Characteristics
Operating Control	Burner Safety Circuit
Low Water Cut-Off	Re-check CO_2 and Smoke Readings

SERVICE TIPS

The following information has been compiled to assist the installer and serviceman in locating and correcting service problems with our "LC" series burners. These burners are equipped with 3450 r.p.m. motors and pumps, one-stage firing, and with flame retention.

All of the models can be fired with draft or with pressure in the firebox. (See boiler installation manual for maximum allowable pressure in the firebox.)

A forced draft burner supplies all the air for combustion and can be fired in a boiler with natural draft, induced draft or with no draft.

Pressure firing is a term used when there is pressure in the firebox during the burner operation. The pressure is produced by the resistance through the boiler or furnace and the combustion air supplied by the burner.

AIR FOR COMBUSTION

If lack of combustion air is suspected, close the door to the boiler or furnace room and operate the burner for at least 30 minutes. If the flame appears to become gassy and tends to snuff out, insufficient combustion air is the cause and corrective measures must be taken to provide the proper amount of air.

BLOWER WHEELS (FANS) - VIBRATION

If undue vibration is detected in the burner, it could be caused by the blower wheel being out of balance. Check to determine if any foreign matter has been drawn into the burner and lodged in the blower wheel. If not, replace the blower wheel. Remove the motor from the burner and run it without the blower wheel to determine if there is any undue vibration. Replace the motor if the operation is not smooth. When installing a new blower wheel in the burner, it is very important that it be secured tightly to the motor shaft.

The replacement blower wheel must be located on the motor shaft so that the set crews bear on the center of the flat on the 1/4 H. P. motors. Make sure that the set screws on blower wheels are securely tightened. There should be adequate clearance on both sides of the blower wheel in the housing.

The blower wheels used in the burners are dynamically balanced for operation at 3450 r.p.m. and any replacement should be an exact duplicate of the original.

DRAFT

The burners are designed for firing against pressure in the firebox, but operate just as satisfactorily in a natural draft installation.

It is important that the vent or chimney be located so as to be free of downdrafts. Forced draft burners can operate with back pressure in the boiler and flue pipe, but strong surges of down draft can cause the fire to become smoky and erratic. After a shut-down the heat in the combustion area could damage the burner if it is forced back through the burner by down-drafts. It may be necessary to increase the height of the vent or chimney above the building and in some instances install a dutch cap or similar appliance to prevent downdrafts.

FUEL SYSTEM

The burners can be installed with a single line if no lift from the oil tank is involved. If a long single line is used, it should be large enough in diameter so that the vacuum reading on the fuel unit is no more than 10 inches. If the oil tank is below the level of the burner, use a two-line system.

If two or more burners are piped to a common suction line, each burner must have its own check valve.

If the pressure gauge on the fuel unit shows the 100 p.s.i. cannot be obtained, the fuel unit should be replaced. The quick cut-off pumps used should never be adjusted above 100 p.s.i.

A pressure gauge and a vacuum gauge should be used if a fuel unit problem is suspected. If the pressure is excessive, such as 125# to 150#, check the flame base at the flame retention cup. Excessive pressure may cause the flame to lift away from the spinner. The pressure should be maintained at 100#.

Refer to the fuel unit manufacturers data for the proper vacuum for the installation. If the vacuum reads higher than the calculated vacuum (see manufacturer's instructions) check for restrictions in the oil line, excessively long lines, closed tank valve, kinked copper tubing, plugged oil filter, frozen oil line, undersized oil line, excessive oil lift or a restricting check or foot valve. If the vacuum reads low, look for air leaks in the suction line, valve fittings or fuel unit. On a gravity flow installation, no vacuum will be shown on the gauge except where there are restrictions caused by a closed valve, plugged oil filter, kinked, undersized, or excessively long suction line.

All restrictions must be eliminated and undersized or excessively long lines replaced with lines of a greater diameter so that the vacuum reading will be no more than 10 inches.

A singing sound in the fuel unit may indicate air in the suction line. Excessively high vacuum can also cause noise in the fuel unit. Air in the suction line can cause delayed lighting. This condition will in time coat the photocell with carbon and safety shut-downs may result.

If it is suspected that the oil is returning to the tank after shut-down, inspect for leaks in the suction line and check valve. If the check valve is not seating properly and there is a slight air leak in the suction line, the oil will flow back to the oil tank. On the next start up of the burner, there will be a delay in the oil delivery while the pump is lifting the oil from the tank. Repair any air leaks and replace the check valve if necessary.

IGNITION PROBLEMS

Hard (rough) lighting can be caused by ignition problems. Check the transformer for adequate spark. Check for a spark by momentarily short circuiting the transformer across the terminals by use of a screwdriver with an insulated handle. A 3/4" long spark should be obtained. If there is no spark or if the spark was weak (less than 1/2 inch), replace the transformer. Check the spark gap with the dimensions in the installation manual.

With standard control systems the spark should appear immediately when the burner starts. If a delay is detected, check the power supply to the burner. When a condition of this type is suspected, the best check is to have a voltage recorder connected to the burner for a period of 48 hours. This will indicate any voltage drop during that period. Voltage drops are usually caused by undersized wiring or a long run from the burner to the source of power. If delayed ignition is not corrected, it could cause an explosion.

Ch[illegible] the drawer assembly for possible high voltage leaks in the insulators. If in doubt, change the electrode assemblies. Check the electrode springs and points for adequate clearance to the ground. Check for carbon on the electrode points. Check all dimensions on the drawer assembly according to the dimensions shown in the manual and reset if necessary.

If the cup is not correctly positioned in relation to the end cone hard lighting could occur. This is usually caused when the cup is positioned too far back inside the end cone. To correct this condition, loosen the screw that locks the drawer assembly in place and move the assembly forward in steps of 1/16 of an inch until the lighting is smooth.

Be sure to tighten the set screw after making this adjustment and check the electrode springs from the electrodes to the transformer, making sure there is adequate clearance to a ground and there is no possibility of a short circuit.

If the fire is clean with no smoke while in operation, but the heating unit continues to become coated with soot, check for short cycles on the burner. Short cycling will eventually cause hard lighting due to carbon on the spinner and nozzles. Under these conditions the limit control on the heating unit should be set with a greater differential.

INSTRUMENTS

In most forced draft units it is impossible to view the flame satisfactorily so instruments must be used to properly adjust the flame.

Do not attempt to obtain a higher percentage of CO_2 than a clean fire will give. Keeping the heating surface of the unit clean is more important than securing a higher percentage of CO_2. Set the flame at no more than #2 on the Bacharach scale.

NOZZLES

Use only the nozzles recommended for they are of the proper type, capacity and spray angle, and these nozzles should give the best performance in each burner and unit combination under normal conditions.

However, because of the great variation in fuel oils in different localities, normal conditions do not always apply. Nozzles will not always deliver the gallons per hour or the spray angle with which they are marked, and in some instances nozzles other than those furnished as original equipment could give better performance.

The nozzles used should give smooth lighting and be able to produce a CO_2 reading of 10.5 to 12.5 percent with no more than a #2 smoke.

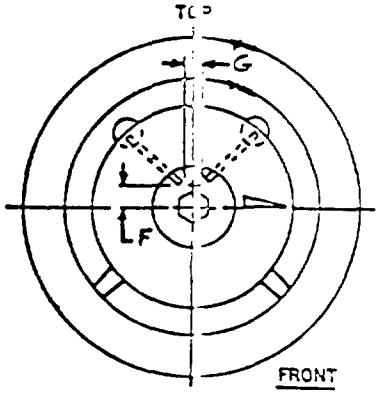
Do not attempt to install the nozzle through the end cone. It is impossible to get a tight joint between the nozzle and the adapter unless two wrenches are used. Remove the drawer assembly from the burner and then remove the cup before installing the nozzle.

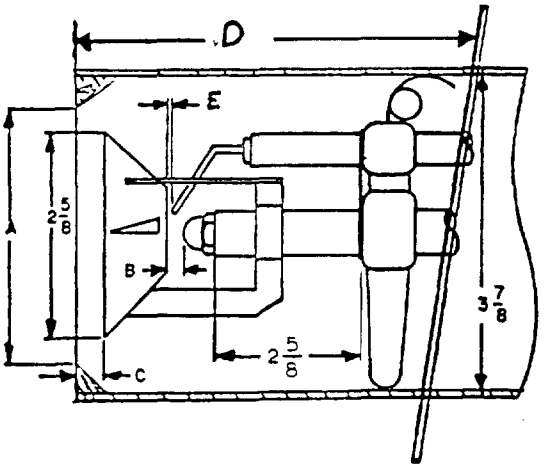
BURNER ADJUSTMENT SETTINGS

Boiler Number	Burner Model No. & Spec. No.	"A" I. D. Of End Cone	"B" Nozzle To Back of Cup	"C" From Face of Cup To End Cone
PFA-34	LC334-A3/1171	3"	1/4"	3/16" to 1/4" *
PFA-35	LC334-A/1172	3-1/4"	1/4"	1/16" to 1/4"
PFA-36	LC534-A/1173	3-9/16"	1/4"	1/16" to 1/4"
PFA-37	LC534-A/1173	3-9/16"	1/4"	1/16" to 1/4"

* CUP EXTENDS IN FRONT OF END CONE ON PFA-34 BOILERS

Boiler Number	Burner Model No. & Spec. No.	"D" Burner Flange To End of Air Tube	Electrode Settings "E" Back of Cup To Electrode Points	Electrode Settings "F" Centerline Nozzle up To Electrodes	Electrode Settings "G" Spark Gap
PFA-34	LC334-A3/1171	2"	1/32"	1/4"	1/8"
PFA-35	LC334-A/1172	2"	1/32"	1/4"	1/8"
PFA-36	LC534-A/1173	2"	1/32"	1/4"	1/8"
PFA-37	LC534-A/1173	2"	1/32"	1/4"	1/8"





AIR HANDLING DATA

Boiler No.	Burner No. & Spec. No.	IBR Boiler Rating GPH	End Cone Data I. D.	End Cone Data Part No.	Cup Data O.D.	Cup Data Part No.
PFA-34	LC 334-A3/1171	2.65	3"	C51671	2-5/8"	A40752
PFA-35	LC 334-A/1172	3.30	3-1/4"	C61681	2-5/8"	A40752
PFA-36	LC 534-A/1173	3.95	3-9/16"	C51691	2-5/8"	A40752
PFA-37	LC 534-A/1173	4.60	3-9/16"	C51691	2-5/8"	A40752

Boiler No.	Burner No. & Spec. No.	Stabilizer Ring Part No.	Disc Data O. D.	Disc Data Part No.	Nozzle Data Qty. Used	Nozzle Data Size G.P.H.	Nozzle Data Spray Angle	Type
PFA-34	LC 334-A3/1171	A41181	2-1/4"	S40904-3	1	2.50	70	B
PFA-35	LC 334-A/1172	A41181	2-1/4"	S40904-3	1	3.25	45	S
PFA-36	LC 534-A/1173	A41181	2-1/4"	S40904-3	1	4.00	45	S
PFA-37	LC 534-A/1173	A41181	2-1/4"	S40904-3	1	4.50	~~80~~45	S

BURNER RATING CAPACITY CHART

Boiler Number	Burner No. & Spec. No.	Gallons Per Hour Min.	Gallons Per Hour Max.
PFA-34	LC334-A3	2.00	4.00
PFA-35	LC334-A	2.00	5.00
PFA-36	LC534-A	3.00	6.00
PFA-37	LC534-A	3.00	6.00

TRANSFORMER

Allanson Mfg. Corp. - Niagara Falls, New York

Burner Model	Sunray Part No.	Manufacturer Name	Manufacturer Part No.	Type	Burner
LC334-A3					
LC334-A					
LC534-A	M51072	Allanson	452		

TWO-STAGE FUEL UNITS FOR OIL BURNERS

Sundstran Hydraulics - Rockford, Illinois

Burner Model	Sunray Part No.	Manufacturer Name	Manufacturer Part No.	Shaft DIA.	Shaft FLAT
LC334-A3 LC334-A LC534-A	P40072	Sundstrand	H3BA200	7/16"	1-3/16"

MOTORS FOR OIL BURNERS

Marathon Electric Mfg. Corp, Wausau, Wisconsin

Burner Model	Sunray Part No.	MFRS. Part No.	H. P.	Frame	Voltage and Cycles	Type	Shaft DIA.	Shaft FLAT
LC334-A3 LC334-A LC534-A	M40061	48S34S3B	1/4	48-6	115-60	split phase	1/2"	1-3/8"

BURNER MOUNTINGS

PARTS INFORMATION

American-Standard Boiler No.	Burner Model No. And Spec. No.	Air Tube Part No.	Welded Flange & Air Tube Assembly Part No.
PFA-34	LC334-A3/1171	---	A51232-7-3
PFA-35	LC334-A/1172	---	A51242-7-3-1/4
PFA-36	LC534-A/1173	---	A51262-7-3-9/16
PFA-37	LC534-A/1173	---	A51262-7-3-9/16