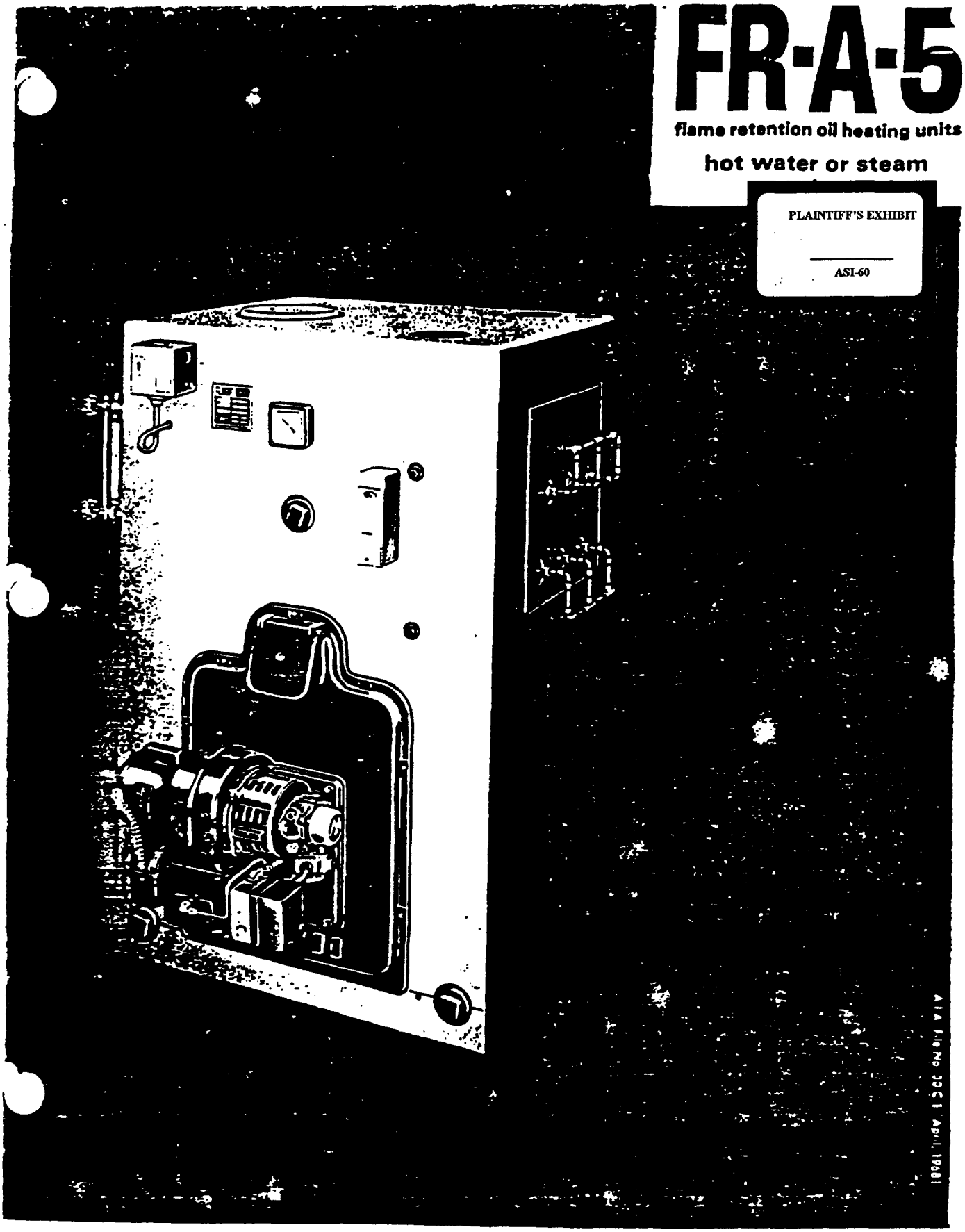
FR-A-5

flame retention oil heating units

hot water or steam

PLAINTIFF'S EXHIBIT

ASI-60

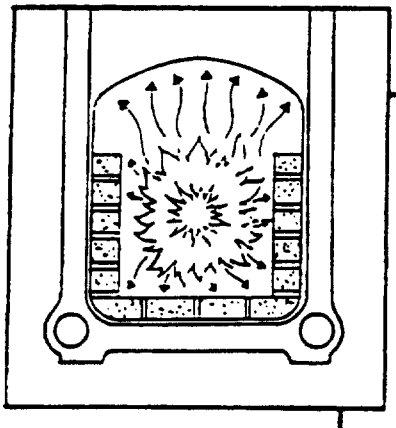


A I A File No 30C 1 April, 1968

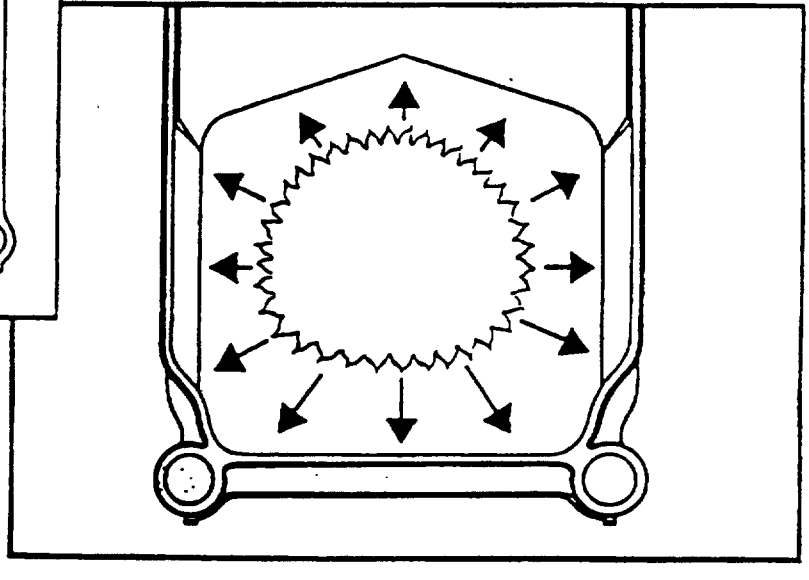
FR-A-5 flame retention oil heating unit — more Btu's at no extra cost

The new American-Standard FR-A-5 oil heating unit operates at greater efficiency and with higher outputs than comparably sized conventional boilers —yet it costs no more! The superior flame retention burner and improved interior design make it possible. The new FR-A-5 is available in 8 sizes for steam, forced circulation and gravity hot water. With an I=B=R approved output range of 384,000 to 1,000,000 Btuh, it's ideal for installation in large homes and all commercial and industrial buildings. And installation is quicker, easier, too. For example, FR-A-5 units need no combustion chamber — a big help on the job and no worry about future replacement. Make it the FR-A-5 on big oil jobs!

Flame Retention Burner—uses a high speed fan in the housing and a special 12-blade spinner at the nozzle to produce an air-oil mixture so finely vaporized that every drop of fuel is burned. The flame is steady, quiet and concentrated into a well-defined pattern. More heat is generated; efficiency is improved; ratings are higher.



With conventional burner, flame pattern varies, chamber is needed to support combustion.



The flame retention burner requires no chamber to support combustion, therefore, the wet base becomes primary heating surface.

plus all these quality American-Standard features—

- Lifetime cast iron sections tested at 2½ times normal operating pressure
- Sturdy steel jackets, attractive gray finish, fully insulated
- Light-sensing primary controls
- Internal coil for domestic hot water

FR-A-5 ratings

unit number●		gross I=B=R output (Btu/hr)	net I=B=R ratings▲			I=B=R burner● capacity (gph)	chimney		water content full (gallons)
water	steam		water (Btu/hr)	steam (sq. ft.)	steam (Btu/hr)		size (in.)	height (ft.)	
FR-A-504-WB(T)	FR-A-504-SB(T)	384,000	333,900	1200	288,100	3.55	12x12	15	57.7
FR-A-505-WB(T)	FR-A-505-SB(T)	472,000	410,400	1475	354,100	4.30	12x12	20	66.7
FR-A-506-WB(T)	FR-A-506-SB(T)	560,000	487,000	1750	420,100	5.10	12x12	20	75.5
FR-A-507-WB(T)	FR-A-507-SB(T)	648,000	563,500	2025	486,100	5.90	12x16	20	84.5
FR-A-508-WB(T)	FR-A-508-SB(T)	736,000	640,000	2301	552,100	6.70	12x16	20	93.4
FR-A-509-WB(T)	FR-A-509-SB(T)	824,000	716,500	2576	618,200	7.45	12x16	20	102.3
FR-A-510-WB(T)	FR-A-510-SB(T)	912,000	793,000	2851	684,200	8.25	16x16	20	111.3
FR-A-511-WB(T)	FR-A-511-SB(T)	1,000,000	869,600	3126	750,200	9.05	16x16	20	120.2

● Suffix "T" denotes internal tankless heater.

● For complete information on flame retention burners (nozzle sizes, etc.), refer to chart on back page. (Based on oil at 140,000 Btu per gallon.)

▲ Net I=B=R ratings shown are based on a piping and pick up allowance of 1.333 for steam and 1.15 for water. American-Standard should be consulted before selecting an FR oil heating unit for installations having unusual piping and pick up requirements

no. 530 tankless heater ratings for the FR-A-5

unit number	number of heaters	ratings● (gpm)
FR-A-504—FR-A-511	1	4
FR-A-504—FR-A-511	2	7
FR-A-505—FR-A-511	3	10
FR-A-508—FR-A-511	4	13
FR-A-510—FR-A-511	5	16

● Gallons of water per minute raised from 40°F to 140°F with 200°F boiler water temperature.

The table shows the recommended number of heaters to be used with each unit and the ratings attained if more than one heater is connected in parallel. Additional heaters can be added if the heaters are serving different systems and it is not likely that all will be in use at the same time.

No. 530 tankless heater available for single purpose or multiple parallel hook-up. Copper manifolds for two, three or four-heater parallel arrangement furnished with No. 530 heater if specified.

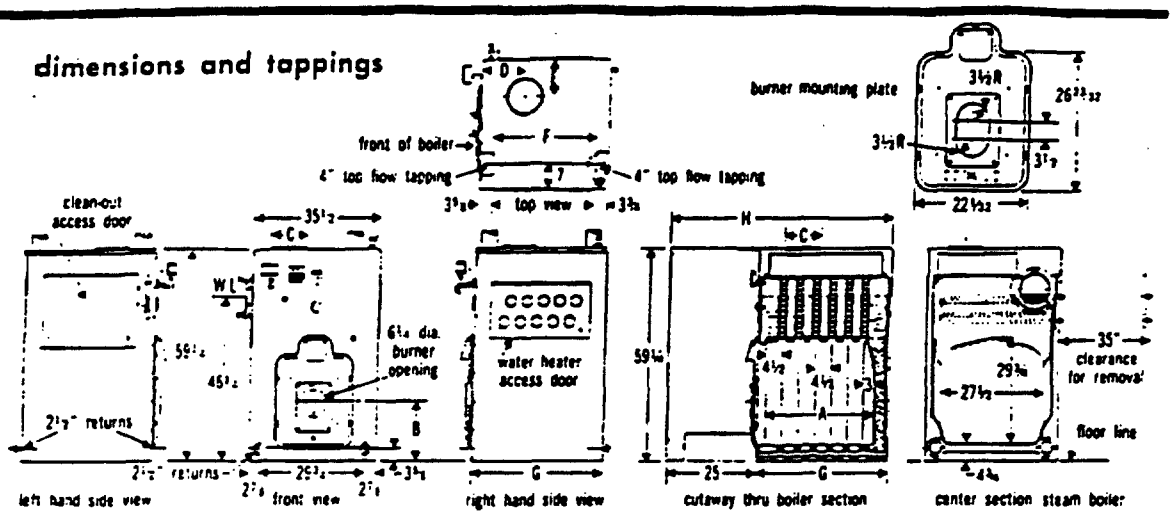
Provision for tankless heater is available when specified. If suffix letter "T" is added on order to unit numbers, the following maximum number of center sections with heater openings will be furnished: FR-A-504-T—2 openings; FR-A-505-T, FR-A-506-T, FR-A-507-T—3 openings; FR-A-508-T, FR-A-509-T—4 openings; FR-A-510-T, FR-A-511-T—4 to 5 openings.

American-Standard FR oil heating units are designed and built to comply with the American Society of Mechanical Engineers' Code and bear their approval symbol. Ratings have been approved by the Institute of Boiler and Radiator Manufacturers.

control sets for FR-A-5 oil heating units

control set	control function	description
standard		
no. 1 steam	unit without domestic hot water	thermostat, Pressuretrol
no. 3 water	unit without domestic hot water, immersion control	thermostat, Aquastat limit control
optional		
no. 2 steam	unit with year-round domestic hot water, built-in tankless heater	thermostat, Pressuretrol Aquastat operating control
no. 4 water	unit without domestic hot water	thermostat, Aquastat limit and circulator control
no. 5 water	unit with year-round domestic hot water, built-in tankless heater, using circulator	thermostat, Aquastat limit, reverse and operating control, circulator relay
no. 5-Z water	one no. 5-Z control set is required for each zone in addition to the first zone which is controlled by no. 5 control set.	thermostat, relay

dimensions and tappings



unit number	number of sections	number and size of tappings		dimensions (inches)							
		flow (in.)	return (in.)	A	B	C	D	E	F	G flush jacket	H jacket extension
FR-A-504	4	(2)-4	(4)-2½	16½	13¼	9	11½	9½	15½	22⅞	47⅞
FR-A-505	5	(2)-4	(4)-2½	21	13¼	9	11½	9½	20	27⅜	52⅜
FR-A-506	6	(2)-4	(4)-2½	25½	16¾	12	12	10	24½	31⅞	56⅞
FR-A-507	7	(2)-4	(4)-2½	30	16¾	12	12	10	29	36⅜	61⅜
FR-A-508	8	(2)-4	(4)-2½	34½	16¾	12	12	10	33½	40⅞	65⅞
FR-A-509	9	(2)-4	(4)-2½	39	16⅜	14	13	11	38	45⅜	70⅜
FR-A-510	10	(2)-4	(4)-2½	43½	16¾	14	13	11	42½	49⅞	74⅞
FR-A-511	11	(2)-4	(4)-2½	48	16¾	14	13	11	47	54⅜	79⅜

assemblage of sections

arrangement of sections from front of boiler (with tankless heater opening)[a]

1	2	3	4	5	6	7	8	9	10	11
FX	CT	CT	BX	—	—	—	—	—	—	—
FX	CT	CT	CT	BX	—	—	—	—	—	—
FX	CT	CT	CT	C	BX	—	—	—	—	—
FX	CT	CT	CT	C	C	BX	—	—	—	—
FX	CT	CT	CT	C	C	C	BX	—	—	—
FX	CT	CT	CT	CT	C	C	C	BX	—	—
FX	CT	CT	CT	CT	C	C	C	C	BX	—
FX	CT	CT	CT	CT	C	C	C	C	C	BX

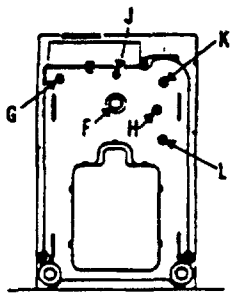
legend

FX—front connecting section
CT—center section with tankless heater opening
C —center section without tankless heater opening
BX—back connecting section

[a] If internal heat exchanger tapping is not required, all intermediate sections can be "C" sections.

control tappings

location on unit	size (inches)	control used	
		steam	water
F	2½	internal low water cut-off	tapping F can be used for bottom connection to external low water cut-off.
G	¾	pressure limit control	temperature limit control
H	¾	operating control, tankless heater	—
J	½	pressure gauge	combination altitude gauge and thermometer
K	¾	—	operating control, tankless heater
L	¾	—	reverse acting control



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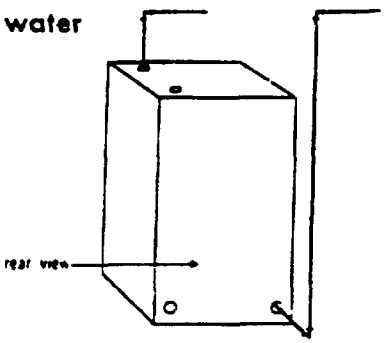
USA

minimum piping recommendations

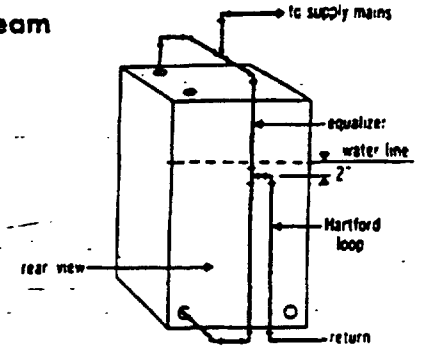
Note: These schematic drawings are intended solely to show recommended tapping locations and general piping arrangements. Actual piping details should be designed in accordance with standard engineering practice.

hot water



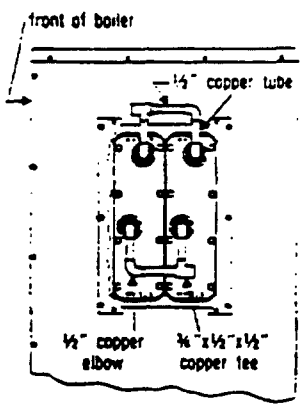
unit numbers	gravity		forced	
	supply (in.)	return (in.)	supply (in.)	return (in.)
FR-A-504	2½	2½	2	2
FR-A-505	(2)-2	(2)-2	2	2
FR-A-506	(2)-2½	(2)-2½	2	2
FR-A-507	(2)-2½	(2)-2½	2½	2½
FR-A-508	(2)-2½	(2)-2½	2½	2½
FR-A-509	(2)-3	(2)-3	2½	2½
FR-A-510	(2)-3	(2)-3	3	3
FR-A-511	(2)-3	(2)-3	3	3

steam

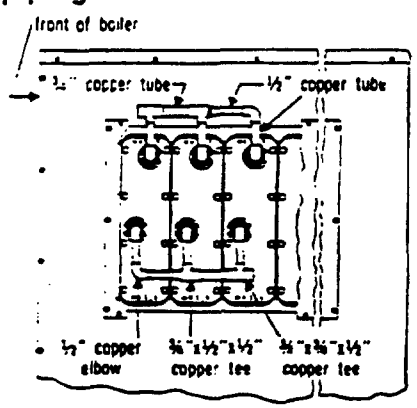


unit numbers	riser (in.)	header (in.)	return (in.)	equalizer (in.)
FR-A-504	4	—	1¼	2½
FR-A-505	4	—	1¼	2½
FR-A-506	4	—	1½	2½
FR-A-507	(2)-3	3	1½	2½
FR-A-508	(2)-4	4	2	2½
FR-A-509	(2)-4	4	2	2½
FR-A-510	(2)-4	5	2	2½
FR-A-511	(2)-4	5	2	2½

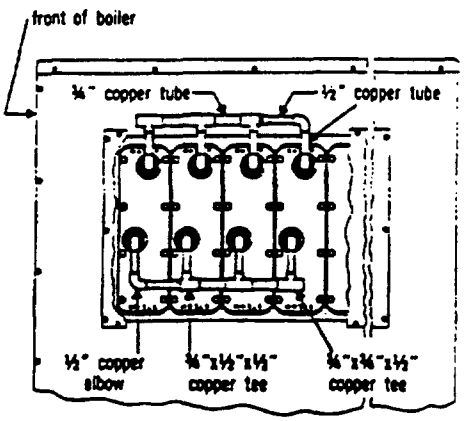
tankless heater piping



2-heater manifold piping



3-heater manifold piping



4-heater manifold piping

Note: Single arrangement or any combination of the above manifold piping arrangements can be used. Water heaters are assembled in boiler starting with the second section from front of boiler. Heater cover plates are marked "steam" and "water". When installing in a steam boiler, the word "steam" should read at top; when installing in a water boiler, the word "water" should read at top.

flame retention burner specifications
(2-stage fuel unit)

unit number	burner number	I=B=R burner capacity (gph)	nozzle data				mount
			number required	gph each	spray angle	type	
FR-A-504	92A-7240-D	3.55	two	(2)-1.75	80°	hollow	flange
FR-A-505	92A-7242-D	4.30	two	(1)-2.00 (1)-2.25	80° 80°	hollow hollow	flange
FR-A-506	95A-300-7468-D■	5.10	one	4.00■	70°	solid	flange
FR-A-507	95A-300-7468-D■	5.90	one	4.50■	70°	solid	flange
FR-A-508	96A-M-7498-D	6.70	two	(1)-3.25 (1)-3.50	70° 70°	solid solid	flange
FR-A-509	96A-M-7546-B	7.45	two	(1)-3.50 (1)-4.00	70° 70°	solid solid	flange
FR-A-510	96A-M-7548-B	8.25	two	(2)-4.00	70°	solid	flange
FR-A-511	96A-M-7548-B	9.05	two	(2)-4.50	70°	solid	flange

■ 95A-300-7468 furnished with 200 Psig fuel unit.

Other listed burners are furnished with factory-installed cad cell, bracket and leads. R8184B light-sensing constant ignition primary control in accord with UL requirements as follows:

primary control no.	burner nozzle capacity	flame-failure shutdown
R8184B1204	3 to 7 gph	30 seconds
R8184B1196	7 to 20 gph	15 seconds

Oil burners regularly furnished with light-sensing primary are available with electronic flame safeguard controls to meet UL and Factory Mutual Approval. See current price book for description.

APPROVAL: American-Standard flame retention oil burners (115 and 230 volt/60 cycle) are listed with Underwriters' Laboratories, Inc. for No. 1 and No. 2 grades of fuel oil, whether obtained by distillation or catalytic cracking process. They are approved by the New York City Board of Standards and Appeals, the State Fire Marshal of the Commonwealth of Massachusetts, and the Department of State Police, State of Connecticut.

sample specification for FR-A-5 oil heating unit

Contractor shall furnish and install, as indicated on plans, FR-A-5.....oil heating unit(s) having a firing rate of..... gph and an I=B=R gross output of.....Btuh. Boiler(s) shall be constructed of cast iron in accordance with A.S.M.E. requirements for low pressure heating boilers and bear the A.S.M.E. symbol. Each section shall be factory tested at 2½ times maximum working pressure of 50 lbs. for water. Boiler(s) shall have I=B=R ratings. Boiler(s) shall be composed of cast iron sections with vertical flues. Manufacturers will furnish boilers with an aluminized steel canopy. Water or steam trim as required. Oil burners shall include controls as herein described. (Note: Include description of controls as required and other burner features as desired.) Boiler(s) shall be equipped with tankless heater(s) having a rating of.....gpm. If more than one heater is needed to meet requirements, a copper manifold factory assembled will be installed by the contractor as recommended by the manufacturer to connect heaters in parallel arrangement.

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