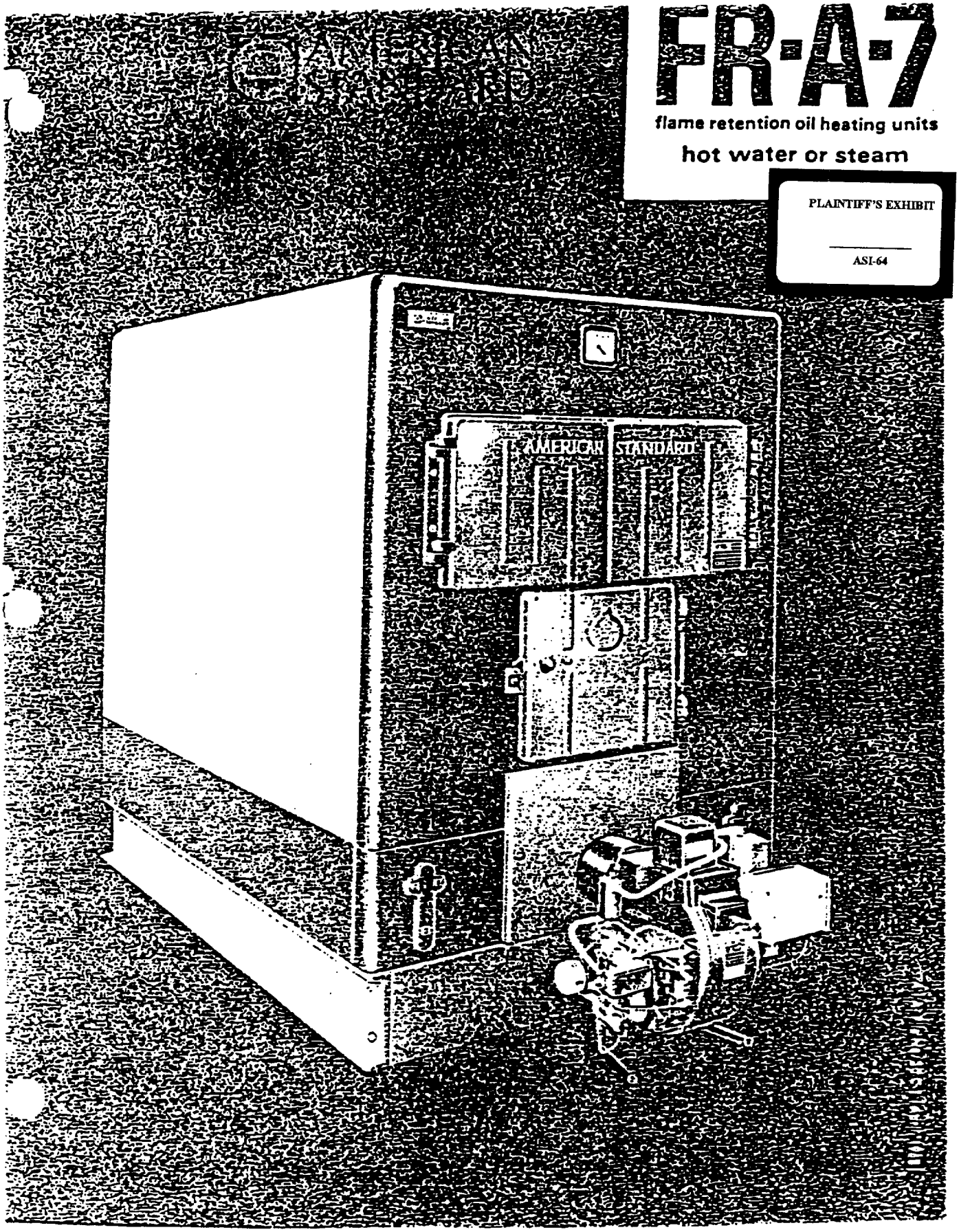
# FR-A-7

flame retention oil heating units

hot water or steam

PLAINTIFF'S EXHIBIT

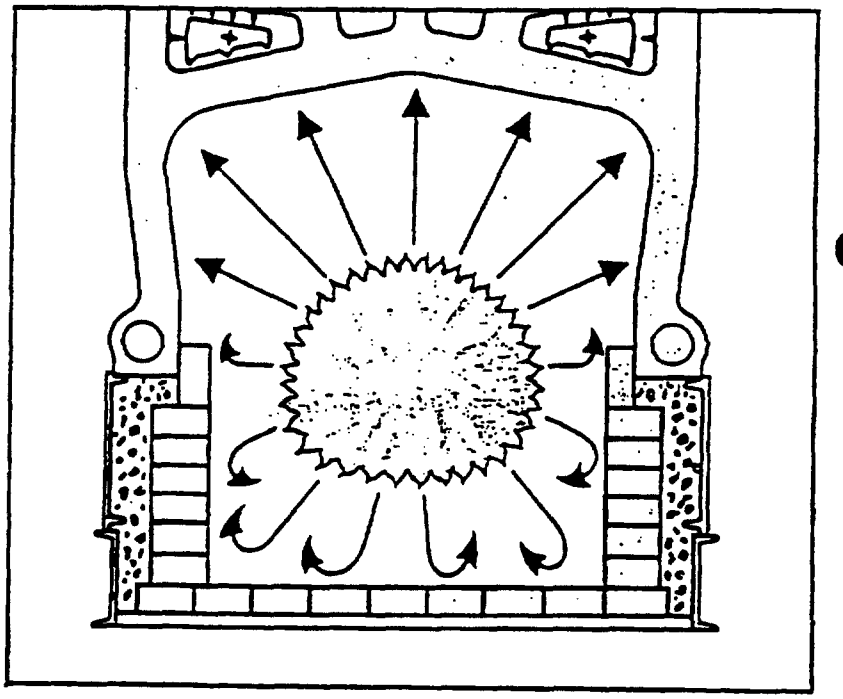
ASI-64



## FR-A-7 flame retention oil heating unit—more Btu's at no extra cost

The new American-Standard FR-A-7 oil heating unit operates at greater efficiency and with higher outputs than comparably sized conventional boilers—yet it costs no more to buy and install! The superior flame retention burner and improved interior design make it possible. The new FR-A-7 unit is available in 9 sizes for steam, forced circulation and gravity hot water. With an I=B=R approved output range of 1,160,000 to 3,000,000 Btuh, it's ideal for installation in most commercial and industrial buildings. For higher outputs – without paying higher costs – make it the FR-A-7 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.



On FR-A-7 units, the concentrated flame pattern of the burner and the fact that the combustion chamber is primarily for base insulation permits the combustion chamber to be smaller than in conventional boilers. This exposes more section area directly to the burner flame, resulting in greater efficiency and higher outputs.

### 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
- External arrangement for domestic hot water

## FR-A-7 ratings

| unit numbers | | gross I=B=R output (Btu/hr) | net I=B=R ratings | | | I=B=R burner capacity (gph) | I=B=R allowance for piping ▲ | | chimney | | water content full (gallons) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| water | steam | | water (Btu/hr) | steam (sq. ft.) | steam (Btu/hr) | | water | steam | size (in.) | height (ft.) | |
| FR-A-706-WO-B◆ | FR-A-706-SO-B◆ | 1,160,000 | 1,008,700 | 3626 | 870,200 | 10.55 | 1.15 | 1.333 | 16x16 | 30 | 167.3 |
| FR-A-707-WO-B◆ | FR-A-707-SO-B◆ | 1,376,000 | 1,196,500 | 4340 | 1,041,600 | 12.30 | 1.15 | 1.321 | 16x20 | 35 | 189.5 |
| FR-A-708-WO-B◆ | FR-A-708-SO-B◆ | 1,580,000 | 1,373,900 | 5049 | 1,211,700 | 14.15 | 1.15 | 1.304 | 16x20 | 35 | 211.6 |
| FR-A-709-WO-B◆ | FR-A-709-SO-B◆ | 1,812,000 | 1,575,700 | 5848 | 1,403,600 | 16.35 | 1.15 | 1.291 | 20x20 | 40 | 233.7 |
| FR-A-710-WO-B◆ | FR-A-710-SO-B◆ | 2,020,000 | 1,756,500 | 6535 | 1,568,300 | 18.15 | 1.15 | 1.288 | 20x20 | 45 | 255.9 |
| FR-A-711-WO-B◆ | FR-A-711-SO-B◆ | 2,228,000 | 1,937,400 | 7208 | 1,729,800 | 20.20 | 1.15 | 1.288 | 20x20 | 55 | 277.9 |
| FR-A-712-WO-B | FR-A-712-SO-B | 2,440,000 | 2,121,700 | 7893 | 1,894,400 | 21.95 | 1.15 | 1.288 | 20x24 | 60 | 302.5 |
| FR-A-713-WO-B | FR-A-713-SO-B | 2,720,000 | 2,365,200 | 8799 | 2,111,800 | 24.10 | 1.15 | 1.288 | 20x24 | 70 | 327.1 |
| FR-A-714-WO-B | FR-A-714-SO-B | 3,000,000 | 2,608,700 | 9705 | 2,329,200 | 26.30 | 1.15 | 1.288 | 24x24 | 80 | 351.7 |

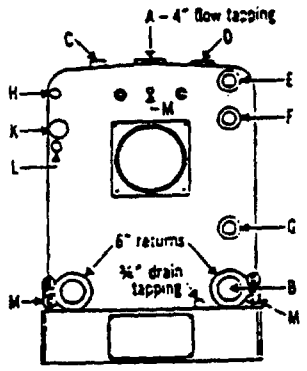
● FR-A-7 is tapped for external heater arrangement.
● For complete information on flame retention burners (nozzle sizes, etc.), refer to chart on back page. (Based on oil at 140,000 Btu per gallon.)
▲ American-Standard should be consulted before selecting an FR oil heating unit for installations having unusual piping and pick up requirements.
◆ Crown sheet baffle furnished with 6 and 7 section boilers. Flue way baffles furnished with 8 thru 11 section boilers.
Note: FR-A-7 oil heating unit furnished with Pressuretrol for steam, Aquastat limit control for water.

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 tappings

| location on unit | size (inches) | steam | water |
|---|---|---|---|
| A | 4 | — | water heater—external type |
| B | 6 | water heater—external type | water heater—external type |
| C | 1 | — | — |
| D | 2½ | A.S.M.E. safety valve | A.S.M.E. relief valve |
| E | 3 | blow-off or pop safety valve | water heater—external type |
| F | 3 | water heater—external type | water heater—external type |
| G | 3 | water heater—external type | water heater—external type |
| H | ¾ | steam pressure limit control | water temperature limit control |
| K | 2½ | internal low water cut-off | — |
| L | ¾ | water temperature control, domestic hot water | water temperature control, domestic hot water |
| M | 1½ | nipple port inspection tapping | nipple port inspection tapping |

Note: Special tapping, 6 inches below water line, provided on front section for connecting low water cut-off when required.

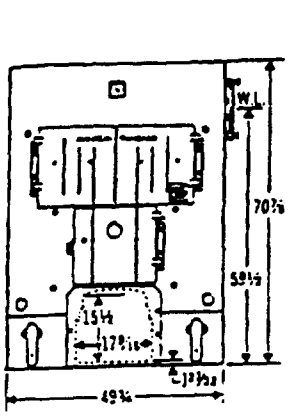


rear view (showing control tappings)

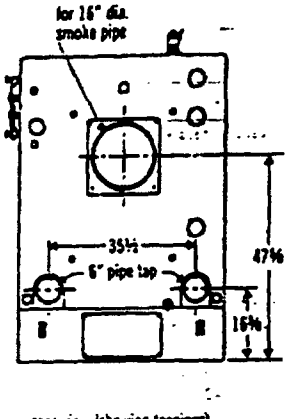
## boiler horsepower and shipping weight

| water | steam | boiler horsepower | approx. boiler weight (pounds) |
|---|---|---|---|
| FR-A-706-WO-B | FR-A-706-SO-B | 34.6 | 4841 |
| FR-A-707-WO-B | FR-A-707-SO-B | 41.1 | 5484 |
| FR-A-708-WO-B | FR-A-708-SO-B | 47.2 | 6384 |
| FR-A-709-WO-B | FR-A-709-SO-B | 54.1 | 7022 |
| FR-A-710-WO-B | FR-A-710-SO-B | 60.3 | 7731 |
| FR-A-711-WO-B | FR-A-711-SO-B | 66.5 | 8334 |
| FR-A-712-WO-B | FR-A-712-SO-B | 72.8 | 9024 |
| FR-A-713-WO-B | FR-A-713-SO-B | 81.2 | 9765 |
| FR-A-714-WO-B | FR-A-714-SO-B | 89.6 | 10516 |

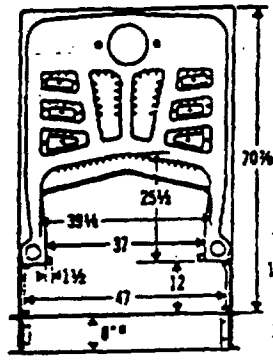
## dimensions and tappings



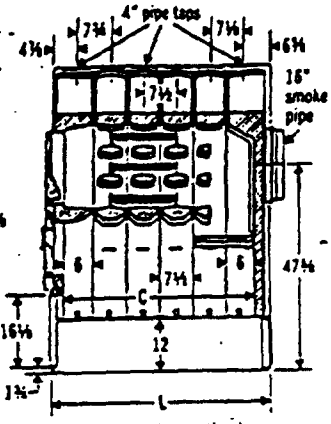

front view (oil-fired)




rear view (showing tappings)




section view
a 8" steel pedestal base on FR-A-708 through FR-A-714 only.




side view (thru sections) showing flue and fire box baffles

| unit number | number of sections | dimensions (inches) C | dimensions (inches) L | number and size of tappings (inches) flow | number and size of tappings (inches) return | assemblage of sections |
|---|---|---|---|---|---|---|
| FR-A-706 | 6 | 42⅛ | 49 | (3)-4 | (2)-6 | FX, C, CX, C, RC, BX |
| FR-A-707 | 7 | 49⅜ | 56½ | (3)-4 | (2)-6 | FX, C, C, CX, C, RC, BX |
| FR-A-708 | 8 | 57⅛ | 64 | (3)-4 | (2)-6 | FX, FC, C, CX, C, RC, RC, BX |
| FR-A-709 | 9 | 64⅝ | 71½ | (4)-4 | (2)-6 | FX, FC, CX, C, C, CX, RC, RC, BX |
| FR-A-710 | 10 | 72⅛ | 79 | (4)-4 | (2)-6 | FX, FC, CX, C, C, CX, C, RC, RC, BX |
| FR-A-711 | 11 | 79⅝ | 86½ | (4)-4 | (2)-6 | FX, FC, FC, CX, C, C, CX, RC, RC, RC, BX |
| FR-A-712 | 12 | 87⅛ | 94 | (5)-4 | (2)-6 | FX, FC, FC, CX, C, C, CX, C, RC, RCX, RC, BX |
| FR-A-713 | 13 | 94⅝ | 101½ | (5)-4 | (2)-6 | FX, FC, FC, CX, C, C, CX, C, C, RCX, RC, RC, BX |
| FR-A-714 | 14 | 102⅛ | 109 | (5)-4 | (2)-6 | FX, FC, FC, CX, C, C, CX, C, C, CX, RC, RC, RC, BX |

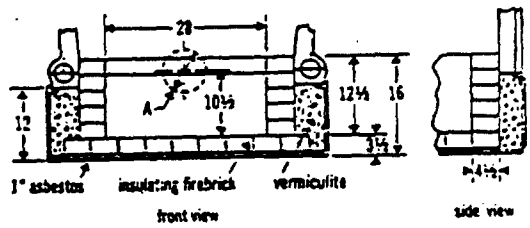
### legend

FX—front connecting section
C—center section
CX—center connecting section
FC—front center section
RC—rear center section
RCX—rear center connecting section
BX—back connecting section

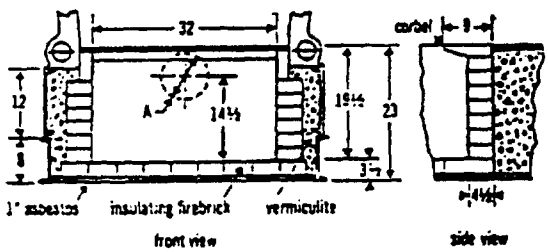
## insulating chamber dimensions (inches)

| unit number | A diameter (inches) | inside chamber length (inches) |
|---|---|---|
| FR-A-706 | 6½ | 35 |
| FR-A-707 | 6½ | 42½ |
| FR-A-708 | 6½ | 38 |
| FR-A-709 | 7⅛ | 41 |
| FR-A-710 | 7⅛ | 44 |
| FR-A-711 | 7⅛ | 47 |
| FR-A-712 | 7⅛ | 50 |
| FR-A-713 | 7⅛ | 53 |
| FR-A-714 | 8⅛ | 56 |

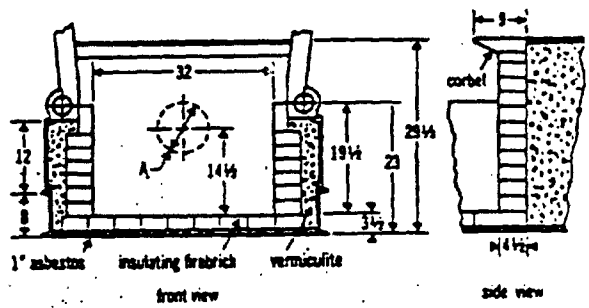
### FR-A-706 and FR-A-707




### FR-A-708 through FR-A-710




### FR-A-711 through FR-A-714

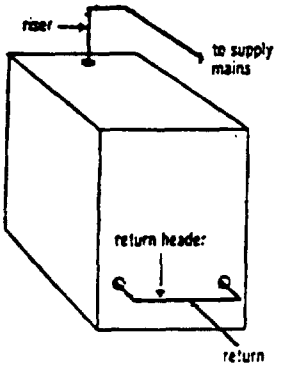



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## minimum piping recommendations

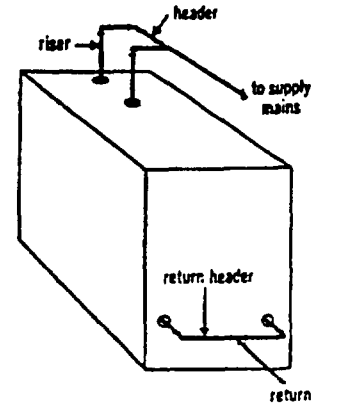
Note: These schematic drawings are intended solely to show recommended tapping locations and general piping arrangements. Actual piping details should be designed in accordance with standard engineering practice.

### hot water
(forced circulation only)

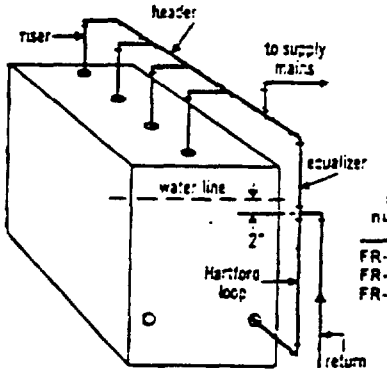



| unit number | riser (in.) | header (in.) | return (in.) | return header (in.) |
|---|---|---|---|---|
| FR-A-706 | 4 | — | 4 | 4 |
| FR-A-707 | 4 | — | 4 | 4 |
| FR-A-708 | 4 | — | 4 | 4 |
| FR-A-709 | 4 | — | 4 | 4 |

| unit number | risers (in.) | header (in.) | return (in.) | return header (in.) |
|---|---|---|---|---|
| FR-A-710 | (2)-4 | 5 | 5 | 4 |
| FR-A-711 | (2)-4 | 5 | 5 | 4 |
| FR-A-712 | (2)-4 | 5 | 5 | 4 |
| FR-A-713 | (2)-4 | 5 | 5 | 4 |
| FR-A-714 | (2)-4 | 5 | 5 | 4 |

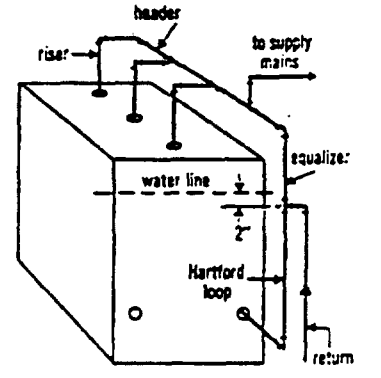


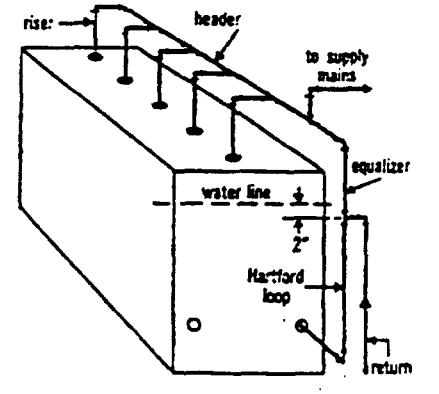

### steam




| unit number | risers (in.) | header (in.) | return (in.) | equalizer (in.) |
|---|---|---|---|---|
| FR-A-706 | (3)-4 | 5 | 2½ | 2½ |
| FR-A-707 | (3)-4 | 5 | 2½ | 2½ |
| FR-A-708 | (3)-4 | 6 | 2½ | 2½ |

| unit number | risers (in.) | header (in.) | return (in.) | equalizer (in.) |
|---|---|---|---|---|
| FR-A-709 | (4)-4 | 6 | 2½ | 2½ |
| FR-A-710 | (4)-4 | 6 | 2½ | 4 |
| FR-A-711 | (4)-4 | 8 | 2½ | 4 |




| unit number | risers (in.) | header (in.) | return (in.) | equalizer (in.) |
|---|---|---|---|---|
| FR-A-712 | (5)-4 | 8 | 3 | 4 |
| FR-A-713 | (5)-4 | 8 | 3 | 4 |
| FR-A-714 | (5)-4 | 8 | 3 | 4 |

AMERICAN STANDARD
PLUMBING & HEATING DIVISION

## flame retention oil heating units

### 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-706 | 96A-M-7543-B | 10.55 | two | (1)-5.00<br>(1)-5.50 | 80°<br>80° | solid<br>solid | pedestal |
| FR-A-707 | 96A-M-7543-B | 12.30 | two | (2)-6.00 | 80° | solid | pedestal |
| FR-A-708 | 96A-T-7935-K• | 14.15 | three | (2)-6.00<br>(1)-2.00 | 90°<br>90° | solid<br>solid | pedestal |
| FR-A-709 | 96A-T-7937-K• | 16.35 | three | (2)-6.50<br>(1)-3.00 | 90°<br>90° | solid<br>solid | pedestal |
| FR-A-710 | 970-8111-B | 18.15 | two | (2)-9.00 | 70° | solid | pedestal |
| FR-A-711 | 970-8111-B | 20.20 | two | (2)-10.00 | 70° | solid | pedestal |
| FR-A-712 | 97A Hi-Lo-7673-EA | 21.95 | three | (2)-6.00<br>(1)-10.00 | 80°<br>80° | solid<br>solid | pedestal |
| FR-A-713 | 97A Hi-Lo-7673-EA | 24.10 | three | (2)-6.00<br>(1)-12.00 | 80°<br>80° | solid<br>solid | pedestal |
| FR-A-714 | 98A Hi-Lo-7773-EA | 26.30 | four | (2)-9.00<br>(1)-8.00 | 80°<br>80° | solid<br>solid | pedestal |

•Electronic flame safeguard control: RA890E Protectorelay and Q270A base, C7013A photocell. Provides 15-second trial-for-ignition and 15-second flame-failure-shutdown.

Available with optional controls to meet Factory Mutual Approval: RA890E Protectorelay, W415A panel (includes Q270A base and R488F switching relay), C7013A photocell. Provides 15-second trial-for-ignition and 2- to 4-second flame-failure-shutdown.

▲R4150A Electronic flame safeguard programming panel, C7013A photocell. Provides 10-second trial-for-ignition and 2- to 4-second flame-failure-shutdown.

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-7 oil heating unit

Contractor shall furnish and install, as indicated on plans, FR-A-7.....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. Contractor shall furnish where required (on 8 through 14 section sizes) 8-inch channel steel pedestal base under regular 12-inch cast iron base as manufactured and recommended by boiler manufacturer. Boiler sections shall be so constructed that the water line for steam boilers shall be above the bottom of top nipple ports to insure proper water circulation between sections. Rear section shall have external water heater tappings as provided by the manufacturer. Boiler flue passages shall be horizontal, finned type, baffled as recommended by manufacturer, with flue travel along both side passages from rear to front and back through center passages to rear and smoke collar connection. 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.)

AMERICAN STANDARD PLUMBING & HEATING DIVISION
40 WEST 40TH STREET • NEW YORK, N.Y. 10018

e-788-2 (4/68)

Litho in U.S.A.