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MODEL R & S BURNER INSTALLATION INSTRUCTIONS FOR FIREBOX, HRT & CAST IRON BOILERS

GENERAL INSTRUCTIONS

These instructions provide illustrations of typical R & S burner installations in various kinds of boilers. They should be carefully read and the example selected that most nearly fits the job before attempting the installation.

The furnace or boiler should be thoroughly cleaned if not already done. The heating surfaces should have all scale, soot and ashes removed.

The combustion chamber illustrations are general in nature and show approximate chamber dimensions and recommended types and thickness of insulating materials.

CAUTION

It is the installing contractors responsibility to include and provide expansion joints, refractory supports, wall ties, etc., as may be required for a proper installation. Consult your refractory supplier for construction details and requirements for these items.

Fig. 1 provides minimum chamber dimensions and pertinent burner dimensions necessary for a correct installation for the various size burners. Compare those dimensions given for your burner firing rate to be certain that adequate clearances and base heights exist.

FIRING FIREBOX BOILER THROUGH THE BASE

Fig. 2 illustrates a type "R" burner installed in a firebox boiler with a conventional base and combustion chamber. This is also applicable to the "S" burner where the boiler base height is sufficient to allow clearance for the blower housing illustrated in Fig. 5.

When installing a burner that will be firing on oil, the opening centerline height (nozzle height "H_c" in Fig. 2) above the combustion chamber floor should be maintained as stated or higher. The nozzle height is based on recommended practice for efficient oil combustion. Lower nozzle height may be used, but at reduced efficiency with tendency toward smoke and flame impingement on floor which may cause carbon buildup.

When the burner will be firing only on gas, the "H_c" nozzle height dimension may be reduced to one-half of the burner head diameter plus one inch. In cases of an extremely low boiler base, the burner head may be located up against the boiler water leg.

The burner opening should be made in accordance with the proper illustration in Fig. 3.

The burner head must be packed with high temperature insulating rope before the plastic refractory is put in place. Seal

between the burner mounting flange and boiler frontplate with high temperature insulating rope gasket.

Fig. 2 illustrates a combustion chamber floor thickness of 1" block insulation, 2-1/2" insulating firebrick and 2-1/2" of standard No. 1 (high duty) firebrick for installations at firing rates of 2,800,000 Btu/Hr or 20 GPH and above. For firing with low to medium furnace temperatures at inputs below 20 GPH, the center layer 2-1/2" of insulating firebrick is not required.

The insulation fill material, used between the refractory walls and the steel boiler base, should be block insulation or other insulating material that will not settle.

Firebrick should be laid with high temperature bonding mortar, such as Hiloset, Sairset, or as recommended by the refractory manufacturer.

Expansion joints should be 3/32" wide per linear foot in any direction. If more than 1" is required, two joints should be installed.

Burner Size	Oil GPH	Recommended Minimum Dimensions for Combustion Chamber (inches)			
		Width W	Length L	Nozzle Height H _c	Base H _b
R6 S6	3 to 4	11	22	6	14
	4 1/2 to 5 1/2	13	26	7	15
	6 to 7	15	30	8	16
R8 S8	8 to 9	17	34	9	17
	10 to 11	19	38	9	18
	12 to 13	21	42	10	19
	14 to 16	23	46	11	20
	17 to 19	25	50	12	21
R10 S10	20 to 22	27	54	12	21
	15 to 16	23	46	10	25
	17 to 18	25	50	11	26
	19 to 20	26	52	11	27
	21 to 22	27	54	12	28
	23 to 24	28	56	12	29
	25 to 26	30	60	13	30
	27 to 28	31	62	13	31
	29 to 30	32	64	14	32
	31 to 32	33	66	14	33
R12 S12	33 to 36	35	70	15	34
	37 to 40	37	74	15	35
	41 to 44	39	78	16	36
	45 to 48	41	82	17	38
	49 to 52	43	86	18	39
	53 to 55	45	90	19	40
S14	60	50	86	23	46
	65	52	90	24	46
	70	54	94	25	46
	75	56	96	26	46
S16	80	58	98	27	47
	90	60	103	28	47
	100	62	108	29	47
	110	65	115	30	51

L - Minimum length of combustion chamber (normally made full length of boiler firebox).
H_c - Dimension applies to oil firing only. (For gas firing, dimension is one-half of burner head diameter plus one inch).
H_b - Minimum base height without pitting combustion chamber.

FIGURE 1 - Combustion Chamber Dimensions

Combustion chamber width and length dimensions may vary from Dimension Table (Fig. 1) to fit job conditions. The floor area may be reduced to a minimum of 70 sq. inches per GPH of oil or 50 sq. inches per 100 MBh input, at some sacrifice of refractory life. Floor area increases are permissible, but reduce

combustion chamber temperatures. Combustion chamber length should be no less than 1-1/3 times the width. Combustion chamber height should be approximately twice the nozzle height of the burner from the floor.

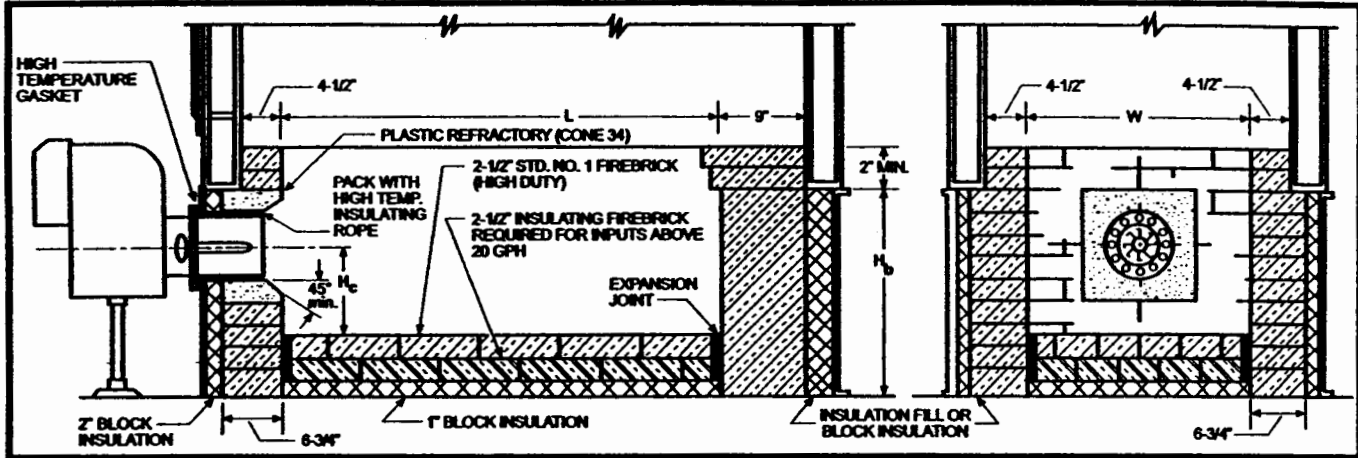


FIGURE 2 - Type "R" Burner Installation Firing Firebox Boiler through Front of Base

FRONTPLATE CUTOUT AND MOUNTING DETAIL

In instances where the frontplate is not supplied with the burner, the burner opening size and mounting stud locations should be

determined from the appropriate boiler frontplate cutout and mounting dimensions, Fig. 3.

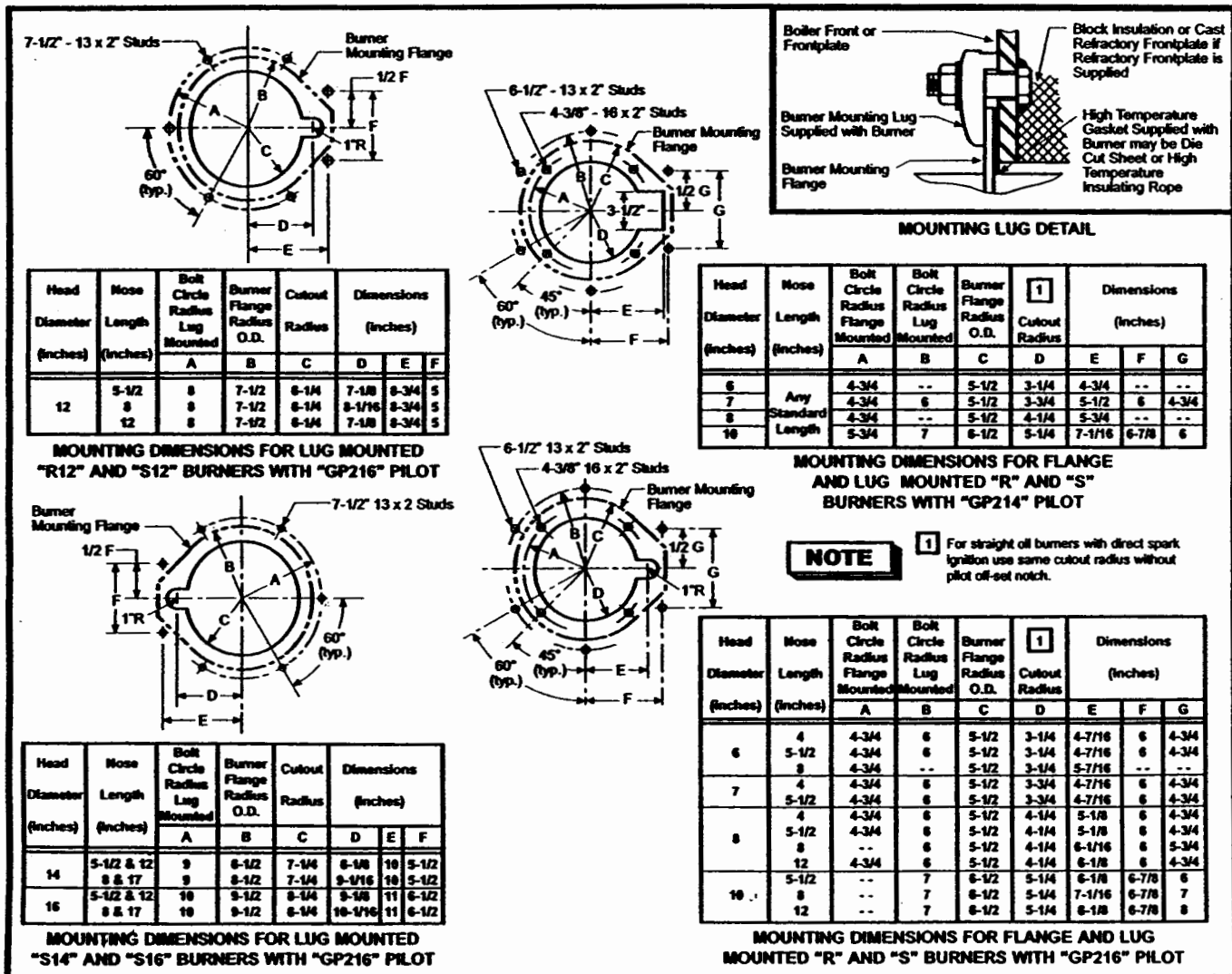


FIGURE 3 - Mounting Details

FIRING FIREBOX BOILER THROUGH THE FIRING DOOR

"Through the Firedoor" installations are recommended where conditions allow. This method will prevent the need for expensive pitting when insufficient base height is available to permit the installation of a standard combustion chamber, or when it is desired to fire over a stoker which is used as the standby fuel burner. See Fig. 4.

In some cases, it may be desirable to provide a new access opening in the side or rear of the boiler firebox to avoid having to remove the burner to get into the firebox, particularly if there is only one firedoor for the boiler.

When the boiler has two firing doors the burner may be installed in one door but angled to fire towards the opposite corner of the chamber. See Fig. 7. Note that "angled" installations require an extra long head length and in some cases may require as much as 12" head length. **HEAD MUST EXTEND THROUGH TO INSIDE EDGE OF WATER LEG.**

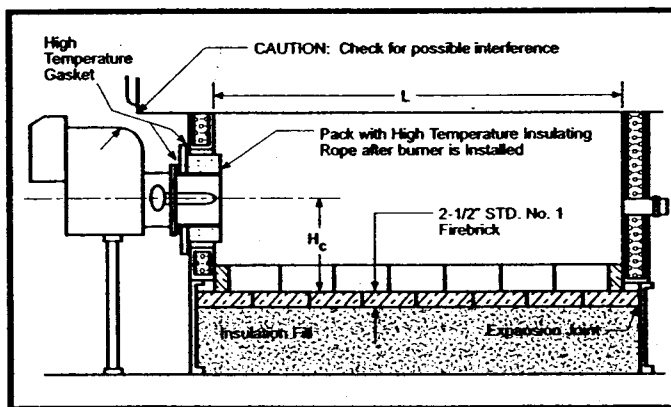


FIGURE 4 - Type "R" Burner Installation Firing Firebox Boiler through the Door

Fig. 5 shows an "S" burner which is designed for use where clearance for boiler smokebox doors would not be sufficient to permit installation of a standard type "R" burner.

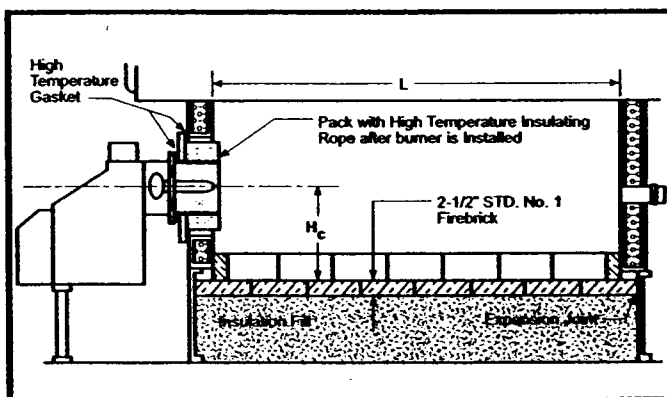


FIGURE 5 - Type "S" Burner Installation Firing Firebox Boiler through the Door

In instances where the burner head is too large to allow proper refractory between its head and the boiler firing door opening, or where a special frontplate is desired, a reflector frontplate may be supplied. See Fig. 6. For installation procedure of reflector frontplate, see Fig. 7 and 8.

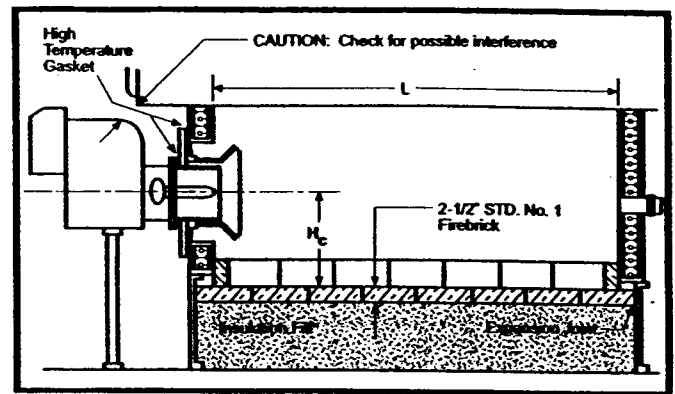


FIGURE 6 - Type "R" Burner Installation with Reflector Frontplate

REFLECTOR FRONTPLATE INSTALLATION

Before installation of the reflector frontplate can be made, the existing boiler firing door and frame must be removed. The reflector frontplate and cone are shipped as an assembled unit and may be installed as a unit. In instances where the reflector cone diameter is larger than the opening, the reflector cone must be detached from the frontplate, with the removal of the 10-32 flat head machine screws, Fig. 7 and 8. A cord is attached to the reflector cone for use in retrieving the cone for mounting. The cone is then placed through the opening and inside the boiler.

Mounting holes are then drilled in the frontplate mounting flange, as required to fit the existing door frame mounting studs. With the Fiberfrax insulating paper in position, bolt the frontplate to the mounting studs. The reflector cone, if detached, is repositioned on the frontplate and mounted with the 10-32 flat head machine screws. A high temperature gasket is placed between the burner mounting flange and the reflector frontplate, and the burner mounted in place.

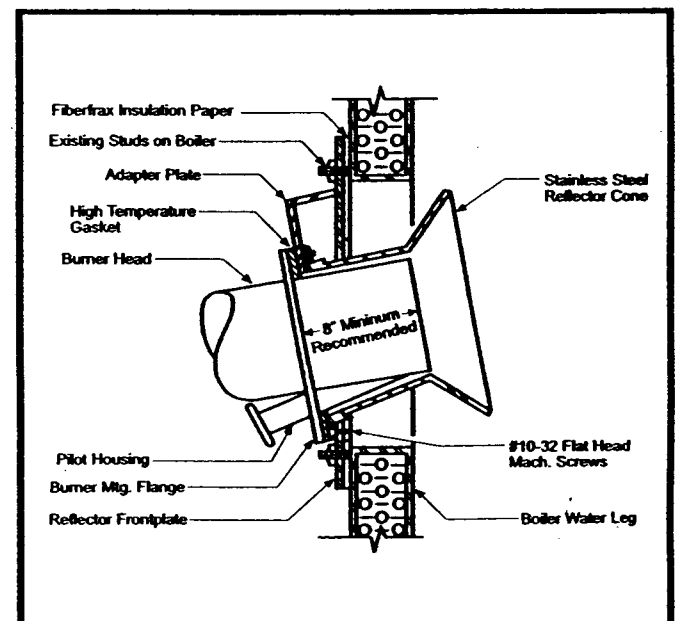


FIGURE 7 - Top View Reflector Frontplate through Right Hand Firing Door

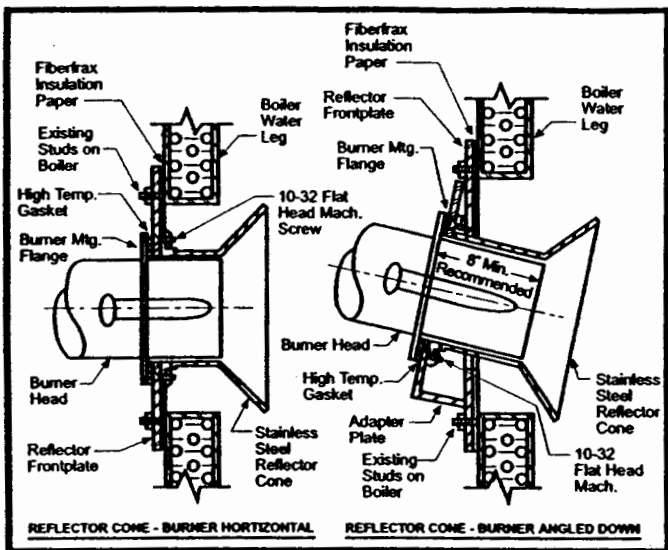


FIGURE 8 - Reflector Frontplate Installation Boiler with Single Firing Door

FIRING A BOILER WITH BLANKET INSULATION

When firing a boiler with blanket insulation, a frontplate with refractory of a minimum of 3000° F must be installed as shown in figure 9.

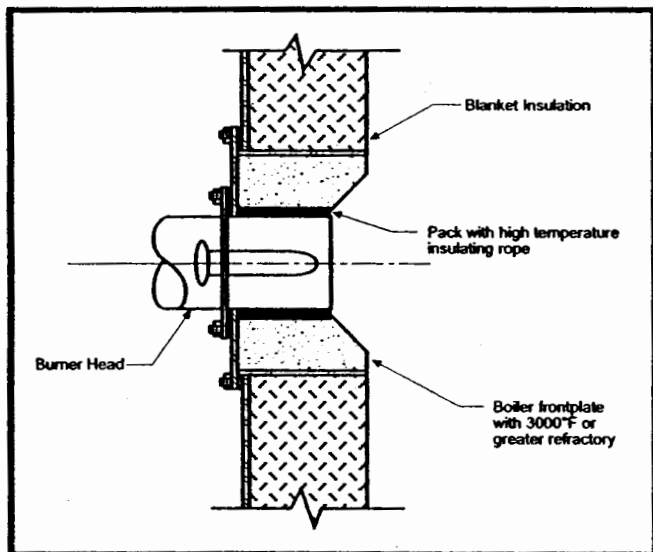


FIGURE 9 - Frontplate Installation with Blanket Insulated Boiler

FIRING FORCED DRAFT BOILER

The burner installation in a firebox type boiler designed for forced draft firing requires no refractory other than in the floor of the firebox and the boiler frontplate, Fig. 10. The refractory floor is normally furnished with the boiler and the refractory frontplate may or may not be with the burner. The burner centerline height ("Hc" dimension) above the refractory floor should be approximately the same as those shown in Fig. 1.

All pressurized or forced draft fired boilers require a high temperature insulating gasket seal between the boiler and the refractory-lined frontplate and between the refractory-lined frontplate and the burner mounting flange to prevent leakage of high temperature combustion gases at this point. In the absence of high temperature gasket, high temperature insulating rope may be used for sealing.

CAUTION

When used, high temperature insulating rope must be wrapped around the burner head, inside the mounting studs, to provide a complete gas tight seal. Wrapping the rope around the outside diameter of the mounting studs will allow leakage around the stud openings in the frontplate. Damage to the burner, due to high temperature gas leakage, will not be covered by the warranty.

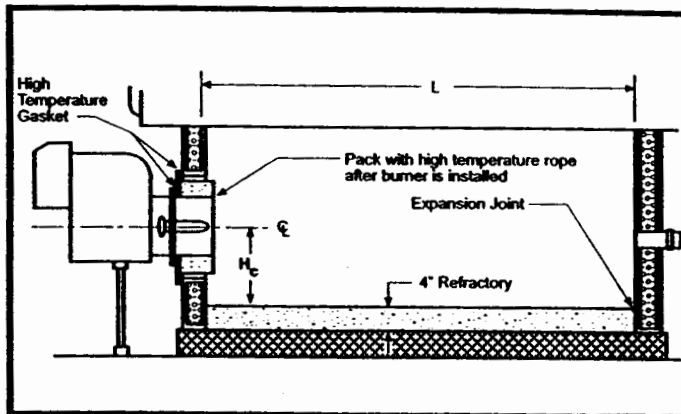


FIGURE 10 - Type "R" Burner Installation Firing Forced Draft Boiler

FIRING CAST IRON BOILERS SINGLE DOOR

Cast iron boilers having low crowns may require burner installations as shown in Fig. 11 or 12. When the distance from the burner horizontal centerline to the crown sheet is less than $1.5 \times H_c$ then the burner must be installed at an angle that will prevent the flame from impinging on the cast iron boiler sections. Significant impingement on cast iron sections can cause damage to the sections.

CAUTION

Standard nose length is 5-1/2 inches. Angled installations require that the burner nose reach to the inside edge of the water leg and usually requires 8 or more inches nose length.

The refractory chamber floor is to be A. P. Green greencast -97-L (3300°F) or equal castable refractory on top of high temperature block insulation. Super duty fire clay brick P. C. E. cone 33-34 A. P. Green "Clipper" or equal may be used in lieu of castable refractory. Use A. P. Green "Sairset" or equal high temperature mortar with firebrick. All exposed brick surfaces must be scrubbed with thin wash before setting. Loose insulating fill is not a requirement, but is recommended for minimum heat loss through the boiler base. The burner head must be wrapped with high temperature insulating rope before installing plastic refractory.

FIRING CAST IRON BOILER WITH DOUBLE DOORS

When firing a cast iron boiler with double doors, the burner may be installed through either door at an angle as to allow the center-line of the burner to point at the opposite rear corner of the combustion chamber as shown in the top section view of Fig. 12. If the cast iron boiler has a low crown the burner must also be installed at a downward angle (Fig. 12 Side View), to prevent the flame from impinging on the cast iron sections. Installation of Firebrick in unused firedoor is necessary to prevent heat loss through the door opening. Installation is otherwise identical to installing burner in a cast iron boiler with a single firedoor, Fig. 11.

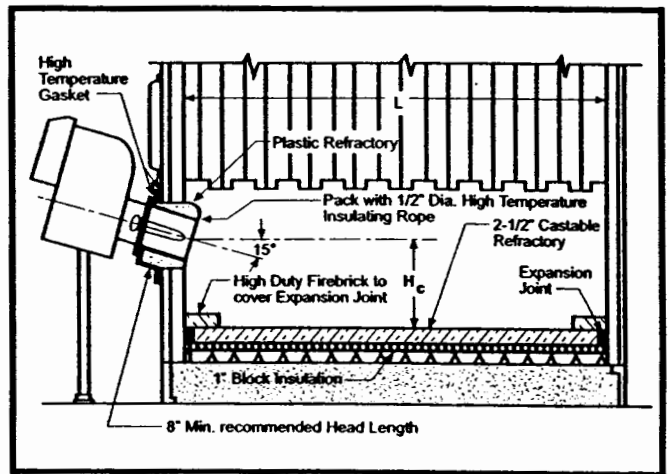


FIGURE 11 - Type "R" Burner Installation Firing Cast Iron Boiler with Single Door

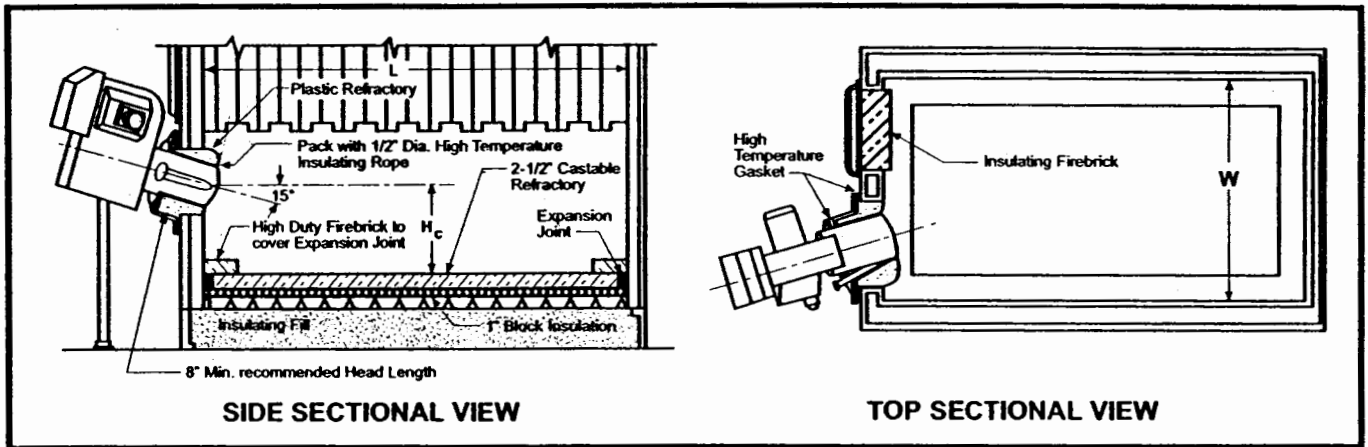


FIGURE 12 - Type "R" Burner Installation Firing Cast Iron Boiler with Double Doors

FIRING HRT BOILER

When installing an R burner in an HRT boiler, Fig. 13, the minimum combustion chamber dimensions H_c , L and W must be maintained as given in Fig. 1. The existing side and rear walls may be reused if in good condition and equal to 18 inches of standard No. 1 high duty firebrick. All expansion joints are to be filled with a compressible insulating material and must be kept free of material that will not compress.

It is recommended that the combustion chamber floor be raised to obtain the minimum H_c dimension and the area below filled with insulating fill material, reducing heat loss to a minimum. It is possible, that when replacing a stoker, the combustion chamber floor may be laid on top of the existing grates, if the minimum H_c dimension may be obtained.

The proper burner opening cutout and burner mounting stud location must be determined from the appropriate chart, Fig. 3. The burner head must be packed with high temperature insulating rope before the plastic refractory is put in place.

CAUTION

The bridgwall must not be directly under a girth seam or girth seam leakage may result. The girth seams located within the combustion zone must be protected by an inverted refractory arch.

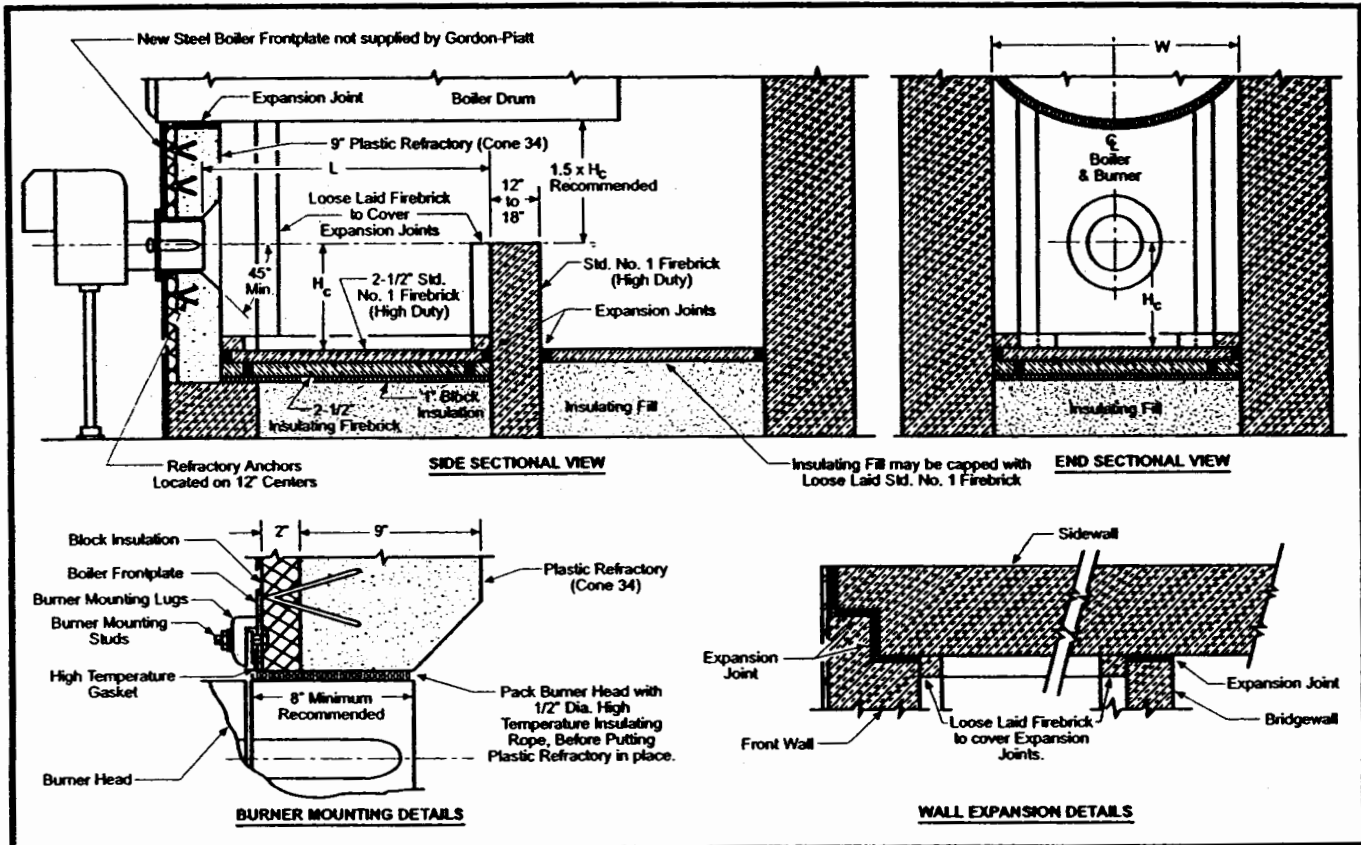


FIGURE 13 - Type "R" Burner Installation in an HRT Boiler