

REAR DOOR REFRACTORY REPAIR OR REPLACEMENT

BOILER DIAMETERS

36", 48", 60", 78", 96"

SERVICE - PARTS

Cleaver  Brooks®

DIVISION OF AQUA-CHEM, INC.

MILWAUKEE, WISCONSIN, U.S.A.

BILL OF MATERIALS AND SUGGESTED TOOLS

Boiler Diameter	Part No. 872-162 V-Block Mix*	Part No. 872-61 1/4" Asbestos Board J. M. No. 106 or equal	Part No. 872-22 1-1/2" Hi-Temp Insulating Block	Part No. 872-167 1" Hi-Temp Insulating Block	Part No. 872-96 Castable Refractory Furnas-Crete or equal**	Part No. 872-47 Refractory Cement Firefrax No. 1 or equal	Part No. 853-348 3-Ply 1/4" Asbestos Rope: J. M. No. 4202 or equal	Part No. 853-249 5/8" x 5/8" Asbestos Rope	Baffle Tile Laclede-Christy or equal	Support Refractory
36"	60 lbs.	1-4 x 34 1-2 x 33	Not Used	Not Used	150 lbs.	2 lbs.	114"	48"	(7) Part No. 94-115	None
48"	75-100 lbs.	2-1-1/2 x 44 1-3 x 44 1-12 x 12	15 sq. ft.	15 sq. ft.	350 lbs.	10 lbs.	152"	60"	(9) Part No. 94-172 3 x 5-1/2 x 12-1/2	None
60"	175-225 lbs.	2-1-1/2 x 56 1-3 x 56 1-12 x 12	20 sq. ft.	20 sq. ft.	800 lbs.	10-15 lbs.	190"	72"	(12) Part No. 94-144 3 x 5-1/4 x 13-1/4	None
78"	200-250 lbs.	2-2 x 72 1-4 x 72 1-12 x 12	55 sq. ft.	30 sq. ft.	1600 lbs.	20-25 lbs.	None Required	90"	(15) Part No. 94-162 3 x 5 x 16-3/4	(2) Part No. 85-1459
96"	250-350 lbs.	2-2 x 90 1-4 x 90 1-12 x 12	120 sq. ft.	36 sq. ft.	2900 lbs.	50 lbs.	None Required	108"	(19) Part No. 94-189 3 x 5 x 18	(2) Part No. 85-1461

15-40 HP.

50-100 HP.

125-200 HP.

250-350 HP.

400-800 HP.

Boiler Diameter	Part No. 872-26 Asbestos Cement J. M. No. 450 or equal	WOOD FORM DIMENSIONS SEE Figure 1, Page 2				Part No. 903-137 1-1/2" Cup-head insulation pins, each	Sight Tube	Angle Iron 1-1/2" x 1-1/2" x 1/4" x Length shown below	Refractory Anchors	Tadpole Gasket	Part No. 853-249 5/8" Asbestos Rope	Part No. 841-507 Gasket Clip Fastener	Baffle Tile Sealing Bar 1/2" x 1/2" mild steel Purchase locally
		"A"	"B"	"C"	"R"								
36"	1 lb.	Not Used	Not Used	Not Used	Not Used	23	Part No. 94-143	41"	None Required	Part No. 32-442	48"	15	As Required
48"	15 lbs.	5"	35"	10"	17-1/2"	17	Part No. 94-165	53"	2-5" Part No. 51-51 2-6" Part No. 51-161	Part No. 32-516	60"	15	As Required
60"	25 lbs.	3"	45"	15-1/2"	22-1/2"	21	Part No. 94-166	65-1/2"	5-5" Part No. 51-51 2-6" Part No. 51-161	Part No. 32-105	72"	15	As Required
78"	50 lbs.	8-1/2"	60"	18-1/2"	30"	30	Part No. 94-167	83-1/2"	9-6" Part No. 51-161 4-7" Part No. 51-41	Part No. 32-899	90"	15	As Required
96"	50 lbs.	11"	77"	25-1/2"	38-1/2"	30	Part No. 94-168	101-1/2"	9-6" Part No. 51-161 4-7" Part No. 51-41	Part No. 32-901	108"	15	As Required

15-40 HP.

50-100 HP.

125-200 HP.

250-350 HP.

400-800 HP.

* As required, according to condition of upper portion of door.

** Order by Part No. and amount required.

OTHER SUPPLIES NEEDED FOR RE-WORKING DOOR REFRACTORY

- 4 - "C" clamps, 4" or 6"
- 1 - threaded rod, 1/2" x 16" with nuts and washers
- 3 - hinges, strap-type, 4"
- As required: 3/4" plywood bailing wire

NOTE: If possible, make certain that all necessary parts and materials are on hand before commencing major repairs, involving extended interruption of service.

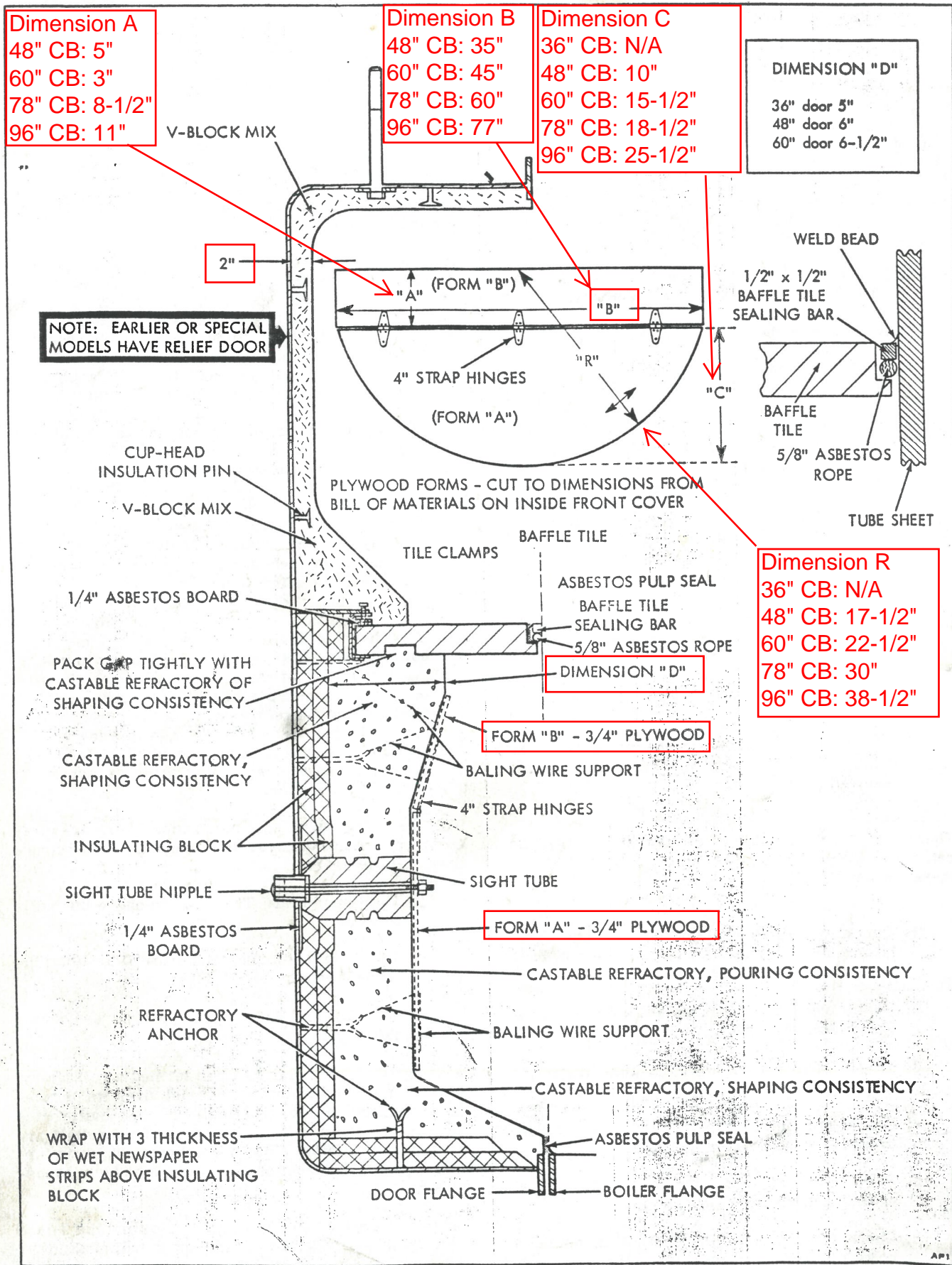


FIGURE 1. REAR DOOR CROSS SECTION AND DIMENSION CHART FOR WOOD FORMS

Section I

INDICATIONS

The rear door on a Cleaver-Brooks boiler performs four main functions. These are:

1. It retains the heat.
2. It directs the combustion gases through the "Four-Pass" Cleaver-Brooks design.
3. It prevents leakage of combustion gases.
4. It provides access for inspection, cleaning, etc.

Essentially, the rear door is a steel shell lined with insulation material and castable refractory; it also positions a horizontal baffle tile.

Burned or discolored paint on the outer surface of the door does not necessarily indicate refractory trouble. This may be an indication of other conditions, such as:

1. Leaky gaskets.
2. Improper seal.
3. Door retaining bolts tightened insufficiently or unevenly.
4. The air line running from the front of the boiler head to the sight tube may have become blocked.

Therefore, before acting on the assumption that the refractory requires re-working, it is best to check these points:

1. Check to make certain the air line from boiler head to sight tube is clear; if not, blow out with air hose.
2. Check condition of tadpole gasket on rear flange of boiler body.
3. Check condition of asbestos pulp protecting tadpole gasket.
4. Check horizontal baffle tile for large cracks, breaks, chipped corners, etc.
5. Check for cracks in castable refractory at ends of baffle tile.
6. Check for uneven or insufficient tightening of bolts holding rear door to mating flange on boiler.

If the above points are checked and found to be satisfactory, proceed to examine the refractory for possible indications of trouble.

It is normal for refractories exposed to hot gases to develop thin ("hair-line") cracks; this by no means indicates improper design or workmanship. Since all refractory materials expand and contract to some degree with changes in temperature, they should be expected to show minor cracks due to contraction when examined at low temperatures. Cracks up to about 1/8" across may be expected to close at high temperatures. Refer to Section in this Bulletin on "Minor Repairs." If inspection shows condition of refractory to be such that replacement is required, follow the appropriate steps described here.

NOTE

This Bulletin covers replacement of refractories on boilers with shell diameter of 48, 60, 78, or 96 inches. On these models, replacement is normally performed with the door in place; that is to say, opened in a vertical position. Much of the procedure outlined here is applicable to the 36" diameter boiler also. However, it is customary to remove the door of the 36 inch boiler and place it in a horizontal position before commencing work on it. Therefore, most of the directions for the larger sizes will apply, with a few exceptions. For example, the plywood forms are not required when replacing the refractory on the 36-inch door.

For the purposes of this discussion, there are three basic sections of the rear door insulation and refractory. These are:

1. The Upper Half: That portion above the baffle tile.
2. The Middle Section, consisting of the horizontal baffle tile.
3. The Lower Half: That portion below the baffle tile.

Although the Upper Half is often termed a refractory, it is actually an insulation material since its purpose is to impede the passage of heat. The baffle tiles and the castable refractory of the Lower Half are backed by insulation block and asbestos board to further protect the steel of the boiler door from excessive heat.

In nearly every case, the baffle tiles and the 2-inch coating of V-Block Mix on the upper half of the rear door will be found in such condition as to require little if any attention.

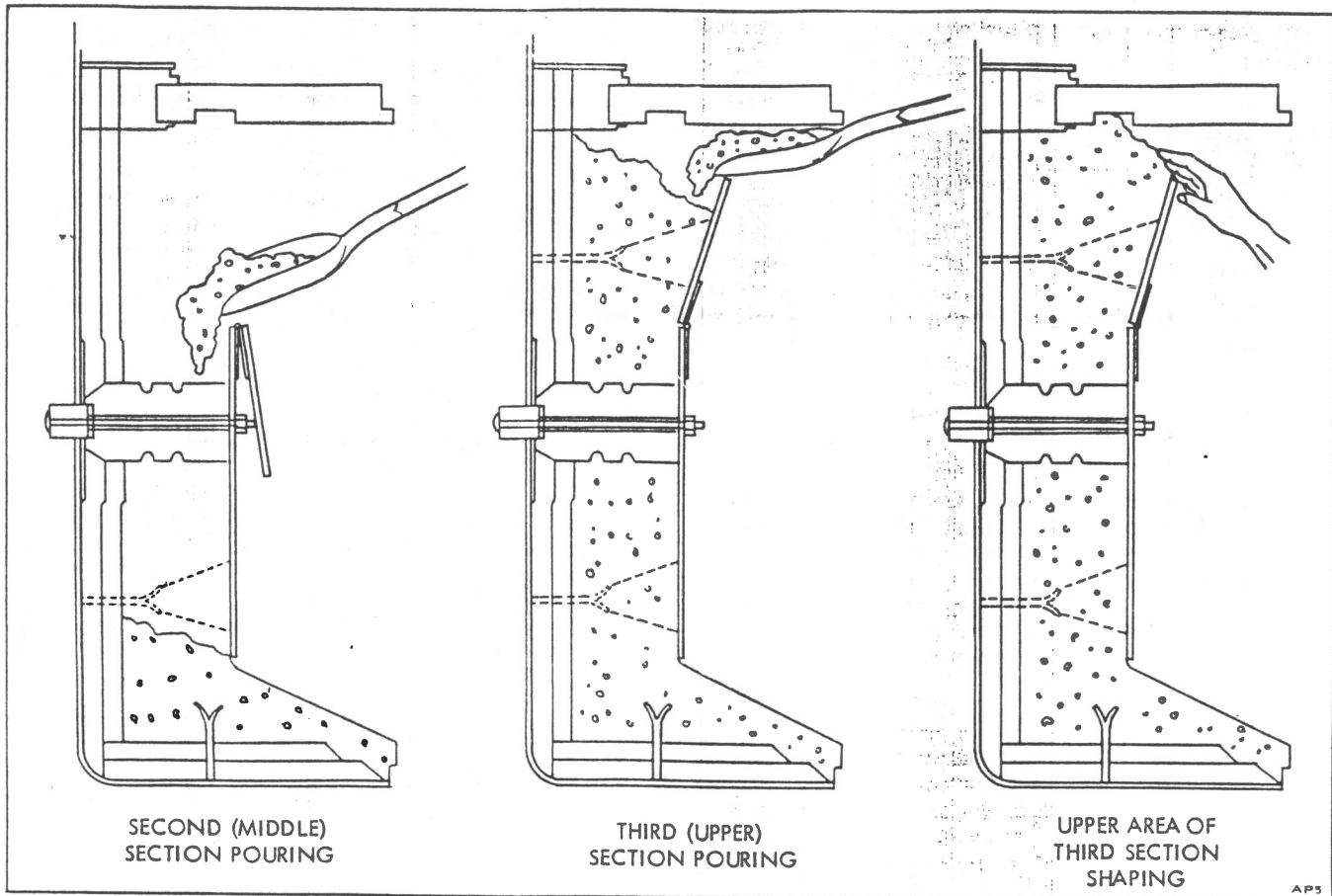


FIGURE 5. REPLACING REFRACTORY IN LOWER HALF

THIRD (UPPER) SECTION FORMING:

Now position the straight piece of form at the proper angle to provide sufficient tile support and sealing effect. Secure the form to channel support with baling wire. The refractory in this upper section is further divided into a lower or poured area and an upper or formed area (figure 3).

The lower portion of this section is poured, behind the inclined form to a height even with the top of the inclined form. The upper area of the third section is filled with a refractory of shaping consistency similar to that used for the lower, or first, section. This portion of the refractory must be tamped or pounded into place by hand to assure a good tight bond. Special attention must be given to forcing the refractory into the recessed area on the bottom side of the baffle tile (figure 5). If this recess is not completely filled with refractory, the flue gases will be able to contact the metal of the rear door and may burn or damage it.

Venting: To provide adequate moisture release, vent holes must be made about 18 inches apart in the newly poured and formed refractory. These holes can be formed by inserting a short piece of welding rod into the refractory to the entire depth of the castable

material before it has set. Drilling a few small holes to diameter of the welding rod in the wooden forms will allow the placement of vent holes in the poured sections.

CAUTION

Do not force the rod into the insulating block at the rear of castable material when forming the moisture vent holes!

REPLACING UPPER HALF OF REAR DOOR:

To replace V-Block Mix refractory in entire upper half of rear door, mix with water to a troweling consistency, making certain that the mixing is completely uniform, with no portions either wetter or drier than the others. Inspect the cup-headed insulation pins for correct number and spacing.

Install Hi-Temp Insulating Block and applicable refractory support as per figures 1a and 6a.

will result in cracks and leakage of flue gases at that point.

Thoroughly mix the Furnas-Crete refractory before adding any water to insure uniform distribution of the ingredients. Do not mix too large a batch - one bag per application - at a time. Follow directions on bag as to ratio of water to castable refractory. Strongest refractory results when water temperature is between 50 and 70°F. Water should be clean and free of foreign materials; mixing should be rapid and thorough.

NOTE

Avoid use of excessive amounts of water as this will seriously weaken the finished refractory. Grease the wooden forms to keep refractory from sticking to them and to prevent loss of moisture from the mix. Rodding and tamping will eliminate voids and will free air bubbles that may be entrapped.

FIRST (LOWER) SECTION FORMING:

(Refer to figure 5.) The first section to be placed is the one on the bottom and sides extending up to the outer curved edge of the semi-circular plywood form (see figure 4).

The amount of water added to the Furnas-Crete used in this area should only be enough to provide a moist mixture, that is to say, of shaping consistency. Refractory in this area must be tamped or placed by hand into position to assure proper bonding of the refractory. Refractory in this area should be tightly packed against lower edge of plywood form to retain poured portion of refractory in middle section.

SECOND (MIDDLE) SECTION FORMING:

The consistency of the refractory mixture in this section should contain just enough water to produce a mixture for pouring instead of shaping. After pouring, a bar or slender stick is inserted into the mixture with a gentle stabbing motion to remove all air pockets that may have formed during the pouring operation.

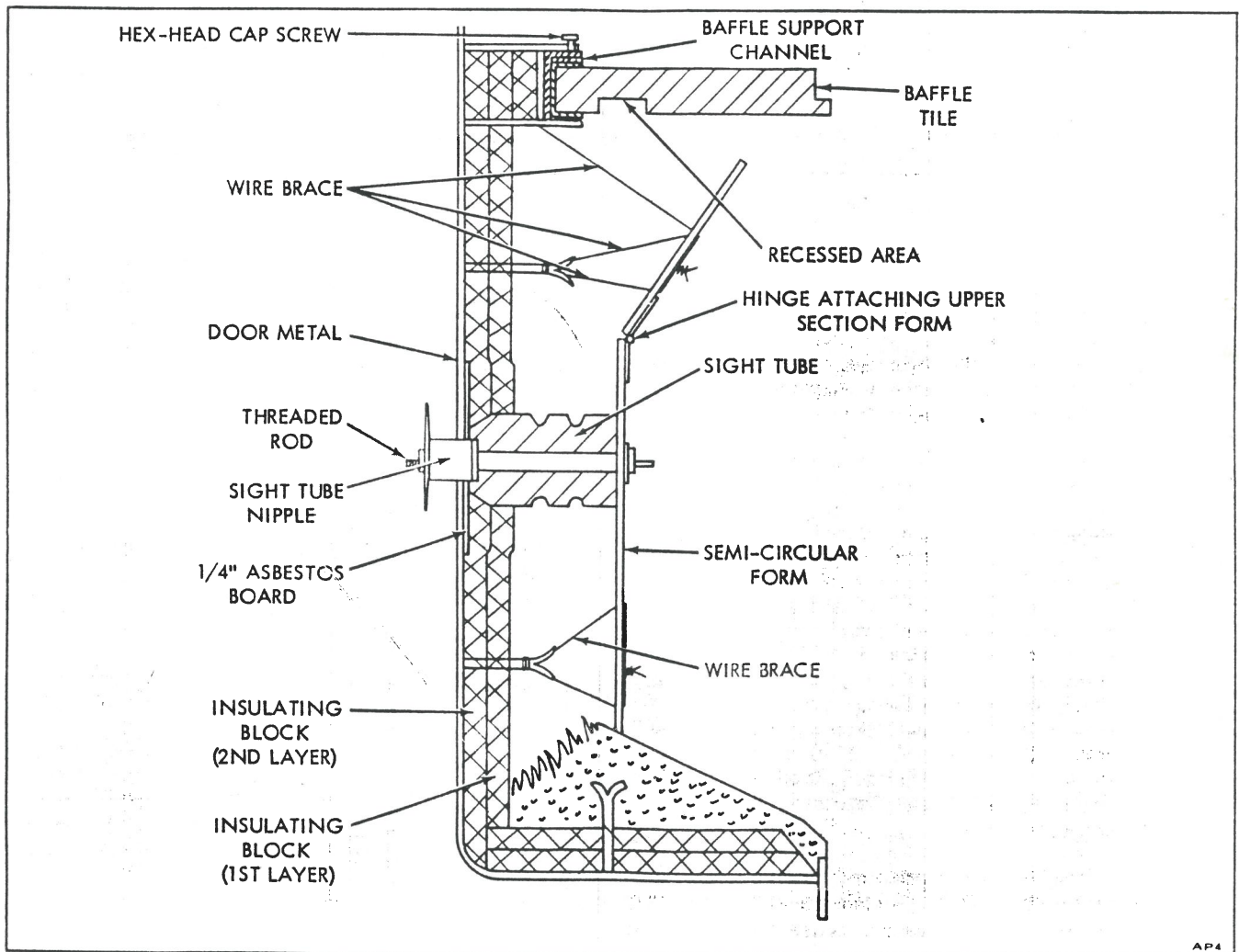


FIGURE 4. FIRST SECTION FORMING

Put the lower strip of 1/4 inch asbestos in place along the bottom of the tile channel and put the vertical (wider) strip of 1/4 inch asbestos board in place against the rear of the channel. Now lay the tiles in place, without fastening, to check them for proper fit, resting the front edge on the angle-iron support, which should be checked to see if it is still aligned with the marks scribed on the flange of the door. Leave about a two-inch space between the side of the steel door shell and the first tile. The final tile, when laid in place, should clear the opposite side of the door shell by about two inches also. If it does not, it may be necessary to chip away a portion of one tile to get the necessary two inches of clearance at both ends of the baffle tiles.

Replacement of Baffle Tiles: When the tiles have been fitted in place as described above, take them out, leaving the two strips of 1/4-inch asbestos board in place in the channel. Replace the tiles as previously positioned, one at a time. Coat the side surface between each tile and the next with Firefrax No. 1. Make certain that all tiles are straight and square, and that the lip of each tile forms a straight line with all the others. When all the tiles are in place, put the other strip of 1/4-inch asbestos board in place on the upper rear surface, put the strip of steel bar-stock on top of it and tighten the cap-screws snugly in place, with uniform tension. Note that the recess on the flat surface of the tile should be on the bottom, as shown in figure 4.

When the lower half of the door has been filled in with castable refractory, the spaces between the ends of the baffle tiles and the side of the door shell are filled in with Furnas-Crete refractory of shaping consistency, both above and below the baffle tiles, as shown in figure 7.

INSULATING BLOCK INSTALLATION: Cut a circular hole in the center of the 12" x 12" x 1/4" asbestos board (see Bill of Materials) large enough to clear the inner projection of the sight tube nipple (figure 1). Press this board tightly to the metal inner surface of the door. Then install the insulating block as shown in figure 4, leaving clearance around the sight tube nipple for installation of the sight tube. When positioning the second layer of insulating block, stagger the seams and joints. Fill all cracks and voids with asbestos cement (Johns-Manville No. 450 mixed with water). Note that the space between the door metal and the baffle support channel (figure 4) must be completely filled in with insulating block.

SIGHT TUBE AND PLYWOOD FORM POSITIONING: Coat the outer surface of the sight tube nipple and the inner surface of the sight tube with asbestos cement (J-M No. 450 and water) to provide a proper seal between the sight tube and the sight tube nipple. Bolt the sight tube and the semicircular form into position, using the threaded rod, nuts and washers (see figure 4). Drill 1/4" holes in the plywood form opposite the metal anchors and secure the form to the anchors with baling wire as shown in figure 4. Fasten the straight portion of the form "A" to the lower edge of form "B" using the strap-type hinges called for in the Bill of Material. This will make the

positioning of the straight piece easier after the space behind the lower form has been filled with refractory.

The portion of the refractory anchors projecting through the insulating block should be wrapped with three thicknesses of wet newspaper in strips about one inch wide. This is to prevent cracking of the refractory from expansion and contraction.

NOTE

Make sure that sufficient supply of refractory is readily available. Sufficient time must also be allowed because forming must be done quickly and in one continuous operation, without interruption. Any delay in mixing and placement will allow refractory placed first to commence setting so that refractory added later will not adhere in it properly.

REPLACING LOWER HALF:

Mixing and Forming: Forming of castable refractory on the lower half of the door is done in three sections: one, the lower; two, the middle; and three, the upper, in that order, (figure 3). Do not attempt to form or pour castable refractories with any considerable period of time between the sections, since calcium aluminate cements begin to set very soon after mixing with water. For the best results, the operation should be completed in less than 20 minutes from initial mixing to final positioning, per batch with time stoppage on the complete job held to a minimum. If any section is allowed to harden before the next section is poured, the sections will not bond and this

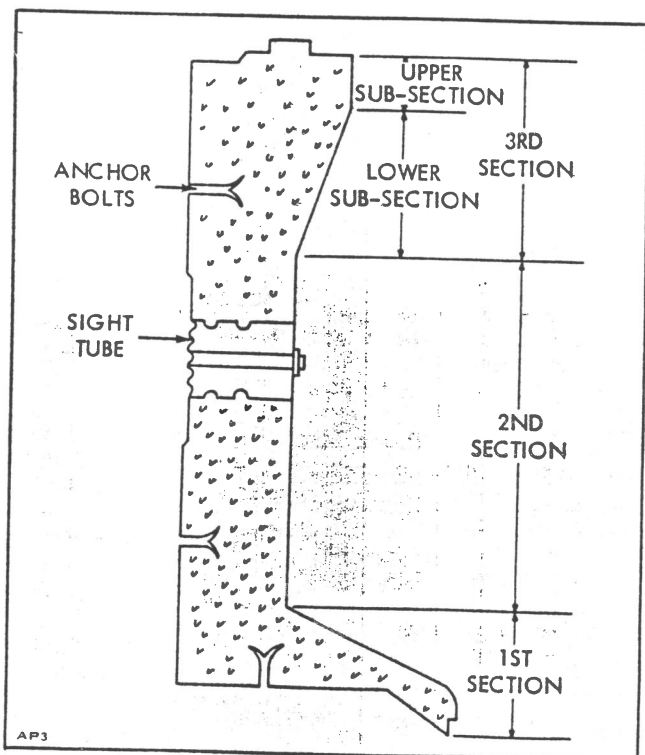


FIGURE 3. SECTION FORMING

Section III

REFRACTORY REPLACEMENT

Cutting Plywood Forms: Patterns for the semicircular and rectangular forms are laid out on 3/4" plywood (rough, interior grade is satisfactory) according to the sketch in figure 1 and the dimensions given in the Bill of Materials. Note that the curved form is made by laying out half a circle with the radius given and then cutting a portion which is Dimension "C" from midpoint of straight side to outer circumference. With this in mind, it is usually possible to cut both pieces from a single piece of plywood if they are laid out before one is cut.

Positioning: Swing the door to an approximate 45° angle to the boiler shell and properly support or brace it below the working area with suitable bridging material. This bracing prevents abnormal elongation of the door.

NOTE

When insulation and refractory must be removed from all or most of the rear door prior to repair, it should be removed in this order: upper half, baffle tiles, lower half. In replacing the insulation and refractory, it is replaced in this order: baffle tiles, lower half, upper half.

Baffle Tile Support: BEFORE loosening or removing the baffles, the angle iron support called for in the Bill of Materials should be cut for clearance and clamped to the door as shown in figure 2, so that it contacts the lower surfaces of the baffle tiles. When this is in place and tightly clamped, carefully scribe a reference mark on the flange of the door on both sides to insure accurate relocation if the angle should accidentally become shifted during the reworking operation. This is quite important since it would be extremely difficult and time-consuming to establish the location for the front edge of the tiles by trial-and-error and improper positioning of the baffles would either permit undesirable bypassing of combustion gases or it would make it difficult or impossible to close the door.

Removal of V-Block Mix and Refractory: This material can best be removed with the aid of an electric or air hammer, if available. CAUTION should be used to avoid damaging or dislodging the cup-headed insulation pins and/or refractory anchors, both of which are normally concealed by the refractory or V-Block Mix. If any of these are knocked loose or damaged, they should either be re-affixed or replaced with new ones, welded to the steel shell of the rear door in the same manner and location. If any of the old refractory or V-Block Mix is to be left, it should be under-cut so as to anchor the new material firmly in place. All dust, dirt, and foreign material should be carefully cleaned from the door

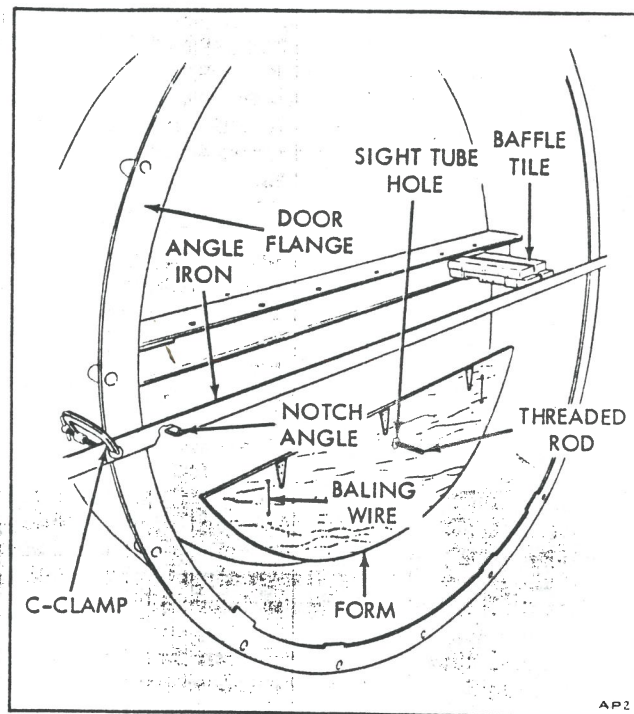


FIGURE 2. TILE SUPPORT AND SEMICIRCULAR FORM

after removal of refractory or V-Block Mix before commencing to replace it.

Removal of Baffle Tiles: Loosen all of the cap-screws and remove the strip of steel bar-stock that the cap-screws bear against. Remove the strip of 1/4 inch asbestos board along the upper rear portion of the tiles.

Remove the baffle tiles, one at a time, carefully separating any that adhere to each other and examine to see if they are all right to use again. Gently chip or scrape away any dried cement that adheres to the edges, rear, or groove in lower surface. Defects to watch for are: large missing pieces or corners; cracks which may soon cause a piece to fall off; burned areas as shown by erosion or crumbly texture. Discard defective tiles, if there are only a few, and replace with new ones. If a substantial number of the tiles are damaged, it is best to replace the entire number with new tiles.

Before proceeding with baffle tile replacement, clean out the tile channel, removing the old strips of 1/4 inch asbestos board. Inspect the cap-screws used to clamp the tiles in place; replace these if they are seriously rusted or damaged.

BILL OF MATERIALS AND SUGGESTED TOOLS

Boiler Diameter	Part No. 872-162 V-Block Mix*	Part No. 872-61 1/4" Asbestos Board J. M. No. 106 or equal	Part No. 872-22 1-1/2" Hi-Temp Insulating Block	Part No. 872-167 1" Hi-Temp Insulating Block	Part No. 872-96 Castable Refractory Furnas-Crete or equal**	Part No. 872-47 Refractory Cement Firefrax No. 1 or equal	Part No. 853-348 3-Ply 1/4" Asbestos Rope: J. M. No. 4202 or equal	Part No. 853-249 5/8" x 5/8" Asbestos Rope	Baffle Tile Laclede-Christy or equal	Support Refractory
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48"	75-100 lbs.	2-1-1/2 x 44 1-3 x 44 1-12 x 12	15 sq. ft.	15 sq. ft.	350 lbs.	10 lbs.	152"	60"	(9) Part No. 94-172 3 x 5-1/2 x 12-1/2	None
60"	175-225 lbs.	2-1-1/2 x 56 1-3 x 56 1-12 x 12	20 sq. ft.	20 sq. ft.	800 lbs.	10-15 lbs.	190"	72"	(12) Part No. 94-144 3 x 5-1/4 x 13-1/4	None
78"	200-250 lbs.	2-2 x 72 1-4 x 72 1-12 x 12	55 sq. ft.	30 sq. ft.	1600 lbs.	20-25 lbs.	None Required	90"	(15) Part No. 94-162 3 x 5 x 16-3/4	(2) Part No. 86-1459
96"	250-350 lbs.	2-2 x 90 1-4 x 90 1-12 x 12	120 sq. ft.	36 sq. ft.	2900 lbs.	50 lbs.	None Required	108"	(19) Part No. 94-189 3 x 5 x 18	(2) Part No. 86-1461

15-40 HP.

50-100 HP.

125-200 HP.

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400-800 HP.

Boiler Diameter	Part No. 872-26 Asbestos Cement J. M. No. 450 or equal	WOOD FORM DIMENSIONS SEE Figure 1, Page 2				Part No. 903-137 1-1/2" Cup-head insulation pins, each	Sight Tube	Angle Iron 1-1/2" x 1-1/2" x 1/4" x Length shown below	Refractory Anchors	Tadpole Gasket	Part No. 853-249 5/8" Asbestos Rope	Part No. 841-507 Gasket Clip Fastener	Baffle Tile Sealing Bar 1/2" x 1/2" mild steel Purchase locally
		"A"	"B"	"C"	"R"								
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60"	25 lbs.	3"	45"	15-1/2"	22-1/2"	21	Part No. 94-166	65-1/2"	5-5" Part No. 51-51 2-6" Part No. 51-161	Part No. 32-105	72"	15	As Required
78"	50 lbs.	8-1/2"	60"	18-1/2"	30"	30	Part No. 94-167	83-1/2"	9-6" Part No. 51-161 4-7" Part No. 51-41	Part No. 32-899	90"	15	As Required
96"	50 lbs.	11"	77"	25-1/2"	38-1/2"	30	Part No. 94-168	101-1/2"	9-6" Part No. 51-161 4-7" Part No. 51-41	Part No. 32-901	108"	15	As Required

15-40 HP.

50-100 HP.

125-200 HP.

250-350 HP.

400-800 HP.

* As required; according to condition of upper portion of door.

** Order by Part No. and amount required.

OTHER SUPPLIES NEEDED FOR RE-WORKING DOOR REFRACTORY

4 - "C" clamps, 4" or 6"
 1 - threaded rod, 1/2" x 16" with nuts and washers
 3 - hinges, strap-type, 4"
 As required: 3/4" plywood
 baling wire

NOTE: If possible, make certain that all necessary parts and materials are on hand before commencing major repairs, involving extended interruption of service.

Section IV

CURING (AIR AND WATER)

Most castables take on a fast, hard set. Allow about eight hours for setting and then remove the forms. To determine when water-curing should begin, rub the surface with a moistened finger after forms are removed. If the finger comes away soiled, air-curing should continue. If no refractory rubs off on the finger, it is time to begin water-curing. Apply a fine water spray, sufficient to keep the sur-

face moist, but not soaked. Water-curing should continue as described for about 24 hours after initial mixing of refractory.

CAUTION

Avoid freezing of uncured mixtures during cold weather.

Section V

CLOSING AND SEALING

It is recommended that the tadpole gasket be replaced. This is secured to the flange of the boiler with 15 gasket clip fasteners, Part No. 841-507. Usually it is best to use new fasteners. Before closing the door, the gasket should be coated with a mixture of oil and graphite.

The flange of the door should be clean, smooth and free of old lumps of hardened cement. Before closing the door, a new piece of 5/8" asbestos rope should be placed under the bar welded to the tube sheet.

The rope is held in place with furnace cement or other high-temperature adhesive.

Apply an asbestos pulp seal (Johns-Manville No. 450 cement mixed with water) around entire door circumference, placing asbestos pulp just within the inside diameter of the tadpole gasket, as shown in figure 8. The lip of the baffle tile should be filled with the same mixture. On closing the door, this pulp will squeeze out and protect the tadpole gasket and the asbestos rope along the horizontal center line of the tube sheet, forming a seal between the refractory surface and tube sheet (figure 8).

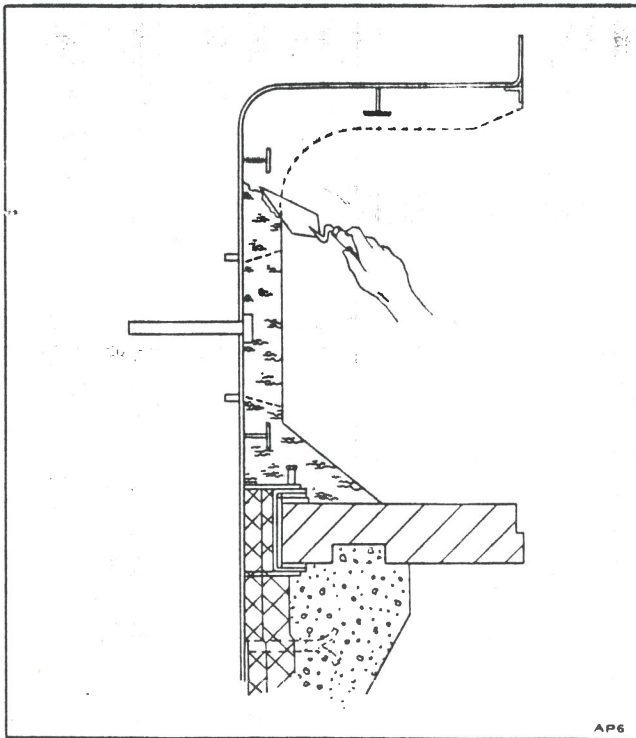


FIGURE 6. UPPER HALF OF DOOR
36" THROUGH 60".

Apply V-Block Mix (see figure 6), beginning on top surface of baffle tile, forming to approximately 6 inches out from shell of rear door at the bottom, (see figure 1). V-Block Mix should taper up and back to a height of about 5 inches across the entire baffle width. From this height, apply V-Block Mix to a thickness of 2 inches, using a trowel, and applying V-Block Mix horizontally back and forth across the upper half of the door, in layers, until the required 2-inch thickness is reached. Note that the corners are rounded in contour. Since the insulation pins are 1-1/2 inches long, the heads should be covered by 1/2 inch of V-Block Mix.

V-Block Mix should not be used in the lower half of the rear door, since it is not intended to continuously resist the temperatures encountered in this section.

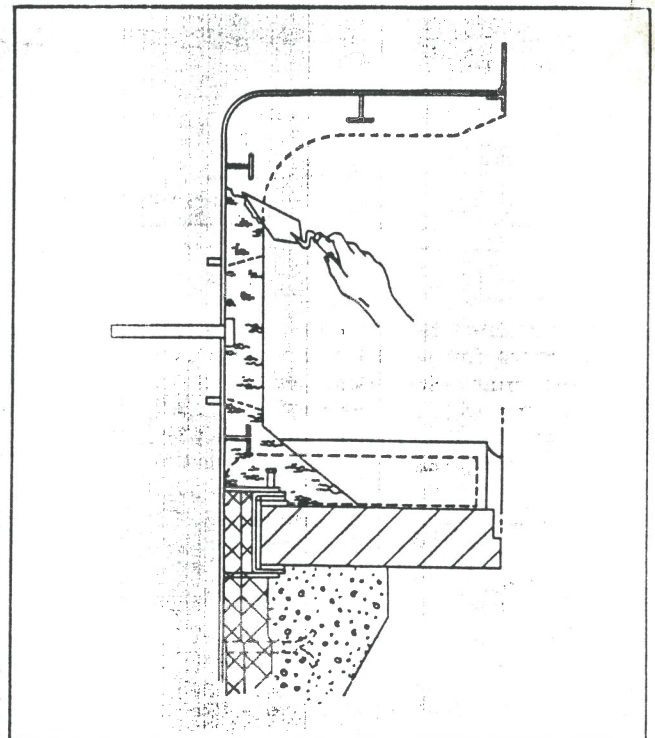


FIGURE 6a. UPPER HALF OF DOOR
78" AND 96".

REPLACING BAFFLE TILE SEALING BAR:

If, upon inspection, the segments of 1/2 inch square, mild steel sealing bar prove to be burned, warped, loosened or damaged in any way, they should be replaced.

In removing and replacing the segments of sealing bar, care must be taken to locate new segments in precisely the same place, in perfect alignment with adjoining segments, whether all segments are being replaced or merely one or two.

Note (figure 1) that segments of bar are welded to the tube sheet only on the upper side of bar; stitch or skip welding sufficient.

ALLOW ABOUT 2" CLEARANCE TO HEAD ON EACH END. FIT TILES BEFORE CEMENTING AND CLAMPING IN PLACE CUTTING TILE IF NECESSARY. FILL WITH CASTABLE REFRACTORY OF SHAPING CONSISTENCY AS SHOWN.

CUT END TILES. ALLOW APPROXIMATELY 2" CLEARANCE TO HEAD ON EACH SIDE. FILL WITH CASTABLE REFRACTORY.

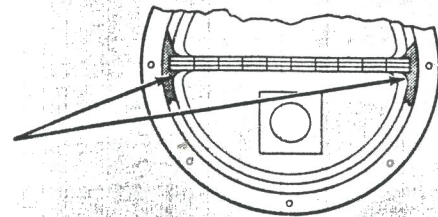


FIGURE 7. PLACEMENT OF REFRACTORY ON ENDS OF BAFFLE TILE.

BILL OF MATERIALS AND SUGGESTED TOOLS

Boiler Diameter	Part No. 872-162 V-Block Mix*	Part No. 872-61 1/4" Asbestos Board J. M. No. 106 or equal	Part No. 872-22 1-1/2" Hi-Temp Insulating Block	Part No. 872-167 1" Hi-Temp Insulating Block	Part No. 872-96 Castable Refractory Furnas-Crete or equal**	Part No. 872-47 Refractory Cement Firefrax No. 1 or equal	Part No. 853-348 3-Ply 1/4" Asbestos Rope: J. M. No. 4202 or equal	Part No. 853-249 5/8" x 5/8" Asbestos Rope	Baffle Tile Laclede-Christy or equal	Support Refractory
36"	60 lbs.	1-4 x 34 1-2 x 33	Not Used	Not Used	150 lbs.	2 lbs.	114"	48"	(7) Part No. 94-115	None
48"	75-100 lbs.	2-1-1/2 x 44 1-3 x 44 1-12 x 12	15 sq. ft.	15 sq. ft.	350 lbs.	10 lbs.	152"	60"	(9) Part No. 94-172 3 x 5-1/2 x 12-1/2 172	None
60"	175-225 lbs.	2-1-1/2 x 56 1-3 x 56 1-12 x 12	20 sq. ft.	20 sq. ft.	800 lbs.	10-15 lbs.	190"	72"	(12) Part No. 94-144 3 x 5-1/4 x 13-1/4 144	None
78"	200-250 lbs.	2-2 x 72 1-4 x 72 1-12 x 12	55 sq. ft.	30 sq. ft.	1600 lbs.	20-25 lbs.	None Required	90"	(15) Part No. 94-163 3 x 5 x 16-3/4 162	(2) Part No. 85-1459
96"	250-350 lbs.	2-2 x 90 1-4 x 90 1-12 x 12	120 sq. ft.	36 sq. ft.	2900 lbs.	50 lbs.	None Required	108"	(19) Part No. 94-189 3 x 5 x 18 189	(2) Part No. 85-1461

5-40 HP.
50-100 HP.
25-200 HP.
50-350 HP.
100-800 HP.

162

Boiler Diameter	Part No. 872-26 Asbestos Cement J. M. No. 450 or equal	WOOD FORM DIMENSIONS SEE Figure 1, Page 3				Part No. 909-137 1-1/2" Cup-head insulation pins, each	Sight Tube	Angle Iron 1-1/2" x 1-1/2" x 1/4" x Length shows below	Refractory Anchors	Tadpole Gasket	Part No. 853-249 5/8" Asbestos Rope	Part No. 941-307 Gasket Clip Fastener	Baffle Tile Sealing Bar 1/2" x 1/2" mild steel Purchase locally
		"A"	"B"	"C"	"D"								
36"	1 lb.	Not Used	Not Used	Not Used	Not Used	23	Part No. 94-143	41"	None Required	Part No. 32-442	48"	15	As Required
48"	15 lbs.	5"	35"	10"	17-1/2"	17	Part No. 94-165	53"	2-5" Part No. 51-51 2-6" Part No. 51-161	Part No. 32-516	60"	15	As Required
60"	25 lbs.	3"	48"	15-1/2"	22-1/2"	21	Part No. 94-166	65-1/2"	5-8" Part No. 51-51 3-6" Part No. 51-161	Part No. 32-105	72"	15	As Required
78"	50 lbs.	8-1/2"	60"	18-1/2"	30"	30	Part No. 94-167	83-1/2"	9-6" Part No. 51-161 4-7" Part No. 51-41	Part No. 32-899	90"	15	As Required
96"	50 lbs.	11"	77"	25-1/2"	38-1/2"	30	Part No. 94-168	101-1/2"	9-6" Part No. 51-161 4-7" Part No. 51-41	Part No. 32-901	108"	15	As Required

5-40 HP.
50-100 HP.
15-200 HP.
50-350 HP.
100-800 HP.

* As required; according to condition of upper portion of door. **OTHER SUPPLIES NEEDED FOR RE-WORKING DOOR REFRACTORY**

** Order by Part No. and amount required.

4 - "C" clamps, 4" or 6"
1 - threaded rod, 1/2" x 16" with nuts and washers
3 - hinges, strap-type, 4"
As required: 3/4" plywood
bailing wire.


NOTE: If possible, make certain that all necessary parts and materials are on hand before commencing major repairs, involving extended interruption of service.

DIA.	HORSEPOWER	DRY OVEN	LINER TILE	
			PRIOR TO L-27704	AFTER L-27704
36"	P&M 15-40	(1)94-133 (100 Series)	(5)94-131 (100 Series)	
	CBH 25-50A	(1)94-134 (200 & 700 Series)	(6)94-132 (200 & 700 Series)	
	CB15-40	(2)94-90 (1)94-113 (1)94-114		
48"	P&M 50-60	(1)94-219 (100 Series)	(8)94-388	
	CBH 50-125A	(1)94-220 (200 & 700 Series)	(8)94-389	
	CB50-125A (Old Style)	(8)94-386 (8)94-387	(8)94-160	
	CB 50-80	(8)94-217	(16)94-216	
	CB 100-125A	(8)94-218		
60"	CB 125-200	(16)94-130	(7)872-41 (7)872-42 (1)872-43 (1)872-44	(17)94-203
78"	CB 250-350	(25)94-343 (1)872-468 SHIM	(11)872-43 (22)872-44	(39)94-204
96"	CB 400-500	(35)94-344	(32)872-203	(34)94-205 (Plain) (32)94-205 (Corr.)
	CB 600-800	(1)872-469 Shim	(48)872-203	(51)94-205 (Plain) (48)94-205 (Corr.)

872-47 Hi Temp Bonding Mortar, 50# Drum

NOTE: Old Style Liner Tile can be furnished, but we recommend replacing old style with new style liner tile.

Handwritten:
16
17
33
16
4

 DIVISION OF AQUA-CHEM, INC. P.O. BOX 421 • MILWAUKEE, WIS. 53201	DATE	DRY OVEN & LINER TILE FIRETUBE BOILERS		
	11/1/85	REVISION NO.	SHEET	REFERENCE NO.
PARTS REFERENCE		1	NO 1 OF 4	FT 2.3.1

THIS INFORMATION IS CONFIDENTIAL AND IS NOT TO BE USED IN ANY WAY DETRIMENTAL TO THE COMPANY'S INTERESTS.