

# PRELIMINARY

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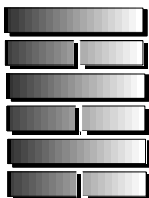
Heat-Kit System

Modular Contraflow Masonry Heater Core

**Assembly Manual**

HK-22fo-c

22" Firebox Corner Unit with Front Bake Oven



Masonry Stove  
Builders

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## Material List

320	Standard Firebricks 4 ½ ”x9”x2 ¼ ” (2 ¼ ” dimension may vary. <b>Important:</b> The 4.5” and 9” dimensions are important - please ask your supplier to confirm that they are +/- 1/16”)
20	Firebrick “Splits” 4 ½ ”x9”x1 ¼ ”
20 Kg.	Air Setting Refractory Mortar (“Sairset” from A.P. Green, or equivalent. “Fire Cement” or “Refractory Cement” sold by masonry suppliers for setting firebricks. Avoid the new “Non-Soluble Refractory Mortar”)
30	Common clay bricks (8”x4” nominal)
2 bags	Mortar Mix
1 bag (20 lbs)	Vermiculite (Block Fill, Zonolite, etc.) (See “Instructions for Finishing Heater”)
1 bag	Portland Cement (See “Instructions for Finishing Heater”)

## Assembling the Bottom End

The bottom end of a contraflow heater is the most complicated part of the whole job. The two downdraft channels connect here, underneath the firebox. As well, the chimney connection and the cleanout openings for the particular installation need to be determined and located here.

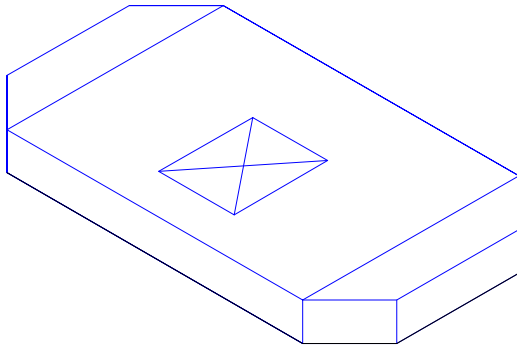
The insulated base slab allows you to do a dry layout first and make sure that everything is located properly in relation to the chimney and the slab.

### Cleanout Openings and Chimney Connection:

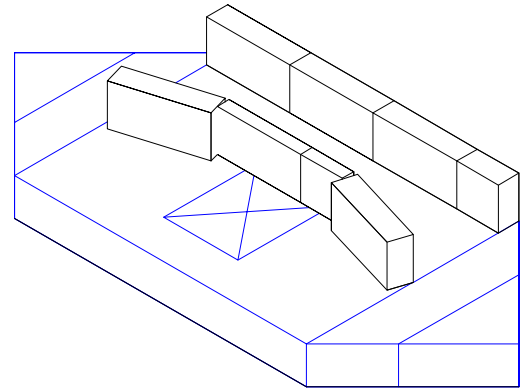
You will need to allow for a chimney connection and a cleanout opening for each downdraft channel (3 openings total). **NOTE:** Location for these vary and are not indicated in the drawings below.

A short piece of 8x12 flue liner will later connect the heater opening with the chimney opening. It will simply be butted up against the firebricks from outside. The cleanout doors will get installed later in the facing, so the openings in the firebricks don’t have to be exact.

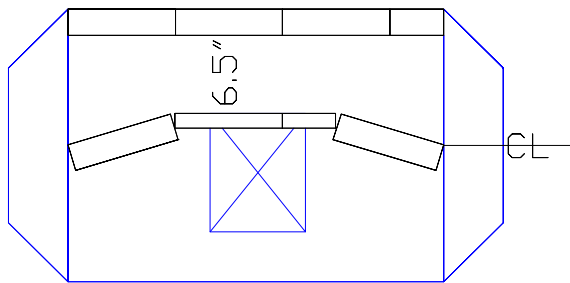
Use the 1 ½” x 14” x ¼” steel flatbars provided to span openings in the firebricks. You will need to notch the firebricks to accept the bars, since the mortar joints don’t have much thickness.

**Figure 1**

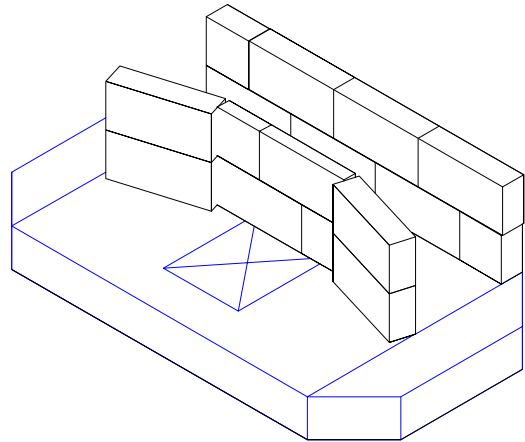
Position insulating base slab dry to determine layout for heater and chimney.  
Mark final position at corners with a pencil.  
Install insulating base slab level onto a mortar bed.

**Figure 2**

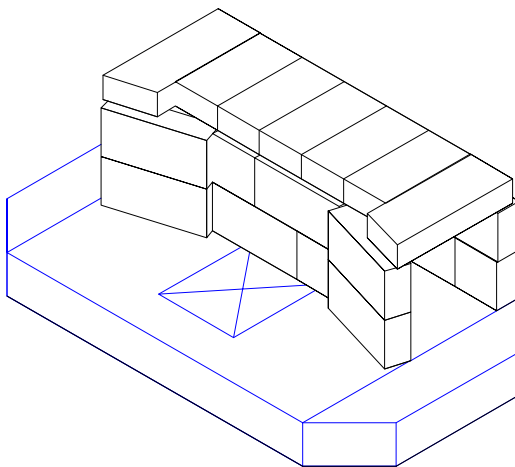
Build connecting channel.  
(If there is a rear chimney, leave opening and span with flat bar supplied (notch bricks to maintain thin joints)).  
Firebrick shiner is flush with outside of slab.  
Firebrick split shiner is set to form a 6-1/2" channel.  
(Note: "shiner" = brick set on edge)  
See Figure 5 for more layout information



**Figure 3**



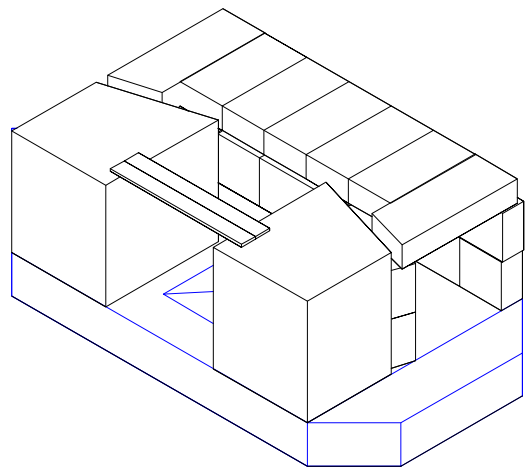
**Figure 4**



**Figure 5**

Form connecting channel ceiling as shown. The two endpieces are precast (supplied).

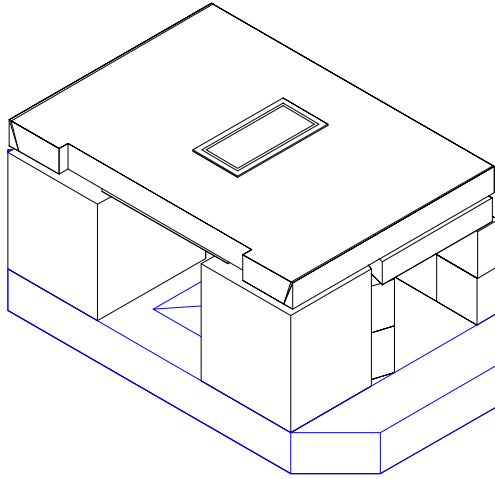
Sponge inside of channel to remove hanging drips.



**Figure 6**

To form support for firebox floor, use common brick and mortar to build up fill as shown to same height as firebrick. Fill all gaps solid with mortar. Leave approx. 8 - 10" channel for ashes.

Install 2 14" flatbars as shown to provide extra support for firebox floor. Use mortar joint underneath bars to gain height



Install firebox floor onto generous mortar bed and level accurately.

Ensure full mortar bed between flat bar and floor.

You are now ready to build the firebox.

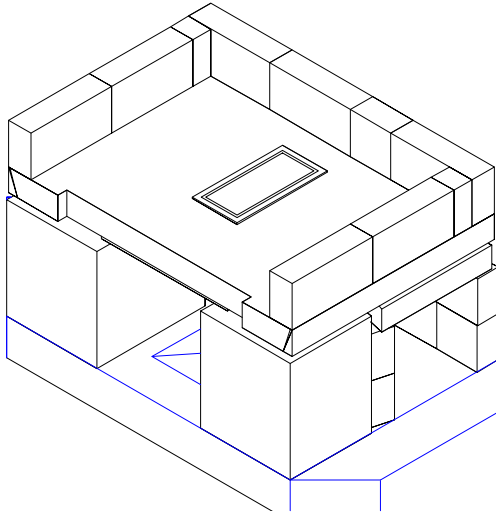
**Figure 7**

## Assembling the Firebox

The firebox is laid up from standard firebricks. Standard firebricks are 4 ½” wide by 9” long by 2 ¼” thick. The thickness will vary between 2 ¼” and 2 ½” depending on the supplier. Since the Heat-Kit is designed around the standard firebrick module, it is important to check the width and length of your bricks beforehand, to avoid having to make modifications to the assembly procedure.

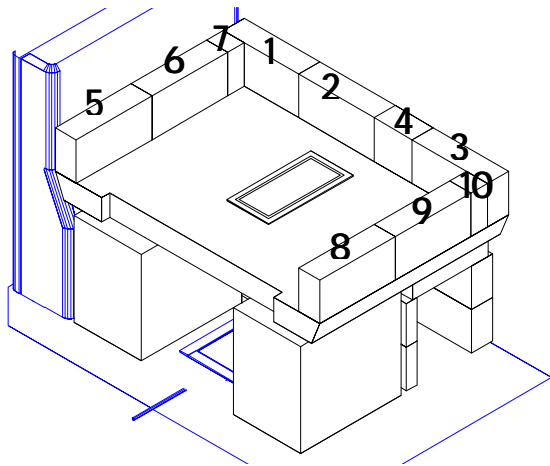
The firebox consists of two shells of firebricks set on edge. This allows the inner shell to be a field replaceable firebox liner. The firebrick installation sequence has been numbered. By following this order, you maximize the ability to “bury” odd lengths where they don’t show and reduce the amount of precise cutting that you have to do. Note that full contact between inner and outer shell is not required at the inside corners. Where convenient, a little play right at the corner provides some expansion room for the liner. There is no mortar joint between the inner and the outer shell - it is a dry joint.

Firebricks are laid up with clay air setting refractory mortar (“Sairset”, or fire cement) with thin joints. Only enough clay needs to be used to completely fill the joint. No joint thickness needs to be built up - you are only filling in gaps and irregularities between the bricks. Although masons are used to trowelling firebricks, the best joints are obtained by dipping the bricks into mortar that has been thinned to the right consistency. It looks messy, but the cleanup is easy later with a sponge. You can tell if the mortar has the right consistency by setting a brick down in a bucket of mortar. It will sink about half way. We like to dip the bricks and also keep a margin trowel handy for the odd bit of trowelling.



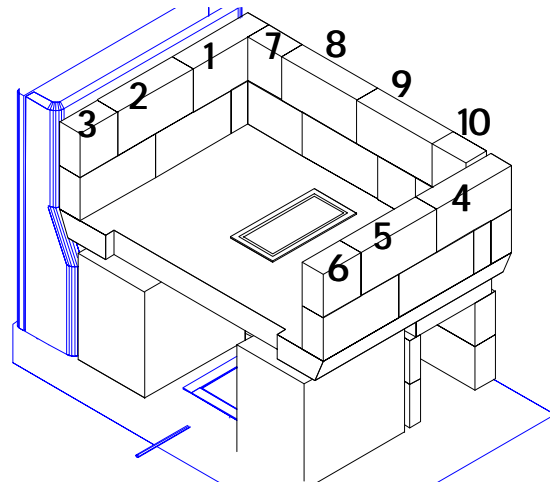
**Note:** The remaining firebox assembly drawings show a standard heater without corner channels. Ignore the precast channels that are indicated - the firebrick assembly sequence is identical.

**Figure 8**



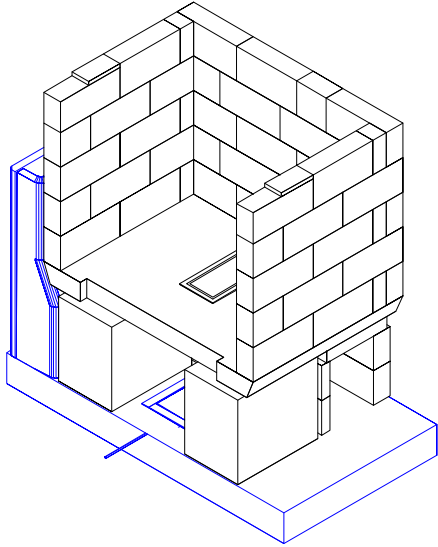
**Figure 9**

Lay out firebox as indicated. Outside width is 31½". Set bricks using air setting refractory mortar.



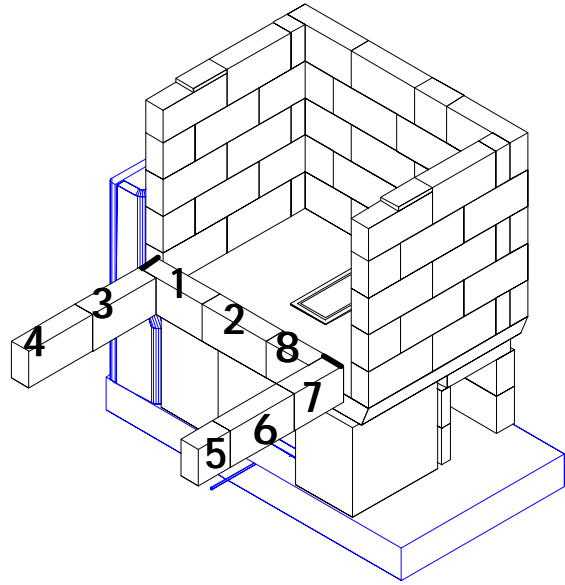
**Figure 10**

Exact bond is dependent on firebrick thickness, generally between 2-1/4" and 2-1/2".



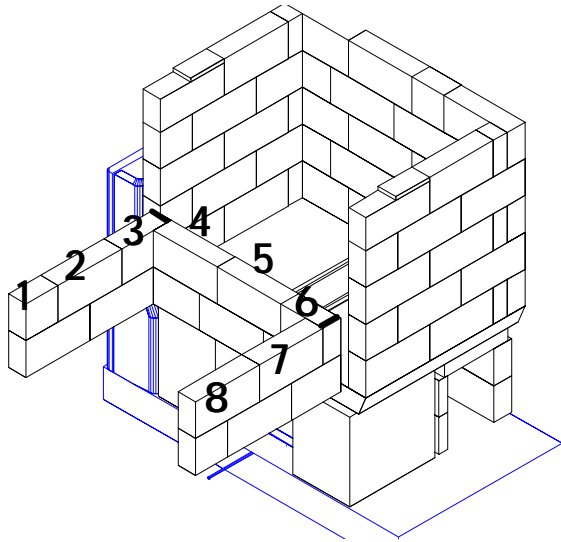
**Figure 11**

Top front firebricks are notched 1/4" x 4" for firebox lintel.

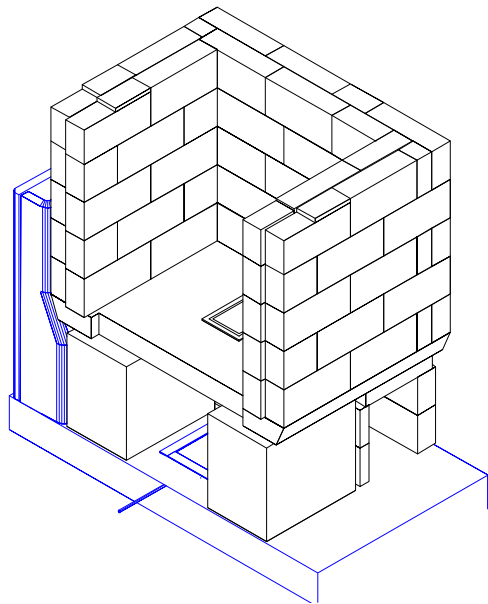


**Figure 12**

Install firebox liner with indicated bond. Depending on firebrick thickness, some adjustments may be needed in corners. It is desirable to leave a 1/16" - 1/4" gap wherever a butt end meets an inside corner, indicated above by dark shading.

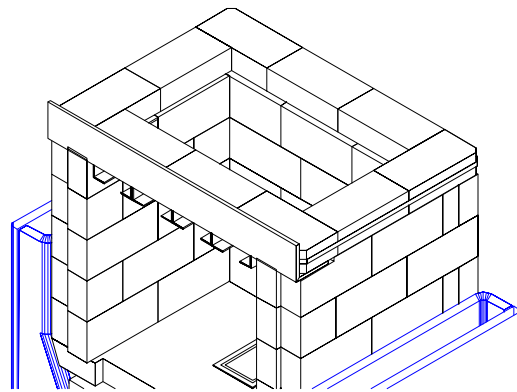


**Figure 13**



**Figure 14**

Notch top course of liner as shown.

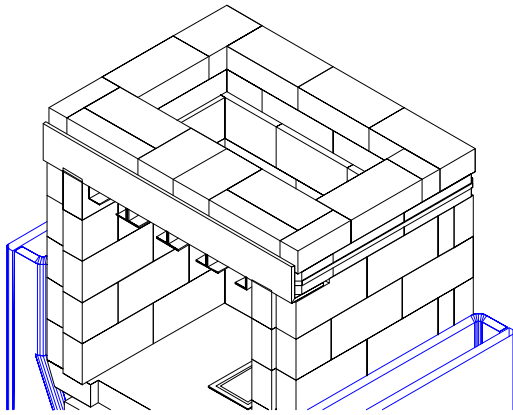


**Figure 15**

Install firebox lintel. Brackets on lintel are for heat shields (firebrick splits).

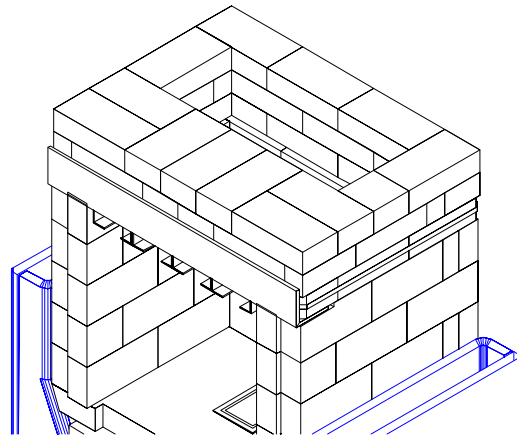
Lay up next course as shown. Use a dry joint with lintel. This course can be strapped as shown, but this is optional. If a strap is used, then round outside corners of bricks slightly.





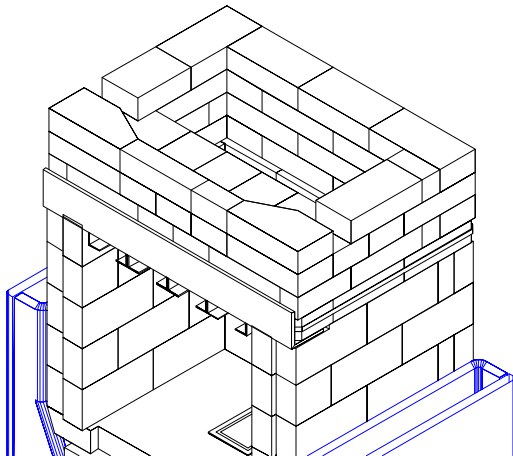
**Figure 16**

A total of 10 soaps (5 bricks ripped lengthwise) is used. All bricks are either full length (9"),  $\frac{3}{4}$  length (6  $\frac{3}{4}$ ") or half length (4  $\frac{1}{2}$ ")



**Figure 17**

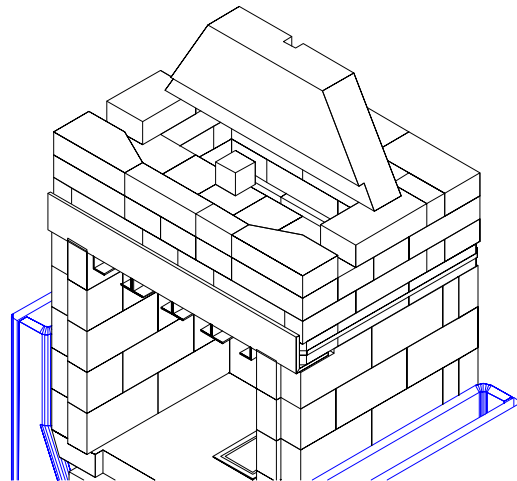
Next course.



**Figure 18**

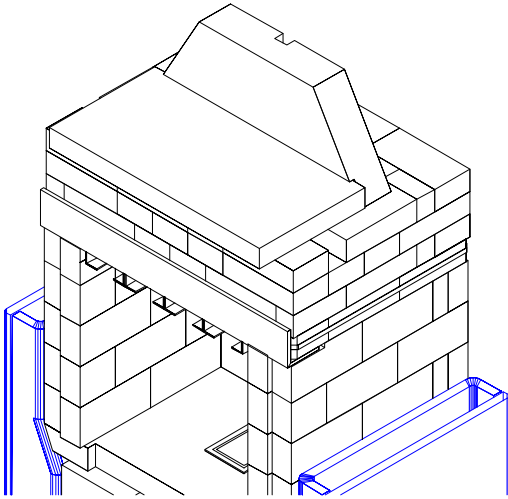
Check bricks for level before starting this course to see if there are high or low spots. When setting this course, carefully level the section where the oven will sit.

Cut front corner bricks as shown. Leave oven floor heat bypass gaps as shown. Standard gap is 2  $\frac{1}{2}$  inches.



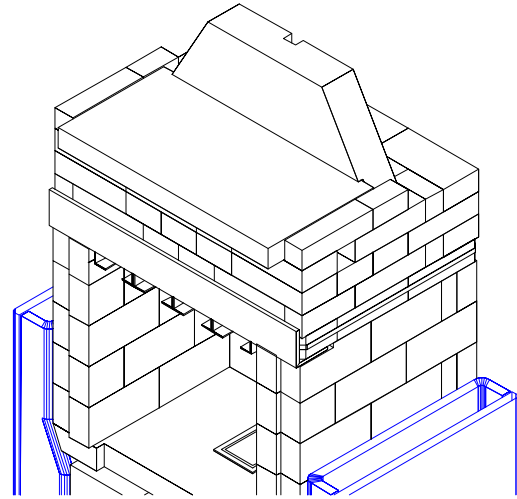
**Figure 19**

Install oven back as shown. Leave a 3  $\frac{1}{2}$  inch channel behind. Install small floor support piece as shown.



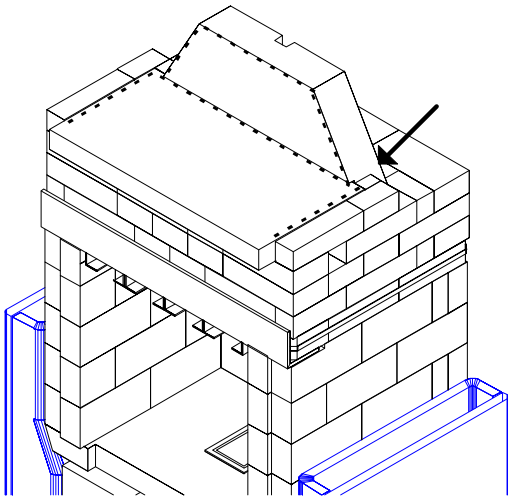
**Figure 20**

Install oven floor as shown. Set floor into Sairset. Inset into relief in oven back (not shown).



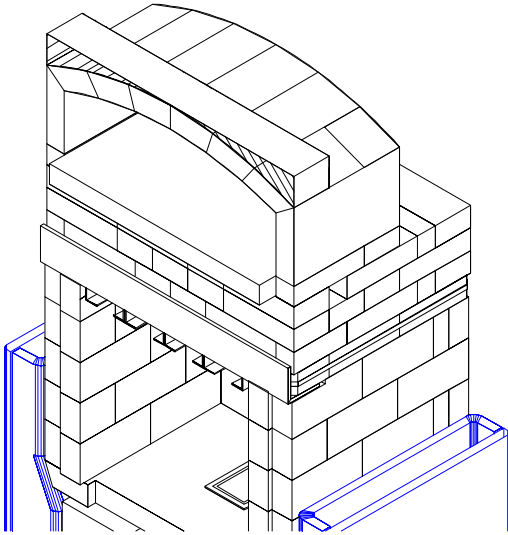
**Figure 21**

Install soaps as shown and level.



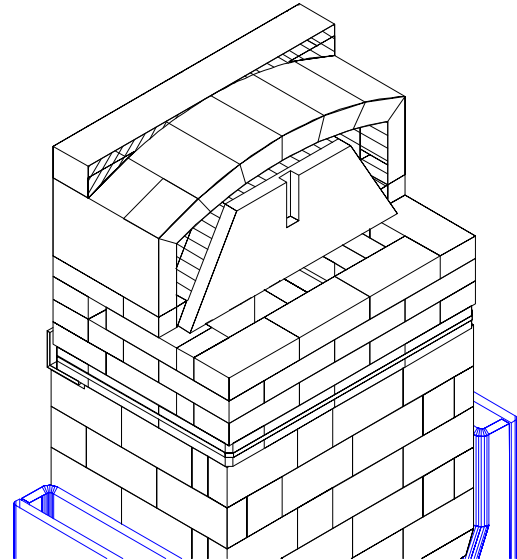
**Figure 22**

Install small wedge cuts (supplied) where shown. Gasket locations are shown (installed later)



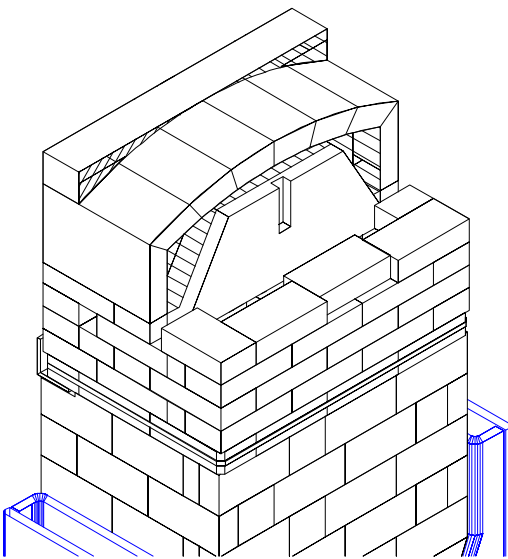
**Figure 23**

Apply Sairset to the soaps that will be under oven sidewalls. Make sure that you have adequate foot scaffold, and install large oven casting as shown. Use a helper, being sure to set oven straight down vertically onto back.



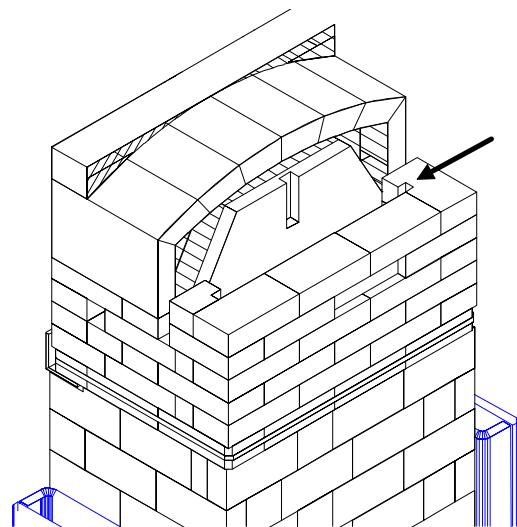
**Figure 24**

View from rear. If necessary, oven back insert can be shimmed with cut-up brick ties to ensure snug gasket space at top (other side)



**Figure 25**

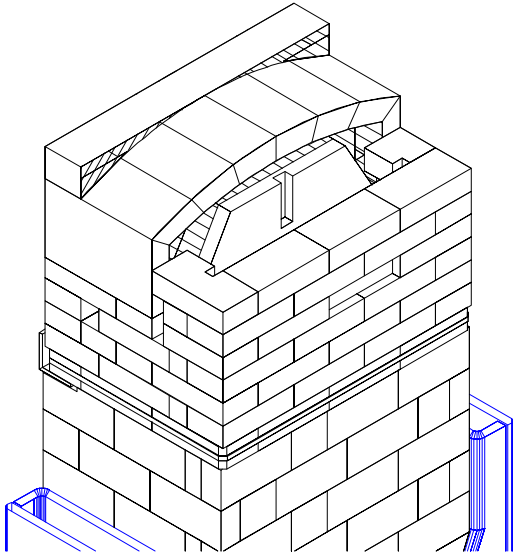
Project back brick  $\frac{3}{4}$ " as shown to form ledge for millboard.



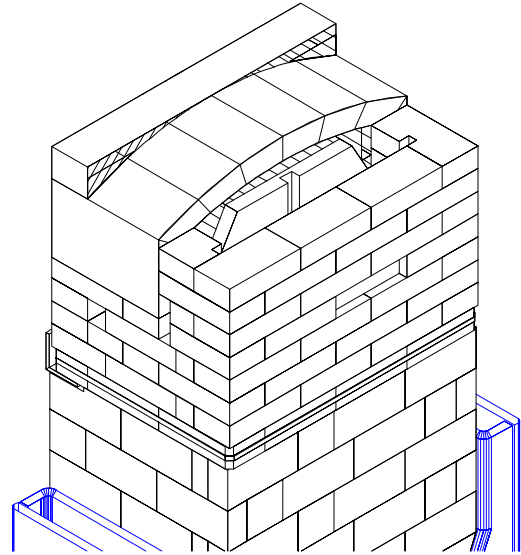
**Figure 26**

Form notches as shown for 1 inch millboard. Make notches slightly over 1 inch to allow for irregularities when sliding in millboard. The easiest way to cut these notches is to make 2 or 3 saw kerfs and pop piece out with brick hammer.

There are 5 courses of notches.

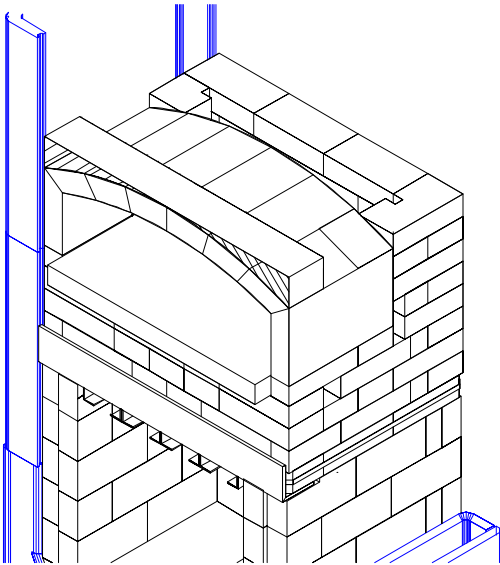


**Figure 27**

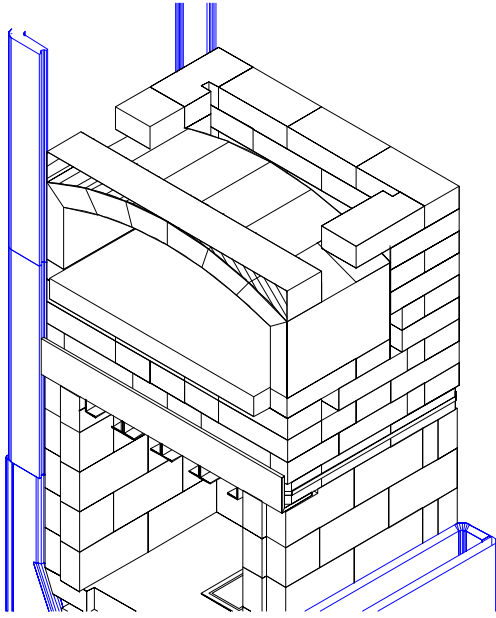


**Figure 28**

Continue as shown

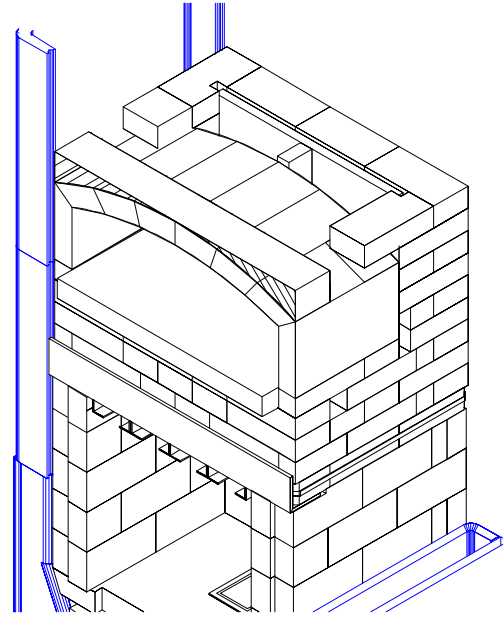


**Figure 29**



**Figure 30**

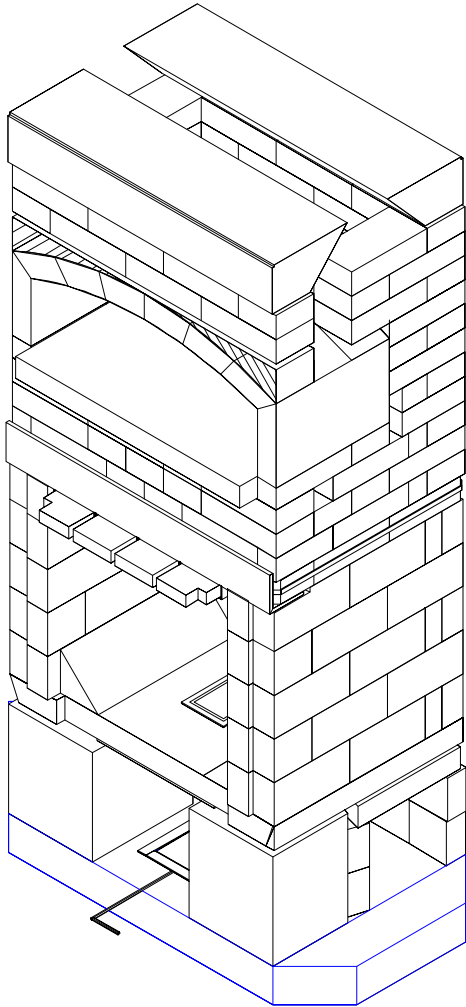
Top of oven and back firebricks need to be brought to same level. If height difference is less than 1/2", use a common mortar joint on the appropriate side. If difference is greater than 1/2", use either a castable refractory joint, or rip the bricks to the correct height. Alternatively, adjust difference later by cutting down one of the ceiling transitions (see below), which are a softer material.



**Figure 31**

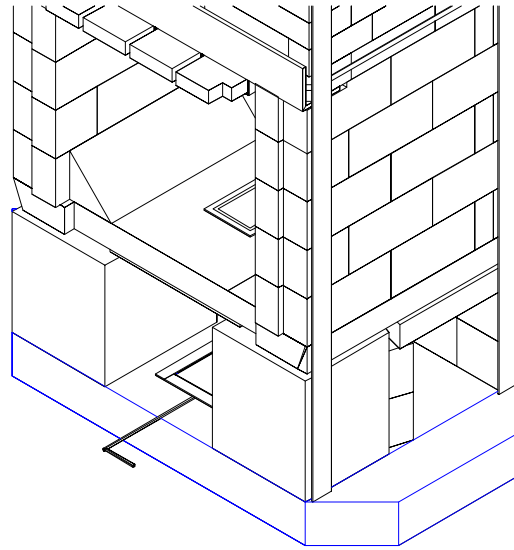
Slide in 24 1/2" x 12" millboard. Rip firebrick split and insert into oven back notch to form retainer for millboard as shown.

Install fiberglass rope gaskets (supplied) inside oven. See Figure 22 for locations.



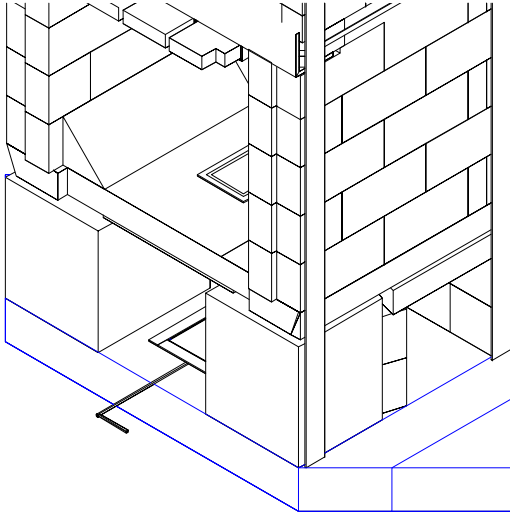
**Figure 32**

Install ceiling transitions.



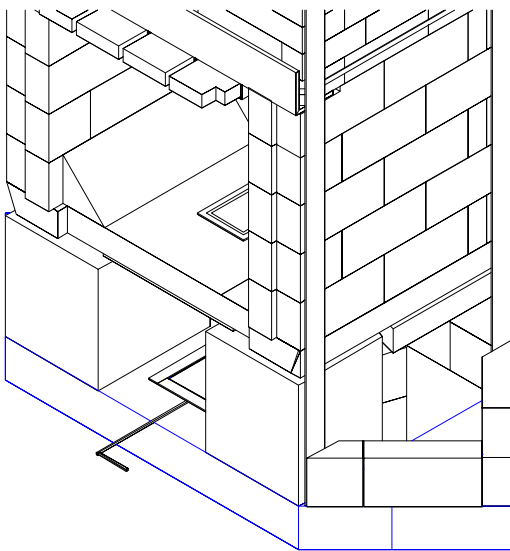
**Figure 33**

Install expansion joints at channel corners. Take 1" thick ceramic blanket supplied and cut into 2" wide strips with a sharp utility knife. Take 1" thick strips and carefully split apart into 1/2" thick strips. Glue on with a bead of clear silicone (supplied)

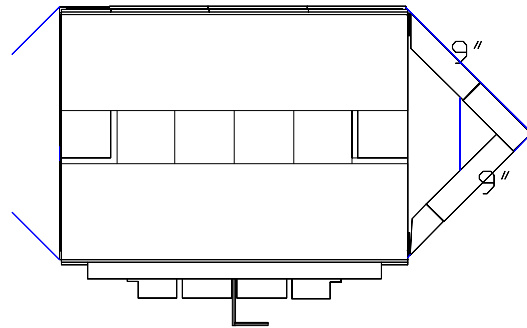


Install base slab extensions as shown. Set onto full mortar bed. Let mortar bed firm up, or insert brick scraps as wedges to prevent sagging as you build the channels.

**Figure 34**



**Figure 35**

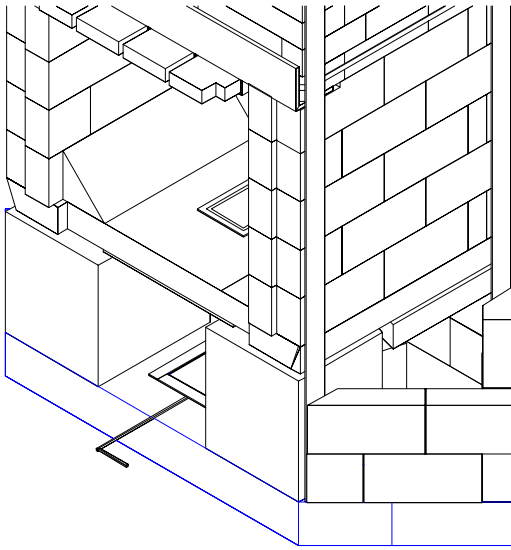


**Figure 36**

Begin constructing side channels. If bricks are 2 1/4" thick, cuts are as follows:

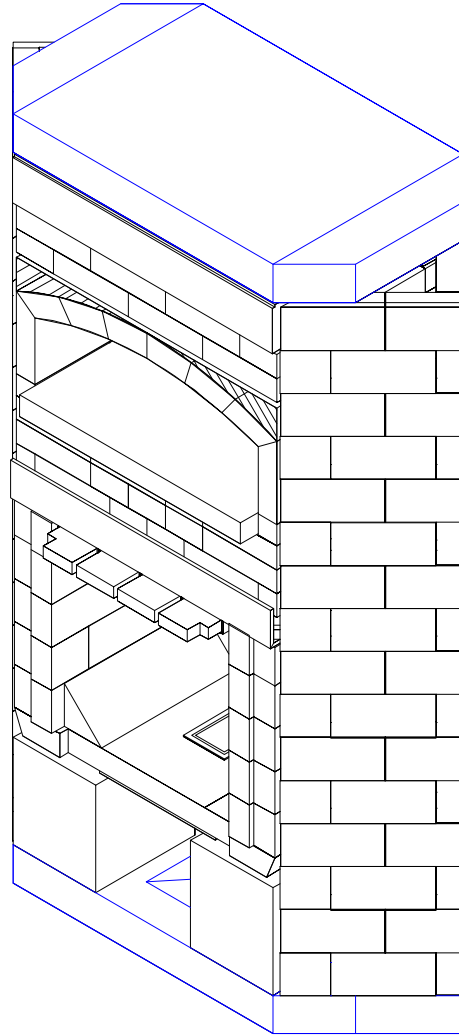
- 9" brick with 45 degree bevel
- 4 1/4" (+/-) brick with 45 degree bevel
- 6 1/2" (+/-) straight brick
- 9" straight brick (no cut)

Dip bricks in Sairset, and push up against expansion joint to compress it. Don't use any mortar against the expansion joint. Important Note: Ensure that there is no mortar bridging or dirt in the expansion joint. A solid connection will defeat the purpose of the expansion joint, and cause the heater facing to crack.



**Figure 37**

The same cuts are used on every course, with alternating bond.



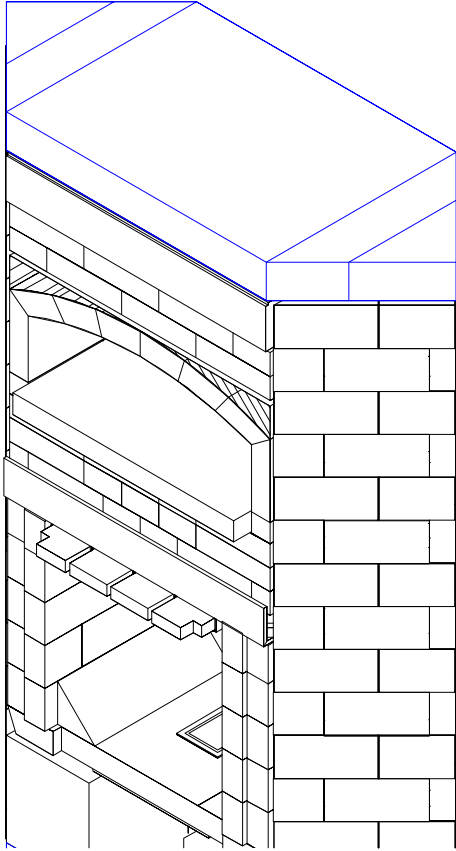
**Figure 38**

Continue as shown to the top.

If necessary, rip top course of bricks to the same height as the ceiling transitions.

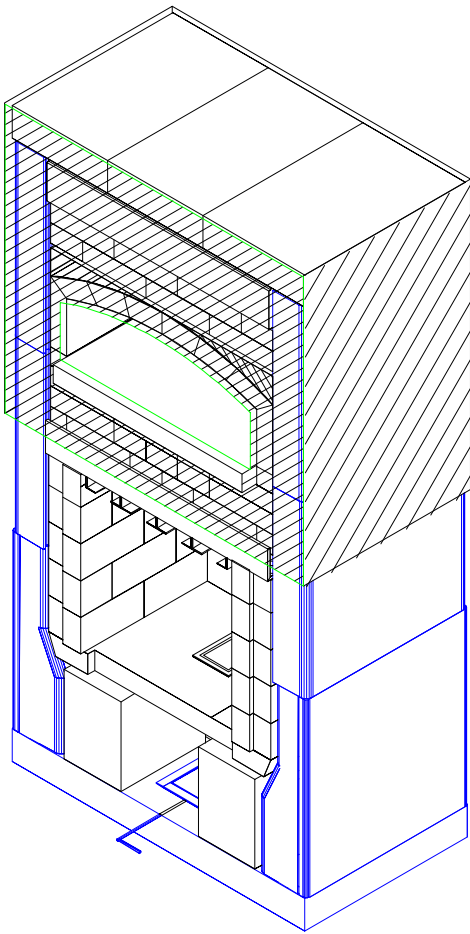
Install 3 piece ceiling slab (not exactly as shown). Use a helper, and set up adequate staging (foot planks). Be careful handling them, as the insulating board facing on bottom is fragile.





**Figure 39**

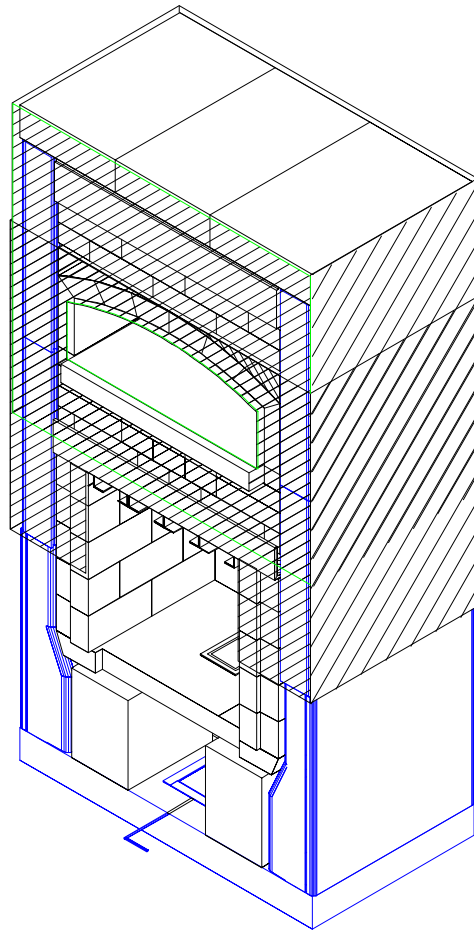
Install triangular ceiling slab extension pieces, using clear silicone to make tight joints with main ceiling slab and with firebricks. Using clear silicone, carefully seal all ceiling slab joints, particularly the shiplap joints and the bottom joint.



**Figure 40**

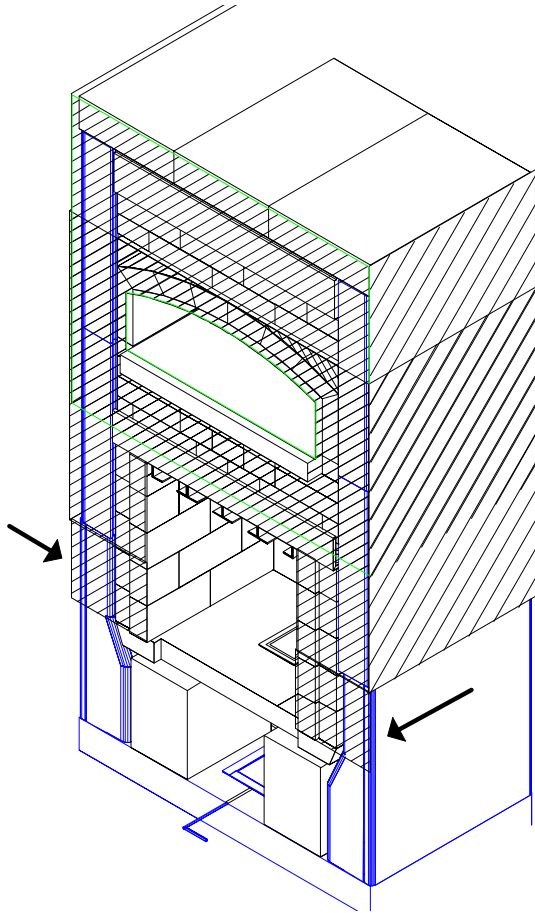
**Note:** drawings show standard heater. Procedure for corner heater is similar

Next comes a double wrap of fiberglass matt to act as an expansion and slip joint. Quickly dab silicone approximately 4" - 6" o.c. over entire area indicated. Start at top of ceiling slab and go 38" down. Carefully unfold fiberglass mat and, with a helper, wrap around heater. Make sure mat goes all the way to top of ceiling slab. Have helper hold in ends in place, and go around heater, patting the mat onto the silicone. The mat is somewhat fragile. Trim to give approx. 4" overlap, and secure end with silicone dabs and several 3" pieces of duct tape.



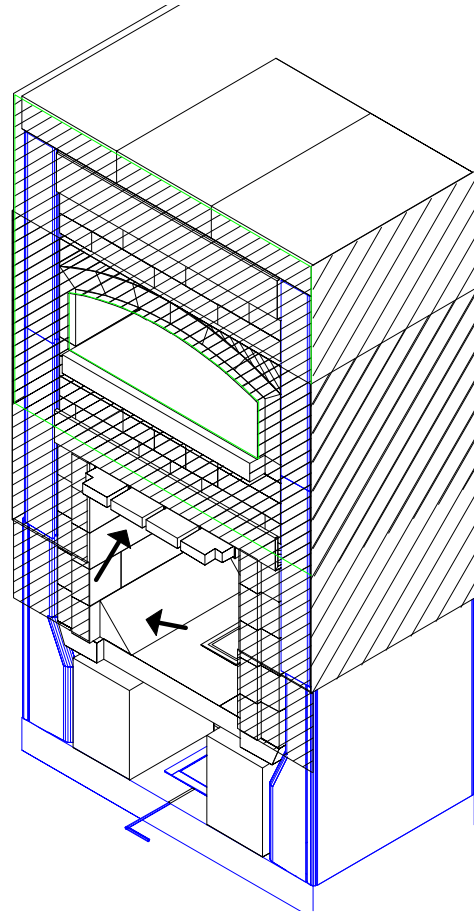
**Figure 41**

Second wrap of fiberglass mat starts 28" above the concrete and goes 38" up. Use same procedure as before. Trim around firebox and use offcuts to cover exposed firebricks at front. (Next figure)



**Figure 42**

Add two additional pieces as shown.



**Figure 43**

Note location of firebrick split heat shields.  
Install sloped floor pieces onto a bed of refractory mortar, similar to setting a firebrick.