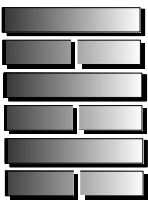

Revised on July 23, 2004

Heat-Kit System
Modular Contraflow Masonry Heater Core
Assembly Manual

HK-32no
Custom 32” Firebox, no oven

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**Masonry Stove
Builders**

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Material List

280	Standard Firebricks 4 ½ ”x9”x2 ¼ ” (2 ¼ ” dimension may vary. Important: The 4.5” and 9” dimensions are important - please ask your supplier to confirm that they are +/- 1/16”)
30	Firebrick “Splits” 4 ½ ”x9”x1 ¼ ”
45	Common clay bricks (8”x4” nominal)
3 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

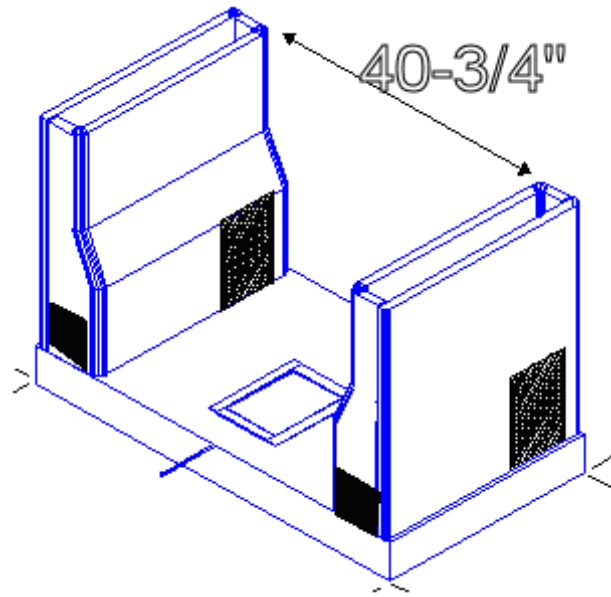
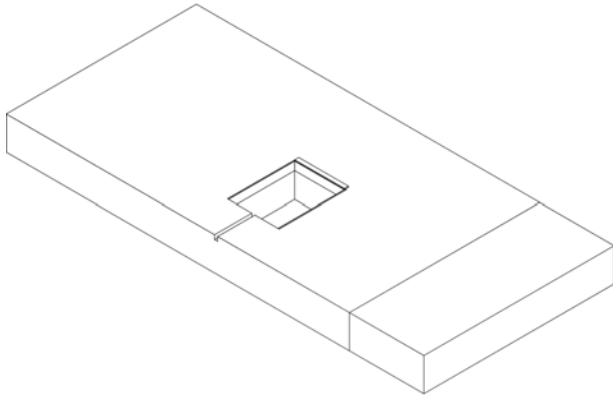
The bottom end of a contraflow heater is the most complicated part of the whole job. The two downdraft channels connect here, underneath the firebox. As well, the chimney connection and the cleanout openings for the particular installation need to be determined and located here.

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). If there are heated benches, there may be additional openings. See “Assembly Details” documents for photos of typical heated bench setups. **NOTE:** Location for these varies and is 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 channels from outside. The cleanout doors will get installed later in the facing, so the openings in the channels don’t have to be exact.



Insulating base slab is 2 pieces, including a 9" extension piece on the right.

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 full mortar bed. Joint between the 2 pieces can be dry, or fire cement.

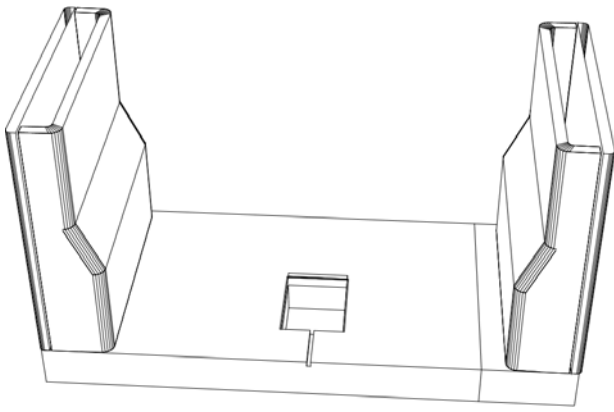
Before setting base channels, determine the best place in your layout to locate the cleanouts. One is needed for each base channel.

Mark clean out cuts on the base channels. Mark chimney connection on base channel.

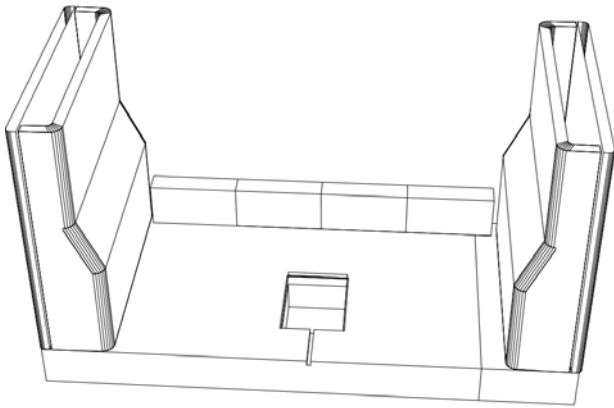
Cut appropriate holes for chimney connection and for clean outs. In this example, a right side chimney and front channel cleanouts are shown.

If there is a heated bench, determine the cutouts for the heated bench. Included in the package of construction documents is "Assembly Photo Details", which shows some examples.

Set base channels dry as shown. Bottom seam will be sealed later by mortar slush between channels and facing.



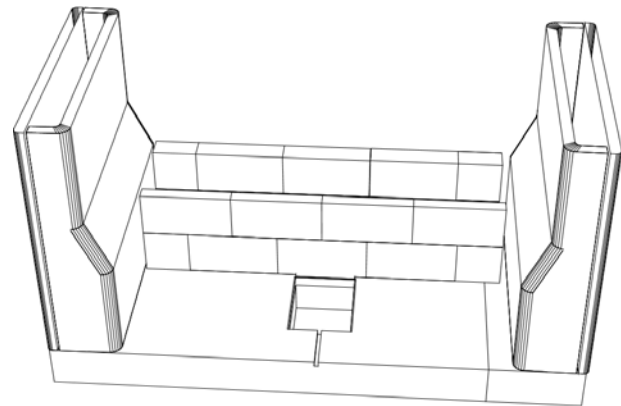
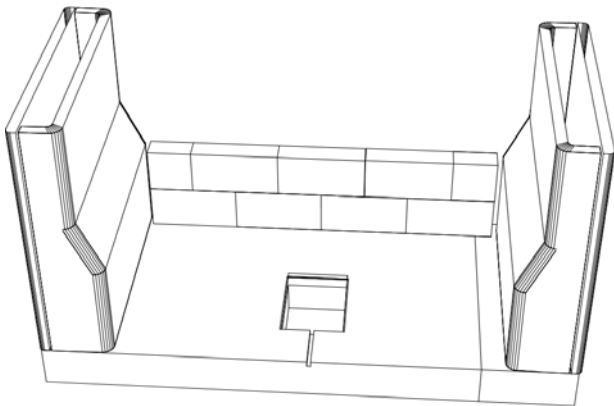
(Cutouts not shown)



Build connecting channel.

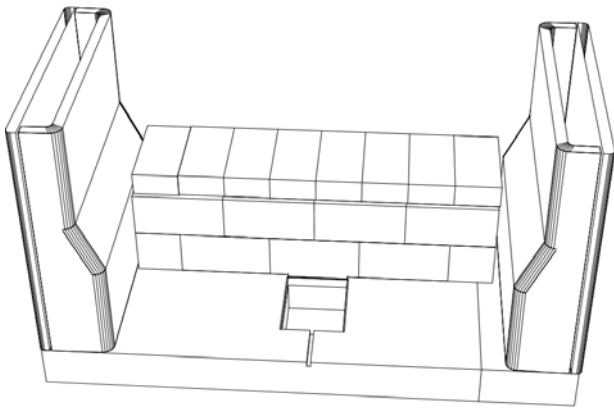
(If there is a rear chimney, leave 10.5" opening and span with flat bar supplied (notch bricks to maintain thin joints)).

Firebrick shiner is flush with outside of slab.
(Note: "shiner" = brick set on edge)

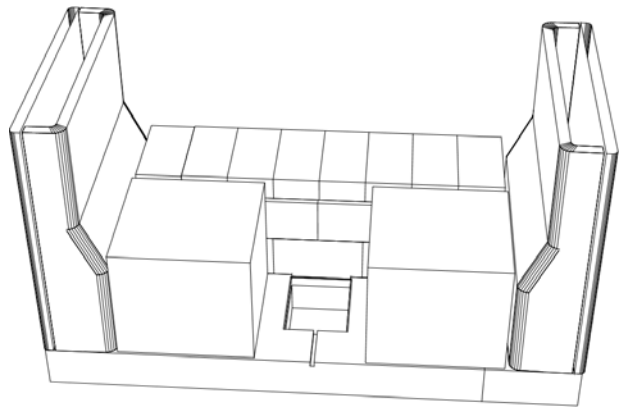


Form a 6-1/2" wide channel.

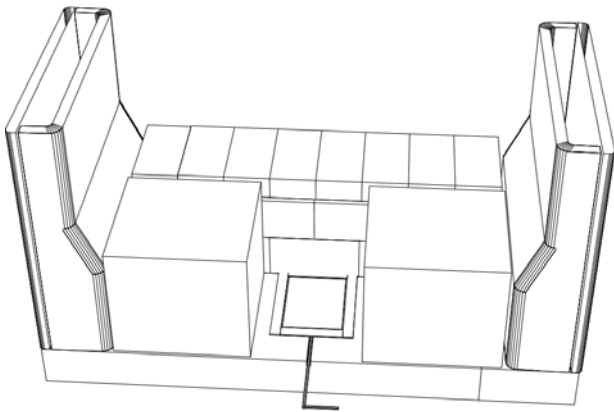
Front of channel is built from firebrick splits
(1.25" thick).



Form connecting channel ceiling as shown.
Use a sponge and water to clean any hanging mortar drips from the inside of channel.



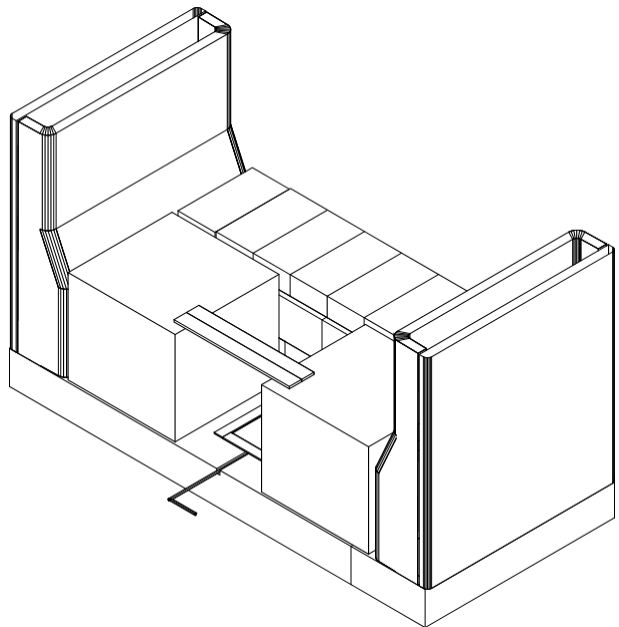
To form support for firebox floor, use common brick and mortar to build up fill as shown to same height as firebrick. Fill all gaps solid with mortar. Leave approx. 10" channel for ashes and combustion air.



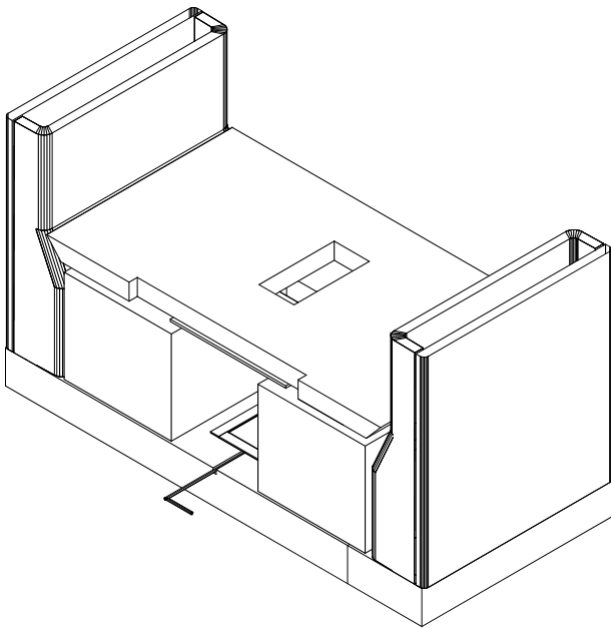
Outside air control is shown installed. Actually, it is better to install it after the core is complete, to avoid walking into the handle.

If there is a heated bench or raised hearth in front, handle will be longer.

Clean the precast pocket and install onto a bed of silicone.



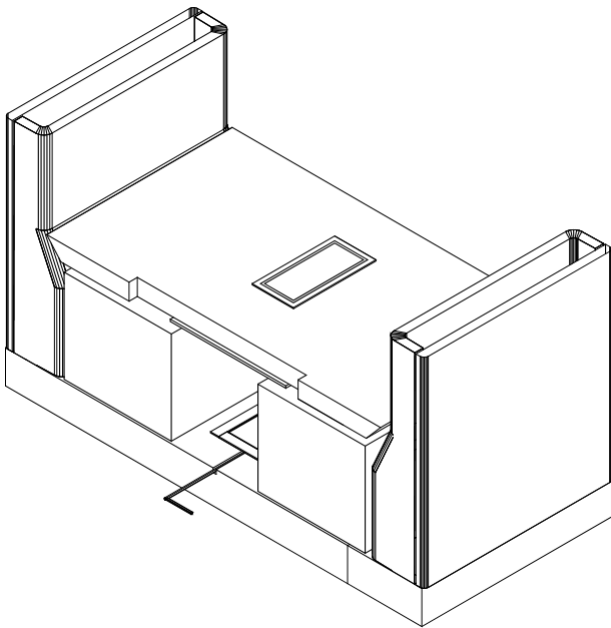
Install 2 14" flatbars as shown to provide extra support for firebox floor. Use mortar joint underneath flat bars to gain height



The rear of the firebox floor lines up with corner leads that are cast in the downdraft channels (ignore the leads that are cast in the front).

Install firebox floor onto generous mortar bed and level accurately in both directions.

Ensure full mortar bed between flat bar and floor.



The cast iron ash dump is shown installed dry into the firebox floor. You can also install it later.

You are now ready to build the firebox.

Setting Firebricks

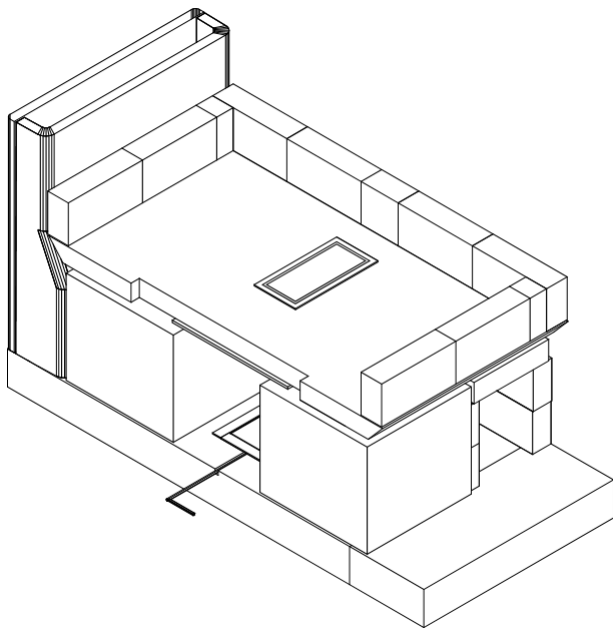
Firebricks are laid up with clay air setting refractory mortar ("Sairset", or fire cement) with thin joints. Only enough clay needs to be used to completely fill the joint. No joint thickness needs to be built up - you are only filling in gaps and irregularities between the bricks. Although masons are 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.

The Sairset that comes with the heater core kit has been pre-thinned to dipping consistency. You may need to add a some water, since it tends to thicken a little with time. You can tell if the Sairset 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 (small rectangular trowel) handy for the odd bit of trowelling.

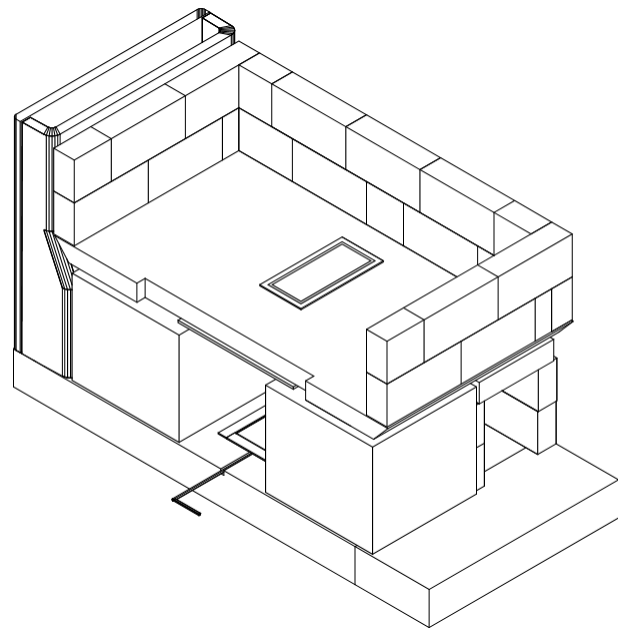
Assembling the Firebox

The firebox is laid up from standard firebricks. Standard firebricks are 4 1/2" wide by 9" long by 2 1/4" thick. The thickness will vary between 2 1/4" and 2 1/2" 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.

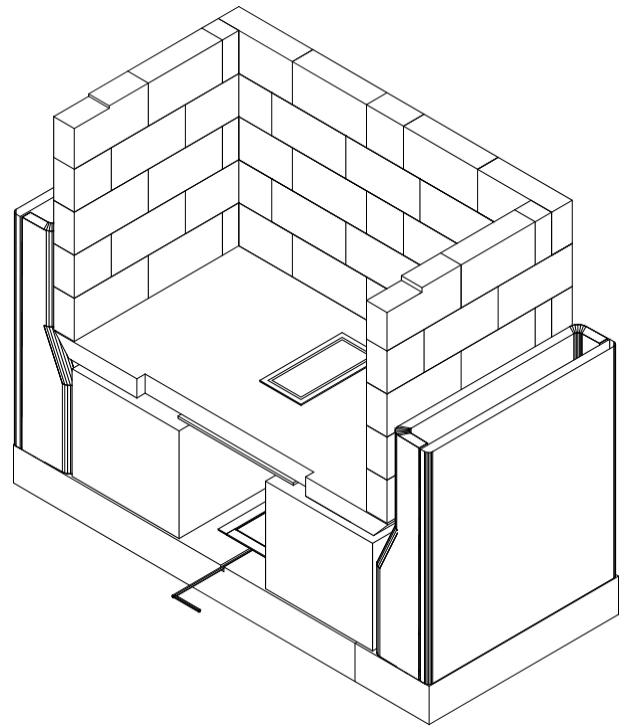
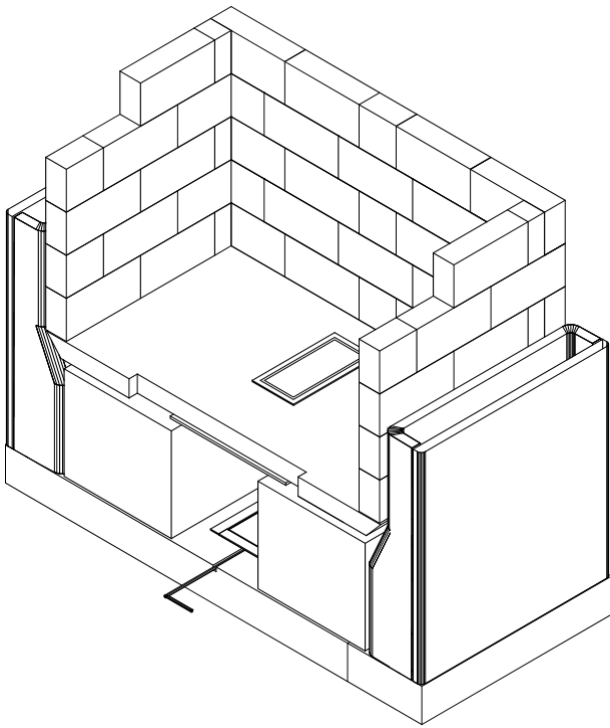
The firebox consists of two shells of firebricks set on edge. This allows the inner shell to be a field replaceable firebox liner. Note that full contact between inner and outer shell is not required at the inside corners. Where convenient, a little play right at the corner provides some expansion room for the liner.



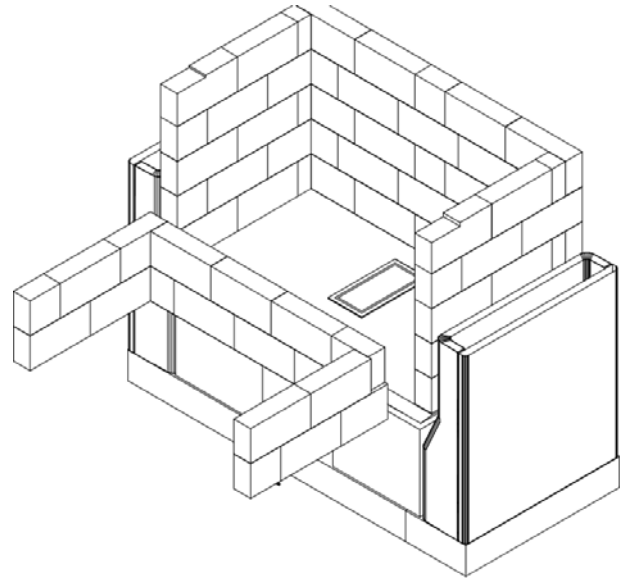
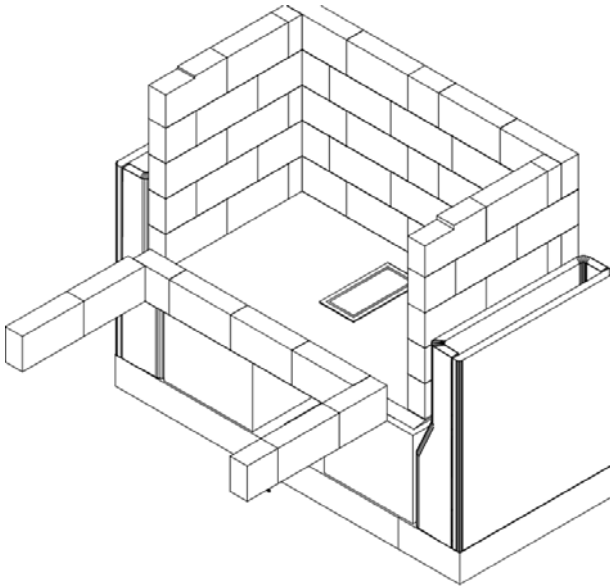
Lay out firebox as shown. Outside width is 40-1/2". Set bricks using air setting refractory mortar.



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



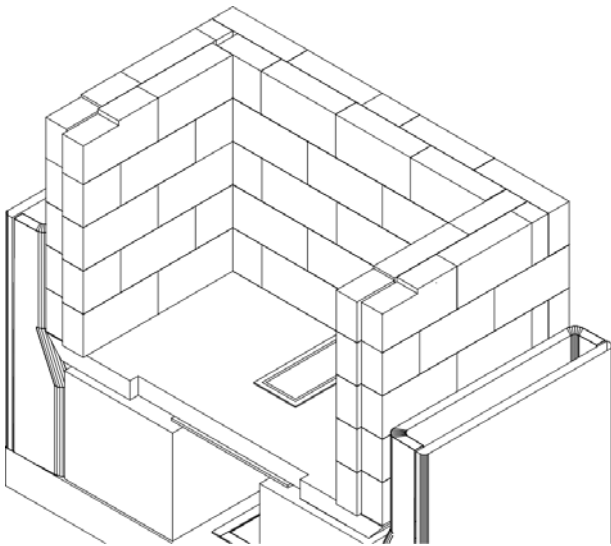
Top front firebricks are notched 1/4" x 4" for firebox lintel.



Begin inner firebox. Note that the bricks are left about 1/4" short at the blind inside corners. The cuts on these bricks are hidden.

Start with the half brick on the right. Inner firebox may project 1/4", depending on brick thickness. This is OK.

The inner firebox is set dry against the outer firebox. There is no mortar joint between the two fireboxes.



Notch top course of liner as shown. Notches are 1/4" x 4"

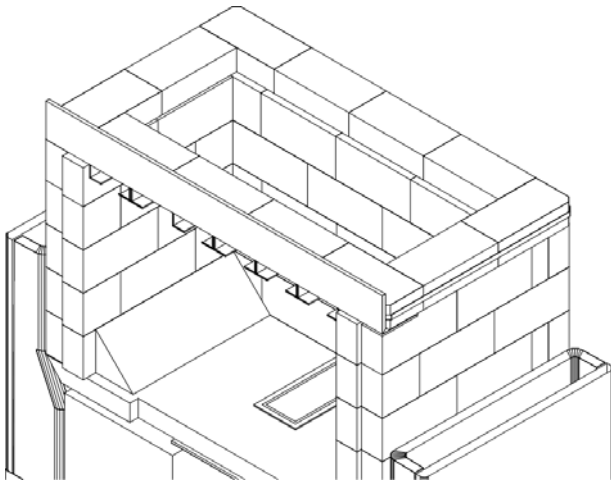
Immediately wash down the firebox with a sponge and a liberal amount of water. Rinse with clean water. If this is done right away, it is easy to get a nice clean firebox.



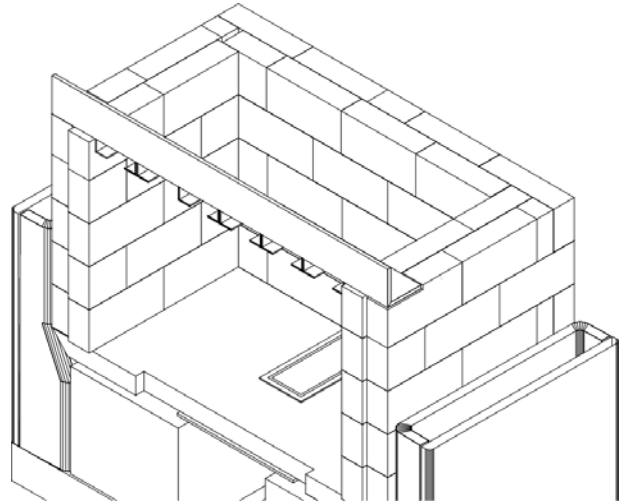
(22" firebox shown)

Building the Upper Firebox

Install firebox lintel onto a bed of Sairset. Brackets on lintel are for heat shields (firebrick splits).



Firebox floor slopes are shown mortared in place with fire cement. These can be installed later.



Lay up next course as shown. Use a dry joint with lintel.

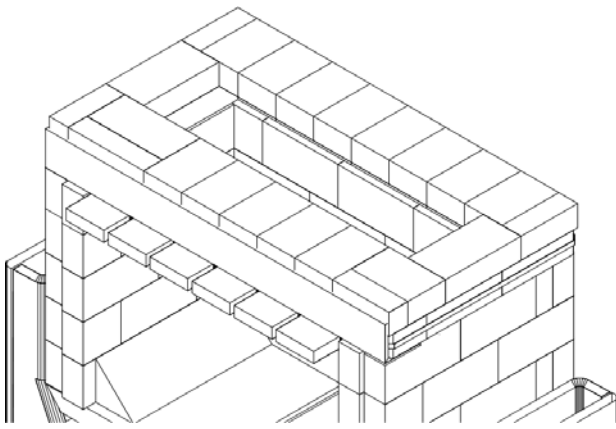
Round the bricks slightly where they meet the inside corner of the lintel to get a tighter fit.

There should be about 1/8" gap between lintel and bricks.

If you have access to strapping tools, this course can be strapped as shown. This is optional. If a strap is used, then round outside corners of bricks slightly.

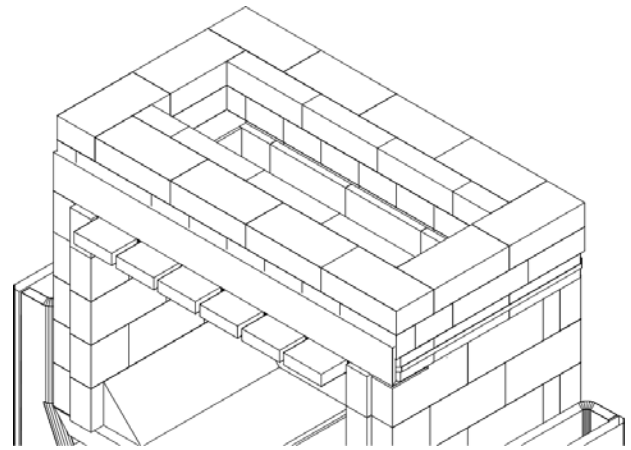
The purpose of the strap is to transfer weight onto the outer firebox.

This allows the complete inner firebox to be removed, if necessary, rather than in sections.

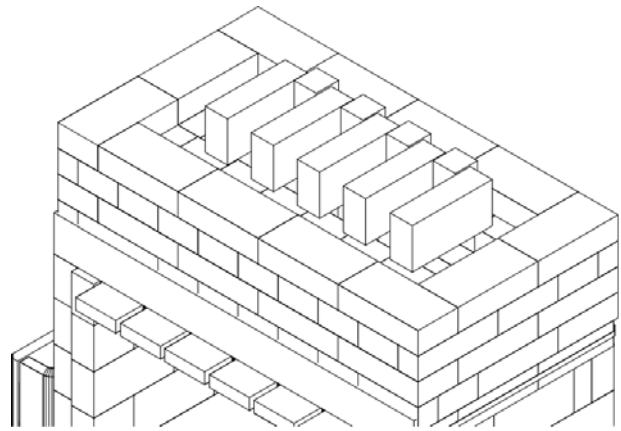
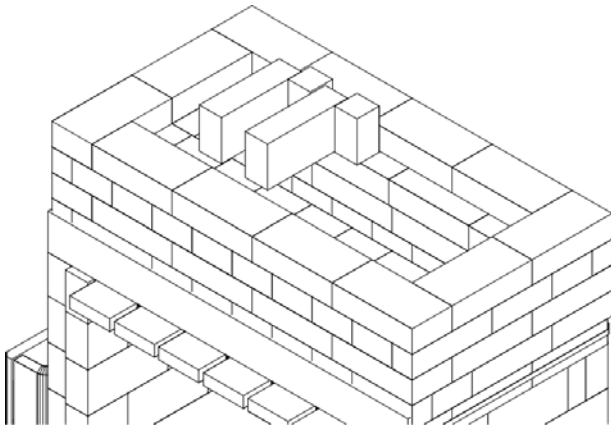
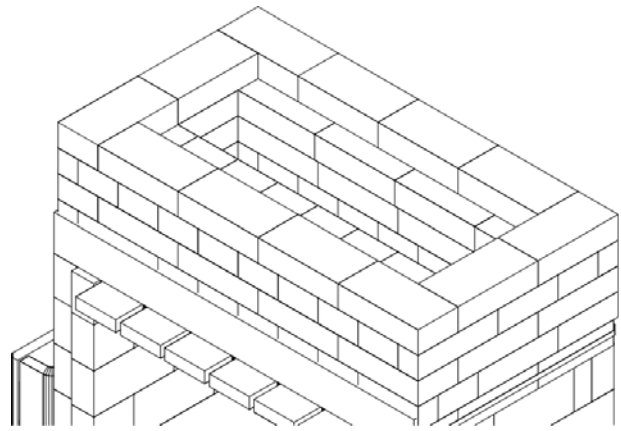
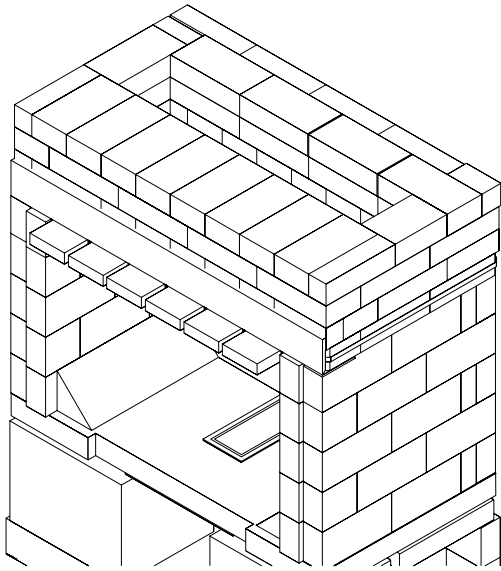


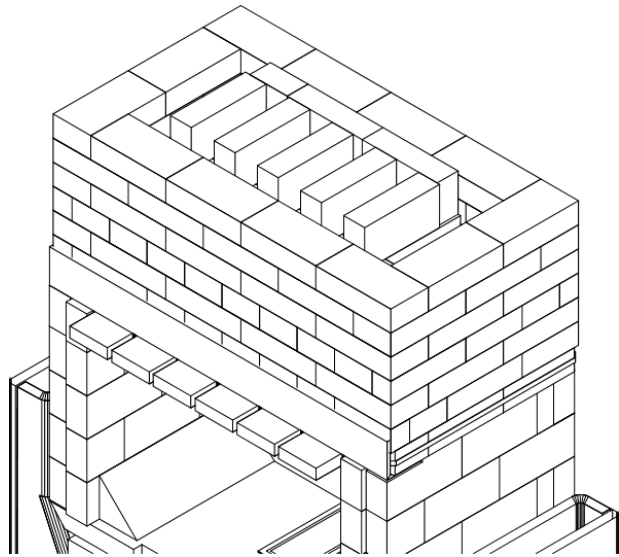
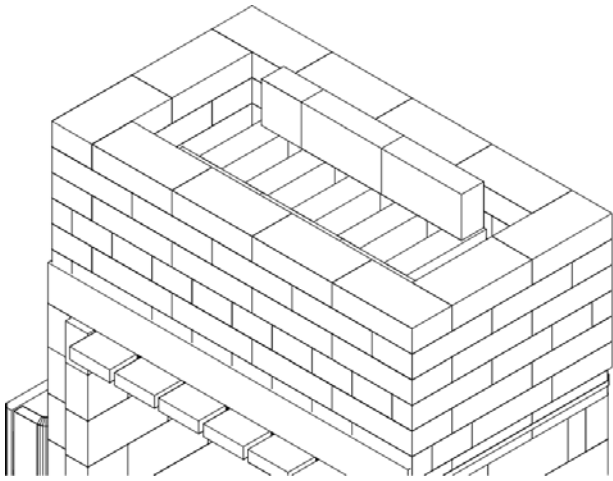
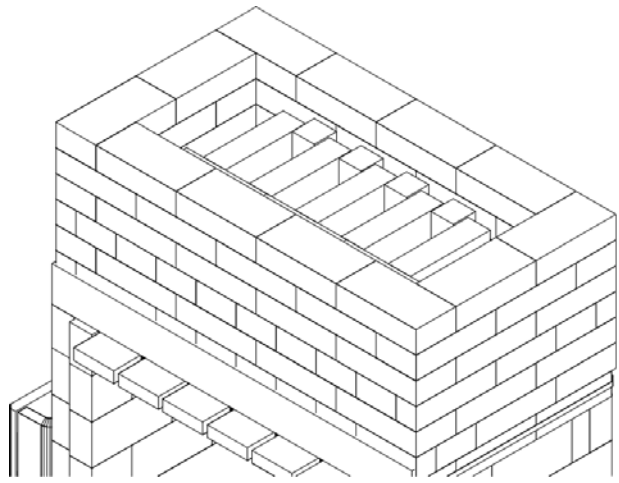
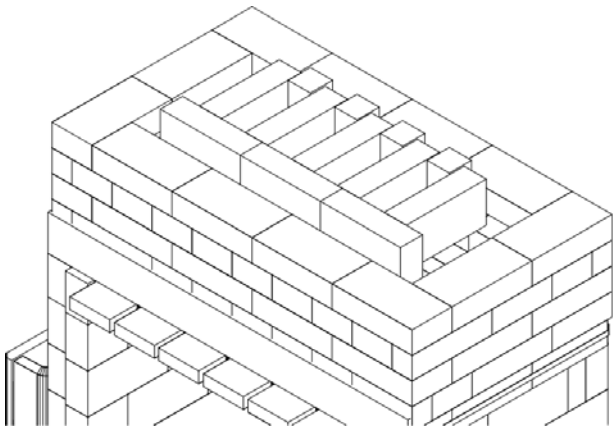
A total of 12 soaps (5 bricks ripped lengthwise) is used. All bricks are either full length (9"), $\frac{3}{4}$ length (6 $\frac{3}{4}$ ") or half length (4 $\frac{1}{2}$ ").

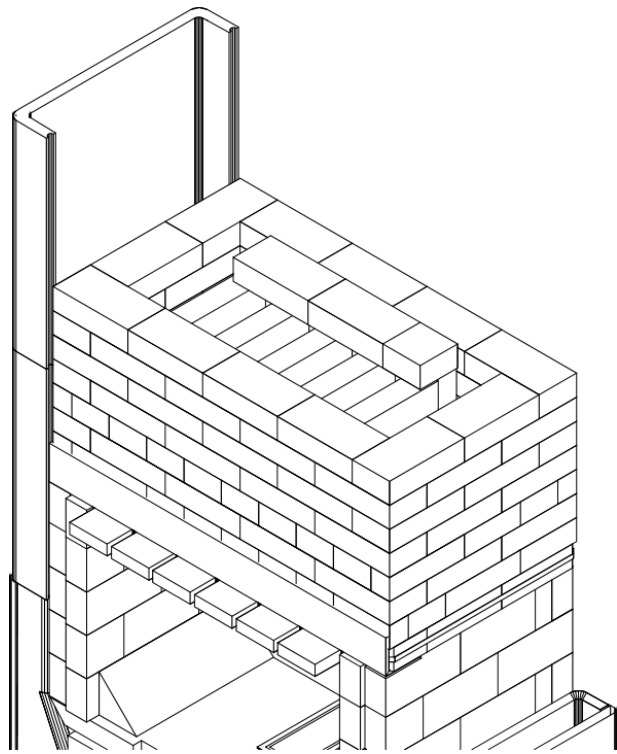
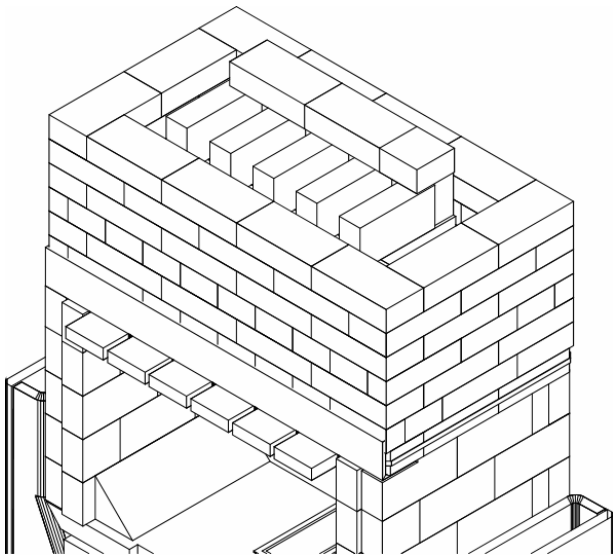
Note the firebrick split (1-1/4") heat shields installed in the firebox lintel. These can be installed later, when the door is installed in the facing. It is good practice to shorten and round them at the back, to line up with the next higher course of bricks.



Next course.







Set next course as shown.

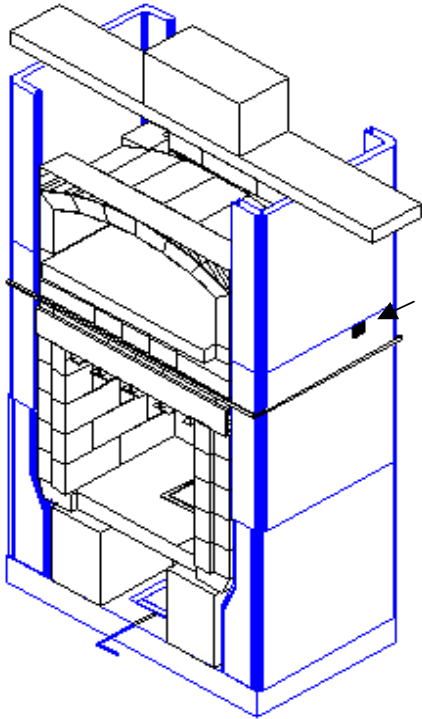
Seal the joint between the bottom channels and the firebox with a bead of silicone.

Install the downdraft channels. They have a smooth (cast) edge, and a rough trowelled edge. Install smooth edge down.

Use a Sairset joint between the channels.

Install them with the aid of a helper, to avoid damaging the outer corners of the channels.

Once the second set of channels is in place, you can temporarily secure it with a web clamp (tie downs used for pickup truck beds). Don't tighten the clamp any more than necessary.



For easier heater startup during difficult conditions (cold heater, warm outside temperatures) we highly recommend cutting a gas slot. This consists of a 2" X 2" direct connect. In the above example, the arrow shows the location for a right side chimney towards the back of the heater. Cut a notch in the channel at the appropriate location. Later, when facing the heater, create the direct connect to the flue liner by using firebricks or firebrick splits (see **Error! Reference source not found.**).

Install middle channels onto a bed of Sairset.

Strap middle channels or use tie wire. When strapping, compress expansion joint gaskets no more than 50%.

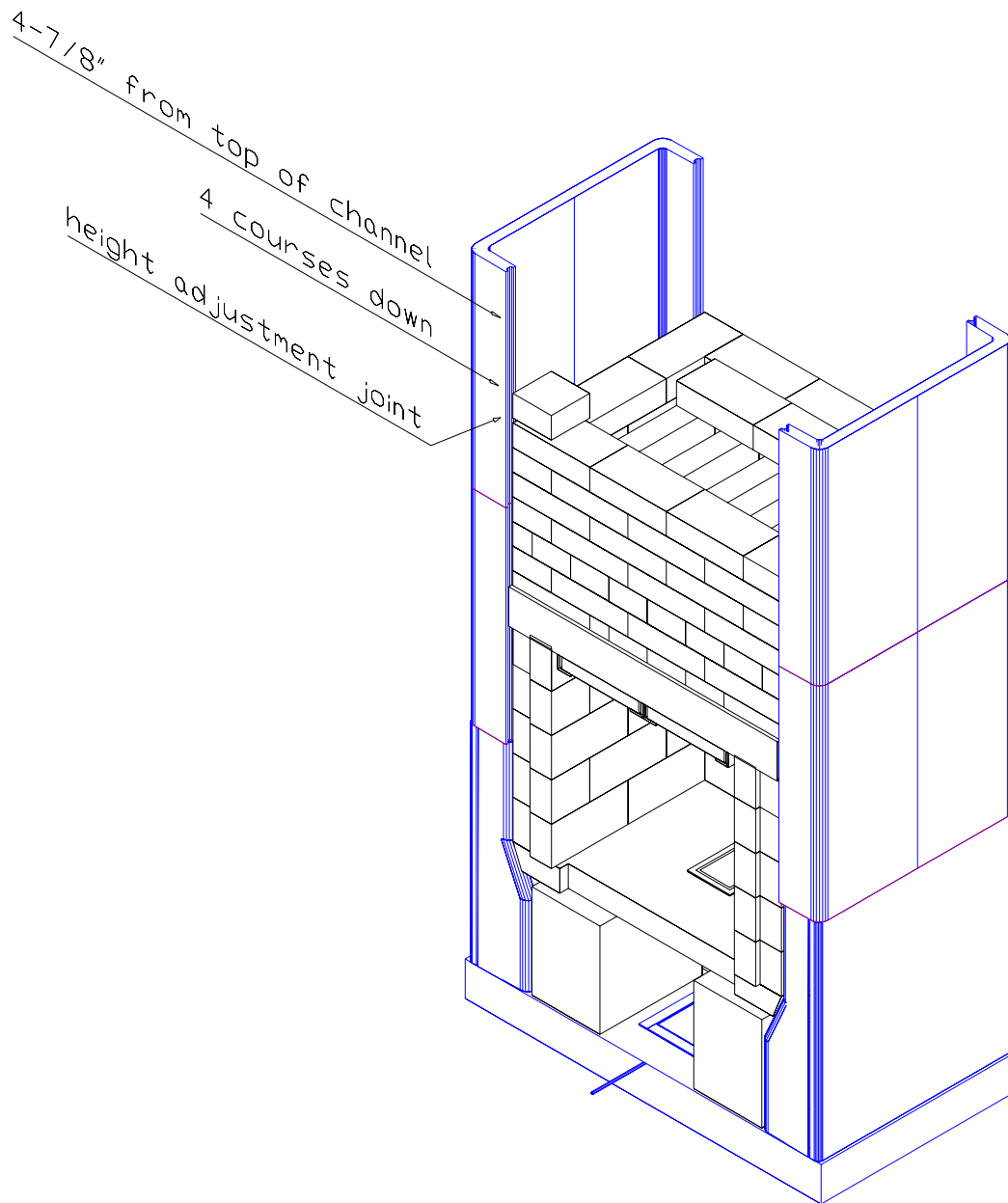
Clean off joints from inside. Make sure there is no mortar bridging at the expansion joints from inside.

Install top channels and brace temporarily as shown.



Gas slot detail

Completing the Core



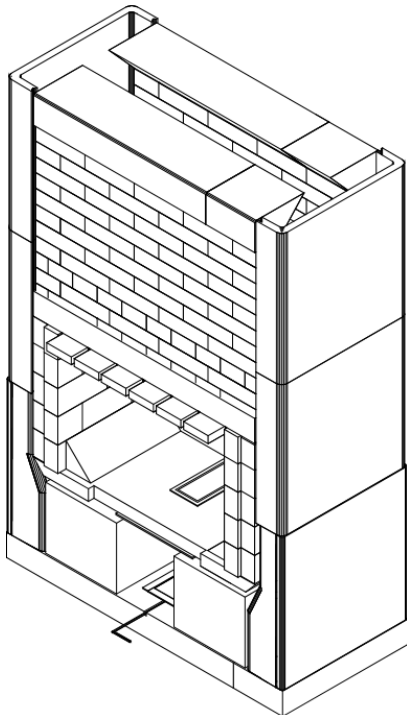
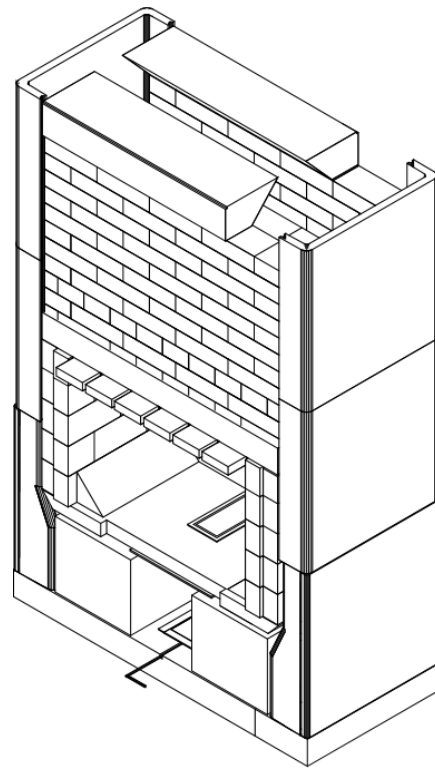
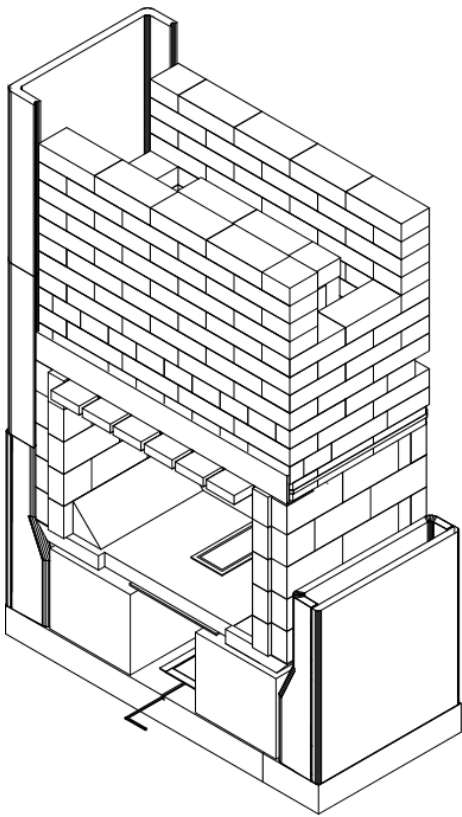
At this point, a height adjustment is necessary.

Place a pencil mark 4-7/8" from the top on all 4 channel ears. Next, measure the height of 4 existing courses of firebrick. Using this distance, place a second mark on all 4 ears as shown.

The second mark indicates the top of the next course. If an adjustment greater than 1-1/4" needs to be made, insert a course of splits. If the adjustment is less than 3/4", use ordinary brick mortar. For 3/4" to 1-1/4", use castable refractory. Alternatively, you can cut the bricks to height on a brick saw.



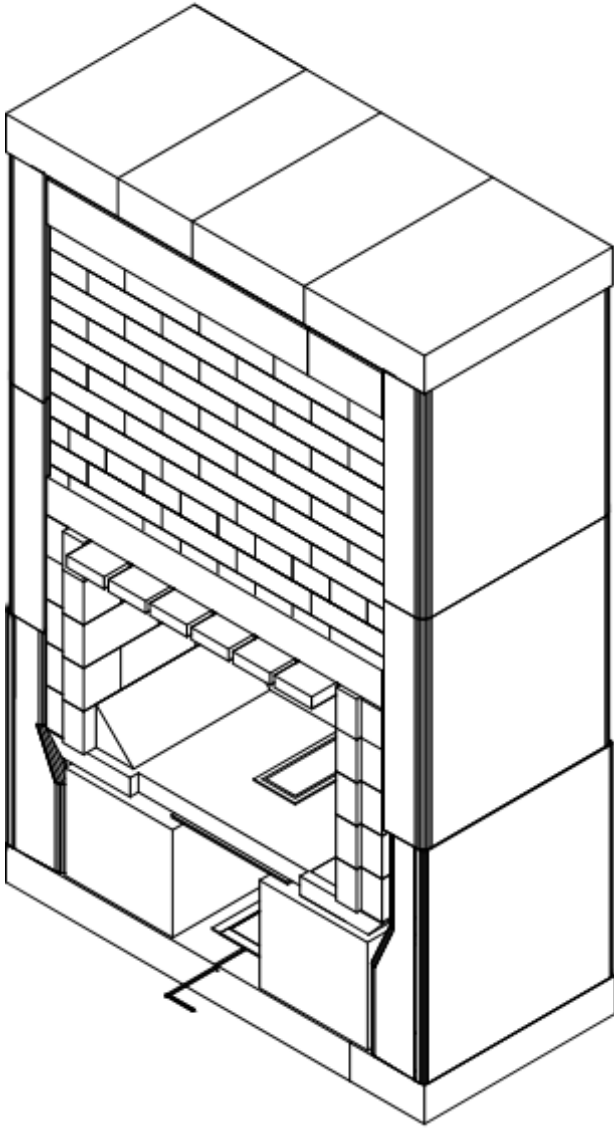
In this example, a row of splits and a 1/4" mortar joint is required.



Install ceiling transitions, including extension pieces as shown. Front-to-back outside distance is 22.5”.

Ceiling transitions should be slightly (1/8”) higher than side channels.

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.



Install ceiling slabs, smooth side down. Use a helper, and set up adequate staging (foot planks).

Pay attention to the order of the shiplap joints.

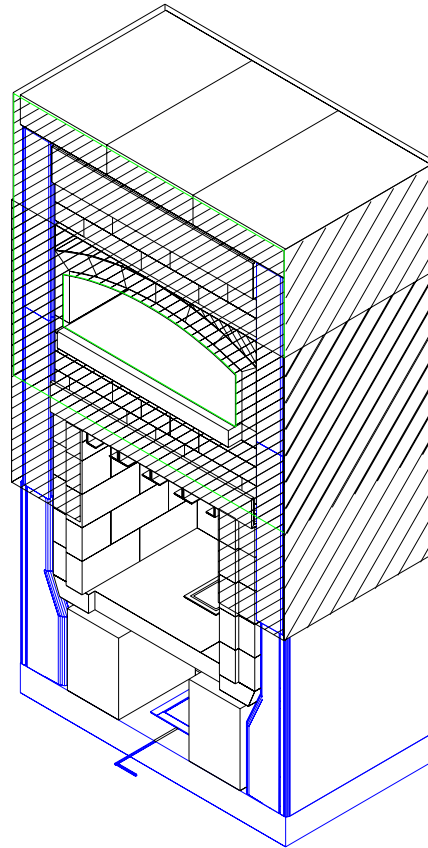
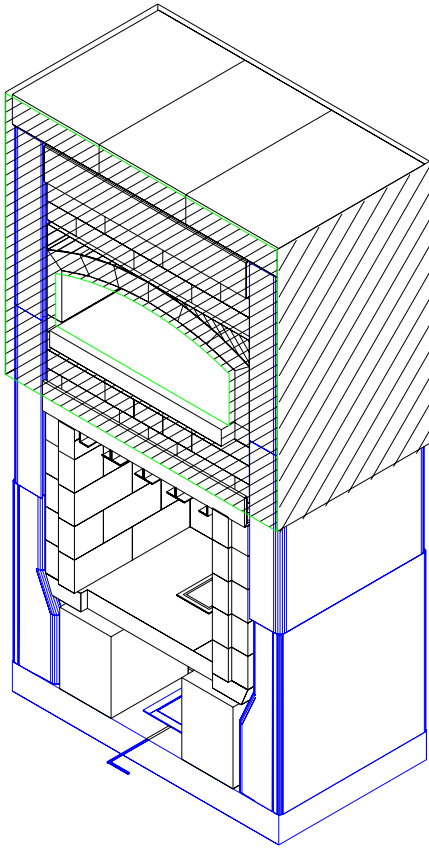
Second piece from right is a 9" custom fill piece for this widened heater.

Set slabs dry. Leave about a 1/8" gap between slabs.

Carefully fill all joints between and around the slabs with silicone. There is a recess provided in the ceiling transitions, below the slabs.

Fill the joint between the bottom of the slabs and the top of the side channels with silicone. Use a piece of scrap wood, etc., as a spatula to force silicone into the joints, if required.

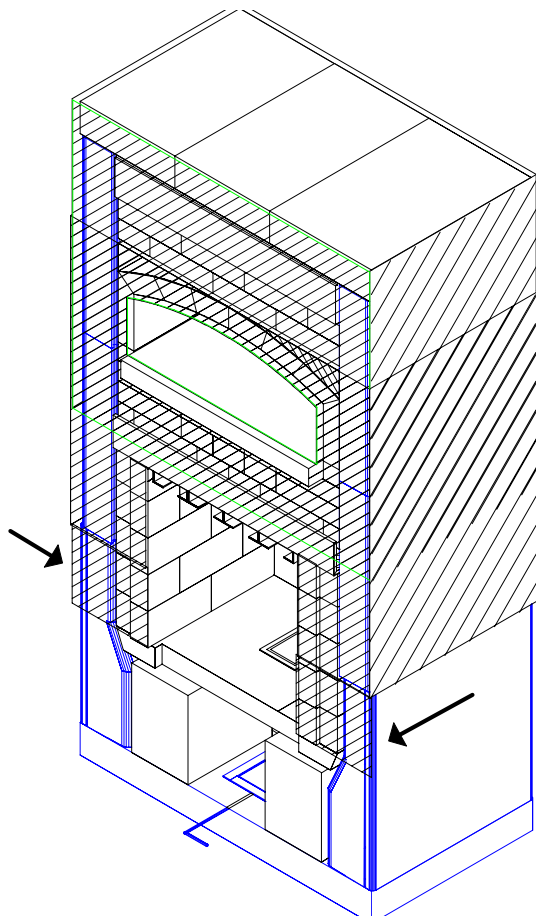
Installing the Fiberglass Wrap



Note: drawings show standard heater.
Procedure for stretched heater is similar

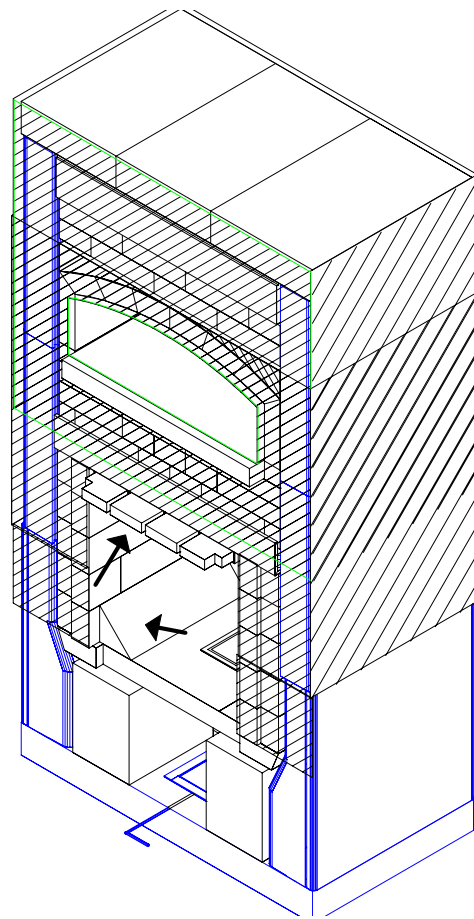
Next comes a double wrap of fiberglass mat to act as an expansion and slip joint. Quickly dab silicone approximately 4" - 6" o.c. over entire area indicated. Start at top of ceiling slab and go 38" down. Carefully unfold fiberglass mat and, with a helper, wrap around heater. Make sure mat goes all the 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. Scissors or sharp tin snips work well for trimming.

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



Trim around firebox opening and bypass slot, using a sharp utility knife.

Add two additional pieces as shown.



Note location of firebrick split heat shields.

If not already installed, install sloped floor pieces onto a bed of refractory mortar, similar to setting a firebrick.