

# TROUBLESHOOTING AND FIXING BRICK PROBLEMS

## INSTRUCTIONS FOR USING BRICK REPAIR KIT

GENERAL NOTE: Firebrick is a very fragile material and subject to breakage, spalling and heat shock. The good news is that it is very easy to repair and maintain with the proper materials and techniques. Our Brick Repair Kit has all the materials you will need to do a first class job.



### LIST OF BRICK REPAIR KIT MATERIALS

- (1) Firebrick piece
- (1) 1/8 pint of Phosphate Cement (in a 1/2 pint container)
- (1) Quart container of Brick Dust
- (1) 1/2 pint Brick Facing

### MIXING A BATCH OF GROUT

The grout should be mixed up JUST prior to use. (Otherwise it will dry out). Mix the ingredients with a small spatula in a container (like a glass jar or plastic cup). Mix in the following:

- 1/2 cup firebrick dust
- 1/4 cup water
- 1 tablespoon Phosphate Cement

### NOTE ABOUT GROUT

The special grout material is firebrick dust mixed with water and a small amount of cement. The cement makes a matrix of the firebrick dust. This compound dries into a material almost exactly like the original firebrick with the same color, consistency, texture and insulating properties.

### CAUTION:PHOSPHATE CEMENT

The special cement that is used by itself and with the grout is a phosphorous based cement. It has unusually strong adhesive properties which makes it ideal for repair work. It is different from the cement we normally use for cementing our firebrick. The phosphorus makes phosphoric acid. It is best to use rubber gloves. Be sure to wash your hands with soap and water immediately following your use. **Phosphoric acid is very hazardous to your eyes. Protect your eyes with glasses.**

## BRICK PROBLEMS

### EXCESSIVE BRICK WEAR

- 1) Excessive brick wear can be the result of various conditions. Most common is improper curing of the brick when first fired. FOLLOW THE INSTRUCTIONS FOR THE FIRST FIRING AND CURING CYCLE. (See *first-firing.pdf* in the Operation Section).
- 2) All insulating firebrick expands and contracts when heated and cooled. Over time this will lead to cracking and spalling. Spalling is the continued cracking of the brick which eventually results in large pieces of the brick falling out from the brick section. This is a normal condition as long as the emphasis is on eventually. Factors such as how close the kiln is operated at or near maximum temperature, how often and how fast the kiln is cycled up to heat and then cooled, how heavy the loads are, all figure into the brick wear equation. There is no set rule as to how long a brick lining will last. There are some L&L kilns which are 25 to 40 years old with the original lining still in usable shape.
- 3) Frequent door openings when the kiln is at high temperatures can cause thermal shock, leading to excessive cracking and spalling.
- 4) For light to moderate spalling, re-coat the brick with the Brick Facing available in the Brick Repair Kit or separately in the Parts List. This procedure can allow the brick to remain operational.

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## **BRICK REPAIRS**

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### **APPLICATION OF BRICK HARDENER**

- 1) First brush and vacuum the surface of the brick clean to remove any loose material or crumbling firebrick.
- 2) Next wet the brick surface lightly. Use a paint brush or spray bottle (make sure there is no soap residue in the bottle).
- 3) Then apply a thin coat of the brick hardener with a soft brush over the surface of the firebrick. Do not make too thick a coat of the hardener or it will spill off.
- 4) Let the hardener dry for 24 hours.
- 5) Run the First Firing Cycle (See *first-firing.pdf* in the Operation Section).

### **REPAIRING SMALL HOLES & CHIPS IN BRICK**

- 1) Dig out any loose particles with a small knife.
- 2) Brush and vacuum the surface of the brick clean to remove any loose material or crumbling firebrick.
- 3) Next wet the brick surface lightly. Use a paint brush or spray bottle (make sure there is no soap residue in the bottle).
- 4) Apply a thin coat of brick cement all over the hole. This is defined as about 1/32" to 1/16" thick. Do this with your finger or a small brush.
- 5) Fill hole with the special grout material. Apply grout with a spatula (like plaster.) You can also use your finger. Push it into the hole. It is OK to let it be a rough surface or slightly larger than the hole it is filling.
- 6) Let dry for 24 hours.
- 7) Take some rough sandpaper and sand surface to even it out with the rest of the firebrick.
- 8) Run the First Firing Cycle (See *first-firing.pdf* in the Operation Section).
- 9) You can brush on hardener or facing afterward if you desire.

### **REPAIRING VERY LARGE HOLES IN BRICK**

- 1) Cut out an area around the brick chip with a small knife, saw or router. The hole that you make should have 90° angles so that a square or rectangular block will fit in the hole.
- 2) Cut a piece of firebrick to fit into this cut out hole. The piece should be slightly smaller than the hole (by about 1/16" to 1/8").
- 3) Both the hole and the brick piece should be brushed and vacuumed clean.
- 4) Wet the brick surface lightly. (Both the hole and the surface of the block that you are going to insert in the hole). Use a paint brush or spray bottle (make sure there is no soap residue in the bottle).
- 5) Apply the Kiln Cement to the surface of the the piece that you are going to put in the hole. Use only about 1/32" to 1/16" of an inch of cement.
- 6) Let dry for 24 hours at a minimum.
- 7) Cut off and/or sand off excess brick and cement.
- 8) Cover with Brick Facing and allow to dry for another 24 hours.
- 9) Turn kiln onto low for 3 hours to dry totally.
- 10) Run the First Firing Cycle (See *first-firing.pdf* in the Operation Section).

### **FIRST FIRING AFTER REPAIR**

(See *first-firing.pdf* in the Operation Section). The only modification is that you can fire to a lower temperature because you do not need to reseal the elements. However, firing to cone 5 instead of 05 is OK.

On the first firing of the kiln fire it empty.

For kilns with the manual control fire the kiln on low (setting #2) for two hours to bake out any moisture. Then set to medium (setting #5) for two hours and then increase enough to reach final temperature. Fire it to cone 05 (1888°F).

If you have the DYNA-TROL program control fire the following program: Using the "Easy-Fire" mode fire on Slow Bisque to Cone 05 with a PreHeat setting of 3 hours and a hold of 1 hour.

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## **CRACKS IN THE LID & BOTTOM**

- 1) It is quite normal to get hairline cracks in both the lid and the bottom firebricks.
- 2) They are caused by the expansion and contraction of the firebrick as it heats and cools.
- 3) As long as the bottom is fully supported by the stand the cracks in the bottom will not adversely affect the operation of the kiln.
- 4) The stainless steel clips we use in our lids also help keep these natural cracks from normally becoming a problem in the lids.
- 5) Note that it is possible to put another bottom under the original bottom as a second layer (this can also improve performance and heat up rate of the kiln).
- 6) It generally does not make sense to cement these hairline cracks.
- 7) You can tighten the stainless steel band.

***This crack is OK:***



## **TIGHTENING STAINLESS BANDS**

- 1) The brick will shrink slightly over time. This is more pronounced when using the kiln at higher temperatures like cone 10. If you only use the kiln for low fire bisque you may never notice this condition.
- 2) If the bricks shrink too much they will become loose.
- 3) Tighten the case by turning the screws of the case clamps. Do this 1/4 of a turn at a time on each of the

clamps. Keep a balanced tightening (i.e don't tighten one clamp too much at one time). Slow is good.

***Tightening the bands:***



- 4) You can do this on the bands around the top and bottom also. This will help maintain the integrity of those slabs even if there is a crack.

## **REPLACING FIREBRICK IN SIDES**

- 1) If you need to replace a firebrick piece in one of the sections do the following. While it does not require a great deal of experience to accomplish it does take time and patience.
- 2) Order the firebrick precut and prerouted from L&L Kiln. You can order this with the proper element holders already in place or you can reuse the holders from your old brick. Be sure to order it for your specific model kiln. Also, be sure to say whether it is a brick where the element connections come through (because this has different element holders).
- 3) There are no holes drilled in the brick for either peepholes or element connections. This has to be done in the field.
- 4) Take the section off the kiln and put it on a flat surface like a flat floor or table. Elements will have to be removed and probably replaced.
- 5) Loosen up the adjustable clamps that hold the stainless steel wrapping. Loosen them just enough to allow the brick to slide out with slight hand pressure (so that the other bricks stay in place). NOTE: If you don't have the section on a flat surface then the bricks will all come out of proper alignment at this point.

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6) Slide the bad brick(s) up and out and put in new brick(s). Be sure the element holders line up with the other holders on either side. Note there is a top and a bottom in the element holder so be sure to get the orientation correct.

7) Retighten the clamps on the wrap. Alternately tighten the two or three clamps (about a 1/4 or 1/2 turn at a time) so that you don't cock the stainless casing.

8) Sand off the top surface of the firebrick to match the surface of the other firebricks. Sandpaper will work fine. Reface with Brick Facing.

## **DRILLING OUT HOLES FOR PEEPHOLES & DAWSON**

1) Some of the bricks that you may need to replace will need to have holes drilled in them in the field. These holes can not be drilled in the factory because the alignment would not be perfect.

2) To drill out for peepholes use a 1" diameter drill bit or hole saw. You can also drill with a smaller drill and then file out with a round hasp type file. Drill slowly through the firebrick using the prepunched hole in the stainless steel. You may have to remove the bit several times and clean it out as you drill deeper. It is a good idea to have someone help you by watching from the side to make sure you are drilling straight. It is hard to see this when you are doing the drilling.

3) For sections that have two element rows: the hole is drilled perpendicular to the stainless case.

4) For sections that have three element rows: the hole is not drilled at a perfect 90° perpendicular angle to the kiln case. It will be drilled at a slightly down angle (about 5° to 7°). This is to miss the element holders.

5) Before drilling, as a precaution, you can measure down from the top of the brick to the top of the existing hole in the stainless steel case. This measurement on the inside will show you where the top of the drill bit will protrude. Adjust your angle of drilling accordingly.

### **Drilling the peephole:**



## **DRILLING OUT FOR THE ELEMENT CONNECTIONS**

1) Use a 1/8" to 3/16" diameter drill bit and drill out from the center of the hole in the stainless steel case. Do this slowly with a speed control.

2) Do this perpendicular to the case.

## **REPLACING BOTTOMS**

1) Remove the kiln sections.

2) Take the old bottom off the stand.

3) Put the new bottom on the stand.

4) Relevel the kiln. (This is important).

5) Replace the kiln sections.

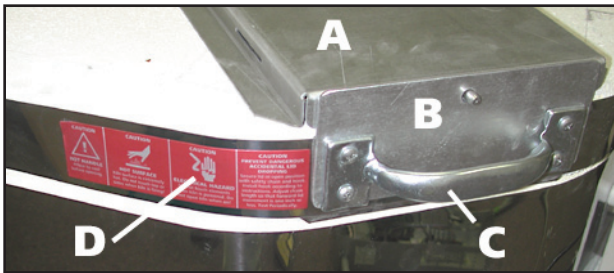
NOTE: You may want to experiment with using the old bottom as a secondary back up bottom if it is not too badly damaged. Just make sure it is totally flat so that it doesn't crack the new bottom. Some people find that having this extra insulation thickness helps firing times and bottom uniformity.

# TROUBLESHOOTING AND FIXING BRICK PROBLEMS

## **REPLACING EASY-LIFT LIDS**

1) Remove the Hinge Pin and take the old top off the kiln. See the Assembly Instructions for guidance if you have questions about how to do this. Use the Hinge Tool to take the tension off the spring. **BE SURE TO USE SAFETY GLASSES - THERE IS A LOT OF TENSION ON THE SPRING AND INJURY COULD RESULT.**

2) Remove the Top Hinge Part from the old lid. Note that there are three parts to this. There is the main Top Hinge Part. Then there is the Front Hinge Part (the little 3" x 4" aluminized steel plate with a small hole that gets attached to the front of the top with the screws for the Handle). Then there is the Handle. Note that the hole in the Front Hinge Part should be centered around the the little stud that protrudes from the Top Hinge Part.



**A= Top Hinge Part, B= Front Hinge Part  
C= Handle, D=Label**

3) Using the old top as a guide, install the Top Hinge Part onto the new lid.

4) Reinstall the top and reset the spring. See the Assembly Instructions if you have questions about how to do this.