

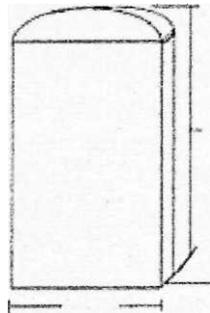
## RESETTING MARKERS BROKEN AT BASE:

### Casting a New Base

Some markers are broken off at ground level and laying flat in the cemetery. The best practice for resetting these stones is to create a new base with a recessed die or socket. Before beginning the project, examine the stone for any other signs of breakage, cracking, spalling, or other damage. Handle the maker with care.

- Step 1.** Measure the gravemarker height, width, and thickness (Fig.1) and then prepare a form of sufficient dimensions based on the measurements. Irregularities such as curvature, shoulders, and varying thickness must be taken into consideration. Also, the end to be inserted into the recess in the base must be at right angle (or nearly so) to the vertical edge of the stone. A particularly "ragged" bottom may be "trimmed" using a masonry blade in a circular saw. The safest method is employing a monument dealer or mason to do the "trimming."

Fig. 1: Stone dimensions



- Step 2.** A "box" form should be constructed that is at least 7 inches greater than the measured width and 7 inches thicker than the stone measurements. The height of the "box" form should be at least 6 inches plus an additional 1/2 inch for each 8-12 inches of the stone height above 36 inches. Example, for a 42-48 inch high stone, the box depth would be 6-1/2 inches.

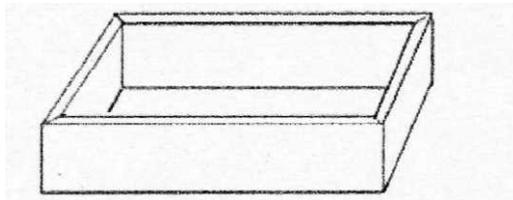


Fig. 2: Box for casting a new base.

- Step 3.** Construct a block to form a recess in the box. The width and length of the block forming the recess should be at least 1 inch greater on both dimensions than the stone, depth at least 3 inches plus 1/2 inch deeper for each 8-12 inches of stone height above 36 inches.



Fig. 3: Side view of recess block.

- Step 4.** Thoroughly saturate the interior surfaces of the box and the recess block with linseed oil or similar material to insure the form will "release" the casting when it is cured. Pour in the concrete to the point where the recess block makes an indentation. Secure the recess block to the box form and continue filling the remaining space with concrete tamping with a stick to compact the concrete. As soon as the concrete surface becomes dull (about an hour) and a trowel mark holds its shape, remove the recess block carefully. Permit the casting to "cure" for a week, wetting it frequently to assist the "curing" process (Fig. 4).

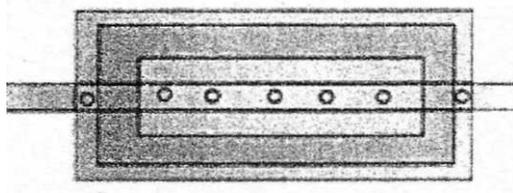


Fig. 4: Top view of recess block in box form filled with concrete (the dark-shaded area).

If the block has become too firmly embedded in the concrete it can be extracted later using a masonry bit to drill several holes up from the bottom until the drill reaches the block; then drive the block out with a dowel. These holes will be covered when mortar is introduced to set the stone.

- Step 5.** The cast base should be allowed to "cure" for a least a three days. Frequent wetting of the cast will aid in the curing process.
- Step 6.** Set the new base into the ground on a bed of pea gravel and sand for drainage. The top of the base should be an inch or so below grade so that it does not show since it could detract from the appearance of the stone. Level the new base lengthwise and crosswise.
- Step 7.** Prepare the mortar. Mix a fairly wet 1:4:8 mix of white (not gray) Portland cement, hydrated lime, and fine clean sand. White Portland cement (ASTM C-150, Type I) does not contain sulfates or other soluble salts that can cause staining and efflorescence. The hydrated lime (ASTM C-207, Type S) helps provide high plasticity and water retention with a safe degree of strength. This setting mortar is softer than the stone and any failure is likely to occur in the mortar, preventing the stone from being damaged.
- Step 8** To set the stone, first lay a 1/2 inch layer of mortar in the bottom of the recess, set the stone in place, fill the perimeter with mortar to the top of the cast base and slightly above shaping a "bead" to assist water run-off (Fig. 5). Make sure the stone is level. If necessary, additional mortar can be added to the sides of the slot and small pieces of soft waste stone can be used as shims to hold the stone in position while the mortar sets.

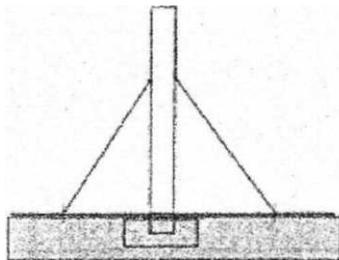


Fig. 5: Reset stone mortared into the base and braced.

- Step 9.** Backfill & brace the stone ensuring it to be plumb (vertical) and level. Remove brace after a week or so.

## RESETTING AND REPAIRING: APPROPRIATE MATERIALS



### Resetting Mortars to Fill Recessed Slot in Base

Portland cement with extra lime mix to soften cement can be used to set stone in recessed base. **1 Part White Portland Cement** (recommended: ASTM C-150, Type I) **4 Parts Hydrated Lime** (recommended: ASTM C-207, Type S) **8 Parts Clean Sand**  
Clean water, use sparingly, mixture should be very stiff, almost 'dry'

### Mortar for Resetting Stacked Markers with Multiple Components

**1 Part White Portland Cement** (recommended: ASTM C-150, Type I)  
**3 Parts Hydrated Lime** (recommended: ASTM C-207, Type S)  
Clean water, use sparingly, mixture should be very stiff, almost 'dry'

### Mortar for Filling Void Patch Mix

**2 parts White Portland Cement** (recommended: ASTM C-150, Type I)  
**4 parts Hydrated Lime** (recommended: ASTM C-207, Type S) **7 parts Stone dust and grit**  
Clean water, use sparingly, mixture should be very stiff, almost 'dry'. Use different colors of powdered grout to color the mortar mix for a decent color match

Received special training in mixing and application should use these products. Example: Jahn Mortar available through Cathedral Stone Products, Inc., 7266 Park Circle Drive, Hanover, Maryland 21076, 800 684-0901.

### Material Appropriate Stone Adhesives

**Mastico Epoxy** (Mix clear and white then add stone dust.)  
Hilgartner Natural Stone Co., 101 W. Cross St., Baltimore,  
Maryland 21230 410-752-4832

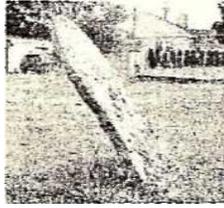
**AKEMI: Akepox 2010**, 2010 Gel Mix Stone Boss Industries, Inc.  
San Francisco, CA 415-822-2577,

**Barre Pak Epoxy** - 70 gram kit (gray) Miles  
Supply Company Inc., PO Box 237 Barre, VT  
05641-0237, 802-476-3963

### Sources

"John Walters' Recipes for Various Mortar Mixes," <[www.rootsweb.com/~inpcrp/mortarmixes.htm](http://www.rootsweb.com/~inpcrp/mortarmixes.htm)>! Association for Gravestone Studies, <[www.gravestonestudies.org](http://www.gravestonestudies.org)> Chicora Foundation, [www.chicora.org/resetting.htm](http://www.chicora.org/resetting.htm)

## RESETTING TILTED MARKERS



### When to Reset

Only reset gravemarkers that are severely tilted since there is always the possibility that resetting may cause other damage to the stone. Assume that all stones are fragile and have some form of internal cracking or damage. Photographically document the stone before, during, and after treatment.

### Resetting Tilted Markers

- Step 1** Dig around the base of the gravemarker *very carefully*; steel shovels can easily damage stone (hand trowels work well). If possible excavate from the backside of the stone so if there is any marring it will be on the back of the marker. Try to keep firm earth on one side to provide a strong, compacted earth face against which to reset the stone.
- Step 2** Keep the sod and set it aside separately. Stockpile the spoil on a plastic tarp or in a wheelbarrow so the dirt will not get mixed with grass; this soil will be used for backfilling.
- Step 3** Once the stone is free of earth, carefully remove it from the ground and lay it aside, outside the work area, on several 2x4s to support it. This will also make it easier to pick up again later. Examine the stone for any writing or carving that might have been obscured by soil.
- Step 4** If necessary, excavate the hole a little more, usually about 3 to 6 inches deeper and about 6 inches more in diameter. Make sure to leave one side compacted.
- Step 5** Create a firm base for the stone so that the weight will be distributed evenly. If the base of the stone is relatively flat, set an even layer of bricks as a base, then about an inch of sand. If the base of the stone is pointed, use only gravel and sand.
- Step 6** Replace the stone in the hole. Make sure enough stone remains below ground to support the upper portion and prevent it from retilting once it's reset (roughly 30%).
- Step 7** Level the gravemarker vertically and horizontally (use a builder's level).
- Step 8** Refill the excavation using the original dirt. Use occasional bricks or gravel to assist holding the stone upright if necessary. Gravel can also be used to help with drainage around the stone, especially in heavy, clay soils. Tamp (a wooden baseball bat works well) this material every few inches to ensure that it is well settled around the stone. Be careful with the tamping, however, to prevent damage to the stone.
- Step 9** Fill so water drains away from the stone. Reset the sod. All remaining spoil should be carried away or used on site to fill holes.