

## Slotted Base

Tablet type stones in slotted bases are one of the most common types of monument you will encounter. These bases were made from a variety of quarried stone types, often central to the area of the cemetery. Bases are generally rectangular rough cut blocks with hand chiseled slots to accommodate a tablet style stone. The inscribed grave marker was then mortared into this slot. When this mortar wears away and the stone becomes loose, it then becomes necessary to re-mortar it back into place. At this juncture it is now important to understand historic lime mortars. Why lime mortar and not a modern concrete mortar? Lime mortars are durable, yet much softer than modern mortars found at local building supply stores. It is very important to use a lime mortar for this reason. Modern mortars are too hard for older softer grave markers made of marble, sandstone and the like. These harder mortars and concretes will do much more harm than good. The softer lime mortar acts as an adhesive and a buffer between the tombstone and base. This section below will walk you through the basics of how to accomplish this. You can also find a list of materials required under PRODUCTS USED...Mortars. And further information under TECHNICAL concerning MSDS.

# Historic Mortars and Slotted Bases for Cemetery Preservation



The following is a great tutorial on mortaring tablets into slotted bases with a focus on the approved standard methods used in Oregon. We feel this is a great place to start when it comes to re-mortaring tablets into slotted bases. More on this procedure and mortar products that are widely accepted across the rest of the country, will be addressed below this article.

## RESETTING HEADSTONES IN SLOTTED BASES

By CCUS member Lloyd Collins of Polk Cemetery Savers

Headstones in most of the cemeteries across the country have either been set in the ground, in slotted bases, and some rare cases in concrete. Over time, the ground has shifted, rodents have burrowed under the bases, or animals, using them as scratch poles, have pushed the headstones off of vertical. Vandals have also caused damage by pushing the headstones over or breaking them in pieces. Whatever the reason, some of the headstones are no longer standing vertical. It is to the benefit of these headstones to be cleaned and reset so they stand vertical. The headstone can then shed water and breathe properly.

Slotted bases in cemeteries have been set above ground, half buried, or totally buried. The base may have been placed on an earth, gravel, or crushed rock bed. Inspection of the base should give you a good indication of how deep it should be buried. Depending of the severity of the climate, the base should be placed on a proper bed so the freezing weather will not push it out of the ground. The depth of the base should match the majority of the bases in the cemetery.

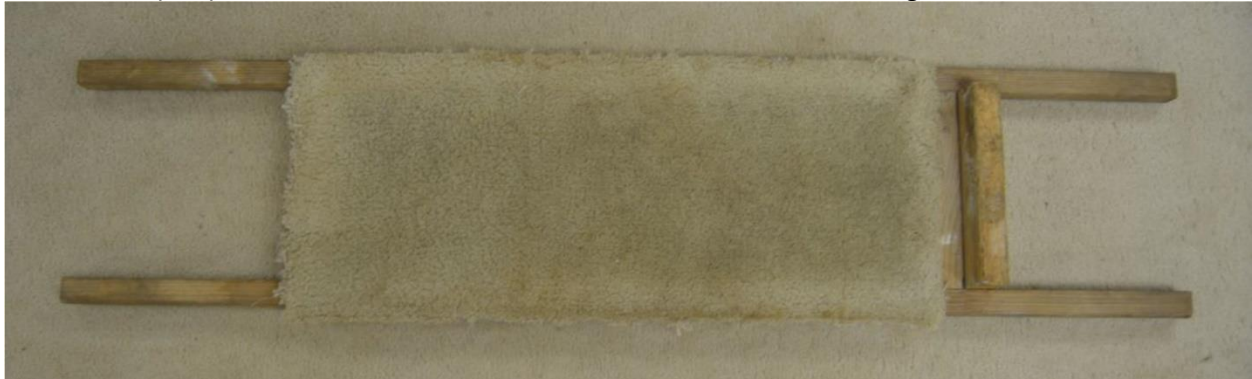
Over the years, headstones in slotted bases have been set with many types of material. A few include; dirt, clay, wood wedges, lead wedges, molten lead, mortar, lime, and some other materials harder to

define. Some have been set with a very hard black material that chips off like Obsidian. See the section on materials to see CCUS preferred material to be used when resetting headstones.

## **PRECAUTIONS**

Resetting headstones is a two person task at minimum. Always work with a partner. As with any work done on headstones, the stone must be carefully inspected before any work is started. Headstones, even though they are made of stone, are very fragile. Over the years they may have developed damage from the environment. This damage could include delamination, stress cracks, and areas where water has infiltrated the stone and frozen causing larger cracks or broken areas.

Before moving a headstone, ensure it is structurally supported to prevent any new damage. A supporting structure could be as simple as two pieces of wood strapped to the headstone. I have made a wooden platform that allows the headstone to lie on a carpet pad. The stone is loosely strapped to the platform and two people can lift and move the headstone without damage.



If the stone is broken, it should be cleaned and repaired before resetting it in the slotted base.

When moving a stone that has been lying on the ground ensure it is supported along its' entire length as you lift it onto a flat surface for cleaning. Clean the headstone using the procedures and materials in CCUS Bulletin # (TBD). After cleaning one side, inspect for stress cracks and proceed carefully, turning the stone over, to clean the other side. After cleaning, if the stone is structurally sound, it can be reset into a slotted base.

If there is a slotted base for the stone, inspect it for damage. Most original slotted bases are made from Sandstone or Limestone. You may find some made from Granite, and rarely, concrete. If the base is damaged, repair or replace it as necessary. See CCUS Bulletin # (TBD) for making slotted bases.

## **LEVELING THE BASE**

Excavate all four sides of the base. Save the grass on a separate tarp so it can be replaced after the work is done. Place the dirt on a tarp or other material. Determine what type of bed is under the base. If necessary, remove the base from the hole. Level the base by rearranging, removing, or adding material in the hole or under the base until the proper depth is reached. Compact the material under the base and ensure the base is level and aligned with the other markers. In some cases you may have to move the base a few inches to align it to a row. Some rows are not aligned. If this is the case, just square up the base to the grave site and/or leave it in its' original location. Fill in the dirt around all sides, compacting it as you add dirt, until all dirt has been used. You may need extra dirt. Replace the grass and tamp it down to ensure a professionally left area around the base.

## **CLEANING THE SLOT**

The slot may be filled with dirt, material from a previous setting, and broken parts of the headstone. If there are broken parts and they can be removed without further damage, they can be epoxied to the bottom of the headstone before resetting. If the setting material is hard you may have to use a hammer and chisel to carefully remove it from the slot. The setting material should be softer than the stone.

Take your time and chip little pieces at a time. The edges of the base slot are also fragile. In some rare cases you may need to use a diamond saw to cut the edges of the material so it can be chiseled out. Be careful not to cut the base.

When the slot is cleaned, you can do a test fit of the headstone to ensure it has a solid fit. Carefully carry the headstone to the base. Ensure the bottom of the headstone is fairly square and fits into the slot without any gaps showing above the slot. If it wobbles you will need to remove pieces of the bottom or place pieces of lead or other material under the bottom of the stone until it is plumb. I have found the use of lead fishing weights work well. They can be flattened as necessary to plumb the headstone.



## RESETTING THE HEADSTONE

Now that all of the inspections and preparations are finished, you are ready to reset the headstone into its' slotted base.

Carry the headstone to the base. Carefully place it into the slotted base and hold it upright in place while your partner attaches the wooden braces and clamps to the headstone. After the clamps are in place, ensure the headstone is plumb. Lift the headstone out of the slot and place it on the edge of the base or on pieces of wood. Keep the bottom of the headstone clean. Mix up the setting mortar. Ensure the leveling spacers have not moved from their location in the slot. Trowel in the setting mortar being careful to not move the leveling spacers. Ensure there are no holes in the mortar placed in the slot. Place enough mortar in the slot to ensure some is squeezed out around the bottom of the headstone when the headstone is placed into the slot.

Place the headstone into the slot. Press down on the headstone until it bottoms out in the slot. Adjust the wooden braces and clamps if necessary to plumb the headstone. Tighten all clamps and drive steel stakes at the end of the braces to keep them from moving. Check again to ensure the headstone is plumb. Remove excess mortar and use the putty knife to smooth the mortar and the pointing tool to make the final grooved finish in the mortar. Do not leave any areas that can fill with water. The finished joint should allow water to run off onto the base. Allow the mortar to set for at least two days. Check the mortar to ensure it has hardened sufficiently to allow the removal of the braces and clamps. If not, allow it to set another two days. After the mortar has set, carefully clean the excess off of the headstone and base. Do not damage the pointed joint.



## RECOMMENDED TOOLS AND MATERIAL

Below is a list of possible tools you may need when resetting headstones:

steel toe boots leather gloves tarp shovel  
tamper lever work table grass knife  
torpedo level compressed air pointing tool gravel  
crushed rock lifting straps chain hoist tripod  
chisels wooden mallet hammer steel stakes  
plastic bucket water nylon brushes sponge  
orvus soap sprayer w/water wooden braces clamps w/plastic pads  
plastic scrapers putty knife trowel mixing pan

**WARNING!** Most of the following lime products have a very high PH. (11 to 13) It is imperative you read the MSDS for the items on this material list and take adequate personal precautions when using them. Some cause skin damage, and breathing dust will cause lung irritation. These two are among other warnings listed on the MSDS.

The materials listed below are recommended by CCUS:

Follow the mixing instructions.

Natural Hydraulic Lime, 3.5 or 5, manufactured by Saint Astier®

Lime Mortar, 1 part lime to 3 parts washed, well graded, sharp sand

However, recommended material used to reset headstones varies by State and National Organizations. Check your State and/or local requirements for their list of setting materials.

For instance, the material shown below is specified for use in Oregon.

White 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 1)

4 parts Hydrated Lime (recommended ASTM C-207, Type S)

8 parts clean sand

There is a commercial product available special ordered from Home Depot, that with added lime, closely matches Oregon's' recommendation. We have received permission to use this.

Quikrete White Glass Block Mortar Mix with 5 parts added hydrated lime. This type "S" mortar mixture consists of 2 parts White Portland Cement, 1 part lime and 9 parts sand. (12 parts) By adding the extra lime, the mixture is sufficiently weakened.

Mix ratio... add slightly less than 1 cup of hydrated lime to two cups of the Quikrete mortar mix.

## CLEANUP

After the mortar has cured, clean any excess left on the base and the headstone. Tidy up the area. Leave it as if no one had disturbed the ground around the headstone.

**December 12, 2016 – CEMETERY CONSERVATORS FOR UNITED STANDARDS**

As you can see there are several lime mortar based mortar mixes and recipes that can be used for slotted bases. Unless your state or area has some specific stipulation concerning a certain type of lime mortar that must be used, here is perhaps the easiest and most accessible lime mortar for this procedure. We recommend an NHL 3.5 for mortaring tablets into slotted bases, as mentioned above. We draw your attention to this again because we feel it the simplest way to go about using lime mortar.



When bought in this 55 lb. bag form, you need only add a fine sharp grade sand to mix your mortar. For best results, we recommend the mix ratio be 1 part natural hydraulic lime to 2 parts sand. For example...1 cup natural hydraulic lime to 2 cups sand.



Ecological Mortar (F) is a readymade non-pigment lime mortar that already has fine sand mixed in. It comes in 38.5 lb. bags and quart containers. It is the most prevalent of the Ecological Mortars for use in slotted bases and the majority of other mortar methods that do not require color.

You will find NHL 3.5 under PRODUCTS USED...Noncommercial Mortars, because it is a lime mortar product that requires the addition of sand to make ready to use as a mortar. You will find Ecological Mortar (F) under PRODUCTS USED...Commercial Mortars, because it is a readymade mortar with sand included.

Both of the products above may be found under PRODUCTS USED...Commercial Mortar Products

**December 23, 2017 – CEMETERY CONSERVATORS FOR UNITED STANDARDS**