Making the base and setting the gravestone of George Washington Harbach

This slate gravestone was among those broken and lying on the ground downgrade, beyond the large beech tree.

The inscribed section and the shards that were found were cleaned, assembled with epoxy and gaps filled by Betty & Carlo Mencucci. (Subsequent digging uncovered no more pieces.)

George W. Harbach
son of Mr. Daniel
& Lucrecia Harbach
died Sept. 6, 1803
aged 3 years 10
months & 17 days

Because of the missing portion, resetting this repaired tablet-style stone directly into the ground using the standard 1/3 below ground - 2/3 above ground ratio would have obscured the bottom line. Their recommendation was to pour a concrete base with a center groove into which the gravestone could be inserted with all of the inscription above ground level. That would provide the structural strength to protect the below-ground portion from roots and frost heaving and aid the above-ground portion in resisting the forces of wind, snow and ice.

A base molding box was constructed off-site. (See information below on sources of materials).

The sides were made from 2" x 8" common white pine planking (2" x 6" planking could also have been used for this small stone). The insert is a piece of 2" thick foam plastic insulation. Purpose is to provide a slot – when the foam insulation is removed – where the gravestone can be inserted using a natural hydraulic lime mortar (a/k/a high lime mortar). The purpose of the lime mortar is to have the gravestone in contact with a material that is more flexible during temperature and moisture changes than the rigid Portland cement used to caste the base.

This gravestone is 16" wide and 1" thick. The front and back pieces of the wood for the mold box are 26" long – allowing for a 1/2" gap on each side of the gravestone plus 3" of the base extended on each side for stability. Each end is 10", providing same gap and 4" extensions.

Note: I assembled this molding box using the materials I had on hand – nails (with the holes pre-drilled to make it easier to disassemble the next day).

Betty & Carlo have a better arrangement. They use "L" brackets on the 4 top corners held in place with screws. Stones are set at the bottom of the hole around the outer perimeter of the box to resist the outward thrust of the heavy concrete. Next day the screws are removed from the corners (stones removed if necessary) and the 4 sides wiggled out. Advantage is the 4 pieces can be stacked together available for future use and taking up less room in your vehicle (or garage between jobs) than the boxes.

The hole was dug 10" deep. Bottom was filled with a mixture of 3/4" stones, crushed gray stone and sand (gravel is an alternative fill). The surface in this area is uneven and drops off to the west (top of this picture). Enough fill was put in to raise the lower left corner in this photo about 1" above grade and the upper right corner about 2". **The mold box was leveled in both directions.** The pieces of wood across the top keep the insert centered and held it down as the box was filled with the concrete mix.

About 100 lbs. of concrete pre-mix (Sakcrete, Quikcrete or similar) and 2 1/2 gals. of water were used to make the 2 batches to fill this mold.

Next day

Removed the molding box and backfilled with the soil on hand.

The slot was partially filled with natural hydraulic lime mortar (a/k/a high lime mortar) to compensate for the slanted base on the repaired stone. The stone was set in place, leveled (using the horizontal line above George's name as the reference) and plumbed. The gap between the gravestone and the base was then filled with the mortar.

Gravestone Base – to make in place – checklist

For mold box (size for specific gravestone, pre-cut and pre-assemble, no bottom or top)
2" x 8" – cut to length based on width & thickness of gravestone plus 3" on each side and 4" front and rear of stone (can use 2" x 6" for small stones).
2" foam insulation for disposable insert – cut to size to leave a groove for the gravestone. Size it to have 1/2" – 3/4" gap around the perimeter of the gravestone to be filled with lime mortar.
1" x 3" – cut to length as needed. Nail 2 pieces in place across the open top of the mold to center the insert.

Hole digging & prep
Turf cutter
Pry bar
Shovels (trenching shovel to loosen stones & digging shovel to transfer materials)
Sifting box (to remove stones and roots from dirt dug out when making the hole)
6' x 8' (or larger) drop cloth

Fill materials
3/4" stone
Gravel with smaller stones or a mixture of crushed gray stone and sand
Surface soil (from site and additional, as needed)
Wooden tamper (2" x 4" x 4' [+/-] long with "handle" across one end)

Cement/mortar
Cement/gravel pre-mix (Sakcrete/Quickcrete/etc.)
Natural hydraulic lime mortar (a/k/a high lime mortar). (There are pre-mixes available. I mixed the mortar using a 3.5 rated natural hydraulic lime and sand at a ratio of 1 part NHL to 3.5 parts sand. Do **not** use mortars that contain Portland cement – types K, M, N, O, S)
Mixing tray
Mixing hoe
Hand shovel/scoop (to transfer the cement mix)
Trowel(s)
Level
Tape measure
Pails
Water

Misc
Trash bags

Sourcing materials

Wood planking

Unified[2] Packaging (formerly Atlas Box) has lengths of 2" x 8" pine planking (and some other sizes) left over from manufacturing of their standard size boxes. Although these lengths are retained to use for making specially-sized boxes, they have an abundance of left-overs and are happy to donate these for good uses. To check availability and arrange to pick-up, contact Nick Hartland at 508-667-6021. Address is 223 Worcester-Providence Turnpike, Sutton.

2" Foam Plastic Insulation

The 2" thick insulation in this photo was donated by Koopman Lumber & Hardware. They had some damaged pieces which are great for this purpose. Check availability of damaged pieces at the Whitinsville store by contacting Matt DeVries, 508-244-0760. Other companies that sell building supplies such as C & S Lumber, Home Depot and Lowes may have similar damaged pieces that they would donate for this use.

Call me at 774-810-6755 to draw from the supply I currently have on hand.

Concrete Mix

Quikrete, Sakrete and similar pre-mixes are available at most hardware stores, Home Depot, Lowes, etc. For the Sutton Center Cemetery project, contact Cemetery Commission Jim Renaud at 508-769-0401 to inquiry if there is any on hand at the Cemetery Commission garage.

Lime Mortar (a/k/a Natural Hydraulic Lime)

Caution! The companies that make Quikrete, Sakrete and similar pre-mixes also make mortar pre-mixes (which are great for use on new construction). On-line I saw one labeled "lime mortar". When I looked more closely, I saw it was also labeled Type S. Mortars that are designated Types K, M, N, O & S also contain Portland cement – in various ratios from 1:1 to 3:1 Portland cement-to-hydraulic lime. Anything made with Portland cement is more rigid and expands and contracts with temperature and moisture changes at a different rate than many natural stone materials. That is the reason for using less rigid lime mortar abutting the stones.

Use a product that is identified as hydrated lime, hydraulic lime or natural hydraulic lime. You will see these designated as 2, 3.5 and 5 (which refers to the ratio of lime to sand in the final mixture). 3.5 is the best for this application.

The Sutton Cemetery Commission is purchasing some of this material for this project. Contact Jim Renaud at the number above.

If you prefer to purchase directly or have other gravestones you want to reset, the products are available at:

Limeworks	limeworks.us
Atlas Preservation	atlaspreservation.com