



Documentation of Restorations to 1870 section of West St Cemetery, Amherst

MONUMENT CONSERVATION COLLABORATIVE LLC, NORFOLK, CT

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At a meeting with the Historical Commission on May 7, 2018, MCC presented a location map and list of 136 markers in the 1870 Section of the West Cemetery requiring restoration.

Restoring or stabilizing this total (136), is far beyond the scope of this first Phase of restoration. While the contract did not identify the markers to be restored, MCC submitted a list of markers to be restored this year. The first group were markers classified as:

- U: Unstable and Hazardous
- D: Unstable and dangerous
- V: Highly visual markers that are either tilted, fallen, and/or fractured and
- E: Markers with any of the above conditions *and* adjacent to the Emily Dickinson plot (the most visited area of the cemetery).

The markers within these groups were then located and identified:

- 14 markers adjacent to the Dickinson plot, either unstable, fallen or fractured
- 5 markers found to be extremely dangerous
- 9 markers both unstable and highly visible

28 Total

At the meeting the Historical Commission and the Senior Planner agreed that these 28 should be listed as "priority 1" and are circled in red on the attached map

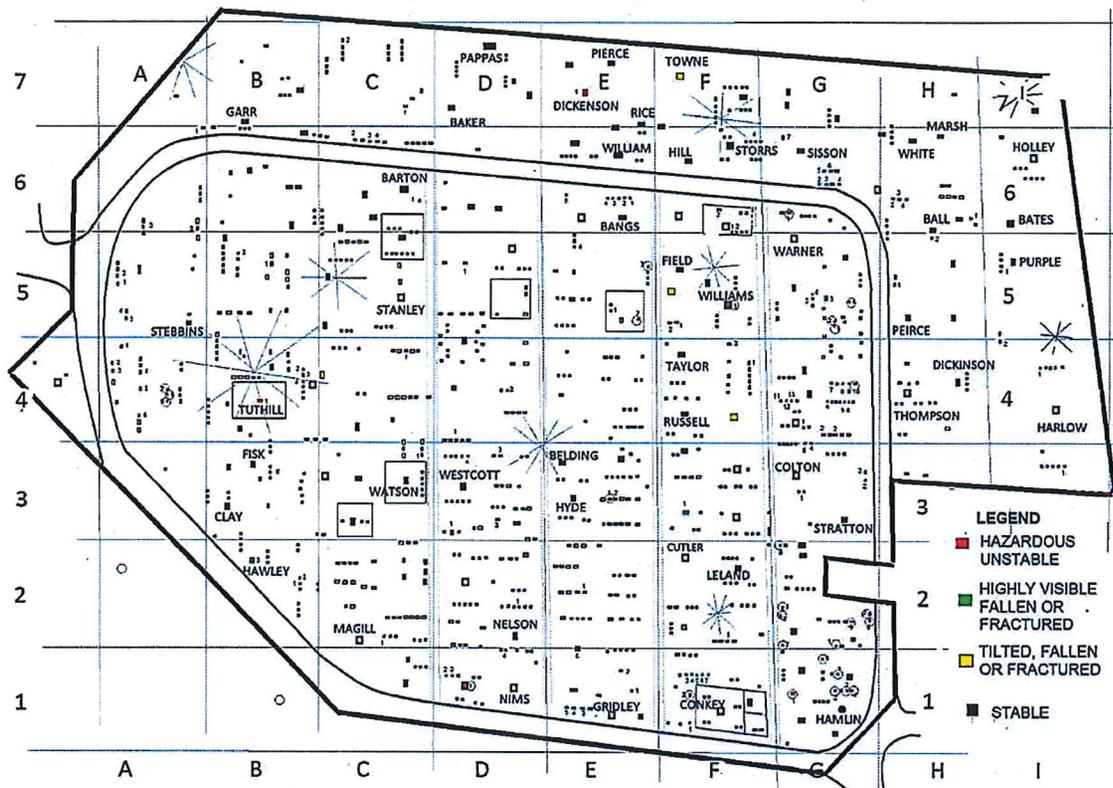
The additional markers that were listed for restoration were the highly visible markers facing the entrance on Triangle street that have fallen off their bases and other nearby unstable markers.

In this initial phase of restoration, a total of 56 markers were restored or stabilized.

Documentation

Prior to starting any work, all gravestones, tombs and other monuments to be restored were digitally recorded. A condition assessment form was prepared for each monument, describing existing conditions and recommended treatments.

Documentation was made of all conservation treatments performed, and a completed set of these documents is enclosed. All digital images are recorded on the enclosed DVD and are identified with the marker's ID number; the grid location on the enclosed map.



Approximate location of markers

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STONE CONSERVATION TREATMENTS West Cemetery Amherst MA

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A4.1	Mary Clowes	Fallen off base	F6.1	Bentley Obelisk	Bio-growth
A4.2	George Davis	Unstable	G1.1	Lucius Church	Fallen off base
A4.3	George H. Davis	Fallen off base	G1.2	Father	Unstable
A4.7	George	Fallen off base	G1.3	n.a.	Unstable
A4.8	n.a.	Unstable	G1.4	n.a.	Unstable
A4.9	Martha Curtis	Unstable	G1.5	Joseph Bardwell	Tilted
A5.1	Frederick Robinson	Fallen off base	G1.6	Mary	Fallen off base
A5.2	Etta Robinson	Fallen off base	G2.1	Sarah	Fallen off base
A5.3	Clarence Wheaton	Fallen off base	G2.2	Starr	Fallen reset
A5.4	Lucy Wheaton	Unstable	G2.3	Cornelia Turner	Fallen off base
A5.5	Lyman Blanchard	Fallen off base	G2.4	John Turner	Fallen off base
A6.3	Mary Williams	Fallen off base	G2.5	Alice Dickinson	Fallen off base
C6.2	Anne Spaulding	Fallen off base	G2.6	Charles Dickinson	Unstable
C6.3	George Spaulding	Fallen off base	G2.7	Lydia Dickinson	Fallen off base
C6.4	Elbertine Spaulding	Unstable	G2.8	Elizabeth Godfrey	fractured
D1.1	Beldman Obelisk	Unstable tilted	G3.4	Fanny Boltwood	Unstable
D3.1	Bangs	Unstable	G4.2	Edwards Frisbee	Unstable
D3.2	Ashley Barrows	Unstable	G4.3	Charlotte Porter	Unstable
D3.3	Mahla Dickinson	Unstable	G4.10	Gertrude Merrick	Fallen off base
D3.4	Fanny Hawley	Unstable	G5.1	Eddie	Unstable
D4.1	Eddie	Unstable	G5.2	Eddie	Unstable
D4.2	Henry-Sm. obelisk	Unstable	G5.4	Edward Ashley	Unstable
E1.1	n.a.	Unstable	G6.1	Mary Crowell	Unstable
E3.1	Clara Dickinson	Unstable, fractured	G6.2	John Ashcroft	Fallen off base
E5.2	Carrie Wildes	Unstable, fractured	G6.3	Elizabeth Ashcroft	Fallen off base
E5.3	Thurston	Unstable, fractured	G6.4	Martha Ashcroft	Fallen off base
F1.2	Noble Goodall	Unstable, Fractured	G6.5	Abbie Johnson	Fallen off base
F5.3	Williams obelisk	Unstable	G6.6	Eben M. Johnson	Fallen off base

List of 56 Restored Markers in 2018

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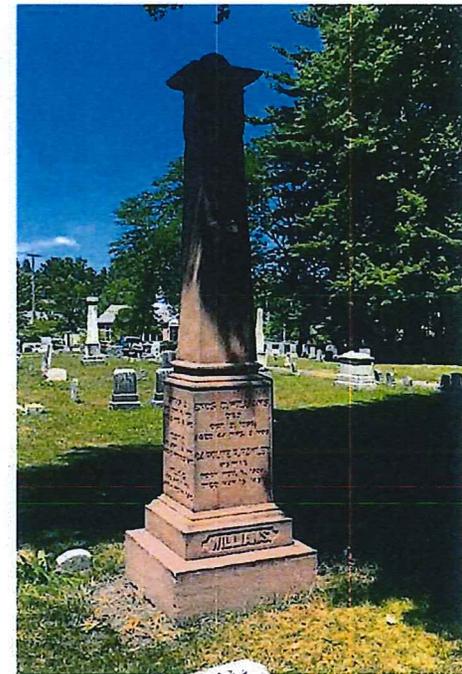
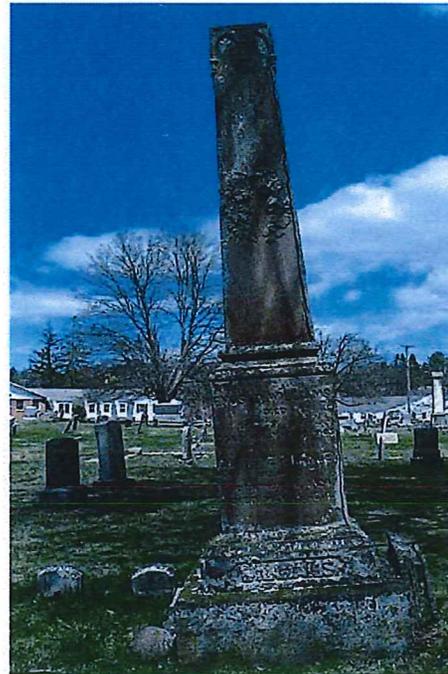
Cleaning

The goal of cleaning is not to return the monument to a "like new" appearance, but to remove particulate soiling, staining and biological growth that may interfere with successful restoration. In most situations, cleaning was done prior to other treatments.

Cleaning of marble markers was limited to those requiring structural adhesions. General cleaning of marbles would make the markers appear very white and the cemetery would appear historically inac-

Removal of biofilm was with D/2 Biological Solution. It is an aqueous antibacterial solution that also aids in the removal of algae, fungi and other organisms. After application and scrubbing with soft brushes, surfaces are fully rinsed with water. Stubborn, well-attached growths will slowly release their grip in a short amount of time and the stone will appear cleaner.

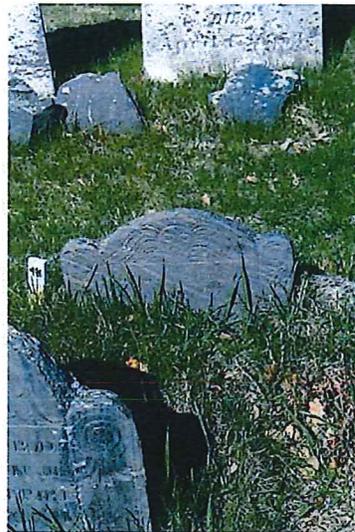
Failed adhesives, mortars and pins were carefully removed before proceeding with new conservation treatment. Mechanical removal was done with hand tools and smaller power tools.



Before and after cleaning

Resetting Tilted and Sunken Markers

Earlier gravestones are typically long panels of stone that were set directly into the ground. After determination of the correct location and orientation of the stone, soil was removed to an appropriate depth. Gravel (or broken stone) was introduced to establish a stable base. The stone was made plumb and level, and set in plane with the adjacent markers. Backfilling was done with sand and gravel, wetted and compacted. Every effort was to replace disturbed areas with existing topsoil and turf, however additional topsoil was required at a number of sites.



18th century markers often have as much below the ground as above. Upon excavating this marker for resetting the very massive below grade portion becomes apparent..

Resetting Monuments

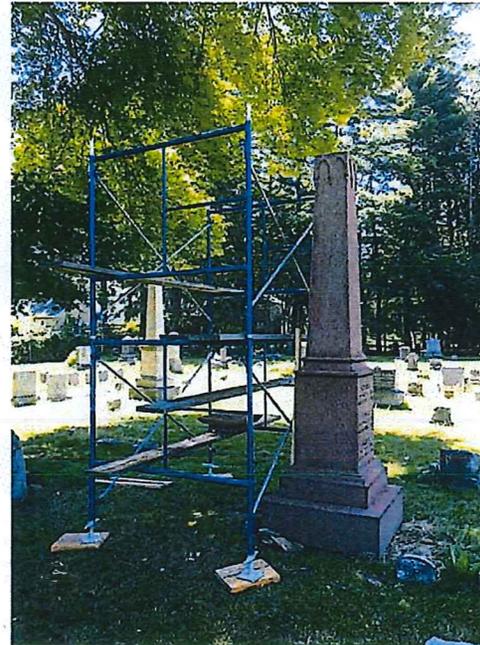
Older large monuments, such as the Williams Obelisk monument, are typically set on a deep bed of dry laid stones. At times these stones will shift due to ground conditions; sometimes due to burrowing animals, frost heaves, flooding, etc. causing the monument to tilt and become unstable.

At a certain angle they become hazardous to themselves, adjacent stones, and to bystanders.

Using cranes or hydraulic jacks to lift these substantial monuments, the base is stabilized and set level. If required, individual elements are separated and reset onto a mortar bed.



F5.3 Williams Obelisk



Scaffolding was used to help aid resetting the upper elements



Example of leveling the base with hydraulic jacks.

Resetting into existing bases

In many cases, fallen markers had been originally set into below grade sandstone bases. When discovered, these bases were often uncommonly deep, more than one foot. Bases were excavated, examined for soundness and reset level at a higher elevation and aligned with adjacent markers.



When excavating for resetting often original, or old bases are discovered



Old base reset higher and aligned with adjacent markers



Gravestones that required insertion into existing bases were set with a relatively weak cement/lime-based grout (3:2:9 with fine aggregates (000), made fluid with a high-range water reducer which ensures a complete fill. This was poured into the base slot. Stones were braced for a minimum of three days to limit movement during curing of the grout.

Resetting into New Bases

A new below-grade base was fabricated when an original base could not be located, or the existing base was damaged beyond repair. Fabrication of a base was also necessary to re-erect the upper fragment(s) of earlier gravestones that did not have adequate length for conventional re-setting. These stones were usually fractured at or near the ground level and their lower elements are missing.

Bases were made on site by casting in place with concrete. The casting is generally 9 to 12 inches deep, and 6 inches greater in both thickness and width than the stone itself. The finished top surface of the base should be entirely below grade. A form for a 1 inch deep setting slot, ½ inch wider and ½ thicker than the stone, was positioned in the concrete. After the base cured, the gravestone was reset into the slot with a cement/lime-based grout as previously described. The top of the new base was covered with topsoil.



Form for new below grade concrete base



Concrete poured, with form for setting slot in place



Form removed, ready for resetting marker

Resetting onto existing Bases

When required, existing bases were leveled and aligned with adjacent markers.

For resetting onto existing bases or ledgers, setting surfaces were first primed with Acryl 60 diluted with water 1:3, and markers were reset with a cement/lime-based grout (3:2:9:1) with fine aggregates (000).

When necessary, stones were braced for a minimum of three days to limit movement during curing of the grout.



Discovering and excavating existing base.



Raising and re-setting base



Marker securely reset onto base

Resetting onto existing bases cont'd

Any remaining failed setting mortar or material is removed by hand and the setting surfaces treated with D/2 Biological Solution.

Existing pins were inspected and if sound, were re-used. If missing or unsound they were removed by drilling around them with a core drill and replaced with stainless steel threaded rods. Setting holes were drilled to clean out debris.



Loose pins are easily removed by hand and replaced with threaded stainless steel.

Below: failed setting mortar removed from setting surfaces and areas treated with antimicrobial D/2



Above: Example of cracking cause by rusted pin.

Below: Iron pins removed with core drill, replaced with threaded stainless steel.



Structural Adhesion

All fragments were carefully cleaned and dry fitted. A thixotropic, thermosetting structural resin (A-5522, by Abatron, Kenosha, WI or equivalent) was thinly and evenly applied along the bond line only. The fragments were aligned, joined with clamps, and adequately braced during curing, which was typically a period of several days.

Several factors, including weathering, can result in a loss of stone surface, which results in a poor 'fit' at the fracture. In this instance, a structural fill (mix of structural resin and fine aggregates) was required in addition to the structural adhesive. The fill was tucked into any voids of the fracture, but was kept well back from the surface of the stone. After curing, the structural fill was concealed by installation of an appropriately colored cement/lime-based crack filler or restoration mortar (see "Cracks and Losses").

Work in this section was not performed when the temperature of the air or of the stone surface was below 50 degrees Fahrenheit.



Example of structural adhesion

Cracks and Losses

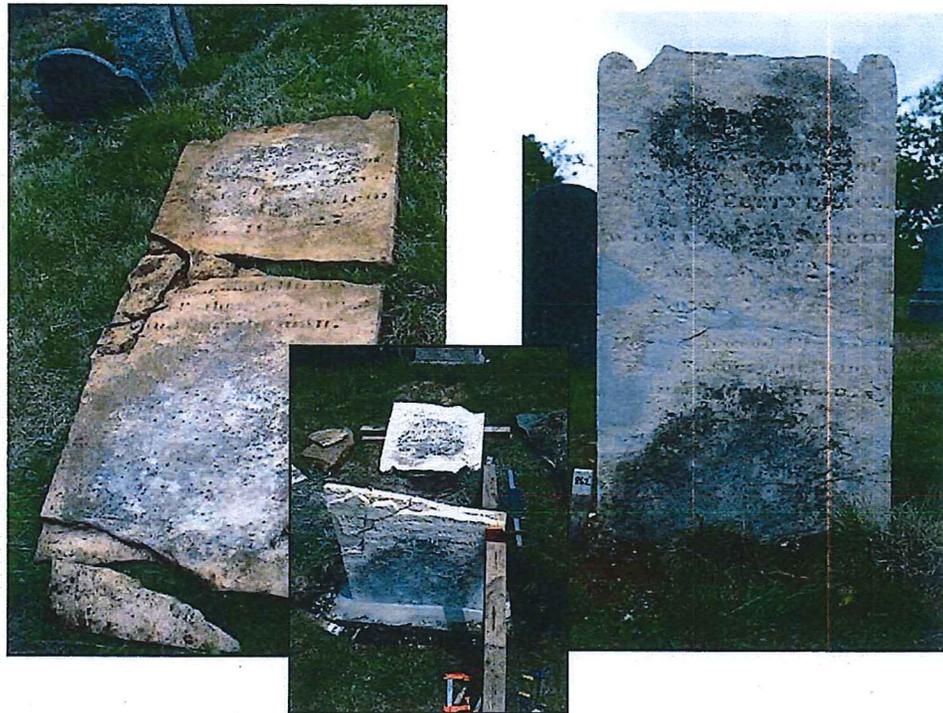
The color and texture of all composites used to fill cracks and losses was matched to that of adjacent unsoiled stone.

Fine cracks were filled with an integrally colored cement/lime-based formulation (RepliCal™ Crack Filler. Larger areas of loss were filled with either Jahn™ M-70, or M-110 Restoration Mortars or with RepliCal™ a cementitious repair composite designed to match weathered surfaces. For marbles, RepliCal contains specially sized and graded marble aggregates.

After partial curing, the fills were treated with a light acid washing with 5% acetic acid. This final treatment removes any cement or lime from the surface of the filled area and exposes the aggregates of the mix. All treated areas were thoroughly rinsed with water.

Fills and patches are made to look weathered. Where lettering and inscriptions are lost, they are not replaced.

In these areas the filled plane is kept slightly back from the stone surface to indicate that there is a loss. Areas where there are no inscriptions can be filled level with the original stone.



*Example of fractured marker with fills, Before and After
After structural adhesion, losses were filled with Jahn M-70 and M-110
pigmented mortar*

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