Condition Assessments and Conservation Recommendations for North Cemetery, Wayland MA April 2017

MONUMENT CONSERVATION COLLABORATIVE LLC
PO Box 541, Norfolk CT 06058 860 307 6695 413 346 4400 mcc-monument-conservation.com

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Summary of conditions

On March 30, 2017, Martin Johnson and Irving Slavid principals of MCC, located the 98 markers designated for restoration. These were located on a gridded map, staked with identification numbers and digitally recorded. They are identified on the enclosed map in red.

In most cases the conditions found were similar to the 2015 treatment proposal. Excavating and working on each marker may uncover different conditions but this event is likely and not un-expected.

The majority of markers- 76, require the bases to be leveled and elements reset. Additionally there are 7 large monuments to be reset plumb and stabilized, and 4 markers require new bases. The remaining 11 markers are fractured or have pin damage. Detailed recommendations of methods and materials fro the conservation of these markers are included in this report.

All markers that are restored will have an individual final treatment report with before and after images and a description of conservation treatments.
Sample below

CONDITION ASSESSMENT Inspection Date: **11/4/2014** Inspected By: IS & MJ

MONUMENT CONSERVATION COLLABORATIVE LLC
PO Box 541, Norfolk, CT 06058 860 307 6695 MCCLLC@gmail.com

Hanover Center Cemetery, Hanover MA

NAME ON MARKER **Hosiah Dwelley**

Death Date: 6/25/1866 Marker Type:Headstone/base

Cond. of InscriptionLegible/decipherable Material: Marble

EXISTING CONDITIONS	CONSERVATION STRATEGY
Fallen	**Evaluate resetting options Reset into new below grade concrete base**

TREATMENT

Treatment Dates 6/12-29/2015

1. Setting area excavated for new below grade cast concrete base
2. A new concrete base sized min. 12" deep, 12" greater in thickness and 6" wider than the stone is cast. The finished top to be below grade. A form for a setting slot 1" wider than the marker is placed in the concrete.
3. Setting forms are removed after partial curing of the concrete and the base backfilled with tamped sand or gravel
4. Lower fragment was reset plumb and level into slot using a cement/lime grout (3/2/9) with 000 sand. Braced for min 3 days
5. All mating edges of fragments cleaned with water
6. Fragments attached with structural adhesive (Abatron 55-22), clamped and braced until cured. Excess epoxy removed with hand chisels within 24 hours.
7. All surfaces treated with D/2 Biological Solution, scrubbed with nylon brushes and water. Rinsed fully with water

Comments:

All information given and recommendations made herein are based upon our research and are believed to be accurate, but no guarantee, either expressed or implied, in made with respect thereto. © MONUMENT CONSERVATION COLLABORATIVE LLC

Height35 Width 16 Thickness2 Marker# **A.2.2**

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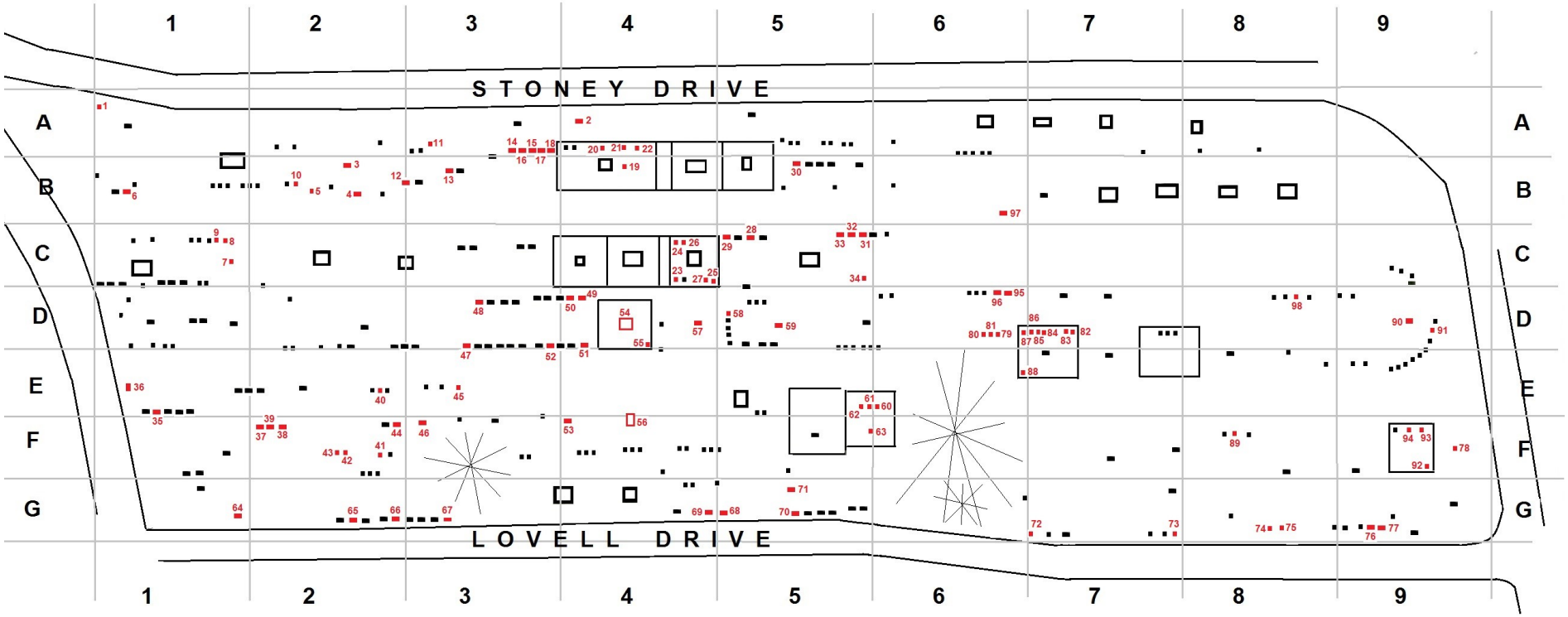

Marker location map– Stoney Section
(all locations approximate)

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List of stones requiring treatments
(sorted by location with map references by grid)

1	A.1	"Our Baby"	Stearns	Level base, reset	25	C.4	"Mother	Baldwin	Level base, reset
2	A.4	E	Caverly	Level base, reset	26	C.4	Frankie	Baldwin	Level base, reset
3	B.2		Willis	New base, probe for exist	27	C.4	"Father	Baldwin	Level base, reset
4	B.2		Willis	Investigate fragment?	28	C.5	Marshall	Baldwin	Level base, reset
5	B.2		Willis	3 small st. fragments? reset	29	C.5	Samuel	Baldwin	Level base, reset
6	B.1	illeg	illeg	2 sm. Stones, level, loss, reset	30	B.5	Carrie	Johnston	level base, reset,- pin damage
7	C.1		Pousland Mon.	Level base, reset	31	C.5	Charlotte	Peters	Level base, reset
8	C.1	"Father	Pousland	Level base, reset	32	C.5	Octavia	Heard	Level base, reset
9	C.1	"Mother	Pousland	Level base, reset	33	C,5	Alonzo	Heard	Level base, reset
10	B.2	Joseph	Abbot	Level base, reset	34	C.5	Harriet	Bettis	Level base, reset
11	A.3		Price Mon.	Stabilize	35	E.1	John M.	Hayward	Level base, reset
12	B.2		"Little Brother"	Level base, reset	36	E.1	Harry	Hayward	Level base, reset
13	B.3		Bryden	Remove adhesive from slot - reset	37	F.2	Lucy	Lee	Level base, reset Clean?
14	A.3	John	Heard	Level base, reset	38	F.2	Cyrus	Lee	Level base, reset Fracture- Clean
15	A.3	Jerusha	Heard	Level base, reset	39	F.2	Susan	Lee	Level base, reset Fracture Clean
16	A.3	Newell	Heard	level base, reset,- pin damage	40	E.2	Emily Noyes	Reynolds	Level base, reset
17	A.3	Grace	Heard	Level base, reset	41	F.2	Augustus	Moore	Level base, reset
18	A.3	Blanche	Heard	Level base, reset	42	F.2	Abbie	Baldwin	Level base, reset
19	B.4	E.	S.	New base	43	F.2	William	Baldwin	Level base, reset
20	A.4	Willie	Cutting	Level base, reset	44	F.2		Baldwin (slate)	New base Fracture- clean
21	A.4	Charlie	Cutting	Level base, reset	45	E.3	Ellen	Rice	Level base, reset
22	A.4	C.S.	D.	Level base, reset	46	F.3		illeg	UnstabLe obelisk
23	C.4	Martha	Baldwin	Level base, reset	47	D.3	I.M.	Francis	New base
24	C.4	Frank	Baldwin	Level base, reset	48	D.3	James M.	Francis	Level base, reset

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List of stones requiring treatments cont'd.

49 D.4	Elizabeth	Chandler	Level base, reset	74 G.8	Horace	Eaton (Granite)	Level base, reset	Clean
50 D.4	Mary	Kent	Level base, reset	75 G.8	A. Augusta	Eaton (Granite)	Level base, reset	Clean
51 D.4	John	Garrison	remove previous adhesive- Reset	76 G.9	Martha	Heard		Fracture
52 D.3	Hiram	Garrison	remove previous adhesive- Reset	77 G.9	Eva	Heard	Reset? Poss New base	
53 F.4	S.	Mann	UnstablLe obelisk	78 F.9	Sarah	Sarah Morse	Level base, reset	
54 D.4	Elizabeth	Bramen	Large mon- reset	79 D.6	A.A.	Sherman	Level base, reset,- pin damage	
55 D.4	Elizabeth	Braman	Level base, reset	80 D.6	Elizabeth	Sherman	Level base, reset	
56 F.4		Mellon mon.	Reset elements	81 D.6	Sarah	Sherman	Level base, reset	
57 D.4		Bennett	Sm Obelisk reset	82 D.7	Father	Sherman	Level base, reset	
58 D.5	Adeline	Adeline	Level base, cross?	83 D.7	"Mother"	Sherman	Level base, reset	
59 D.5		Heard	Sm Obelisk reset	84 D.7	Warren	Sherman	Level base, reset	
60 E.6	Leonard	Drury	Level base, reset	85 D.7	Mary Lucy?	Sherman	Level base, reset	
61 E.5	Leonard H.	Drury	level base, reset,- pin damage	86 D.7	Lucy Ann	Sherman	Level base, reset	
62 E.5	Abigail	Drury	level base, reset,- pin damage?	87 D.6		Sherman	Level base, reset	
63 F.5		Drury	Level base, reset	88 E.6	Ida	Sherman	Level base, reset	
64 G.1	Elbridge	Giles (Granite)	Level base, reset	89 F.8	A.D.	Wellington (Gr)	Level base, reset	Clean
65 G.2	Harriet	Wade	Level base, reset	90 D.9		Draper (Brown)	Stabilize- Cross?	Clean
66 G.2	"Father"	Parmenter	Level base, reset	91 D.9	(C.E.?) Ella	Draper	Level base, reset	
67 G.3	G.L. "Sister"	Parmenter	Level base, reset	92 F.9	William	Wyman	Level base, reset	
68 G.5	Aaron	Drury	Level base, reset	93 F.9	Nancy	Wyman	Level base, reset	
69 G.4	G& A	Gleason	Level base, reset	94 F.9	Jane	Wyman	Level base, reset	
70 G.5		Reeves	Level base, reset,- pin damage	95 D.6	Edwin	Dudley (Gra)	Level base, reset	Clean
71 G.5	Hannah	Reeves	Level base, reset,- pin Fracture	96 D.6	Harriet	Dudley (Gra)	Level base, reset	Clean
72 G.7	Imogene	Carter	Level base, reset	97 B.6	W	Chanloner (Gra)	Level base, reset	Clean
73 G.7	F "Daughter"	Moore	Level base, reset	98 D.8	James	Walker	Level base, reset	

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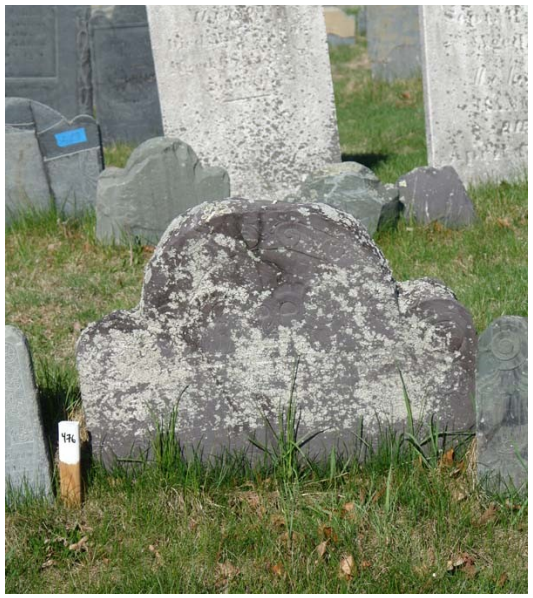
Cleaning

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 will be done prior to other treatments.

Cleaning of marble markers should be limited to those requiring structural adhesions. General cleaning of marbles would make the markers appear very white and the cemetery would appear historically inaccurate.

Other markers such as slate, schist and sandstone can be successfully cleaned without disturbing the overall aesthetics.

The cleaning of one marble inappropriately stands out; and cleaning all the stones would be historically incorrect.



Typical slate marker, benefitting from cleaning

When cleaning, both aesthetic and technical considerations should be considered.

Removal of biofilm is 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 are carefully removed before proceeding with new conservation treatments. Mechanical removal to be done with hand tools and smaller power tools.

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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 is removed to an appropriate depth. Gravel (or broken stone) is introduced to establish a stable base.

The stone is made plumb and level, and set in plane with the adjacent markers. Backfilling to be done with sand and gravel, wetted and compacted. Replace disturbed areas with the existing topsoil and turf.

Since the existing conditions of these marker are typically not discovered until excavating, there can be a number of restoration variables.

Breaks at, or just below grade are very common. Most of these markers will require new bases, since the success of below and near grade repair with structural adhesives is limited.

Fabrication of a base may also be necessary to re-erect the upper fragment of earlier gravestones that now do not have adequate height for proper re-setting, i.e., for positioning to permit the viewing of inscription and decoration.

A new below-grade base is also fabricated when an original base cannot be located, or an existing base is damaged beyond repair.

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

Resetting Tilted and Sunken Markers Cont'd

Resetting into existing bases

In many cases, markers have been set into below grade bases either originally or at a later date upon fracturing. When discovered, these bases can often be uncommonly deep, more than one foot.

Older bases should be carefully 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

Old base removed and inspected for soundness

Gravestones that required insertion into existing bases are to be set with a relatively weak cement/lime-based grout (3:2:9:1) with fine aggregates (000), made fluid with a high-range water reducer which ensures a complete fill.

This mix is poured into the base slot. Stones to be braced for a minimum of three days to limit movement during curing of the grout.

Resetting Tilted and Sunken Markers Cont'd

Re-setting in new base

A new below-grade base is fabricated when an original base cannot be located, or an existing base is damaged beyond repair.

New below grade bases are made on site by casting in the ground with concrete. The casting is generally 9 to 12 inches deep, and 12 inches greater in thickness and 6 inches wider than the stone itself. The finished top surface of the base should be entirely below grade.

Formwork for new base

A form insert for a 1-inch deep setting slot, 1/2 inch wider and 1 inch thicker than the stone, is positioned in the concrete, in line with adjacent markers.

Poured base with form insert for setting slot

After the base has cured, the form is removed, and the area backfilled. The gravestone is reset into the slot using a cement/lime mortar (3:2:9) with 00 or 000 sand, made fluid with a high-range water reducer which ensures a complete fill.

After stones are set plumb and level, and braced for a minimum of three days, topsoil is added to re-grade the disturbed area..

New base ready for resetting

Resetting Tilted and Sunken Markers Cont'd

Re-setting on/in existing base, cont.

When the gravestone has (typically) broken just above an existing slotted base, stone fragments may have to be removed from the slot and the bottom of the gravestone re-squared. Even with power tools, this is a time-consuming and arduous task.

Example of marker broken just above existing base

Removing slot fragments with power tools

The original base for this marker may be discovered by probing, or a new below grade base may be required.

Stones are set with a mix of cement/lime/sand (3:2:9) with 00 or 000 sand made fluid with a high-range water reducer which ensures a complete fill.

Set plumb and level, and braced for a minimum of three days to limit movement during curing of the grout.

Example of bracing after re-setting with mortar.

Resetting Tilted and Sunken Markers Cont'd

Resetting onto existing Bases

Often markers are soundly attached to a base yet fallen or unstable on their foundations or in-ground bases. When required, foundations are to be leveled and aligned with adjacent markers.

For resetting, setting surfaces were first cleaned and any remaining failed mortar removed with hand tools. Prime setting surfaces with Acryl 60 diluted with water 1:3, and reset markers with a cement/lime-based grout (3:2:9:1) with fine aggregates (000).

Discovering and excavating existing foundation or in ground base.

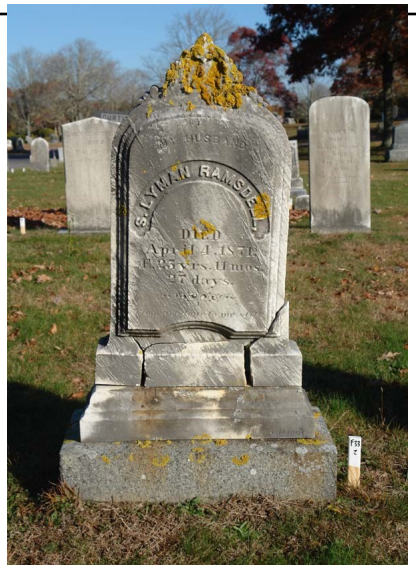
Raising and leveling in-ground base

Marker reset

Resetting onto existing bases cont'd

Pin removal and replacement

Inspect existing pins and if sound and made of copper or bronze can be re-used. Replace all iron pins.
If missing or unsound carefully remove by drilling around them with a core drill and replace with stainless steel threaded rods. Setting holes were drilled to clean out debris.



Above: Examples of cracking cause by rusted pins.

Loose pins are often easily removed by hand and replaced with threaded stainless steel.
Setting mortar is removed from setting surfaces with hand tools and areas treated with D/2 Biological Solution

Example of removing iron pins with a core drill. These will be replaced with threaded stainless steel rods

For larger markers, which can weigh many hundreds of pounds, lifting and resetting can be the most difficult and expensive portion of the operation. This work requires the careful use of hoisting equipment, and is dangerous.

The large die (above) will require mechanical assistance to reset level. Resetting this monument after it falls is considerably more costly than stabilizing it now.

Example of re-setting a large monument onto base with scaffolding and chain hoist

After leveling and stabilizing the in-ground base or foundation, marker elements are re-set on a full bed of mortar. A successful mix is a cement/lime/sand (3:2:9) with 00 or 000 sand.
Setting surfaces can be primed with Acryl 60 diluted with water 1:3 for good bonding. Lead shims can be used to establish a reasonable joint dimension, or for minor adjustments to level.

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Fractures-
Most broken markers can be re-assembled with structural adhesives, without pinning. Bonding is dependent upon the soundness, cleanness and conformation of the fractured surfaces, factors often associated with the age of the break.

Marble gravestone, before and after restoration

Structural adhesion
All bonding surfaces to be carefully cleaned and the fragments dry fitted. Aboweld 55-22 (Abatron, Inc.), a thixotropic, moisture-insensitive two-part epoxy, is thinly and evenly applied along both surfaces of the glue line, keeping slightly back from the edge of the break.

The properly-aligned fragments are joined with clamps, and braced during curing, which is typically a period of several days. Any extra epoxy flowing from clamped joints should be left to partially cure for 24 hrs before attempting removal, and carefully chipped off. The slight gap created is concealed with a crack filler.

Example of bracing and clamping

Although the use of pins is not typically recommended for routine adhesion, complex breaks sometimes require drilling and structural pinning for safer re-assembly. (Larger voids can be spanned by these pins to provide an armature for restoration mortars.)

Where pinning is required, threaded stainless steel rods are recommended, the diameter not more than 1/3 the thickness of the stone, and the total depth of the pin equal to 8 to 10 times its diameter, set in a two-part epoxy.

Filling of cracks and losses

Loss is the disappearance of material by fracturing, erosion, or flaking, or by the delamination of larger, distinct layers that have entirely detached (and fallen) from the monument.

The loss of significant parts of a marker can create complex structural and/or weathering problems. The restoration of the profiles, decoration and inscriptions, can require complicated aesthetic decisions.

Losses designated for treatment can be filled with a pigmented cement/lime mortar, using colored aggregates.

The mortar color and texture should be matched to that of the unsoiled stone. If the stone has not been cleaned, artificial "soiling" of the cured mortar surfaces can be done by a variety of means, including use of potassium silicate paint systems, such as Keim, or a diluted acrylic wash with alkali-stable pigments.

Examples of cement-lime repair mortars

Losses in sandstone are filled with a custom-colored cementitious restoration mortar, such as Jahn™ M-70 (Cathedral Stone Products, Inc.). For marble, losses are filled with Jahn™ M-70 Custom Limestone Maximum White or with RepliCal™ Marble, a marble-based repair composite designed to match the appearance of weathered surfaces. Most fine cracks can be filled with pigmented Voidspan PHLc, a pozzolanic hydraulic lime crack filler and grout.

All filled areas are misted with water and covered for a minimum of 3 days. After partial curing the filled areas are given a light acid washing and thoroughly rinsed with water to remove the paste from the surface and expose the aggregate.

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.

Filling cracks in a sandstone with a pigmented crack filler

Patching and crack filling should not be performed when the temperature of the air or of the stone surface is below 40 degrees Fahrenheit.

PRODUCTS/SUPPLIERS

D/2 Biological Solution

Granite City Tool
11 Blackwell Street Barre, VT 05641
802) 476-3137

Jahn™ Restoration Mortars

Cathedral Stone Products Inc.
7266 Park Circle Drive
Hanover, MD 21076 USA
800 684 0901 fax 800 684 0904

Adhesives
Aboweld 55-22

Abatron Inc
5501 95th Avenue
Kenosha, WI 53144
414 653 2000 fax 414 653 2019

VoidSpan PHLc

VoidSpan Technology
34 Boardman St
Salem MA 01970

1 (A.1) Our Baby

2 (A.4) E. Caverly

3 (B.2) Willis

4 (B.2) Willis

5 (B.2) Willis

6 (B.1) n.a.

7 (C.1) Pousland

8 (C.1) Pousland “Father”

9 (C.1) Pousland “Mother”

10 (B.2) Joseph Abbot

11 (A.3) Price Mon

12 (B.2) Spring Harris

13 (B.3) Bryden

14 ((A.3) John Heard

15 (A.3) Jerusha Heard

16 (A,3) Newell Heard

17 (A.3) Grace Heard

18 (A,3) Blanche Heard

19 (B.4) E.S.D.

20 (A.4) Willie Cutting

21 (A.4) Charlie Cutting

22 (A.4) C.S.D.

23 (C.4) Martha Baldwin

24 (C.4) Frank Baldwin

25 (C.4) “Mother” Baldwin

26 (C.4) Frankie Baldwin

27 (C.4) “Father” Baldwin

28 (C.5) Marshall Baldwin

29 (C.5) Samuel Baldwin

30 (B.5) Carrie Johnston

31 (C.5) Charlotte Peters

32 (C.5) Octavia Heard

33 (C.5) Alonzo Heard

34 (C.5) Harriet Bettis

35 (E.1) John Hayward

36 (E.1) Harry Hayward

37 (F.2) Lucy Lee

38 (F.2) Cyrus Lee

39 (F.2) Susan Lee

40 (E.2) Emily Reynolds

41 (F.2) Augustus Moore

42 (F.2) Abbie Baldwin

43 (F.2) William Baldwin

44 (F.2) Baldwin?

45 (E.3) Ellen Rice

46 (F.3)

47 (D.3) Francis?

48 (D.3) James Francis

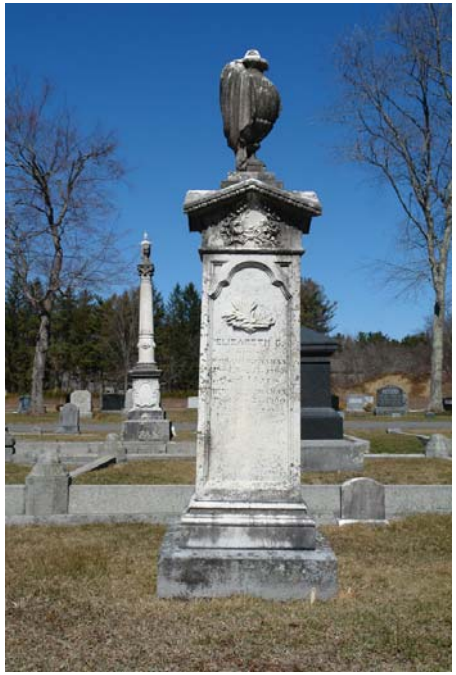
49 (D.4) Elizabeth Chandler

50 (D.4) Mary Kent

51 (D.4) John Garrison

52 (D.3) Hiram Garrison

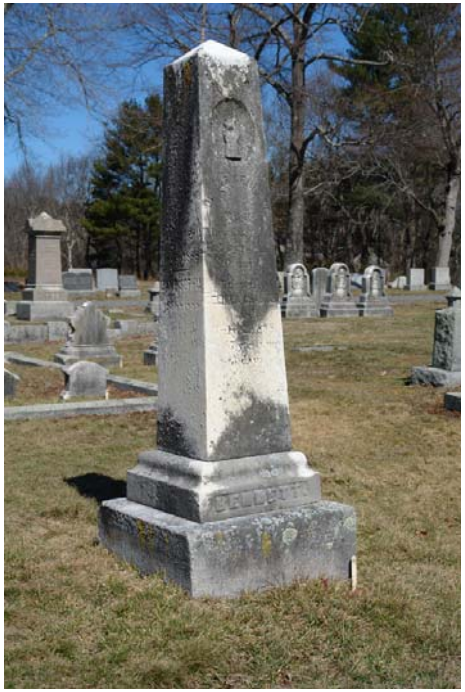
53 (F.4) S. Mann



54 (D.4) Elizabeth Bramen

55 (D.4) Elizabeth (Bramen)

56 (F.4) Mellon



57 (D.4) Bennett

58 (D.5) Adeline

59 (D.5) Heard

60 (E.6) Leonard Drury

61 (E.5) Leonard H. Drury

62 (E.5) Abigail Drury

63 (F.5) Drury

64 (G.1) Elbridge Giles

65 (G.2) Harriet Wade

66 (G.2) “Father” Parmenter

67 (G.3) “sister Parmenter

68 (G.5) Aaron Drury

69 (G.4) George Gleason

70 (G.5) ? Reeves

71 (G.5) Hannah Reeves

72 (G.7) Imogene (Carter)

73 (G.7) “Daughter” Moore

74 (G.8) Horace Eaton

75 (G.8) Augusta Eaton

76 (G.9) Martha Heard

77 (G.9) Eva Heard

78 (F.9) Sarah Morse

79 (D.6) A. Sherman

80 (D.6) Elizabeth Sherman

81 (D.6) Sarah Sherman

82 (D.7) “Father” (Sherman)

83 (D.7) “Mother” (Sherman)

84 (D.7) Warren (Sherman)

85 (D.7) Mary ? (Sherman)

86 (D.7) Lucy Ann (Sherman)

87 (D.6) (Sherman)

88 (E.6) Ida (Sherman)

89 (F.8) A. Wellington

90 (D.9) Draper

91 (D.9) Elizabeth Draper

92 (F.9) William Wyman

93 (F.9) Nancy Wyman

94 (F.9) Jane Wyman

95 (D.6) EdwinDudley

96 (D.6) Harriet Dudley

97 (B.6) W. Chanloner

98 (D.8) James Walker

Poss extra. Fallen adj to 35 (E.1)

Poss extra Tilted Sherman(D.6)

Poss extra Tilted adj to 91 (D.9) numerous

Poss extra Two fallen, fractured. Along walkway (Lovell Section