



August 26, 2008

Ms. Kaja Savasta
CSS Architects, Inc.
Building 2, Suite 300
107 Audubon Road
Wakefield, MA 01880

Re: Building Envelope Evaluation
92 Crafts St., Newton, MA
Newton Dept. of Public Works

Dear Ms. Savasta,

We report herewith our findings, conclusions, and recommendations resulting from the evaluation of the roofs and façade at the stable Newton D.P.W. at 92 Crafts Street, Newton, Massachusetts.

I. BACKGROUND

The structure at 92 Crafts Street was originally designed as a stable and was built in 1894. The main building is an 'L' shaped structure with walls constructed of water struck brick and granite trim at window and door sills. The main roofs of the building are hip roofs covered with slate shingles with dormers containing windows on the front, right, and left side of the building. There is a cupola above the center of the long leg of the building. There is copper cladding at window openings in dormer. The valleys, hip caps, gutters, pipes and flashing are copper including the snow guards. There is a rectangular lower area on the building at the interior corner of the "L" which has a low sloped roof covered with a fully adhered single ply membrane. At the rear elevation of the long leg of the building, there is a rectangular structure beneath a concrete slab at basement level. This building is two stories and a basement. The basement walls are made of rubble stone and brick. First and second floors are wood frame construction with open joist ceilings throughout.

The next sections of this report give the results of our conditions survey. Sections II and III describe our observations of interior and exterior conditions, and Sections IV, V and VI present our comments and recommendations for corrective work. Appendix A contains marked up elevation drawings showing the conditions observed. Appendix B contains photographs showing some of the conditions observed and Appendix C contains a cost estimate.

2. Apply Bituthene primer to roof deck, cricket, and chimney base. Install Grace Ultra membrane to roof deck and turn up a minimum of 8" onto the brick chimney base which has also been primed. All laps and wrapped corners shall be installed in a manner that works with and not against the flow of water (installing from bottom to top). Install membrane with no bridging at the base of chimney. The membrane may also be applied in sections providing the membrane in the chimney laps over the membrane installed to the wooden roof deck. Apply Grace Ultra membrane to cricket and install 30 lb roof felt as needed. Install 20 ounce copper pan to base of chimney.
3. Install 20 ounce copper over cricket to match exposure of existing copper. Install 30 lb felt as needed. Install slate around cricket with a 5" minimum lap. All joints to be lead soldered.

All joints in the saddle flashings (crickets) must be soldered. Dimensions and design can be adjusted as necessary for specific weather conditions and the roof pitch. Saddle flashings must be flanged 4 inches up the wall of the chimney and 4" onto the roof. It is to be cleated to the roof deck on 12" centers using cleats of the same material as the saddle (16 ounce copper).

Note: Copper counterflashing to be installed by others.

4. Install slate with exposure and color to match body of roof, installing 20 ounce copper step flashing beneath each course of slate next to chimney.

C. Gable End Rake (front elevation)

Replace the gable end rake in the following manner:

1. Remove slate 36" from rake. Replace any deteriorated or damaged wood roof decking. Clean and prepare wood roof deck surface. Replace any damaged wood roof decking.
2. Apply Bitumen primer to wood deck. Install Grace Ultra Membrane. Install new 20 oz copper drip edge securing with 1-3/4" ringed copper nails.
3. Install 30 lb felt paper, lapped beneath existing felts. Install slates with color pattern and exposure of that which occurs on the body



of roof with a minimum 2" head lap. Fasten all slates with 2-1/2" ringed copper nail, two nails per slate.

D. Vent Stacks

Replace copper vent stack flashings in the following manner:

1. Remove slate 36" around vent stack. Clean and prepare wood roof deck. Apply bitumen primer to wood deck.
2. Install new Grace Ultra membrane with a 2" turn up onto the vent stack. Apply a collar using Grace Ultra around pipe turning down 2" onto the base sheet of the installed Grace Ultra membrane.
3. Install new 20 oz copper pipe sleeve and base with copper cap (all joints soldered). Install slate to complete area around vent stack.

E. Damaged and Missing Downspouts

Replace damaged and missing downspouts in the following manner:

1. Replacement downspout sections are to be constructed from 16 ounce copper and fabricated to match the existing downspout profiles.
2. Detach the hangers and remove the downspouts to be replaced.
3. Install new downspouts and reattach the hangers.

F. Copper Hip/Ridge Capping and Fascia/Soffits

Repair existing cap flashings at hip and ridges and fascia/soffits

1. Remove all hip and ridge caps. Examine and replace all wood nailers which are found to be deteriorated.
2. Securely fasten all existing caps, fascia and soffit pieces as needed using 1-3/4" brass wood screws and neoprene washers.
3. Replace any missing copper cap sections with the same ounce copper shop fabricated to replicate the existing cap flashings.

G. Deteriorated/Missing or Broken Slate (Replacement)

Replace deteriorated missing and damaged slate in the following manner:



1. Remove broken and deteriorated slates. Cut or remove nails and remove any remaining small pieces of slate.
2. Insert the new slate and nail it through the vertical joints of the slates in the overlying course, approximately 5" from the head of the slate, or 2" below the tail of the second course of the slate above.
3. Cover the nail holes in the new slate with a piece of copper approximately 3" wide by 8" long. Insert the piece of copper so that it will extend under the course above, lengthwise, so that it will extend a minimum of 2" under the succeeding course. Form and install the copper piece so that it is mechanically held in place.
4. Seal exposed nail heads. Cover heads of exposed nails with bituminous plastic cement.

RECOMMENDATION B – BRICK MASONRY WALL

A. Defective Mortar Joints

Repair all defects (cracks, voids, etc.) in the brick masonry walls using the following manner:

1. Rake back all mortar from the joints to a minimum depth of ¾" from the exterior face of the brick where deteriorated mortar is greater than ¾" in depth, until sound mortar is reached. Take care to avoid damaging the brick. Use compressed air to remove all loose material from the joints. Do not use power chisels or jack-hammer type devices to cut back mortar at joints.
2. Wet the surface of each joint prior to the installation of the pointing mortar. Allow no standing water on the brick surface during pointing.
3. Pack type O mortar in thin layers not exceeding ¼" in depth. Tool the joints to match the surrounding walls.
4. As work proceeds, use clean sand, burlap or a brush to remove most of the mortar from the surface of the brick before it sets.



B. Step Cracks in Brick Masonry (Option 1) – Enlargement and Caulking

Enlarge the cracks in the wall and install caulking in the crack in the following manner:

1. Enlarge the cracks to ½” wide by 1” deep. Use compressed air to remove all loose material from the enlarged crack.
2. Clean surfaces of both substrates with a proper cleaning solvent. Prime the substrates with a primer recommended by the sealant manufacturer.
3. Install closed cell back-up rod in the enlarged crack.
4. Install Sonneborn NP2 multi-part polyurethane sealant in the enlarged crack. Dry tool the sealant into place. While the sealant is still fresh, broadcast sand onto the surface of the sealant to match the surrounding area.
5. As the work proceeds, use clean sand, burlap or a brush to remove most of the mortar from the surface of the brick before it sets.

C. Repair of Exterior Step Cracks in Masonry Walls (Option 2)

Repair cracks in the masonry walls by pointing in the following manner:

1. Rake back all mortar from the joints to a minimum of 1-1/2” from the exterior face of the brick or where deteriorated mortar is greater than 1-1/2” in depth until sound mortar is reached. Take special precautions to ensure that the brick faces and profiles are not damaged during the process of raking out or repointing. All raking shall cease if the methods employed by the contractor are causing damage to the brick. Use a water hose or compressed air to remove all loose material from the joints. Do not use power chisels or jack hammer type devices to cut back mortar joints.
2. Wet the surface at each joint prior to the installation of the pointing mortar. Allow no standing water on the brick surface during pointing.
3. Pack Type ‘O’ mortar in the joints in thin layers not exceeding ¼” in depth. Tool the joints to match the surrounding wall areas.



4. As the work proceeds, use clean sand, burlap, or a brush to remove most of the mortar from the surface of the brick before it sets.

D. Chimney Counter Flashing

Installation of copper counterflashings in the brick chimney walls in the following manner:

1. Cut back reglet, removing existing mortar. Remove existing counterflashing. Clean area using compressed air. Remove all loose material from the reglet. The reglet is to be a minimum of 1-1/2" in depth.
2. Install 16 ounce copper step flashing a minimum of three bricks up from roof surface. The width may vary but should be wide enough to cover a minimum of 4" of the base flashing. Replace mortar using a Type 'O' mortar. Tuck point the joints to ensure that they are filled with mortar. Tool the joints to match the surrounding adjacent joints.
3. As the work proceeds, use clean sand, burlap, or a brush to remove most of the mortar from the surface of the brick before it sets.

E. Replacement of Spalled Brick

Remove spalled brick units from the brick masonry walls using the following procedures:

1. Remove spalled brick from the exterior wythe. Remove all mortar from the surfaces of the brick abutting the brick replacement location. Take care to avoid damaging the abutting bricks.
2. Wet the surface of each joint prior to the installation of the pointing mortar. Allow no standing water on the brick surface during pointing.
3. Install the replacement brick with full head and bed joints of Type 'O' mortar. Tuck point the joints to ensure that they are filled with mortar. Match the brick to the coursing and plane of the abutting brick. Tool the joints to match the surrounding adjacent joints.



F. Repair of Spalled Concrete and Defective Cast Concrete Roof Deck (former ramp) and Install Roof System

Repair the former concrete ramp and install a roof system in the following manner:

1. Concrete Repairs

- a. Sound concrete surfaces on the roof deck (former ramp) to locate all spalled and defected patch areas which require repair.
- b. Prepare the spalled/damaged concrete area by chipping to a sound concrete or a minimum of 1" in depth, whichever is greater. Cut the spalled area to be replaced in such a manner that the widest part of the repair is at the deepest cut and the top surface is less wide to create a dovetail effect with the appearance of a truncated pyramid. Such a procedure will allow for a mechanical locking of the replacement concrete to the existing concrete.
- c. Install stainless pins and wire in patch areas larger than one square foot. Install pins with a minimum 4" embedment in the original concrete. Recess the top of the pins 1/2" behind the finish surface of the patch. Set the pins in epoxy. Slightly sloped (5° to 7°) toward the interior on horizontal surfaces and slightly sloped (5° to 7°) away from perpendicular on the ramp surface.
- d. Moisten areas to be repaired with water followed by a brushed on coat of patching mortar similar to Sikatop 123 from Sika Corp. Immediately apply the first 1" to 1-1/2" layer of patching mortar. Build up in 1" to 1-1/2" layers requiring patches greater than 1-1/2" deep. Allow each layer to achieve initial set before applying the next layer. Scarify the top surface of each inner layer to provide a mechanical bond for the next layer. Force the final layer into place with heavy pressure and finish the surface to match the adjacent concrete surfaces.

At curbs and walls, force the final layer into place and trowel the surface with heavy pressure to match the adjacent concrete surface.



2. Repair cracks in the following manner:
 - a. Repair cracks 1/32" in width or greater in the cast concrete roof deck (former ramp) by enlarging the cracks to a minimum width of 3/8" and a minimum depth of 3/8".
 - b. Prime surfaces in all enlarged cracks and in the deck and joints between the deck and curbs.
 - c. Install bond breaker tape in the joints and enlarged cracks to achieve a minimum 3/8" depth of sealant.
 - d. Install Sikaflex 2C NS multi-part polyurethane sealant in the joints and enlarged cracks. Dry tool the sealant into place flush with the surface of the concrete.
 - e. Install Sikaflex 2C NS multi-part polyurethane sealant in the joint between the concrete deck and the wall with a 1/2" bite on both substrates as measured from the edge of the triangular back-up rod. Dry tool the sealant into place with a flat surface. Allow the sealant to cure overnight prior to the application of pre-treatment.

3. Apply deck coating on the concrete ramp using the following procedures:
 - a. Apply primer to the concrete deck, wall, and curbs.
 - b. Pre-treat with a 30-mil detail coat of Neogard Peda-Gard base coat material 6" in width, centered over the following:
 - 1) Curbs
 - 2) Joints
 - 3) Enlarged cracks
 - 4) Cracks less than 1/64" in width
 - 5) Edges of patches
 - 6) Sides of the decks.



Feather the detail coat out along its edges. Allow detail applications to cure in accordance with the manufacturer's instructions prior to the general application of deck coating.

- c. Apply the Neogard base coat at the rate of 60 mils per square foot over the surface of the deck and curb. Allow the base coat to cure for a minimum of 6 hours and a maximum of 24 hours.
- d. Install the Neogard top coat at the rate of 12 mils per square foot. While the top coat is still wet, broadcast the aggregate at the rate of 15 to 18 pounds per 125 square feet. Back-roll the aggregate into the top coat. Make sure the aggregate is evenly distributed over the surface.
- e. Allow a minimum of 48 hours before allowing any foot traffic on the deck.
- f. Make sure the deck is clean at the end of the construction project.

Very truly yours,
THE THOMPSON & LICHTNER COMPANY, INC.

Dan Holahan

Waterproofing Specialist

Reviewed by

Michael Vielmetti

Manager, Weatherproofing Services

DH/MV/aws



Photograph #15 – View of void in head joints, weathered back mortar joints, and holes in the brick wall where fixtures have been removed.



Photograph #16 – View of spalled brick, weathered back mortar joints, and crack between stucco infill and the brick wall



Photograph #17 – View of voids in the mortar joints in the rear brick walls.



Photograph #18 – View of deteriorated concrete deck and step crack in brick walls below the deck.

The following is our estimated cost to perform the repair program outlined in this report.

<u>ITEM</u>	<u>ESTIMATED COST</u>
A. <u>SLATE ROOFS</u>	
1. Replace all open copper valleys approximately 160 lineal feet to include replacement of deteriorated wood decking and installation of Ice & Water Shield on deck.	
2. Replace copper cricket, copper flashing, and copper pans at the chimneys including replacement of deteriorated wood decking and installation of Ice & Water Shield.	
3. Installation of copper drip edge with Ice & Water Shield to gable end on the front elevation.	
4. Replace all copper vent pipe flashing and Ice & Water Shield at vent pipes.	
5. Replace damaged and missing copper down spouts.	
6. Repair/replace copper hip/ridge capping and fascia/soffits and add fasteners. Replace wood beneath caps.	
7. Replace existing snow guards with new premanufactured snow guards.	
8. Replace 500 damaged, deteriorated, and missing slates.	
The total cost estimate for the above items 1 through 8 should range between	\$90,000 - \$100,000



	<u>ITEM</u>	<u>ESTIMATED COST</u>
B.	<u>BRICK MASONRY</u>	
1.	Total for repointing all four elevations only defective mortar joints	\$137,025
2.	<u>Step Crack Repairs</u>	
	Option 1 – Sealant	\$650
	Option 2 – Pointing	\$1,100
	All four elevations	
3.	<u>Spalled Brick Replacement</u>	
	All four elevations	\$5,000
4.	Repair of concrete and coating of concrete at rear elevation	\$18,000
 GRAND TOTAL RANGE OF		<u>\$251,775 TO \$261,125</u>