APPENDIX

February 23, 2004

1116 TECHNOLOGIES INCORPORATED

Mr. Philip Franks
Hurley-Franks and Associates
1429 Walnut Street
Suite 601
Philadelphia, Pennsylvania 19102

Re: Laurel Train Station
Roofing Condition Assessment Report

Dear Mr. Franks,

On January 14, 2004, I observed the existing condition of the slate roof of the historic train station located in Laurel, Delaware, including flashings, rainwater conduction systems, and the brick masonry chimney. Observations were made from grade, from a ladder, and from the interior of the building, where the roof decking and framing is largely exposed. No test openings were made in the roof, except for the removal and reinstallation of two or three slate shingles.

The purpose of this report is to document the findings of our existing conditions survey and make recommendations for addressing observed deficiencies. Recommendations for more detailed site observations and test openings are suggested where these will help to both better define the scope of roof rehabilitation work and estimate the cost of such work. These services can be provided during future design phases.

In short, the roof system of the Laurel Train Station is at a point in its serviceable life where it can either be successfully repaired or replaced, depending on the goals of the Owner. The existing slate shingles likely have a remaining life of from 15 to 25 years. Realistically, if the repair option is selected, regular and increasingly more frequent maintenance of the gutters and shingles will be required even after the repairs recommended herein are carried out, and the roof will appear more and more mottled as even the most carefully selected replacement slates will not exactly match the soiled color of the existing. The replacement option will provide an historically appropriate roof system that will last well over a century with only minor maintenance (short of catastrophic events) and the replacement of flashings and gutters every 60 to 70 years or so. Estimates of probable construction cost and several repair/replacement options are provided in the recommendations section of this report to aid the Owner's decision making process.

Slate Roofing

Roof surfaces are covered with Peach Bottom slate shingles measuring 20 inches long by 10 inches wide by 1/4 inch thick. The slates are laid with an 8 inch exposure and a 4 inch headlap, which is entirely appropriate for the 30 degree (approximately 7 in 12) roof pitch. Exposures increase to 8-1/2 inches to 9 inches in the bottommost 6 to 7 courses, where there is a subtle change in roof pitch, providing headlaps of from 2 to 3 inches. Given the lower roof slope at the eaves, this reduced headlap makes the roof more prone to water infiltration during driving rains. In the past, there was little that could be done about this if the slates were to lay flat. Today, a layer of ice and water shield membrane alleviates the concern. Replacement slates used in previous repair campaigns are relatively few and consist primarily of Buckingham Virginia slate and, to a much lesser degree, Pennsylvania Soft-Vein (also know as Pennsylvania Black) slate.

Roof decking and framing consists of solid wood boards measuring 5 to 6 inches in width on wood rafters spaced at approximately 2 feet on center. There is no wood ridge pole. Wood kickers nailed to the rafters create the subtle change in roof slope at the eaves. The wood rafters have sagged slightly, except for those on the east slope located adjacent to the north and south faces of the chimney. As a result, slate shingles abutting the north and south sides of the chimney are no longer laying flat (Photograph No. 1).

The roof's slate shingles are held in place with 1-1/2 inch long galvanized roofing nails with 3/8 inch diameter heads. The few nails I was able to observe were in good condition and there is no evidence above the first 3 to 4 courses at the eaves to suggest that the nails are failing. Displaced and sliding slates in the first 3 to 4 courses are likely due, not to corroding nails, but rather to poorly executed past repairs. In fact, based on the number of copper bibs present, the presence of mismatched replacement slates, the aluminum gutters, the presence in the field of a slate that was cut to be adjacent to a hip, and the inconsistent mixing of lightly stained and deeply stained original slates, I believe that the bottom 4 or 5 courses of slate were stripped and re-laid some time ago (Photograph Nos. 2 and 3, see also footnote number 3, below).

The existing slate is original to the building. Peach Bottom slate was quarried in Delta, Pennsylvania and Cardiff, Maryland up until about the 1940s and is world renowned for its durability and long service life, which some sources put at 300 years. Unfortunately, the station's slate has not weathered well during its approximately 100 years of service and likely only has a remaining serviceable life of 15 to 25 years. Aside from random broken and cracked slates, the slate generally suffers from flaking and delamination, primarily on its back side (Photograph No. 4). The shingles no longer ring when struck, but rather give off a rather dull thud, further indicating that delamination is taking place. While we may never know exactly why this particular slate has not fared well, several possible explanations come to mind. The first is that slate is a natural material, and the slate placed on the Laurel Station may have, by chance, come out of a quarry (there were several) or a portion of a quarry containing impurities capable of expediting the process by which slate deteriorates. More likely, however, is that sulphur compounds coming out of the building's chimney and the stacks of coal-fired steam engine locomotives exacerbated the weathering process. The deep reddish brown staining on the exposed portions of the slates suggest that soot was heavy in the air around the station for many years.

A general rule of thumb is that when 15 to 20 percent of a roof's slate shingles are cracked, missing, or broken, it is generally more cost effective to replace the roof than repair the many damaged slates. The number of damaged slates on the Laurel Station is well below these percentages. Thus, one option is to repair the broken slates to prevent water infiltration, make other flashing and masonry repairs (as outlined below), and retain the roof for another 15 to 25 years. It is important to keep in mind that replacement slates used to repair the roof will likely not match the weathered color of the existing slates. To some, this is acceptable and an indication of a building's history. To others, mismatched repair materials are aesthetically disconcerting. If a longer serviceable life is desired, we would recommend removing the existing roof and installing new slate shingles and all new flashings, gutters, and downspouts. Although Peach Bottom slate is no longer quarried, two historically appropriate options exist for the slate to be used in re-roofing the station. Option 1 is new Buckingham Virginia slate. This slate possesses the same general color and luster as Peach Bottom slate and has an expected serviceable life of about 175 years. Option 2 is to obtain Peach Bottom slate that has been salvaged from old roofs. This second option is a bit more risky than the first (the slate's provenance may not be clear and availability of sufficient quantities would have to be carefully verified) and may even be a bit more expensive.

Flashings

Given the simplicity of the roof, flashings are limited to the chimney, a soil pipe, a ridge, rakes, and hips. In short, these flashings are either non-existent or in poor condition. The chimney's north, south, and east base and counterflashings are covered with roofing cement (see Photograph No. 1). The chimney's west cricket is constructed of terne metal that has not been painted in many years and, as a result, is rusting. The lone soil pipe is located immediately north of the chimney. It's flashing is secured to the roof deck with exposed screws and rises only about 6 inches up the pipe, where a sealant joint has failed. The north-south running ridge is covered with a terne metal flashing that is severely corroded (Photograph No. 5). The building's hips and rakes have no flashings. Should a new roof be installed, a copper drip edge should be installed at the rakes. Mastic covers most of the slate hip shingles (Photograph No. 6). In some locations, the roof deck is visible through a gap between the hip slates. These shingles should be removed and replaced and copper or lead flashings interwoven with each course as the new slate is reinstalled.

An aluminum louvered vent is located at the top of the north and south slopes. Further research is required to determine the original appearance of these ventilation openings. Certainly, the white color of the existing louvers is not appropriate. Treatment options will likely include removal of the existing louvers and replacement with new wood louvers to match the originals, or simply painting the existing louvers to match their original color.

Gutters and Downspouts

A 5 inch, white, aluminum K-gutter encircles the entire perimeter of the building. Above the gutter is a white aluminum drip edge, and below, the fascia and character defining soffit of the building are clad with white aluminum and vinyl siding respectively. Rusting steel screws hold much of the gutter and drip edge together. Downspouts consist of 2x3 corrugated, rectangular, white aluminum leaders an elbows secured with poorly detailed and an insufficient number of aluminum hangers. The entire rainwater collection system is generally poorly detailed and historically inappropriate. With the exception of a few crushed and missing downspouts, however, the system is functional and could be repaired and retained. If funds are available, and especially if election is made to replace the slate shingles, removal of the existing aluminum and vinyl and restoration of the original gutter and downspout system is recommended. This will require some archival research and a number of test openings on site to determine original detailing and the condition of extant original materials, such as the soffit and fascia. In addition, paint analysis may be able to reveal the original color(s) of these elements. Already, we know that each downspout was served at grade by a round cast iron boot (Photograph No. 7) and that the extant downspouts located on the west elevation (currently missing) were originally located on the north and south elevations (Photograph Nos. 8 and 9). We also know from historic photographs that the original gutter was a pole gutter. In addition, based on the size of the notches cut in the terra cotta beltcourse located at window sill level, we know that the original downspouts were 3x4 inch rectangular, and that these would have been plain, not corrugated, based on the age of the building.

Whereas underground drain lines served all six original downspouts, currently four downspouts elbow out at grade and only two downspouts enter the ground (center of north elevation and north end of east elevation). The original cast iron boots have been cut off at grade and filled with concrete at the four locations currently draining to grade. The condition of the active, and inactive, underground drain lines is unknown, but the worst should be assumed – total replacement.

Chimney

A brick masonry chimney is located just south of center on the east slope of the roof. Its top corbels out slightly and is covered by a stone or cast stone cap. The chimney is in poor condition, suffering from open mortar joints, a cracked cap, and significant cracks through the brick on its south and east sides (Photograph No. 10). A steel band has been installed six courses below the cap to help prevent the chimney from splitting apart. The best solution for addressing these problems is rebuilding the chimney.

Recommendations

Recommendations for roof repair and replacement for the Laurel Train Station are given below. Alternative recommendations are offered where cost, service life, and aesthetic issues may impact decision making.

The estimates of probable construction cost included in this section of the Report are intended as general indications of magnitude of cost primarily because they are not based on actual, quantifiable construction documents. Prior to undertaking any of the work outlined in the recommendations, more detailed investigations and design work should be completed in order to determine the full extent of deterioration requiring treatment, to ensure proper detailing for the new work, and to develop specifications for appropriate materials and methods. Upon completion of the detailed investigations, the cost estimates should be revised. The following information should be considered and used in conjunction with the estimates of probable cost:

- Prices are based on mid-year 2004 construction costs. Once a construction period is established, an appropriate escalation factor should be added to the costs contained herein.
- A fifteen percent contingency should be added to the estimates for unforeseen conditions.
- The contractor's general conditions and overhead and profit at 25 percent are included in each of the prices.
- No architectural, engineering, or project management fees are included in the prices.
- Prices do not include an allowance for the identification, testing, or abatement of hazardous materials.

1. Replace all cracked, broken, missing, displaced, face nailed, and mismatched slate shingles with new salvaged slate shingles to match the existing as closely as possible (assume 200 slates).

   Estimated Cost: $ 9,660

2. Remove all displaced slates from the first 4 courses at the eaves and reinstall (assume 50%).

   Estimated Cost: $ 9,936

3. OPTION: In lieu of recommendations 1 and 2 above, remove the existing slate shingles down to the wood roof deck and install new Buckingham Virginia slate, 100% of all roof surfaces. Remove and replace all rotted wood roof decking (assume 5%). Install new copper drip edges at the north and south rakes. Install new snow guards above all entrances to the building.

   Estimated Cost: $175,743 .(Note for the total cost of roof replacement, see all recommendations below, except nos. 8 and 10).

3a. OPTION: In lieu of recommendations 1 and 2 above, remove the existing slate shingles down to the wood roof deck and install new dimensional asphalt shingles, 100% of all roof surfaces . Remove and replace all rotted wood roof decking (assume 5%). Install new copper drip edges at the north and south rakes.

   Estimated Cost: $44,643 (Note for the total cost of roof replacement, see all recommendations below, except nos. 8 and 10).

4. Remove all existing chimney flashings and install new copper base flashings, counterflashings, an apron flashing, and a cricket. Remove, salvage, and reinstall slate shingles as required for the installation of the new flashings. Assume 5% breakage and replacement with new, salvaged slate shingles. Remove existing mastic from face of brick units located adjacent to reglets. Fill reglets with mortar. See also recommendation no. 13 (chimney rebuilding).

   Estimated Cost: $2,415

5. Remove existing and install new, properly detailed, copper flashing at 1 pipe penetration. Remove, salvage, and reinstall slate shingles as required for the installation of the new pipe flashing. Assume 5% breakage and replacement with new, salvaged slate shingles.
   Estimated Cost: $621

6. Remove the existing ridge flashing, full length and install a new copper ridge flashing to match the existing.

   Estimated Cost: $6,728

7. Remove all existing hip slates and replace with new, salvaged hip slates that match the originals as closely as possible. Interweave new soft copper flashings in with each course of hip slates. Secure new hip slates with concealed fasteners.

   Estimated Cost: $8,253

8. Prepare, prime, and paint the existing aluminum louvers located at the north and south ends of the roof to match the original color(s).

   Estimated Cost: $690

9. OPTION: Remove the existing aluminum louvers and install new wood louvers to match the originals. Prepare, prime, and paint the new wood louvers to match the color(s) of the originals.

   Estimated Cost: $2,070

10. Repair the existing hanging gutters, fascia, and soffit. Repairs to include replacing missing screws, sealing open seams with gutter rubber, and reinstalling displaced drip edge. Replace two missing 2x3 aluminum downspouts on the west elevation. Replace crushed portions of 2 existing downspouts on the east elevation with new aluminum downspout sections (assume 16 feet, total).

    Estimated Cost: $3,450 (allowance)

11. OPTION: Remove all existing aluminum drip edge, gutters, and fascia and vinyl soffit cladding and install new copper drip edge and copper hanging gutters. Strip, prepare, prime, and paint exposed wood fascias and soffits. Allow for the removal and replacement of 400 square feet of deteriorated soffit and 100 linear feet of deteriorated fascia. Remove all existing downspouts and install new 3x4, plain rectangular, copper downspouts.

    Estimated Cost: $35,431

11a. OPTION: Remove all existing aluminum drip edge, gutters, and fascia and vinyl soffit cladding and install new copper drip edge at the eave, new wood poles, and new, properly detailed, copper pole gutter liners. Strip, prepare, prime, and paint exposed wood fascias and soffits. Allow for the removal and replacement of 400 square feet of deteriorated soffit and 100 linear feet of deteriorated fascia. Remove all existing downspouts and install new 3x4, plain rectangular, copper downspouts.

    Estimated Cost: $55,800

12. Excavate all existing underground drain lines and install new PVC drain lines (assume 6 drains lines at 100 linear feet each). Install 6 new cast iron boots to match the originals as closely as possible. Prepare, prime, and paint the boots.

    Estimated Cost: $28,980

13. Carefully dismantle the existing brick masonry chimney to a point 2 to 3 feet below the roof line, salvage and clean the brick, and rebuild the chimney to match the existing Flemish bond (approximately 50 courses). Assume the replacement of 75 cracked and damaged brick. Remove the existing chimney cap and install a new masonry cap to match the existing.

    Estimated Cost: $11,730

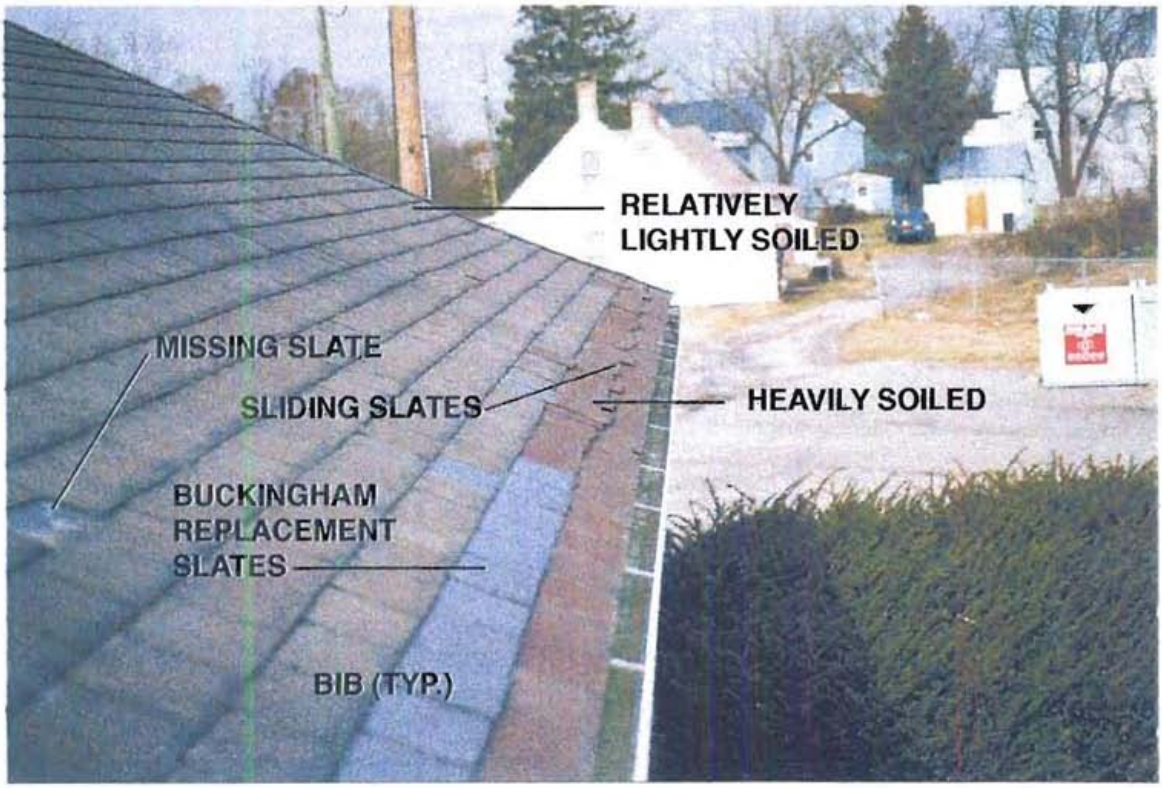
I hope the above is helpful. Please let me know if you have any questions concerning the above, or if I can be of further assistance.

Sincerely,

1:1:6 TECHNOLOGIES INCORPORATED

Jeffrey S. Levine
Principal

Photo 1



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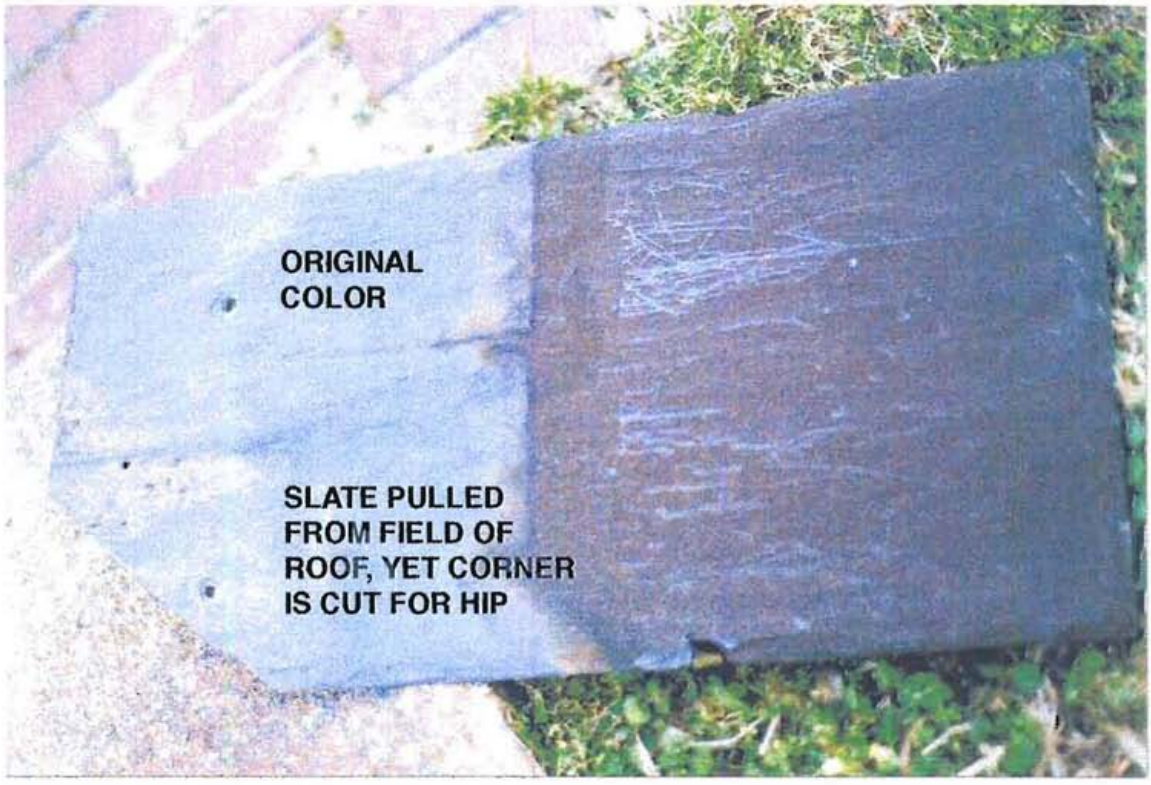

Photo 3

Photo 4

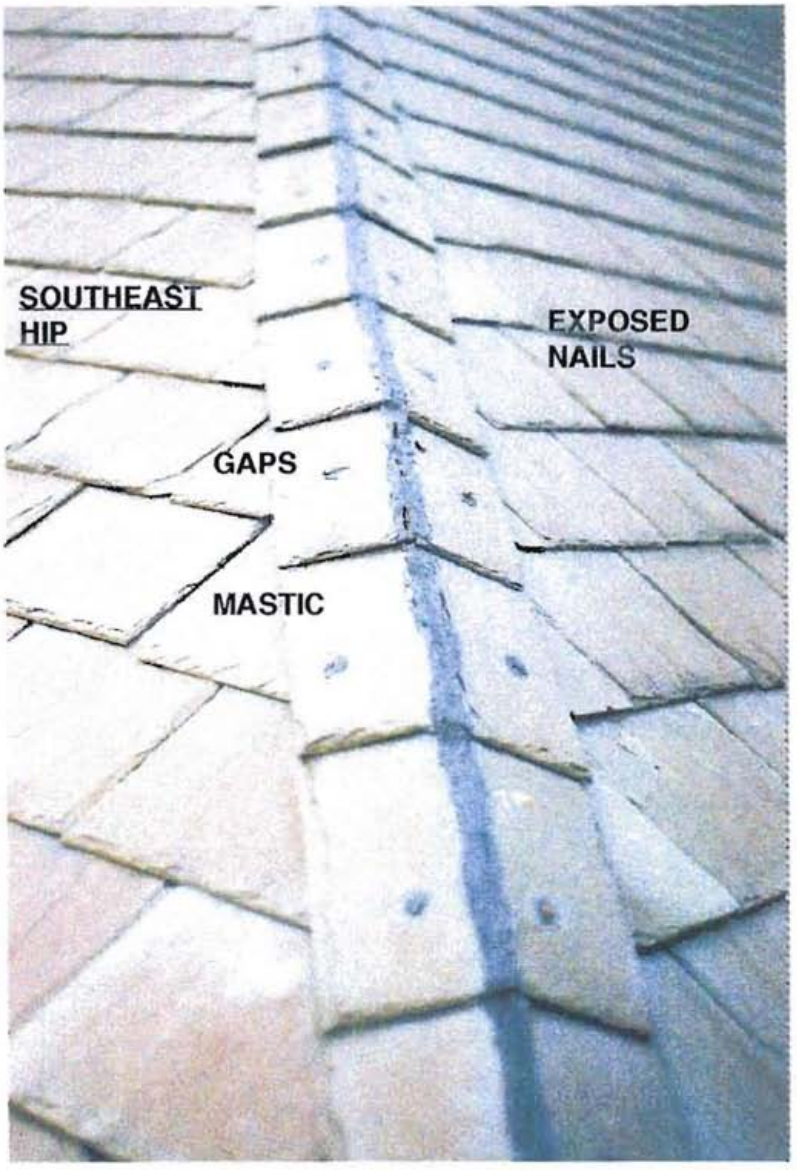

Photo 5

Photo 6

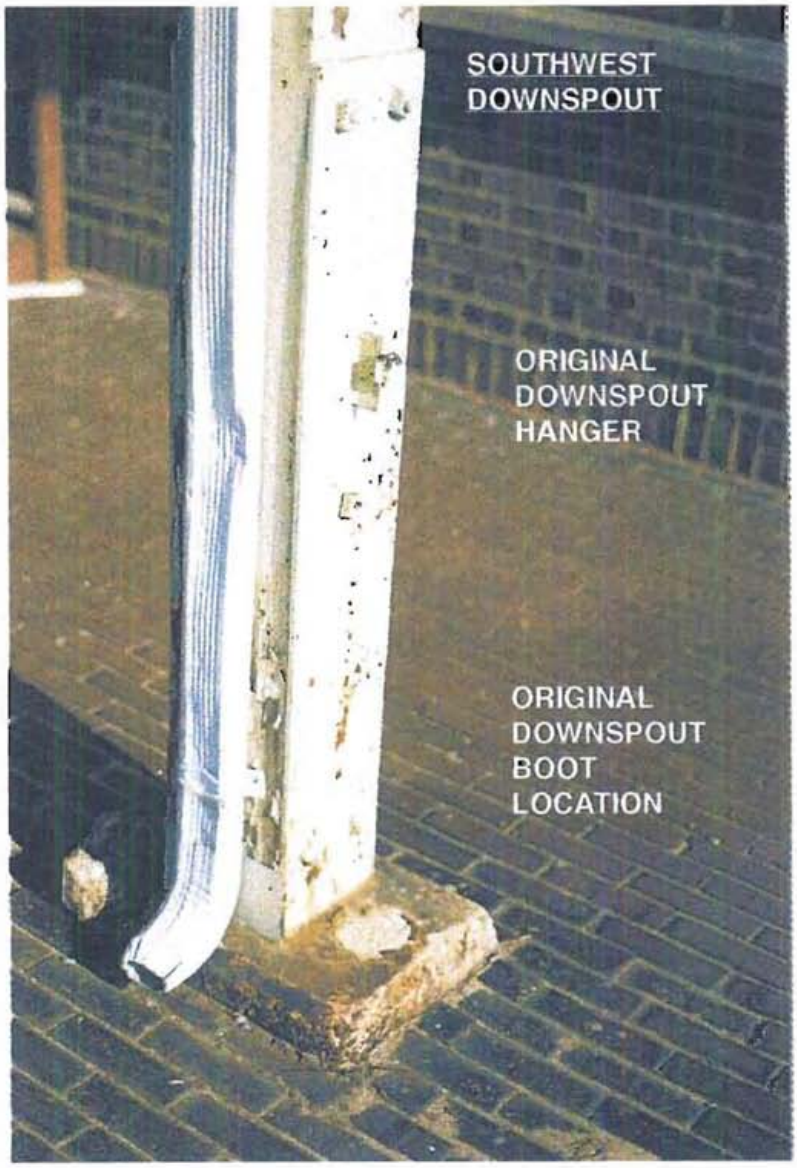
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Photo 7

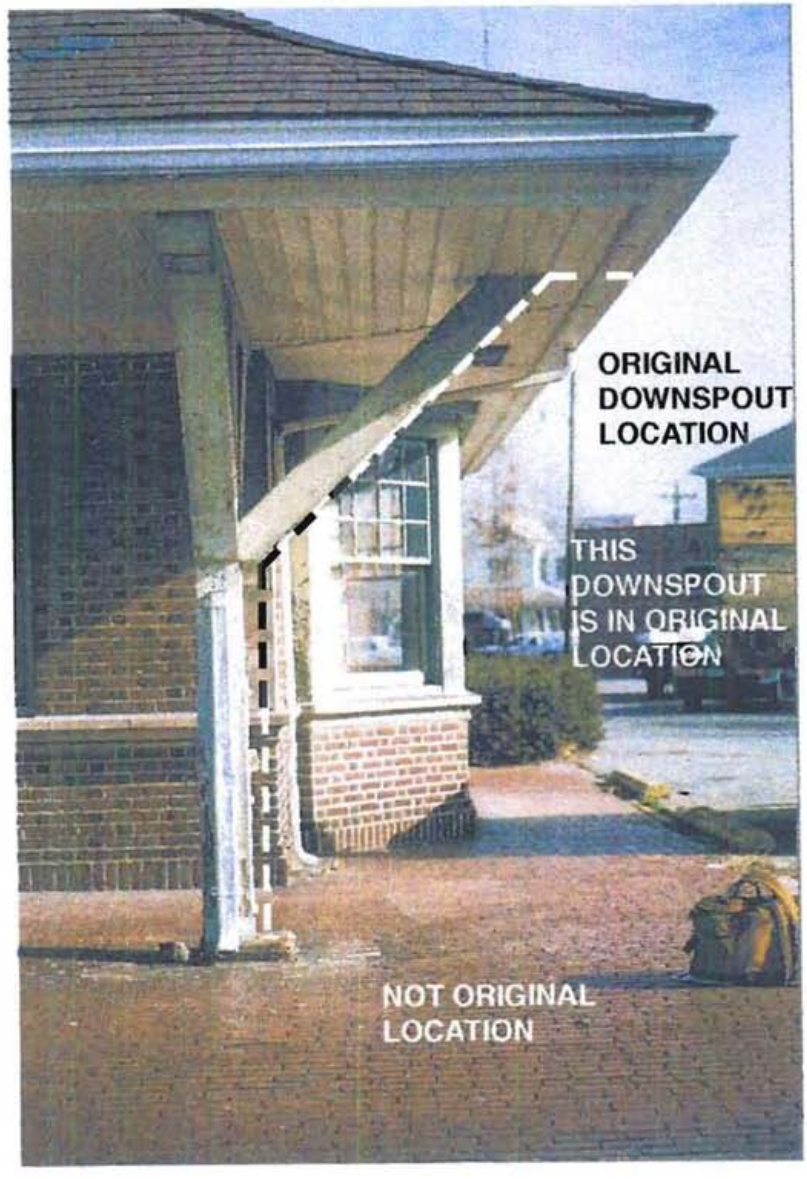
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Photo 8

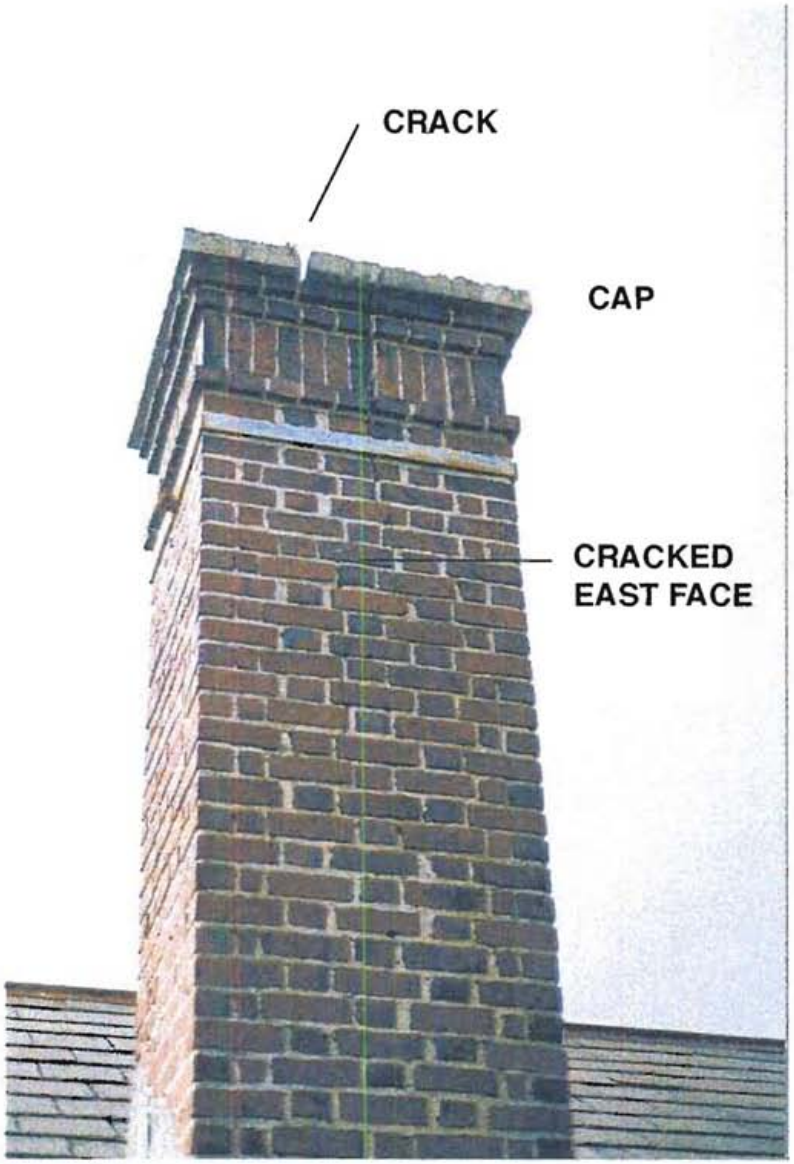

Photo 9