



McMullan & Associates, Inc.

**CONDITION ASSESSMENT OF THE CONFEDERATE  
POWDERWORKS CHIMNEY IN AUGUSTA, GEORGIA**

***JULY 2003***

*Consulting Structural Engineers*

8381 Old Courthouse Road, Suite 350 • Vienna, Virginia 22182  
Telephone: (703) 556-0651 • Facsimile: (703) 556-0378 • Email: [Mcma@mcmse.com](mailto:Mcma@mcmse.com)

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A. International Chimney Report	
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Introduction:

McMullan and Associates Senior Engineer, Mr. Douglas Bond, PE, visited the Confederate Powderworks Chimney in Augusta Georgia on May 15, 2003 along with representatives from the International Chimney Corporation, led by Mr. Bob Larocque to perform a condition assessment of the chimney.

Survey Methods:

A temporary scaffolding ladder was constructed by Mr. Larocque in order to access the top of the chimney and inspect the condition of the masonry adjacent to the ladder because the condition of the existing ladder was uncertain. The plan was to access the top of the chimney and determine if the condition of the chimney interior would safely allow Mr. Larocque to drop down inside the chimney. While on top, Mr. Larocque determined that the top 30 or more feet of the chimney interior brick liner had collapsed some time in the past, and that accessing the interior of the chimney would be unsafe. Therefore the inspection was limited to the chimney exterior and the areas inside the chimney that could be viewed from the top.

Mr. Bond inspected the outside of the chimney with a 10x optical zoom camera and photographed several areas. Mr. Bond also visited the Augusta Museum where several prints of the original Powderworks are kept. Photographs of some of the prints were provided by members of the Sons of the Confederate Veterans.

Findings:

The chimney is approximately 153 feet tall, 20 feet square at the base, and 10 feet square at the top. The chimney is constructed of an outside wall of brick that is separated from an inside liner of brick by an airspace. There is a cast iron cap at the top of the chimney.

The detailed observations by the International Chimney Corporation are included in their attached report. Their observations are summarized as follows:

1. There are several small areas of loose of brick that present a falling hazard.
2. The lightning protection system is improperly anchored and is not grounded.
3. There are areas of significant mortar erosion that are several inches deep. Mortar erosion is more significant towards the top of the chimney.
4. There is one vertical crack that is at least  $\frac{3}{4}$ " wide on the west face of the chimney that is approximately 40 feet long.
5. There is significant plant growth at the top of the chimney.
6. The remains of the upper part of the interior liner that had collapsed have been removed from the base.

Mr. Bond's inspection of the chimney using the camera revealed several areas on each side of the chimney with significant mortar erosion. There a few vertical cracks on the west, south, and east sides of the chimney that range in length from approximately 3 to 10 feet.

At the base of the chimney, there are several cracks at the corners in the base stones and brick work just above the stones, measuring in width from hairline to up to ¼" wide in one location. Some areas of the mortar are of a sandy consistency that are not easily penetrated with a screwdriver but can be scraped away. There are other areas of mortar that are a different color and have a harder consistency. Several of the bricks were scraped with a screwdriver and found to be very resistant to penetration.

The prints viewed at the Augusta Museum contained information on several of the buildings at the Powderworks but no information on the interior dimensions or construction of the chimney. One drawing did provide details and dimensions of the brick projection at the top of the chimney and included several hand notations indicating changes to some of the original dimensions.

### Conclusions

The detailed results of the International Chimney Corporation survey are included in the attached report. The results are summarized as follows:

1. While the chimney is in overall fairly good condition considering the age of the structure, there has been significant deterioration of the mortar.
2. There are areas of loose bricks that present an immediate falling hazard that need to be repaired.
3. The lightning protection system is inadequate and needs repair.

The large vertical crack on the west face could have been caused by several factors including overheating, an explosion during use, or minor settlement. The other vertical cracks near the base may also be signs of minor settlement.

### Recommendations

Mortar joints that have deteriorated should be repointed and the cracks filled with a mortar consistent with the historical brick masonry. Bricks that present a falling hazard should receive priority. The lightning protection system should be repaired. A stainless steel cover should be applied to the top of the chimney to limit water infiltration into the chimney interior. A cost estimate for this work is included in the appendix. The cost estimate does not include engineering fees, administration, general contractor overhead, contingencies, or escalation.

If you have any questions, please contact me.

Sincerely,

Douglas E. Bond, PE

Senior Structural Engineer

McMullan & Associates

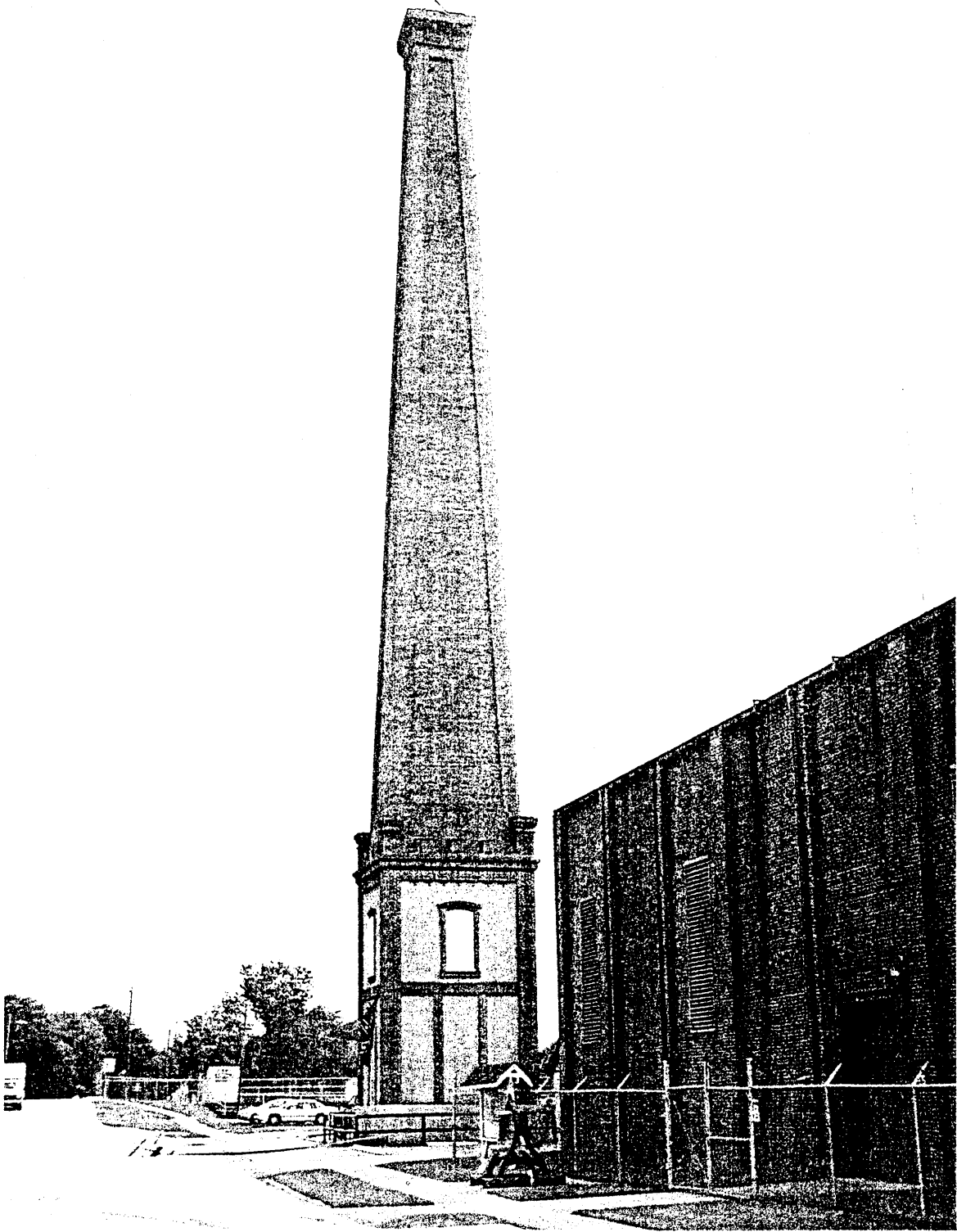
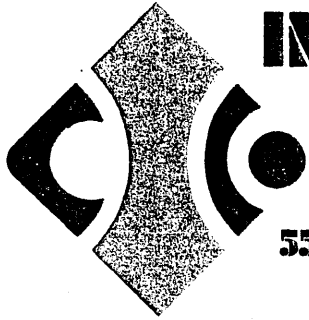


Photo #1: Overall view of the Confederate Powder Works Chimney



# INTERNATIONAL CHIMNEY

CORPORATION

ENGINEERS • CONTRACTORS

**55 S. LONG ST. BOX 260 BUFFALO N.Y. 14231-0260**

(716) 634-3967 • (800) 828-1446 • FAX (716) 634-3983



CONFEDERATE POWER WORKS  
AUGUSTA, GEORGIA

INSPECTION OF 153' SQUARE RED BRICK CHIMNEY



June 11, 2003

Our File #CE-34190-C

CONFEDERATE POWER WORKS  
AUGUSTA, GEORGIA

INSPECTION OF 153' SQUARE RED BRICK CHIMNEY

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CONFEDERATE POWER WORKS  
AUGUSTA, GEORGIA

INSPECTION OF 153' SQUARE RED BRICK CHIMNEY

I. STACK DESCRIPTION

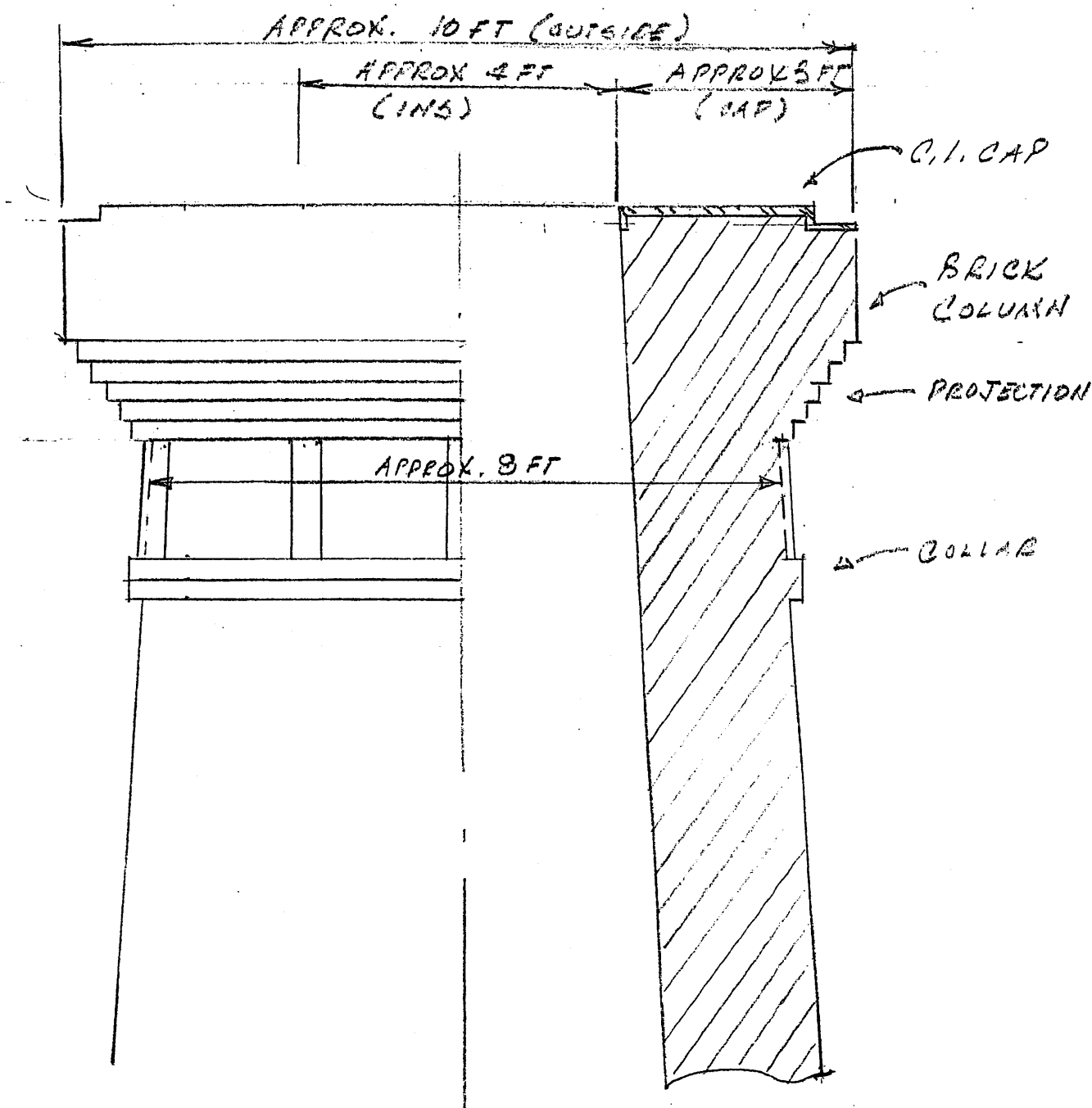
The subject chimney is constructed square from red brick, standing approximately 153' high. It has a top outside dimension of approximately 10' (outside of cap); a top inside dimension of approximately 4' (inside of cap) and a base measurement of approximately 20' as measured across the face of the pedestal. The base pedestal stands approximately 35' high with ornamental brick piers surrounding stucco covered, recessed brick panels.

Hardware items on the chimney includes a 19" Ø round cast iron access door on the North side, lightning protection system consisting of one (1) approximately 20' high spiked ball at the top supported by four (4) cast iron cap brackets, a cast iron cap approximately 1/2" thick by 3' wide and a full height wrought iron ladder.

The chimney has an internal liner constructed of common brick that has a thickness of approximately 9" near the top and 18" near the base. There appears to be a 1" airspace between liner and column.

The chimney is historically significant as it sits within the Augusta Canal Industrial District; Historic Register data: 5/27/71, A, C, NHL, 71000285. It is the last remnant of the Confederate States Powder Works in Augusta, Georgia (Augusta Powder Works) which was constructed by Colonel George Washington Rains. The Augusta Power Works is historically significant as a major source of ammunitions for the Confederate Army and is responsible for its continued existence during the Civil War as it added significantly to the duration of the conflict by affording the Confederate States a consistent and superior grade of gun powder.

As an engineering achievement, the design of the Augusta Powder Works incorporated many modern industrial concepts including the assembly line, automatic fire suppression systems, sacrificial bulkheads designed to collapse in the face of a blast thus directing the explosion away from the structure and facility, personal protective equipment in the form of rubber soled, anti-spark shoes, etc. The innovations appear consistent with the thought process used for a job hazard analysis.



ELEVATION - SECTION

CONFEDERATE  
POWDER WORKS  
CHIMNEY

INTERNATIONAL CHIMNEY CORP.  
6-10-03

DIMENSIONS ARE APPROXIMATE  
BASED ON BRICK COUNT

**INTERNATIONAL CHIMNEY CORPORATION**

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AUGUSTA, GEORGIA**

**INSPECTION OF 153' SQUARE RED BRICK CHIMNEY**

**II. INSPECTION PROCEDURE**

Our inspector, Mr. Robert Larocque, accompanied by his crew, first photographed the subject chimney on different elevations from ground level, using a 35 mm camera and digital camera.

The climbing inspection was then performed utilizing International Chimney Corporation scaling ladders installed adjacent to the existing ladder on the West side. Close up photographs were taken of representative areas.

At the top of the chimney, it was noted that conditions on the interior were unsafe therefore an interior inspection was not performed.

# INTERNATIONAL CHIMNEY CORPORATION

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## CONFEDERATE POWER WORKS AUGUSTA, GEORGIA

### INSPECTION OF 153' SQUARE RED BRICK CHIMNEY

#### III. OBSERVATIONS

##### Chimney Pedestal

On the chimney's pedestal or base, the inlaid and parged stucco panels each show signs of deterioration and delamination.

The ornamental brickwork surrounding the parged panels is becoming weathered evidenced by the deep mortar joint erosion.

Some of the brick is missing on corner piers.

The clean out door appears surprisingly intact, however paint is weathered.

Deep mortar joint erosion was also noted on the granite portions of the chimney pedestal.

##### Masonry Column

The general appearance of the mortar joints is weathered, however the mortar joint deterioration appears to be most severe in the uppermost 53' where mortar joints are open approximately 60% to 70%. There is evidence of a previous repair.

From about 50' above ground elevation to 100' above ground elevation, the mortar joints deterioration appears to be 40% to 60%. Below the 50' elevation, the joint deterioration appears to be 10% to 40%.

In general, projections, ornamental piers, and the head area of the chimney appears to have suffered the most amount of mortar joint deterioration and should be treated as a priority.

Moss and organic growth is visible along the West and North sides predominately near the top. Also, looking at the interior from the top, plant life is visible growing from the mortar joints exposed to direct sun light.

A major crack was noted in the chimney on the West (ladder) side from about 110' above grade to 145' above grade. This crack runs parallel to the left side of the ladder, approximately 2' from the ladder and is open to 1/2" and at least one (1) brick deep. Due to the close proximity of the ladder, we originally felt as the iron anchors for the ladder may have been exfoliating or rust jacking the masonry however this does not appear to be the case.

The crack may have been caused by thermal expansion. Additional minor cracking was noted on existing mortar joints.

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CONFEDERATE POWER WORKS  
AUGUSTA, GEORGIA

INSPECTION OF 153' SQUARE RED BRICK CHIMNEY

III. OBSERVATIONS (Continued)

Hardware Items

The existing wrought iron ladder appears intact with minor surface rusting and weathered paint.

No interior step irons were noted.

Several areas on the cast iron cap are cracked and paint is weathered.

The lightning protection system is substandard in accordance with UL guidelines and has no connection to ground. Additionally, cracks were found in two (2) of four (4) supporting legs for the lightning protection point.

Interior

Due to unsafe conditions, an interior inspection was not performed. At the top of the stack, our inspector noted that the uppermost 30' of brick liner had entirely fallen away and that the remaining loose liner brick would constitute a drop hazard for our inspector if dislodged. The existence of or absence of interior step irons were not noted. As previously mentioned, plant growth was evident from interior mortar joints accessible to direct sun light. The mortar joints appear open and weathered.

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**IV. PHOTOGRAPHS**

There are sixty-five (65) photographs included in this report which better depict the conditions found during our inspection.

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AUGUSTA, GEORGIA

INSPECTION OF 153' SQUARE RED BRICK CHIMNEY

V. RECOMMENDATIONS

1. The chimney shall be rigged with a "International" scaling ladder and work access structure. As required swing stage scaffolding shall be utilized to perform the pressure wash.
2. The pressure wash shall be performed utilizing a low pressure application of a mild detergent (trisodium phosphate, sure clean 600, or equal) and as applicable, mild herbicide shall be applied to organic growth, including the upper 5' of the interior. A high pressure water rinse shall be performed utilizing pressures of 1,000 psi or less, as not to damage existing masonry. The high pressure water wash shall be performed using a fan tip by a skilled operator. The rinse of the interior top 5' shall be low pressure
3. Starting at the base of the chimney, all deteriorated mortar joints (see percentages in report) shall be thoroughly cut out to a depth required to obtain a good key for new mortar, joints thoroughly wetted, and repointed with a lime rich, "historic" mortar. The mortar proportions shall be approximately one (1) part white Portland cement to two (2) parts lime to five (5) parts sand, adjusted to suit workability requirements. Mortar color shall be added to the approximate color of the existing joints. A bonding agent such as Acryl 60, as manufactured by Chemrex (a Thoro Systems Product) shall be added to the mortar mix in the prescribed proportions in order to increase bondability to the existing mortar. Joints shall be tooled to match existing and "weathered" using stiff bristle brushes.

It is not the intent of the masonry restoration to install a hard Portland cement mix (such as type "S" or "N"), as the mortar to be used for repointing shall approximate the strength of the existing mortar. This is important from a historic perspective and as a structural consideration, as chimneys flex in the wind and "hard" mortar repointing will cause a stress differential.

4. Inclusive with the masonry repairs, approximately one-hundred and twenty (120) bricks require replacing on the exterior column. The old cracked brick shall be thoroughly cut out and brick (salvaged from the liner) shall be installed into a fresh bed of mortar.
5. At the chimney pedestal, all loose stucco shall be removed and fresh stucco applied in parged areas. The new stucco shall be colored to match the existing. Acryl 60 shall be mixed with the scratch coat to increase bondability.
6. The existing ladder shall be power brush cleaned, solvent rinsed and coated with a black rust inhibitive paint, such as Rustoleum or equal.
7. The cast iron cap shall be power brushed clean, solvent cleaned, and the cracks repaired. The crack repair in the cast iron for structural connections shall be performed by pre-heating, plug welding with a high nickle rod and post heating. Non-structural repairs may be ground out and back filled with Belzona Super XL metal, a titanium based epoxy filler.

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INSPECTION OF 153' SQUARE RED BRICK CHIMNEY

V. RECOMMENDATIONS (Continued)

8. Lightning Protection System Discussion:

The existing lightning protection system is currently not connected to ground, as the ladder, which formally served as the ground has been discontinued above the existing ground level. Whereas it would normally be advantageous to install a UL master label lightning protection system on the structure, in this case there are historical considerations. The existing lightning protection system point is very much a part of the historic fabric and as such should not be changed. (the alternate would be installing eight (8) points around the perimeter of the cap) instead, we suggest running two (2) new copper downlead cables on the East & West elevations.

The existing lightning protection system point and brackets shall be dismantled, lowered to grade and all cracked or broken segments will be cleaned, re-welded with nickle rod, painted and re-installed at the top.

Two (2) new downleads consisting of 1/2" Ø seven (7) strand copper shall be installed on the East & West elevation of the chimney and anchored at 4' intervals with drill in lead shields and copper cable anchors.

At the base of the chimney, two (2) new 10' long ground rods shall be installed to terminate the ground connection. Copper shields shall be installed from ground up the cable for approximately 8'. If possible, a second cable shall be installed at or near the base, horizontally, such that the potential between the two (2) downleads is equalized.

9. At the request of the customer a stainless steel cover shall be designed and installed over the top of the chimney. The cover shall be installed such that it is anchored to the existing cast iron cap and/or existing interior masonry, cover a portion of the cast iron cap (in order to allow for proper drainage) and allow for some ventilation to the interior.
10. Upon completion the material, debris, tools, equipment, etc. shall be removed from the site and the site left in a broom clean condition.