

**STATE OF VERMONT
DEPARTMENT OF BUILDING
MONTPELIER, VT**

**VERMONT STATE HOSPITAL
WATERBURY, VT**

**EXTERNAL/INTERNAL INSPECTION
TWO RADIAL BRICK CHIMNEYS**

SUBMITTED BY

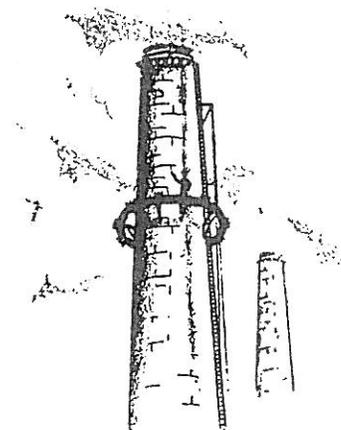
GERARD CHIMNEY COMPANY

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October 10, 2006

STATE OF VERMONT
Department of Building and General Services
Agency of Administration
Office of the Commissioner
Two Governor Aiken Avenue
Drawer 33
Montpelier, VT 05633-5801

Attention: Mr. Kevin Henderson
Maintenance Contract Engineer

Subject: Internal/External Inspection Report
Two Radial Brick Chimneys
Contract ID 9886

Mr. Henderson:

In accordance with our subject Contract, our Field Superintendent, Mr. Dennis Streets, performed an internal and external inspection of the subject chimneys.

Please find the inspection report attached including photographs and recommendations for future maintenance and repair work.

Should you have any questions regarding this report, or require further information or clarification, please contact us at the toll free number shown above.

We look forward to again being of service to the State of Vermont on future projects.

Sincerely,

Mike Gregory
Project Manager

MG/sg

Project

External/Internal Inspection
Two Radial Brick Chimneys

Location

Vermont State Hospital
Waterbury, VT

Department of State Building
Montpelier, VT

Report Prepared For

Mr. Kevin Henderson
Maintenance Contract Engineer

STATE OF VERMONT
Department of Building and General Services
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Two Governor Aiken Avenue
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Prepared By

Mr. Mike Gregory
Project Manager

Gerard Chimney Company
4607 Beck Avenue
St. Louis, MO 63116

Inspection Dates

August 10 through 14, 2006

CHIMNEY DESCRIPTION

State Hospital - Waterbury, Vermont

The lower 142' of the chimney is constructed of buff radial brick. The upper 8' is constructed of common brick. The total height is 150', with an inside diameter of 6'-6" and bottom inside diameter of 10'. There is a brick liner starting at ground level that extends upward 45'. The brick liner interior surface has a gunite lining the full height of the chimney.

The lightning protection system consists of four air terminals, a top encircling cable, and two downleads. The upper 25' is lead coated for protection from chimney discharge and weather.

There is a formed concrete cap atop the chimney column.

The chimney column has fourteen steel tension bands evenly spaced in the upper 75'.

The breeching enters the chimney column on the east side approximately 18' above ground level.

Department of State Building - Montpelier, Vermont

The chimney is constructed of red radial brick and is 120' in height, with an outside diameter of 7', and bottom outside diameter of 11'. The chimney has a full height gunite lining.

The lightning protection system consists of three air terminals, top encircling cable, and two downleads. The upper 25' is lead coated for protection from chimney discharge and weather.

There is a formed concrete cap atop the chimney column.

There are five steel tension bands in the upper 20' of the chimney column.

The breeching enters the chimney on the east side 7' above ground level.

INSPECTION PROCEDURE

External ladders were installed on each chimney by Gerard Chimney Company to gain access to the top of the chimney. Equipment was securely rigged at the upper elevation and the inspector was lowered down the entire height of the chimney interior. The inspector marked the walls with spray paint during each descent and photographs were secured at various elevations and locations.

The exterior surface was inspected as he ascended the ladder. Photographs were secured at various elevations and locations.

The State Hospital in Waterbury, Vermont and the Department of State Building in Montpelier, Vermont chimneys were inspected as described above.

REPAIRS COMPLETED

The following repairs were completed in August, 2006 as part of the subject contract:

State Hospital, Waterbury, VT

- Tuckpoint and crack repair upper 8'
- Lightning protection system inspected and re-anchored as needed
- Internal washdown
- Breeching interior crack repair and re-clad
- Internal inspection

Department of State Building, Montpelier, VT

- Internal washdown
- Concrete cap repair and waterproof
- Internal inspection
- Lightning protection system inspected and reanchored as needed

INSPECTION REPORT

STATE HOSPITAL, WATERBURY, VERMONT

Exterior Surface Radial/Common Brick Chimney

A visual inspection of the exterior surface was performed. A set of 35 photographs were taken that show the typical condition of the radial and common brick shell.

The exterior shell is generally in good condition, however the upper 8' of the column has 30% of the mortar joints worn, weathered, and deteriorated, as can be seen in Photograph Nos. 16, 17, and 19. There are intermittent hairline cracks and missing mortar joints the full height and on all sides of the chimney column, as can be seen in Photograph Nos. 10 through 13, 22, 24, 29, and 33.

The formed concrete cap atop the chimney column is worn and weathered, as can be seen in Photograph Nos. 17, 18, 36, 37, and 38.

The top encircling cable anchor is loose, as can be seen in Photograph No. 17. The remainder of the lightning protection system is interconnected and properly functioning, as can be seen in Photograph Nos. 2 through 20.

Interior Surface - Brick and Gunite Lining

The upper 12' of the gunite lining have large areas of missing gunite. Cracks of 1/4" to 1" wide, and areas of spalling, as can be seen in Photograph Nos. 36 through 40. The next 80' extending downward is in sound condition as can be seen in Photograph Nos. 41 through 48. At 43' above ground level the gunite is worn thin, exposing the brick liner, as can be seen in Photograph Nos. 49 and 50. The remainder of the lining is in solid and sound condition, as can be seen in Photograph Nos. 51 through 56.

Breeching Interior and Exterior

The metal breeching exterior and interior surfaces are rusted as can be seen in Photograph Nos. 57 through 72. Weld seams have rusted through as can be seen in Photograph Nos. 62, 64, 66, and 68 through 71.

INSPECTION REPORT

DEPARTMENT OF STATE BUILDING - MONTPELIER, VERMONT

Exterior Surface Radial Brick Chimney

A visual inspection of the exterior chimney surface was performed. A set of 18 photographs were taken, which show the typical condition of the radial brick shell.

The exterior surface of the radial brick shell is in solid and sound condition as can be seen in Photograph Nos. 73 through 91. The upper five courses have hairline to 1/4" wide mortar joint cracks, as can be seen in Photograph Nos. 89, 90, and 91.

The formed concrete cap atop the chimney column is worn, weathered, and has a 1/4" wide crack as can be seen in Photograph Nos. 90 and 92 through 95.

The lightning protection system is interconnected and properly functioning.

Interior Surface - Gunite Liner

The entire interior surface received a high-pressure water washdown prior to a visual inspection. A set of 21 photographs was taken which show the typical condition of the gunite liner.

The upper 20' of the gunite liner have 1/8" to 1" wide cracks, and gunite missing exposing brick, as can be seen in Photograph Nos. 95 through 98. The next 70' extending downward is in good condition, as can be seen in Photograph Nos. 90 through 104. Thirty feet above ground level the lining has spalled and cracked, as can be seen in Photograph Nos. 105 through 107. At 15' above ground level the lining is thin and worn, exposing the brick, as can be seen in Photograph Nos. 108 through 110. The remainder of the lining is in good condition, as can be seen in Photograph Nos. 111, 112, and 113.

RECOMMENDATIONS

The following repairs are recommended for the State Hospital, Waterbury, Vermont.

- Remove upper 12' of gunite liner
- Sandblast upper 12' and 4' wide area at elevation 43'
- Install new liner upper 12'
- Install flashcoat liner at elevation 43' above ground level
- Remove old cap
- Install new formed concrete cap

The following repairs are recommended for the State Department Building, Montpelier, Vermont.

- Remove upper 8' of gunite liner
- Sandblast upper 20' and areas at elevation 15' and 30' above ground level
- Hammer test remainder of liner
- Install flashcoat upper 20' and at elevation 15' above ground level.

PROPOSALS

STATE HOSPITAL, WATERBURY, VT

Proposal No. 1 - Repair Interior Gunite Liner

The following scope of work will be performed:

The gunite work will be performed as follows:

All necessary scaffolding, rigging equipment, and internal power elevators will be installed, as well as hoisting apparatus to lift material and equipment from ground level.

The existing gunite in the upper 8' of the chimney interior will be removed by the piece meal method, using hand tools and pneumatic air hammers. The debris will be dropped to the inside of the chimney, where it will be cleaned out, loaded, and hauled away to a proper disposal site. The next 12' downward will be hammer tested. Whenever the gunite is broken away or indicates looseness, the disintegrated gunite will be cut away. Existing gunite which is firmly adhered to the internal surface will not be removed.

The upper 20' and the 4' wide area at elevation 43' above ground level will be sandblasted to remove scale, residue, flyash, and corrosion to expose clean, sound surfaces, and to roughen the internal areas.

Sand and accumulated debris will be removed through the cleanout door and disposed of.

Guniting involves metering dry powder into a delivery hose by a distributor or feed wheel within the gunite machine or gun. The dry material is carried by compressed air through the delivery hose to a nozzle. The nozzle is inside a perforated manifold through which potable water or liquid binder is sprayed under high pressure and intimately mixed with the dry material jet. The wetted material is applied from the nozzle at high velocity onto the surface to receive the lining or repair material.

The surface in the upper 8' only has deteriorated to the extent that a thicker lining is required to restore the original wall thickness and to further stabilize the internal surface of the column. Gunite applications over 3/4" in thickness must be reinforced with a suitable anchorage system to support the applied material.

T-shaped refractory anchor devices will be attached to the internal surface in the upper 8' only at 8" horizontal and vertical centering to facilitate retention of the cement product to the internal surface.

A 2" thickness of gunite will be applied in the upper 8' only.

A "flash" coat of gunite material will be applied up to nominal 3/4" inches thick to the 8" from the top downward for 12' and at elevation 43' above ground level.

The cement will be calcium aluminate mix. Calcium aluminate is a monolithic lining well suited to resist corrosive vapors and condensate over a pH range of 4.0 to 12.0-, as well as many solvents and withstands temperatures up to 2,000°F.

The guniting operation will be conducted by experienced nozzle men and operators. The nozzle will be held in such a position that, as nearly as possible, the jet of material is applied at right angles to the surfaces being covered. The lining will be applied in a continuous operation to avoid laminations. The material will be applied to a natural gun finish. A smooth trowel finish will not be attempted.

Rebound material will not be reused and will not be allowed to accumulate and harden.

The remaining deteriorated cap will be removed, dropping the pieces to the inside of the chimney. A new reinforced concrete cap of monolithic design will be formed and poured to seal the top of the chimney from moisture and the discharge of chemical gases. The cap will be reinforced with steel bars, which will be anchored or wired to the upper chimney wall.

The price below is based on the following services to be furnished by the Owner or others:

- 110 and 220-volt single phase electric at or near the chimney base.
- Mixing water at or near the chimney base.
- Forklift or similar equipment for material unloading and handling.
- Temporary storage or shelter for equipment and/or material.

When the project is completed, all scaffolding and rigging equipment will be removed from the chimney, and the area will be left in raked-clean condition.

For the internal gunite repair at the State Hospital in Waterbury, Vermont as described above, a budgetary price of Twenty-Nine Thousand, One Hundred Dollars (\$29,100.00) is submitted. This price, as well as the subsequent price, including all required labor, material, equipment, and insurance coverage as per the attached Certificate. Payment terms are Net 15 days after monthly progress billings and upon job completion, including retention.

Department of State Building
Montpelier, Vermont

Proposal No. 2 - Repair Interior Gunite Lining

The scope of work will be performed as outlined in Proposal No. 1. However, the areas to be repaired are different.

The upper 20' and the thinning areas at elevation 30' and 15' above ground level will receive a flashcoat gunite liner of a nominal 3/4" of thickness.

The primary objective of a "flash" coat is to fill open mortar joints, cavities from broken or missing brick faces, cracks, and voids.

The primary objective of a "flash" coat is to fill open mortar joints, cavities from broken or missing brick faces, cracks, and voids.

For the internal gunite lining repair at the Department of State Building in Montpelier, Vermont as described above, a budgetary price of Twenty-One Thousand, Six Hundred Dollars (\$21,600.00) is submitted.

All pricing includes sales taxes on materials and rental equipment used on the project (if applicable), but does not include any other taxes (state or local), licenses, permits, fees, or bonds. The appropriate tax exemption certificates are to be furnished to Gerard Chimney Company by the Owner.

The removal of normal waste generated from this project is included. However, the handling, removal, and/or disposal of hazardous waste, asbestos, contaminated material, lead paint, or any like substance requiring special handling or treatment that must be taken to a specific dump/disposal site is not included in the Proposal. Testing of any material for hazardous content is not included in the Proposal, and should be performed by the Owner or others prior to the start of the work. The testing can be performed by Gerard Chimney at added cost. Title to all hazardous waste material will remain with the Owner.

In accordance with OSHA "Confined Space Regulations", an evaluation of the chimney interior must be performed prior to entry for the interior work. As part of this proposal, Gerard Chimney will analyze the interior for confined space hazards including testing the atmosphere for safe levels of oxygen, combustibles and carbon monoxide. Testing of additional gases unique to the job location will be the responsibility of the Owner or others.

If the interior is found to be safe to enter, the interior work will continue. If the interior is found to be hazardous, the hazardous condition(s) must be removed by the Owner or others, and reevaluated for safe conditions prior to entry.

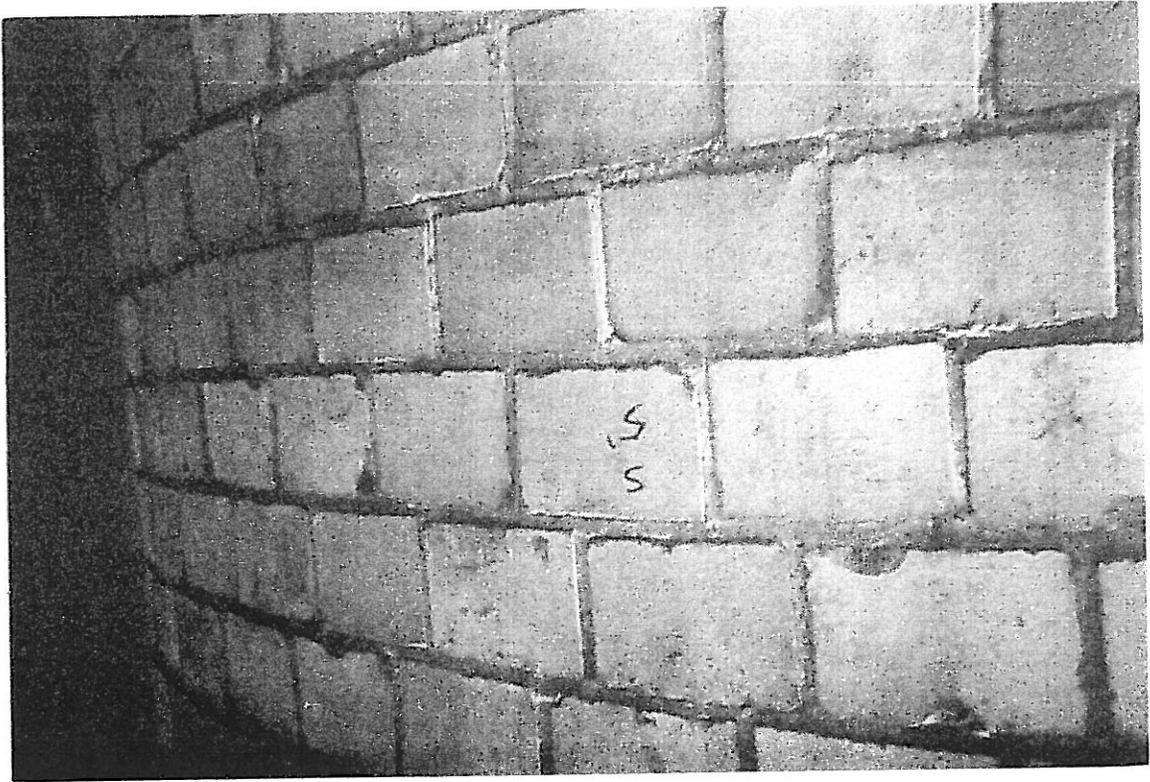
If the hazardous condition(s) cannot be eliminated, the cost for manpower, materials, equipment, and emergency rescue to comply with the "Permitted Confined Space Entry" requirements will be in addition to the price quoted herein. The "Permitted Confined Space Entry" requirements can be performed by the Owner or by our personnel on an hourly or firm-price basis.

Testing of the interior by the Owner or others prior to the field crew's arrival is recommended to prevent incurring backcharges for standby or down time.

For all of the above work, all labor and materials will be guaranteed for a period of one year after completion. All work will be performed in accordance with standard industry practices. The work will be performed by non-union craftsmen who are experienced in chimney repair, under the supervision of a competent foreman.

GERARD CHIMNEY COMPANY

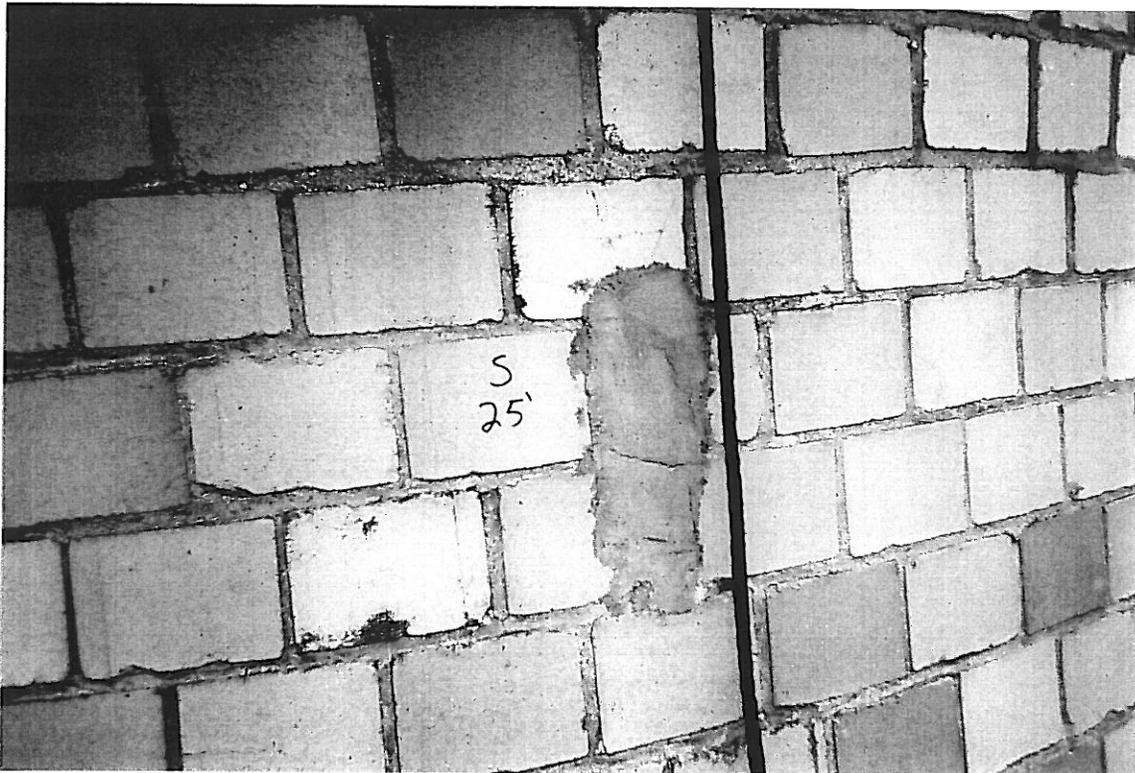
STATE OF VERMONT
STATE HOSPITAL
WATERBURY, VERMONT



1. Exterior surface - south side - elevation 5' above grade level - good condition.

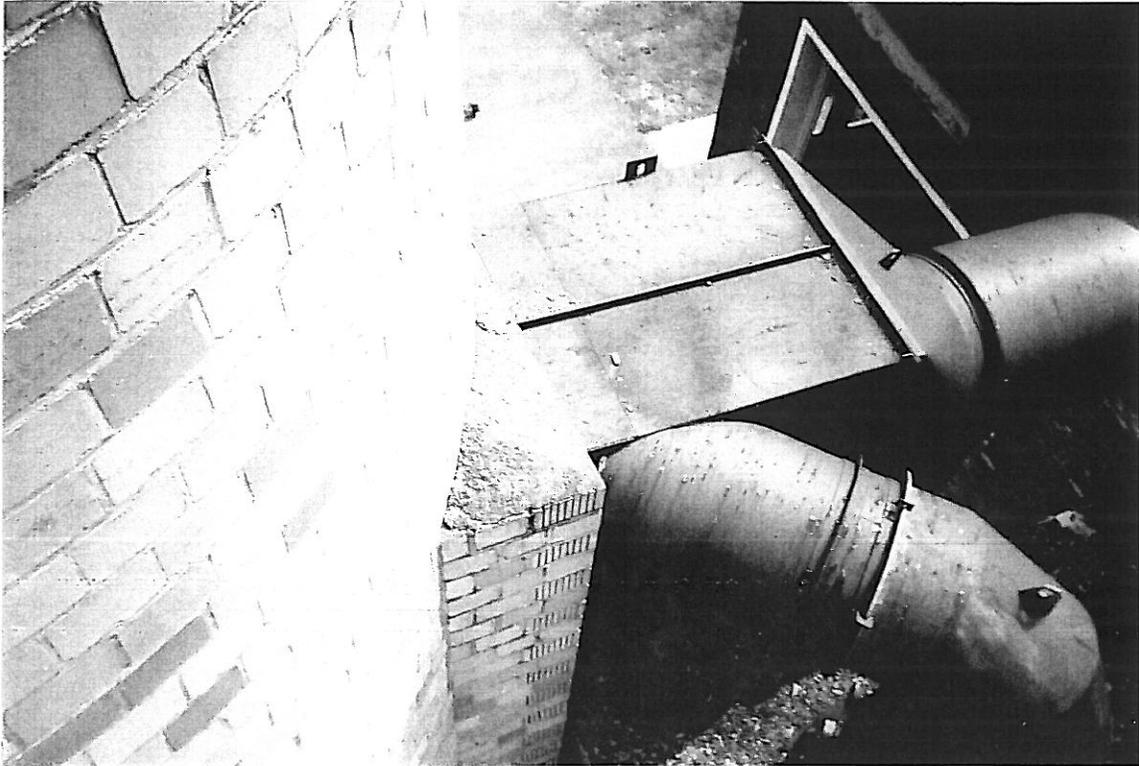


2. Exterior surface and downlead - south side - elevation 15' above ground level - good condition.

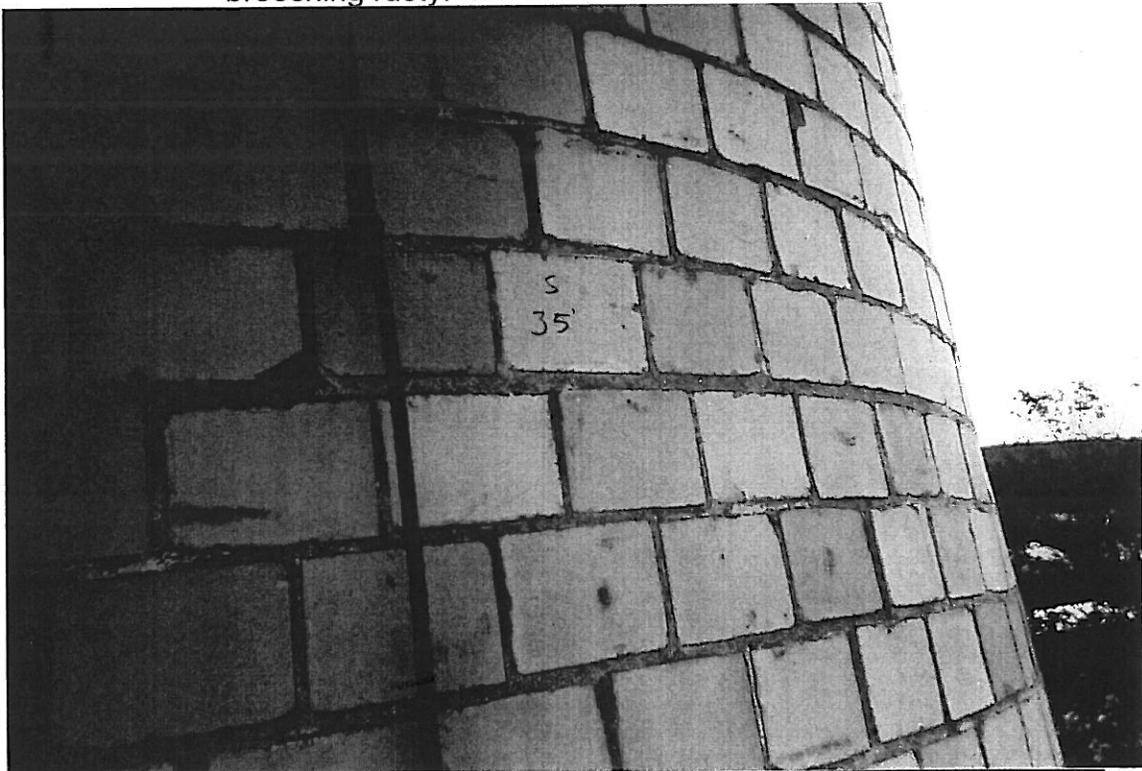


3. Exterior surface and downlead - south side - elevation 25' above ground level - good condition.

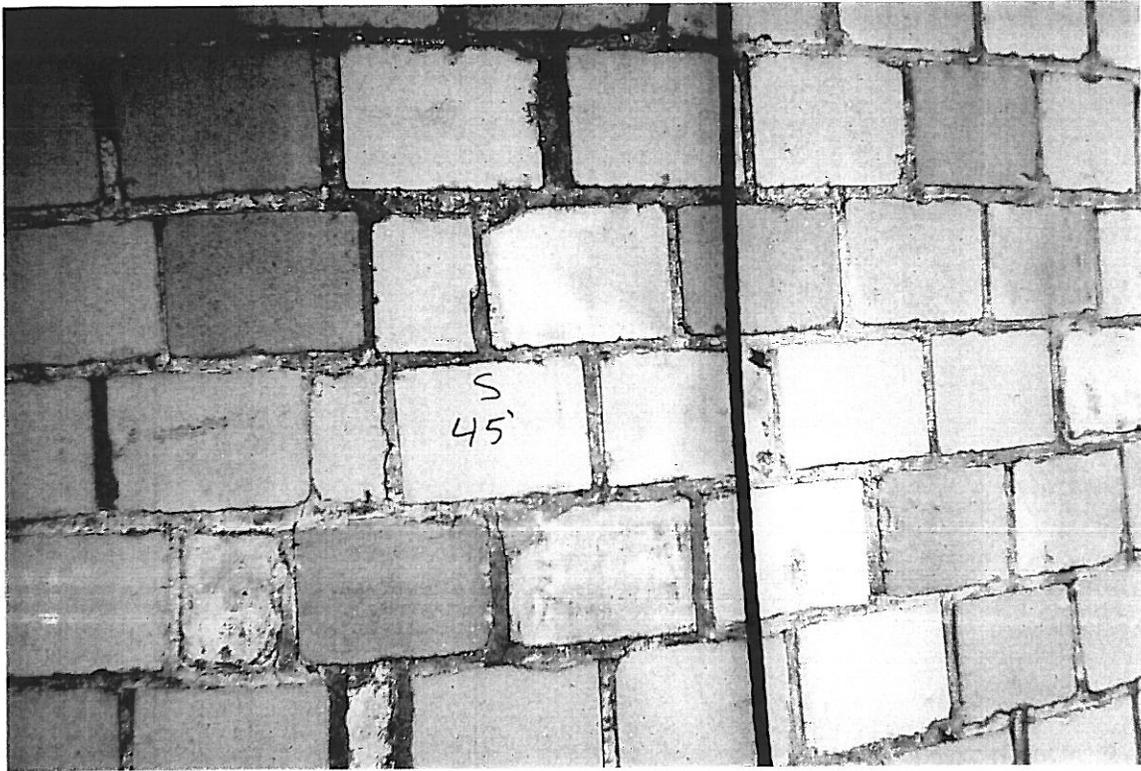
GERARD CHIMNEY COMPANY



4. Exterior surface and breaching entry - south side - elevation 30' above ground level - shell good condition - breaching rusty.



5. Exterior surface and downlead - south side - elevation 35' above ground level - good condition.

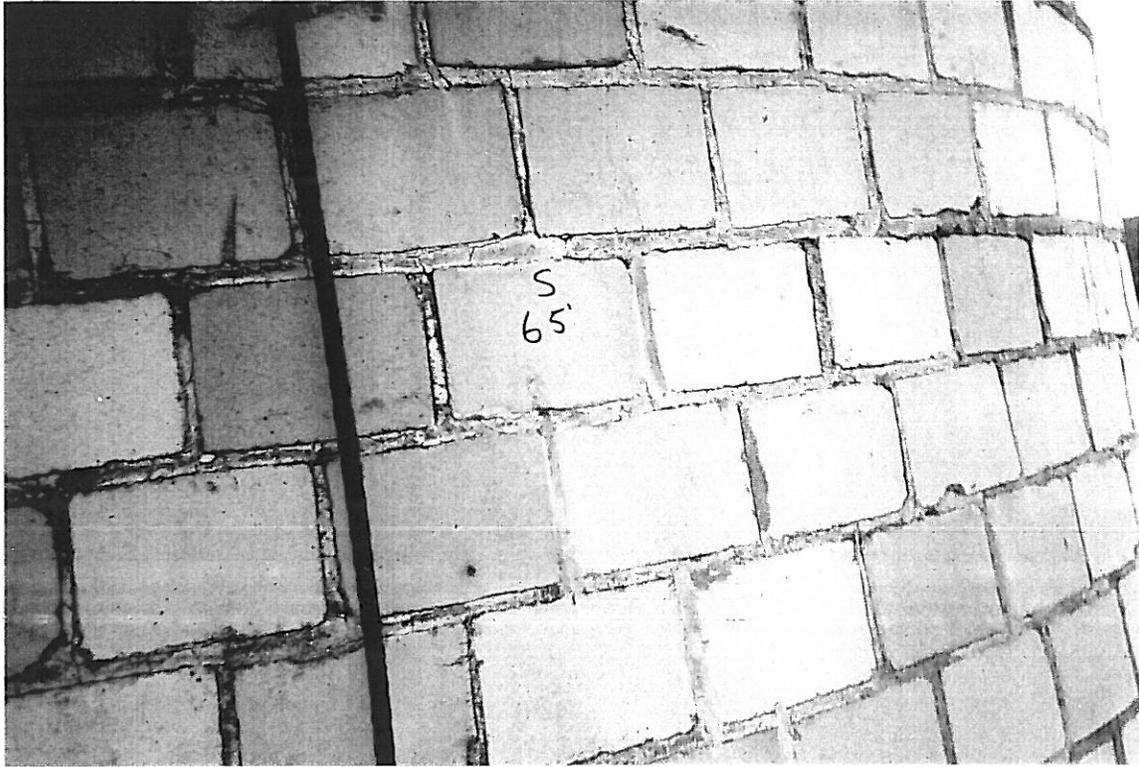


6. Exterior surface and downlead - south side - elevation 45' above ground level - good condition.

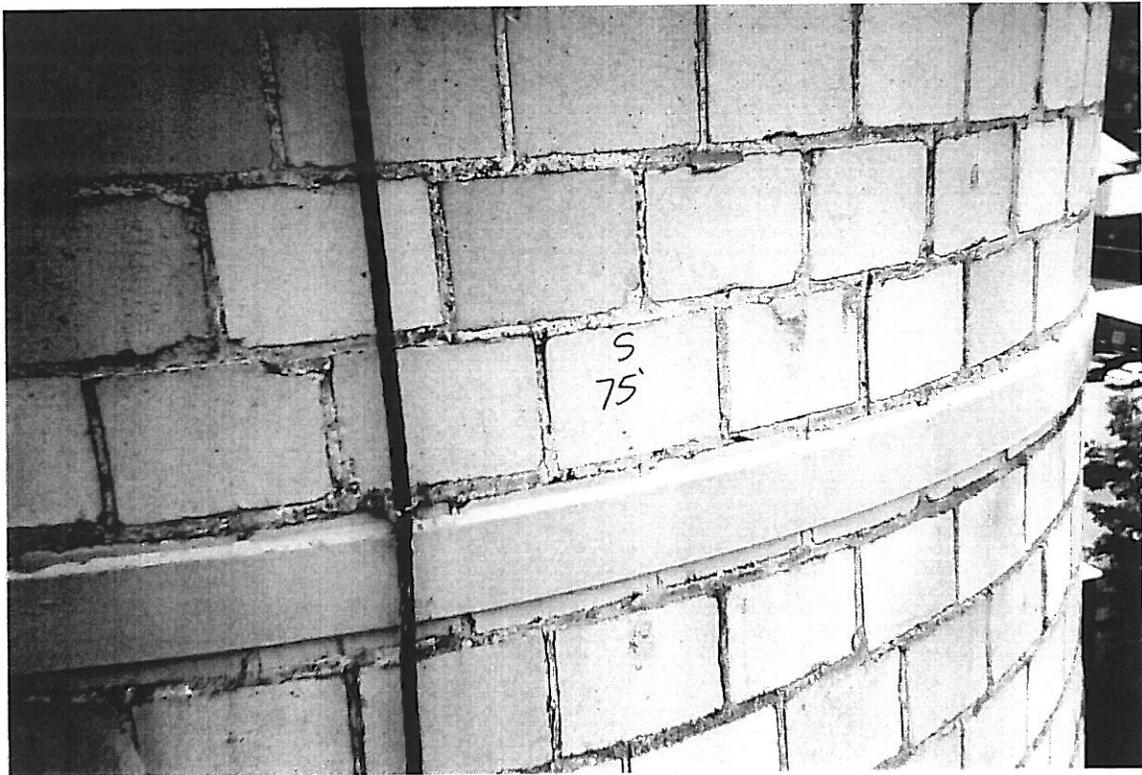


7. Exterior surface and downlead - south side - elevation 55' above ground level - good condition.

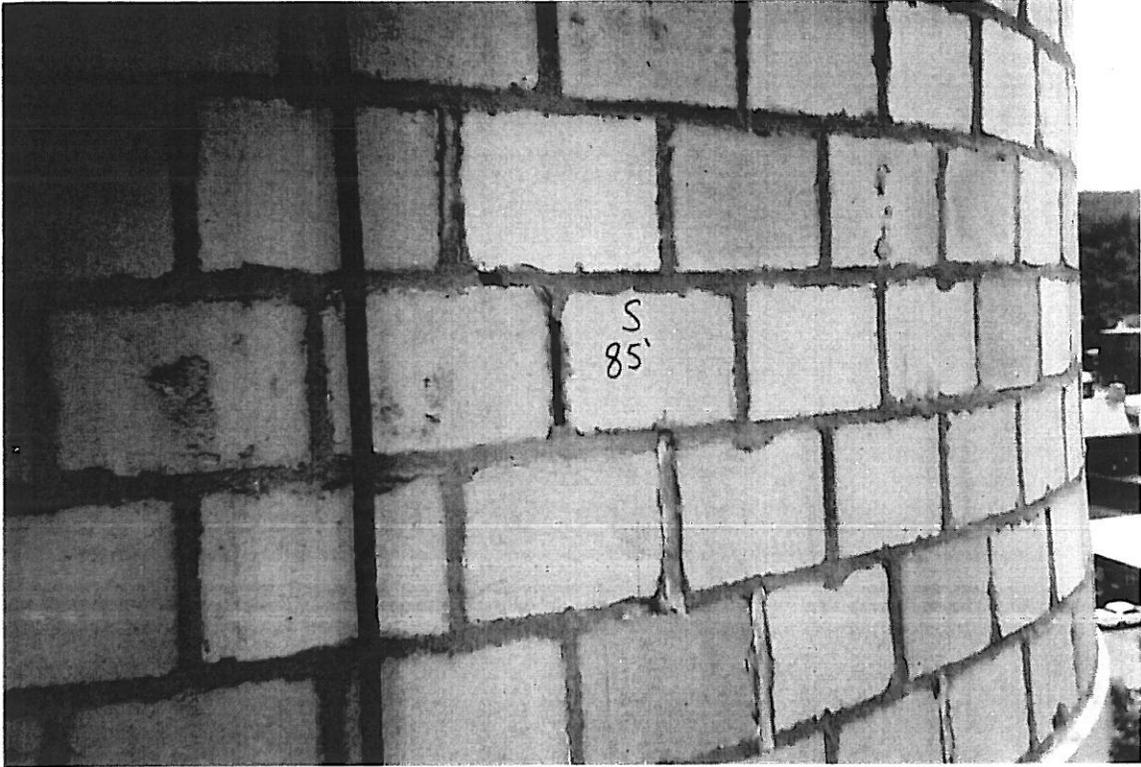
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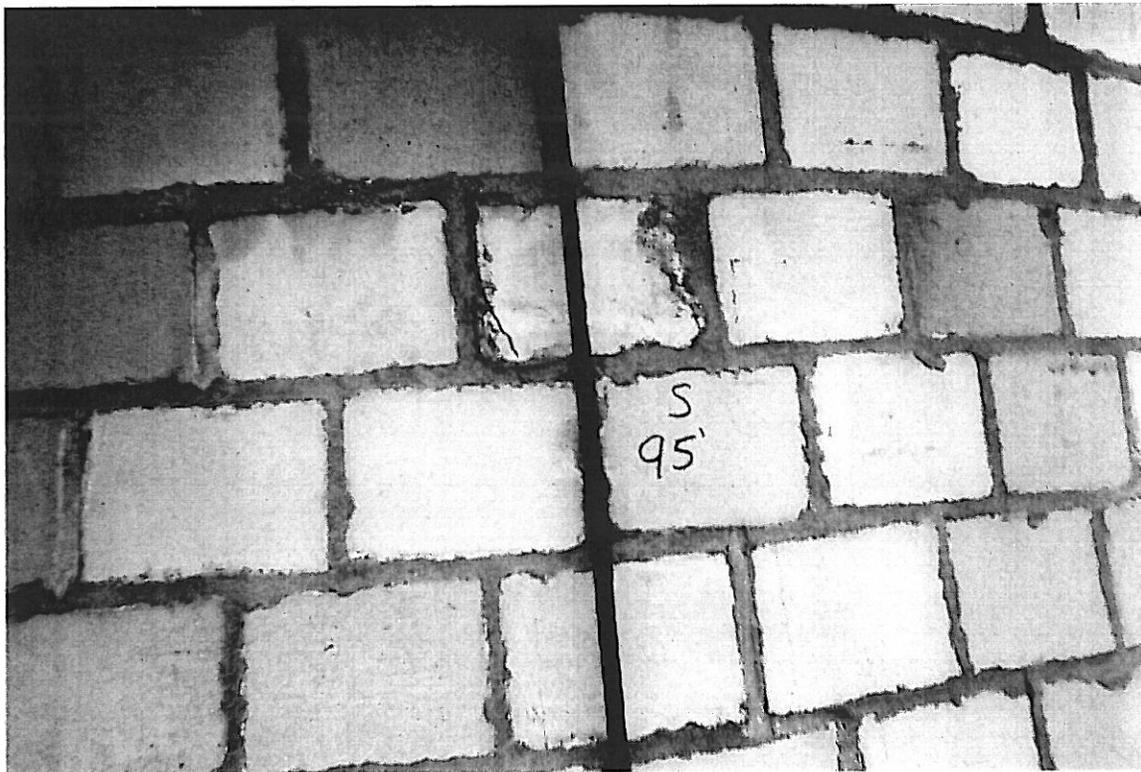
8. Exterior surface and downlead - south side - elevation 65' above ground level - good condition.



9. Exterior surface, steel tension band, and downlead - south side - elevation 75' above ground level - good condition.

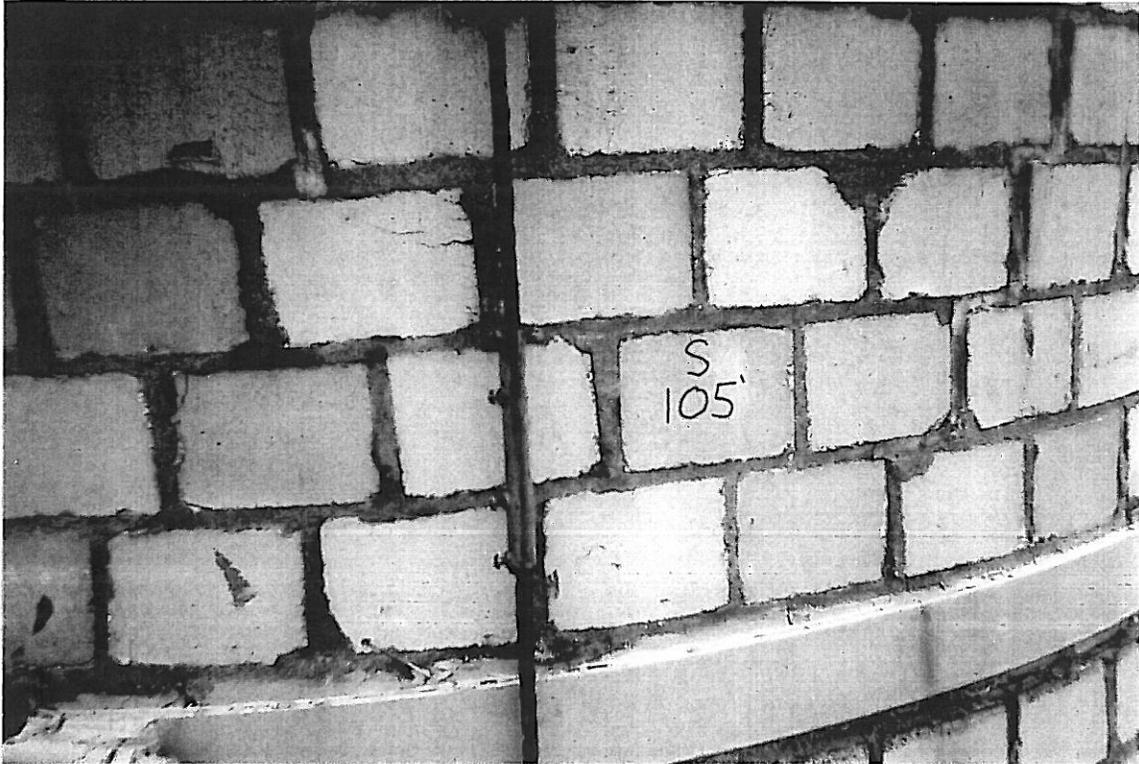


10. Exterior surface and downlead - south side - elevation 85' above ground level - mortar joint missing - shell good condition.

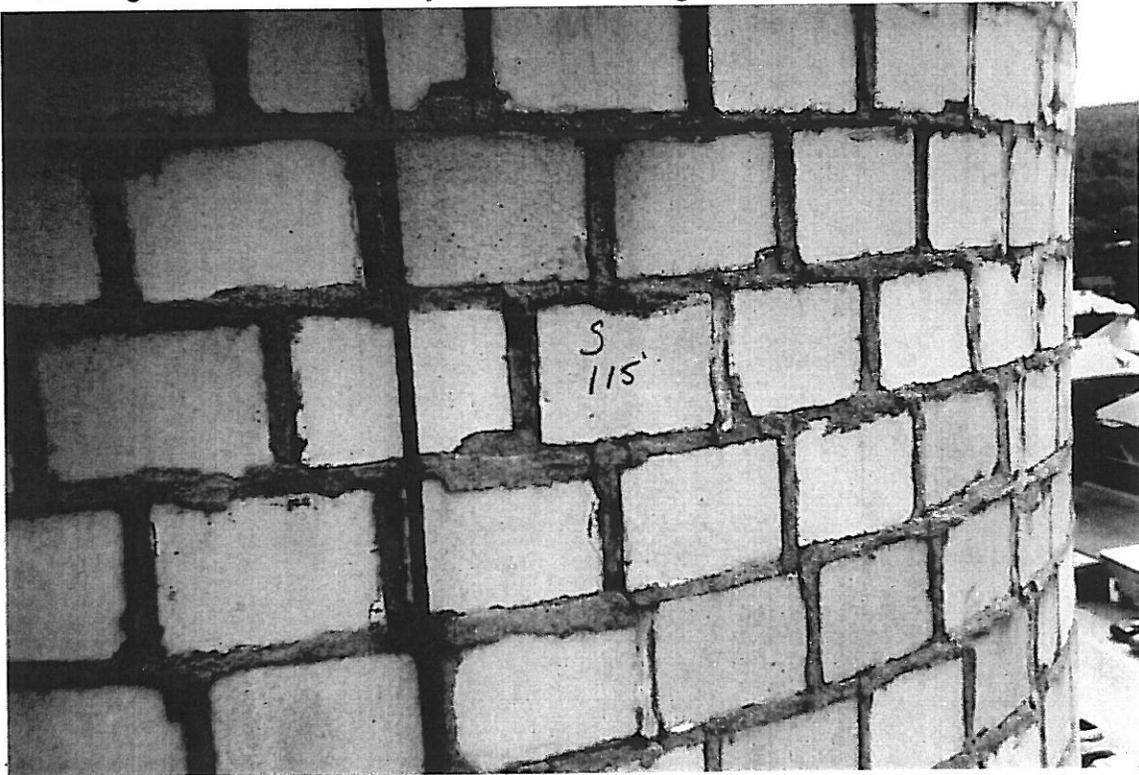


11. Exterior surface and downlead - south side - elevation 95' above ground level - brick face crack - shell good condition.

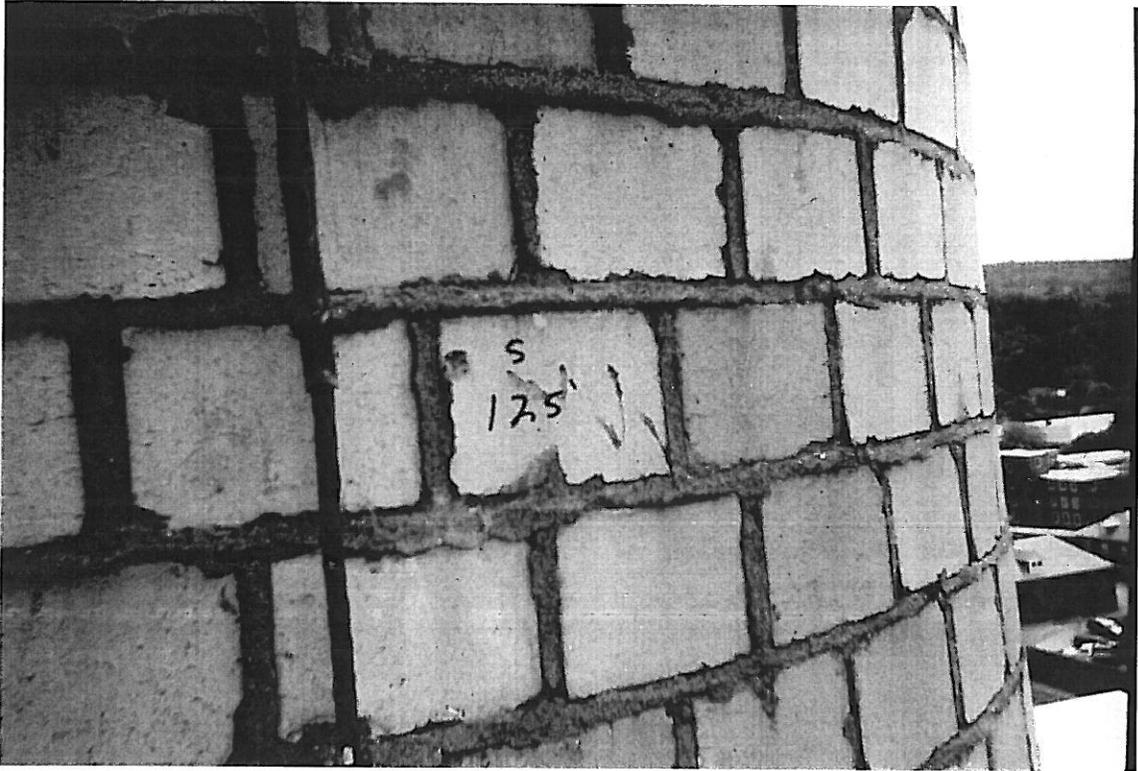
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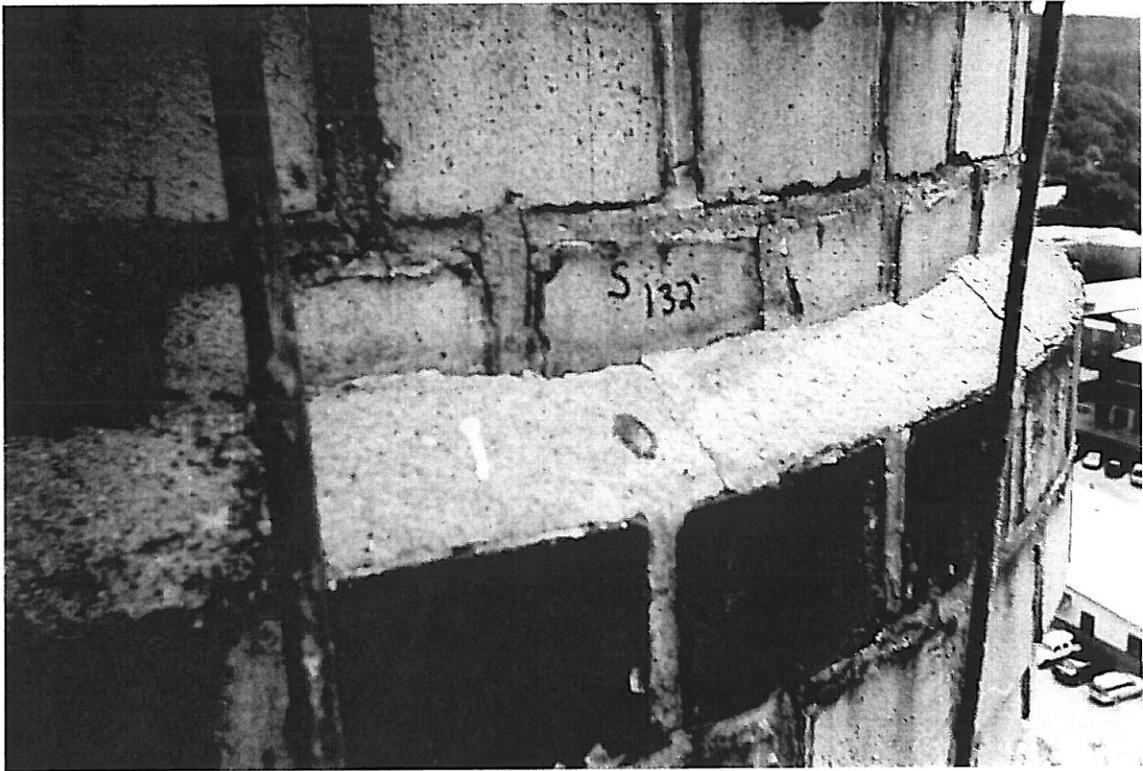
12. Exterior surface, steel tension band, and downlead - south side - elevation 105' above ground level - mortar joint crack - shell good condition.



13. Exterior surface and downlead - south side - elevation 115' above ground level - mortar joints crack - shell good condition.



14. Exterior surface and downlead - south side - elevation 125' above ground level - good condition.

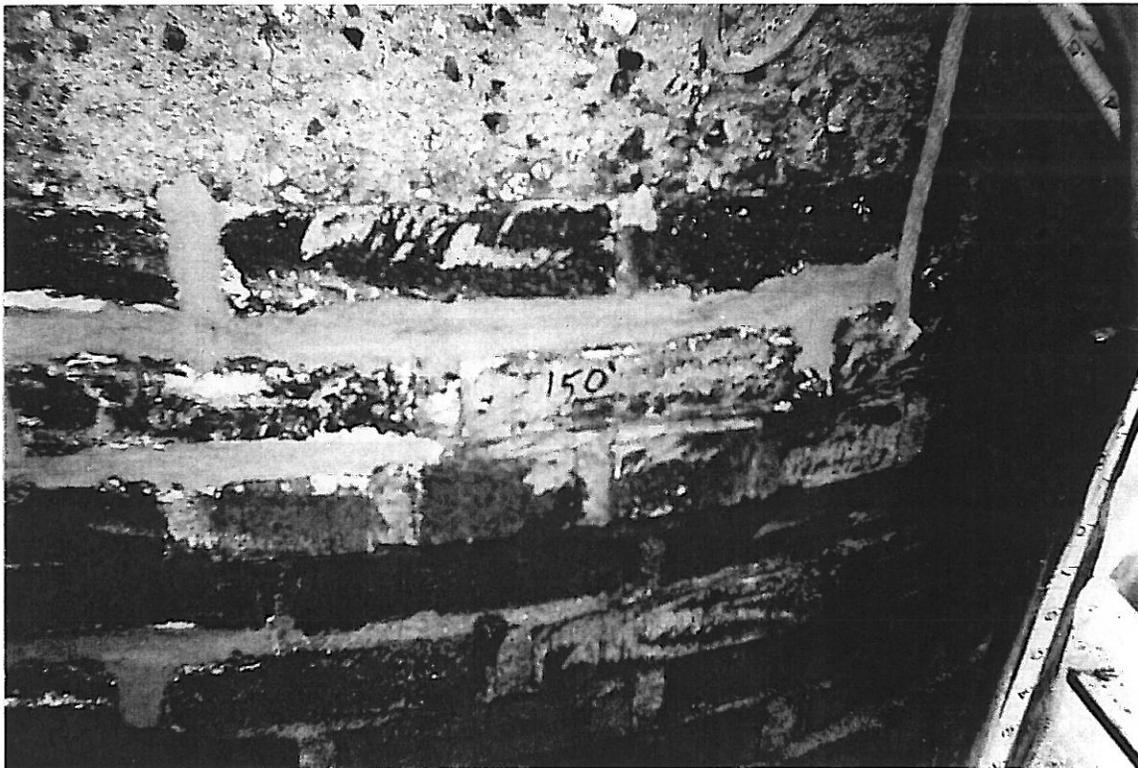


15. Exterior surface, watertable, and downlead - south side - elevation 132' above ground level - hairline cracks in watertable - shell good condition.

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16. Exterior surface and downlead - south side - elevation 142' above ground level - good condition.



17. Exterior surface, air terminal, and cap - south side - elevation 150' above ground level - cap worn - shell good condition.