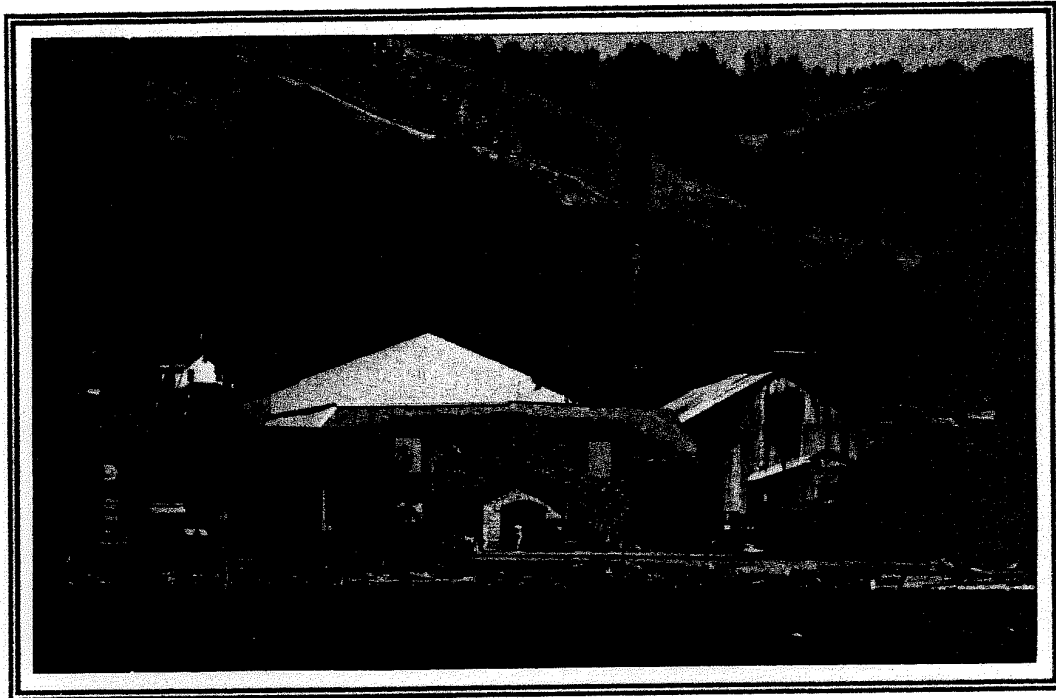


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# INTERNATIONAL CHIMNEY CORPORATION

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***KEWEENAW NATIONAL HISTORICAL PARK - CALUMET, MICHIGAN  
QUINCY SMELTER REVERBERATORY FURNACE SMOKESTACK***

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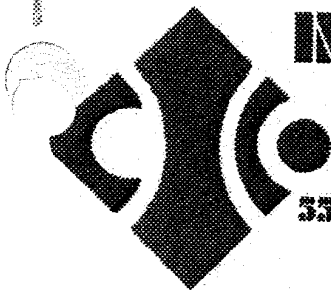
## SPECIALTY SERVICES BULLETIN

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Financial assistance provided by the Coastal Zone Management Act administered by the National Oceanic and Atmospheric Administration and the Michigan Coastal Management Program, administered by the Department of Environmental Quality, Land and Water Management Division.



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August 12, 2002

Our File #CH-34204-C

United States Department of the Interior  
National Park Service  
Keweenaw National Historical Park  
25970 Red Jacket Road  
Cahmet, MI 49913

Attention: Mr. Steve DeLong, ASLA  
Landscape Architect

Subject: Exterior Inspection  
Keweenaw National Historical Park  
Quincy Smelter Reverberatory Furnace Bypass Stack  
Hancock, Michigan

Gentlemen:

In accordance with contract, a complete exterior and partial interior inspection of the subject stack was performed and we are submitting our inspection report including findings, photographs depicting the stack condition, as well as recommendations for stack rehabilitation in accordance with historical guidelines and standards.

We believe our report and budgetary pricing are clear in all details, however, should there be any questions or if we can be of further assistance, please feel free to contact the writer at the address below.

*International Chimney Corporation  
Midwest General Office  
20622 South Amherst Court  
Joliet, IL 60433  
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Fax (815) 727-1008*

Respectfully Yours,  
INTERNATIONAL CHIMNEY CORPORATION

By

*W. J. Gantermann*  
Wilfried F. Gantermann  
Vice President

WJC/lrb



***KEWEENAW NATIONAL HISTORICAL PARK  
CALUMET, MICHIGAN  
QUINCY SMELTER REVERBERATORY FURNACE SMOKESTACK***

**INSPECTION PROCEDURES**

The complete exterior and partial interior inspection was completed utilizing a crane and man basket in accordance with OSHA safety regulations.

Photographs taken during the inspection are attached for your review.

Upon completion of the inspection, a brief discussion was conducted with the understanding that the area next to the stack will have to be roped off immediately and warning signs posted.

**KEWEENAW NATIONAL HISTORICAL PARK  
CALUMET, MICHIGAN  
QUINCY SMELTER REVERBERATORY FURNACE SMOKESTACK**

**INSPECTION FINDINGS**

**Stack Superstructure**

The stack superstructure is heavily corroded, deteriorated and in a dangerous condition.

The refractory flue ducts from the furnaces to the bypass stack has caved in. The roof on the ducts are non-existent. The breeching opening at the base of the stack is disconnected.

**Stack Shell**

Only a very little portion of the stack shell remains. The upper 30' of the steel stack shell is so heavily deteriorated that this portion does not provide any structural strength or support. The firebrick lining is exposed throughout the mid-portion of the stack down to approximately 15' above roof elevation.

The stack shell above and below roof elevation is also deteriorated to the extent that it does not provide any structural strength or any kind of integrity.

**Guy Wires**

Only three guy wires are in existence. The guy wires are located approximately 15' below the top of the stack attached to the existing stack shell on the east, northeast and southwest quadrants. The guy wire on the southwest quadrant are only connected by approximately a 1/2" to 3/4" steel plate. This steel plate is heavily corroded and suspect that this guy wire will not be in place much longer.

The two remaining guy wires are downwind and also heavily corroded not providing any support.

The six guy wires at the 79'6" elevation, as well as the four guy wires at the 39'6" elevation must have fallen off years ago and were never replaced.

**Stack Cap**

As previously stated, there is no evidence of a steel cap on top of the stack, however, there is some refractory concrete on top of the firebrick lining which is deteriorated.

**Stack Shell Below Roof**

As previously stated, the steel stack below roof elevation is almost in identical condition as above roof and is not providing any structural strength.

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QUINCY SMELTER REVERBERATORY FURNACE SMOKESTACK*

**DESCRIPTION of STACK**

The stack is located on top of a steel superstructure approximately 11' high within the smelter building. The stack extends approximately 85' above roof elevation.

The original design of the stack is as follows.

The lower 25' of the stack is of 1/4" riveted steel plate construction with the upper 75' being of 3/16" riveted steel plate construction. The lower 25' of the rivets are 5/8" - 3" on centers with the upper 75' of the rivets being 1/2" - 3" on centers.

A breeching opening and a cleanout door are located in the bottom of the stack.

The steel shell I.D. is 6'2". The stack has a 9" firebrick lining with a 2" grout between the outer perimeter of the firebrick lining and the inner surface of the steel shell.

Originally, the stack was equipped with two sets of guy wires. The lower four guy wires were located at the 39'6" elevation of 9/16" galvanized material spaced equally on centers. The upper six guy wires were located at the 79'6" elevation also of 9/16" galvanized material. At the present time, there are only three guy wires spaced equally on centers approximately 15' below the top of the stack.

At sometime in the past, the lower steel shell of the stack was repaired, whereby, steel clad was welded over the existing plate. The rivets were either imitated and/or the newly welded plate stopped in front the rivets thereby, making it appear that this was also a riveted type section.

The top of the firebrick lining was covered with a refractory castable material acting as a cap. There is no evidence of a steel cap on top of the stack.

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CALUMET, MICHIGAN  
QUINCY SMELTER REVERBERATORY FURNACE SMOKESTACK**

**PHOTOGRAPHS**

A total of (16) photographs were taken depicting the condition of the stack exterior and a total of (9) photographs were taken of the interior.

A brief explanation of the photos are as follows.

**Exterior**

- Photo 1 Overall view of stack indicating where the stack plate is in place and where the lining brickwork is exposed, as well as the three guy wires approximately 15' below top of stack.
- Photos 2 & 3 Typical condition of steel shell throughout the upper portion of the stack, which is also the condition of the balance of the steel shell.
- Photos 4 & 5 Shows stack plate and rivets which clearly indicates that the stack has separated at the rivets and the firebrick lining is exposed. Photo #5 shows that a firebrick has been pushed outward in order to maintain an annular space between firebrick and steel shell, which is also the area where the grout was installed and has disintegrated and ultimately fallen out.
- Photos 6 & 7 Shows the stack shell and exposed portion of the firebrick. In this area at one time, was a guy wire, but due to the deterioration of the stack shell the guy wire fell off.
- Photo 8 Shows a close up of the southwest guy wire and only approximately 3/4" of the connection is in place. As previously stated, this could break off at any time, especially during high winds from the southwest.
- Photos 9 & 10 Shows the exposed portion of the brickwork and deteriorated steel plate.
- Photo 11 Shows the exposed portion of the lining brickwork. Please note the one kicker brick. This is also the brick provided the spacer for the steel shell and ultimately to apply the grout.
- Photo 12 & 13 Shows the stack above and below roof elevation. Please note the steel plates and debris laying on top of the roof, as well as guy wires. Photo #13 shows the condition of the corrugated metal roof and stack shell below roof.
- Photos 14 & 15 Again show the stack below roof and deterioration of the roof joists and support steel.
- Photo 16 Shows the area above the breeching duct and brickwork beyond.

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CALUMET, MICHIGAN  
QUINCY SMELTER REVERBERATORY FURNACE SMOKESTACK***

**PHOTOGRAPHS (cont.)**

**Interior**

I believe no explanation is necessary for the interior photographs, since they clearly depict the condition of the liner. In the writer's opinion, the reason why the stack is still standing is the heavily encrusted inner surface of the stack. The mortar joints are tight and no cracks were evident, nevertheless, the liner and the flue ducts are in a serious condition.

*KEWEENAW NATIONAL HISTORICAL PARK  
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QUINCY SMELTER REVERBERATORY FURNACE SMOKESTACK*

Exterior Photographs

Please note that the date on the photos was not changed on the camera.

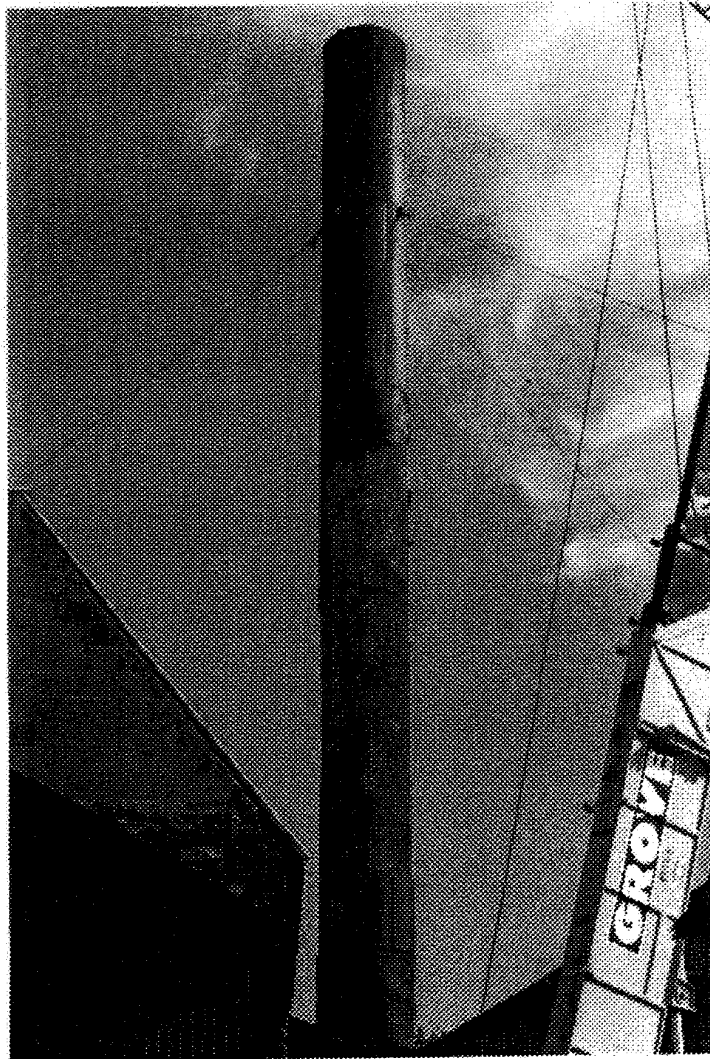


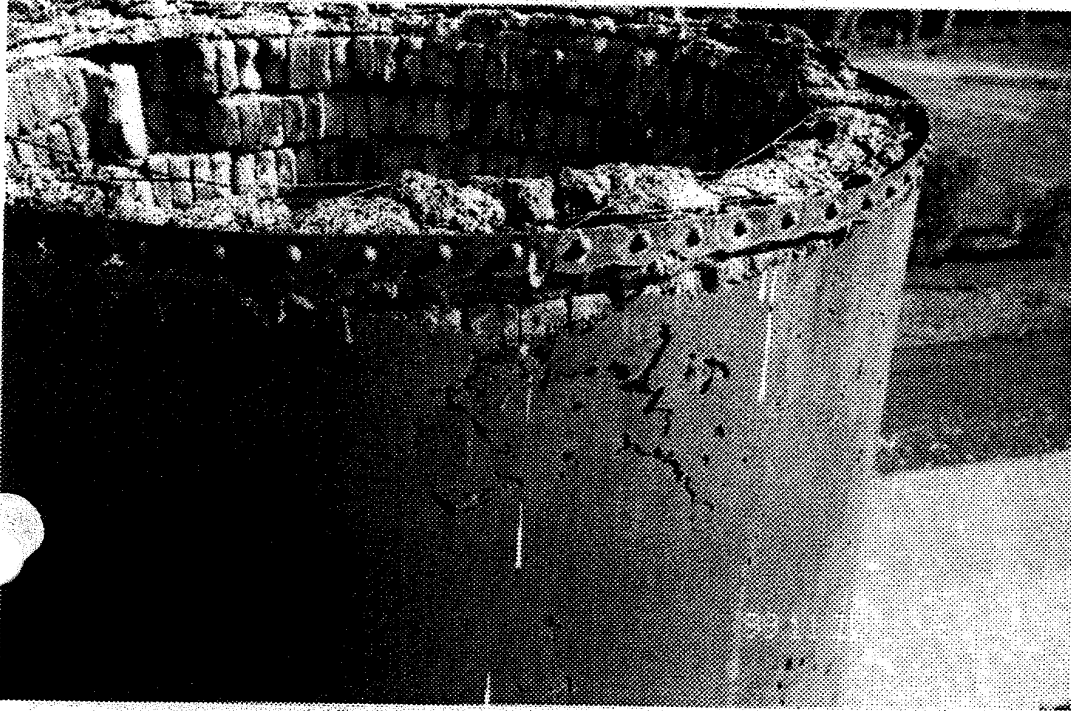
Photo # 1: View looking at  
stack above roof elevation,  
south quadrant.



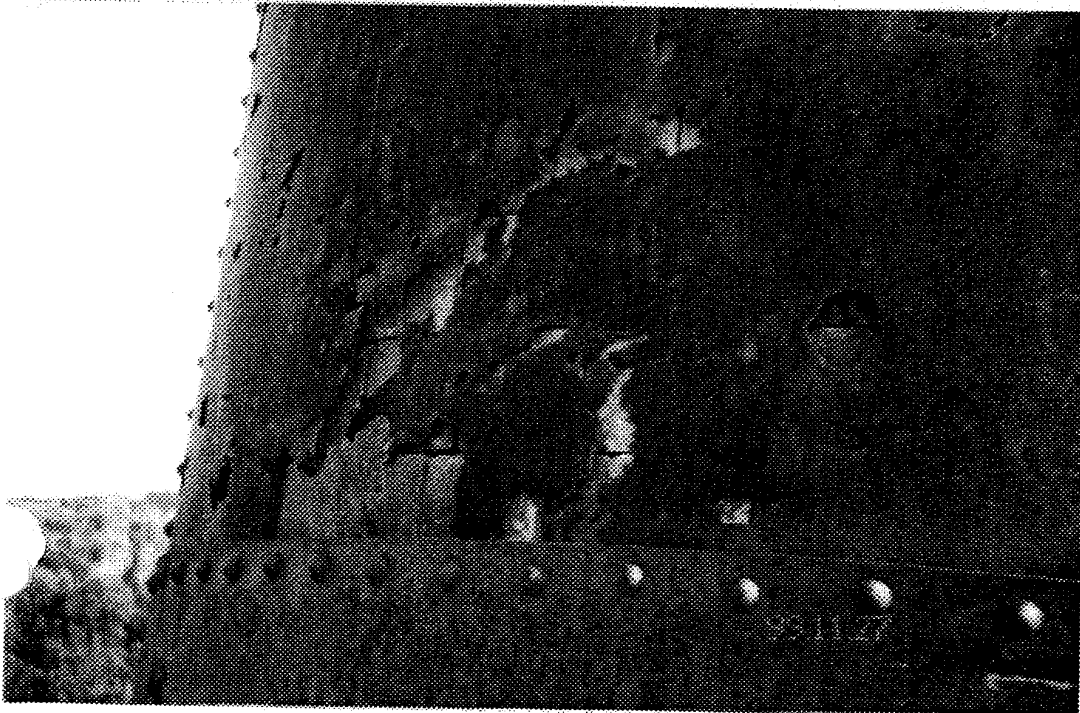
**KEWEENAW NATIONAL HISTORICAL PARK  
CALUMET, MICHIGAN  
QUINCY SMELTER REVERBERATORY FURNACE SMOKESTACK**

**Exterior Photographs**

Please note that the date on the photos was not changed on the camera.



**Photo # 2: Close up view of top of stack.**



**Photo # 3: Typical condition of uppermost plate.**

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CALUMET, MICHIGAN  
QUINCY SMELTER REVERBERATORY FURNACE SMOKESTACK*

Exterior Photographs

Please note that the date on the photos was not changed on the camera.

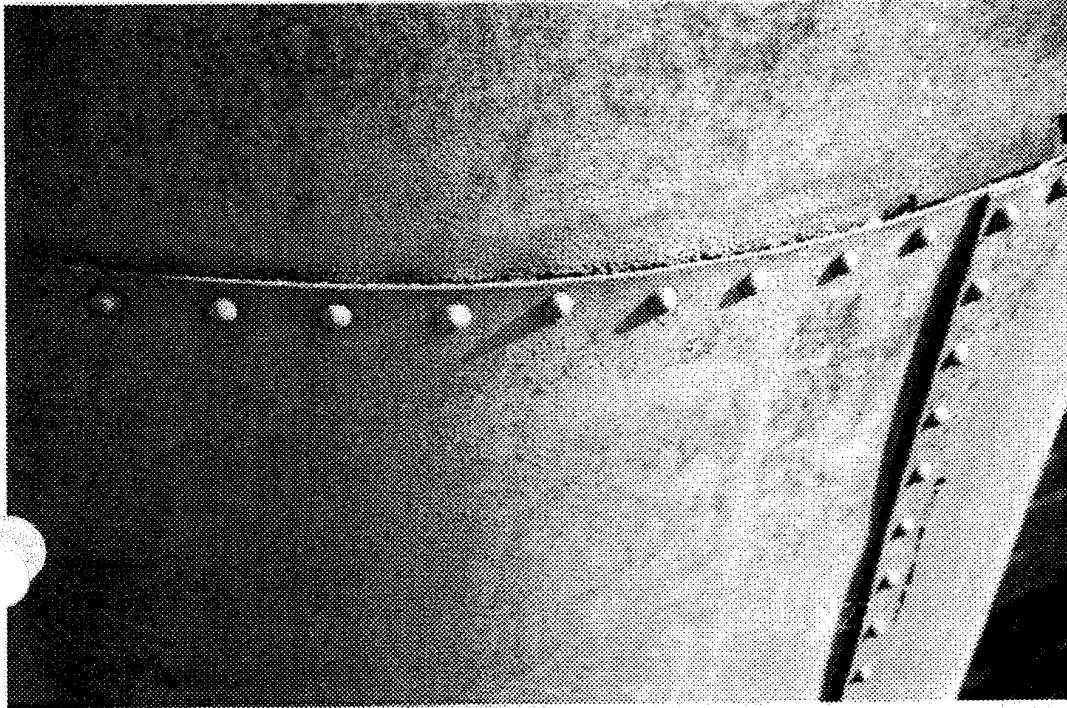


Photo # 4: Top of #3 plate  
± 10' below top of stack.

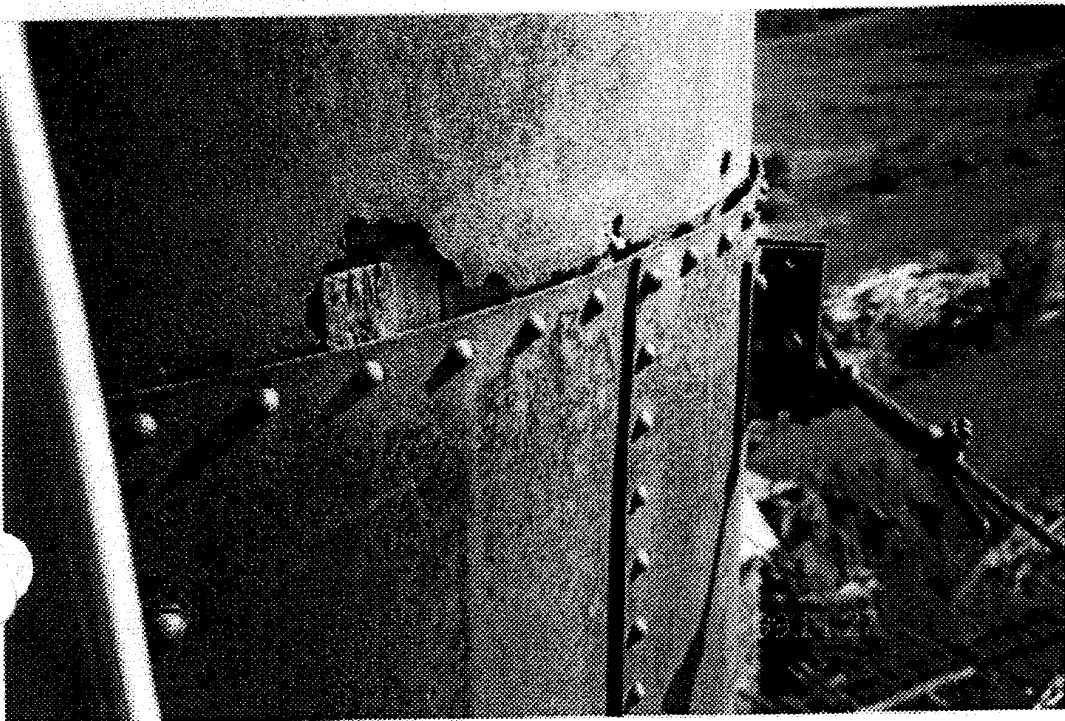


Photo # 5: Top of #4 plate  
± 15' below top of stack.

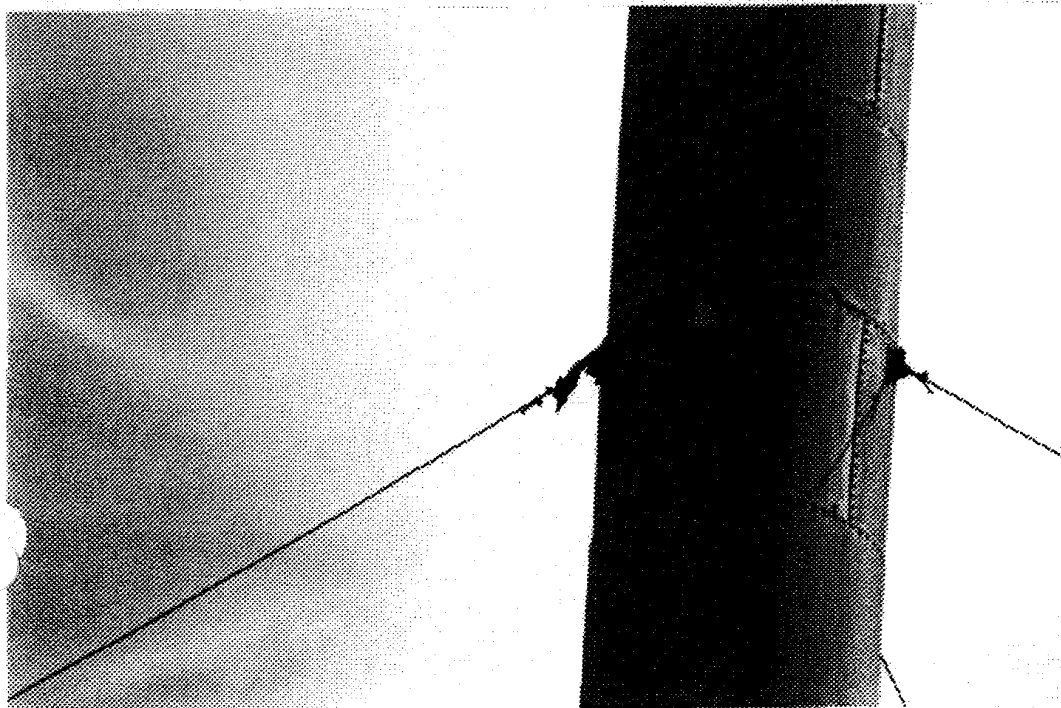
**KEWEENAW NATIONAL HISTORICAL PARK  
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QUINCY SMELTER REVERBERATORY FURNACE SMOKESTACK**

**Exterior Photographs**

Please note that the date on the photos was not changed on the camera.



**Photo # 6:** Hole in steel plate noted  $\pm$  15' below top of stack, west quadrant.

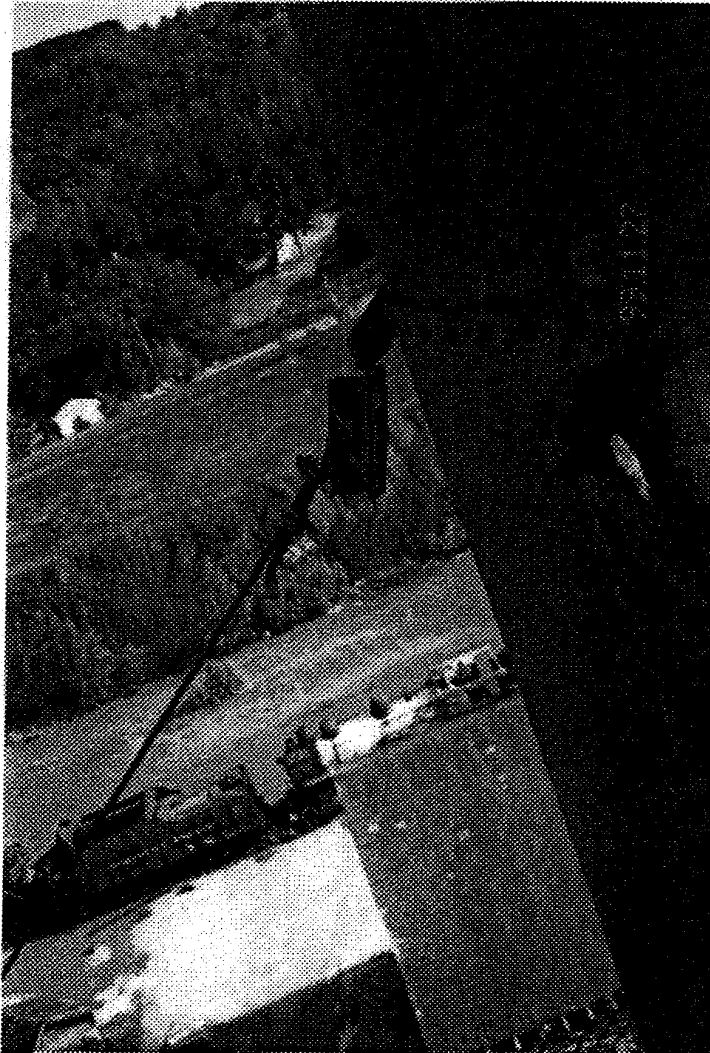


**Photo # 7:** View looking up at guy wires, south quadrant.

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QUINCY SMELTER REVERBERATORY FURNACE SMOKESTACK**

**Exterior Photographs**

Please note that the date on the photos was not changed on the camera.



**Photo # 8: Close up view of  
guy wire  $\pm$  15' below top of  
stack, west quadrant.**

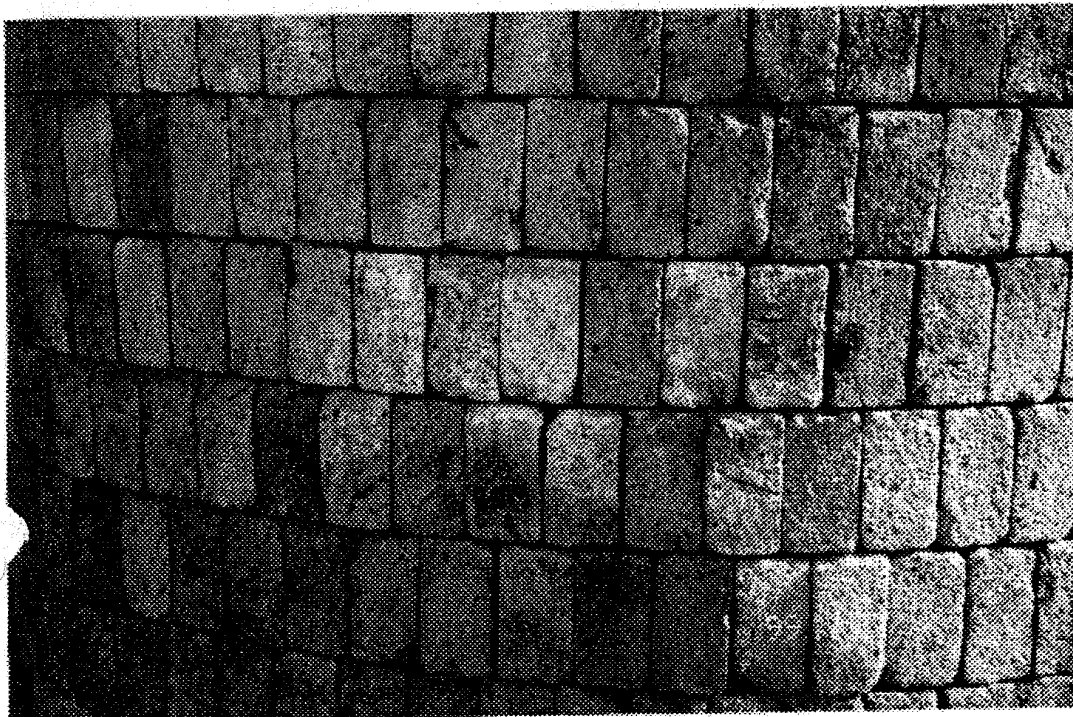
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QUINCY SMELTER REVERBERATORY FURNACE SMOKESTACK**

**Exterior Photographs**

Please note that the date on the photos was not changed on the camera.



**Photo # 9:** View looking down east quadrant of stack from 30' below top.



**Photo #10:** View of exposed portion of lining brickwork from  $\pm$  32' below top of stack down to 10' above roof.



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QUINCY SMELTER REVERBERATORY FURNACE SMOKESTACK**

**Exterior Photographs**

Please note that the date on the photos was not changed on the camera.



**Photo #11: View of exposed portion of lining brickwork from  $\pm$  32' below top of stack down to 10' above roof.**

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QUINCY SMELTER REVERBERATORY FURNACE SMOKESTACK**

**Exterior Photographs**

Please note that the date on the photos was not changed on the camera.



**Photo #12:** View of stack at roof elevation. Note steel debris laying on roof.



**Photo #13:** View looking up stack below roof elevation. Note holes in roof.

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QUINCY SMELTER REVERBERATORY FURNACE SMOKESTACK**

Exterior Photographs

Please note that the date on the photos was not changed on the camera.



**Photo #14:** View looking up  
stack below roof elevation.



**Photo #15:** View of stack  
below roof elevation at top  
of stack support  $\pm$  11' above  
floor.



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QUINCY SMELTER REVERBERATORY FURNACE SMOKESTACK**

**Exterior Photographs**

Please note that the date on the photos was not changed on the camera.



**Photo #16: View of stack at  
breeching duct elevation.**

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QUINCY SMELTER REVERBERATORY FURNACE SMOKESTACK**

**Interior Photographs**

Please note that the date on the photos was not changed on the camera.



**Photo # 1:** View of lining brickwork at top of stack.



**Photo # 2:** View of top  
± 10' of lining brickwork.

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QUINCY SMELTER REVERBERATORY FURNACE SMOKESTACK**

**Interior Photographs**

Please note that the date on the photos was not changed on the camera.



**Photo # 3:** View looking up lining brickwork from base of stack.



**Photo # 4:** Close up view of lining brickwork 10' above base.

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QUINCY SMELTER REVERBERATORY FURNACE SMOKESTACK**

**Interior Photographs**

Please note that the date on the photos was not changed on the camera.



**Photo # 5: View of  
breaching duct opening at  
base of liner.**



**Photo # 6: View of  
breaching duct opening at  
base of liner.**

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QUINCY SMELTER REVERBERATORY FURNACE SMOKESTACK*

Interior Photographs

Please note that the date on the photos was not changed on the camera.



Photo # 7: View looking into breaching duct.



Photo # 8: View of brick arch over cleanout door.

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Interior Photographs

Please note that the date on the photos was not changed on the camera.



**Photo # 9:** View looking at  
brick duct from outside of  
stack



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CALUMET, MICHIGAN  
QUINCY SMELTER REVERBERATORY FURNACE SMOKESTACK**

**RECOMMENDATIONS for REHABILITATION**

**Alternate #1 - Guy Wires**

The uppermost three guy wires should be replaced with new guy wires to secure the stack. A crane will have to be supplied at no cost to I.C.C.

**Budgetary Pricing**

The approximate cost to remove and install three new guy wires is,  
**SEVENTEEN THOUSAND DOLLARS..... \$17,000.00**

**Alternate #2 - Demolish Stack**

To demolish the entire stack, it will be necessary to replace the southwest guy wire prior to the demolition to secure the stack. The demolition can be performed by either dismantling the stack piece by piece, lowering it down in buckets and disposing the debris or by dropping the stack, internally and externally, down through the roof and down inside for ultimate removal. Again, a crane will have to be supplied to I.C.C. at no cost. The removal of the debris will have to be done by others and necessary compressed air will have to be provided.

**Budgetary Pricing**

The approximate cost to demolish the stack by dropping the debris either inside or outside the stack is,  
**THIRTY THOUSAND DOLLARS..... \$30,000.00**

In the event you wish to have the debris lowered to grade, the cost will be approximately,  
**FIFTY THOUSAND DOLLARS..... \$50,000.00**

**Alternate #3 - Stack Rehabilitation**

In order to restore the stack shell for its entirety including the super structure the following steps need to be taken:

1. Complete engineering analysis of the stack superstructure will have to be performed and drawings will have to be prepared for a new stack shell and restoration of superstructure.

**Budgetary Pricing**

The approximately cost to provide engineering analysis and drawings will be,  
**TEN THOUSAND DOLLARS..... \$10,000.00**

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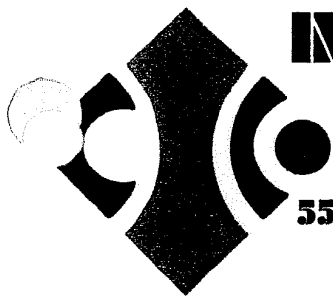
**RECOMMENDATIONS for REHABILITATION (cont.)**

2. The approximately cost to perform restoration of stack superstructure will be,  
**TWENTY THOUSAND DOLLARS..... \$20,000.00**
3. The approximately cost to install temporary guy wires and remove balance of steel shell will be,  
**FIFTEEN THOUSAND DOLLARS..... \$15,000.00**
4. The approximate cost to install new stack shell, new cap and guy wires will be,  
**TWO HUNDRED EIGHTY THOUSAND DOLLARS..... \$280,000.00**

The approximate cost for the complete restoration of stack in compliance with historical consideration is,  
**THREE HUNDRED TWENTY FIVE THOUSAND DOLLARS..... \$325,000.00**

This concludes our inspection service. Again if there are any questions, please contact the writer.





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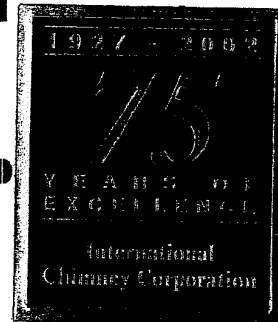
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August 19, 2002

Our File #CH-34204-C

United States Department of the Interior  
National Park Service  
Keweenaw National Historical Park  
25970 Red Jacket Road  
Calumet, MI 49913

Attention: Mr. Steve DeLong, ASLA  
Landscape Architect

Subject: Exterior Inspection  
Quincy Smelter Reverberatory Furnace Bypass Stack  
Hancock, Michigan  
Clarification to Your Letter of 8-15-02

Gentlemen:

In response to your letter of August 15, 2002, I have notified our accounts receivable department to reissue our invoice to Mr. Glenn Ekdahl, Franklin Township Supervisor, P.O. Box 465, Hancock, MI 49930-0465.

Concerning your questions pertaining to budgetary pricing, the answers are as follows.

#### Alternate #1 - Guy Wires

We would need a crane for approximately three days.



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QUINCY SMELTER REVERBERATORY FURNACE BYPASS STACK**

**Alternate #2 - Demolish Stack**

- A. If we drop the debris inside, we would need a crane for approximately nine to ten days.
- B. If we lower the debris outside, we would need a crane for approximately fifteen to sixteen days.

Total amount of debris removal for items A or B is 41 yards or approximately 85 tons.

The stack will be demolished down to top of superstructure, which is below roof elevation.

A 350 cfm compressor fully operated would be required. For item A, we would need the compressor for nine to ten days and for item B, we would need the compressor for fifteen to sixteen days.

**Alternate #3 - Stack Rehabilitation**

- 1. The cost for engineering should read \$21,000.00 and not \$10,000.00, this was an error.
- 2. No comment.
- 3. Crane requirement would be approximately one day.
- 4. Crane requirement would be approximately fifteen days.

Please deduct the crane cost for item 3 and 4 respectively from the quoted prices.

I sincerely hope the above clarification is clear in all details, nevertheless, if I can be of further help, please feel free to contact our Midwest General Office (800) 278-6214.

Respectfully Yours,  
INTERNATIONAL CHIMNEY CORPORATION

By 

Wilfried J. Guntermann  
Vice President

WJG/lrb

7-27-02  
SKD

## **Quincy Smelter Reverberatory Furnace Smokestack Treatment Alternatives**

### **ALTERNATIVE 1 – Guy Wire Replacement**

Remove and install three guy wires	\$17,000
Crane & man basket rental - three days	\$7,360
<b>TOTAL</b>	<b>\$24,360</b>

### **ALTERNATIVE 2 – Demolish Stack (debris dropped inside stack)**

Demolition labor	\$30,000
Crane & man basket rental - 10 days	\$18,700
Compressed air equipment rental @ \$300/day	\$3,000
Stack Cleanout	\$4,800
(Bobcat & operator @ 60/hr – 10 days)	
Loading (75/hr, 2 hr/trip)	\$750
Trucking – 41yds/85tons	\$1,400
( $\$70/\text{hr} \times 4 \text{ hours/trip}$ , 18 tons/trip = 5 trips)	
Disposal – 85 tons @ \$63/ton	\$5,355
<b>TOTAL</b>	<b>\$64,005</b>

### **ALTERNATIVE 2 – Demolish Stack (debris dropped outside stack)**

Demolition labor	\$50,000
Crane & man basket rental - 16 days	\$28,420
Compressed air equipment rental @ \$300/day	\$4,800
Loading (75/hr, 2 hr/trip)	\$750
Trucking – 41yds/85tons	\$1,400
Disposal – 85 tons @ \$63/ton	\$5,355
<b>TOTAL</b>	<b>\$90,545</b>

### **ALTERNATIVE 3 – Stack Rehabilitation**

Engineering Analysis and drawings	\$21,000
Restoration of stack superstructure	\$20,000
Install temporary guy wires & remove shell	\$15,000
Install new stack shell new cap & guy wires	\$280,000
Crane & man basket rental - 16 days	\$28,420
<b>TOTAL</b>	<b>\$364,420</b>

