

SMOKE STACK CONDITION STUDY

at the Quincy Smelter for



Environmental Quality Management, Inc.



Keweenaw
NATIONAL
HISTORICAL
PARK



U.P. ENGINEERS & ARCHITECTS, INC.

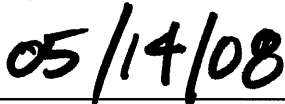
May 2008

SMOKE STACK CONDITION STUDY
AT THE QUINCY SMELTER FOR
ENVIRONMENTAL QUALITY MANAGEMENT, INC.

I hereby certify that the structural inspection was conducted by me and the condition study contained herein was also prepared by me and that I am a duly Licensed Professional Engineer under the laws of the State of Michigan.



George A. Kiiskila, Jr., P.E.



Date



Registration No.

U.P. Engineers & Architects, Inc.
100 Portage Street
Houghton, MI 49931

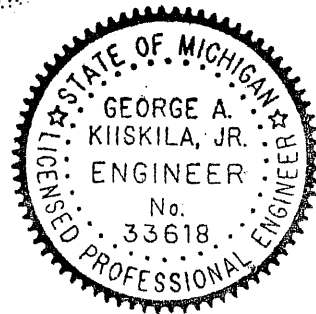


TABLE OF CONTENTS

Introduction	1
Scope of Work and Inspection Procedures.....	2
General Description of Smokestack.....	3
Inspection Observations	4
Recommendations of Repairs or Removals	6
Photograph Logs and Descriptions.....	7
Miscellaneous Inspection Observation of Buildings No. 14, 15, 17 and 18	18
Recommendations of Structural Stabilization Work for Asbestos Abatement at Buildings 14, 15, 17 and 18	19
Appendix I (Map of Buildings and Smokestacks on Quincy Smelter Site)	

INTRODUCTION

The following structural report and recommendations are for the inspection work conducted on the Reverberatory Furnace Smokestack at the former Quincy Smelter Facility in Franklin Township, Houghton County, Michigan.

This inspection is being done in preparation for the asbestos removal project being done by Environmental Quality Management, Inc. (EQM). Since the asbestos removal work is being done within the smokestack's fall radius, this structural inspection is being done as a safety precaution.

SCOPE OF WORK AND INSPECTION PROCEDURS

U.P. Engineers & Architects, Inc. was retained by EQM to perform a structural inspection on the existing smokestack for the Reverberatory Furnace at the former Quincy Smelter Facility in Franklin Township, Houghton County, Michigan. This inspection is being done from a safety standpoint in preparation of the asbestos abatement work done by EQM and its subcontractors within the 200 ft fall radius of the stack.

U.P. Engineers & Architects, Inc. was also requested to revisit (assess again) some of the buildings inspected during December, 2004, to go over the required structural stabilization work with EQM and Weston Solutions personnel. This structural work, again, would be in preparation of asbestos abatement in those buildings. The buildings were (by report numbers) #14 (Briquette Plant), #15 (Crushing Plant), #17 (Cupola Building) and #18 (Boiler House).

Originally, the smokestack inspection was scheduled for May 5, 2008 at 1:00 p.m. (ET). However, windy conditions caused our firm to postpone the inspection until May 7, 2008 at 8:00 a.m. (ET).

The exterior of the stack (inspected on May 7, 2008) was completed utilizing a crane and man basket rented from Julio Contracting Company and in accordance with OSHA safety regulations.

The interior of the stack and structural steel frame base were also inspected that same day (May 7, 2008) in the presence of one (1) member from each of the firms of EQM and Weston Solutions. At this time, buildings no. 14, 15, 17 and 18 were inspected as previously described.

Several photographs were taken during the May 5, 2008 and May 7, 2008 inspection days. From these photos, we have selected and displayed the enclosed numbered photographs with a brief description of each.

Our report includes inspection observations and some basic recommendations of repairs or removals.

GENERAL DESCRIPTION OF SMOKESTACK

From our inspection, and other information provided from previous reports, the stack description is as follows:

The stack is located on top of a steel frame 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 ¼" 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 ½" – 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. (This could not be verified at the time of our inspection because of the newly placed temporary steel cap covering the top of the stack.)

The existing stack had a temporary steel cap placed on it in the summer of 2007, and four (4) new guy wires placed approximately 9 feet from the top of the cap.

INSPECTION OBSERVATIONS

Stack Superstructure

1. The stack superstructure is still heavily corroded, and still in a dangerous condition.
2. The refractory flue ducts from the bypass stack were noted as “caved in” from the previous inspection report dated August, 2002. We note no improvements in the conditions here.

Stack Shell

Only the top 30 feet (and 15 feet at the roof line) of the steel stack shell remains in place. This steel shell provides very little structural support for the stack, other than providing a few anchorage points for the old guy wire cables.

The remaining portions of the stack shell below the roof line is deteriorated a little more than during the August 2002 inspection.

Brick Lining of Stack

The brick lining of the stack has become the primary structural support element of the stack, since a large portion of the steel shell is gone.

The smokestack is primarily being held up by the mass weight (gravity) of the brick lining and the guy wires attached to the remaining steel shell near the top.

The previous (2002) inspection report noted the vertical crack in the brick on the south side, but was only about 5/8” to 3/4” inch wide. (Crack width was not noticed any larger in summer of 2007 when temporary steel cap was installed.) Now this south side crack is about 1-1/2” wide. Also, you can see another vertical crack developing on the opposite side of (northside) 1/4” to 1/2” wide. This is evident in that you can see daylight directly through the center of the stack.

Additionally, a new and more serious crack from the southwest direction has developed. It is about 2” wide in most places, however there is a 6 foot vertical length of crack that is about 6 inches wide. This crack is 6 inches wide because brick has been falling out of the cracked opening.

Further, and most serious of all, is that a portion of the brick stack is beginning to become oval or “egg-shaped” on this south side. This is a sign that “stack failure” is beginning.

Guy Wires

There is no change in the existing three (3) guy wires remaining, other than their attachment to the stack shell is getting more deteriorated.

There are four (4) new guy wires with the new steel cap installed in 2007.

Structural Steel Frame Base

The structural steel frame base which rises about 11 feet off the floor, has deteriorated over the years due to moisture entering the building and corroding these steel members. We estimate that this frame has deteriorated to a point that its capacity is about 60% of its original maximum capacity. The beams, columns, and plate decking have a range of reduced capacities of 40 to 80 percent of their original capacity.

RECOMMENDATIONS OF REPAIRS OR REMOVALS

Smokestack Structure

Due to the accelerated changes in the cracking of the stack and development of the “egg-shape” to circular stack body, it is our recommendations that:

1. Asbestos abatement work cannot be done safely within the 200-foot fall radius of the smokestack under any wind conditions.
2. The smokestack should be removed down to approximately 15 feet above the top of the roof. This location is at the approximate point of the two conveying south and southwest cracks.
3. The stack should be topped or pulled over towards the south in order to minimize damage to the existing adjacent structures.

In Conclusion, the “window of opportunity” to safely repair the stack and allow it to stay in-place has passed by. We cannot recommend or allow construction workers to do repairs or be in close proximity to the face of the stack for repair work without compromising their safety.

PHOTOGRAPH LOG AND DESCRIPTIONS

Several photographs were taken during the May 5 and May 7, 2008 inspection days. A total of 14 outside photographs and 4 inside photographs were selected to best depict the smokestack condition. These photos are displayed in this report and have a brief description below:

Outside Photographs of Stack



Photo #1
View of Stack from the south.



Photo #2
View of stack from the southeast.

Photo #3
View of temporary stack cap from the south.

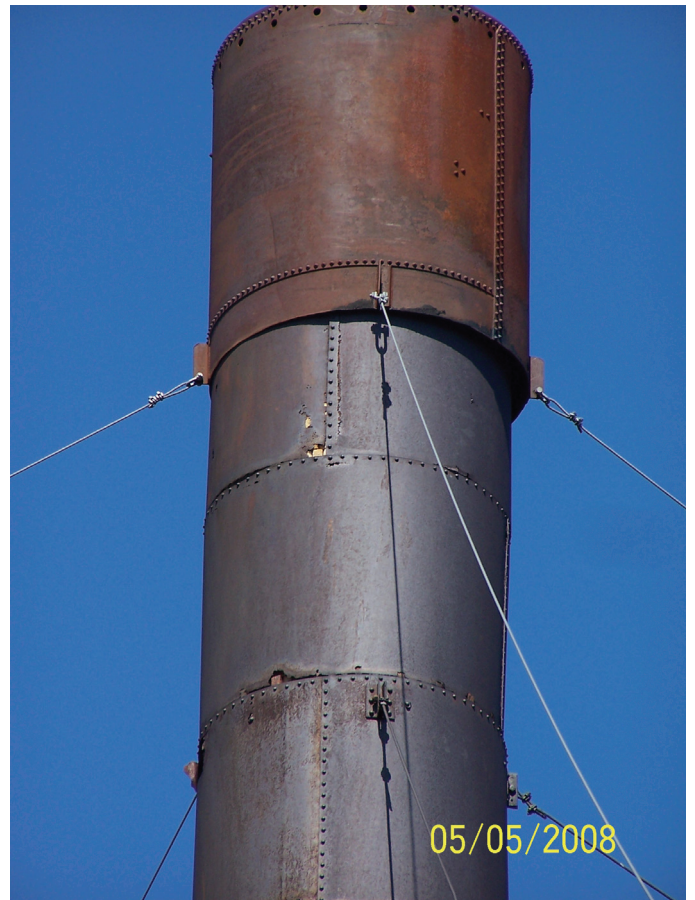
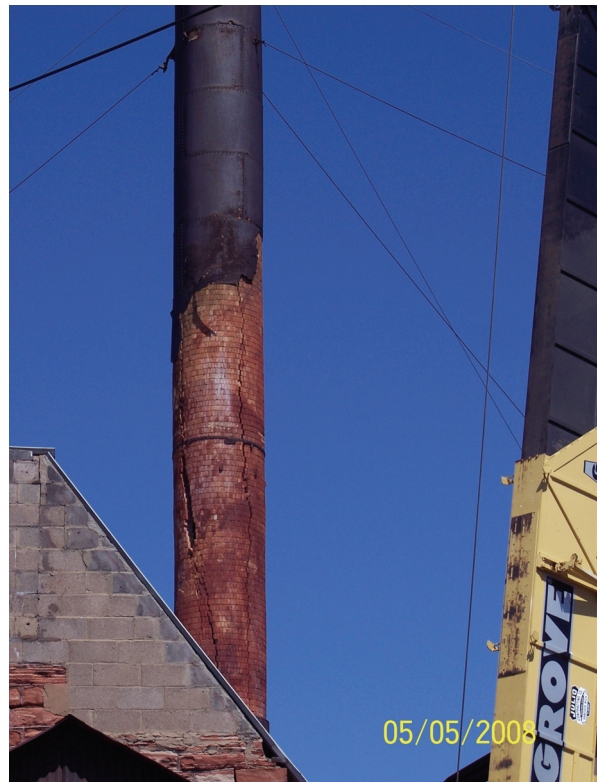




Photo #4
View of converging south and southwest
cracks.

Photo #5
View of south and southwest side cracks.



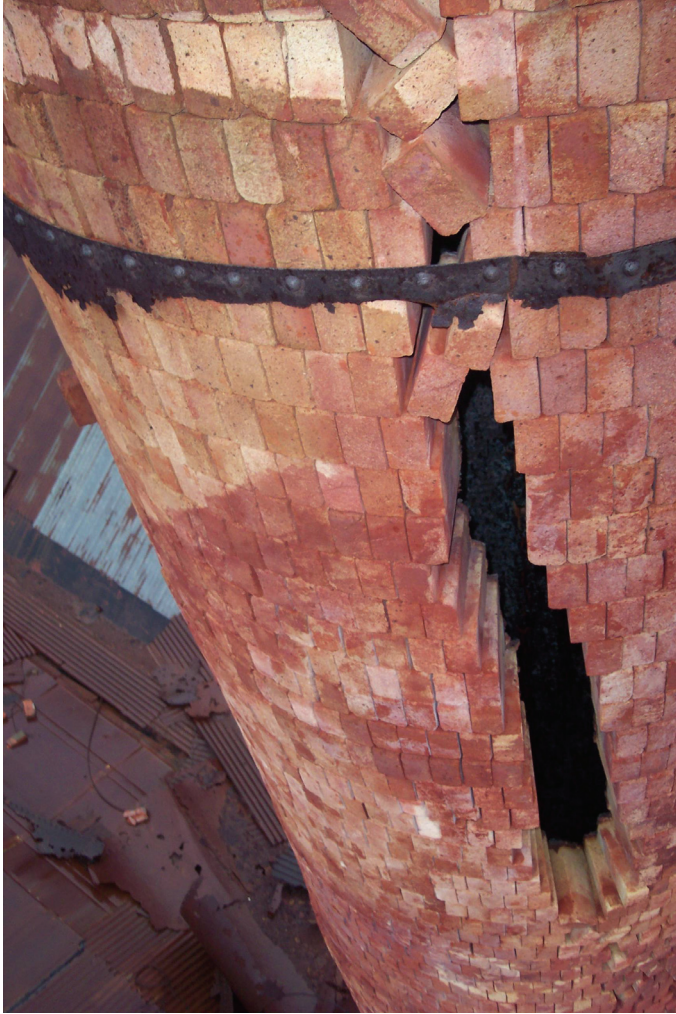


Photo #6
View of opening of southwest crack.



Photo #7
View of 1-1/2" to 2" opening size of south side crack.



Photo #8
View looking down at both the south and southwest side crack. Circular stack shape starting to become "egg-shaped".



Photo #9
View of deteriorating steel shell and crack on east side.



Photo #10
View of top of temporary stack cap.



Photo #11
View of “failed” northwest guy wire cable connection.



Photo #12
View of new guy wire cable on temporary stack cap just above.



Photo #13
View of remaining steel shell of stack on north side.



Photo #14
View of cracks in stack forming on the north side.

Inside Photographs of Stack



Photo #15

View of east side of structural steel frame base from smokestack.



Photo #16

Typical one of four structural steel lattice columns on smokestack base.



Photo #17

View of inside of smokestack. Note: Lots of daylight coming in from the southwest side crack.



Photo #18

View of inside the stack wall and brick lining. Note: Hole made in southeast side for pipe penetration of some kind.

MISCELLANEOUS INSPECTION OBSERVATION OF BUILDINGS NO. 14, 15, 17 AND 18

The following observations outline in our previous report dated December 2004, were revisited with representatives of EQM and Weston for four (4) building locations and have been outlined again below:

Building No. 14 (Brigette Plant)

1. Settling/failing sections of 2nd floor.
2. Loose and rotted materials overhead.
3. Tops of some columns completely rotted.

Building No. 15 (Crushing)

1. Loose materials and junk laying all around.
2. Doors on south and east sides boarded up.

Building No. 17 (Cupola Building)

1. Hole in second floor.
2. Lots of debris and material laying around.
3. Some pipe supports look suspect for failure.

Buliding No. 18 (Boiler House)

1. Lots of debris everywhere and along access ways.
2. Loose roof metal and other materials overhead.
3. Overhead pipe supports look suspect for failure.
4. East and west should have some bracing.

**RECOMMENDATION OF STRUCTURAL STABILIZATION WORK FOR ASBESTOS
ABATEMENT AT BUILDINGS NO. 14, 15, 17 AND 18**

Building No. 14 (Briquette Plant)

1. Stabilize settling/failing sections of the floor and columns with temporary steel jack posts on concrete blocking on south half of building.
2. Remove loose and rotted materials on second floor and roof.
3. Provide temporary bracing (struts) to support north wall of building into 2nd floor of south half of building.

Building No. 15 (Crushing Plant)

1. Remove any loose material that may fall on workers or impede contractor traffic during asbestos abatement.
2. Open boarded-up door on south wall of building that is used as an emergency exit.
3. Open up door from Building No. 14 on east wall.

Building No. 17 (Cupola Building)

1. Temporarily restrict usage of the south half of the building for contractor movement and removal of materials.
2. Clear the doorway openings on the west wall of the north room for material removals and movement of contractor personnel. This will require all the stabilization work to be done in BUILDING NO. 18 prior to work in this BUILDING NO. 17.
3. Check pipe supports prior to any asbestos abatement. Provide supplemental pipe support if necessary.

Building No. 18 (Boiler House)

1. Clear debris in boiler house and pathway for both doorways in Building No. 17.
2. Remove all loose and rusted-through metal roof panels, and other debris overhead that may fall.
3. Stabilize the top masonry stone of the east wall, including window lintel in southeast corner on upper floor.
4. Provide temporary bracing for the east and west walls, using an adjustable steel struts or similar. These braces shall be left-in-place after project is complete.
5. Check pipe supports prior to any debris removal below or asbestos removal. Provide supplemental pipe support if necessary. Remove pipe if impractical to provide support. Leave additional pipe supports after project completion.

Photographs of the above buildings taken on May 7, 2008 are available upon request, but are similar to the photos provided in the December, 2004 report.

APPENDIX I



NOTE:

FINISHED FLOOR ELEVATIONS (F.F.E.) ARE AT THE BUILDINGS DOOR THRESHOLDS, SO ARE APPROXIMATE. PROPERTY BOUNDARY EXCEPTS ANY FORM OF RAIL ROAD (R.O.R.) EXACT LOCATION OF UNDERGROUND IS UNKNOWN.

SYMBOL LEGEND:

SYMBOL	DESCRIPTION
	SURFACE CONTOURS
	UNDERGROUND CONTOURS
	BUILDINGS
	BUILDING DESIGNATOR
	RETAINING WALLS
	CONCRETE PAVEMENT (APPROXIMATE DO TO ROAD BLOWN OR OTHER FILL CONDITIONS)
	BITUMINOUS PAVEMENT
	PROPERTY LINE
	UNIMPROVED ROADS
	OVERHEAD TRAM STRUCTURE
	UNDERGROUND POWER
	UNDERGROUND TELEPHONE
	FENCE LINE
	FIRE HYDRANT
	UTILITY POLE
	CITY WIRE
	TEL. MANHOLE
	TEL. PED.
	STORM DRAIN MANHOLE
	GAS MARKER
	DUCK PINHOLE
	VERTICAL TRAM SUPPORTS
	SPOT ELEVATIONS
	SET 5/8" PIN
	1/2" DIA. HOLE
	1/4" DIA. HOLE
	1/8" DIA. HOLE
	1/16" DIA. HOLE
	1/32" DIA. HOLE
	1/64" DIA. HOLE
	1/128" DIA. HOLE
	1/256" DIA. HOLE
	1/512" DIA. HOLE
	1/1024" DIA. HOLE
	1/2048" DIA. HOLE
	1/4096" DIA. HOLE
	1/8192" DIA. HOLE
	1/16384" DIA. HOLE
	1/32768" DIA. HOLE
	1/65536" DIA. HOLE
	1/131072" DIA. HOLE
	1/262144" DIA. HOLE
	1/524288" DIA. HOLE
	1/1048576" DIA. HOLE
	1/2097152" DIA. HOLE
	1/4194304" DIA. HOLE
	1/8388608" DIA. HOLE
	1/16777216" DIA. HOLE
	1/33554432" DIA. HOLE
	1/67108864" DIA. HOLE
	1/134217728" DIA. HOLE
	1/268435456" DIA. HOLE
	1/536870912" DIA. HOLE
	1/1073741824" DIA. HOLE
	1/2147483648" DIA. HOLE
	1/4294967296" DIA. HOLE
	1/8589934592" DIA. HOLE
	1/17179869184" DIA. HOLE
	1/34359738368" DIA. HOLE
	1/68719476736" DIA. HOLE
	1/137438953472" DIA. HOLE
	1/274877906944" DIA. HOLE
	1/549755813888" DIA. HOLE
	1/1099511627776" DIA. HOLE
	1/2199023255552" DIA. HOLE
	1/4398046511104" DIA. HOLE
	1/8796093022208" DIA. HOLE
	1/17592186044416" DIA. HOLE
	1/35184372088832" DIA. HOLE
	1/70368744177664" DIA. HOLE
	1/140737488355328" DIA. HOLE
	1/281474976710656" DIA. HOLE
	1/562949953421312" DIA. HOLE
	1/1125899906842624" DIA. HOLE
	1/2251799813685248" DIA. HOLE
	1/4503599627370496" DIA. HOLE
	1/9007199254740992" DIA. HOLE
	1/18014398509481984" DIA. HOLE
	1/36028797018963968" DIA. HOLE
	1/72057594037927936" DIA. HOLE
	1/144115188075855872" DIA. HOLE
	1/288230376151711744" DIA. HOLE
	1/576460752303423488" DIA. HOLE
	1/1152921504606846976" DIA. HOLE
	1/2305843009213693952" DIA. HOLE
	1/4611686018427387904" DIA. HOLE
	1/9223372036854775808" DIA. HOLE
	1/18446744073709551616" DIA. HOLE
	1/36893488147419103232" DIA. HOLE
	1/73786976294838206464" DIA. HOLE
	1/147573952589676412928" DIA. HOLE
	1/295147905179352825856" DIA. HOLE
	1/590295810358705651712" DIA. HOLE
	1/1180591620717411303424" DIA. HOLE
	1/2361183241434822606848" DIA. HOLE
	1/4722366482869645213696" DIA. HOLE
	1/9444732965739290427392" DIA. HOLE
	1/18889465931478580854784" DIA. HOLE
	1/37778931862957161709568" DIA. HOLE
	1/75557863725914323419136" DIA. HOLE
	1/151115727451828646838272" DIA. HOLE
	1/302231454903657293676544" DIA. HOLE
	1/604462909807314587353088" DIA. HOLE
	1/1208925819614629174706176" DIA. HOLE
	1/2417851639229258349412352" DIA. HOLE
	1/4835703278458516698824704" DIA. HOLE
	1/9671406556917033397649408" DIA. HOLE
	1/19342813113834066795298816" DIA. HOLE
	1/38685626227668133590597632" DIA. HOLE
	1/77371252455336267181195264" DIA. HOLE
	1/154742504910672534362390528" DIA. HOLE
	1/309485009821345068724781056" DIA. HOLE
	1/618970019642690137449562112" DIA. HOLE
	1/1237940039285380274899124224" DIA. HOLE
	1/2475880078570760549798248448" DIA. HOLE
	1/4951760157141521099596496896" DIA. HOLE
	1/9903520314283042199192993792" DIA. HOLE
	1/19807040628566084398385987584" DIA. HOLE
	1/39614081257132168796771975168" DIA. HOLE
	1/79228162514264337593543950336" DIA. HOLE
	1/158456325028528675187087900672" DIA. HOLE
	1/316912650057057350374175801344" DIA. HOLE
	1/633825300114114700748351602688" DIA. HOLE
	1/1267650600228229401496703205376" DIA. HOLE
	1/2535301200456458802993406410752" DIA. HOLE
	1/5070602400912917605986812821504" DIA. HOLE
	1/10141204801825835211973625643008" DIA. HOLE
	1/20282409603651670423947251286016" DIA. HOLE
	1/40564819207303340847894502572032" DIA. HOLE
	1/81129638414606681695789005144064" DIA. HOLE
	1/162259276829213363391778010288128" DIA. HOLE
	1/324518553658426726783556020576256" DIA. HOLE
	1/649037107316853453567112041152512" DIA. HOLE
	1/1298074214633706907134224082305024" DIA. HOLE
	1/2596148429267413814268448164610048" DIA. HOLE
	1/5192296858534827628536896329220096" DIA. HOLE
	1/10384593717069655257073792658440192" DIA. HOLE
	1/20769187434139310514147585316880384" DIA. HOLE
	1/41538374868278621028295170633760768" DIA. HOLE
	1/83076749736557242056590341267521536" DIA. HOLE
	1/166153499473114484113180682535042704" DIA. HOLE
	1/332306998946228968226361365070085408" DIA. HOLE
	1/664613997892457936452722730140170816" DIA. HOLE
	1/1329227995784915872905445460280341632" DIA. HOLE
	1/2658455991569831745810890920560683264" DIA. HOLE
	1/5316911983139663491621781841121366528" DIA. HOLE
	1/10633823966279326983243563682242733056" DIA. HOLE
	1/21267647932558653966487127364485466112" DIA. HOLE
	1/42535295865117307932974254728970932224" DIA. HOLE
	1/85070591730234615865948509457941864448" DIA. HOLE
	1/170141183460469231731897018915883728896" DIA. HOLE
	1/340282366920938463463794037831767457792" DIA. HOLE
	1/680564733841876926927588075663534915584" DIA. HOLE
	1/1361129467683753853855176151327069831168" DIA. HOLE
	1/2722258935367507707710352302654139662336" DIA. HOLE
	1/5444517870735015415420704605308279324672" DIA. HOLE
	1/10889035741470030830841409210616558649344" DIA. HOLE
	1/21778071482940061661682818421233117298688" DIA. HOLE
	1/43556142965880123323365636842466234597376" DIA. HOLE
	1/87112285931760246646731273684932469194752" DIA. HOLE
	1/174224571863520493293462547369649383989504" DIA. HOLE
	1/348449143727040986586925094739298767979008" DIA. HOLE
	1/696898287454081973173850189478597535958016" DIA. HOLE
	1/1393796574908163946347700378957195071916032" DIA. HOLE
	1/2787593149816327892695400757914390143832064" DIA. HOLE
	1/5575186299632655785390801515828780287664128" DIA. HOLE
	1/11150372599265311570781603031657560575328256" DIA. HOLE
	1/22300745198530623141563206063315121150656512" DIA. HOLE
	1/44601490397061246283126412126630242301313024" DIA. HOLE
	1/89202980794122492566252824253260484602626048" DIA. HOLE
	1/178405961588244985132505648506520972005252096" DIA. HOLE
	1/35681192317



NOTE:

FINISHED FLOOR ELEVATIONS (F.F.E.)
ARE AT THE BUILDINGS DOOR
THRESHOLDS, SO ARE APPROXIMATE
PROPERTY BOUNDARY EXCEPTS ANY
FORM OF RAIL ROAD (R.O.W.)
EXACT LOCATION OF UNDERGROUND
IS UNKNOWN

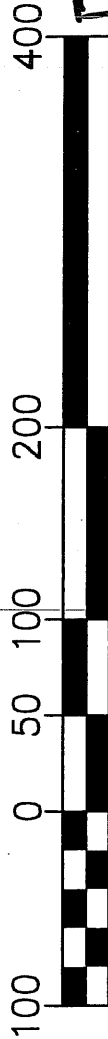
SYMBOL LEGEND:	
SYMBOL	DESCRIPTION:
	SURFACE CONTOURS
	UNDER WATER CONTOURS
	BUILDINGS
	BUILDING DESIGNATOR
	RETAINING WALLS
	CONCRETE PAVEMENT DRAIN BLOWN OR OTHER FILL CONDITIONS)
	BITUMINOUS PAVEMENT
	PROPERTY LINE
	UNPAVED ROADS
	OVERHEAD TRAM STRUCTURE
	POWER GROUND
	UNDER GROUND TELEPHONE
	FENCE LINE
	FIRE HYDRANT
	UTILITY POLE
	GUY WIRE
	TEL. MANHOLE
	TEL. PED.
	STORM DRAIN MANHOLE
	GAS MARKER
	DOCK PILINGS
	VERTICAL TRAM SUPPORTS
	SPOT ELEVATIONS
	SET 5/8" PIN
	WITH CAP #46897
	FORMER RAIL ROAD
	R.O.W. ENCROACHED FROM SUBJECT PROPERTY

BUILDING LEGEND:	
#	BUILDING DESCRIPTION (YEAR CONSTRUCTED)
01	ICE HOUSE (1899)
02	DOCKSIDE WAREHOUSE (1898) (DRYHOUSE ADDITION, 1916)
03	ASSAY OFFICE (1898) (ADDITION, 1908)
04	CHARCOAL HOUSE (1898)
05	CASTING PLANT (1920)
06	#5 REVERBERATORY FURNACE BUILDING (1904)
07	REVERBERATORY FURNACE BUILDING (1898)
08	SCALE BUILDING (1898)
09	COOPER SHOP (1898)
10	LUMBER SHED (1917)
11	COOPER STOCK (1898)
12	MINERAL HOUSE (1904)
13	LIMESTONE BINS (1907)
14	BRIQUETTE PLANT (1908)
15	CRUSHING PLANT (1919)
16	PUMP HOUSE ADDITION (1906)
17	CUPOLA BUILDING (1898)
18	BOILER HOUSE (1905)
19	BADEN HAUSEN BOILER BLDG. (1919)
20	MACHINE SHOP (1907)
21	SCALE HOUSE (1898)
22	UNKNOWN USE
23	STORAGE *
24	UNKNOWN USE
25	BARN (1898)
26	GARAGE *
27	OFFICE (1898)
28	HANKE AUTO **

INFORMATION FROM - QUINCY MINING COMPANY;
 QUINCY SMOELTING WORKS: SURFACE MAP-1920
 DENOTES BUILDING NOT IDENTIFIED BY
 MINING COMPANY, BUT USE IS EVIDENT
 DENOTES NOT PART OF SITE



GRAPHIC SCALE



(IN FEET)
1 inch = 100 ft.

REVERBERATORY
FURNACE
SMOKESTACK
LOCATION