TANK INDUSTRY CONSULTANTS

EVALUATION OF THE

710,000 GALLON CONCRETE GROUND STORAGE TANK

"CRESTWOOD TANK"
BOSTON, NEW YORK

FOR

ERIE COUNTY WATER AUTHORITY
BUFFALO, NEW YORK

March 31, 2017

16.081.L614.016

TIC
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May 24, 2017

SUBJECT:

The subject of this report is the field evaluation of the 710,000 gallon concrete ground storage tank in Boston, New York. The tank was owned by the Erie County Water Authority and was known as the "Crestwood Tank." The field evaluation was performed on March 31, 2017 by Gregory P. Cannon, NACE Coating Inspector Level 3 Certified, Certificate No. 10993 and Eugene Dube of Tank Industry Consultants. According to information on the tank nameplate, the tank was built in 1997 by Natgun Corporation and had a capacity of 710,000 gallons. Measurements taken at the time of this field evaluation indicated the dome-roof tank had a diameter of approximately 51 ft, and a shell height of approximately 46 ft. The tank was previously evaluated by Tank Industry Consultants on September 9, 2009 under tank number L511.026.

OBJECTIVE:

The purpose of this washout and evaluation was to determine the condition of the tank interior, exterior, exposed foundation, and accessories. The purpose of this report is to present the findings of the evaluation and to make recommendations for recoating, repairing, corrosion protection, and maintenance. Budget estimates for the work, anticipated life of the coating and the structure, and the replacement cost of the tank are also included.

AUTHORIZATION:

This washout, evaluation, disinfection, and report were authorized in the PSA dated March 24, 2016 and signed by Earl L. Jann, Chairman.

EXECUTIVE SUMMARY:

The interior was in fair condition with cracking noted and stalactites located on the roof. It is recommended the interior be repaired within the next 3 years. When the interior is repaired, repairs should be performed to the exterior as well.

ANSI/OSHA and Safety-Related Deficiencies: There were ANSI/OSHA and safety-related deficiencies observed on this tank. These deficiencies included:

- the antenna and conduit attached to the exterior ladder could interfere with the climber's use of the side rails (29 CFR 1910.23(d)(13)(i)),
- the exterior ladder safe-climbing device did not extend the industry recommended minimum height above the roof,
- the bottom bracket of the exterior ladder safe-climbing device was loose and a nut was missing,
- the depth of the safety cage on the exterior ladder was too small (29 CFR 1910, Subpart D, Figure D-15),
- the roof access was not equipped with safety railing (29 CFR 1910.28(b)(1)), and
- the deposits on the interior ladders could injure the climber's hands.

If the Owner wishes to fully comply with OSHA and safety-related standards, it is recommended that these deficiencies be rectified.

AWWA, Sanitary, and Operational Deficiencies: A sanitary and operational deficiency was observed on the tank at the time of the field evaluation:

- stalactites were located on the roof interior which indicated run-off water had infiltrated the tank.

The safety-related, sanitary, and operating deficiencies listed above are not intended to be a complete list of deficiencies on this tank. The Owner should refer to the complete report text and accompanying photographs for a complete account of all observed deficiencies.

This evaluation and the reporting of the condition of this tank do not warrant the original structural condition of the tank or any of the original design for seismic loadings. Likewise, recommendations for this tank do not include modifications which may be required for compliance with present structural codes.

PHOTOGRAPHS:

Color photographs were taken of the tank interior and exterior and are included as a part of this report. The significant photographs are keyed to the observations.

NOMENCLATURE:

Warning: Some appurtenances on this tank may be referred to as erection or rigging attachments, lugs, or brackets. This does not mean that they are safe for rigging. Each attachment for each tank should be evaluated on an individual basis by a structural engineer or an experienced rigger before being used. These devices may have been intended for only the original erectors and painters to use with specialized equipment.

OBSERVATIONS:

A. Site

SITE:
Size: approx. 60 ft diameter
Fence: none

Nearest Structures:
Type: control building
Direction: northwest
Distance: approx. 17 ft 6 in.

Type: pond
Direction: south
Distance: approx. 20 ft

Type: residential building
Direction: east
Distance: approx. 60 ft

Nearest Overhead Power Lines:
Direction: southwest
Distance: approx. 37 ft

FOUNDATION: none visible

1. **Site Location**: The tank site was located at 7491 Chestnut Ridge Road in Boston, New York. The site was accessed from a gravel and dirt-covered drive which had several ruts in it. The site was located in a residential and wooded area. The nearest residence was located east of the tank site. The nearest overhead power lines were located southwest of the tank site, and there was a pond to the south. (See photos 3-4)

2. **Site Conditions**: The tank site was covered with grass. The site was graded such that water was standing around the base of the tank. The tank site was not fenced. A control building was located on the site northwest of the tank. (See photos 1-2, 5)

B. Exterior Surfaces

DESCRIPTION:
Construction: prestressed concrete
Shell Diameter: approx. 51 ft
Shell Height: approx. 46 ft
Roof Type: dome

NAMEPLATE:

Location: on west side of shell, approx. 8 ft above grade

TOWN OF BOSTON
710,000 GALLON WATER STORAGE TANK
TOWN BOARD MEMBERS
TANK BUILDER:
NATGUN CORPORATION
WAKEFIELD, MASSACHUSETTS

SHELL MANHOLES:

Number: 2

Location: southwest side of shell

Type: flanged and bolted
Size: 29-1/2 in. diameter
Neck: 21-3/4 in. projection x 1/4 in. thick
Flange: 4-1/4 in. projection x 2-1/4 in. thick
Cover:
Size: 39 in. diameter x 1 in. thick
Hinged: yes, exterior
Bolts:
Number: 28
Size: 1-1/4 in. diameter x 5 in. long

Location: northwest side of shell

Type: flanged and bolted
Size: 23-1/2 in. diameter
Neck: 21-3/4 in. projection x 1/4 in. thick
Flange: 4 in. projection x 1-7/8 in. thick
Cover:
Size: 32-1/8 in. diameter x 1 in. thick
Hinged: yes, exterior
Bolts:
Number: 20
Size: 1-1/4 in. diameter x 5 in. long

OVERFLOW PIPE:

Size: 8 in. diameter
Visible Air Break: 29 in.
Protective Screening: fine mesh
Drain Basin: 2 ft square x 2 ft 10 in. deep

EXTERIOR LADDER:
- Number of Rungs: 32
- Distance from Ground to Lowest Rung: 13 ft 4 in.
- Width: 17 in.
- Side Rails: 2-1/2 in. x 1/2 in., flat bar
- Rung Size: 1 in. diameter
- Spacing: 12 in. on center
- Toe Room: 12 in. minimum
- Brackets:
  - Construction: bolted
  - Size: 2-1/2 in. x 1/2 in., "L"-shaped x 3 in. and 13 in. long
  - Bolts: 1/2 in. diameter
  - Spacing: approx. 4 ft
- Safe-Climbing Device:
  - Type: 3/8 in. diameter cable-type
  - Extension above Roof: 26-1/4 in.
- Safety Cage:
  - Depth: 25-1/2 in.
  - Width: 27-1/2 in.
  - Vertical Bars:
    - Size: 1-1/2 in. x 1/4 in., flat bar
    - Spacing: 8-1/4 in. on centers
  - Horizontal Bars:
    - Size: 2 in. x 1/4 in., flat bar
    - Spacing: 4 ft
- Vandal Deterrent:
  - Type: hinged door at base of ladder cage
  - Size: 30 in. x 36 in.
  - Locked: yes
- Terminals: 26-1/2 in. wide

ROOF SAFETY RAILING: none

ROOF OPENINGS:
- Manhole:
  - Size: 40-3/4 in. x 41 in.
  - Curb: 6 in.
  - Overlap: 2 in.
  - Locked: yes

Roof Vent:
- Type: dome-cover
- Neck Diameter: 30 in.
- Neck Height: 12 in.
- Screening:
  - Type: fine mesh
  - Orientation: vertical
- Cover: 42 in. diameter
- Bolts:
  - Number: 8
  - Size: 1/2 in. diameter

1. **Exterior Condition**: The exterior of the concrete tank appeared to be in fair to good overall condition as several cracks with efflorescence were observed. The concrete exterior surfaces were not coated.

2. **Shell Condition**: The concrete shell exterior appeared to be in fair to good overall condition with numerous cracks observed. The cracks measured less than 2 ft long, and efflorescence was observed at most of the cracks. The largest cracks were located in the surfaces beneath the shell manholes and overflow pipe projection. A significant amount of mildew and moss were also observed on the lower part of the shell. The tank nameplate was attached to the west side of the shell. (See photos 10-17, 22-23)

3. **Shell Manholes**: The tank was equipped with two circular flanged and bolted shell manholes located on the northwest and southwest sides of the tank. The manhole covers were equipped with hinged support arms located on the exterior of the tank. (See photos 7-8)

4. **Overflow Pipe:** The overflow pipe exited near the base of the shell and discharged above a grate-covered drain basin. The discharge end was equipped with fine mesh screening which appeared to be in adequate condition at the time of the field evaluation. A significant amount of peeled coating and corrosion were observed on the overflow pipe, bolts, and flange surrounding the protective screening. (See photo 9)

5. **Exterior Ladder**: **There were safety-related and ANSI/OSHA deficiencies noted: (1) the antenna and conduit attached to the ladder could interfere with the climber's use of the side rails, (2) the 26-1/4 in. extension of the safe-climbing device above the roof did not meet the industry recommended 54 in. minimum, (3) the bottom bracket of the safe-climbing device was loose and a nut was missing, and (4) the 25-1/2 in. depth of the ladder safety cage did not meet the minimum required 27 in. minimum.** A ladder provided access from near grade to the roof. The ladder was equipped with a cable-type safe-climbing device and a safety cage. The ladder was equipped with bolted brackets, and the ladder and brackets appeared to be in nearly their original structural condition at the time of the field evaluation. A conduit extended up the ladder brackets to an antenna located at the roof's edge. The conduit was bent just above grade level, and the conduit could interfere with the climber's use of the ladder side rail. The base of the ladder was equipped with a vandal deterrent. The ladder deterrent was locked prior to and after the field evaluation. The top of the ladder was equipped with terminals at the roof. (See photos 18-21, 24-25)

6. **Roof Safety Railing: There was a safety-related and OSHA deficiency noted: the roof access was not equipped with safety railing to deter personnel from inadvertently falling.**

7. **Roof Condition**: The concrete roof exterior appeared to be in fair condition at the time of the field evaluation. Several hairline cracks were observed, and surface voids were located near the edge of the west side of the roof. An area of spalling was also located on the west side of the roof near the edge. Efflorescence was observed at some of the hairline cracks. (See photos 27-33)

8. **Roof Manhole**: The roof was equipped with one hinged cover manhole. The manhole was locked prior to and after the field evaluation. The manhole surfaces appeared to be in adequate condition at the time of the field evaluation. (See photos 24, 26)

9. **Roof Vent**: The roof was equipped with a dome-cover vent located in the approximate center of the roof. The vertically oriented screening was shielded from wind-driven dust and debris. The screening appeared to be in adequate condition at the time of the field evaluation. (See photos 34-35)

C. Interior Surfaces

INTERIOR LADDERS:
- Number of Ladders: 2
- Location: beneath each shell manhole
- Number of Rungs: 5 per ladder
- Width: 17 in.
- Side Rails: 2-1/2 in. x 1/2 in., flat bar
- Rung Size: 1 in. diameter
- Spacing: 12 in. on center
- Toe Room: 12-3/4 in.
- Brackets:
  - Construction: welded to ladder and bolted to tank
  - Size: 2-1/2 in. x 1/2 in., "L"-shaped x 3 in. and 13 in. long
- Safe-Climbing Device: none

OVERFLOW:
- Inlet Type: open pipe
- Location: approx. 10 in. below the roof-to-shell connection

INTERIOR PIPING:
- Pipe #1:
  - Size: 6 in. diameter
  - Sump: 18 in. square x 6 in. deep
  - Projection: 34 in. above basin floor
  - Protective Cover: none

Pipe #2:
Size: 10 in. diameter
Sump: 22 in. square x 6 in. deep
Projection: 12 in. above basin floor
Protective Cover: none

Drain Pipe:
Size: 6 in. diameter
Sump: 18 in. square x 6 in. deep
Projection: flush w/ floor of basin
Protective Cover: none

1. **Interior Condition**: The interior concrete surfaces appeared to be in fair to good overall condition at the time of the field evaluation. The interior surfaces were not coated.

2. **Roof Condition**: **There was a sanitary deficiency noted: stalactites on the roof indicated that water had infiltrated the roof.** The concrete roof appeared to be in fair condition at the time of the field evaluation. No significant cracks or spalls were observed, but the concrete surface was exceedingly rough. Stalactites were located in a few areas which indicated water had infiltrated the roof. (See photos 36-41)

3. **Shell Condition**: The concrete shell appeared to be in generally fair condition as no significant areas of chipping or spalling were noted. Corrosion and rust tubercles were observed at approximately 12 locations where exposed rebar had corroded. Hairline cracks were noted on the shell especially around the overflow pipe pilaster. Sealant was located in a horizontal area near the base of the shell. (See photos 42, 45-49, 53)

4. **Interior Ladders**: **There was a safety-related deficiency noted: the deposits on the ladders could injure the climber's hands.** The tank was equipped with two interior ladders which provided access from each shell manhole to the floor. The ladders were welded to brackets which were bolted to the tank. Deposits were noted on the ladders which could injure the climber's hands. Except for the deposits, the ladders and brackets appeared to be in adequate condition at the time of the field evaluation. A bolted grab bar was located above each manhole. (See photos 50-52)

5. **Overflow Pipe**: The overflow pipe was equipped with an open pipe inlet. The location of the overflow inlet was such that the top capacity level was below the shell-to-roof connection. The overflow pipe extended down the shell and was located within a concrete pilaster. The overflow pipe exited the tank near grade level. (See photos 46-47)

6. **Floor Condition**: The floor appeared to be in good overall condition as no significant areas of cracking or spalling were observed at the time of the field evaluation. A foam gasket-type material was located at the shell-to-floor connection. The gasket material appeared to be in fair condition at the time of the field evaluation with a few voids noted. (See photos 54-56)

7. **Interior Piping**: The tank was equipped with three pipes which were located within separate basins in the concrete floor. Two of the pipes projected above the basin and tank floor level, and one pipe, the apparent drain pipe, was flush with the basin. The pipes were not equipped with protective covers. Corrosion and rust tubercles were observed on all of the pipes and on the piping bolts. (See photos 57-60)

RECOMMENDATIONS:

A. Site

1. **Site Maintenance**: The site should be regarded so that drainage away from the base of the tank occurs.

2. **Tank and Site Security**: Water tanks have been defined by some courts under certain circumstances as attractive nuisances. As such, there may be a significant potential liability in the event of injury to persons on the tank and tank site, even if access is not authorized. Recent events have prompted the entire water industry to consider measures that inhibit intentional acts that could threaten the water supply. A review of the security requirements for the tank and site is recommended to confirm that the existing measures are consistent with the require site security requirements. Primary tank and site security should be focused on eliminating, preventing, and detecting unauthorized access to the tank. Such security measures might include routinely and periodically verifying all manholes and gates are locked, and all exterior ladders have suitable deterrents. Other security measures might include installing site lighting, motion detectors, surveillance cameras, and alarms on gates and tank manholes, and arranging more frequent site visits by law enforcement agencies. At a minimum, it is recommended that the site be enclosed by a chain-link fence which is topped with barbed wire and equipped with a locked gate.

B. Exterior Surfaces

1. **Exterior Surfaces**: The exterior concrete surfaces appeared to be in fair to good overall condition at the time of the field evaluation. The exterior should be repaired in 3 years, in conjunction with the interior repairs. The cracks should be filled with a cementitious crack compound to prevent moisture collection from causing additional damage to the tank. For added weathering resistance, the exposed surfaces of the exterior could be coated with a cementitious waterproofing material or sealed with a silane or siloxane coating. If aesthetics are of concern, the mildew could be removed from the shell surfaces.

2. **Rehabilitation Schedule**: To obtain the lowest possible prices for the work outlined in the recommendations, specifications should be prepared and the work bid in the spring, with the work scheduled to start in early summer (if possible).

3. **Nameplate**: When exterior rehabilitation is performed, the tank nameplate should be removed.

4. **Electrical Apparatus**: All unused electrical equipment should be removed from the tank and tank site. All required equipment should be repaired and maintained in accordance with the National Electric Code (NEC). The bent conduit should be repaired.

5. **Existing Shell Manholes**: At the time of recoating and repairs, the gaskets for the existing shell manholes should be replaced. The bolts should be replaced with galvanized steel bolts.

6. **Overflow Pipe**: The discharge end of the overflow pipe should be equipped with a new screened, counter-weighted flap gate or elastomeric check valve to prevent the ingress of birds, small animals and insects into the tank.

7. **Exterior Ladder**: A ladder safety cage is not required on a ladder equipped with a safe-climbing device. As the OSHA is phasing out safety cages, Tank Industry Consultants recommends that the exterior shell ladder safety cage be removed. The loose bracket on the safe-climbing device should be repaired, and the device should be modified to extend the industry recommended 54 in. above the roof. The conduit and antenna should be relocated away from the ladder side rails.

8. **Roof Safety Railing**: Safety railing which meets current OSHA dimensional requirements should be installed at the roof access and adjacent to the roof manhole. The access opening to the safety railing should be equipped with a self-closing gate. When the railing is installed, the ladder terminals should be removed.

9. **Clog-Resistant Vent**: The tank was not equipped with a clog-resistant vent. AWWA D100 Standard (applicable for steel tanks) recommends that all vents with screening against insects be designed to ensure "fail-safe" operation if the insect screens become occluded. However, a concrete roof is typically capable of withstanding more pressure or vacuum than a steel roof. If the Owner desires to provide the utmost in safety, the center vent should be removed and a clog-resistant vent installed in its place. The vent should include a removable cover in order to provide a means of access and egress for personnel.

C. Interior Surfaces

1. **Interior Surfaces**: The interior surfaces appeared to be in fair overall condition with cracking noted and stalactites located on the roof. It is recommended the interior be repaired within the next 3 years. A cementitious leak-stopping coating system such as Xypex or Vandex, or a solventless elastomeric polyurethane system such as Polibrid, could be applied to help deter leaks. The coating system should meet the certification criteria of ANSI/NSF 61 regulations.

2. **Metal Piping**: The existing metal piping should be cleaned to the equivalent of an SSPC-SP 10, Near-White Blast Cleaning and a three-coat epoxy system applied. Due to the extent of corrosion observed, it is recommended this be performed within the next 2 years.

3. **Rebar**: The exposed rebar in the shell should be cleaned, coated, and patched with a material compatible with the concrete coating and that meets ANSI/NSF 61.

4. **Interior Ladders**: Interior ladders may be susceptible to ice damage and corrosion. If the Owner decides to keep the interior ladders, the existing ladders should be replaced with fiberglass

ladders. If the ladders are not removed or replaced, the deposits should be removed so they do not injure the climber's hands.

5. **Shell-to-Floor Connection**: The gasket-material located at the shell-to-floor joint should be replaced to eliminate the voids.

ECONOMIC FACTORS:

Item	Cost	Life in Years
Replacement of tank with a new one	$ 900,000[1]	75+

The following is a complete list of repairs and estimated costs for their respective recommendations found in the RECOMMENDATION section of this report.

Item	Sanitary & Safety	Scheduled Maintenance Repairs
Exterior Clean and Coat		$ 110,000
Interior Clean and Coat with Elastomeric Polyurethane		170,000
Interior Clean and Coat Metal Piping		10,000
Replace Shell-to-Floor Gasket		6,000
Remove Exterior Ladder Safety Cage & Relocate Conduit	$ 3,000	
Install Overflow Pipe Elastomeric Check Valve	6,000	
Install Roof Safety Railing with Self-Closing Gate	6,000	
Install Clog-Resistant Vent	8,000	
Contingency Items	8,000	12,000

Estimates are believed to be a high average of bids that would be received in 2017.

[1] The replacement estimate includes costs associated with new tank fabrication and erection, foundation, painting, and engineering. The budget estimate given does not include costs associated with tank demolition, site acquisition, and distribution interruptions.

The following economic factors include only those work items that the Engineer believes to be the minimum to properly maintain this tank from an operational standpoint. Other items related to safety and risk management should be evaluated by the owner of the tank.

Item	Cost
Exterior Clean and Coat	$ 110,000
Interior Clean and Coat with Elastomeric Polyurethane	170,000
Interior Clean and Coat Metal Piping	10,000
Replace Shell-to-Floor Gasket	6,000
Remove Exterior Ladder Safety Cage & Relocate Conduit	3,000
Install Overflow Pipe Elastomeric Check Valve	6,000
Install Roof Safety Railing with Self-Closing Gate	6,000
Contingency Items	12,000
Total of Engineer's Recommendations	**$ 323,000**

Tank Industry Consultants has no control over the cost of labor, materials, or equipment, or over the contractors' methods of determining prices, or over competitive bidding, or the market conditions. Opinions of probable cost, as provided for herein, are to be made on the basis of our experience and qualifications and represent our best judgment as design professionals familiar with the design, maintenance, and construction of concrete and steel plate structures. However, Tank Industry Consultants cannot and does not guarantee that proposals, bids, or the construction cost will not vary from opinions of probable cost prepared for the Owner.

Due to the numerous potential scopes of work which exist, an updated budget estimate should be prepared once the final scope of work has been determined. This would permit an accurate budget of monies for additional mobilization costs and damaged coating rehabilitation costs.

Engineering and resident observation costs are not included in the Total of the Engineer's Recommendations because these fees are dependent upon the scope of work to be performed. Tank Industry Consultants performs all facets of the engineering services which would be required for this project. Estimated fees for engineering and resident observation will be furnished upon request.

CLOSURE:

Brief Summation: The Erie County Water Authority operates a 710,000 gallon concrete ground storage tank. The interior was in fair condition with cracking noted and stalactites located on the roof. It is recommended the interior be repaired within the next 3 years. When the interior is repaired, repairs should be performed to the exterior as well. Proper maintenance after completing the recommendations herein would include periodic washouts and evaluations approximately every 3 to 5 years in accordance with AWWA recommendations.

Contractor Selection: The work should be performed by a competent bonded contractor, chosen from competitive bids taken on complete and concise specifications. The coatings used should be furnished by an experienced water tank coating manufacturer, supplying the field service required for application of technical coatings.

Standards for Repairs and Coatings: All work done and coatings applied should be applied in accordance with NACE, ACI, ANSI/NSF Standard 61, the manufacturer's recommendation, AWWA D110 and AWWA D102 (latest revisions), and the SSPC: The Society for Protective Coatings.

Observation of Work: Observation of the work in progress by experienced personnel will offer additional assurance of quality protective coating application. Observations can be performed on a continuous basis or spot (critical phase) basis. The actual cost of observation may be less using spot as opposed to full-time resident observation; however, with spot observation it is often necessary for work to be redone to comply with the specifications. This somewhat lowers the quality of the finished product, lengthens the job, and is frequently a cause of conflict between the contractor, tank owner, and field technician. Resident full-time observation minimizes the amount of "rework" required.

Anniversary and Maintenance Evaluations: An anniversary evaluation should be conducted prior to the end of the one year bonded guarantee. Washouts and coating, structural, sanitary, safety, and corrosion evaluations should be conducted not less than every 3 to 5 years.

Time Frame: If the work is not performed within the next 24 months, the structure should be reevaluated prior to the preparation of specifications and solicitation of bids.

Specifications and Bidding Documents: The recommendations in this report are not intended to be specifications on which a contractor can bid. Complete bidding documents must include general and special conditions, detailed technical specifications, and other information necessary for the competitive bidding process. To properly protect the interests of the tank owner, Contractor, and

Engineer; the initial evaluation, the technical specifications, legal portions of the contract documents, and the observation should be performed by the same firm or with close coordination of all parties involved.

Limitations of Evaluation: It is believed that the conditions reported herein reflect the condition of the tank as observed on the date of the evaluation, using reasonable care in making the observations, and safety in gaining access to the tank. Should latent defects be discovered during the cleaning of the structure, they should be brought to the attention of the tank owner and the Engineer.

Seismic and Wind Loadings: This tank is located in or near a region of moderate seismic activity. This evaluation and the reporting of the condition of this tank do not warrant the structural condition of the tank or any of the original design for seismic or coastal wind loadings. Likewise, recommendations for this tank do not include modifications which may be required for compliance with present structural codes. It is possible the tank was erected in compliance with pre-existing industry standards which have since been replaced by more restrictive standards.

Hazardous Materials in Coatings: It should be taken into consideration that Federal, State, and local environmental agencies have placed stricter controls on the removal of lead-based and other heavy-metal based coatings from steel structures by the use of conventional abrasive blasting techniques. The paint and blast residue may be considered to be hazardous waste depending on the concentration of lead or other particles in residue.

Please contact Tank Industry Consultants if you have any questions or comments.

Respectfully submitted,

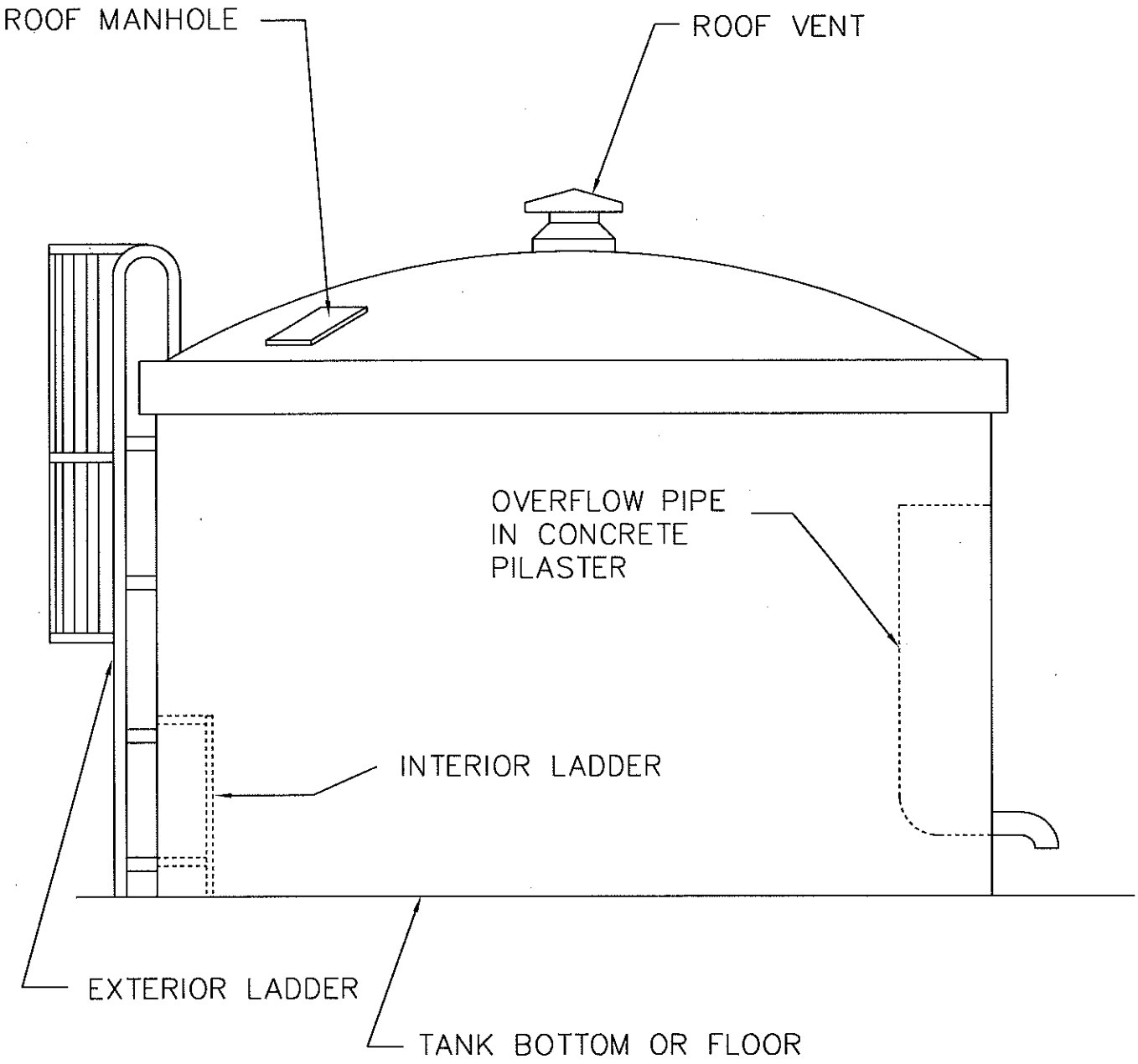
Tank Industry Consultants

Jennifer Coon, ASP, CHMM, CET

Gregory R. "Chip" Stein, P.E.
Managing Principal

STATE OF NEW YORK
GREGORY R. STEIN
073283
LICENSED PROFESSIONAL ENGINEER

CONCRETE GROUND STORAGE TANK



NOMENCLATURE

1. Tank and site.

2. Tank.

3. Surrounding area.

4. Surrounding area.

5. Access road to site.

6. Water standing around tank.

7. Shell manhole.

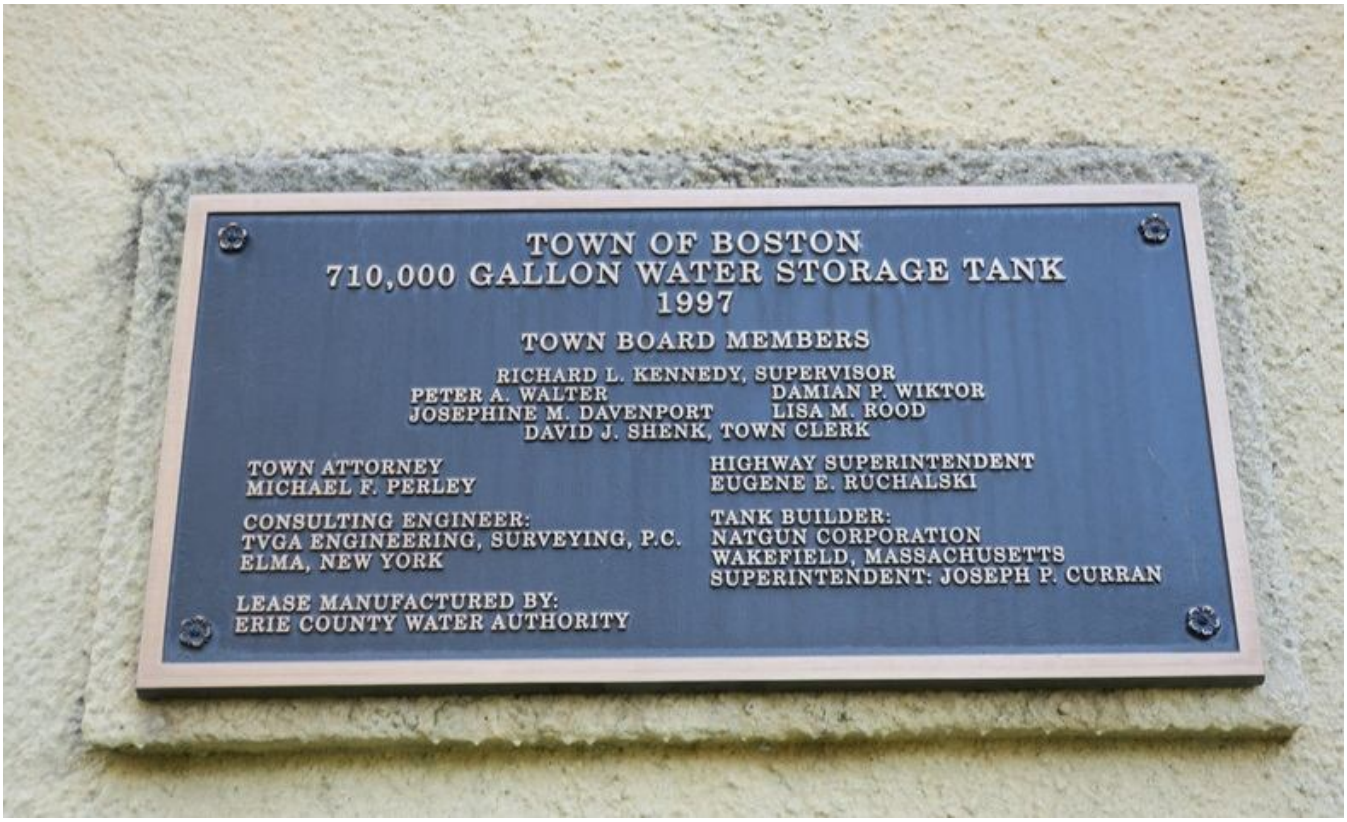
8. Shell manhole.

9. Overflow pipe discharge above drain basin.

10. Shell exterior.

11. Shell exterior.

12. Shell exterior.



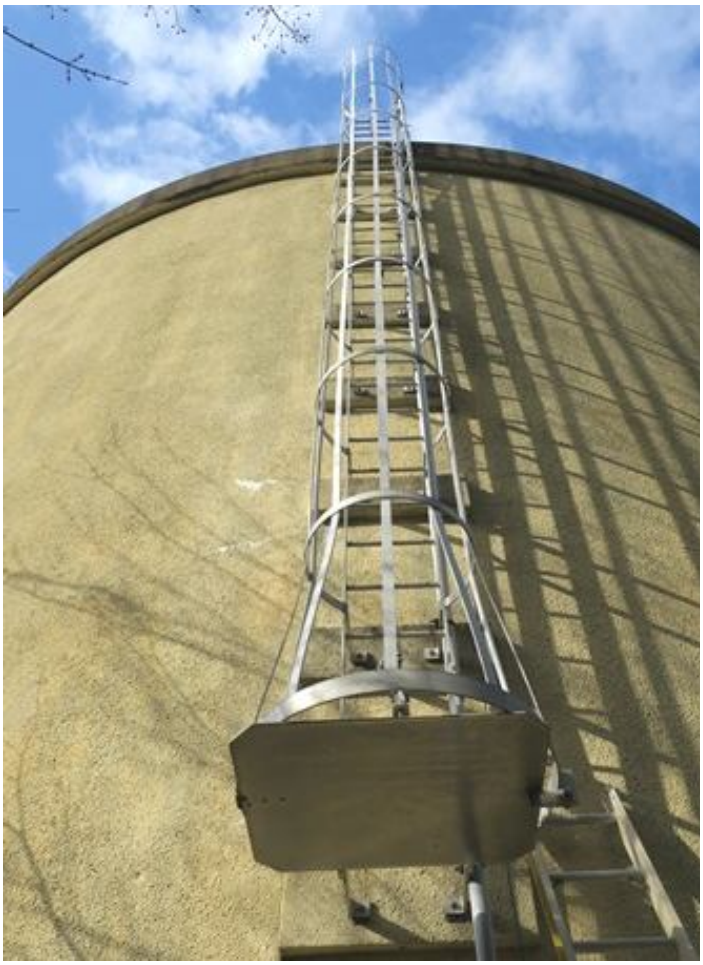
13. Tank nameplate.

14. Moss near base of shell.

15. Efflorescence on shell.

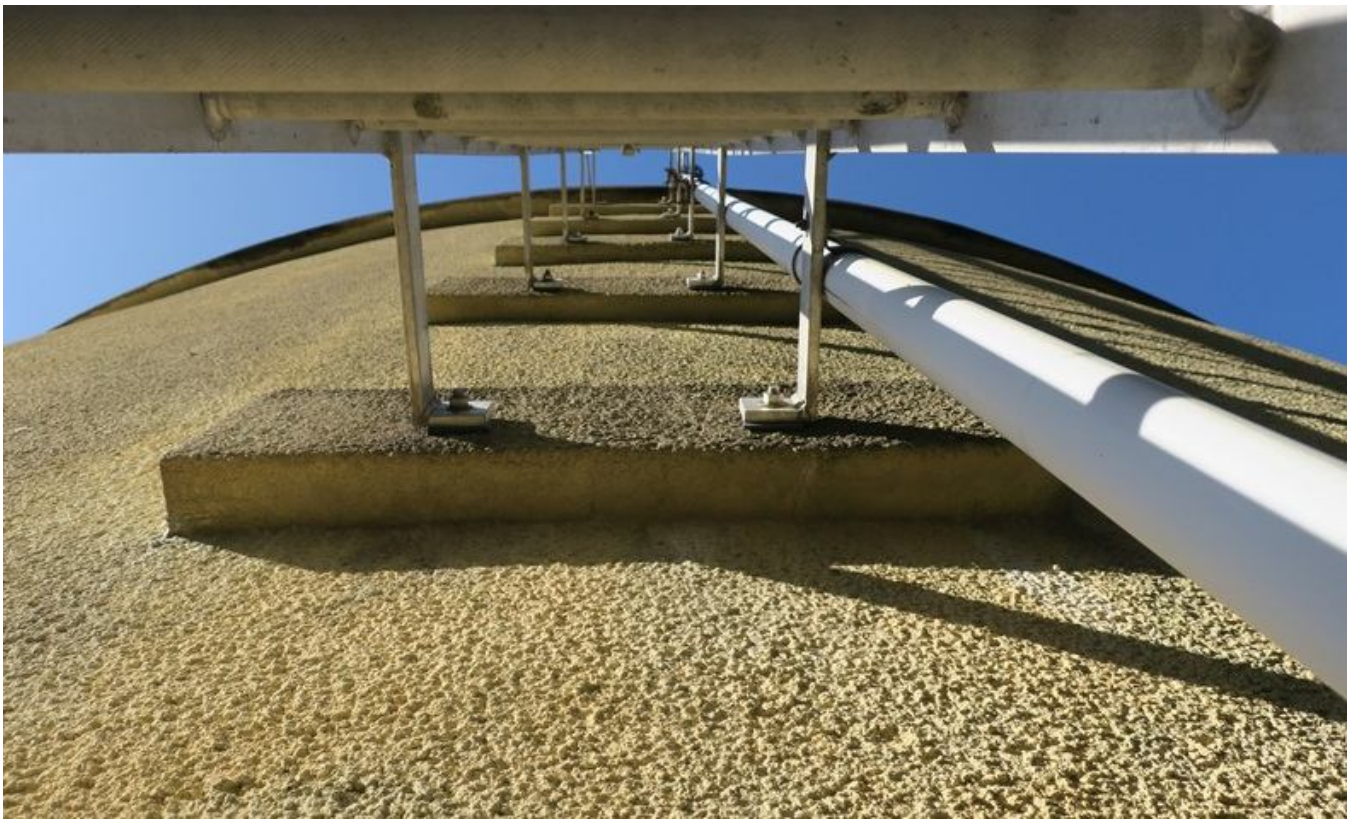
16. Efflorescence on shell.

17. Efflorescence on shell.



18. Exterior ladder, safety cage, and vandal deterrent.

19. Exterior ladder, safety cage, and safe-climbing device.



20. Exterior ladder, brackets, and conduit.

21. Safe-climbing device bracket not equipped with washer and nut.

22. Shell exterior.

23. Ring beam.

24. Roof manhole, roof access, and antenna.

25. Antenna and roof access.

26. Roof manhole.

27. Surface deterioration in roof perimeter.

28. Efflorescence in roof.

29. Roof exterior.

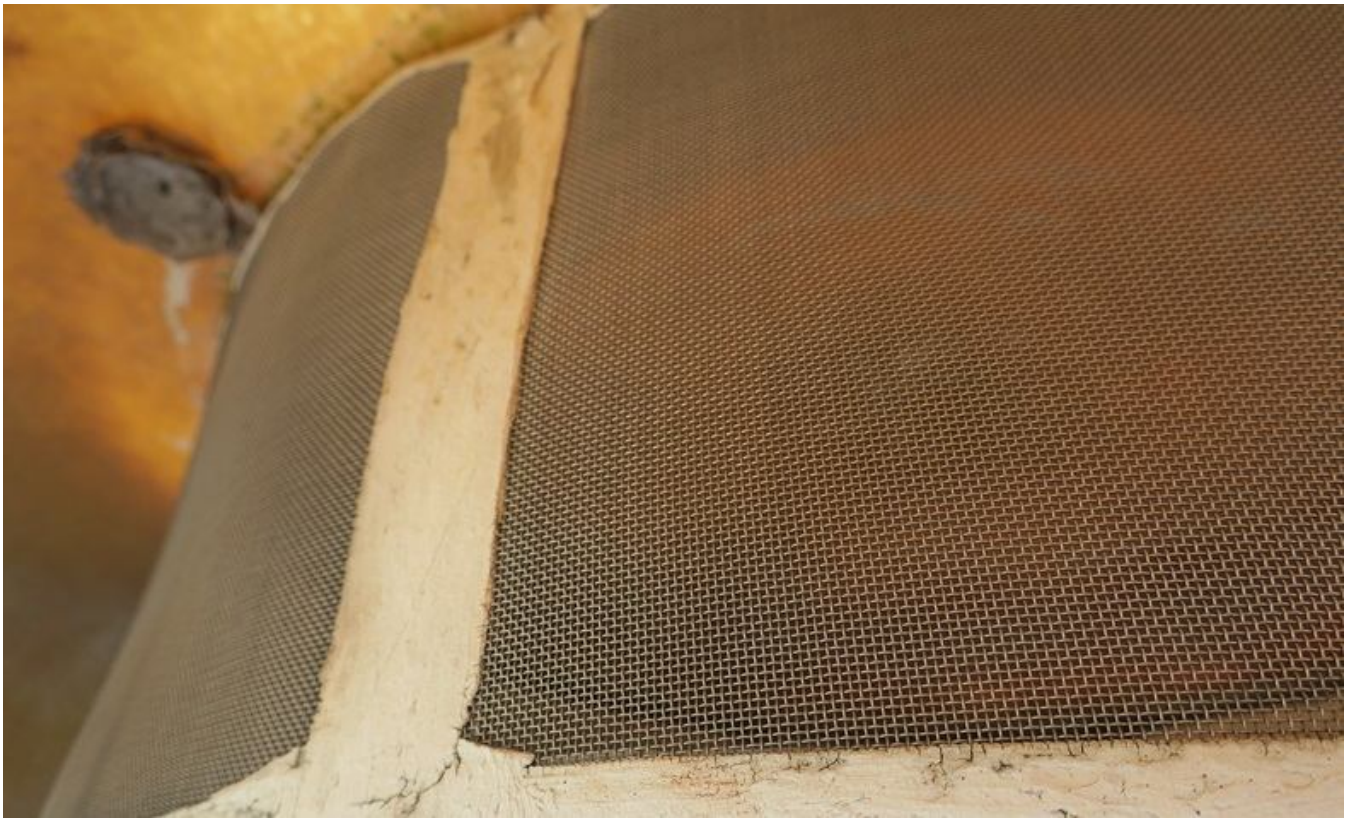
30. Roof exterior.

31. Roof exterior.

32. Efflorescence on roof.

33. Spalling and cracking in roof.

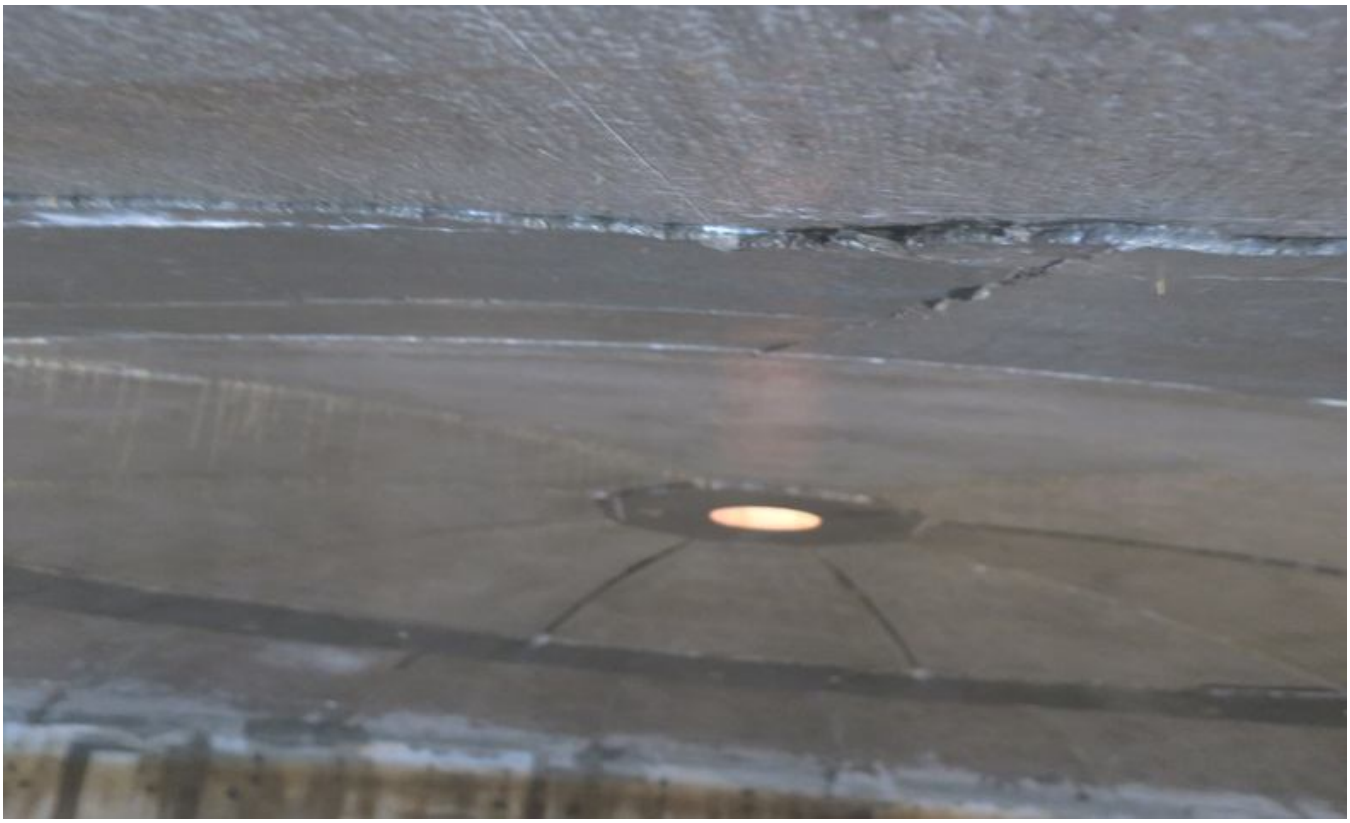
34. Roof vent.



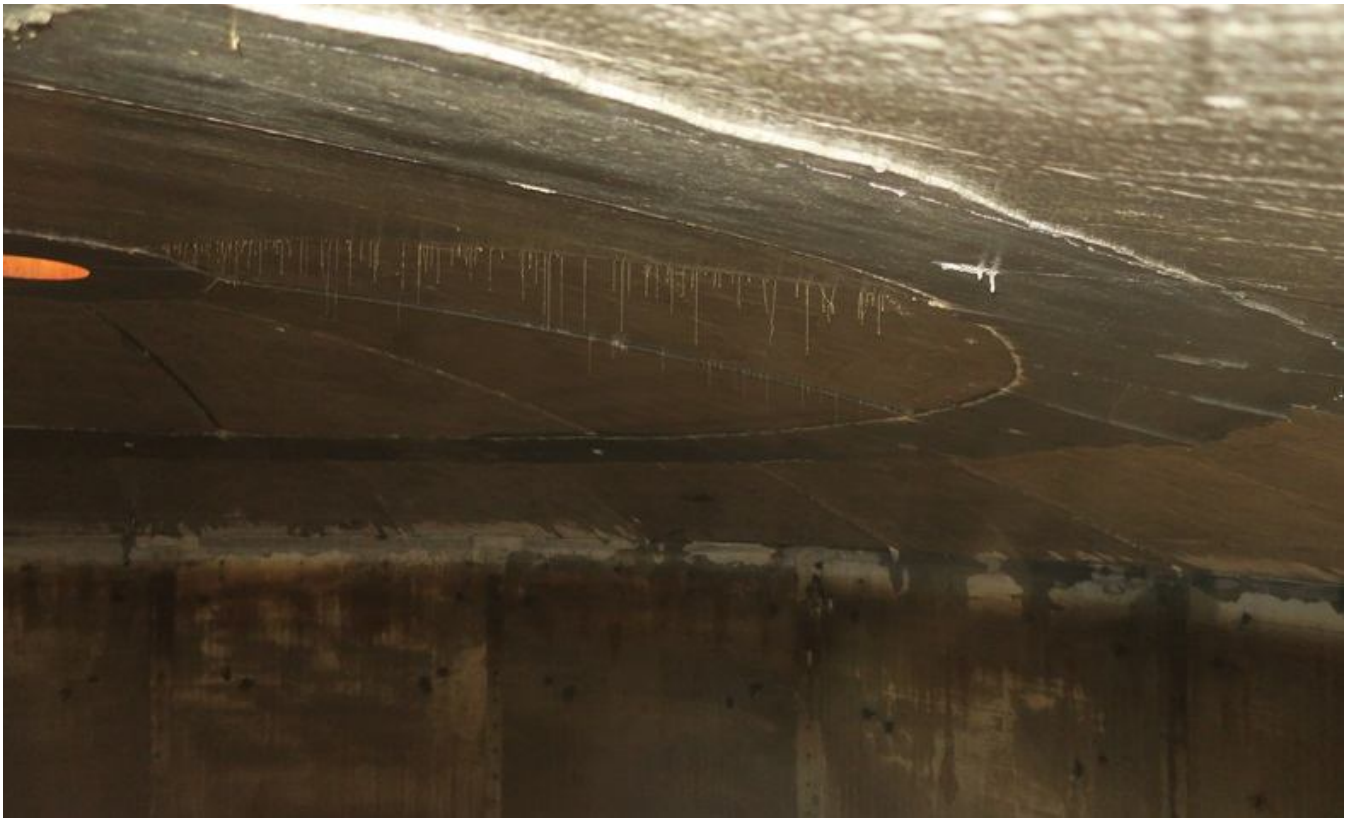
35. Roof vent screening.

36. Roof interior.

37. Roof interior.



38. Crack in roof.



39. Stalactites on roof.

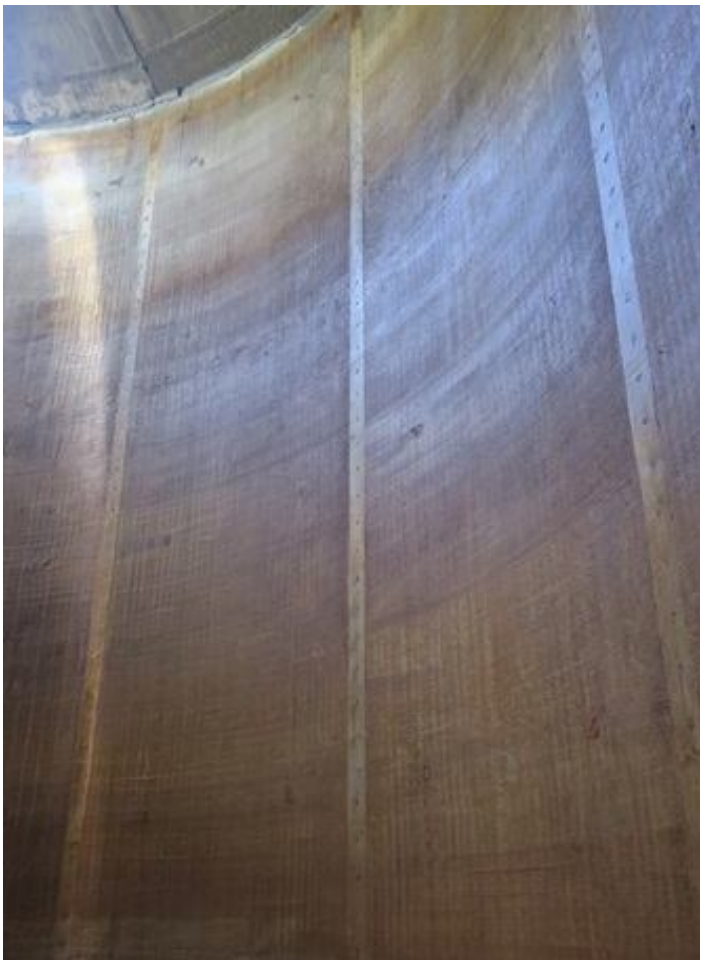
40. Roof interior.

41. Roof interior.

42. Upper shell.

43. Concrete encasing overflow inlet.

44. Concrete encasing overflow pipe.



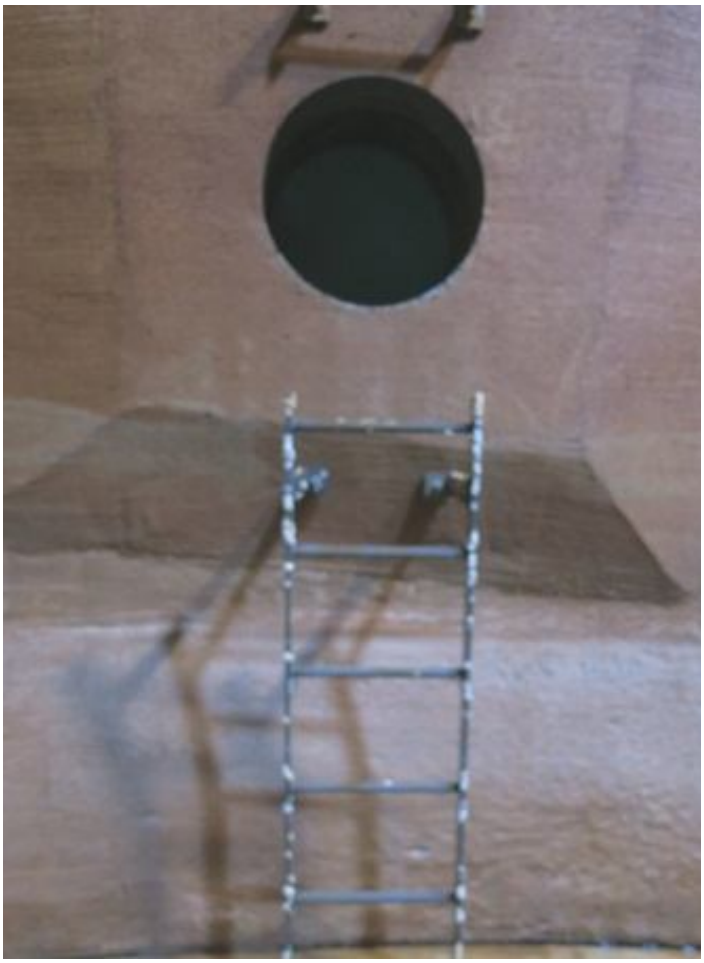
45. Shell interior.

46. Shell joint.

47. Shell interior.

48. Rust tubercles at exposed steel in shell.

49. Rust tubercles at exposed steel in shell.



50. Shell manhole interior and ladder.

51. Deposits on interior ladder.

52. Sealant on lower shell.

53. Deposits on interior ladder.

54. Voids in material along shell-to-floor connection.

55. Floor.

56. Floor.

57. Corrosion on interior pipe projection.

58. Corrosion on piping in sump.

59. Piping in sump.

60. Corrosion on piping in sump.