APPENDIX C
Dive Inspection Report – Existing Welded Tank

INSPECTION REPORT FOR THE

TWAIN HARTE COMMUNITY SERVICE DISTRICT'S

MILLION GALLON TANK #2

DECEMBER 29TH, 2017

ADVANTAGE TECHNICAL SERVICES, Inc.
Specialty Engineering & Inspection Company
(805)595-2282

INSPECTION REPORT FOR THE
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MILLION GALLON TANK #2

DECEMBER 29TH, 2017
REVISION DATE: N/A

Pursuant to the California Business and Professions Code section 6735, the engineering report contained herein has been prepared by or under the direction of the following Registered Engineer:

ADVANTAGE TECHNICAL SERVICES, INC.
6661 FERN CANYON LANE
SAN LUIS OBISPO, CA 93401
805-595-2282

UNDER THE SUPERVISION OF:
WILLIAM D. BELLIS

Registered Civil Engineer, CA C55334

EXECUTIVE SUMMARY

Advantage Technical Services, Inc. (ATS) inspected the Twain Harte Community Services District's Million Gallon Tank #2 on November 29th, 2017. The internal and external conditions of the tank were examined in preparation for future rehabilitation work. Advantage Technical Services, Inc. (ATS) performed the inspection and evaluation.

The interior roof coatings and structural steel are in poor condition. Significant corrosion and metal loss are present on the rafters. This corrosion has reduced the strength of the roof. The corrosion has also roughened the surfaces which will make future coating more difficult.

The interior coatings below the water line are generally protecting the steel from corrosion except in scattered spots. The tank plate steel is in good condition overall but coatings are significantly aged and are beginning to fail. Adhesion testing showed a fair bond between the existing finish coat and the underlying paint so top coating the existing will have risks.

SCOPE, OBJECTIVE, AND LIMITATIONS

An inspection was completed on the interior and exterior of the welded steel potable water storage reservoir located in Twain Harte, California. Principle Inspector/Engineer, Will Bellis, P.E. and ATS associates provided the tank inspection.

ATS divers have experience and certifications that meet or exceed the requirements of AWWA C652 Standard for Disinfection of Water Storage Facilities and OSHA regulations for technical or commercial diving. Additionally, our team's certifications or licenses include a Registered Professional Engineer, API 653 Tank Inspector, AWS Certified Welding Inspector, National Association of Corrosion Engineers Level III Coating Inspector, and American Society of Nondestructive Testing Level III Engineer. With these applicable credentials, our team exceeds any other in the industry. The dive team has combined experience of over five hundred tank dive inspections.

The diver's air supply is supplied by air hoses from the surface using either a dive compressor or bottled air. The diver's air supply system offers triple redundancy; including a self-contained system maintained in the diver's possession and control. A full-time communication system supports documentation of findings and operational or emergency communications. All disinfection procedures are in accordance with the American Water Works Association Standard for Disinfection of Water-Storage Facilities (ANSI/AWWA C652-11).

The photographs provided within this report display representative views and subsequent analysis. Digital video, also included, provides additional documentation of the conditions.

The observations made during the inspection, and included in this report, provide a reasonable evaluation of the tank conditions at the time of the inspection. Considerations of safe access and reasonable care were observed in making and reporting the observations.

Latent defects or conditions found during subsequent cleaning, inspections, or other work at the tank must be brought to the Engineer's or Owner's attention.

OBSERVATIONS

General Tank Data

Type: Ground supported welded steel reservoir
Media Stored: Potable water
Diameter: 66'-0" (Measured Circumference: 207'-7")
Height: 40'-0"
Construction Date: 1976
Water level during inspection: Approximately 38'-6"

Foundation

The concrete ring footing foundation is in good condition overall. The tank may have originally been set on asphalt impregnated expansion joint material, commonly used at the time of construction, but the bottom is now resting directly on the concrete. This tank does not appear to have a thickened an annular ring (as compared to tank #1).

Exterior Shell

The exterior shell coating is in fair condition. The coatings have protected the steel shell effectively from significant corrosion.

The coatings are aging and minor chalking is present. Chalking is a powdery, friable layer on the surface of a coating. It is normally caused by exposure to UV light and weathering. The degree of chalking indicates the level of erosion of the paint film.

The coatings have been reported to contain lead. Lead is hazardous and should not be disturbed by anyone other than those specifically trained and qualified to work with it. The lead however provides good corrosion protection.

There are 2-3 layers of paint (variation due to maintenance spot repairs). Coating dry film thickness was measured to range from 7-12 mils with 9 mils being the approximate average.

Exterior Roof

The exterior roof coating is in fair condition with minor chalking and some significant areas of general corrosion where the coating thickness has worn away. Corrosion covers approximately 2% of the roof area but none of the locations appear to have significant metal loss and corrosion rates in these conditions are likely to be low due to the climate.

Minor ponding conditions exist on some areas of the roof near the shell. Ponding is often found on tanks with low roof pitch or problems with tank erection. Extreme conditions could result in excessive roof loads but the primary concern on this tank is that the exterior coatings are exposed to submersion conditions. Typical exterior coating systems do not withstand submersion.

The coatings on the roof have been spot repaired so the number of layers of paint ranges from 2-3 (variation due to maintenance spot repairs). Coating dry film thickness was measured to range from 0-6 mils.

Interior Bottom

The coating on the interior bottom appears to be a "hot mop" style of coal tar. The coal tar extends up the shell. A few widely scattered corrosion nodules are present. The nodules are around ½" diameter.

Corrosion product from the roof structure and a light dusting of light brown material was present over the entire bottom. Corrosion product was most concentrated around the center of the tank. The sediment was not removed as part of this work scope. Interior spot repairs were not completed by the diver as part of this work scope.

Interior Shell

Interior shell plate is in good condition overall. Reddish colored staining is present on much of the interior shell. Coal tar extends up the shell from the bottom for about 4 inches. Epoxy coatings are protecting the remaining shell well overall. The worst area of coating failures is around the "door sheet" where scattered nodules are present along with some cracking and peeling coatings.

Several red oxide colored spot repairs are present. One is in ring 3 about 20 ft. clockwise of the shell door sheet. The other repair area is adjacent to the manway in quadrant 3. The area of each of these is approximately 4 square feet. Other repairs are smaller.

Interior Roof Plate

The interior roof plate steel is in fair condition but aging coatings have broken down and are in poor condition. Some significant metal loss can be seen along the lap joints. Staining is present over most surfaces. The staining appears to be the result of the increased permeability of the coatings. Cracking of the coating is visible in many areas.

Roof Structure

The roof is supported by a single center column with channel rafters and a round tubular center column. The base plate is the welded type. The most serious corrosion problems are above the water line.

The coatings and structure itself are in poor condition above the water line. Significant metal loss is present due to the corrosion. Corrosion is most concentrated near the roof vent at the center of the tank. It is estimated that the metal loss has progressed enough to cause severe roughening on the tops of the rafter flanges and sharp edges on the flanges themselves. Both of these conditions will make future preparation and coating less effective and more difficult.

Several sets of bolts are missing at the rafter to center support connections.

Cathodic Protection System

The elements of the sacrificial anode cathodic protection system appeared to be intact but the system is reported as being non-operable. The reference cell(s) appeared to be in normal operating condition.

Appurtenances

Level Gage: Gage board brackets, roof hardware and float all appear to be in fair to good condition and the gage appears to be operational.

Exterior Ladder and Cage: This area is in good condition overall. Adequate clearance is provided to the tank shell. There is no ladder below the mid platform.

Roof Guardrail: The guardrail is in fair condition overall but with minor scattered corrosion.

Roof Hatch: One lockable square roof hatch and one multi-bolt round opening are present. Corrosion, metal loss and roughening are present on the interior of the square hatch.

Internal Ladder: There is no internal ladder. Some brackets are present but they appear to be from a previous ladder installation.

Overflow: The visible exterior of the overflow is in good condition. The internal areas of the overflow weir were corroded and mostly uncoated.

Outlet: The outlet penetration in the tank bottom appeared to be in normal condition. Heavy interior corrosion was visible on the piping.

Sample Tap: Not accessed on exterior. Interior locations appeared to be in operable condition.

Roof Vent: The roof vent and screen are in fair condition. Significant corrosion was noted on the interior and hardware.

High Inlet: The PVC inlet piping is in good condition. The pipe is caulked at the shell penetration.

Manways: Two manways are present. The manways are in good condition overall but with minor corrosion on the interior.

RECOMMENDATIONS

The following recommendations are based on our experience as engineers and inspectors with regard to the best industry practices used by both public and private tank owners. The intent is to provide information that will likely help lower risks, optimize water quality and increase long term value for the tank owner(s). Our scope of work does not include a safety audit or evaluation but we are making recommendations where we have noted potential issues. The owner's insurance provider or safety consultant should be consulted for a review of the safety features of this facility where desired.

1. The corrosion conditions on the upper interior necessitate preparation and coating at the earliest possible time to prevent further damage from corrosion. Plan to replace most rafters due to excessive pitting, section loss, and the challenges associated with coating the rough surfaces. Have an engineering evaluation of the roof structure with consideration of snow and seismic sloshing loads to verify appropriate rafter size. Consider installation of an additional large manway or temporary door sheet during future work to improve access during coating and repair operations.

2. Exterior coatings have been effective in protecting against corrosion but they are aging and beginning to fail on the roof. Adhesion between the existing prime coat and finish coat is fair as indicated by the cross cut adhesion testing that was completed as a part of this work. Top coating the existing system would reduce preparation cost but will also increase risk of premature failure. Removal of existing spatter should be included in the coating preparation specification for future work. Containment should be provided if exterior blasting is used (assuming lead is present).

3. Consider options to repair the roof ponding or design coatings to withstand submersion during future rework.

4. The inlet is PVC. Include applicable special provisions for coating and preparation during any future painting work.

5. Cathodic protection anodes appear to be in good condition. Remove, rehabilitate and reinstall the CP system during the future coating project.

6. The exterior ladder safety climb has been painted. Check to confirm that this does not create issues with operation and rectify if appropriate. Specify no painting during future work.

7. This tank has previously been reported as having lead based coatings. Notify personnel working on this tank that lead based coatings are likely present and that the coatings shall not be disturbed without proper training and procedures. ATS took

samples during our visit. These should be tested by a qualified lab prior to any disturbance or action that would cause release into the environment or would otherwise expose workers or the public. Testing should include heavy metals found in coatings such as lead, cadmium and chromium.

8. Provide a designated tie off point on the roof. Since only partial guardrail is present, fall protection anchorage is required. The tie off point should be engineered for fall protection pursuant to OSHA regulations. A permanent cable lanyard affixed to the roof vent may be adequate, but this system would also require an Engineer's acceptance. ATS, Inc. or other engineers familiar with tank structures and OSHA regulations can provide assistance with meeting the applicable regulations.

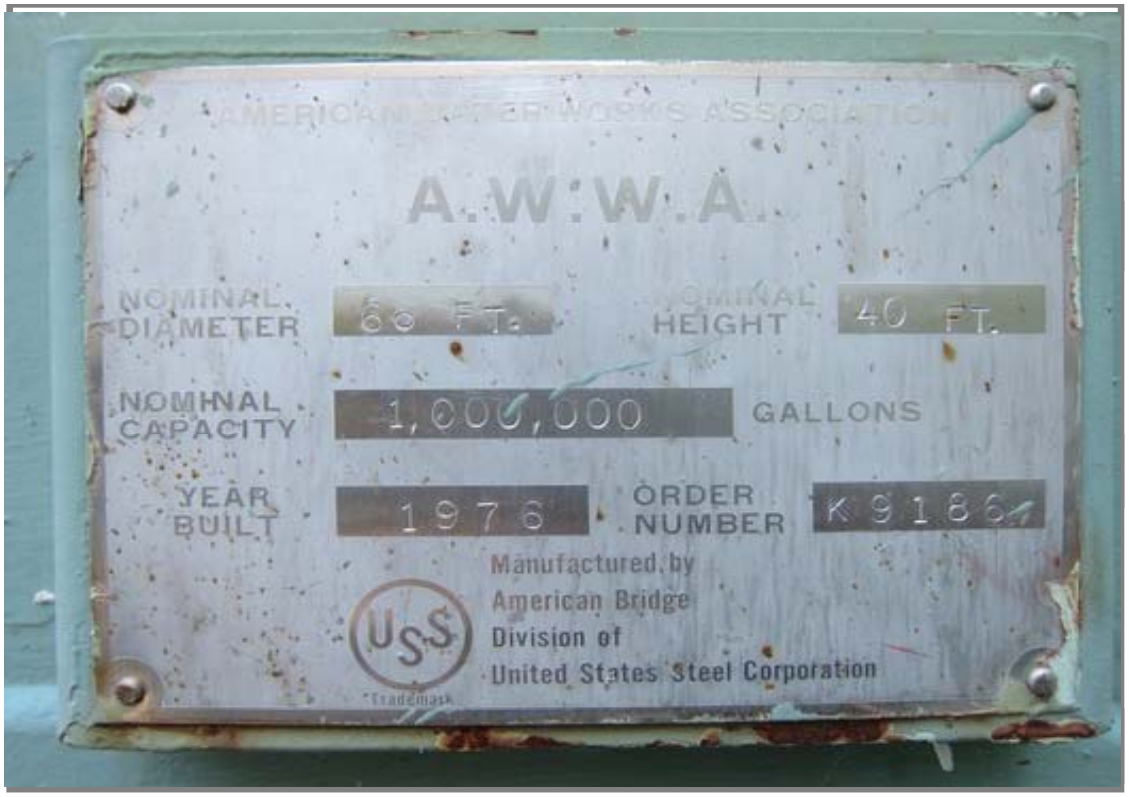
9. The roof guardrail opening at the ladder is un-protected. Instruct and document training of personnel on the use of fall protection and other applicable safety procedures when working on tank roofs and other elevated locations.

10. Consider a review of the seismic design of the tank prior to future rehabilitation work. This type of review would include updated engineering evaluations that could help lead to improving the potential for service after an earthquake. Updates include design to prevent shell failure, improved flexibility of piping connections and new recommendations for preventing roof damage from sloshing waves. ATS recommends consideration of the tank seismic use category such as post-earthquake fire suppression, post-earthquake recovery, or service to facilities that are important to the welfare of the public.

11. Provide annual inspections of the exposed side of the tank shell to bottom connection pursuant to AWWA D100-11. Weeds, dirt, and foreign materials should be removed from this area to eliminate or reduce trapped moisture and associated corrosion.

12. Provide inspection of the interior and exterior along with corrective maintenance at the recommended interval of every three years pursuant to AWWA D100-11 (Forward, Section III, pg. XX).

Plan view of tanks and site (courtesy of Google).



Tank name plate.

Overall view of the MG #2 Tank.

Lower shell and concrete footing. No significant corrosion points were identified.

This view of the concrete footing and lower shell shows the typical condition found.

This view represents the typical conditions on the upper shell and shell to roof joint. The upper shell is in good condition with only minor corrosion points noted.

Welds on the exterior shell are generally smoother than the older tank #1 because the welds on this tank are mostly by a mechanized system. Some scattered spatter is present particularly in the areas of welded repairs completed manually.

This view indicates the overall condition of the roof. The roof plate (steel) is in good condition but coatings are in poor condition.

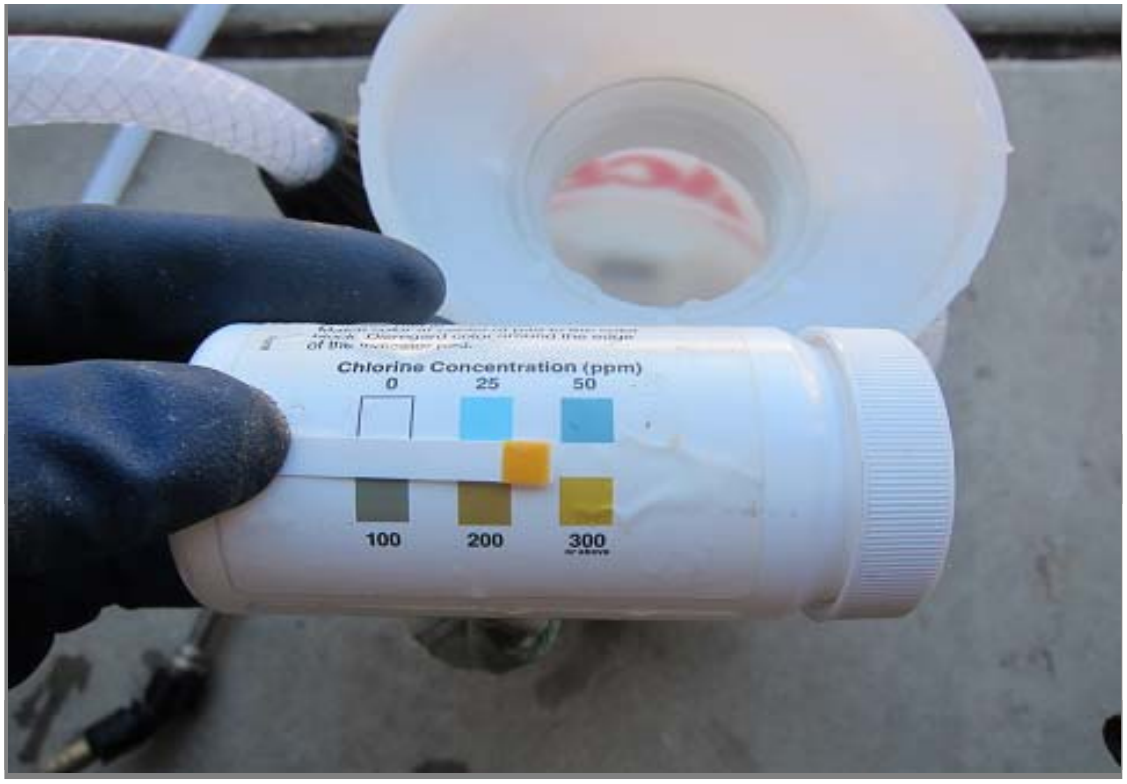
Close view of a ponding area with corrosion. Submersed exterior coatings pose a maintenance challenge.

The photo above shows the roof hatch area with guardrail. A second hatch is visible in the foreground.

This view from the ground shows the platform, exterior ladder and cage.
No significant corrosion is present. The climber safety rail has been painted.

The roof vent consists of a steel cover over a steel riser pipe.

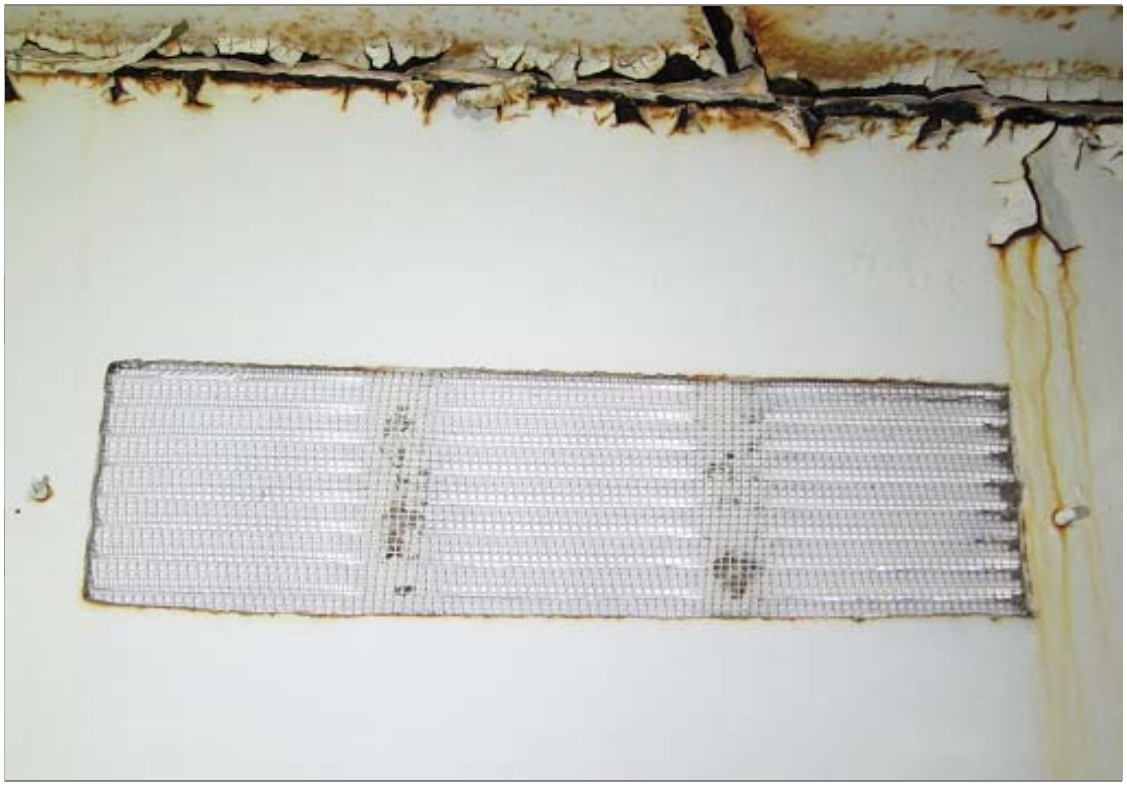
This view of the underside of the vent hood shows that the screen is in good condition. Corrosion is present on the riser but the screen appeared to be bug proof.



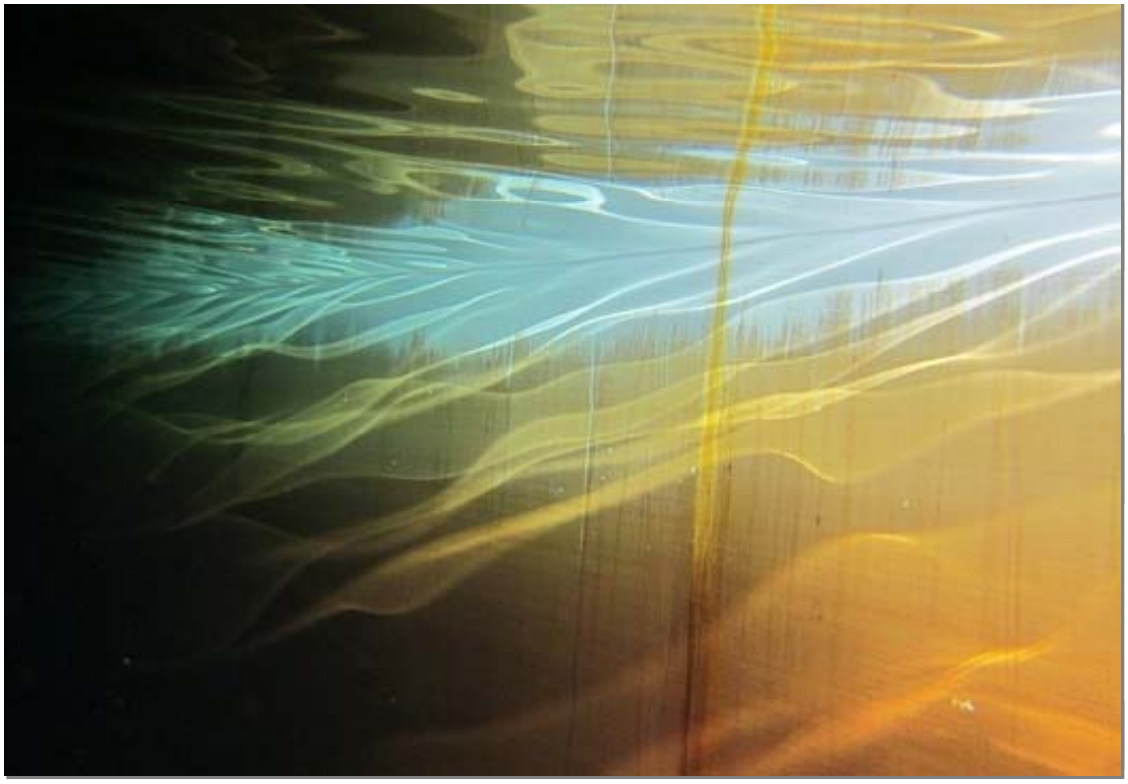
The disinfecting solution is tested to verify that it exceeds the 200 ppm free chlorine concentration level.

Diver and equipment are disinfected with the chlorine solution just prior to entry. This procedure is pursuant to AWWA disinfection standards for potable water diving.

Upper shell, rafter and adjacent roof. Coatings are peeling and general corrosion is present on many surfaces.



This is a close view of the upper shell showing one of the numerous shell vents.



The photo above shows the interior shell just below the water surface (submersion zone). The rust color on the shell is staining.

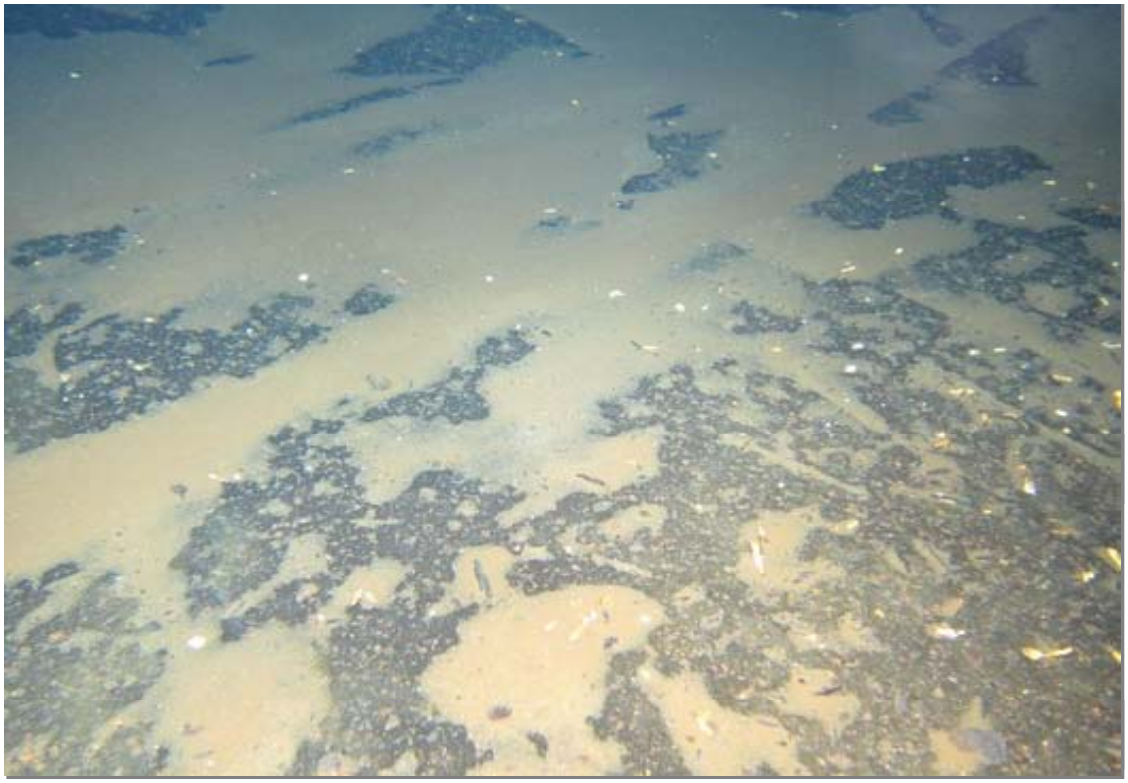
Interior shell in the submersion zone. This view shows a junction between a horizontal and vertical shell joint. The interior shell steel appears to be in good condition overall.

Interior shell in the submersion zone near the manway in quadrant 1. The coatings are cracking and corrosion is present.

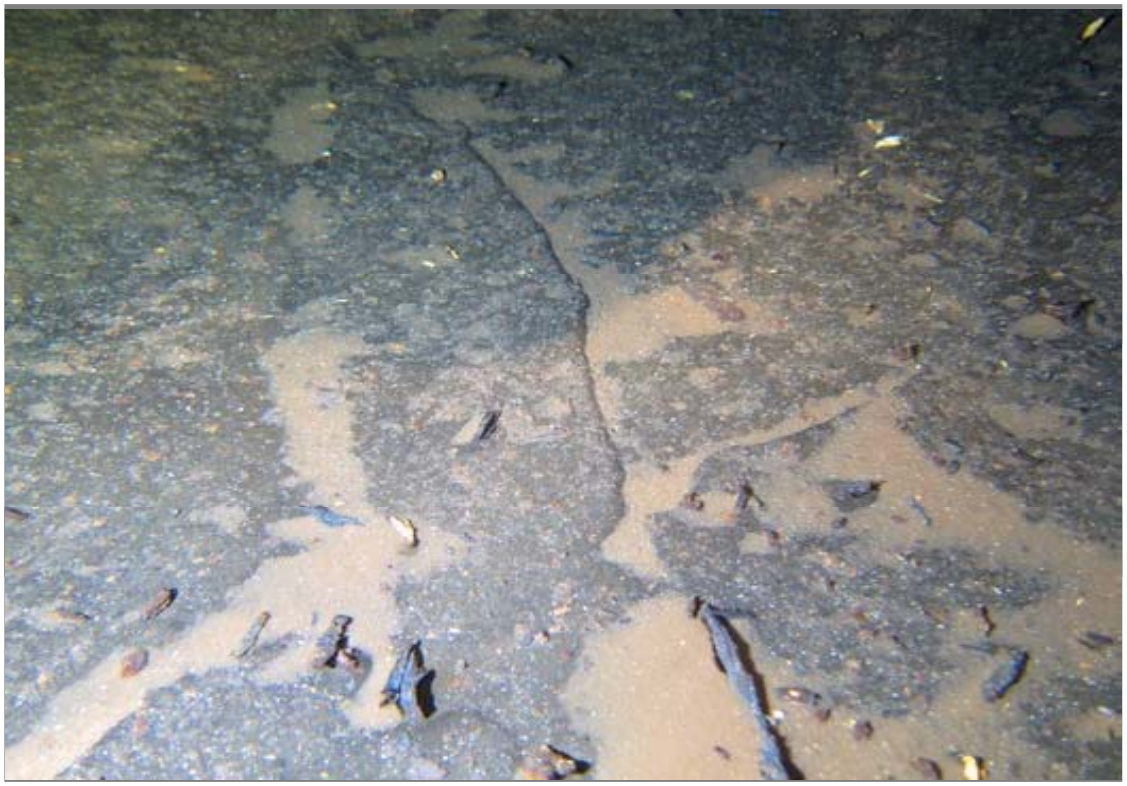
This view of cracked coatings is where a shell opening (door sheet) was cut and re-welded upon completion of the work. This area has a particularly high concentration of coating failures.

Lower shell and tank bottom. Coatings are in fair condition overall in this zone.

This photo shows an area of the lower shell where coatings are failing. This is an example of the worst condition in this zone.



This photo shows the typical condition of the bottom. Sediment removal was not completed with this inspection.

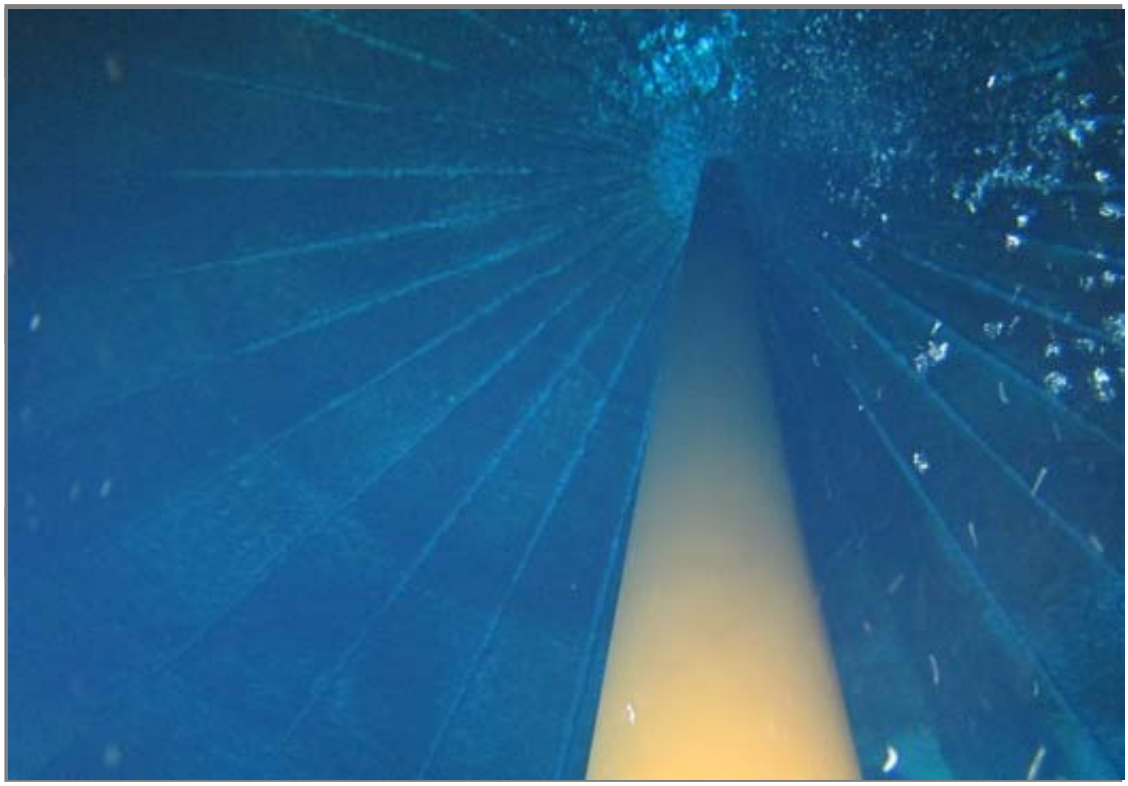


This additional view of the bottom shows some of the corrosion product from the rusting roof rafters above.

Additional view of interior bottom with coating chip from a roof rafter.

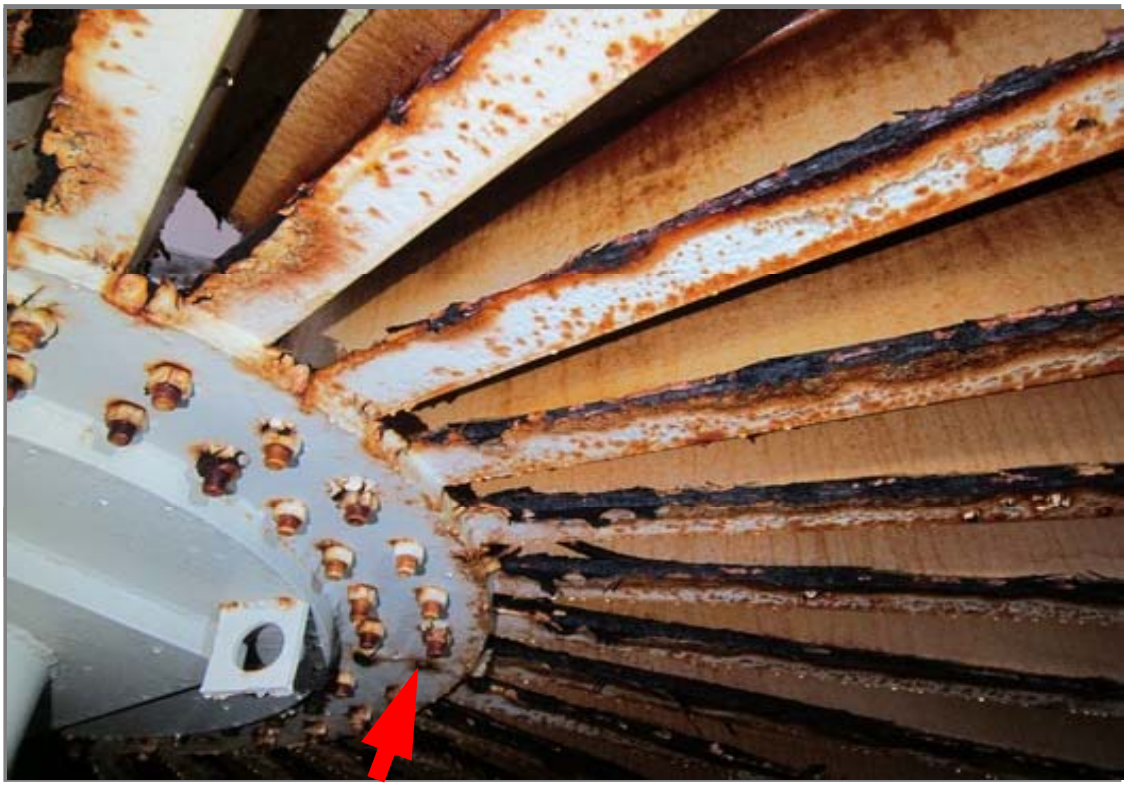
Bottom at the center support.

This view shows the column base plate and adjacent bottom plate. Coatings are in poor condition overall on the column and base plate.

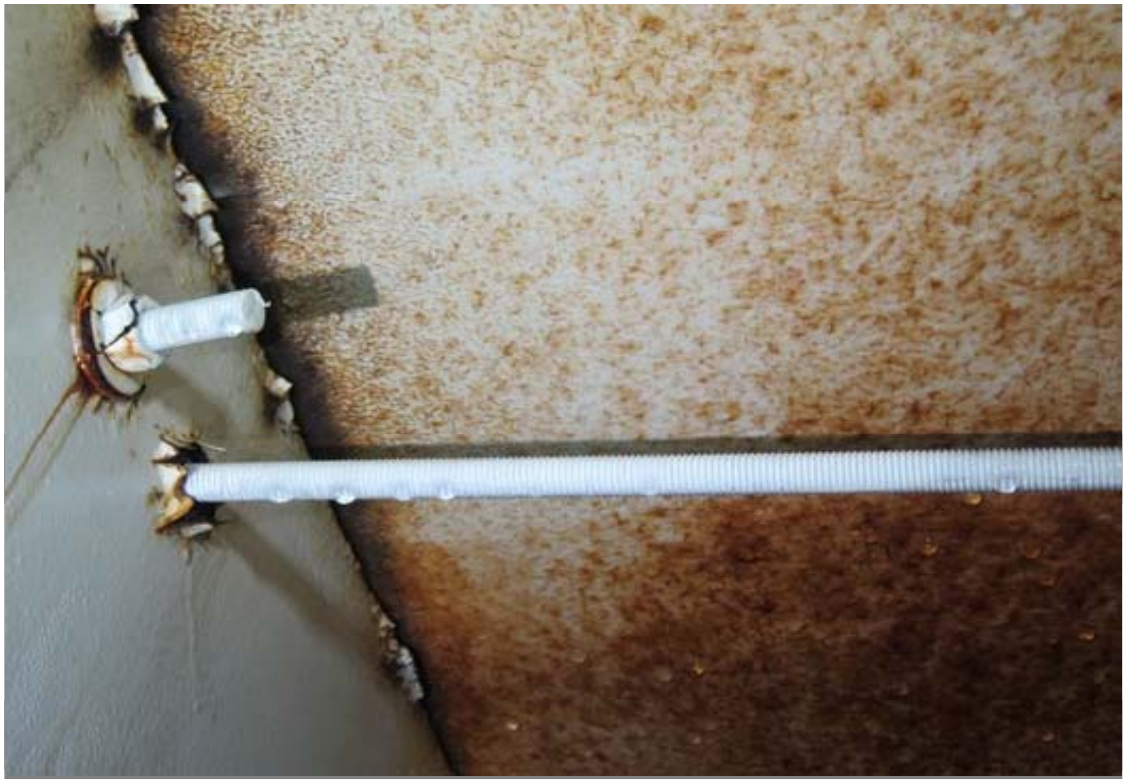


This shot was taken looking upward at the center column. The column is in good condition overall.

Upper center column, rafters and roof plate. Significant corrosion and associated metal loss are present.



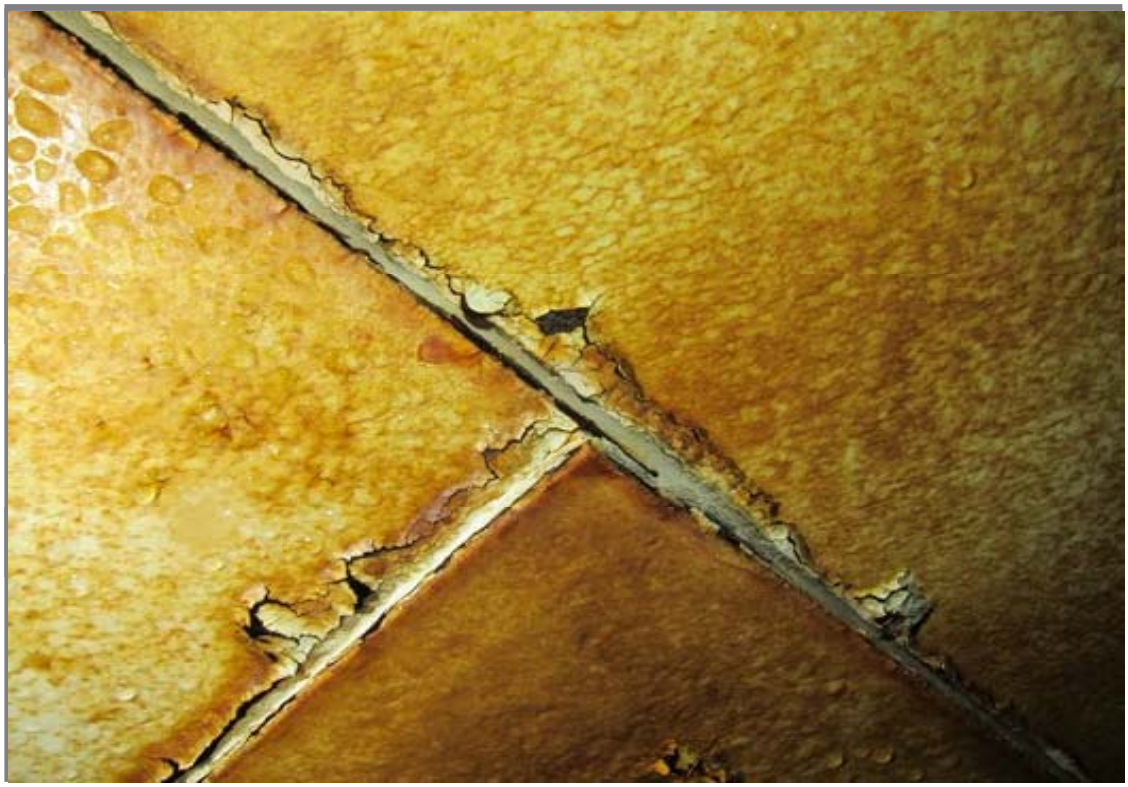
Close view of the center support and rafters. Coating failure and associated corrosion are visible. Several sets of bolts are also missing one of which is shown at the arrow.



Rafter bracing at the connection to the web of a channel rafter on the interior roof.

A typical rafter with serious metal loss due to corrosion on the flanges.

This broad view of the roof is looking toward the roof hatch from near the center.

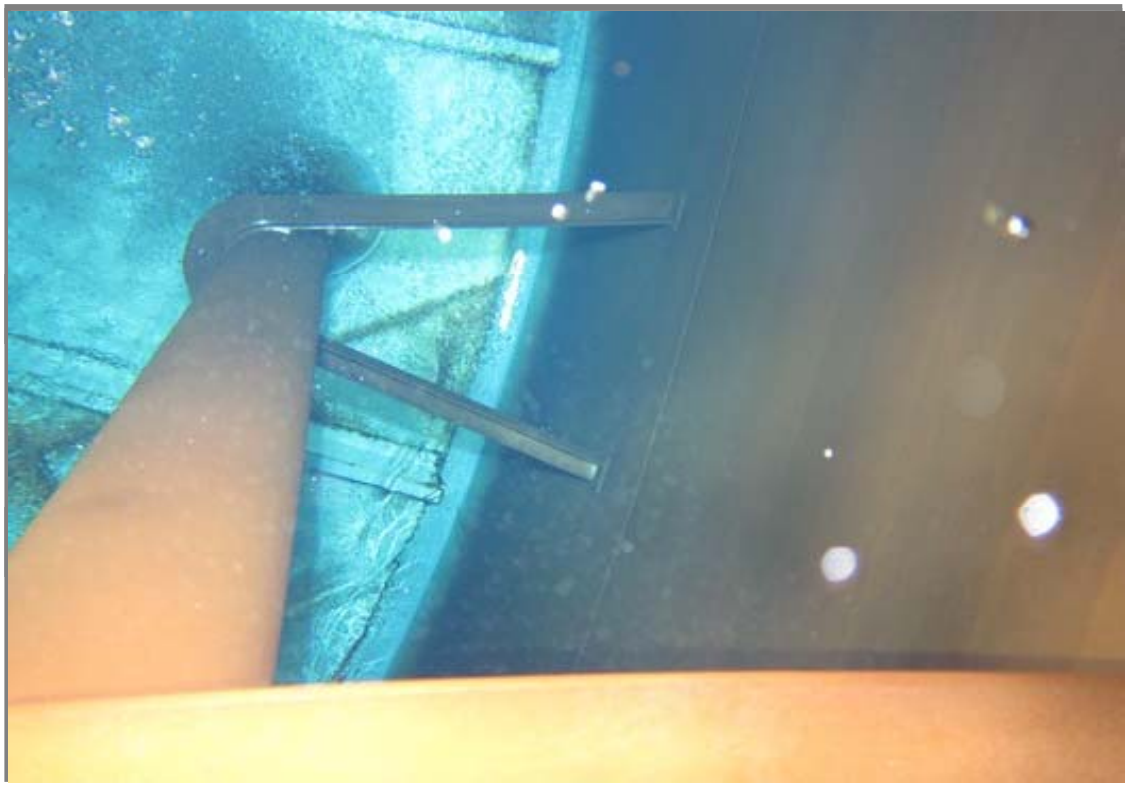


Interior roof plate lap. This view shows the concentrated corrosion that is present at lap joints along with the general corrosion on the plate.

View of the roof hatch from the interior. The diver's entry ladder is visible.

Corrosion on the interior side of the roof hatch.

Interior of the overflow weir.



Overflow riser pipe looking upward.

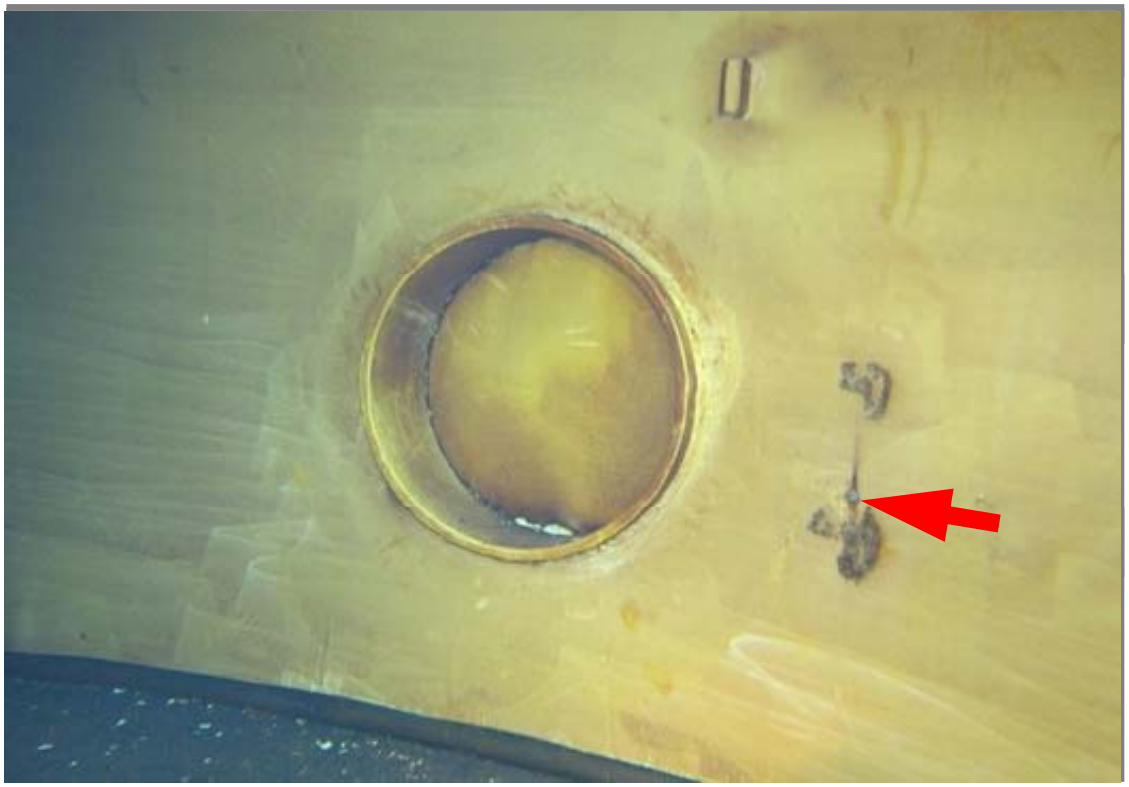
The drain is located approximately 4 ft. from the shell.

An additional view showing the interior of the drain.

Interior bottom with the outlet penetration.

Corrosion nodules on the interior of the outlet pipe.

Interior view of the shell manway near quadrant 3. A spot repair is visible to the right and some significant corrosion is present below the manway.



Shell manway in quadrant 1 as viewed from the interior. The spots shown at the right are areas of significant corrosion with a 3/4" diameter nodule at the arrow.

These cathodic protection system reference cells are located below the roof hatch.

Typical view of a cathodic protection hand hole cover in good condition as viewed from the exterior roof.

Adhesion was evaluated with a cross cut tape test and found to be 2A-3A.
This location was on the exterior roof.

Adhesion was evaluated with a cross cut tape test and found to be 2A-3A.
This location was on the exterior shell at the mid platform.

Chalking was evaluated pursuant to ASTM D4214, test method A. Chalking is approximately a No. 7 valuation as compared to photographic reference standard No. 1

Scattered areas of spatter are present on the shell and roof welds. The area shown above is a repair completed manually. The weld on the left is by a mechanized system.